

BOHS

[BASIC OCCUPATIONAL HEALTH SERVICES]

for Informal Industry Manual for Primary Care Providers



EDITORS:
Ramnik Parekh | Suvarna Moti

Foreword by:

*The President - International Commission on Occupational Health and
The President - World Organisation of Family Doctors*



Indian Association of Occupational Health
Basic Occupational Health Services Initiative

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(BASIC OCCUPATIONAL HEALTH SERVICES)

for Informal Industry
Manual for Primary Care Providers

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Editors

Ramnik Parekh | Suvarna Moti



Indian Association of Occupational Health
Basic Occupational Health Services Initiative

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*“When a doctor arrives to attend some patient of
the working class... let him condescend to sit down...
if not on a gilded chair... one a three-legged stool...
He should question the patient carefully...
So says Hippocrates in his work ‘Affections.’
I may venture to add one more question:
What occupation does he follow?”*

— **Bernardino Ramazzini**

De Morbis Artificum Diatriba (1713) Trans. by W.C. Wright
in A.L. Birmingham, Classics of Medicine Library (1983).

Quoted in Edward J. Huth and T. J. Murray
Medicine in Quotations: Views of Health and Disease
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BOHS for Informal Industry through Primary Care Providers

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BOHS for Informal Industry Manual for Primary Care Providers

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After completing medical graduation from KMC, did post graduate diploma studies in occupational and industrial health, industrial hygiene and hospital administration. He is an ILO master trainer in workplace alcohol and other drugs, HIV/AIDS at workplace. Has industrial experience of over 35 years both in private and CPSU. He is the current National President of Indian Association of Occupational Health and has been an active member of the association for over 3 decades and has been promoting OH both at state and national level. His professional affiliation includes Ex-chairman, Green Triangle Society, Ex-chairman, ISTD, Member ICOH, Ex-president, IMA Goa, and SHE Advisor on ILO/ARMADA board.

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He has presented paper titled “CSR: Initiatives and Achievement” at the 7th International Conference on Social Responsibility held in Dubai in April 2012 where MDL was awarded the National Golden Peacock Award for CSR.

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He has also undergone the Lead Auditors Course in ISO 14001 & OHSAS 18001.

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He has experience in the areas of conducting Fire Audits, Fire Evacuation Drills, Hazardous chemicals and implementation of Safety & Environment Management System as per ISO 14001 & OHSAS 18001.

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Foreword – ICOH

*“Safety and Health is not only sound economic policy,
it is a **basic human right**”*

– **Kofi Annan**, UN Secretary General, 2003

HAVING BEEN LOCATED and working for extended periods of my working life in different continents and countries one particular lesson has become clear. Workers around the world need – and have a right to – better work, decent work and they should be able to maintain their physical, mental and social well-being, in other words health at their work.

Far too often occupational health is not taken care of. This is, in particular, the case of those not having a formal contract and employment, those who are in the informal sector, self-employed, farmers or farm-workers, fishermen, and any other women, men and even working children not covered by the regulatory framework. This is the case also in India, one of the most populous countries globally.

While we should strive for better jobs and proper contracts we can do a lot in the present work environment in India.

Based on ILO and WHO data it has been estimated that there are 609,000 people in the WHO South East Asian Region who die every year caused by work. The major reasons are cardiovascular diseases at work, occupational injuries, work-related cancers and work-related communicable diseases. India being the most populous economy in the region will unfortunately have the biggest burden of these deaths, and the millions of cases of ill-health and non-fatal injuries.

The ILO has established a number of tools, in particular, Convention Nr. 155 on Occupational Safety and Health, Convention on Occupational Health Services, Nr. 161 Convention on the Promotional Framework on Occupational Safety and Health, Nr. 187, related Recommendations and other instruments. The WHO has established a Strategy to tackle these problems.

I am very pleased to see that many members of the International Commission of Occupational Health and best experts in occupational health in India have established this Manual for Primary Care Providers on Basic Occupational Health

Services for Informal Industry. It is to alleviate the identified problem of poor occupational health services resulting in the death, disability and disease.

It is also very encouraging to see such voluntary action and effort to collect all evidence and experience to help practitioners around India to take informed decisions.

I sincerely hope that this Manual will also be a good guidance for not only identifying the causes and factors at work that are harmful and treating the patients, but also reducing the exposures that are behind the ill-health. In such a way this Manual may be widely shared for para-medical and non-medical staff that may have impact on such adverse conditions at work. Primary health care staff may also find a way to keep the patients and working population informed and aware of the factors that cause problems, and help the workers themselves in preventing problems and disorders.

My congratulations go to all the authors and staff behind this Manual, and I look forward to see visible impact of your invaluable work.

Singapore 18 November 2015



Dr. Jukka Takala

President

International Commission of Occupational Health

Foreword – WONCA



16th November, 2015

I commend the Indian Association of Occupational Health (IAOH) on the development of this manual for training Primary Health Care Physicians about occupational health services. Those of us working in primary care have a responsibility to provide the basic occupational health services needed by our individual patients and our communities in each country of the world. Nowhere is this more important than in India, with the challenges of a huge and growing population in a nation which is advancing in innovation and industry on an unprecedented scale.

This manual advances the pledge made by the World Organization of Family Doctors (WONCA) and the International Commission on Occupational Health (ICOH) in our recent joint statement on addressing the health care needs of workers and the members of their families, *“to work with other partner organizations (including the World Health Organization and the International Labour Organization to address the gaps in services, research, and policies for the health and safety of workers, and to better integrate occupational health in the primary care setting, to the benefit of all workers and their families.”*

Together we can make a difference, and I congratulate the authors of this manual and look forward to witnessing the improvements that this initiative brings in the health of workers and their families in India.

Professor Michael Kidd

President, World Organization of Family Doctors (WONCA)
Executive Dean, Faculty of Medicine, Nursing and Health Sciences,
Flinders University, Australia



About IAOH and Our Initiative on BOHS

About IAOH

The relationship between work and health has been well established since the 17th century when Bernardino Ramazzini an Italian physician- known as the father of Occupational Medicine documented the effect of chemicals on health and also propagated that all physicians should enquire from their patients the nature of their occupation. The discipline of Occupational Health has been recognised in India for a long time now. It was in the steel city of Jamshedpur, in the year 1948, that three visionaries of industrial medicine, Lt. J.R.Kochar, Col. Najib Khan & Maj. R. C. Tarapore, nurtured an idea of establishing a national scientific forum where problems related to Industrial Medicine could be discussed. It was through their relentless efforts that the society for the study of Industrial Medicine (SSIM) India was ceremonially baptized on 9th July, 1948. The Society was renamed as the Indian Association of Occupational Health in the seventies.

The Association which had only 28 members at the inception has grown over the years and presently has more than 3000 members in 22 branches across the country and presently is the largest professional non-governmental organization in the country which is active in the discipline of occupational and environmental health and is committed to the promotion of health & safety at work.

For over 67 years IAOH continues to provide scientific knowledge and guidance to industries on problems of occupational health & hygiene. We believe that purposeful and involved occupational health services at the work place as envisaged by the International Labour Organization (ILO), is the best channel through which modern medicine can help industry achieve positive health and productivity.

The Association holds regular scientific meetings and Regional & National Conferences regularly. It has successfully hosted the Asian Congress on Occupational Health on two occasions and the MEDICHEM Congress once.

India is a large country with a population of 1.3 billion and a workforce of over 600 million. It already ranks as the third economic power globally (GDP by PPP). India's working sector is growing fast not only in the traditional manufacturing sector but also in the emerging services sector. India is well known for its dominance

in the global IT sector. Majority of the workforce are in the informal economy, predominantly agriculture and services. An earlier study, based on an epidemiological analysis of the burden of occupational illness in the country, estimated that there are close to 2 million cases of occupational illness and over 18 million injuries (mostly unreported) in the country.

IAOH is backed by years of experience of organising continuing medical education (CME) sessions, regional and national conferences over seven decades. It is supported by large Indian and Multi-national Industries and Business houses. IAOH has affiliation and/or collaborative and/or ideological relationship with ICOH, ILO, WHO, WONCA, NIOH, NSC and ITRC.

About the Initiative

Cancun Charter of International Commission on Occupational Health (ICOH) advocates: *“Joining our forces and collaborating with other international and national occupational health organizations and actors for ensuring every working individual in the world the right to the enjoyment of the highest attainable standard of occupational health as a part of their basic human rights.”* IAOH, as a member of ICOH, remains committed to this charter.

Over last few years, since the concept of BOHS was universally accepted and promoted, IAOH considered the idea of achieving concrete steps for introducing and implementing it in India. The principal objective of IAOH is its social responsibility and obligation towards the country as the largest NGO in the discipline of Occupational and Environmental Health.

The project took its initial shape during the tenure of the last Central Council and is now in its optimum momentum for action and implementation. We both wish to express our appreciation to the Core Committee chaired by Dr Ramnik Parekh, with Dr Suvarna Moti, Dr G Jayaraj, Dr Hiren Desai, Dr Shyam Pingle, Dr Dileep Andhare and Dr Joel Samuel for their untiring efforts and time.



Dr Chaitanya Gulvady
Immediate Past President

Dr GV Prabhu
President, IAOH



Preface

This manual for training of Primary Health Care Physicians has been developed in the context of the project development of “Basic Occupational Health Services (BOHS) for Informal Industry through Primary Care”. This project, initially conceptualised and funded by the Indian Association of Occupational Health (IAOH) will be carried out in select states as a model project before replicating it on a national scale.

WHO Constitution, Declaration of Alma Ata, Health for All strategy, WHO’s Global Healthy Work Approach (HWA) and the meetings of the WHO Collaborating Centres in Occupational Health have reiterated the importance of preventing occupation-related ill-health, occupational diseases and safety issues at all levels and have emphasized upon the primary health care model for extending these services to those deprived. WONCA and the ICOH have made a joint statement on workers and their families and took a pledge *“to work with other partner organizations (including the WHO and the ILO) to address the gaps in services, research, and policies for the health and safety of workers and to better integrate occupational health in the primary care setting, to the benefit of all workers and their families.”*

Considering the situation in India, the primary health care model seems to best fit the expectations out of BOHS for the informal sector primarily, for affordability reasons.

The objective of Basic Occupational Health Services (BOHS) is to ensure the provision of services for all workplaces which so far have not had such services available or the services have not met their occupational health needs. The BOHS are an effort to provide occupational health services available to each and every working individual in the country irrespective of sector of economy, size of company, geographical area, or nature of employment contract.

Of the 1.3 billion people in India, over 63% belong to the productive age group i.e. of the total workforce of 457.46 million workers in India, 92.38% work in the informal economy, predominantly agriculture and services. Of 92.38%, while 86% are in the informal sector, the remaining 6.38% are actually sub-contracted

workers in the formal sector. Highest proportion of workers is seen in agriculture in the informal sector amounting to almost 58%. Informal sector, also known as unorganised sector, refers to all unlicensed, self-employed or unregistered economic activity such as owner manned general stores, handicrafts and handloom workers, rural traders, farmers, etc. The unorganised occupational groups include:

1. Occupation: Small and marginal farmers, landless agricultural labourers, share croppers, fishermen, those engaged in animal husbandry, beedi rolling, labelling and packing, building and construction workers, leather workers, weavers, artisans, salt workers, workers in brick kilns and stone quarries, workers in saw mills, and workers in oil mills.
2. Nature of employment: Attached agricultural labourers, bonded labourers, migrant workers, contract and casual labourers.
3. Distressed: Toddy tappers, scavengers, carriers of head loads, drivers of animal driven vehicles, loaders and unloaders.
4. Service Workers: Midwives, domestic workers, barbers, vegetable and fruit vendors, newspaper vendors, pavement vendors, hand cart operators, and the unorganised retail.

The objectives of this manual are two-fold:

- Capacity building of primary health care providers in rural areas by providing subject-specific training and monitoring inputs to create a health workforce trained in occupational health practice and capable of adequate delivery;
- Wider dissemination of preventive and control principles of occupational health in the workplaces in the unorganized sector through the agency of the primary health care physicians.

The manual outlines a curriculum for training of PHC physicians/community health workers. It is intended to serve as a reference for physicians and nurses in primary health centres and other health care providers who provide clinical care to those exposed to various health hazards at their workplaces in rural areas of India. It presents the collective knowledge of occupational health and safety relevant to the occupations commonly practised in the unorganized sector. It is important to understand that the evaluation and management of the diseases or injuries in the workers should involve a coordinated team effort including the patient, the primary care physician and wherever possible, the work supervisor/ owner. Ideal though as it may be, involvement of the safety inspectors may be seen subject to introduction of pertinent legislative measures.

Continuous updates in medicine mandate a process to update the contents of this manual. Exploiting the latest technological advances has enabled the utilization of digital platforms for dissemination of specific information through mobile and computer applications. Health care providers are encouraged to use this manual

Preface

as a guide and seek the latest trends made available through these supplemental sources so that they can deliver the highest quality care to those seeking assistance or treatment. However, under no circumstances, does this manual propose to be a comprehensive reference book on the subject and suggests readers to approach authoritative texts for the same.

We gratefully acknowledge Dr. G Jayaraj's kind consent to use his books for sourcing valuable material. We also acknowledge using ILO's Encyclopaedia of Occupational Health and Safety as authentic resource for reference.

The editors thank IAOH for the financial contribution that has enabled the publication of this manual and gratefully acknowledge the professional contributions of GK Kulkarni, Shyam Pingle, Hiren Desai, Dileep Andhare, Joel Samuel and Jeevan Rao. We also appreciate valuable inputs of Dr Vishakhadutt Patil and his team of Dr Madhura Kadoor and Vaishali Tikotkar for content inputs and layouts.

Dr. Ramnik Parekh

Dr. Suvarna Moti



Conceptual Framework: Integrated OHS

Precept

Ramnik Parekh and Suvarna Moti

OF THE 1.3 BILLION POPULATION OF INDIA, over 63% belong to the productive age group i.e. of the total workforce of 457.46 million workers in India, 92.38% work in the informal economy, predominantly agriculture and services. Of 92.38%, while 86% are in the informal sector, the remaining 6.38% are actually sub-contracted workers in the formal sector. Highest proportion of workers is seen in agriculture in the informal sector amounting to almost 58%. The dearth of research and statistics on the magnitude of occupational diseases and injuries in India, coupled with, the shortage of human resources in this sector has severely affected delivery of quality care despite the need. Except a few pilot surveys in some of the segments of the informal sector, no authentic statistics at the national level are available on accidents and occupational diseases in these segments.

ILO has declared agriculture as one of the most hazardous industries to human health possessing several characteristics that are risky for health. Significantly, safety and health conditions and OH measures are very poor in informal workplaces. Survival, rather than OSH, is the primary concern of informal women and men workers and enterprises.

The Factories Act has been unable to offer the workers' rights against occupational diseases and related hazards, with over 90% of Indian labour falling outside its purview. OSH services in the largest employment sector – informal sector are non-existent and dysfunctional.

The Working Group on OSH under the Planning Commission suggested measures as may be necessary to ensure occupational health and safety of workers in (i) the agricultural occupations and (ii) non-agricultural occupations, in particular, workers in non-registered factories, road transport, shops, eating establishments, printing, dyeing, chemical storage and handling, etc. There is severe capacity deficit in terms of human resources in OHS.

The Basic Occupational Health Services (BOHS) approach is an application of the Alma Ata principles in occupational health and seeks to provide access to occupational health services to the so far, underserved, majority of the workers

of the world. BOHS seeks to develop these services to the level required by the ILO Conventions Nos. 161 and 155. This mandate was reaffirmed in the 2002 International Labour Conference.

Furthermore, specific ILO conventions such as Conventions 151(1981), 181(1985); 187 (2006), mandate governments to promote the right of workers to a safe and healthy working environment and to establish national policies, programmes and services on OSH. Convention 187 in particular calls upon governments to establish, through appropriate laws, agencies and mechanisms, a national system of OSH support that would involve, among others, information and advisory services; OSH training; occupational health services; research, data collection on occupational injuries and diseases; collaboration with insurance systems and, notably, “support mechanisms for a progressive improvement of occupational safety and health conditions in micro-enterprises, in small and medium-sized enterprises and in the informal economy.”

Considering the situation in India, the primary health care model seems to best fit the expectations out of BOHS for the informal sector primarily, for affordability reasons.

Statement of Goals and Objectives

The development of BOHS model that can be integrated into the primary health care ecosystem appears compelling as an important step towards improving informal workers’ physical and mental health. The goals of such a model are to provide primary medical treatment and/or referral, support rehabilitation, decrease occupational risk factors, and promote good health practices while controlling occupational diseases and its hazards.

Goal

Improved health care through Basic Occupational Health Services delivered through Primary Health Care Providers (PCPs) for workers in the informal sector, to control work-related illnesses and injuries.

Project Objectives

- To increase the capacity of the health care system in the project sites to provide thorough and high quality occupational health care to those employed in the informal sector lacking formal OHS services.
- To set up and develop OSH services in Primary Health Centres (PHC) through the development of knowledge and capacity of PCU staff, on occupational risk assessment and utilization of information, for planning effective OSH services, covering all health aspects including curative, health protection, health promotion, and rehabilitation.
- Create awareness and training about Occupational Health and Safety to Primary Care practitioners specifically for health & safety hazards, risks and

Precept

occupationally caused diseases limited to agriculture and other informal occupations.

- Reduce vulnerability of high risk groups among informal workers

Specific Objectives

- To study the working practices of PHCs in terms of occupational health provision;
- To set up the guidelines for BOSH services and practices in PHCs and Primary Care Providers;
- To design and implement a training curriculum on occupational health;
- To monitor and evaluate the provision of services at the PHCs.

Outcomes Expected

- BOHS Manual for training the PHC staff and that will act as reference guide;
- 75% PHC staff in project areas are formally certified trained in OHS care;
- Trained PHC staff and private primary care providers actively manage 90% OHS complaints in rural project sites;
- End-users at informal worksites undergo basic training in safe working under certified PHC staff and interested third parties;
- Safe working practices being used among majority of informal workers as identified by reduction in incidents of pesticide poisonings, injuries over the implementation period.

Countries like Finland, France and Brazil have made remarkable strides in providing BOHS to hitherto underserved section of workers. With basic training to about 25000 Primary Health Centre physicians, staff of Community Health Centres and rural primary care physicians, within a reasonably short period of time it will be feasible to offer BOHS to largest informal sector of agriculture and other workers.

It is time to take this significant step towards reaching out to 92.38% of India's work force employed in the informal economy in reasonably short time at a significantly attractive cost. IAOH has expressed willingness to provide trainers gratis from their experts' pool.

Holistic and Integrated Occupational Health Services

Suvarna Moti

Introduction

MAJOR PART OF ADULT LIFE and sometimes even childhood is spent as working life that contributes to economic returns for the individual and productivity for the low-income nations. These returns are tempered with the stresses and exposure to hazards at the workplace and may result in adverse health outcomes. The rewards and hazards influence the individual's health and ability to care for it. Employment and working conditions are significant determinants of access to health directly and indirectly, and influence the health equity in the population. They affect the social protection mechanisms, contribute to self-esteem and social status and determine the health of the concerned through their spending ability and exposure to hazards.

A healthy worker, as part of the larger society, contributes to a healthy society, and is the intended focus of public health activities. All the efforts in public health are geared towards the betterment of the health of the community and thereby, reduce preventable health conditions and their financial implications. Provision of occupational and environmental health services is an important step towards safeguarding the workers' physical and mental health. Since the health of the workers affects the family's economic status and the nations' productivity, maintaining and restoring it becomes a key function of the health services. However, this emphasis upon occupational health is missing from contemporary public health and needs to be established.

Current Status

Occupation-related ill health and injuries contribute to a significant morbidity for the community aggravating the expenditure on their treatment by the health systems and result in loss of wages and enhanced risk of poverty. Realistically speaking, there is a vast disparity in the practice of effective primary and secondary prevention

of occupational diseases, development of healthy workplaces and coverage of occupational health and safety services (OHS). In the Indian context the coverage of OHS services is minimal for the unorganised sector (for the purpose of the manual, the emphasis is on informal sector) and hardly satisfying the expectations of the workers regarding access to interventions and protective measures through basic OHS services.

One cannot help consider the similarities in principles for both PHC and OHS, though specific elements to address work-related impact upon health are lacking in PHC. Disinterest in the patient's occupation and lack of awareness and knowledge about work-related hazards among the PHC physicians and staff has set back the delivery of OHS at this level. Considering the crucial role of the public health system in health care in the rural areas, this lack of insight into occupational health has severely affected servicing demands of the informal sector despite employing about 92% of the Indian working population.

The asymmetric development of OHS restricted to urban and industrialised areas within the monopoly of enterprise or management promoted OHS and neglect of the informal economy, has deprived the micro-sector or unorganised sector workers of their occupational health and safety needs. Inadequate social protection mechanisms, employers' apathy, policy deficit and weak regulatory apparatus, crippling deficit of adequately trained OH resources have served to isolate the advocacy of this issue.

Need for Integrated Services

The need for an integrated approach for OHS stems from the realisation that an individual cannot be viewed separately as a worker and distinct from the community he lives in. His health needs – met or unmet through the PHC have to factor his work status and address it. Current void in OHS, predominantly for this sector, can be overcome with effective utilisation of the existing public health system infrastructure. Policies to facilitate this process will have to realign considering the health needs of the community holistically, rather than fragmenting these into public health under the state health department and OHS under the labour ministry.

A holistic approach should be the key for a vital integrated OHS with the understanding that every worker deserves a safe and healthy workplace. Approach towards the individual patient should be tempered bearing his occupation and his context in mind, with a lifetime interest, stressing upon improving his functioning rather than just episodic disease care, looking at communities with greatest needs, within the framework of PHC. Thereupon, the twin objectives of maintaining health, while extending working life and ensuring productivity look achievable and realistic. Simultaneously, this would ensure a focus upon optimisation of functional capability of individuals rather than issue-based or disease-based care.

One would expect a larger impact on the health of the community with the synergies involved but the actual implementation would be guided by the existing circumstances. In a rapidly changing scenario in the wake of globalisation, coupled

with longevity, ageing populations, chronic diseases, digital e-commerce and technology, changes have ushered in the informal sector also. These are leading to changing health problems that need to be managed by health systems keeping pace with the transformation. Jobs are becoming temporary and workplaces are losing stability resulting in a dynamic and increasingly mobile population exposed to changing spectrum of workplace risks. Managing workplace risks is becoming increasingly challenging.

Conceptual Framework

The guiding principles for basic occupational health services are:

- Availability to all working people;
- Addressing local needs;
- Adapted to local conditions;
- Affordable to providers and clients;
- Provided by the public sector for the self-employed and the informal sector;
- Supported by intermediate level services.

Key principles guiding the integration of OHS and PHC should be:

- Worker's health is a part of the health of the community, and hence their;
- Health needs should be met with strategies evolved locally rather than importing ideas used elsewhere;
- People at greatest risks or with greatest needs should be targeted first;
- Health care training should include training in work-related health;
- Stakeholders' involvement and workers' empowerment are critical for promotion of health and safety at work.

Areas for convergence of OHS with public health practice occur when there are similar health conditions threatening both the workers and the general public like indoor air pollution or in cases of asthma, cancers where the occupational risk factors play a contributory role. If one considers access to health services one realises the tremendous reach of PHC in rural areas and the pockets of working population who have been denied regular OHS. Public health targets people in need and the informal workers definitely are deserving of occupational health care. Additionally, these are the groups that by virtue of their economic or social profile are inclined to develop work-related health conditions. So, OH disparities are created among population sub-groups that are at a greater risk of occupational diseases and also, lack the access to services to take care of these.

ILO Convention No. 161 and its recommendations concerning OSH services stress that such services are concentrated on preventive functions and are responsible for advising employers, workers and their representatives on maintaining safe and healthy working conditions, as well as on the adaptation of work to the capacities of workers. The community model implemented through governmental agencies seems to be appropriate for delivering such services to the informal workers. In India, the primary health care model is widely followed.

WHO has suggested that a primary health care worker should provide OHS in the following areas:

- Identify and evaluate work-related health hazards;
- Identify basic occupational health problems;
- Provide health education for promotion of workers' health and prevention of occupational diseases and injuries;
- Provide primary care and primary medical treatment;
- Record related data for surveillance.

This brings into focus the need for a multidisciplinary collaboration between the Ministry of Health & Family Welfare, Ministry of Labour, Ministry of Agriculture and Industry. It places onus upon the health system to ensure a speedy integration with the OHS services through strengthening of the technical competency of the staff at the health centres, administrative support, enhanced budgeting, adequate personnel and logistic support.

Strategic Directions

BOHS forms an important element of the overall OSH infrastructure in the country, referred to as the OSH system, comprising of the national health system and services for OSH, both in terms of organisation and functioning.

Role of the national and local governments to guarantee access of all workers to all curative and preventive health services to allow for full and productive working life cannot be understated. They should have access to essential interventions and basic health services for prevention of occupational and work related diseases and injuries.

The inclusion of OHS interventions in comprehensive, integrated PHC would involve guidance for improving working conditions, promoting health at work, surveillance of OH diseases, early detection of work-related diseases and support for return to work and preservation of functional capability.

The scope of the coverage should be widened to offer comprehensive care to all sectors within the unorganised sector in the area. Provision and financing of OH care should be prioritised for those in need and at greatest risk through the financing mechanisms existing for PHC.

Support for capacity building would involve training, consultation, information and use of mobile or digital platforms. Referral services for specialised care, scaling up access and focus on primary prevention of occupational diseases for continuity of care should distinguish this collaboration of basic OHS services and PHC.

Policy cohesion at the national and state levels should percolate to the operating levels at the health centres regarding employer participation, monitoring by regulatory agencies, multi-sectarian cooperation and systematic implementation plans. Advocacy efforts to improve and enforce legislation and quality monitoring need to be sustained for an effective integration.

A significant aspect of this integration would be empowerment and support of workers and other stakeholders to devise community participatory research and promote the concept of control over one's health. Suitable strategies at the local level with stakeholders' participation will ensure the development of policies and implementation plans with worker's health as the central focus of this integration.

Occupational Health: Integration with Primary Health Care Ecosystem

Ramnik Parekh

OVER 90 PERCENT OF INDIA’S working population is part of the informal sector. Informal sector, also known as ‘unorganised’ sector, refers to all unlicensed, self-employed or unregistered economic activity such as farmers, rural traders, handicrafts and handloom workers, etc.

India’s Ministry of Labour, in its 2008 report, classified the informal labour in India into four groups. This classification categorized India’s informal labour force by occupation, nature of employment, especially distressed categories and service categories. The informal occupational groups have been elaborated in the preface.

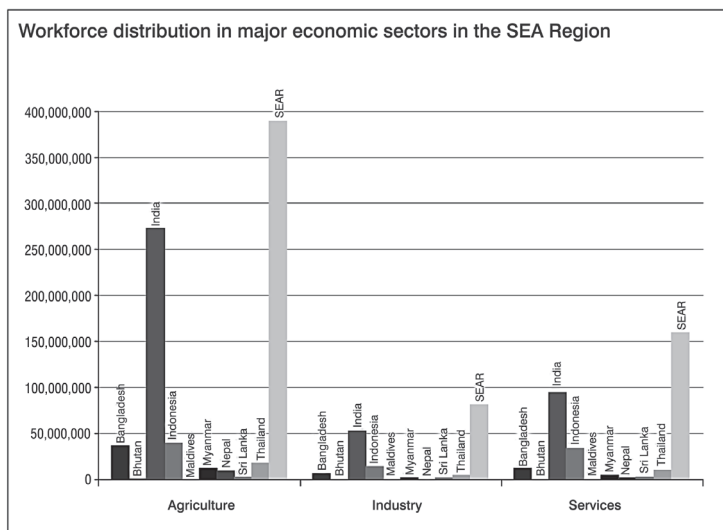


Figure 1: Workforce Distribution South East Asia

Agriculture, dairy, horticulture and related occupations alone employ 52 percent of labour in India. About 30 million workers are migrant workers, most in agriculture, and local stable employment is unavailable for them.

India's economy has been adding about 8 million out of 13 million new workers every year predominantly in low paying, informal sector. The remaining 5 million youth are joining the ranks of poorly paid partial employment, casual labour pool for temporary infrastructure and real estate construction jobs, or in many cases, being unemployed.

The informal sector has low productivity and offers lower wages. Despite accounting for over 90 percent of workers, informal sector created just 57 percent of India's national domestic product (2006), Poverty rates are reported to be significantly higher in families where all working age members have only worked the informal sector throughout their lives.

Economic Impact of Informal Sector

Informal sector has a crucial role in our economy:

- Vital role in terms of providing employment opportunity to a large working force in the country;
- Contribution of the unorganized sector in the total NDP at current prices has been over 60%;
- Share of household sector in the total gross domestic saving mainly unorganized sector is about three fourth.

The Constitution of India states that 'State shall make provisions for securing just and humane conditions of work'. This provides the basis for provision of basic occupational health services to all citizens of the country.

Current Status

India has decentralized OH delivery system which is mainly governed by Factories Act. There is no OHS in hospitals or even in healthcare facilities managed by Employees' State Insurance Scheme (ESIS). Most OHS is available in manufacturing facilities like factories of large enterprises only, often treated as a welfare or philanthropic activity. Even trade unions do not consider OHS as an essential necessity for the workers. A large section of manufacturing sector also cannot boast of an OHS. There is a need for an official Occupational, Environmental and Safety Policy for consolidation of currently fragmented OHS system with consultation with all stake-holders. In near future, if "Make in India" campaign catches momentum, foreign investors will demand inclusion of OHS in trade agreements. It is therefore imperative that OHS gets more attention, particularly in underserved informal industry employing over 90% of workforce contributing significantly to the GDP.

Burden of Occupationally — Caused Injuries and Diseases

Out of 11 million cases of occupational diseases in the world, 1.9 million cases occur in India, along with 17 million occupational non-fatal injuries (17% of the world) and 45,000 fatal injuries (45% of the total deaths in world).

The amount paid as compensation for death and disablement resulting from work related injuries has increased from mere Rs. 8 million in 1961 over 800 million in 2010.

“The occupational health scenario is undergoing a paradigm shift in developing countries with rapid industrialization. Inadequate human resource is, however, a concern. The creation of Basic Occupational Health Services will demand a further increase in specialist manpower. The current training capacity of occupational health specialists has been mapped by a systematic review in India. Twenty-one institutes have been identified all across the country. They have an existing capacity for training about 460 specialists. This number is inadequate considering the population of India’s working class. A mixture of strategies must be urgently planned for addressing this issue.” [Zodpey SP, Negandhi H, Tiwari RR. Public Health Education, Public Health Foundation of India, New Delhi, India. Indian Journal of Occupational and Environmental Medicine, 2009; 13(3):135-40]

It is obvious that with such meagre figures of human resource capacity development of qualified specialists in occupational health, it may take a couple of decades to meet today’s requirement!

This painful fact has seized international agencies like WHO, ILO and professional societies like ICOH and WONCA and prompted them to think about rerouting occupational healthcare delivery through primary care providers. In his keynote speech at the recent WONCA (World Organisation of Family Physicians representing about half a million individual members) Europe conference in Lisbon in 2014, Prof Michael Kidd, WONCA President, announced a joint statement with ICOH (the International Commission on Occupational Health) on workers health.

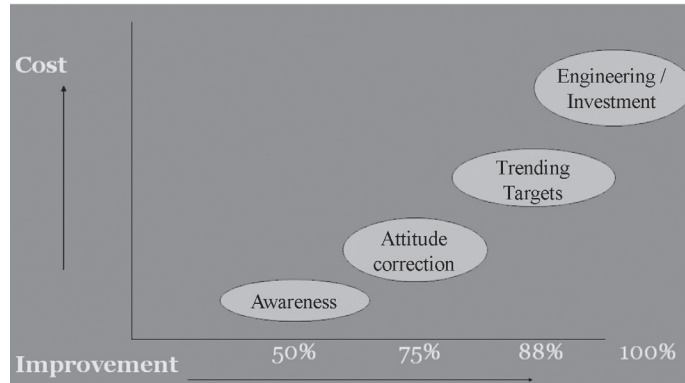
“In another innovation, WONCA has been working with the WHO and the ICOH looking at the health of workers and their families, especially in developing parts of the world.

We recognise that health and safety are threatened by poor working conditions, which are a daily reality for many workers around the world. We are also aware of the poor health of many migrant workers based in countries where they have no access to health services. And we recognize that most health care and preventive services for workers and their families is provided in primary care settings.

Today WONCA and the ICOH are launching our joint statement on workers and their families and we pledge “to work with our partner organizations (including the WHO and the International Labour Organisation) to address the gaps in services, research, and policies for the health and safety of workers and to better integrate occupational health in the primary care setting, to the benefit of all workers and their families.”

IAOH, for several years, has been in internal consultations and has come to a definitive plan to actually prepare a training manual for primary care providers, who are particularly accessible to the workers of informal industry, to provide Basic Occupational Health Services to them. Another compelling logic for this approach

of delivering occupational health service through primary care providers was the fact that creating awareness and the necessary attitude could achieve 75% success as per the worldwide experience.



There is a constant complaint about paucity of resources. Our simple suggestion is to utilise three large resources which do exist in the whole country in major streams of Primary Care Providers. We firmly believe that if these providers are given a systematic and need-based training in Occupational Health and Safety specifically, addressing the occupationally caused injuries and diseases of informal industry that is a major need of country's largest workforce.

Primary Care System

There are three constituents of Primary Care System:

Family Physicians

There are family physicians that are in private practice in the geographical areas of country, mainly rural, and treat a large population, considering that over 70% of medical spend comes from personal pockets of the citizens. Doctors qualified in Allopathy, Homeopathy, Ayurveda and Unani constitute about 70% of the total number of private practitioners. 2001 census reported existence of a total of 1.7 million Family Physicians in the country with the following system-wise break up:

Registered Allopathic	– 32%
Un-Registered FPs	– 30%
Registered ISM FPs	– 38%

Primary Health Centres System

Primary Healthcare System managed by Government of India consists of Sub-Centres (SC), Primary Health Centres (PHCs) and Community Health Centres (CHCs). As of March 2012, there were 148366 SCs, 24049 PHCs and 4833 CHCs functioning in the country. The number of allopathic doctors at PHCs is 28984 (2012) and nursing

staff is 66424 [Rural Health Statistics in India 2012, Statistics Division, Ministry of Health and Family Welfare, GOI]

Employees State Insurance Scheme

In 29 states and Union Territories there are 787 medical centres and nearly 150 hospitals serving a population of over 5.5 crore. There are also about 1500 ESIC dispensaries in the country manned by 7300 medical officers assisted by 1500 private practitioners. All ESIC facilities are appropriately placed for BOHS. This by itself is a significant resource to provide occupational health service provided these personnel are trained specifically for the target population of informal industry. Although a majority of the insured persons work in manufacturing units, ESIC has not given adequate thought to include occupational diseases in their scope.

IAOH BOHS Plan

Based on the following objectives, IAOH is taking the initiative of starting a pilot project to provide BOHS to informal industry through Primary Healthcare Providers:

- Use existing primary healthcare network of family physicians, PHCs, ESIS facilities, including paramedical staff and nurses;
- Train them in Occupational Health & Safety only in OHS problems relevant to informal sector;
- Hand-holding and follow-up post-training;
- Prepare and publish a BOHS manual in English and all major languages;
- Use mobile apps, which can be used in cellular phones, tablets etc. for quick on-the-spot reference;
- After the success of pilot project, hand over to the government as a ‘model’ for nationwide implementation.

Project Title	Delivery of BOHS through Primary Health Care – Pilot Project
Sector	Occupational Health/Unorganised sector
Objectives	To increase the capacity of the primary health care system in the project sites to provide thorough and high quality occupational health care to those employed in the unorganised sector lacking formal OHS services.
Project Purpose	PHC staff and private physicians in rural areas receive specialised training and supervisory inputs in provision of OHS services through primary health care satisfying significant felt need for OH services
Beneficiaries	Direct: 75% PHC physicians, nurses, ANMs/MPWs, registered private health care providers at 8 project sites Indirect: 58% agricultural workers and 32% other workers in unorganised sector in project areas
Implementing Partners	Monitored directly by IAOH and district health authorities, medical colleges

It will be appropriate to quote WHO's declaration on the matter. The World Health Organization (WHO) published the outcomes of a conference — **Connecting health and labour: What role for occupational health in primary health care?** (The Hague Conference, 2011). Throughout, the experts found common ground between primary health care and occupational health care, and a set of principles were formulated to address the health of workers more effectively. The Hague Conference summary outlines the strategy to reach more workers by integrating basic occupational health care within primary health care. Important elements include:

- Training primary healthcare professionals to recognise early work-related ill-health, to advise about improving working conditions and health-at-work, to support return-to-work, and preserve and restore working capacity;
- Linking primary healthcare centres and occupational healthcare services under local primary care networks and providing joint training, referral systems, and occupational information to foster collaboration and continuity of care;
- Financial arrangements for human and technological capacity, including development of work-related guidelines;
- The setting of a research agenda and promotion of good practices; and
- Developing national plans for the health of workers, involving professionals of primary health care and occupational health care, and key stakeholders in the society. Governments should guarantee access to care, allowing for a full, productive working life.

Occupational Health: Concept, History and Scope

Ramnik Parekh and G. Jayaraj

CONCEPT OF OCCUPATIONAL HEALTH or Health at Workplace is, perhaps, fundamental to an appreciation of what the subject is really about. Historically, occupational health has been mainly concerned with factors in the work environment which can give rise to ill-health in exposed workers. Emblematic example is the metal lead in the work environment that can produce lead poisoning among workers handling that metal. Work environment may also include presence of '*machines*' or 'mechanical devices' which have an inter-relation with the workmen.

In recent years, however, the concept of occupational health has been broadened to include the implications of not only of 'work on health' but also that of '*health upon work*'. Thus good health could improve work performance or morale. Conversely, poor health could affect the quality of the working life. For example, diabetes mellitus is not known to be directly due to factors in the work environment unless we consider effect of stresses. To an increasing extent, occupational health is concerned with what kinds of jobs unhealthy workers can or cannot do on either a temporary or permanent basis.

We could say that 'occupational health' concerns all the interrelationships between work and health, and both the positive and negative factors affecting such relations. Other terms also commonly used are 'industrial health' and 'industrial medicine'. Often they are used as synonyms for occupational health and occupational medicine respectively. We prefer to think of 'industrial health' as 'occupational health applied to the industrial sector; 'industrial medicine' would be the 'role of doctors in industrial health'; 'agricultural health' would be the 'health of agricultural workers', and 'marine health' would be the 'health of seafarers.'

One of the declared aims of occupational health is to provide a safe 'occupational environment' in order to safeguard the health of the workers and to step up productivity. By 'occupational environment' is meant the sum of external conditions and influences which prevail at the place of work and have a bearing on the health

of the working population. The industrial worker today is in an environment that is getting more complicated as man is becoming more ingenious. There are three types of interaction in a working environment:

- a) Man and physical, chemical and biological agents
- b) Man and machine
- c) Man and man

Man and Physical, Chemical and Biological Agents

- i. **Physical agents:** The physical factors in the working environment which may be adverse to health are heat, cold, humidity, air movement, heat radiation, light, noise, vibrations and ionizing radiation. The factors act in different ways on the health and efficiency of the workers, singly or in combinations. The area of working and breathing space, toilets and washing facilities are also important factors in an occupational environment.
- ii. **Chemical agents:** There are a large number of chemicals, toxic dusts and gases which are potential hazards to the health of the workers. Some chemical agents cause disabling respiratory illnesses, some cause injury to skin and some may have a deleterious effect on the blood and other organs of the body.
- iii. **Biological agents:** The workers may be exposed to viral, rickettsial, bacterial and parasitic agents due to close contact with animals or their products, contaminated water, soil or food.

Man and Machine

An industry or factory implies the use of machines driven by power with emphasis on mass production. The unguarded machines, protruding and moving parts, poor installation of the plant, poor training of their use and lack of safety measures are the causes of accidents which is a major problem in work places. Working for long hours in un-physiological postures is the cause of fatigue, backache, diseases of joints and muscles and impairment of the worker's health and efficiency.

Man and Man

There are numerous psychosocial factors which operate at the place of work. These are the human relationships amongst workers themselves on the one hand, and those in authority over them on the other. Examples of psychosocial factors include the type and rhythm of work, work stability, service conditions, job satisfaction, leadership style, security, workers participation, communication, system of payment, welfare conditions, degree of responsibility, trade union activities, incentives and a host of similar other factors, all entering the field of human relationships. In modern occupational health, the emphasis is upon the people, the conditions in which they live and work, their hopes and fears and their attitudes towards their job, their fellow-workers and employers.

The *domestic environment* of workman is also considered as a part of his occupational environment. Both are complimentary to each other. The worker may take his worries home, and bring to his work some domestic disturbances. Stress at work may disturb his sleep, just as stress at home may affect his work. Severe prolonged stress, no matter where it has been aroused, may produce serious physical and mental symptoms which do not allow man to work efficiently. Stress is a very influential factor in determining health at the workplace.

According to ecological approach, occupational health represents a dynamic equilibrium or adjustment between the workers and their occupational environment.

The joint International Labour Organization (ILO)/World Health Organization (WHO) in 1950 gave the following definition to occupational health:

1. Occupational Health should aim at the promotion and maintenance of highest degree of physical, mental and social well-being of workers in all occupations.
2. The prevention among workers of departure from health caused by their working conditions.
3. The protection of workers in their employment from risks resulting in factors adverse to health.
4. The placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological equipment.
5. To summarize the adaption of work to man and each man to his job.

The twelfth session of the Joint Committee in 1995 focused occupational health on three objectives:

1. The maintenance and promotion of workers' health and working capacity;
2. The improvement of the working environment and work to become conducive to safety and health;
3. Development of work organization and working culture in a direction which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation which may enhance productivity of an undertaking.

Health of the people at work (industry) and healthy work environments (free from health hazards) are among the most valuable assets of industries, individuals, communities and countries put together. Multiple disciplines viz. medical, public health, epidemiology-biostatistics, safety, human resource, industrial economics, sociology, legal network, labour legislations, industrial psychology, organizational behaviour, human engineering etc. are involved and integrated in the practice of Occupational Health in order to protect the overall well-being of the work force.

The aim of Occupational Health is no longer merely to diagnose, treat and rehabilitate sick workers, but to anticipate work-related diseases/disorders that may develop due to exposure of known and unknown hazards at workplaces; initiate preventive measures; promote health through continuous dialogue with workers, shop

floor managers, safety executives, production staff, process engineers, epidemiologists, social scientists, healthcare professionals, private medical practitioners around industries, medical consultant in the government and corporate hospitals, community planners, industrial township administrator, trade union representatives, Chief Executive Officer (CEO) of the companies, community leaders in the neighbourhood population, government authorities, factory inspectorate, health inspectors, legal advisors, etc.

Brief History of Birth and Development of Occupational Health

Mining is one of the oldest industries and working in mines has always been a hazardous occupation. Conditions in the gold, silver and lead mines of ancient Greece and Egypt reveal an almost complete disregard for miners' health and safety. Since the earlier miner was considered a slave, prisoner or criminal, there was no reason to improve his working conditions because one of the objectives of this employment was punishment, and there were ample reserves of manpower to replace those who were killed or maimed.

Agricola, Paracelsus and Ramazzini

The first observations on miners and their diseases were made by Agricola (1494-1555) and by Paracelsus (1493-1541). During the middle Ages, mining in Central Europe had become a skilled occupation, which led to the emancipation of the miner. The growth of trade and increased demand for currency and capital required increased supply of gold and silver from these mines. Agricola, in 1527, was appointed official town physician to Joachimstal, a metal mining centre in Bohemia. He described in his book *'De Re Metallica'* the diseases that prevailed in the mining community.

Paracelsus based his monograph on occupational diseases of mine and smelter workers, in 1567, on his experience as town physician in Villach, Austria, and later as a metallurgist in the metal mines in that area. He relates, *"We must have gold and silver, also other metals, iron, tin, copper, lead and mercury. If we wish to have these, we must both life and body in a struggle with many enemies that oppose us"*. Paracelsus realized that the increasing risk of occupational disease was a necessary and concomitant result of industrial development.

In 1700 Bernardino Ramazzini (1633-1714) physician and professor of medicine in Modena and Padua first published his book *'De Morbis Artificum Diatriba'*. It was the first systematic study of trade diseases and in it he put together the observations of his predecessors and his own, based on visits to workshops in Modena. Rightly acclaimed the ***father of occupational medicine***, he showed an unusual sympathy for the less fortunate members of society. He was the first to recommend that physicians should enquire about a patient's occupation.

As a physician of that time he was probably unique. His empathy for occupationally ill workers and his philosophy did not influence his medical colleagues or other

learned affluent leaders. At that time there was no economic necessity to protect the life and health of workmen.

Indifference to the health and safety of work people has been a feature of both ancient and modern societies. It is only since the Second World War, from the 1940s onwards, that there has been a rapid growth in occupational health on a worldwide scale. Important factors which accelerated the development of occupational health are the humanity of a society, its wealth and the economic need to conserve a healthy and efficient work force, the status of its workers, and knowledge of occupational risks. Interventions by governments by relevant legislations also strengthened the efforts. These have all influenced countries, industries and individual workplaces to control hazards and promote well-being.

ILO Conventions

The ILO frames key Conventions for protecting the rights of workers; many of them are specifically on occupational health and safety. Once ratified by member states (including India), these conventions form guiding principles for the formulation of national policies and law. ILO has formulated conventions that are targeted at addressing the issue of occupational safety and health (OSH). India as a Member State periodically ratifies these conventions and treaties on labour welfare and labour rights. India is yet to ratify important conventions related to health and safety, i.e. Convention 155 on occupational safety and health and the working environment, Convention 161 on occupational health services, Convention 167 on safety and health in construction, Convention 176 on safety and health in mines, Convention 187, the promotional framework for occupational safety and health.

New Challenges in the 21st Century

Occupational Health practice in industry helps control unnecessary costs from sickness, absenteeism and work disabilities. The costs of health care and social security can be effectively managed with the help of occupational health.

The workplace environment is generally hazardous and affects a large numbers of workers. Approximately 30-50% of workers are estimated to have a significant exposure to hazardous physical, chemical or biological agents or an overload of unreasonably heavy physical work or ergonomic factors that may be hazardous to health and to working capacity. An equal number of working people report being psychologically overloaded at work, resulting in stress symptoms. Many individuals spend one-third of their adult life in such hazardous work environments.

The most important current 21st century challenges are the health problems linked to:

1. New chemical substances and physical energies
2. Health hazards associated with new biotechnologies
3. New information technologies and automation
4. Transfer of hazards technologies

5. Ageing of working populations
6. Special problems of vulnerable and underserved groups (e.g. chronically ill and handicapped)
7. Increasing migrants and the unemployed rates
8. Problems related to growing mobility of working populations
9. Occurrence of new occupational diseases of various origins
10. Rapid change experienced in modern working life associated with increasing demands of learning new skills and the need to adapt to new types of work
11. Pressure of higher productivity and quality of work – Time pressures, hectic jobs, growing psychological workload and stress among the workforce

Occupational Health: Current Situation and Scope for BOHS

Shyam Pingle

UNITED NATION'S UNIVERSAL DECLARATION of Human Rights states that everyone has the "right to work, to free choice of employment, to just and favourable conditions of work and to protection against unemployment". Indian Constitution also states that "State shall make provisions for securing just and humane conditions of work". This provides the basis for provision of basic occupational health services to all.

Basic Occupational Health Services (BOHS) are an application of the primary health care principles in the sector of occupational health. The concept of BOHS has been developed jointly by the WHO, the International Labour Organisation (ILO), and the International Commission on Occupational Health (ICOH). World Organisation of Family Doctors (WONCA) also has committed position in favour of this approach. BOHS principles were discussed for the first time in the WHO/ILO Joint Committee of Occupational Health in 2003. BOHS has become a central piece of global occupational health services development plans of WHO and ILO. WHO is working for BOHS together with its collaborating centres in occupational health, the ILO, ICOH and other international organizations.

BOHS envisage coverage of all workers, and has a strong focus on prevention. BOHS are aimed at:

- a) Protection of health at work,
- b) Promotion of health, well-being, work ability and
- c) Prevention of occupational diseases and accidents.

Activities under BOHS encompass not only health surveillance, emergency preparedness and first aid services but also include surveillance of work environment, risk assessment and preventive & control measures. Health education and health promotion are also an integral part of BOHS.

Basic occupational health services provides a practical tool for identifying priorities and pooling scarce resources to develop an integrative and effective occupational health system and services, tailored according to the national conditions

and needs of each country. Improved conditions of work will lead to a healthier work force and improved productivity.

There is plenty of opportunity to provide occupational health services to all working population, in both developing and developed countries. Occupational health services are available to only 10-15% of workers worldwide and to a miniscule of working population in developing countries. Even where services are available, their quality and relevance may be low.

Occupational Health in India

Occupational safety and health (OSH) for India is a ‘developmental tool’ and an empowering movement. As a result of globalisation, Indian industry is exposed to the latest trends in OSH. Progressive industries have launched many initiatives to spread awareness on OSH among all stakeholders and to reduce OSH risks at workplace. A large number of companies have a corporate health, safety and environment (HSE) policy and have opted for various certifications in OHS.

India’s population crossed 1.21 billion according to the last government census carried out in 2011. Of these, 833 million reside in rural area and 377 million reside in urban area. However, the urban population has been on rise. Those in working age group are estimated to be 63.6%. More than 90% work in the informal economy, mainly agriculture and services (60% self-employed and 30% without regular jobs). Less than 10% have jobs in the organized sector; mainly industry, mining and some services.

Major occupational risks are accidents, pneumoconiosis (especially silicosis and asbestosis), musculoskeletal injuries, lung diseases (e.g. byssinosis, Farmer’s lungs), pesticide poisoning, noise induced hearing loss and workplace stress. Increasing proportion of females in the workforce adds to traditional OSH issues. Women are subjected to indoor air pollution due to biomass fuels (more so in rural area) and to the dual burden of home work and occupation. Agriculture, mining and construction have high levels of accidents and diseases.

Statistics on accidents and occupational illnesses are not easily available. Research reports suggest that the official figures of fatalities and injuries may be grossly underestimated.

Statistics of Factories at a Glance (DGFASLI 2009)

Registered Factories	324,761
Working Factories	270,294
Employment	13,100,129
Safety Officers	2,642
Welfare Officers	3,096
Factory Med. Officers	6,809
Total Injuries	33,093
Fatal Injuries	1,509

The OSH challenges in India may be summarized as follows:

1. Huge workforce in unorganised sector
2. Availability of cheap labour due to high unemployment
3. Meagre public spending on health
4. Inadequate implementation of existing legislation
5. Large numbers of unrecognised/unreported occupational illness
6. Relative shortage of trained and skilled OSH professionals
7. Multiplicity of statutory controls
8. Apathy of stakeholders
9. Infrastructure problems
10. Delay in implementation of national policy on OSH.

Policy, Legislation and Training

India has 16 laws related to working hours, conditions of services and employment. The major legal provisions for the protection of health and safety are contained in two acts: the Factories Act (1948) and the Mines Act (1952). The Factories Act was amended in 1987. It provides for pre-employment and periodic medical examination and mandatory, periodic monitoring of the work environment in those industries defined as hazardous. There are other legal provisions for protection of special groups of workers including those in plantations, docks, building and construction, tobacco, mining, and insecticides. There are also legal provisions on prohibition and regulation of child labour. OSH is split between two ministries. While primary health care and medical education fall in the mandate of Health Ministry, the Ministry of Labour has the main responsibility for OSH.

Two important International Labour Organization (ILO) conventions in the OSH area, the Radiation Protection Convention (No. 115), 1960, and the Benzene Convention (No.136), 1971, have been ratified and consultations are taking place with stakeholders for ratifying two more conventions; no. 170 (Safety in the use of Asbestos, 1986) & no. 162 (Safety in the use of Chemicals at work, 1990). However, other ILO conventions are yet to be ratified.

The organised sector, both private and public, has well developed OSH based on ILO conventions; however, this sector is miniscule. OSH in the largest unorganised sector is almost non-existent. Currently, there is no government agency or department that deals exclusively with OSH matters. DGFASLI deals with the safety and health of workers employed in factories and ports, whereas the Directorate General of Mines Safety deals with the safety and health of miners. There is no agency that covers safety and health for workers in unorganised sectors.

There is separate training on OSH for safety professionals and occupational health professionals. The Central Labour Institute and other institutes recognized by it viz. Indian Institute of Public Health offer a 3 month certificate course in Industrial Health with an annual capacity of around 150. Postgraduate courses in occupational health are not yet available though efforts are being made to start the same.

Occupational Health in Indian Industries

Bhopal gas disaster led to an extensive review of health and safety legislation in the country. Indian Factories Act amended in 1987 provided for the provision of occupational health centre (OHC) along with availability of certified occupational health physicians in hazardous industries. While progressive industries follow the applicable statutory provisions, it is an open secret that this is followed only on paper by many industries.

Progressive industries have launched many initiatives. Many progressive companies go beyond the statutory provisions and have set up full-fledged OHCs; not only at manufacturing locations but also in offices. Besides emergency medical services, the OHCs offer preventive, promotional and curative health services to its employees.

Important OSH Needs

The three most important OSH needs are:

1. Legislation to extend OSH coverage to all sectors of working life including the unorganized sector;
2. Spreading the awareness about OSH among stakeholders;
3. Development of OSH infrastructure and OSH professionals. Other issues include integration of occupational health with primary health care.

National Policy and Legislation

After prolonged deliberations, the Government of India approved the National Policy on Safety, Health and Environment at Work Places in February 2009. In line with this national policy, a general OSH legislation needs to be enacted, applicable to factories, mines, plantations, ports, construction etc., as well as to unorganised sectors including home work. Workers' bodies, NGOs and other agencies can influence lawmakers to expedite the issue.

Suitable guidelines need to be developed for the unorganised sector including agriculture and home work. Principal employers who outsource '*home work*' should also have the basic responsibility to provide basic safety and health information. There is a need for an appropriate enforcement strategy and overhaul of the existing enforcement agencies. There is an urgent need to build credibility, competence and acceptability for enforcement authorities. Extensive training of factory inspectors should be undertaken. A national registry of occupational diseases and accidents should be established and maintained.

Creating Awareness

There is strong need to create OSH awareness among all stakeholders such as lawmakers, employers, employees, contractors and the general public. OSH needs to

be included in educational curricula at all levels of school, university and technical education. Public awareness should be created through mass media. The unorganised sector needs OSH training and effective awareness campaigns.

There is an urgent need to change the mindset of workers and employers through OSH education. Trade unions can be very effective in the prevention of accidents and work-related diseases through the use of OSH as a collective bargaining issue and by exerting pressure on political leadership.

Development of Infrastructure and Competence

There is a great shortage of occupational health professionals in India. More than 15,000 occupational health physicians and industrial hygienists are immediately needed in the organised sector alone, but currently their number is little over 1,500. The majority of medical practitioners lack training in occupational health and consequently, lack the skills to diagnose and prevent occupational diseases. An independent, national accreditation agency is needed to establish national standards on OSH. An audit system for assessing the effectiveness of OSH in industries, ports and mines would be helpful as would an international exchange of OSH experts.

Occupational Health in Service Sector

While growth in the Indian manufacturing sector has been sluggish in last two decades, the service sector is booming and contributing an increasing proportion in country's GDP. With globalization, IT enabled and BPO services have grown exponentially. IT sector has contributed to 25% of India's exports and has provided direct employment to a population of over 3 million and indirect employment to over 9 million. Its contribution to GDP was 7.5% in FY 2012 with revenues of US\$100 billion. 12 – 14% annual growth has been forecast. The service sector is not covered by factories act and there is need for appropriate focus on health and safety in service sector.

Way Forward

There are many factors, which are changing the industrial environment in India such as: globalization, outsourcing, transfer of technology, newer type of jobs (IT, Call Centre), change in employment pattern etc. Another important factor in India is Judicial Activism, which has had a positive impact on matters of public interest. NGOs, media and employee pressure groups are also playing a positive role in this matter. Recently, the national occupational health and safety policy has been finalized by the government and let us hope that it will take the country one step closer towards BOHS for all.

IAOH and BOHS

Indian Association of Occupational Health has taken a lead in this matter with Occupational health day themes in last 7 years repeatedly focussing on BOHS. IAOH has put emphasis on following:

- Advocacy;
- Awareness of stakeholders;
- Dialogue with government;
- Support capacity building;
- Facilitate action oriented research;
- International collaboration;
- Course correction.

What can we do?

At our individual and organizational level, each one of us can also contribute in this effort by following:

- Work for the realization of workers' right to health and safe work environment and best available OH services;
- Provide our research and professional capacities and competence;
- Advice and support organizations, governments, employers and workers, communities and workplaces;
- Improvement of occupational health and other conditions of work; prevent hazards and risks;
- Support highest attainable standard of OH as basic human right;
- Facilitate effective transfer of research to practice.

In conclusion, we can say that, India, by virtue of its huge young population, is an important country on the world health and safety map. It has been slow to adopt the high standards of occupational health and safety. However, the situation is expected to slowly but steadily improve with emergence of young and educated workforce, increasing awareness and influence of globalized economy.

Planning and Evaluation of Provided BOHS

Suvarna Moti

BASIC OCCUPATIONAL HEALTH SERVICES (BOHS), as a concept, tries to bring together the principles of equity, accessibility, affordability, appropriate care and universality in primary health care with the expectations of occupational health care defined by ILO Conventions 161 & 155. It is an effort to provide access to occupational health and safety services to the underserved majority of workers from the informal sector.

OHS services that work well and are in tune with the local needs and realities, realise benefits not only from the point of view of workers' health but also promote work ability and productivity of the workers, and nations. Hence, the OHS services demand relevance, competence and quality.

A sustainable occupational health service requires infrastructure. Many countries have not developed a service infrastructure for the whole working population, and it may be difficult, if not impossible, to widen the coverage quickly to all workers. Planning for development of BOHS would require a step-wise strategy: the starting level, basic occupational health services, an international standard service, and, finally, comprehensive occupational health services.

Stage I comprises services provided by a physician/nurse and a safety expert who have had some training in occupational health services and who work for a primary health care unit or for a respective grassroots-level facility. The content of service focuses on the most important and most severe health hazards and on their prevention and control.

Stage II is comprised of infrastructure-based services that work as close as possible with workplaces and communities. The service provision model varies according to local circumstances and needs. The personnel providing these services have been given special training for this purpose. For the current context, we are concentrating on developing Stage I.

Implementation of BOHS would require a supportive policy environment based upon evidence and backed by realistic action plans. A situational analysis would reveal the geographical extent of working population lacking these services and

the patterns of activities under the informal sector as well as the risks and hazards associated with the various occupations in the unorganised sector. This would enable one to draw the strategy and action plan for local implementation.

Available information on various risk factors and hazards should be utilised to inform an appropriate action plan and develop practical tools for assessment and management of these risks.

Health sector should be the lead agency aided by the labour sector under the state administration with clear guidance from the state government for its implementation. An advisory committee on safety and health is recommended as a coordinating body for BOHS including the Ministry of Health, labour, the social partners, employers, trade unions, and other sectors. Involvement of all relevant partners in planning and steering occupational health services ensures the effective implementation of programs. The ultimate responsibility to ensure that occupational health services are organised, funded, and provided rests on the government and its competent authority.

Though primary health care is the major implementation mechanism for BOHS, there should be initiatives to involve and foster public-private partnerships in this venture with a focus on developing employers' and workers' unions/cooperatives' involvement and support.

First line PHC workers should contribute to the planning and implementation of BOHS to develop ownership of the programme that would otherwise, be viewed as an additional burden. Reduction of occupational and work-related injuries and diseases would subsequently reduce the burden on the health system needs to be emphasised for the PHC staff.

Capacity building of the PHC assumes an integral part in the delivery of BOHS. Ensuring filling up of vacancies at various levels, sanctioning of additional posts wherever required, and training in Occupational Health with regular updating of competence need to be prioritised in the planning. BOHS needs sufficient professional competence in occupational health that can be provided through an extensive training program for the personnel providing such services. The services provided should be supported by second-level support with respect to analyses, measurements, special advice, and the diagnosis of occupational diseases through institutes of occupational health, medical colleges, private bodies etc.

Financing of BOHS cannot be the responsibility of the public sector alone, except, in areas, where the employers or other stakeholders are in no position to offer any financial support. Public financing wherever possible can be buttressed through partnerships, donation or grants-in-aid.

Although, BOHS stresses upon primary prevention, other aspects like secondary prevention and rehabilitation may be included with a clear emphasis upon development of a minimum package of OHS services depending upon the need.

Evaluation of BOHS

Scarce resources and competition for priority allocations in constrained settings has shifted the focus to evaluation-substantiated program implementation for the effective use of health resources. Health program evaluation is an integral part of health development with systems analysis approach proving to be appropriate for OHS evaluation. Evaluation as a tool helps in improvement of the programme and identifies the lacunae that need corrective actions. It also helps guide the allocation of resources for the said programme. Evaluation cannot be a sporadic process and is an essential element of the programme cycle with at least an annual frequency.



Figure 1 : Evaluation Process of BOHS

Activities within Framework of BOHS *General health service, individual health record, surveillance of worker's health, assessment of individual's health risk, health education and health information, diagnosis of ODs & WRDs, first aid, prevention of OH hazards, accident prevention and emergency preparedness.*

[Ref: **Rantanen Jorma**; Basic occupational health services. ILO/WHO/ICOH collaboration with Finnish Institute of Occupational Health;. September 2007, Helsinki.]

The evaluation process of BOHS considers:

- Objectives, targets of the programme;
- Inputs, outputs and extraneous variables;
- Information and data systems used to record OHS data;
- Strategy of evaluation and processes to be reviewed.

Evaluation of BOHS would be an analysis of the efficiency, technical effectiveness and impact of the programme on the work and health relationship in the informal sector that is the subject of this manual. The effectiveness of BOHS in reduction and prevention of safety and work hazards and extent of coverage of services is evaluated here. We are concentrating on the internal evaluation to be carried out by the health authorities using systems analysis and survey methodology. Finally, the evaluation summary should be shared with the various stakeholders in BOHS.

The evaluation tool should indicate the sequencing, scope, and information that must be gathered for a successful evaluation. This tool could highlight the OHS program elements with individual activities under these and the evidence to

be considered that should be used in conducting the OHS program evaluation. The methodology could be:

1. The inquiry process by providing formal questions and assisting with informal and follow-up questions;
2. The collection and examination of physical evidence to support evaluation determinations;
3. The inquiry process by providing formal questions and assisting with informal and follow-up questions; and
4. The collection and examination of physical evidence to support evaluation determinations.

The following questions are answered through evaluation:

- a. Do the services respond to the needs of the workplace?
- b. Are the activities directed to priority problems?
- c. Is good occupational health practice followed?
- d. Are the resources, human and technical, sufficient?
- e. Are the services effective in elimination of health problems?
- f. What can be improved?

Evaluation of the impact is important to know as to how far has the OHS service been able to improve the overall health of the working population and bring enhanced working population under its coverage. Whether there has been a decline in pesticide poisonings and accident prevention can be gauged from the statistical figures for mortality and morbidity indicators, sickness absenteeism accident or injury statistics etc.



Occupational Health Practice

Occupational Diseases and Surveillance

Hiren Desai

EFFECTIVE OCCUPATIONAL DISEASE and injury surveillance systems are an essential part of an effective national occupational health and safety strategy. Measurement of occupational disease and injury is essential to validly identify priorities, prevent occupational disease and injury occurring and measure how effective any prevention strategies are. As we are involving the primary care professionals, some of whom may be in private practice this function of BOHS may offer challenges. We are however giving the basic principles of surveillance.

Surveillance systems involve ongoing and systematic collection, analysis, and interpretation of information on occupational disease and injury so that the major hazards can be identified, preventative action can be taken, and the effectiveness of prevention can be evaluated.

The implementation of integrated surveillance systems provides the foundation for a number of important strategic goals through:

- Advancing the usefulness of surveillance information at the national level for prevention of occupational illnesses, injuries, and hazards;
- Strengthening the capacity of the labour, health, and accident compensation departments to conduct occupational surveillance;
- Strengthening surveillance of high-risk industries and occupations, and of populations at high-risk, including any special populations;
- Promoting effective occupational safety and health surveillance conducted by employers, unions, and other non-governmental organisations;
- Facilitating, and thereby increasing, research to improve occupational health and safety;
- Monitoring trends and effectiveness of interventions.

Barriers to Effective Surveillance

The following barriers to effective surveillance have been identified with regard to current methods and systems used for measuring and monitoring occupational disease and injury:

- Expertise required to manage and administer surveillance systems;
- Inadequate hazard/exposure assessment;
- Data ownership and access issues;
- Knowledge gaps;
- Reporting.

Occupational Disease Surveillance in Developing Countries

It is estimated that more than 80% of the world's population live in developing countries which are often financially disadvantaged and many have largely rural and agricultural economies. The status of health of people in developing countries is generally lower than in developed countries as is reflected by higher infant mortality rates and lower life expectancies.

Several factors contribute to the need for Occupational Disease and Safety Surveillance in Developing Countries

- Many of these countries are rapidly industrialising;
- Many of the industries are small scale in nature with limited or non-existent health and safety facilities;
- Some hazardous industries which cannot operate in countries with stringent occupational health legislation are “exported” to developing countries;
- Education levels of workmen are often lower and they may not be trained in safe work practices;
- Child labour is prevalent and this group is more vulnerable to health hazards at the workplace.

Occupational Health Effects are Different from those seen in Developed Countries

It is important to obtain data on health effects for prevention and for prioritisation of approaches to solve problems as data originating from developed countries may not be applicable to developing countries. Overt occupational diseases such as chemical poisonings and pneumoconiosis are still encountered in significant numbers in developing countries, while these problems may have substantially reduced in developed countries. Acute health effects and even death from high exposure to pesticides are a greater immediate concern in developing agricultural countries as compared to the long term health effects from low dose

exposure to pesticides which may be a more important concern in the developed countries.

Unfortunately, occupational disease surveillance information is often lacking in developing countries and surveillance information and programmes from developed countries may be inappropriate for developing countries.

Problems of Surveillance in Developing Countries

While the need for surveillance exists in developing countries, actual implementation of the same is fraught with difficulties:

- Poor control on industrial development;
- Inadequately developed infrastructure for occupational health legislation and services, insufficiently trained occupational health professionals, limited health services and poor health reporting system;
- Occupational health is not accorded a high priority in national development programs in many developing countries. Though the priority may be set on paper.

Approaches to Develop Surveillance

A system with simple mechanisms which employs available and appropriate technology is best suited for developing countries.

Utilisation of Existing Resources

Utilise existing resources such as the Primary Health Care (PHC) Service already available and integrate occupational disease surveillance into the current duties of PHC personnel. For this to happen, the PHC personnel need to be trained in recognition of work related diseases and performing simple assessment of unsatisfactory workplaces in terms of occupational safety and health. The data collected could then be collated and channelled to regional centres and ultimately to the central agency responsible for monitoring work conditions and occupational health morbidity.

Surveillance of Occupational Disease and Work Processes in Small-Scale and Unorganised Industry

Occupational disease surveillance is particularly needed in the small-scale and unorganised industry and the task can be performed by PHC personnel. In order to be effective periodic update of data is essential.

Major Methods for Surveillance of Occupational Disease and Injury

Comprehensive occupational disease and injury surveillance systems utilise data from many different sources:

Mandatory Disease or Injury Reporting of Specific Diseases or Injuries by Healthcare Providers/Facilities

This is perhaps the oldest and most traditional approach. It tends to be more relevant for occupational disease than injury. The major strength is that it is based in an expert system, using clinicians to recognise specific diseases or injuries. The major weakness is low compliance. The proportion of cases that are reported may vary widely, but, in practice, most organisations operating a mandatory reporting system report a very disappointing level of compliance.

Mandatory Disease or Injury Reporting by Employers or Workplaces

This is a variation on the first approach, but uses employers or workplaces as the target to be mandatory reporters. It tends to be more relevant to cases of occupational injury than diseases that may not be recognised by non-clinicians.

Reports by Laboratories

Laboratories are usually highly compliant with reporting results, far more so than healthcare providers. This means that the greatest strength, along with accurate identification of diagnosis and causes, is a high capture rate, but this is only for the population referred for laboratory testing.

Sentinel Surveillance

A sample of reports from individuals and organisations, such as clinicians, laboratories, and hospitals, are used in sentinel surveillance. This can be effective when the goal is to estimate the magnitude and trends of a disease or injury. It is less effective in detecting the earliest cases, or providing data on the entire population of cases.

Periodic or Ongoing Prevalence Surveys

These can be used to assess prevalence trends over time and to help “fill the gaps” left by other types of surveillance systems, e.g. those that have low compliance for reporting. The major strengths of these surveys are as complementary approaches and when designed specifically to meet the needs of groups responsible for policy formulation.

Secondary Analysis of Data Sets Collected for Other Purposes

Data is collected for myriad reasons by a host of agencies. The major advantage is that there are little or no extra resources required. However, data protection and privacy issues may be a problem especially when merging data with other data sources.

Expert Opinion

When data is lacking, expert opinion may fill a vital role. It can be useful in generating hypotheses. However, it is known to be subject to systematic biases and current “fads” in both theory and practice and hence, it needs to be used with caution, but may be invaluable in the short term under certain circumstances.

Mixed Systems

Comprehensive modern surveillance systems usually deploy a mixture of the above techniques, in order to exploit the advantages of more than one approach and try to compensate for the weaknesses of others. The major strength of a mixed system is that it can be more comprehensive. However, the potential weakness is that it requires careful planning, design, implementation, and analysis.

Summary

To summarise, occupational disease services and surveillance is important, especially in the developing countries in view of the reasons mentioned above. There is an urgent necessity to justify, plan and prioritise occupational disease legislation, services and evaluation of outcome of the measures.

Developing countries need to develop a simple surveillance mechanism using available and appropriate technology taking into account the type of industry and occupational hazards important in the country. OHS services that work well and are in tune with the local needs and realities, realise benefits not only from the point of view of workers’ health but also promote work ability and productivity of the workers, and nations. Hence, the OHS services demand relevance, competence and quality.

Understanding Hazards and Risk

Dileep Andhare

THE OBJECTIVE OF THIS CHAPTER is only to offer the concepts of hazard, risk, identification of hazards and risk assessment. Primary Care Providers of the Primary Health Centres, Sub-Centres and Community Health Centres as well as private medical practitioners have severe limitations in accessing workplaces, like farms or fishing vessels or building and construction sites. There is no legislative provision for them to report hazards and risks to the statutory agencies. Till some legislation is put in place we only hope that the primary care system will use their influence and persuasion on employers as well as workers to create awareness which itself is half the battle won.

What is a Hazard?

The meaning of the word ‘hazard’ should be understood clearly as it can be confusing. Many people use the terms hazard and risk interchangeably which is not true. The more common definition when talking about workplace health and safety is as follows:

A hazard is any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work. Basically, a hazard can cause harm or adverse effects not only to individuals as health diseases or conditions or to organizations as property or equipment losses. Sometimes a hazard is also referred to as being the actual harm or the health effects it caused rather than the hazard. For example, tuberculosis (TB) might be called a hazard by some but in reality bacteria causing TB should be considered the “hazard”.

Some Examples of a Hazard

A wide range of sources can be workplace hazards. Examples may include any substance, material, process, practice, etc that has the ability to cause harm or adverse health effect to a person under certain conditions. See Table 1.

Workplace Hazard	Example of Hazard	Example of Harm Caused
Thing/Implement	Knife	Cut or injury
Substance	Benzene	Leukaemia
Material	Asbestos	Mesothelioma – Lung Cancer
Source of Energy	Electricity	Shock, electrocution
Workplace Condition	Wet floor	Slips, falls, injuries
Work Process	Welding	Metal fume fever
Work Practice	Hard rock mining	Silicosis

Table 1: Example of Hazards and their Effects

As shown above, workplace hazards also include practices or conditions that may release uncontrolled energy like:

- Potential or gravitational energy – an object that could fall from a height;
- Chemical energy – a run-away chemical reaction (As in Bhopal tragedy);
- Pressure; high temperature – the release of compressed gas or steam;
- Kinetic energy – entanglement of hair or clothing in rotating equipment; or
- Electrical energy – Contact with electrodes of a battery or capacitor.

What is Risk?

‘Risk’ is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a ‘Hazard’. It may also apply to situations with property or equipment loss. Risk can be described as: The risk of developing cancer by cigarette smokers is stated as “They are 12 times more likely to die of lung cancer than non-smokers”.

In short, ‘risks’ are expressed as a probability or likelihood of developing a disease or getting injured, whereas ‘hazards’ refer to the possible consequences (e.g., lung cancer, emphysema and heart disease say from cigarette smoking).

Factors that influence the degree of risk include:

- Duration and intensity of a person’s exposure to a hazardous thing or material or condition;
- In what manner the person is exposed (e.g., breathing in a vapour, skin contact); and
- How severe are the effects under the conditions of exposure.

What is Risk Assessment?

Risk assessment is the process to:

- Identify hazards at workplace,
- Analyse or evaluate the risk associated with that hazard, and
- Determine appropriate ways to eliminate or control the hazard.

How to do Risk Assessment?

To do a risk assessment, you need to understand what might cause harm to people and decide whether enough is being done to prevent that harm. Having decided that, you need to identify and prioritize putting in place, appropriate and sensible control measures. Start by:

- Identifying what can harm people in workplace;
- Identifying who might be harmed and how;
- Evaluating the risks and deciding on the appropriate controls, taking into account the controls already in place;
- Recording your risk assessment;
- Reviewing and updating your assessment.

What is an Adverse Health Effect?

A general definition of adverse health effect is “*any change in body function or the structures of cells that can lead to disease or health problems*”.

Adverse health effects can belong to many categories such as the following given below:

- Bodily injury;
- Disease;
- Change in the way the body functions, grows, or develops;
- Effects on a developing foetus (teratogenic effects, fetotoxic effects);
- Effects on children, grandchildren, etc. (inheritable genetic effects);
- Decrease in life span;
- Change in mental condition resulting from stress, traumatic experiences, exposure to solvents, and so on; and
- Effects on the ability to accommodate additional stress.

It is not necessarily that exposure to hazards in the workplace always cause injury, illness or other adverse health effects. Doctor or the paramedical professional needs to know:

- What hazards are present at workplace?
- Route of exposure, as well as how often and how much exposure occurred;
- What kind of effect could result from the specific exposure a person experienced?

- The risk (or likelihood) that exposure to a hazardous thing or condition would cause an injury, or disease or some incidence causing damage; and
- How severe would the damage, injury or harm (adverse health effect) be from the exposure?

The effects can be acute, meaning that the injury or harm can occur or be felt as soon as a person comes in contact with the hazardous. Some health effects may be delayed after long period of exposure. For example, exposure to poison ivy may cause red swelling on the skin two to six hours after contact with a chemical. A kind of cancer in the lung – mesothelioma can develop over 20 years or more after exposure to asbestos.

The health effects may be reversible or irreversible after the hazard is removed or eliminated.

What Types of Hazards Exist?

A common way to classify hazards is by category:

- Biological – bacteria, viruses, insects, plants, birds, animals, and humans, etc.;
- Chemical – depends on the physical, chemical and toxic properties of the chemical;
- Ergonomic – repetitive movements, improper set up of workstation, etc.,
- Physical – radiation, magnetic fields, pressure extremes (high pressure or vacuum), noise, etc;
- Psychosocial – stress, violence, etc.;
- Safety – slipping/tripping hazards, inappropriate machine guarding, equipment malfunctions or breakdowns.

HIRA: Hazard Identification and Risk Analysis

- To determine all the hazards;
- To determine likelihood and severity of injury or illness;
- To determine controls;
- To determine effectiveness of controls.

Benefits of Doing HIRA:

- Prevention of accidents;
- Prevention of occupational diseases;
- Cost saving – direct and indirect;
- Increased productivity;
- Decrease in lost man-hours;
- Increased employee morale;
- Corporate image.
- Business sustainability.

Principles of Occupational Safety

Jeevan Rao

OCCUPATIONAL SAFETY IS a discipline with a broad scope involving many specialized fields. In its broadest sense, it aims at:

- Promotion and maintenance of the highest degree of physical, mental and social well-being of people in all occupations;
- Prevention of adverse effects on health of people caused by their working conditions;
- Protection of people in their employment from risks resulting from factors adverse to health;
- Placement of people in an occupational environment based on physical and mental needs;
- Adaptation of work to humans, ergonomic factors etc.

Successful Occupational Safety practice requires the collaboration and participation people in health and safety programmes, and involves the consideration of issues relating to occupational medicine, industrial hygiene, toxicology, education, engineering safety, ergonomics, psychology, etc.

Importance of Occupational Safety

There are three main factors for employees as well as the Organization involved in various kinds of occupation. They are:

1. Economic factors;
2. Legal requirements;
3. Moral issues.

Economic Factors

- Compensation;
- Medical treatment;
- Abetment costs;
- Equipment damage;

- Statutory penalty;
- Loss of Productivity.

Legal Requirements

- Stringent and mandatory legal requirements in the areas of Occupational Safety;
- Litigations in the event of Safety legal non-compliance;
- General liability in the event of Safety non-compliance.

Morale Issues

- Increase in morale by having an effective safety management system in place;
- Brand image which may get damaged due to poor safety performance.

Poor Working Conditions Affect Health and Safety

- Poor working conditions of any type have the potential to affect an employee's health and safety;
- Unhealthy or unsafe working conditions are not limited to factories – they can be found anywhere, whether the workplace is indoors or outdoors;
- Poor working conditions can also affect the environment workers live in, since the working and living environments are the same for many workers. This means that occupational hazards can have harmful effects on workers, their families, and other people in the community, as well as on the physical environment around the workplace. A classic example is the use of pesticides in agricultural work. Workers can be exposed to toxic chemicals in a number of ways when spraying pesticides: they can inhale the chemicals during and after spraying, the chemicals can be absorbed through the skin, and the workers can ingest the chemicals if they eat, drink, or smoke without first washing their hands, or if drinking water has become contaminated with the chemicals. The workers' families can also be exposed in a number of ways: they can inhale the pesticides which may linger in the air, they can drink contaminated water, or they can be exposed to residues which may be on the worker's clothes. Other people in the community can all be exposed in the same ways as well. When the chemicals get absorbed into the soil or leach into groundwater supplies, the adverse effects on the natural environment can be permanent.

Effective ways of addressing the Occupational Safety issue is to recognize and control the hazards and have effective controls in place. While deciding the control methods for reducing the risks or while there are any changes made to the existing controls, the following hierarchy of controls is generally considered:

1. **Eliminating the Hazard** – physically removing it is the most effective hazard control. For example, if employees must work at height, the hazard can be eliminated by moving the piece they are working on to ground level to eliminate the need to work at heights.

2. **Substitution** – Substitution, is the second most effective hazard control, and involves replacing something that produces a hazard (similar to elimination) with something that does not produce a hazard for example, replacing lead based paint with water based paint. To be an effective control, the new product must not produce another hazard.
3. **Engineered Controls** – The third most effective means of controlling hazards is engineered controls. These do not eliminate hazards, but rather isolate people from hazards. For example, noise control by “Enclosure and isolation” creates a physical barrier between personnel and hazards, such as using remotely controlled equipment.
4. **Administrative Controls** – are changes to the way people work. Examples of administrative controls include procedure changes, employee training, and installation of signs and warning labels. Administrative controls do not remove hazards, but limit or prevent people’s exposure to the hazards, such as completing road construction at night when fewer people are driving etc.
5. **Personal Protective Equipment (PPE)** includes gloves, respirators, helmets, safety glasses, high-visibility clothing, and safety shoes. PPE is the least effective means of controlling hazards because of the high potential for damage to render PPE ineffective. Additionally, some PPE, such as respirators, increase physiological effort to complete a task and, therefore, may require medical examinations to ensure workers can use the PPE without risking their health.

Identifying the Cause of an Accident

If these above mentioned controls fail then there is a potential to cause an injury or an accident. In some cases, the cause of an industrial injury is easy to identify. However, very often there is a hidden chain of events behind the accident which led up to the injury. For example, accidents are often indirectly caused by negligence on the part of the employer who may not have provided adequate employee training, or a supplier who gave the wrong information about a product, etc. This calls for increased competency levels of all the people in the value chain and for having a systematic occupational health and safety education programmes that focuses on prevention. It is equally important to promote the development of occupational health services, including the training of doctors to recognize work-related diseases in the early stages.

There are an unlimited number of hazards that can be found in almost any workplace. There are obvious unsafe working conditions, such as unguarded machinery, slippery floors or inadequate fire precautions, but there are also a number of categories of hazards (that is, those hazards that are dangerous but which may not be obvious) including:

- Chemical hazards, arising from liquids, solids, dusts, fumes, vapours and gases;

- Physical hazards, such as noise, vibration, unsatisfactory lighting, radiation and extreme temperatures;
- Biological hazards, such as bacteria, viruses, infectious waste and infestations;
- Psychological hazards resulting from stress and strain;
- Hazards associated with the non-application of ergonomic principles, for example badly designed machinery, mechanical devices and tools used by employees, improper seating and workstation design, or poorly designed work practices.

Control of Accidents Causes

There are three main methods utilized to control accident causes: Engineering, Education and Training and Enforcement. These 3 methods are sometimes referred as the 3 E's of Safety and are outlined below.

The Three E's of Safety

Engineering

Causes of accidents or unsafe conditions can sometimes be eliminated through the application of engineering controls. When an operation is mechanically and physically safe, it is unnecessary to be as concerned as one would about the uncertain behaviour of people. Machines are less apt to fail than people. It may be necessary to make mechanical revisions or modifications to eliminate existing, unsafe conditions and, in some cases, to prevent unsafe acts. Design of machine guards, automobile brakes, traffic signals, pressure relief valves and hand rails are varied examples of safety engineering at work.

Education and Training

Just as safety engineering is the most effective way of preventing accidents involving mechanical and physical conditions, safety education is the most effective tool in preventing accidents by human causes. Through adequate instruction, personnel gain useful knowledge and development of safe attitudes. Training is a particularly important accident prevention control; it gives each employee a personal safety tool by developing habits of safe practice and operation.

Enforcement

Usually, accidents can be prevented through adequate safety engineering and education. However, there are some people who are a hazard to themselves and others because of their failure to comply with accepted safety standards. It is these persons for whom the strict enforcement of safety practices is necessary, backed by prompt corrective action. No organized accident prevention can be successful without effective enforcement because accidents are frequently the direct result of violations of safety principles.

All engineering, education, training, supervision and enforcement measures will be directed toward the solution of specific problems. These problems are identified based on the collection of facts relating to unsafe acts or unsafe conditions.

- Obstacles and impediments to the safe movement of personnel, vehicles or machines, such as blocked fire exits;
- Unsafe working and walking surfaces;
- Worn, damaged or misused tools;
- Failure to provide proper equipment and rigging for the hoisting and movement of heavy objects;
- Operation of equipment with guards for moving parts of machinery removed and/or defeated;
- Allowing employees to work without using required personal protective equipment such as goggles, gloves, hardhats, adequate footwear or seatbelts;
- Worn and/or damaged or unguarded electrical wiring, fixtures and power cords; and
- Absence of required signage warning of particular hazards in the area.

The important factor in eliminating unsafe conditions is doing so before an accident occurs. Near-miss occurrences need to be investigated and corrected as they are a warning of a condition that may eventually lead to an accident. A near – miss occurrence is an incident resulting in neither an injury nor property damage. However, a near-miss occurrence has the potential to inflict injury or property damage if its cause is not corrected. Too often an unsafe condition is allowed to exist simply because it has not caused an accident yet.

Reporting and Correcting Unsafe Conditions and Unsafe Acts

Unsafe conditions and acts should to be reported immediately. Regardless of the degree of safety built into a job, unsafe actions on the part of employees will always be a cause of injuries. Teaching employees safe work habits means showing them how to do their task with less risk to themselves and less damage to equipment. Much of this instruction can be boiled down to a few simple principles or job rules. By concentrating on these safe habits, by showing “why” as well as the “how” of safety and by constantly supervising employees’ safe work habits, they will become the accepted method for the employee to perform tasks.

Actual demonstrations of the right ways of doing tasks should be conducted, accompanied by the basis for preferring one work habit to another. Equally important as this initial instruction, is the review of subsequent performance. When the right way has been presented and agreed to by the individual worker, it is essential that failure to comply be corrected.

Repeated disregard of safety rules should be met with appropriate disciplinary action. No matter how skilful an employee may be in performing their duties, if

Principles of Occupational Safety

the employee does not perform them safely, that employee is playing themselves and others at risk.

Some of the management controls in order to improve the safety performance are –

- **Control** – Through commitment by all employees to comply with health & safety responsibilities and objectives;
- **Co-Operation** – Through encouraging participation and involvement of employees in planning, devising procedures, solving problems and reviewing performance, e.g., workplace self-inspections, safety and health annual evaluation process, incident investigation;
- **Communication** – Regular communication with employees on the subject of safety, risk, and hazards – verbal, written, and promotional activities;
- **Competence** – of all employees through recruitment, training and support to make sure that the right person is there for the right job and they make the maximum contribution to health & safety;
- Provide ways to report hazards, injuries and make recommendations to control hazards.

Legislation Related to Occupational Health in Informal Industry

GK Kulkarni

Introduction

THE FIFTEENTH INTERNATIONAL CONFERENCE of Labour Statisticians (ICLS), held in 1993, adopted an operational definition of the informal sector that is irrespective of the kind of workplace, the extent of fixed assets, the duration of the activity of the enterprises and its operation as a main or secondary activity. Within the household sector, the informal sector comprises:

- i. Informal own-account enterprises that are single member or partnership household units that do not hire workers on a continuous basis.
- ii. Enterprises of informal employers are household units owned and operated by employers, singly or in partnership, which employ one or more employees on a more or less continuous basis. For operational purposes the latter may be defined in terms of either, the size of unit below a specified level of employment or, non-registration of the enterprise or its employees.

Overview

The following Act of Parliament, dealing with the workers of unorganized sector was passed in December, 2008.

The Unorganised Workers' Social Security Act 2008, as it will be called, is aimed to *provide for the social security and welfare of unorganised workers and for other matters connected therewith or incidental thereto*. We will refer to some relevant clauses of the act: *Definitions*. – In this Act, unless the context otherwise requires,

- a. **Employer** means a person or an association of persons, who has engaged or employed an unorganised worker either directly or otherwise for remuneration;
- b. **Home-based worker** means a person engaged in the production of goods or services for an employer in his or her home or other premises of his

- or her choice other than the workplace of the employer, for remuneration, irrespective of whether or not the employer provides the equipment, materials or other inputs;
- c. **Self-employed worker** means any person who is not employed by an employer, but engages himself or herself in any occupation in the unorganized sector subject to a monthly earning of an amount as may be notified by the Central Government or the State Government from time to time or holds cultivable land subject to such ceiling as may be notified by the State Government;
 - d. **Unorganised sector** means an enterprise owned by individuals or
 - e. **Self-employed workers** and engaged in the production or sale of goods or providing service of any kind whatsoever, and where the enterprise employs workers, the number of such workers is less than ten;
 - f. **Unorganised worker** means a home-based worker, self-employed worker or a wage worker in the unorganised sector and includes a worker in the organised sector who is not covered by any of the Acts mentioned in Schedule II to this Act; and
 - g. “Wage worker” means a person employed for remuneration in the unorganised sector, directly by an employer or through any contractor, irrespective of place of work, whether exclusively for one employer or for one or more employers, whether in cash or in kind, whether as a home-based worker, or as a temporary or casual worker, or as a migrant worker, or workers employed by households including domestic workers, with monthly wage of an amount as may be notified by the Central Government and State Government, as the case may be.

Social Security Benefits

As per the provisions of this act the Central Government shall formulate and notify, from time to time, suitable welfare schemes for unorganized workers on matters relating to:

- a. Life and disability cover;
- b. Health and maternity benefits;
- c. Old age protection; and
- d. Any other benefit as may be determined by the Central Government.

The following class of acts cover major areas of Social Welfare / Unorganised Sector Welfare /Acts and Rules:

1. Industrial Relations
2. Industrial Safety & Health
3. Child & Women Labour
4. Social Security

5. Labour Welfare
6. Employment & Training
7. Wages
8. Industrial Relations
9. Others

Industrial Safety and Health

Laws Related to Working Hours, Conditions of Services and Employment

1. The Dock Workers (Safety, Health & Welfare) Act, 1986
2. The Mines Act, 1952
3. The Factories Act, 1948
4. Insecticide act 1968

Social Security

The following laws are related to social security:

1. The Employees' Compensation Act, 1923
2. The Employees' Compensation (Amendments) Act, 2000
3. The Employees' State Insurance Act, 1948

Labour Welfare

The following laws are related to Labour Welfare:

1. The Beedi & Cigar Workers (Conditions of Employment) Act, 1966
2. The Building & Other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996
3. The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979
4. The Cine Workers and Cinema Theatre Workers (Regulation of Employment) Act, 1981
5. The Unorganised Workers' Social Security Act, 2008

[Source: Ministry of Labour and Employment: Last modified: Aug 17, 2015]

It is advisable that one should be aware of salient provisions of occupational health in Factory's Act, ESIS Act, Building & Construction Workers' Act.

The Employees' State Insurance Act, 1948

Every employee employed in or in connection with work of a factory or establishment covered by the act and drawing wages up to Rs.15000 per month [effective from June 1, 2010] is required to be insured under the act.

Every insured employee and his employer have to pay the ESIS Corporation contribution at the rate of 1.75% and 4.75% respectively of the wages of the employee.

The following six benefits are provided under the act:

1. Sickness benefit
2. Maternity benefit
3. Disablement benefit
4. Dependent's benefit
5. Medical benefit
6. Funeral expenses

The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) ACT, 1996

This act is aimed to regulate the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measures and for other matters connected therewith or incidental thereto. It shall be deemed to have come into force on the 1st day of March, 1996.

It applies to every establishment which employs, or had employed on any day of the preceding twelve months, ten or more building workers in any building or other construction work.

The Act prescribes the following facilities and functions to the employer:

Item 223: Medical Facilities:

Medical examination of building workers, etc.: The employer shall ensure at a construction site of a building or other construction works that:

- a. i. A building worker who is employed for a work involving such risk or hazards, inherent in such work as the Director General considers appropriate for the periodical medical examination of such worker, is medically examined at such intervals as the Director General may direct from time-to-time;
- ii. Every operator of a crane, winch or other lifting appliance, transport equipment or vehicle, is medically examined before employing such operator and again periodically, at such intervals as the Director General may direct from time-to-time;
- iii. The medical examination referred to in sub-clause (i) and sub-clause (ii) Is in accordance with Schedule VII, annexed to these rules and is conducted by such medical officers or at such hospitals as are approved by the Central Government for the purpose from time to time;
- iv. In the case of a building worker who is exposed to special occupational health hazard owing to job or work assigned to such worker, the periodical medical examination referred to in sub-clause (i) or sub-clause (ii) includes such special investigation as may be deemed necessary by the construction medical officer examining such building worker for the diagnosis of occupational disease.

- b. No building worker is charged for the medical examination referred to in sub-clause (i) or sub-clause (ii) of clause (a) and the cost of such examination is borne by the employer employing such building worker;
- c. Certificate of medical examination referred to in sub-clause (i) or sub-clause (ii) of clause (a) is issued in Form XI annexed to these rules;
- d. The record of the medical examination referred to in sub-clause (i) or sub-clause (ii) of clause (a) of every building worker employed by him is maintained in a register in Form XII annexed to these rules and such register shall be made available to the inspector having jurisdiction, on demand;
- e. In case a construction medical officer examining a building worker under sub-clause (i) or sub-clause (ii) of clause (a) is of the opinion that such building worker so examined is required to be taken away from the building or other construction work at which he is employed for health protection, such medical officer shall inform the employer of such building worker accordingly and such employer shall inform such opinion to the Board where such worker is registered as a beneficiary.

Rule 224: Duties of Construction Medical Officer:

1. The medical examination referred to in sub-clause (i) or sub-clause (ii) of clause (a) of rule 223 shall be carried out by a construction medical officer.
2. The duties and responsibilities of such construction medical officer shall be as given below, namely:
 - (a) Medical examination of building workers;
 - (b) First-aid care including emergency medical treatment;
 - (c) Notification of occupational diseases to the concerned authorities in accordance with these rules;
 - (d) Immunisation services;
 - (e) Medical record, upkeep and maintenance;
 - (f) Health education including advisory services on family planning, Personal hygiene, environmental sanitation and safety;
 - (g) Referral services.

Rule 225: Occupational Health Centres:

The employer shall ensure at a construction site of a building or other construction work involving hazardous processes specified under Schedule IX annexed to these rules that:

- a. An occupational health centre, mobile or static, is provided and maintained in good order at such site;
- b. Services and facilities as per the scale laid down in Schedule X, annexed to these rules are provided at the occupational health centre referred to in clause (a);

- c. A construction medical officer appointed at an occupational health centre possesses the qualification as laid down in Schedule XI, annexed to these rules.

Rule 226: Ambulance Room:

The employer shall ensure at a construction site of a building or other construction works that:

- a. In case five hundred or less workers are employed at such construction site there is an ambulance room at such construction site or an arrangement with a nearby hospital for providing an ambulance room and such ambulance room is in charge of a qualified nurse and the service of such ambulance room is available to building worker employed at such construction site at every time when he is at work;
- b. In case more than five hundred building workers are employed at such construction site there is an ambulance room with effective communication system and such ambulance room is in charge of a qualified nurse and the service of such ambulance room is available to a building worker employed at such construction site at every time when he is at work; and such ambulance room is in overall charge of a construction medical officer;
- c. An ambulance room referred to in clause (a) or clause (b) is equipped with the articles specified in Schedule IV annexed to these rules;
- d. Record of all cases of accidents and sickness treated at the ambulance room referred to in clause (a) or clause (b) is maintained and produced to the inspector having jurisdiction on demand.

Rule 227: Ambulance Van:

The employer shall ensure at a construction site of a building or other construction work that an ambulance van is provided at such construction site or an arrangement is made with a nearby hospital for providing such ambulance van for transportation of serious cases of accident or sickness of the building workers to the hospital promptly and such ambulance van is maintained in good repair and is equipped with standard facilities specified in Schedule V annexed to these rules.

Rule 229: Occupational Health Services for the Building Workers:

The employer shall ensure at a construction site of a building or other construction work, where more than five hundred building workers are employed that:

- a. A special medical service or an occupational health service is available at such construction site at all times and such service shall:
 - i. Provide first-aid and emergency treatment;
 - ii. Conduct special medical examination for occupational hazards to such building workers before their employment and thereafter at such intervals as may be specified by the Director General from time to time;
 - iii. Conduct training of first-aid personnel of such medical service;

- iv. Render advice to such employer on conditions of work and improvement required to avoid hazards to the health of such building worker;
 - v. Promote health education, including family welfare among such building workers;
 - vi. Cooperate with the Inspector having jurisdiction in the detection, measurement and evaluation of chemical, physical or biological factors suspected of being harmful to such building workers;
 - vii. Undertake immunisation for all such building workers against tetanus, typhoid, cholera and other infectious diseases.
- b. The special medical service referred to in clause (a) collaborates with the labour department or any other concerned department or service of the Government of India in matters of treatment, job placement, accident prevention and welfare of such building workers.
 - c. The special medical service referred to in clause (a) is headed by a construction medical officer and is provided with adequate staff, laboratory and other equipments.
 - d. The premises of the special medical service referred to in clause (a) are conveniently accessible, comprise at least a waiting room, a consulting room, a treatment room, a laboratory and suitable accommodation for nurses and other staff of such service.
 - e. The special medical service referred to in clause (a) maintains records pertaining to its activities referred to in sub-clause (i) to (vii) of clause (a) and sends to the Director General, once in every three months, information in writing on:
 - i. The state of health of such building workers; and
 - ii. The nature and causes of occupational injuries or disease suffered by any of such building worker, treatment provided to such worker and measures taken to prevent recurrence of such injury or disease.

Rule 230: Notice of Poisoning or Occupational Diseases:

The employer shall ensure at a construction site of a building or other construction works that:

- a. When a building worker contracts any disease specified in Schedule II annexed to these rules, a notice in Form XIII annexed to these rules is sent without delay to the Inspector, having jurisdiction, and to the Board with which such building worker is registered as a beneficiary;
- b. If any medical practitioner or construction medical officer attends on a building worker suffering from any disease referred to in clause (a), such medical practitioner or construction medical officer sends information regarding the name and full particulars of such building worker and the disease suffered by him to the Director General without delay.

Rule 232: Emergency Care Services or Emergency Treatment:

The employer shall ensure at a construction site of a building or other constructions work those essential life-saving aids and appliances required to handle all possible medical emergencies at site for stabilizing the victim. Such aids also must be provided to an injured or a sick building worker during his transportation from such building site to a hospital and till such building worker is attended by a doctor in such hospital.

Schedule II: Notifiable Occupational Diseases in Building and Other Construction Work [See Rule 230 (A)]

1. Occupational dermatitis;
2. Occupational cancer;
3. Asbestosis;
4. Silicosis;
5. Lead poisoning including poisoning by any preparation or compound of lead or their sequelae;
6. Benzene poisoning, including poisoning by any of its homologues, their nitro or amino derivatives or its sequelae;
7. Occupational asthma;
8. Pesticide poisoning;
9. Carbon monoxide poisoning;
10. Toxic jaundice;
11. Toxic anaemia;
12. Compressed air illness (Caissons disease);
13. Noise induced hearing loss;
14. Isocyanates poisoning;
15. Toxic nephritis.

The Act also enumerates Articles for Ambulance Room [See Rule 226 (C)]

Schedule V describes Contents of Ambulance Van or Carriage [See Rule 227]

Schedule VII describes Periodicity of Medical Examination of Building Workers [See Rules 81 (IV) and 223 (A) (III)]

Schedule IX describes Hazardous Process: [See Rule 225]

1. Roof work;
2. Steel erection;
3. Work under and over water;
4. Demolition;
5. Work in confined spaces.

Schedule X describes Service and Facilities to be Provided in Occupational Health Centres: [See Rule 225(B)]

Schedule XI specifies Qualification of Construction Medical Officer [See Rules 119(2) & 225(C)]

Sexual Harassment of Women at Workplace

The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 is a legislative act in India that seeks to protect women from sexual harassment at their place of work. It was passed by the Lok Sabha in September 2012. It was passed by the Rajya Sabha in February 2013. The Bill got the assent of the President in April 2013. The Act came into force from 9 December 2013. This statute superseded the Vishakha Guidelines for prevention of sexual harassment introduced by the Supreme Court of India. It was reported by the International Labour Organization that very few Indian employers were compliant to this statute. Most Indian employers have not implemented the law despite the legal requirement that any workplace with more than 10 employees need to implement it. The government has threatened to take stern action against employers who fail to comply with this law.

Background and Provisions

According to the Press Information Bureau of the Government of India:

The Act will ensure that women are protected against sexual harassment at all the work places, be it in public or private. This will contribute to realisation of their right to gender equality, life and liberty and equality in working conditions everywhere. The sense of security at the workplace will improve women's participation in work, resulting in their economic empowerment and inclusive growth.

The Act uses a definition of sexual harassment which was laid down by the Supreme Court of India in Vishaka v. State of Rajasthan (1997). Article 19(1)g of the Indian Constitution affirms the right of all citizens to be employed in any profession of their choosing or to practice their own trade or business. Vishaka v. State of Rajasthan established that actions resulting in a violation of one's rights to 'Gender Equality' and 'Life and Liberty' are in fact a violation of the victim's fundamental right under Article 19 (1) g. The case ruling establishes that sexual harassment violates a woman's rights in the workplace and is thus not just a matter of personal injury.

Under the Act, which also covers students in schools and colleges as well as patients in hospitals, employers and local authorities will have to set up grievance committees to investigate all complaints. Employers who fail to comply will be punished with a fine of up to 50,000 rupees.

Major Features

The Act defines sexual harassment at the workplace and creates a mechanism for redressal of complaints. It also provides safeguards against false or malicious charges:

Legislation Related to Occupational Health in Informal Industry

- The Act also covers concepts of ‘quid pro quo harassment’ and ‘hostile work environment’ as forms of sexual harassment if it occurs in connection with an act or behaviour of sexual harassment;
- The definition of “aggrieved woman”, who will get protection under the Act is extremely wide to cover all women, irrespective of her age or employment status, whether in the organised or unorganised sectors, public or private and covers clients, customers and domestic workers as well;
- While the “workplace” in the Vishakha Guidelines is confined to the traditional office set-up where there is a clear employer-employee relationship, the Act goes much further to include organisations, department, office, branch unit etc. in the public and private sector, organized and unorganized, hospitals, nursing homes, educational institutions, sports institutes, stadiums, sports complex and any place visited by the employee during the course of employment including the transportation. Even non-traditional workplaces which involve tele-commuting will get covered under this law;
- The Committee is required to complete the inquiry within a time period of 90 days. On completion of the inquiry, the report will be sent to the employer or the District Officer, as the case may be, they are mandated to take action on the report within 60 days;
- Every employer is required to constitute an Internal Complaints Committee at each office or branch with 10 or more employees. The District Officer is required to constitute a Local Complaints Committee at each district, and if required at the block level;
- The Complaints Committees have the powers of civil courts for gathering evidence;
- The Complaints Committees are required to provide for conciliation before initiating an inquiry, if requested by the complainant;
- The inquiry process under the Act should be confidential and the Act lays down a penalty of ₹ 5000 on the person who has breached confidentiality;
- The Act requires employers to conduct education and sensitisation programmes and develop policies against sexual harassment, among other obligations;
- Penalties have been prescribed for employers. Non-compliance with the provisions of the Act shall be punishable with a fine of up to ₹ 50,000. Repeated violations may lead to higher penalties and cancellation of licence or registration to conduct business;
- Government can order an officer to inspect workplace and records related to sexual harassment in any organisation.

History Taking in Occupational Health

Wai-On Phoon and Ramnik Parekh

IN MANY WAYS, OCCUPATIONAL HEALTH as a discipline originated with the famous question of Bernardino Ramazzini “What is your occupation?” This question is taught in all schools of medicine, usually in elementary clinic courses when the young medical student encounters patients in the wards for the first time. It is also the question on which hinges the whole of history-taking in occupational health.

The good occupational health physician has first of all to be also a good general physician. He has to attain a reasonable degree of competence in general history-taking just as he has to be able to conduct a physical examination well enough so as not to miss obvious abnormalities. In occupational health as in other specialties of medicine, the importance of a good history is often underestimated by students and practitioners. It is tragic to observe so many of them rushing through taking a history so that they could spend more time on clinical examination but consequently missing important diagnostic points in the process. Therefore, the aspiring occupational health physician is well advised to devote a considerable amount of effort to developing the skill of history, taking insofar as occupational problems are concerned. Sometimes the history alone may clinch the diagnosis and at other times there may even be no positive signs although an occupational health problem undoubtedly exists.

Proper Rapport

To take a good history requires rapport between doctor and patient (we shall use this term even for a healthy worker *who* is seen by the doctor for routine check-ups). The work-site physician who knows the workers has a distinctive advantage over the consultant who may be seeing them for the first or last time. Under the circumstances close rapport between doctor and patient could be established if the doctor is friendly and able to communicate effectively with his patient. A few extra minutes of the doctor’s time in putting the patient at ease can be time very well spent.

Knowledge of the Environment

The doctor must have a good grasp of the work hazards and demands of the main occupations. No doctor, however expert, can be expected to know all the details about every occupation. In any case, hazards at every work-site where the same occupation is practiced are not identical. Nevertheless, there are enough similarities at almost all work-sites for the same job category for the occupational health physician to get by.

Duration and Sequence of Occupations

The process of history taking must vary according to the conditions about which we are trying to elicit information. For example, we may be enquiring about the possible toxicity from a substance which takes effect within hours *or* days of the first exposure without cumulative effects. In that case we may not need to go into a full occupational history of the last several years unless we are also seeking information about an antecedent exposure which might have caused some organ damage pre-disposing to toxicity from the present hazard. On the other hand, a history related to a condition with a very long latent period may require painstaking effort to elicit occupational details stretching for up to half a century before in the life of the worker

If, for whatever reason, a full occupational history is necessary, it is often wise to start with the most recent occupation which the worker should have the least difficulty in remembering. Then the doctor could go backwards in time through other occupations to the worker's first job. In each case the name (and, if indicated, the address) of the enterprise and its main activities and hazards, and the duration of employment there, should be asked for.

Technical Terms

The doctor must be familiar enough with common technical terms to conjure up in his mind their usual associated hazards whenever they are mentioned; e.g. welding, soldering, dyeing, hardening and shot blasting. A simple technical dictionary is often very useful since an ordinary one does not contain many technical terms.

Colloquialisms

In history taking, the physician should not only be on the same mental wave-length as the patient but also understand the colloquialisms or slang words, or dialect used by the patient. There is no easy way to attain this competency but often the best helpers or interpreters in this regard are other workers in the same socio-economic class or dialect group.

The Use of Structured Questionnaire

In some situations like health surveillance in workers and specific hazards, a structured questionnaire on symptoms can save a lot of time. The patient, the nurse or the doctor could fill in the different boxes in the forms. We can allow flexibility to avoid exclusion of important but unexpected information which does not fit into any of the boxes.

Medical Records

Wai-On Phoon and Ramnik Parekh

MEDICAL RECORDS ARE AN ESSENTIAL PART and function of occupational health service of any enterprise. Their importance and utility is particularly more than customary in any other healthcare service. Basic character inbuilt in occupational health practice is epidemiological observation of captive population of workforce over a long period of time. Medical records therefore assume significance. Adverse health effects of hazardous processes in an industry take a long time to manifest clinically and hence legislation of many progressive countries makes preserving of medical records of individual employees mandatory even after they have retired from work.

Occupation Health Services (OHS) have to maintain mainly two types of records. Personal Health Records of individual employees and Daily Attendance and Work Records of OHS often called 'Day Sheets.'

Benefits of Medical Records

Benefits of good medical records are many:

1. Efficient care of employees;
2. Long term epidemiological observations;
3. Analysis of accidents and sickness;
4. Planning interventions;
5. Evaluation of Healthcare Service and its utilization;
6. Statutory compliance.

Before the advent of computers, all medical records were maintained manually in form of hard copies or paper records. Even today in many developed countries, factory employees' medical records are still not computerized. The main reason for such a situation is probably paucity of a robust, efficient and low-cost software and/or reluctance of medical personnel to use it. Actually speaking keeping medical records manually is also not a complex task; what one needs is immaculate discipline and steadfast hard work

Employees' Personal Medical Records

Many enterprises use A4 cards with cloth-backed envelopes for personal records. Each employee has a record card. Envelopes are stored in cabinets in alphabetical

order by surnames or by employees' ID numbers. Envelope also exhibits a colour code for chronic diseases like hypertension, coronary artery diseases or diabetes. Access to these records is only to the medical and paramedical staff of the occupational health service. Every visit of every employee for every sickness or injury is recorded in this card. Symptoms, clinical findings, provisional diagnosis and prescribed treatment are noted. At the end of the day, a summary of the day's work is recorded into a register for periodic data analysis. Meticulously kept records make it easy for the occupational health service to obtain epidemiological observations, quantify the work of OHS, information on utilization of OHS and analysis like frequency, severity and incidence statistics. Specimens of such a manual paper records system are given in figure 1, figure 2 and figure 3.

It is imperative that pre-employment or baseline medical screening data are also stored in the same docket for future reference. They come handy also in case of medico-legal or compensation disputes in future.

Daily Attendance/Activities Register

This Register should typically have the following components Number of cases of sickness (Occupational or non-Occupational):

1. Number of cases of injuries
2. Major Diagnostic codes as per international classification of diseases
3. Number of Pre-employment screening cases
4. Number of Periodic screening cases
5. Statutory Examinations
6. Food Handlers' Checkups
7. Vehicle Drivers' Checkups
8. ECG
9. Audiometry
10. Physiotherapy
11. Referrals to Hospitals or Specialists
12. Referrals for investigations
13. Sick leave record
14. Injury details including the cause

Daily Activity Records are very useful in computing the quantity of activities of the Occupational Health Service, each type of service and utilization of service. They also allow statistical analysis of sickness, injuries and sickness absenteeism.

When batch processing is done at the end of each shift, one staff member per shift must be responsible for medical records, and if more than one staff is involved, each record must mention the staff making the entry. Occupational Health Physician, who is generally heads occupational health services, should clearly and explicitly sensitize the staff on the issue of confidentiality of medical records of the employees.

Occupational Hygiene

Wai-On Phoon and Ramnik Parekh

OCCUPATIONAL HYGIENE IS concerned with the detection, measurement and evaluation of physical and chemical factors in the work environment, and the planning and implementation of measures to improve the environment.

In some countries such as the USA and Finland, specialists in the subject are usually chemists, engineers or physicists by training. In other countries such as the USSR, physicians undergo further specialized training to become occupational hygienists and they are supported by chemists, engineers and physicists in their activities. It is obviously impossible to do justice to a subject as wide as occupational hygiene in a single chapter. Therefore only brief descriptions of the basic occupational hygiene equipment and their uses will be given.

In some developing countries, the physicians have great difficulty in consulting occupational hygienists, who are rare in those parts of the world. As a result, the doctor may find that he is the only professional person around to supervise auxiliary staff in carrying out simple occupational hygiene methods. He may sometimes need to order materials and operate occupational hygiene equipment by himself. Under such circumstances, he should note the following points:

- I. Unless he has had some specialized training in occupational hygiene, he should content himself with acquiring only simple field instruments. And not those requiring elaborate chemical analysis or other difficult procedures.
- II. The instruments to be obtained should also fulfil the following criteria –
 - a. They should be durable and should be able to withstand the warm and tropical heat in those countries.
 - b. The suppliers should be carefully checked to ascertain their capability and willingness to maintain, repair and calibrate the instruments.

From personal experience, it is virtually impossible to get suppliers to retain much interest in the instruments after the sales are completed as the market in developing countries is very small and the likelihood of one department or institute giving further business to the suppliers may be minimal. Wherever possible, expert advice in one's own country or overseas should be sought

before selecting an expensive instrument. This advice moreover should be obtained from an authority familiar with the special problems of developing countries.

- III. The equipment should preferably be stored in an air-conditioned room and the more delicate ones in a room which is both air-conditioned and de-humidified as well since fungi grow more easily in humid conditions.
- IV. The equipment should be tested, maintained and calibrated regularly. In absence of special laboratories for such purposes, one should attempt to obtain the assistance of the Departments of Physics, Chemistry, Biochemistry or Engineering in universities or technical colleges. Sometimes large industries have quality-control laboratories which can help in this respect. Moreover, some Ministries of Health may have laboratory equipment which can be used for occupational hygiene purposes.

The following list contains some instruments which may be useful as basic equipment. It is by no means exhaustive and should be modified according to circumstances. It is assumed that there is no qualified occupational hygienist available but that the physician has some access to unskilled assistance. The doctor would then have to operate the instruments or train others to do so. With some experience, he could increase the size and range of his equipment.

1. **Lighting**

A small photometer

2. **Sound**

- a. A small sound survey meter

- b. A sound level meter with a waveband analyzer

3. **Thermal Environment**

- a. A thermometer

- b. A whirling hygrometer

- c. A globe thermometer

- d. A kata thermometer

4. **Chemical Environment**

A set of direct reading indicator tubes based on colour change as a result of chemical reactions should include a pump and specific tubes to measure common hazards such as carbon monoxide and hydrogen sulphide.

Instruments for counting dust are too complex to be described here. Besides, considerable skill and sophistication in their use and the interpretation of results are required.

Some of the listed instruments are discussed below whereas others will be described elsewhere in the text.

Instruments for the Measurement of Noise

There is a wide range of devices for the measurement of noise. There are three main types although recently their differences have become less distinct:

(1) Sound Survey Meters

These meters are usually small (often pocket sized) and simple instruments. They are useful for the rapid screening and surveying of a large area. The physician can easily take one along during his routine worksite visits. The results need to be confirmed by the more complicated sound level meter described below.

(2) Sound Level Meters

Like the sound survey meter, the sound level meter has a microphone and an electronic circuit. However, it is more complicated and accurate.

(3) Waveband (Frequency) Analyzers

These are used to determine the distribution of noise-levels according to their frequencies. Often the sound level meter comes together with a waveband analyzer in a set.

It is advisable to select instruments which are durable and able to withstand the climate and being knocked about on the uneven roads of many tropical countries. Regular calibration is a necessity.

Audiometry

An audiometer is used to test hearing acuity. There are two kinds of audiometers:

- (1) The manual audiometer operated by a staff member.
- (2) The sel-recording audiometer which is set up by the operator but controlled by the examinee during the test.

The manual audiometer is satisfactory for most worksites but the self-recording model may be preferred by organizations with very large numbers of employees. Either kind can be installed in a van or kept in a clinic.

Whichever model is used, the following should be remembered:

- (a) The testing should be done in a soundproof booth which complies with international standards laid down by the WHO;
- (b) The operator should be trained and skilled in testing;
- (c) Regular and proper calibration by experts should be carried out.

In addition to the usual audiometer, there are several kinds of screening audiometers. Some of these are contained in small boxes and battery-operated. They are useful as screening devices if the results obtained could be confirmed on a more elaborate audiometer.

Direct Reading Instruments for Detecting Toxic Substances

Direct reading instruments are of various kinds. Commonly used are those which produce a colour change when an airborne substance is aspirated through the tube to react with other substances in the tube. Examples are the Drager and Kitagawa indicator tubes. The concentration of airborne substance tested is shown by the

length of colour change in the column of chemical reaction in the tube. With each box of indicator tubes to test a specific substance is a colour chart which serves as a reference standard. Different manufacturers have different ranges of indicator tubes for the measurement of airborne chemical hazards. Most have tubes for the measurement of carbon monoxide, trichlorethylene, hydrogen sulphide, nitrogen dioxide, ammonia and other common substances. Together with the tubes, the manufacturer supplies a manually-operated pump which sucks in a given volume of air each time it is squeezed or pulled. The precise operating procedure varies with the brand of indicator tube used.

The following points, however, should be kept in mind when using direct reading indicator tubes:

1. Select a device with a robustly-built and easily-manipulated pump.
2. The usual storage life is short. The expiry dates are marked on the outside of the containers. It may be necessary to obtain the tubes by air freight. Keeping them in the refrigerator will lengthen their period of usefulness.
3. The rate of chemical reaction varies considerably with the temperature. The volume of air drawn through the tube will also change with the temperature. It must be remembered that the indicator tubes are usually manufactured and calibrated in temperate climates. The results may not be very accurate when the tubes are used in the tropics.
4. The operator must not suffer from colour blindness. Some people are unaware that they are colour blind.
5. Airborne substances, other than those to be tested, may interfere with the reading of the results by reacting with the chemical substance in the tubes.
6. It is highly desirable to calibrate the tubes and pump from time to time but it will be beyond the capability or resources of the usual physician to do so.

Clinical and Biological Monitoring for Effects of Toxic Substances

Wai-On Phoon and Ramnik Parekh

MONITORING FOR OCCUPATIONAL hazards is best considered under three headings:

- Environmental
- Clinical
- Biological

Environmental Monitoring is discussed in another part of the book. *Clinical Monitoring* includes periodic examinations for workers exposed to hazards and is also referred to in the section on 'Routine Medical Examinations'. *Biological Monitoring* refers to laboratory tests done mainly on body fluids such as blood, saliva and urine for the purpose of monitoring.

Clinical Monitoring

Clinical acumen is required in taking a proper occupational history and in examining a patient. In developed countries and to an increasing extent in developing countries, one should not expect to find many florid cases of occupational diseases. This may cause the physician to think that there are no positive signs in any of the cases he examines. Consequently, the physical examination may deteriorate into a kind of meaningless ritual. Occupational diseases with signs do occur from time to time even in the most advanced countries or work-sites with the best occupational health facilities.

Biological Monitoring

Some authorities would include clinical examinations in biological monitoring but for purposes of discussion we shall stick to the definition mentioned above.

Taking the Sample

Care must be taken to obtain samples which are free from contamination. This is extremely important when doing it in the worksite. For example, there may

be a lot of lead in a battery manufacturing plant. Care must be taken to clean the skin thoroughly before venipuncture to obtain blood for the estimation of lead.

Whenever possible, the procedure should be performed far away from the polluted part of the worksite. Care should also be taken to label the personal data accurately. The date and time should also be recorded as well as any other specific details that the sample requires.

1. **Storage of the Sample**

This largely depends on the particular sample but in general refrigeration is preferable.

2. **Despatch to the Laboratory**

In general, the sample should be sent to the laboratory as soon as possible because chemical change or biological degradation tends to occur with time and consequently the result may not be accurate.

3. **Testing**

- (a) We shall not discuss the technical procedure which would vary with the requirement. In general, however, if the result is abnormal, it is usually wise to repeat it as there may be a technical error. However, if the danger as reflected by an abnormal result is great, the worker should be removed from exposure to the hazard pending the results of the repeat test.
- (b) For all laboratory procedures quality control is essential. This is of two kinds. There should be internal quality control within the laboratory itself e.g. between different staff members and pieces of the testing equipment. There should also be external quality control which could relate to the same city or country or internationally. Portions of the same sample are sent around the members of the quality control circle, who then test them blind. The results, are then circulated. Laboratories which have very different results from the rest could then check if there is any error, the method, the equipment, or the tester.

Pulmonary Function Tests

The measurement of pulmonary function is widely used in biological monitoring especially of workers exposed to dust, fumes or gas.

Spirometry

Pulmonary function is usually measured by spirometers of which there are two main types:

- (a) Those which measure volume directly;
- (b) Those which measure flow and derive volume by a method such as the integration of the flow signal.

Volume Spirometers

The three most common types are the water seal, the dry – rolling seal and the bellow type.

Flow Type Spirometers

The three most common types are the pneumotachograph, the hotwire anemometer and the rotating vane.

In general, devices which measure flow and which derive volume are more difficult to calibrate and maintain and are less accurate in determining volume.

All volumes and flows should be connected to a body temperature of 37°C ambient pressure saturated with water vapour.

Like all scientific equipment, spirometers require standardization and regular calibration to ensure that the results are correct.

Common Spirometric Indices

1. Forced Vital Capacity (FVC)

Forced Vital Capacity is the volume of air which can be exhaled forcefully after full inspiration. Any impairment of the expansibility of the lungs or the squeezing out of the inspired air by expiration will result in a reduction of value.

2. Forced Expiratory Volume in one Second (FEV1.0)

Forced Expiratory Volume 1.0 is the volume of air exhaled during the first second of the FVC. Any impairment in expiration e.g. by bronchoconstriction will lead to a fall in value.

3. FEV 1.0/FVC

This is the forced expiratory volume in one second expressed as a percentage of the forced vital capacity. Normally it should be about 15 percent.

Use of Spirometry

Spirometry is of greatest use in such occupational lung diseases as byssinosis and asthma which chiefly affect the airways. Spirometry can also be used to monitor deviations from baseline values in workers exposed to dust hazards.

Factors such as cigarette smoke and atmospheric pollution must be taken into account when considering the significance of Spirometric finding. At the same time personal factors (sex, height and race) have also to be considered as they may affect Spirometric value.

1. Diffusing capacity

The single breath test of diffusing capacity requires the subject to inhale (from residual volume to total lung volume) a mixture of carbon monoxide and helium in the air. After holding the breath for ten seconds, the subject exhales to the residual volume. The expired air is then analysed for carbon

monoxide and helium. This method requires a gas analyzer, a spirometer, a bag for expired air and a timing device. Diffusing capacity **can** be useful to screen early interstitial diseases of the lungs.

2. Single Breath Nitrogen Test

The subject breathes in a vital capacity inspiration of oxygen and expires very slowly to the residual volume. The percentage of nitrogen in the expired air is measured. The test may be useful in detecting early disease of the small airways.

3. Cold air challenge

Subfreezing dehumidified air is breathed through a heat exchanger which keeps the inspired air at between -5° and -20° C. The FEV and FVC after the test are compared with those before. Normal subjects show little change compared with decrements of FEV1 or FVC of nine percent or greater in asthmatics.

4. Methacholine challenge

A series of increasing doses of acetylbetamethylcholine chloride (Methacholine) is administered by inhaled aerosol until the FEV 1.0 falls by at least 20 percent from the control value. The test is used to predict the development of occupational asthma or to diagnose bronchial hyperactivity among workers already exposed to Toulene diisocyanate or other agents well-known for producing occupational asthma.

Comment

In some societies people are averse to having their blood taken. They have erroneous ideas of how much blood there is in the body and object to the taking of even a tiny volume of blood as happened in this case. This was the first time blood was taken by venupuncture from the workers. After some reassurance and a full explanation of why blood had to be taken (for their own safety) and how negligible the amount was in proportion to the total blood volume, the workers returned to work. There was no problem subsequently. However, the manager continued sending the workers in different batches. It is therefore wise to make sure the workers understand fully all the implications of examinations carried out on them and to stagger initial tests to avoid any disruption of individual activity.



Occupational Safety and Health Issues in Informal Occupations

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Agriculture

This chapter will deal with occupational health and safety issues of farmers, landless agricultural labourers, share croppers, attached agricultural labourers, bonded labourers, migrant workers and contract & casual labourers.

THE TERM 'AGRICULTURE' is generally used in a broad sense including all activities directly related to cultivating, growing, harvesting and primary processing of agricultural products, animal and livestock breeding including aquaculture, and agro forestry. The term also refers to all agricultural undertakings, irrespective of size.

Half of the total world labour force (approx.1.3 billion) is engaged in agricultural production worldwide; 60% of them are in developing countries. More than 40% of the world's agricultural population is concentrated in China and more than 20% in India. Today, India ranks second worldwide in farm output. Agriculture and allied sectors like forestry and fisheries accounted for 13.7% of the GDP (Gross Domestic Product) in 2013, about 50% of the total workforce. India exported \$39 billion worth of agricultural products in 2013, making it the seventh largest agricultural exporter worldwide, and the sixth largest net exporter.

Distribution of Workforce

Agricultural labourers in India fall broadly into the following four categories:

- Landless labourers, who are attached to the landlords;
- Landless labourers, who are personally independent, but who work exclusively for others;
- Petty farmers with tiny bits of land who devote most of their time working for others;
- Farmers who have economic holdings but who have one or more of their sons and dependents working for other prosperous farmers.

“Agriculture” as a Farming System encompasses activities and enterprises directly related to cultivating, growing, harvesting and primary processing of agricultural products, animal and livestock breeding including aquaculture, and agro forestry under the following heads:

1. Family Farming
2. Plantations

3. Urban Agriculture
4. Greenhouse and Nursery Operations
5. Floriculture
6. Fruit Orchards

Characteristics of Work

Whatever be the agricultural activity the following are the characteristics of the work:

- Exposure to climatic conditions while working out in open air, seasonal nature of work, urgent in specific periods and exposure to dusts;
- Multiple tasks performed by single person causing variation in working postures and duration of tasks;
- Exposure to bites, infections, allergies and other health problems due to contact with animals, plants, media like soil and water;
- Contact with toxic chemical and biological products such as pesticides, rodenticides, fertilisers;
- Exposure to variety of machines;
- Delay in medical attention, emergency services in time of accidents due to the remoteness of a high percentage of the work sites;
- Increasing the risk of farm-related accidents to children due to proximity of dwellings to workplace;
- High proportion of very young and old workers.

Health Problems and Disease Patterns

Hazards related to health and safety - are more or less shared by all these activities. Agricultural work is prone to a large variety of health problems and the workers are at high risk. Health hazards of the agricultural workers are described below with their causative sources and manifestations.

Health Condition & Causative Source	Clinical Perspective Page
Respiratory Conditions	
Asthma and rhinitis: Immunoglobulin Mediated asthma Causative Source: A number of chemicals with or without direct toxic effect on the skin can also cause systemic intoxication following absorption through the skin. Plant foods can be contaminated by pesticides under a great variety of circumstances and at different times preceding their consumption.	185
Non-immunologic asthma: Causative Source: Organic dust.	186
Mucous Membrane Inflammation Causative Source: Specific plant parts, endotoxins, mycotoxins.	277
Bronchospasm, acute and chronic bronchitis Causative Source: Insecticides, arsenic, irritant dust, ammonia, fumes, grain dust (wheat, barley).	200

Agriculture

Health Condition & Causative Source	Clinical Perspective Page
<p>Hypersensitivity Pneumonitis Causative Source: Fungal spores or thermophilic actinomycetes released from grain moulds or hay, antigens of < 5 mm in diameter.</p>	200
<p>Bagassosis (Interstitial lung disease characterized by cough, hemoptysis, breathlessness, and low grade fever. It starts as pneumonitis but may also progress to acute diffuse broncholitis. X-ray reveals mottling of lungs or shadow.) Causative Source: Thermophilic actinomycetes: moulds on sugar cane.</p>	185
<p>Mushroom worker's lung (A hypersensitivity pneumonitis that can result from alveolitis and interstitial fibrosis due to contact with allergens associated with the mushroom industry and can even progress to respiratory failure. Pathological demonstration of specific IgE and IgG immunoglobulins against spore extracts may be diagnostic but not always found.) Causative Source: Mushroom spores (during clean-out of beds).</p>	186
<p>Farmer's lung (A potentially fatal hypersensitivity pneumonitis if it progresses to becoming a chronic illness. It is caused by inhalation of biological dust from hay, spores or other agricultural products.) Causative Source: Mould on hay, compost.</p>	186
<p>Maple Bark stripper's disease (Maple is grown in temperate regions of North India.) (This is an alveolitis manifested by fever, chest pain, substernal; Hyperhidrosis/Chronic sweating excess, chronic productive cough, bronchospasm, dyspnoea, basilar rales, wheezing and weight loss.) Causative Source: Fungi: mouldy maple bark.</p>	186
<p>Wheat Weevil disease (a hypersensitivity pneumonitis caused by exposure to weevil particles in wheat flour). Causative Source: Anthropoids: infested wheat flour.</p>	189
<p>Organic dust toxic syndrome (This is a potentially severe influenza like syndrome occurring with 4-12 hours of inhalation of organic dust. It presents with fever with rigors, myalgia, headache, rhinitis conjunctivitis, keratitis, and respiratory symptoms such as dry or wheezing cough and dyspnoea that can rapidly progress to pulmonary oedema and hypoxia. Chest X-rays are usually normal and a raised neutrophil count can be seen). Also Grain fever (Occupational history and history of exposure to grains must be elicited). Causative Source: Plant debris, starch granules, moulds, endotoxins, spores, mycotoxins, fungi, gram-negative bacteria, enzymes, allergens, insect parts, soil particles, chemical residues. Plus Dust from stored grain (Grain Fever).</p>	190
<p>Silo unloader's syndrome is different from Farmer's lung and symptoms include fever, myalgia, cough, sensation of chest constriction and headache. Symptoms occur within 12 hours of exposure. Causative Source: Mouldy silage on top of silage in silo.</p>	190
<p>Acute Pulmonary Responses Causative Source: Decomposition gases: NH₃, H₂S, CO, CH₄, SO₂, 3 2 4 2 phosgene, chlorine, ozone, paraquat (herbicide), anhydrous ammonia (fertilizer), oxides of nitrogen.</p>	

Health Condition & Causative Source	Clinical Perspective Page
<p>Silo filler's disease (Symptoms may range from mild cough and mucous membrane irritation to severe exacerbations of underlying pulmonary diseases like COPD or asthma and, in extreme cases, respiratory distress and eventual death. Suspect methemoglobinemia in patients exposed to NO₂ who exhibit cyanosis or dyspnoea.) Causative Source: Nitrogen dioxide from fermenting silage.</p>	
<p>Metal fume fever (An Influenza like illness characterised by headache, fever with rigors, myalgia, nausea, vomiting, and malaise. The onset of the illness may usually be after a gap in exposure to Zinc Oxide such as returning to the job after a vacation.) Causative Source: Welding Fumes.</p>	205
<p>Asphyxiation Causative Source: Oxygen deficiency in confined spaces.</p>	211
<p>Valley fever (coccidiomycosis) causes fever, chest pain and cough due to fungi in soil dust. Causative Source: Soil dust of arid regions.</p>	209
<p>Tuberculosis (migrant workers) Causative Source: Mycobacterium Tuberculosis.</p>	197
Dermatological Conditions	
<p>Contact Dermatitis Causative Source: Ammonia and dry fertilizers, vegetable crops, bulb plants, fumigants, oat and barley dust, several pesticides, soaps, petroleum products, solvents, hypochlorite, phenolic compounds, amniotic fluid, animal feeds, furazolidone, hydroquinone, halquinol.</p>	171
<p>Grain Itch Causative Source: Mites.</p>	171
<p>Allergic Contact Dermatitis Causative Source: Sensitizing plants (poison ivy or oak), certain pesticides (dithiocarbamates, pyrethrins, thioates, thiurams, parathion, and malathion).</p>	171
<p>Tulip Finger Cause: Handling tulips and tulip bulbs.</p>	175
<p>Photo Contact Dermatitis Causative Source: Creosote, plants containing furocoumarins.</p>	177
<p>Sun-induced Dermatitis, Melanoma, Lip Cancer Causative Source: Sunlight, ultraviolet radiation.</p>	328
<p>Heat Induced Dermatitis Causative Source: Moist and hot environments.</p>	172
<p>Nicotine poisoning (green tobacco sickness) An acute syndrome characterised by nausea, vomiting, headache, dizziness, and severe weakness. It is also accompanied by fluctuations in heart rate and blood pressure. Symptoms may be so severe as to require emergency medical treatment. Causative Source: Wet tobacco leaf contact.</p>	273
<p>Burns Causative Source: Fire, electricity, acid or caustic chemicals, dry (hygroscopic) fertilizer, friction, liquefied anhydrous ammonia.</p>	255

Agriculture

Health Condition & Causative Source	Clinical Perspective Page
Arthropod-induced dermatitis, envenomation, Lyme disease, malaria, parasitic diseases like ancylostomiasis Causative Source: Bites and stings from wasps, chiggers, bees, grain mites, hornets, fire ants, spiders, scorpions, centipedes, other arthropods, snakes, soil.	221
Tetanus Causative Source: Punctures and thorn pricks.	225
Toxic and Neoplastic Conditions	
Hodgkin's lymphoma, Alzheimer's disease, acute and chronic Encephalopathy, non-Hodgkin lymphoma, Multiple Myeloma, Leukaemia, cancers of the brain, prostate, stomach, pancreas and testicle, Glioma: Causative Source: Solvents, benzene, fumes, fumigants, insecticides (e.g., organophosphates, carbamates, Acute intoxication, Parkinson's disease, soft-tissue sarcoma, peripheral neuritis, organo chlorines), herbicides (e.g., phenoxy-aliphatic acids, bipyridyls, triazines, arsenicals, acenitilides, dinitro-toluidine), fungicides (e.g., thiocarbamates, dicarboximides).	335
Skin Cancer Causative Source: Solar radiation.	327
Sterility (Male) Causative Source: Ethylene dibromide.	365
Injuries, Mechanical and Thermal Stress Conditions	
Fatalities and Near Fatal Injuries Causative Source: Road vehicle crashes, machinery and vehicles, struck by objects, falls, oxygen depletion, fires.	
Crushing of the chest, extravasation (escape of fluids-e.g., blood and surrounding tissue) Causative Source: Tractors.	
Hypovolemia (loss of blood), sepsis and asphyxia. Causative Source: Augers.	262
Electrocution Cause: Electricity	253
Non-fatal injuries, injury infection (e.g., tetanus) Causative Source: Machinery and vehicles, draught animal kicks and assaults, falls.	225
Friction burns, crushing, neurovascular disruption, avulsion, fractures, amputation Associated with: Hay Balers.	256
Skin or scalp avulsion or de-gloving, multiple blunt injury, amputation Causative Source: Power take-offs.	
Hand injuries (friction burns, crushing, avulsion or degloving, finger amputation). Associated with: Corn pickers.	
Serious or fatal burns, smoke inhalation Causative Source: Fires and explosions.	255

Health Condition & Causative Source	Clinical Perspective Page
<p>Behavioural Conditions</p> <p>Suicide and the vulnerability to suicide is the biggest behavioural hazard for the Indian farmer. 296,438 farmers have committed suicide in India from 1995 to 2013. Farmer suicides accounted for 8.7% of all suicides in the country in 2013. This data from 1995 to 2013 showed that Maharashtra, Andhra Pradesh (including present day Telangana), Karnataka, Madhya Pradesh and Chhattisgarh accounted for two-thirds of all farm suicides thereby indicating that the farmer populations in these areas were more vulnerable than the others.</p> <p>Farmer suicides do not seem to be vastly different in good monsoon years as well as drought years. However a drought definitely influences the yield, which in turn influences the economic, social and emotional well being of farmers and their families.</p> <p>Suicides are overwhelmingly common among cash crop farmers. For example, cultivators of cotton, sugar cane, groundnut, vanilla, coffee, pepper and others are more likely to commit suicide than cultivators of paddy or wheat. It is posited that factors debt, hyper-commercialisation, exploding input costs, water-use patterns, and severe price shocks and price volatility have a much greater influence on cultivation of cash crops.</p> <p>Some groups have also attributed the use of genetically modified seeds that require larger amounts of water, and pesticides. Moreover climatic change due to global environmental damage is also a factor that leads to erratic rainfall patterns and thereby influences productive yields.</p> <p>Though it may be very unlikely that patients directly report suicidal tendencies, it may be possible that some may report symptoms indicative of depression or anxiety. Primary care providers can assess the risk of suicide by making an assessment of the patient's mental state and take appropriate interventional steps to address the symptomatic picture.</p> <p>The other major behavioural hazards that persons in this occupation may face are:</p> <ul style="list-style-type: none"> • Feelings of isolation; • Anxiety due to economic threats; • Violence; • Substance abuse; • Incest; • Stress due to risk taking, inter-generational problems, and patriarchal attitudes; • Stress due to unstable weather; • Immobility leading to poor coping skills depression, anxiety and suicidal thoughts. 	320

Summary

Climate change, exposure to irritants, allergens, and infective organisms seem to be the primary health risk factors for people engaged in agriculture. They are also vulnerable behavioural problems due to lack of a social and economic support mechanism. Eliciting a detailed occupational history would be key to understand predisposing maintaining causes of their clinical problems and finding effective ways to treat them.

Animal Husbandry

This chapter describes occupational health and safety issues of persons who are engaged in the care and grooming of animals, livestock farming, and managing and maintaining their accommodation, breeding and their hygiene. Fisheries, though a part of animal husbandry, is discussed in a separate chapter.

INDIA'S LIVESTOCK SECTOR IS one of the largest in the world. It has 56.7% of world's buffaloes, 12.5% cattle, 20.4% small ruminants, 2.4% camel, 1.4% equine, 1.5% pigs and 3.1% poultry. In 2010-11, livestock generated outputs worth Rs. 2075 billion (at 2004-05 prices) which comprised 4% of the GDP and 26% of the agricultural GDP. The total output worth was higher than the value of food grains.

India continues to be the largest producer of milk in the world and milk production is growing at the rate of 3.5% annually. Additionally, eggs production is growing at an annual rate of almost 5%, while wool production is growing at an annual rate of almost 3%. Furthermore the meat production is growing at an annual rate of nearly 8%.

Distribution of Work

Animal husbandry encompasses several trades that include (but are not limited to) the following tasks:

- Animal Herding;
- Grazing;
- Ranching;
- Domestication and Breeding Techniques Management;
- Aviculture and Poultry Farming;
- Pig Farming;
- Sheep Husbandry.

The major health challenges of animal husbandry sectors are effective control of animal diseases, vector control and the prevention of zoonosis.

Methods of Work/Operations Involved

Animal husbandry practices range from dehorning cattle to prevent injury to herd-mates and farm hands to methods for housing livestock, providing adequate nutrition, devising breeding strategies, and managing pets that live in the household.

Domestication and breeding processes also form part of animal husbandry practices. Incubation, lighting technique in broiler production, artificial insemination and embryo transplantation in cattle, horse and sheep husbandry are also important processes. Milking, mulesing, shearing, crutching and even culling and slaughter are parts of the animal husbandry processes.

Other tasks include feeding, watering, providing, maintaining sanitation, disposing of waste, carcasses, controlling pests and veterinarian care.

Characteristics of Work

There are several types of risks; however, the following are of primary concern:

1. Development of allergies
2. Zoonosis
3. Animal bites and scratches

Development of Allergies

Common clinical symptoms of allergies include inflammation of the skin, nose, eyes; and urticaria. Individuals who develop allergies to animal dander and excretions are at increased risk of developing asthma. The major sources of allergens are:

- Animal bites, animal dander and excretions (e.g., urine, saliva);
- Airborne bedding dust and other respiratory exposures;
- Exposure to allergens can be minimized by;
- Wearing protective clothing and gloves when handling animals;
- Reducing exposure to airborne dusts, dander and exhaust systems;
- Practicing good personal hygiene;
- HEPA filter respirators or masks may help prevent the development of allergies.

Zoonotic Diseases

Zoonotic diseases (i.e. diseases which are transmitted from animals to man), although uncommon in the laboratory setting, can have significant health consequences for personnel.

Persons most at risk:

- Immuno-compromised personnel (e.g., HIV, steroids, chemotherapy, post-transplant, certain arthritis medications);
- pregnant employee.

Risks can be minimized by using appropriate handling techniques of animals, their tissues, and caging. Wearing protective clothing/devices, utilizing appropriate personal hygiene practices will greatly reduce the danger of diseases.

Animal care personnel are expected to change the gear as often as necessary to maintain a clean appearance and prevent contamination to other areas.

It is also important to cover veterinary practices involving livestock in this chapter. Breeding techniques, delivery, inoculation and disease management are some of the veterinary processes that overlap with animal husbandry tasks.

Good Practices

Health risks can be substantially minimized by:

- Using appropriate handling techniques when manipulating animals, their tissues, and caging;
- Following proper sharps (needles, scalpels, glassware) management practices;
- Discarding used sharps immediately after use in a designated sharps container;
- Avoiding recapping of needles or improperly disposing off scalpels;
- Avoiding overfilling of containers.

Protective clothing should be changed as appropriate to minimize cross contamination between species or activities in different animal rooms within the facility. Protective clothing should not be worn outside of the work area unless it is necessary to perform assigned duties.

Hand washing is the most effective practice in reducing the potential of exposure to infectious material. Hand washing should be performed:

- At the start of the work day;
- Upon leaving for breaks, before meals, or after restroom breaks;
- When returning to work;
- After handling of any live animal or animal tissue;
- After handling any other potential source of contamination.

Children at Work

An unusually high number of children may be involved in animal husbandry tasks. Within pastoral communities, one may find all family members, particularly children spending many months shepherding in remote isolated areas tending animals or participating in heavy work, such as leading livestock long distances to water sources. Herding, shepherding and handling livestock may be considered as hazardous work. Injuries from animals include being bitten, butted, jostled, stamped on, gored or trampled. Large and small animals do not need to be aggressive to cause serious harm or even kill a child.

Children rarely wear protective shoes or boots, and this increases their risk for additional injuries and illnesses such as cuts, wounds, bruises, thorn injuries, skin disorders, and infections. Diseases can be contracted through routine contact with animals, insects, pathogens in animal carcasses and work near livestock stabling areas and butchering houses. Exposure to crop dusts and contaminated plant material,

water or soil can also pose a health hazard to children. Additionally, livestock dust can penetrate deep into the lungs causing health problems.

Chemical products, including disinfectants for use in livestock production contain caustic or corrosive materials and may be stored in places accessible to children. Fumes released when mixing and applying products can be a particular health hazard for children.

Among Zoonotic diseases, avian influenza is a major risk today.

Health Condition & Causative Source	Clinical Perspective Page
Injury Conditions	
<p>Bites, scratches, (Rabies is the most important health risk from bites and scratches. Wash the bite area; apply pressure with sterile gauze or a clean cloth if the bite is bleeding. When the bleeding stops, apply antibiotic ointment and cover the area. Anti-tetanus and anti-rabies immunization is absolutely essential and must be given immediately without waiting for report on the animal's behaviour. Immediate immunization of all other workers in contact with the animal is advised if its behaviour indicates rabies infection).</p> <p>Causative Factors: Unpredictable animal behaviour often puts workers, closely associated with the animal, at risk. Workers, especially women and children, may use handling techniques to which the livestock are unaccustomed.</p>	238
<p>Musculoskeletal injuries (Kicking, butting, crushing)</p> <p>Causative Factors: Indulging in risky behaviour such as positioning oneself within the “flight zone” (thereby initiating a flight reaction) or positioning oneself in the “blind spot” (thereby triggering a kicking or butting reaction) Crushing, especially in women and children, may occur due to the sheer size difference between the animal and the worker.</p>	295
<p>Blacksmithing Injuries</p> <p>Cause: Blacksmithing or farrier work includes tasks such as applying horseshoes and involves substantial muscle activity to prepare metal and position animal legs and feet. This may lead to musculoskeletal injuries or wear and tear. Blacksmith activities <i>per se</i>, can also put workers at risk of metal fume fever.</p>	
Zoonotic Conditions	
<p>Anthrax, Tinea Capitis, Orf (A contagious pustular dermatitis disease in sheep and goat that can be transmitted to humans. Symptoms in humans include the appearance of a purulent papule on the fingers, hand, arm, face or penis).</p> <p>Causative Factors: Skin contamination through direct contact or contact with animal secretions, urine or dung.</p>	218

Health Condition & Causative Source	Clinical Perspective Page
<p>Avian Influenza has a higher incubation period than other influenza types but unusually aggressive course with rapid deterioration and high fatality. Lower respiratory affection early in the course of the disease – is a warning sign. Indicative symptoms are voice hoarseness, crackling inhalation sounds, hemoptysis, and respiratory distress. Epistaxis, diarrhoea, vomiting and abdominal and chest pain may also occur. Complications are hypoxemia, multiple organ dysfunction, and secondary infections).</p> <p>Causative Factors: Direct or indirect exposure to infected live or dead poultry or contaminated environments, such as live bird markets. No evidence to suggest transmission through properly prepared poultry or eggs. However, slaughter, defeathering, handling infected carcasses and preparing poultry for consumption are risk factors.</p> <p>The disease is always preceded by an outbreak in poultry animals. Rapid and total culling of all the animals, whether infected or not, must be immediate. In suspected cases, oseltamivir should be given as soon as possible (within 48 hours following symptom onset as it can reduce the viral replication and improve survival rate. Corticosteroids are not recommended.</p>	233
<p>Bovine Tuberculosis, Campylobacter infection, Cryptosporidiosis, Salmonellosis and trichinosis</p> <p>Causative factor: Ingestion of under-treated animal products.</p>	199
<p>Q Fever (Onset usually marked by Influenza like symptoms but soon progresses to pneumonia and acute respiratory distress. Chronic form of the disease resembles endocarditis.</p> <p>Causative Factors: Humans infected through inhalation of infected air particles. Since this is a lambing disease, it may occur during breeding time. Direct contact with milk, birth products, urine, and faeces of infected animals is a predisposing factor. Middle aged males are predisposed to infection. Human to human transmission has rarely occurred through sexual intercourse, during delivery or by blood transfusion.</p>	229
Respiratory Conditions	
<p>Allergic Rhinitis, Hay Fever (seasonal)</p> <p>Causative Factors: Pollen inhalation, inhalation of animal hair, dust mites, moulds, urine, dander or saliva.</p>	277
<p>Anaphylaxis</p> <p>Cause: Usually first time exposure or contact with animal or animal products. Occurs within minutes to hours after contact with allergen.</p>	260
<p>Asthma</p> <p>Predisposing Factors: Persons at greatest risk are already have asthmatic or have allergic reaction while working with animals.</p>	185

Health Condition & Causative Source	Clinical Perspective Page
Dermatological Conditions	
<p>Eczema and Urticaria Causative Factors: Contact with animals or animal products (e.g., caterpillars, dander). Allergic reaction to pelt extracts from rats, mice, and rabbits are known. Major urinary protein complex in rats and mice has been identified as an important allergen. Drying of the urine and the persistence of the urine protein in dust or clothing may be a possible factor in allergen contact.</p>	177

Toddy Tapping

This chapter describes occupational health and safety issues of persons who are engaged in the production and collection of Palm Wine or Palm Toddy, which is an alcoholic beverage made from the sap of various species of palm tree such as the Palmyra and coconut palms.

SEVERAL FAMILIES IN THE SOUTHERN STATES of India have been traditionally engaged in the tapping the sap of palm and coconut trees. Though primarily known as toddy tappers, the collection of sap can be for the purposes of extraction of Neera (unfermented sap also called “padaneer” in Tamil Nadu) which the raw material for the production of jaggery is as well as other economically viable products such as coconut syrup, coconut vinegar, coconut candy and coconut sugar and coconut honey.

Specialized castes engaged in tapping toddy are the Adivasis and Bhandaris in Maharashtra, Thiyyas in Kerala, Edigas in Karnataka, Gouds in Andhra Pradesh and Shaanar or Nadar in Tamil Nadu. Toddy or sap tapping is also conducted in Goa, South Gujarat and Lakshadweep. Tapping for jaggery production is also conducted in coastal areas of West Bengal and Odisha.

Toddy tappers are generally engaged for 8 months (200 days) in a year in collection and selling of toddy. January to April month is the best season for toddy collection and very little toddy collection happens from September to October months. A good tree gives 6 to 10 litres of toddy per day in the season and about 2 to 3 litres in the lean season. An average tree gives 3-5 litres per day in season and 1-2 litres in lean season.

It is estimated that a sizable income can be earned (at least Rupees 2000 per tree) from the tapping of sap for Neera or toddy.

Characteristics of Work

Toddy tappers climb the tree in the evening to rig the pots up and then they go up next morning, to collect the toddy. It collects in the pot after dripping all night in the form of a milky white, translucent sap. Toddy tappers say that the best sap is got from those trees that are just flowering. However, they also tap those trees that are bearing fruit.

Toddy Tappers use very precise tools for the task that are created for them by blacksmiths and often procured from cobblers. They wear a leather belt that has several pouches into which these tools fit. And they strap themselves to the tree around the waist, and also the ankles, so that once up, their hands are free for them to get on with the task of slitting the tree or the fruit to fit in the pipe and to tie their pots beneath to catch the sap.

In some areas in South India, they also use a rope to climb the trees. Often, the rope has foot holds to rest the feet. However this is a more dangerous task as there is absolutely no support apart from the rope.

Health Problems & Disease Patterns in Toddy Tappers

Toddy tapping is a perilous job that carries the inherent risk of frequent falls. It is also a largely uninsured profession and the lack of protective gear or equipment have discouraged many youth from families that have traditionally taken to this profession.

Health Condition & Causative Source	Clinical Perspective Page
Injury Conditions	
Spinal trauma, mouth tear, fractures, dislocations Causative Factors: These are injuries associated with a long fall.	295
Dermatological Conditions	
Contact Dermatitis (non-allergic) Causative Factors: Lime is added to the sap to prevent it from fermenting. Lime can cause irritation and burns to unprotected skin, especially in the presence of moisture.	171
Thermal Burns Causative Factors: Particular care should be exercised with quicklime because its reaction with moisture generates heat capable of causing thermal burns.	255
Ophthalmological Conditions	
Keratoconjunctivitis Causative Factors: Lime can cause severe eye irritation or burning, including permanent damage. Eye protection is recommended where there is risk of lime exposure.	288

Forestry

This chapter will deal with occupational health and safety issues of Forestry workers who are exposed occupationally to a number of harmful factors in their working environment. These include Conservation scientists and foresters who manage overall land quality of forests, parks, rangelands, and other natural resources.

INDIAN FORESTRY REVOLVES AROUND SOCIAL and environmental elements of Sustainable Forest Management (SFM). The forests of the country are catering to 16% of the human and 18% of the cattle population needs. India is also maintaining around 20% of the forest area under a protected area network for providing ecological security. This involves the services of forestry specialists, forestry management experts and forest officers. Forestry involves protection of forests and farming of trees to ensure a continuous timber supply. Forester takes care of forest resources by protecting them from fire, pests, disease, encroachment and indiscriminate felling of trees.

Distribution of Workforce

Forestry workers in India fall broadly under the following categories:

- **Logging, lumbering or timbering** is done by persons who cut down trees for industrial wood or for fuel consumption or industrial purposes;
- **Non-Wood Forest Products Manufacturing** Persons who work in this industry are engaged in collection of material for production of latex, gums, resins, essential oils, flavours, fragrances and aroma chemicals, incense sticks, handicrafts, thatching materials and medicinal plants;
- **Silviculture** is an aspect of forestry that refers to the growth of plantations that yield periodic harvests.

Characteristics of Work

Whatever be the forestry activity the following are the characteristics of the work:

- There is a notion that forestry work is a 3-D job: dirty, difficult and dangerous;

- Forestry work has to be done outdoors. Workers are thus exposed to the extremes of weather: heat, cold, snow, rain and ultraviolet (UV) radiation;
- Workers are exposed to natural hazards such as broken terrain or mud, dense vegetation and a series of biological agents due to working outdoors and even in the night;
- Worksites tend to be remote, with poor communication and difficulties in rescue and evacuation;
- Life in camps with extended periods of isolation from family and friends is still common in many countries;
- The difficulties are compounded by the nature of the work—trees may fall unpredictably, dangerous tools are used and often there is a heavy physical workload.

Health Problems and Disease Patterns

Hazards related to health and safety – are more or less shared by all these activities. Forestry work is prone to a large variety of health problems and the workers are at high risk. Health hazards of the forestry workers are described below with their causative sources and manifestations.

Health Condition & Causative Source	Clinical Perspective Page
Respiratory Conditions	
Asphyxiation Causative Source: Smoke from fuel wood and forest fires causes significant human respiratory problems. Smoke plumes from forest fires can travel hundreds of kilometres, posing a great health risk.	211
Occupational asthma Causative Source: Organic dust, wood workers exposed to wood dust (cedar, ebony, etc.)	185
Zoonotic Hazards Association with deforestation or human expansion into forest areas has been associated with the outbreak of several diseases such as Ebola, SARS, SIV, Rocky Mountain Spotted Fever etc. In India, the threat of reintroduction of the Plague reservoir by wild mice always remains, especially when events like the Gujarat earthquake (in Bhuj) in the year 2000, triggered a migration of wild rodents into urban areas. Apart from that, many postulate that Dengue, Chikungunya, and Leptospirosis are also risks that may affect people who are associated with a forest life or depend on the forest for livelihood.	
Rabies Causative Source: Bats, Feral dogs and wild canine species.	238

Forestry

Health Condition & Causative Source	Clinical Perspective Page
Dermatological Conditions	
Allergic Contact Dermatitis Causative Source: Contact with various plants and shrubs such as poison oak, poison ivy, mucuna prurience, and woods such as cedar, cocobolo, ebony, mahogany, pine, and fir, rosewood, satinwood, teak.	171
Injury Conditions	
Falls, Crush Injuries Causative Source: Difficulties due to nature of work, unsafe use of heavy machinery, trees falling, natural hazards like broken terrain.	
Occupational cervico-brachial disorders (OCD), repetition strain injury (RSI), Cumulative trauma disorders (CTD), overuse (injury) syndrome, work-related neck and upper-limb disorders. Causative Source: Use of repetitive motions in awkward positions.	295
Carpal Tunnel Syndrome, Tendinitis and Tenosynovitis, varicose veins Causative Source Repetitive, forceful, or prolonged exertions of the hands; frequent or heavy lifting, pushing, pulling, or carrying of heavy objects; and prolonged awkward postures.	297

Commercial Fishing

This chapter describes occupational health and safety issues of persons who work in the fishing industry

INDIA HAS 8,118 KILOMETRES of marine coastline, 3,827 fishing villages, and 1,914 traditional fish landing centres. India's fresh water resources consist of 195,210 kilometres of rivers and canals, 2.9 million hectares of minor and major reservoirs, 2.4 million hectares of ponds and lakes, and about 0.8 million hectares of flood plain wetlands and water bodies. Fish as food—both from fish farms and catch fisheries—offers India one of the easiest and fastest way to address malnutrition and food security.

Fish production in India has increased more than tenfold since its independence in 1947. Fish output in India doubled between 1990 and 2010.

The marine and freshwater resources offer a combined sustainable catch fishing potential of over 4 million metric tonnes of fish. In addition, if India were to adopt fishing knowledge, regulatory reforms, and sustainability policies adopted by China India's water and natural resources offer a tenfold growth potential in aquaculture (farm fishing). Marine and freshwater catch fishing combined with aquaculture fish farming is a rapidly growing industry in India. Fish harvest distribution has been difficult within India because of poor rural road infrastructure, lack of cold storage and absence of organized retail in most parts of the country.

India is a major supplier of fish in the world. The country exported over 600,000 metric tonnes of fish, to some 90 countries, earning over \$1.8 billion in 2006. Shrimps [giant tiger prawn and Indian white prawn] are one of the major varieties exported. Farmed shrimp account for about 60% of shrimp exported from the country. In 2008 India was the sixth largest producer of marine and freshwater capture fisheries, and the second largest aquaculture farmed fish producer in the world.

Fishing in India is a major industry in its coastal states, employing over 14 million people. Despite rapid growth in total fish production, a fish farmers' average annual production in India is only 2 tonnes per person, compared to 172 tonnes in Norway, 72 tonnes in Chile, and 6 tonnes per fisherman in China. Higher productivity, knowledge transfer for sustainable fishing, continued growth in fish

production with increase in fish exports have the potential for increasing the living standards of Indian fishermen.

Characteristics of Work

A fishing boat is an unstable platform in perpetual motion, making what is already a high risk occupation even more unsafe. Most of the work is carried out on decks. Decks are routinely washed by seawater, covered with nets and gear, and with a moving cargo of fish. Fish, slime and leaking hydraulic fluid can increase the dangers of deck work. Fishers work in all sea conditions including hostile weather in rain, storms, and extremes of temperature. There are no fixed working hours, with the working rhythm being determined by the sea and the catch. Except for transit times out to fishing grounds, crews typically work around the clock. Fatigue sets in quickly, with crews pushed to breaking point. The vessel is both a place to work and a place to live. In some types of fishing, the fishers live on board for six months at a time or longer.

While the dangers found in different types of fishing operations are very similar, the levels of risk arising from specific dangers may vary between types of vessels. For example, compared to inshore fishing boats, deep sea trawlers use heavier duty machinery, more electricity, have more confined spaces, and are at sea for much longer periods.

Fishing ranks as one of the four most dangerous sectors to work in, along with agriculture, construction and mining. The following characteristics have been consistently observed in commercial fishing in India:

- Fishing takes place in a natural environment totally exposed to weather conditions that often becomes hostile to fishers and their vessels;
- Marine fishing operations can take place anywhere from very close to the shore to far out into the sea;
- Fishing vessels are in constant motion except in very calm weather and the motion may be extreme and unpredictable in particularly rough weather;
- There is no clear separation between working time and personal time. Many fishers live as well as work in their vessels, in conditions that can be cramped; congested, and unsanitary. Long periods away from home and very long working hours lead to excessive fatigue;
- Other facilities like access to food, safe drinking water and basic hygiene can be precarious;
- Children too commonly are found working in fishing in situations that may be hazardous. The ILO estimates that fishing has a worldwide fatality rate of 80 per 100,000 workers, or approximately 24,000 deaths per year.

Methods of Work/Operations Involved

Commercial fishing uses many different methods to effectively catch a large variety of species including the use of pole and line, trolling with multiple lines,

trawling with large nets, and traps or pots. Sustainability of fisheries is improved by using specific equipment that eliminates or minimizes catching non-targeted species.

Fishing methods vary according to the region, the species being fished for, and the technology available to the fishermen. A commercial fishing enterprise may vary from one man with a small boat with hand-casting nets or a few pot traps, to a huge fleet of trawlers processing tons of fish every day.

Commercial fishing gears in use today include surrounding nets (e.g. purse seine), seine nets (e.g. beach seine), trawls (e.g. bottom trawl), dredges, hooks and lines (e.g. long line and hand line), lift nets, gillnets, entangling nets, pole and line, and traps.

Commercial fishing gear is specifically designed and updated to avoid catching certain species of animal that is unwanted or endangered. Billions of dollars are spent each year in researching/developing new techniques to reduce the injury and even death of unwanted marine animals caught by the fishermen.

Vehicles/Implements/Equipment Used – Mechanised or Manual

a) Machinery and Equipment:

- Winches, hoists and accompanying cables and ropes are especially dangerous pieces of machinery. Dangers include: getting fingers, a hand, an arm or foot stuck in the winch drum as it hauls back the gear, getting hit by a broken line as it recoils, and tripping over a line;
- Entanglement in the fishing gear under tension, winch drums and barrels or wire cables; and crushing injuries, of fingers and whole limbs – when connecting trawl doors, setting and hauling trawl, purse seine and other fishing gear;
- Fishing hooks and ‘spines’ in steel wire ropes sticking into hands or other parts of the body. Personal protective equipment can be used to reduce such injuries;
- Workers can also be injured by loads falling from hoists. Areas of the body most frequently injured include the hands, lower limbs, head and neck and upper limbs, followed by the chest, spine and abdomen. The most common types of traumas are open wounds, fractures, strains, sprains and contusions. Many non-fatal injuries may involve amputation of fingers, hands, arms and legs as well as injuries to the head and neck. Infections, lacerations and minor traumas of hands and fingers are quite frequent.

b) Fittings projecting from Decks

Contact with eyebolts, bollards, capstans, etc., can result in injury. Whilst such fittings are essential for the operation of the vessel and cannot be eliminated, they

can be located in less frequented zones and painted to distinguish them from their surroundings. Hatches can be identified by alternate diagonal stripes in red and white or yellow and black. Special care must be taken to latch or stow away all moveable fittings, including coiling ropes away.

Hazards to Health and Safety

There are well-known safety blind spots on fishing vessels and the types of work that are known to be high risk activities for the safety and health of crew members. These include:

- The winch, cables, ropes and otter boards, which are clear causes of occupational injuries;
- Tasks associated with fishing operations, such as shooting or hauling in the net, are responsible for the majority of falls overboard and accidents;
- Lighting and visibility in the handling and transit zones is frequently inadequate; and
- The noise to which crews are exposed, even in the rest area, is often at levels regarded as dangerous, particularly for those crew members working in the engine room;
- Specific hazards in fishing and risks arising from them, primarily applicable to purse seine and trawlers, are outlined below.

Drowning is one of the main risks in fishing and a main cause of fatalities in the industry worldwide. Causes of drowning include:

- a) Falling into water:
 - while shooting (putting out or setting) or hauling in the net;
 - while climbing from the deck to the superstructure (the bridge/dock) on the outside of the boat;
 - through missing one's footing while walking along, or working on, the edge of the boat;
 - when walking along the outrigger pole to change rope settings; and
 - especially if one is knocked unconscious or stunned as a result of a fall.
- b) Swimming and diving entails a risk of drowning especially when diving to free the net and getting entangled in it. Diving can also result in damage to lungs and ear drums.
- c) Being swept overboard in rough seas
- d) Vessel sinking or capsizing
- e) In colder waters, death from hypothermia is a related risk.
- f) The most important jobs or places related to risk of injuries:

Job or tasks	Onboard vessels injury	Onshore injury
Setting and hauling trawl, purse seine and other fishing gear	Entangled in the fishing gear or wire cables, crushing injuries, fall overboard	
Connecting trawl doors	Crushing injuries, fall overboard	
Bleeding and gutting	Cuts from knives or machines, musculoskeletal disorders	Cuts from knives or machines, musculoskeletal disorders
Long-line and hand-line	Wounds from hooks, entangled in the line	
Heavy lifts	Musculoskeletal disorders	Musculoskeletal disorders
Filleting	Cuts, amputations using knives or machines, musculoskeletal disorders	Cuts, amputations using knives or machines, musculoskeletal disorders
Trimming fillets	Cuts from knives, musculoskeletal disorders	Cuts from knives, musculoskeletal disorders
Work in confined spaces, loading and landing	Intoxication, asphyxia	Intoxication, asphyxia

Health Problems and Disease Patterns

The most frequently reported non-traumatic conditions arise as a result of dental conditions, gastro-intestinal, musculoskeletal, psychiatric/neurological, respiratory, cardiological and dermatological conditions. Psychiatric conditions can be the most common reason for evacuating workers from long-term fishing voyages; injuries and cardiological conditions only coming in second place.

Health Condition & Causative Source	Clinical Perspective Page
Respiratory Conditions	
Occupational asthma Causative Source: It is associated with several types of fish, but most commonly it is related to exposure to shrimp, crabs, shellfish and so on. Fishmeal processing is also often related to asthma, as also grinding shells, e.g. shrimp shells.	185
ENT Conditions	
Noise Induced Hearing Loss Causative Factors: Excessive noise as a cause of decreased hearing acuity is observed among workers in the fish-processing industry. The machine room personnel and those working with the older equipment in fish processing on the vessels are at extreme risk, but so are. Organized hearing conservation programmes are widely needed.	285
Sinusitis, Otitis Media, Tinnitus Causative Factors: Exposure to noise, injuries to the nasal septum, and exposure to winds.	280

Health Condition & Causative Source	Clinical Perspective Page
Behavioural Conditions	
<p>Suicide Causative Factors: High death rates of suicide have been reported in fishermen and sailors from the merchant fleet. Many times it could not be said whether the injury was accidental or self-inflicted. There is a widespread belief that suicides in general are under-reported and probably even greater in the fishing industry. Literature even describes a syndrome creating an irresistible impulse for sailors to jump into the sea from their vessels. The underlying causes for the risk for suicide have not been studied. There are indications that the suicide risk increases when the workers stop fishing and go ashore either for a short while or longer.</p>	320
Dermatological Conditions	
<p>Contact Eczema (allergic or non-allergic) Causative Source: These may be related to contact with fish proteins or to the use of rubber gloves. If gloves are not used, the hands are constantly wet and some workers may become sensitized.</p>	171
<p>Boils and abscesses affecting hands and fingers Causative Factors: These may be due to infected wounds of hands and fingers.</p>	215

Prevention and Treatment

Prevention: *The following are the ideal recommendations for Injury prevention*

a) Recommendation for Fishermen:

- Take a marine safety class at least once every 5 years;
- Find a comfortable PFD and wear it on deck at all times;
- Do monthly drills including abandon ship, flooding, fire, and man overboard;
- Heed weather forecasts and avoid fishing in severe sea conditions;
- Maintain watertight integrity by inspecting and monitoring the hull of the vessel, ensuring that watertight doors and hatches are sealed, and inspecting and testing high water alarms regularly;
- Utilize a man overboard alarm system;
- Test immersion suits for leaks if operating in cold water.

b) Recommendation for Vessel Owners & Operators:

- Create a PFD policy for the crew while working on deck;
- Conduct monthly drills including abandon ship, flooding, fire, and man overboard;
- Install a man overboard alarm system, and man overboard retrieval devices;
- Install emergency stop devices on hydraulic deck machinery to prevent entanglement injuries;
- Ensure all crew members have completed marine safety training in the past 5 years.

Leather and Tanning

This chapter will deal with occupational health and safety issues of people engaged in the production of leather and working in leather tanneries.

LEATHER TANNERIES ARE SPREAD ALL OVER INDIA and account for 10% of the world's leather production. They accounted for production of US\$ 11 billion worth of leather goods in 2013-14 out of which US\$6 billion came from exports. Yet most of the tanneries pose health risks not only for their workers but also for the surrounding environment.

India boasts of 21% of the world's cattle population and also has 11% of the world's goat and sheep population. Plus the Indian government has imposed no import duty on raw and semi processed leather. 100% foreign investment is allowed and processed for automatic clearing plus the state governments are empowered to give single window clearance for establishment of production units.

Distribution of Workforce

There is no extensive survey that points to a rational assignment of the workforce to dedicated work processes, so it is assumed that the tannery workers participate in all the work that forms part of the tanning process, which mainly comprises of:

- Skinning and curing;
- Beam house operations: The steps in leather manufacturing between the cutting and tanning processes are together called beam house operations. They comprise;
 - Soaking;
 - Liming;
 - Unhairing and scudding, agents such as sodium sulfide, sodium hydroxide, sodium hydrosulfite, calcium hydrosulfide, dimethyl amine, and sodium sulfhydrate are used to treat the hide. Hair is then removed through machines but when it is done manually using a dull knife, the process is called scudding;
 - Deliming and baiting deliming is a process whereby the pH of the collagen acting on the hide is lowered so that enzymes may act on it. The process of softening the hide by treatment with enzymes is called baiting.

Leather and Tanning

- Pickling once bating is complete, the hides and skins are treated first with and then with sulphuric acid, in case a mineral tanning is to be done. This is done to bring down the pH of collagen to a very low level so as to facilitate the penetration of mineral tanning agent into the substance. This process is known as pickling. Vegetable Tanning using naturally occurring compounds such as tannin;
- Chrome Tanning is done using various types of chrome.

Characteristics of Work

The principal nature of work pertains to tanning hide into leather thereby permanently altering the structure of the hide although making raw hide (which is untanned but worked hide) may be an end result in itself before sending the hide for tanning (or processing with tannin).

The tanning process involves treating raw hide with chemicals that may either be vegetable sources (such as naturally occurring tannin present in barks and leaves of some plants) or chromium compounds.

Health Problems & Disease Patterns

Workers in the leather industry face the risk of physical injury due to accidents or exposure to various noxious agents particularly chromium.

Respiratory Conditions

These arise mainly due to chromium exposure and can have far reaching consequences on the health of the affected persons as well as their ability to lead a normal life.

Health Condition & Causative Source	Clinical Perspective Page
Respiratory Conditions	
Polyps, Sinus Cancer, Nasal Cancer Causative Sources: Leather Dust People involved in raw leather production as well as those working in the shoe and boot manufacturing industry are at an increased risk of cancers of the nose and the para nasal sinuses due to high degree of exposure to leather dust. Chromium Dusts or fumes containing chromium (Chromium VI or Hexavalent Chromium) may predispose the development of nasal and sinus cancers. Smoking and Second hand Smoke may also be contributory factors.	343
Pneumonia Causative Source: Chromium Fumes.	186
Lung Cancer Causative Source: Exposure to Hexavalent Chromium compounds is a major predisposing factor.	345

Health Condition & Causative Source	Clinical Perspective Page
Injury Conditions	
Fractures and other mechanical injuries due to slips and falls. Causative Factors: Improperly drained floors and improper lighting.	295
Drowning and suffocation Causative Factor: Improperly covered storage tanks.	
Cuts and lacerated wounds Causative Factor: Injuries due to flaking knives. Simple measures that can be adopted are keeping all instruments and apparatuses properly covered, wearing protective clothing, and keeping a first aid kit in the premises.	
Neoplastic Conditions	
Skin Cancer Causative Factors: Dermal exposure to Hexavalent Chromium leads to irritation and ulceration due to its corrosive action and also predisposes to skin cancer.	327
Bladder Cancer and Kidney Cancer Causative Factors: Exposure to aromatic amines and benzene based compounds in tanning, liming, and dyeing of leather predisposes to bladder cancer. Dyes and pigments can also predispose to kidney cancer.	348
Pancreatic Cancer Causative Factors: Workers involved in drying and painting/dyeing of leather risk exposure to formaldehyde and to high dye-Direct Black 3 azo dye and solvents. These could initiate DNA mutation and along with the action of chromium III promote pancreatic cancer growth. Smoking is also a predisposing factor in pancreatic cancer development.	358
Testicular Cancer Causative Factor: Exposure to Dimethylformamide (DMF), a substance known to cause testicular damage.	353

Weaving

This chapter will deal with occupational health and safety issues of weavers who are exposed occupationally to a number of harmful factors in their working environment.

THE VAST POOL OF SKILLED and unskilled workers, availability of labour at low costs, strong base for production of raw materials characterise the textile industry in India. The textile sector is highly diverse and has hand-spun and handwoven segments at one end of the spectrum, and capital-intensive, sophisticated and modern mills at the other. The textile industry is vertically-integrated across the value chain and extends from fibre to fabric to garments. At the same time, it is a highly-fragmented sector, and comprises small-scale, non-integrated spinning, weaving, processing and cloth manufacturing enterprises.

Handloom or fabric woven by hand accounts for nearly 11% of the textiles. It is one of the largest economic activities providing direct employment to over 4.3 million persons engaged in weaving and allied activities. Over 38,00,000 Indian weaving industries have been built throughout the country and more than 15,00,000 domestic weaving industries have been set up in the States of North and Eastern parts of India. These include the famous Pashmina and Shahtoosh of J&K, from the tie-and-dyes of Gujarat and Rajasthan to the Eri and Muga silks of Assam. On the other hand, the southern States also have their huge share of weaving industries, for example, the southern State of Andhra Pradesh houses some 3,20,000 weaving industries. Most of these industries are situated in Chirala, Pedana, Polavaram, Mangalagiri, Pochamapali, Ponduru, Dharamvaram, Narayanpet, Puttapaka, Madhavaram, Emmiganur and Gadwal. Along with these centres, the coastal areas of Andhra Pradesh also have numerous centres for weaving.

Powerloom industry on the other hand, is also part of the weaving industry – the only major difference being that it employs fewer workers. Handloom requires at least six workers from start to finish, including dyeing, starching, spooling, weaving, ironing and tying up loose ends. Powerloom needs one worker to operate the loom. Over 60% of all fabric produced in the country is from the powerloom industry, though it employs only a fraction of the workforce of the handloom industry.

It also has a negative environmental impact as handloom has a very small carbon footprint compared to powerloom. Furthermore many handloom motifs and patterns cannot be replicated by powerloom. Due to slack enforcement, many powerloom products are passed off as handloom including many khadi products.

Textile mills constitute the third segment of the weaving industry. This industry includes sectors such as ginning, spinning, weaving, dyeing and garment manufacturing.

Garment manufacturing employs nearly 3 million sewing machine operators in almost 0.7 million units constituting one of the largest unorganized industrial sectors in India. The activity generally consists of workers belonging to a poor socio-economic age group working on a contract basis in sheds.

Knit wear and Khadi village industries also employ weavers as part of their principal operations.

Distribution of Workforce

Handloom requires at least six workers from start to finish, including dyeing, starching, spooling, weaving, ironing and tying up loose ends. Handloom usually includes weaving that is done on the fly shuttle pit looms.

The first process is warp loading, which precedes the weaving process. The yarn after warping is prepared into warp sheets by rolling the length of yarn to an iron rod. The process of transferring the warp sheet into weavers beam is called beaming. In this process the strands of yarn passes through the reeds and healds. This is done by joining each strand to the old warp threads manually. It takes nearly 2-3 days to complete the joining process. Generally women folk perform the joining process.

In the weaving process, the shuttle is made to pass through the openings formed when the threads of warp interlock with those of the weft. This is achieved through a foot pedal that creates openings and aids interlocking. Once the shuttle is passed, the suspended rope from jacquard is pulled to form the weave. The proton of woven cloth is wounded to the wooden beam which is in front of the weaver. Sometimes unwoven warp is intentionally left before and after weaving. This is used for knotting the unwoven strands into a fringe in garments such as saris and shawls. It usually takes 4 to 5 days to complete this process.

Powerloom needs one worker to operate the loom. Employees in powerloom industry are typically grouped into one of four job functions:

1. Machine operators, commonly called weavers, who patrol their assigned production area to check on fabric production, correct some basic machine malfunctions such as yarn breaks and restart stopped machines.
2. Machine technicians, sometimes called fixers, who adjust and repair the weaving machines.
3. Direct production service workers, who transport and load raw materials (warp and filling yarn) onto the weaving machines and who unload and transport finished products (fabric rolls).

4. Indirect production service workers, who perform cleaning, machine lubrication and so on.

The unorganised nature of most of the weaving industry, its vulnerability to market fluctuations, lack of access to financial resources and extended sales cycle between manufacturer and customer – are some of the problems that this industry faces.

Characteristics of Work

Whatever be the weaving activity the following are the characteristics of the work:

- Physical Hazards for example heat, dust, noise and physical characteristics of material;
- Chemical Hazards due to chemicals used in fabric processing;
- Ergonomic Hazards due to repetitious seating and work movements;
- Psychosocial Hazards due to stress, low pay, work pressure etc.

Health Problems & Disease Patterns in Weavers

Hazards related to health and safety - are more or less shared by all these activities. Weaving work is prone to a large variety of health problems and the workers are at high risk. Health hazards of the workers in this industry are described below with their causative sources and manifestations.

Health Condition & Causative Source	Clinical Perspective Page
Respiratory Conditions	
Occupational Asthma: Bronchitis, Weaver’s cough (dyspnoea, dry cough and chest constriction) Causative Source: High exposure to cotton dust and fibres. Mildew spores, which are present in any atmosphere, settle on the threads as they are wound from the sizing machines on to the warp beam. Dampness exacerbates the amount of mildewed settlement.	185
Mill Fever (Self-limiting influenza like condition triggered by first exposure to cotton dust or renewed exposure after a long gap), Mattress Maker’s Fever (Inhalation fever triggered by exposure to contaminated cotton) Causative Source: Gram negative bacteria or fungal moulds.	185
Pulmonary Tuberculosis Causative Source: Work in cramped rooms, chronic exposure and inhalation of fibre and dust leading to vulnerability to infection or secondary outbreak.	197
Nasal and Lung Cancer: Causative Source: Weavers and garment workers are at increased risk of nasal cancer, duration of work experience is known to be directly proportional to the elevated risk. Incidence of lung cancer among weavers and textile workers is known but its association has not yet been fully established.	343

Health Condition & Causative Source	Clinical Perspective Page
<p>Byssinosis Monday morning tightness, dyspnoea, fever Causative Source: Exposure to cotton, hemp and flax processing in textile mills. It is most prevalent in units where bales are broken, opened and carded where dust exposure is the highest. It is lower in spinning, winding and twisting units where exposure is lower and lowest among weavers where dust exposure is minimal.</p>	
Musculoskeletal Conditions:	
<p>Pain: Mainly neck, lower back, thighs, shoulders, elbows and ankles. Causative Source: Forceful and strenuous motions, postural stress. Usually the back and lower extremities are unsupported and the weavers usually have to strain forward and stretch their neck in order to see the point of operation.</p>	304
<p>Repetitive-motion trauma Stress injury to hands and wrists, tissue damage Causative Source: Repetitive, forceful, coordinated eye, hand and leg movements result in stress injuries.</p>	295
<p>Falls, accidental injuries, burns Causative Source: Untrained work on machines, poor lighting, spillage of oil, grease and water spots. Lint, dust and fibre flying during machine cleaning.</p>	255
Ear, Nose and Throat (ENT) conditions	
<p>Hearing loss: Noise Induced Hearing Loss (NIHL) Causative Source: Noise levels of machines that generally exceed 90 decibels.</p>	285
Cardiovascular conditions	
<p>Ischemic Heart Disease Causative Source: Carbon disulphide (CS₂) is an organic compound used in the preparation of synthetic textiles which is the causative source.</p>	
Dermatological Conditions	
<p>Contact Dermatitis: Eczema, Urticaria. Causative Source: Chemicals, bleaching chemicals, stabilizers, softeners, levelling agents etc. used in textiles.</p>	171
Psychosocial Conditions	
<p>Stress related illness: Hypertension, psychosomatic diseases, fatigue, anxiety, depression, physical illness. Causative Source: Work related stress, low pay, long working hours.</p>	

Artisans

This chapter will deal with occupational health and safety issues of Traditional Indian artisans and craftspeople.

ARTISANS CONSTITUTE AN IMPORTANT PORTION of rural Indian people who are not engaged in farming activities. They constitute blacksmiths, carpenters, weavers (carpets, durries, khesh, sarees, etc.), potters, mudha makers, hand tool makers, farm implement makers, metal ware makers (silver, brass, copper), sculptors makers (wood, metal, clay, stone), handicraft makers, and so on. Handloom weavers are an industry by themselves and are discussed in a separate chapter.

They generally live in clusters and one may often find their family names to be representing the trade that the family has engaged in across generations. For example Sutars are likely to be carpenters while Kumbhars are likely to be potters and so on.

Characteristics of Work

Artisans are divided into the following categories:

- The skilled master craftsman;
- The wage-worker;
- The fully self-employed artisan; and
- The part-time artisan;
- A rigid hierarchical division of labour exists between more and less skilled artisans in every craft.

Methods of Work/Operations Involved

The vast majority of artisans operate in informal work. The problems faced by the artisans and craftspeople are mainly concerned with:

- Lack of formal skills;
- Less exposure to information and technology;
- Lack of formal training;
- Absence of non-farmer oriented rural policy;

- Marketing support;
- Non-competitive products;
- Unable to thrive competition;
- Application of traditional left over technologies.

Domestication and breeding processes also form part of animal husbandry practices. Incubation, lighting technique in broiler production, artificial insemination and embryo transplantation in cattle, horse and sheep husbandry are also important processes. Milking, mulesing, shearing, crutching and even culling and slaughter are part of the animal husbandry processes.

Other tasks include feeding, watering, providing, maintaining sanitation, disposing of waste, carcasses, controlling pests and veterinarian care.

Hazards to Health and Safety

There are several types of risks; associated primarily with the nature of work primarily:

- Working with dung or manure kilns (pottery firing);
- Working with compressed gasses: propane oxygen or acetylene;
- Working with silver or other metals;
- Soldering;
- Working with bone, antler, horn, teeth (especially cutting, grinding, buffing);
- Working with lacquer, shellac, varnish;
- Using acrylic or plastic-based paints;
- Working with oil-based paints or solvents for paint or wood coatings;
- Using commercial clays, slips, or mud;
- Working with commercial dyes and mordents;
- Working with collected or natural dyes and mordents;
- Working with vinegar, tannin, nitric acid, other acids or bleach (commercial or natural);
- Working with lye, lime, ammonia, or other bases;
- Working with leather or animal skins (especially the use or preparation of split leathers).

The hazards of crafts such as pottery and metal working were first described by Bernardino Ramazzini in 1715. The introduction of new materials in the crafts people's trades poses new hazards in addition to the existing ones.

Health Problems and Disease Patterns

Health Condition & Causative Source	Clinical Perspective Page
Toxic Conditions	
<p>Chromium Poisoning Causative Factors: Exposure to colouring and painting material. Use of natural dyes such as indigo instead of Cobalt or Chromium.</p>	
Respiratory Conditions	
<p>Rhinitis, Asthma, and Bronchitis Cause: Airborne dust in woodwork shops or establishment, lack of ventilation in gold and silver carving and plating shops, crowded workshops and workspaces. Dust levels should be less than 5 mg per cubic meter area. Moulds in sawdust and damp areas of the shop also contribute to breathing difficulties.</p>	185
<p>Sequiosis (resembles pneumonia. It usually appears within a few hours after exposure, and its symptoms are shortness of breath, broncho-constriction, dry coughing, chills, sweating, fever and general malaise. Repeated episodes of this ailment can cause permanent scarring of lung tissue) Causative Sources: Exposure to Redwood dust.</p>	
<p>Pneumonia Causative Source: Chromium Fumes, and also to toxic materials in silver and gold plating industry. HCl and H₂SO₄ fumes may be highly toxic.</p>	200
<p>Lung Cancer Causative Source: Exposure to Chromium fumes and also to carcinogens present in wood.</p>	345
Skin Hazards	
<p>Allergic Contact Dermatitis Causative Source: Some woods, such as West Indian satinwood and mansonia, are highly toxic and are likely to produce skin eruptions or blisters in most people on first contact. Others, such as cocobolo, are “sensitizers” that may cause allergic dermatitis only after repeated exposure. Reactions may be more frequent in summer, in people over 40 and after exposure to freshly cut wood. Wood extractives such as resins, alkaloids, tannins, acids, salts and gums. Liquid, uncured epoxy resin and hardener will cause adverse reactions in more than 40% of all workers who come in contact with it. Synthetic adhesives, such as urea-formaldehyde and phenol-formaldehyde resin, are other irritants.</p>	171

Health Condition & Causative Source	Clinical Perspective Page
Injury Conditions	
Burns Causative Factors: Gases and solvents used in painting and jewellery making are very inflammable. Moreover volatile fumes and finely dispersed dust in woodworking shops results in scores of fires and explosions. Small grains of wood dust, when scattered throughout a confined area, can explode with tremendous force if ignited by a spark or match.	255
Noise Induced Hearing Loss Causative Factors: High levels of noise usually more than 115 dB per eight-hour working day combined with refraining from using ear muffs will contribute to hearing loss.	285
Blacksmithing Injuries Cause: Blacksmith activities can put workers at risk of metal fume fever.	

Summary

A major problem in ascertaining the occupational health hazards affecting artisans and craft people is the lack of organization and the diverse nature of different crafts and the different materials and working conditions associated with them. The skill of rural artisans continues to be old and technology is traditional. It is therefore imperative that a level of organization or reporting is developed.

Work in Salt Pans

This chapter will deal with occupational health and safety issues of Salt workers who are exposed occupationally to a number of harmful factors in their working environment.

INDIA IS ONE OF THE MAJOR PRODUCERS of salt accounting for eight per cent of the world's salt production. Gujarat, Tamil Nadu, Rajasthan, and Andhra Pradesh are the leading salt producing States of the country. Gujarat alone contributes around 70 per cent of the total salt production in the country. Thoothukudi district in Tamil Nadu alone is the second largest producer of salt in the country after Gujarat.

India's salt industry is labour intensive and provides employment to about 20 million people. Most of them (except a few who are employed by large companies) operate on a no-work-no-pay contract for eight months a year. Several thousands of other workers depend indirectly on the salt industry for their income.

Distribution of Workforce

There are three kinds of salt workers in India depending on the type of location and the pattern of entrepreneurship:

1. The worker may be hired by a land leaseholder who owns a salt pan.
2. The worker may be hired by a manager or a labour contractor on behalf of the leaseholder.
3. The worker may be sub-leased out to the salt worker with a buy-back system.

Salt workers in the organised sector are relatively better off. But the workers in small salt pans are worse off as far as working conditions go.

Characteristics of Work

- Salt pan workers work under extremely harsh conditions that lead to constant exposure to sunlight and UV radiation;
- They do not seem to have access to sheltered places near the salt pans (in most cases) and also suffer due to the bright light reflected from the salt dunes;
- Availability of basic amenities such as toilets, housing, drinking water and sanitation is lacking. Most often persons may not have a proper shade to have their meals;

- People may go without proper food or water during working hours and this may also predispose them to poor or impaired nutrition.

Methods of Work/Operations Involved

Salt pan workers usually adopt the following salt production life cycle:

- Every year during January and February, salt pans are prepared. This process comprises mending of bunds, desilting of channels, and preparing the crystallizer bed;
- Salt pans are then prepared with a special slope in one direction to drain water into the successive pan;
- Once the salt pans are ready, sea water is pumped into it. The water starts evaporating and this concentrated brine is then diverted to the next pan, by the time it reaches the last pan the evaporation is complete and sodium chloride crystals are left behind;
- The crystals which separate are collected by wooden shovels with long handles. This process is called ‘scrapping of salt’;
- The salt thus formed is then carried overhead in baskets and stored in a central place or platform till they become dry;
- Later, the workers fill the salts in gunny bags, weigh them and load them into trucks for transport;
- Salt workers engage in various processes of salt manufacturing - viz., sweeping the salt crystals with a wooden spade; heaping of salt crystals at the edges of pans; loading, weighing, milling, packing or transportation of salt.

Health Problems and Disease Patterns

Workers in salt pans are prone to a large variety of health problems and the workers are at high risk. The following health problems are most common to workers in salt pans:

- Chronic dermatitis and ulceration due to contact with sharp salt crystals, especially on extremities;
- Eye problems due to exposure to bright, white, reflected light and dust leading to loss of vision or Pterygium;
- Increased risk for hypertension (high blood pressure), probably due to the inhalation of salt aerosols;
- Ailments due to poor socio-economic conditions — malnutrition, anaemia, Vitamin B, A and D deficiencies, manifested by symptoms such as headache, giddiness, breathlessness, muscular and joint pains, deterioration of night vision and accelerated ageing;
- Back and shoulder pain, which may be due carrying heavy loads;
- A predisposition to Hypothyroidism especially in women, which may be due to ingestion and exposure to non-iodised salt.

Work in Salt Pans

Health Condition & Causative Source	Clinical Perspective Page
Dermatological Conditions	
Contact Dermatitis: Skin cracks and ulceration Causative Source: Exposure to Chloride in salt crystals, Irritation due to the high concentration of salt and the irritating environment, humidity, high pH of water & the wet environment that prevails in the salt pan environment.	171
Dry skin, Sunburn Causative Source: Strong Sun exposure, UV and white sunlight exposure.	172
Sub Ungual Melanoma Causative Source: Constant exposure to white sunlight and UV radiation	328
Gangrene: Usually starts with shrunken skin leading to dry gangrene Causative Source: Insecticides, arsenic, irritant dust, ammonia, fumes, grain dust (wheat, barley).	371
Ophthalmological Conditions	
Premature Progressive loss of vision: Glare, Redness of eyes, Burning sensation in eyes, Excessive watering in eyes, Cataract Causative Source: Constant exposure to bright, white sunlight and dust, UV radiation exposure.	293
Nyctalopia, Loss of night vision. Causative Source: Nutritional deficiency particularly Avitaminosis A.	292
Circulatory Conditions	
Hypertension Causative Source: Higher salt content in their blood from inhalation of salt aerosols.	
Heat stroke Causative Source: Exposure to heat and working in humid conditions.	272
Musculoskeletal Conditions	
Strain Injuries: Occupational cervico-brachial disorders (OCD), Repetition strain injury (RSI), Cumulative trauma disorders (CTD), Overuse (injury) syndrome, Work-related neck and upper-limb disorders. Causative Source: High salt levels from inhalation of salt aerosols.	295

Work in Brick Kilns

This chapter will deal with occupational health and safety issues of brick kiln workers, bonded labourers, migrant workers, contract & casual labourers and labourers engaged in this industry.

INDIA IS THE SECOND LARGEST PRODUCER of bricks in the world, after China. Around 1,40,000 units across the country produce about 240 to 260 billion bricks per year.

The Indian brick industry is currently based on decentralized production activity using energy intensive, resource depleting and highly polluting technologies and production methods. The large coal consumption of the brick industry (approximately 25 million tonnes) is the cause of significant air pollution in terms of carbon dioxide (CO₂), carbon monoxide (CO), sulphur dioxide (SO₂), nitrogen oxides (NO_x) and suspended particulate matter (SPM). The large amounts of coal used for brick firing also leave behind bottom ash as residue. The air pollution and generated bottom ash cause considerable health problems, especially related to respiratory health.

Tight margins in the brick market coupled with rising costs of energy result in poor remuneration for the majority of brick workers and deterioration in the quality of their life. According to some studies the brick making industry employs around 9-10 million people while some estimates range as high as 25 million. A third of all brick kiln workers are children.

The workers in the brick industry are subject to extreme working conditions and poor remuneration. The brick moulder families are contracted through middlemen and usually belong to poor districts of Uttar Pradesh, Bihar, Chattisgarh and Orissa. According to Action Aid, approximately 200,000 people migrate from tribal Orissa districts to brick kilns. From Bolangir district alone 1,00,000 to 1,50,000 people migrate every year. A child is an important part of the work unit in Brick Kilns. A study of 35 Brick Kilns around Hyderabad revealed that 35% of total migrants comprised children, of which 22% were in the age group of 6-14 years. Most of the migration happens to Andhra Pradesh. But a few also travel to Mumbai, Surat, Varanasi, Raipur etc.

Distribution of Workforce

Brick Kiln labourers in India fall broadly into the following four categories:

- Contract labourers, who are not on the payrolls of the kiln owner;
- Migrant labourers, who migrate towards the major brick production clusters every season;
- Women workers employed in the brick kilns;
- Entire families work in brick kilns resulting in a large number of child labourers;
- A few bonded labourers in some brick kilns.

Characteristics of Work

Whatever be the activity the following are the characteristics of the work in the Brick Kiln workers:

- Exposure to poisonous gases is a primary health hazard and may lead to an unspecified number of deaths;
- Injuries and mishaps due to lack of protective gear or preventive measures taken in the production of bricks;
- Exposure to dust gives rise to chronic obstructive pulmonary diseases & respiratory illnesses. Published studies demonstrate that inhalation of dust and suspended particles emitted by brick kilns matters could not only affect lung function and lead to increased cardiovascular diseases;
- A variety of musculoskeletal disorders and discomfort are seen among brick kiln workers, where heavy physical work is associated with awkward working postures and manual handling of materials, leading to significant morbidity. Workers, even women, have to lift head loads of up to 10 kg at a time;
- Undernourishment combined with long working hours and poor socio-economic conditions leads to prevalence infections, digestive disorders and nutritional deficiencies;
- The risks to children are more hazardous due to their growing bodies and weaker systems compared to the adults;
- High proportion of very young and old workers put both these categories at health risk.

Health Problems and Disease Patterns

Poor safety and protective measures may lead to acute emergencies. Exposure to noxious gases, dust and suspended particulate matter lead to respiratory diseases. Strenuous working conditions lead to musculoskeletal disorders. Poor immune status due to undernourishment and virtually absent healthcare support leads to vulnerability to a number of diseases.

Health Condition & Causative Source	Clinical Perspective Page
Respiratory Conditions	
<p>Carbon Monoxide Poisoning: Persons may experience headache or dizziness but the main risk is that they may become unconscious or even die before any intervention. Children, sleeping persons or inebriated persons are especially at risk.</p> <p>Causative Source: Carbon monoxide build up in tunnel kilns, closed firing of bricks, poor ventilation or procedure for clearing gases.</p>	208
<p>Occupational Asthma: Bronchitis, Chronic Cough, Pharyngitis.</p> <p>Causative Source: Emission from brick kilns comprises of fine dust particles, hydrocarbons, Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Fluoride compounds, Carbon Monoxide (CO) and small amount of carcinogenic dioxins.</p>	185
<p>Chronic Obstructive Pulmonary Diseases and Pulmonary Tuberculosis</p> <p>Causative Source: Working and living in cramped spaces, undernourishment and chronic exposure and inhalation of suspended particulate matter and dust increases vulnerability to infection or interstitial lung disease.</p>	200
<p>Lung cancer:</p> <p>Causative Source: Large amount of dust and smoke with particulate matter are known predisposing factors.</p>	345
Musculoskeletal Conditions and Physical Injuries	
<p>Pain: Acute back pain, knee pain. Work-related MSD includes inflammatory and degenerative processes that may involve the muscles, tendons, cartilages and joints, causing pain and functional impairment.</p> <p>Causative Source: Lifting of heavy loads, unorthodox postures opted by these workers, where the joints and muscles are held in unhealthy positions for protracted periods of time, in suboptimal working conditions.</p>	295
<p>Burns, falls, accidental injuries: Children are especially vulnerable.</p> <p>Causative Source: Uncontrolled fire, hot surfaces, poor working conditions.</p>	255
Ear, Nose and Throat (ENT) conditions	
<p>Recurrent or persistent ear infections (Otitis externa or Otitis media), Hearing loss: Children are especially affected.</p> <p>Causative Source: Exposure to contaminated water and mud.</p>	280
Gastrointestinal Conditions	
<p>Acid Peptic Disease: Nausea, vomiting and even diarrhoea observed.</p> <p>Causative Source: Poly-aromatic hydrocarbon, that is found in smoke emitted from factories of brick-making, may be responsible.</p>	

Health Condition & Causative Source	Clinical Perspective Page
<p>Parasitic Infestation: Children are especially affected. Causative Source: Exposure to contaminated water and mud causes many serious illness such as severe worm infestations.</p>	341
Cardiovascular Conditions	
<p>Ischemic Heart Disease: Men and women may be equally affected. Causative Source: Several parameters such as resting heart rate, pre-working, working, and recovery heart rate were significantly altered especially in working women. This caused a significant rise in the Net cardiac cost (NCC) and relative cardiac cost (RCC). Exposure to heat and heavy work affect the cardiac strain of both male and female workers. Additionally addiction to smoking (predominantly male) and chewing tobacco (both male and female) predispose to the rise in cardiac strain.</p>	
Renal and Genito-urinary Conditions	
<p>Urinary Tract Infection and Infestation: Significantly higher in women. Causative Source: Poor and unsafe toilet facilities for women coupled with working long hours in intense heat, with little downtime and scarce drinking water.</p>	
<p>Chronic Kidney Disease: Hydronephrosis or pyelonephritis. Causative Source: Calculi (urinary stones) or chronic or repeated urinary infection may be the predisposing cause. Profuse sweating leading to daily severe dehydration can also be possible causes.</p>	
Dermatological Conditions	
<p>Contact Dermatitis: Skin infections. Causative Source: Exposure to contaminated water and mud.</p>	171
Nutritional Conditions	
<p>Multiple Nutritional Deficiencies: Vitamin A, B, and D deficiencies, Weakness, Giddiness, Muscular pain, Weakness Causative Source: Poor socio-economic conditions.</p>	
<p>Goitre: Hypothyroidism Causative Source: Iodine deficiency.</p>	369

Work in Stone Quarries

This chapter will deal with occupational health and safety issues of Stone Quarry workers who are exposed to a number of harmful factors in their working environment. These include Stone Cutters, Masons, Quarry Workers, Stone workers, Quarry Specialists, Drillers, Blasters and Rock Splitters.

A STONE QUARRY IS A TYPE of open-pit mine from which rock and minerals are extracted for use as building materials. India has major resources of marble, granite, sandstone, Kotah stone, quartzite & slate. Granite resources are largely in South India and Marble deposits are largely in Western India (Rajasthan & Gujarat). Stone quarrying is the multistage process by which rock is extracted from the ground and crushed to produce aggregate, which is then screened into the sizes required for immediate use, or for further processing, such as coating with bitumen to make bituminous macadam (bitmac) or asphalt.

Distribution of Workforce

Stone quarry workers in India fall broadly under the following categories:

- **Stone Cutters:** A stone cutter is the one who cuts a stone by hand to a specific size to fit in a specific location;
- **Sawyer Masons:** A sawyer mason is someone who takes these rough chunks of stone, and shapes them to meet the required shape and size;
- **Banker Masons:** Banker masons take these stones into their workshop and further shape the stones into to the shape and size required;
- **Carver Masons:** Carver masons use their artistic ability to create patterns and designs in or from the stone like animals, figures, or other types of designs;
- **Fixer Masons:** A fixer mason specializes in fixing stone permanently onto to building structures using various forms of epoxy resins and/or cement;
- **Quarry Workers:** Quarry workers remove mud from surface of stone, chip irregularities from stone slabs to produce uniform, rectangular shapes. They loosen blasted stone, cut notches in blocks of stone, attach hoisting cables and load broken rock to be hoisted from quarry;

- **Slates and Agate workers:** Those who are part of the slate pencil manufacturing industry and agate grinding industry also loosen these materials and shape them for commercial use.

Characteristics of Work

- Often there are no provisions for first aid on the site;
- Although the use of head protection (helmets) and safety shoes is said to be ‘compulsory’ the majority of the workers do not use any PPE;
- Access to the quarry is often unsafe; this mainly applies to vertical quarries. The minimum safe access is to reach safely to the bottom of quarry. Debris scattered in the area, can cause people to slip and injure themselves;
- Normally trucks, trolleys and mechanical cranes are used for loading and unloading of material and transportation of stone, which brings the possibility of accidents;
- During peak summer there are frequent occurrences of boils and sores on the hand of the workers due to extreme heating of the stone as well as the hand tools.

Health Problems and Disease Patterns

Hazards related to health and safety – are more or less shared by all these activities. They mainly pertain to:

- Deterioration of pulmonary function;
- Fatal Accidents;
- Workers are exposed to natural hazards such as broken terrain or mud, dense vegetation and a series of biological agents due to working outdoors and even in the night;
- Respiratory diseases like silicosis and tuberculosis, Asbestosis, Anthracosis, Siderosis, Baritosis, Stanosis etc. due to inhalation of dust;
- Hearing impairment due to exposure to loud noises;
- Eye Strain due to poor illumination;
- Ergonomic Hazards.

Health Condition & Causative Source	Clinical Perspective Page
Respiratory Conditions Pneumoconiosis, Asbestosis, Anthracosis, Siderosis, Baritosis Cause: Dust is the main source of all of the above diseases. Depending on the nature and composition of dust, the pneumoconiosis may be named as Silicosis (silica), Siderosis (iron) Asbestosis (asbestos fibber), Anthracosis (coal), Anthraco-silicosis (silica-mixed coal), Baritosis (barium), Stanosis (tin).	194
Deterioration of pulmonary function (Diminished lung function, Ageing, Chronic disorders of the lungs, Lung Cancer).	200

Health Condition & Causative Source	Clinical Perspective Page
ENT Conditions	
Hearing loss Noise Induced Hearing Loss (NIHL) Causative Factors: Quarries with loud deafening sounds from trucks and machineries pose the risk of noise-induced hearing loss to workers.	285
Ophthalmological Hazards	
Eye Strain Head ache, eye pain, excessive lachrymation, congestion around the cornea, eye fatigue. Causative Factors: Quarries may mostly be poorly lit places but some of them may be too overtly lit. Exposure to excessive brightness, Intense direct glare of light or poor illumination.	291
Ergonomic Hazards	
Strain Musculoskeletal Injuries, Carpel Tunnel Syndrome Causative Factors: Repetitive and forceful movements, vibration, temperature extremes, and awkward postures that arise from improper work methods and improperly designed workstations, tools, and equipment.	297

Work in Saw Mills

This chapter will deal with occupational health and safety issues of workers in the saw mills.

THERE IS NO SPECIFIC COUNT of the number of saw mills operating in India as there are several illegal saw mills that operate without a forestry department license. Despite clear directives by the Supreme Court of India for protecting the forest cover of the country and an order for a complete shutdown of all unlicensed wood-based industries in any state or union territory, the proliferation of illegal saw mills continues at an alarming scale. This is also because there is lack of uniformity in saw mill regulation across States.

A saw mill can be set up in a small room with an investment that is as little as Rs. 20,000 to Rs. 50,000. At many places, close to a forest, a machine is installed in the night and removed in the morning. Availability of cell phone has made it easier for illegal saw mill owners to escape action.

Distribution of Workforce

Workers in saw mills carry out a range of manual tasks in the mill and operate the various machines used to process the timber. The work typically involves the following categories of tasks:

- Cutting down trees – This task is accomplished using specialised equipment (battery operated) or mechanical axes;
- Carrying and Transporting logs to the saw mill area;
- Preparing and pre-cutting – In this activity raw logs are stripped of their bark and other rough material and cut to the required shape and size using a variety of mechanical saws. The cut timber is thereafter seasoned to keep the wood from shrinking or warping;
- Sorting and stacking timber, assisting timber machine operators, assembling orders and racking off cuts;
- Log handling (loading logs on the mill bed, turning the logs, clamping) and pushing the blade through the wood.

Characteristics of Work

Work in saw mills is certainly a dangerous occupation:

- Most of the work is manual which puts workers at greater risk of getting crushed under massive or falling weights, or rolling or sliding logs;
- More often than not there aren't proper safeguards used during operating of the machinery. These can lead to injuries such as lacerations, amputations, severed fingers, and blindness;
- Workers are exposed to a very high level of noise and this has been proven to be detrimental to their hearing abilities;
- Furthermore, wood dust, air borne fungal spores and chemicals used for finishing products, may cause skin and respiratory diseases;
- Workers often have to work in uneven, unstable, or rough terrain; inclement weather; or isolated work sites where health care facilities are not immediately accessible;
- Work in saw mills has its own stress that is precipitated by having to work for long hours, fatigue, lack of motivation and poor social interactions – contribute to psychosocial problems;
- Manual lifting, poor standing and several deviated wrist positions lead to work related musculoskeletal problems;
- Accidental gathering or handling of poisonous plants may occur as some trees contain poisonous or irritant substances in their roots such as poison ivy, oak and sumac and therefore pose health hazards.

Health Problems and Disease Patterns

Hazards related to health and safety mostly go underreported due to the largely illegal nature of many saw mills. However quite a few studies have emerged that have documented the health hazards and disease patterns shared by workers of most saw mills in the country. These health hazards are described below with their causative sources and manifestations.

Health Condition & Causative Source	Clinical Perspective Page
Injuries and Musculoskeletal Conditions	
<p>Fatal or Near Fatal Injuries: Causative Source: Accidents while lifting weights and moving heavy logs in an improper manner. Hand injuries due to improper handling of sawing equipment.</p>	
<p>Pain and Work Related Musculoskeletal Disorders: Usually back pain and headache along with difficulty in fully moving arms and legs. Pain on leaning forward and backward at the waist along with difficulty in moving the head up and down. Causative Source: Rigorous hand intensive jobs along with repetitive tasks and continuous strain on the body. Poor posture and ergonomic techniques applied while lifting or carrying heavy logs.</p>	295
<p>Arthritis Causative Source: Particularly affected are workers who may be working on Horizontal band saw machine, moving log by bending, twisting the body for a considerable time. Assessment of the poor ergonomic and highly strenuous activities through the Rapid Entire Body Assessment (REBA) method and the Rapid Upper Limb Assessment Method (RULA) method have both revealed a high musculoskeletal risk for workers in saw mills.</p>	
Respiratory Conditions	
<p>Bronchitis, Frequent Upper Respiratory Tract Inflammation Causative Source: Chronic exposure to saw dust impairs the lung functions of the workers employed in the saw mills.</p>	185
<p>Chronic Obstructive Pulmonary Disease Causative Source: Inflammatory changes in the respiratory tracts, which leads to increased airway resistance as a result of the saw dust exposure thereby bringing about the remodelling of the airway and consequently lung dysfunction.</p>	200
Ear, Nose and Throat Conditions	
<p>Noise Induced Hearing Loss: Causative Source: The wood working machinery like Band saws, are widely used in the wood industry. Without any measures to reduce noise at source, they can produce noise levels of over 90 dB (typically 100dB at the operator position). At this level of noise, an employee's daily personal noise exposure is too high well above the OSHA's set limits of 90dB at operator's level for 8 hrs.</p>	285

Work in Oil Mills

This chapter will deal with occupational health and safety issues of Oil mill workers.

INDIA IS ONE of the major players in the global oilseeds/vegetable oil economy. With the largest area in the world under oilseeds like groundnut, rapeseed-mustard, sesame, safflower and castor, about 27.9 million tons of oil seeds were produced in India during 2005-2006. The production of rapeseed-mustard in India is about 7 million tons, which is about 12% of the world's total rapeseed-mustard production. Oil extraction from rapeseed-mustard is about 2.1 million tons/year. But the rapeseed-mustard oil milling sector in India is a small scale sector and as its activities are not regulated under any legal provisions, it has remained as unorganized sector. These oil mills are using table ghanis and oil expellers for oil extraction and they are situated in the oil seed growing areas, thus providing employment to rural people.

Distribution of Workforce

Oil mills and their labourers (in India) fall broadly into the following four categories:

- Tiny oil mills in villages of India work on job work basis. Mill owner does not need to purchase oilseeds nor does he have to sell any product. He simply crushes the oilseed on behalf of villagers and earns only job work charges. So there is no element of trading and marketing in this activity. Villagers go with their oilseeds and get it crushed in the tiny oil mills. The owners themselves are the workers in their mills and are therefore self employed persons;
- Medium sized oil mills may be owned by one person or one family and may employ 50 to 100 persons working for the owner. Most of the workers may be contract labourers;
- Big mills are corporate houses run and managed by professional teams. They usually employ full time workers on their pay rolls;
- Women workers are mostly employed part time or full time usually on lesser pay and for lighter jobs.

Characteristics of Work

Whatever be the activity the following are the characteristics of the work in Oil Mill workers:

- Noise Induced Hearing Loss (NIHL): The workers engaged in the workrooms of the oil mills are exposed to high noise, which have a detrimental effect on their health;
- Accidents and injuries resulting from poor or non-existent safety standards – are a common risk shared by small and medium oil mills. Often workers may not be suitably trained on what could go wrong and on how to handle emergencies in case of fire or machine failure;
- Skin problems as a result of sweat induced reactions: Work in Oil Mills involve exposure to heat and where there is too much heat and sweating, followed by too little evaporation of the sweat from the skin, miliaria rubra (prickly heat) can develop and can give rise to bacterial or fungal infections;
- Heat cramps: Working under extreme heat can have an adverse effect on the body and the body may lose salt through excessive sweating. Heat cramps can result. These are spasms in larger muscles – usually back, leg, and arm. Cramping creates hard painful lumps within the muscles,
- Heat exhaustion: Heat exhaustion occurs when the body can no longer keep blood flowing to supply vital organs and send blood to the skin to reduce body temperature at the same time,
- Heat Stroke: Heat stroke occurs when the body can no longer cool itself and body temperature rises to critical levels. Heat syncope can develop as a result of overheating.

Health Problems and Disease Patterns

Hazards related to health and safety – are more or less shared by all these activities. Oil Mill workers are prone to a large variety of health problems. Health hazards of these workers are described below with their causative sources and manifestations.

Health Condition & Causative Source	Clinical Perspective Page
Ear, Nose and Throat (ENT) Conditions	
<p>Noise Induced Hearing Loss (NIHL): Noise disturbs the work, rest, sleep and communication and leads to accidents in industries. The long-term effect of noise is hearing loss.</p> <p>Causative Source: The noise in the oil mills are dominated by low frequency noise. The predominant noise sources in the oil mills are seed cleaner and power transmission system to oil expellers. Poor maintenance of machines and use of bamboo stick to prevent the fall of belt from misaligned pulleys are the main reason of high noise. Noise emitted by the electric motor, table ghani and oil expellers in all the oil mills are well within 85 dBA, which can be harmful to health.</p>	285

Health Condition & Causative Source	Clinical Perspective Page
Injuries and Other Conditions Leading to Physical Harm	
<p>Burns: Thermal burns due to explosions or scalds</p> <p>Causative Source: Major accidents have occurred due to explosions in boilers leading to fires that quickly spread to poorly shielded gowns stacked with raw material or packaged edible oils.</p>	255
<p>Crush Injuries: Limbs may get crushed in crushing machines or in some cases death can also occur.</p> <p>Causative Source: In some well documented cases the crushing machines that are used to crush coconuts and oilseeds may have issues with the pulley or the conveyor belts and workers' limbs may get trapped in these areas when they try to push material inside the machines or try to disconnect the machines or the belts and pulleys. In one well documented case, a worker tried to kick the belt of the moving pulley, so that it may slip and get loose and thus stop the machine. But by accident, his leg got caught between the pulley and the belt and he was pulled up to a height of about six feet from where he fell and died instantaneously.</p>	
<p>Heat Cramps: Painful cramps in arms, legs or stomach which occur suddenly at work.</p> <p>Causative Source: Dehydration induced by heavy sweating drains a person's body of salt, which cannot be replaced just by drinking water. Heat cramps are serious because they can be a warning of other more dangerous heat-induced illnesses.</p>	272
Dermatological Conditions	
<p>Heat Rashes: Red maculopapular rashes with severe pruritus (itching)</p> <p>Causative Source: Hot humid environment and plugged sweat glands.</p>	172
Neurological Conditions	
<p>Syncope and Heat Exhaustion: Fainting: Sudden fainting after at least two hours of work; cold clammy skin and feeble pulse. Exhaustion may be characterised by heavy perspiration; cold and moist skin; body temperature over 38°C or 100°F; weak pulse; hypotension; malaise and weakness; nausea and vomiting; extreme thirst; dyspnoea and blurred vision.</p> <p>Causative Source: Hot humid environment and plugged sweat glands. Fluid loss and inadequate salt and water intake causes a body's cooling system to start to break down.</p>	272
<p>Heat Stroke: High body temperature, weakness, confused, upset or acting strangely. Hot, dry, red skin; a fast pulse; headache or dizziness. In later stages, a person may pass out and have convulsions.</p> <p>Causative Source: If a person's body has used up all its water and salt reserves, it will stop sweating. This can cause body temperature to rise. Heat stroke may develop suddenly or may follow from heat exhaustion. This needs immediate medical attention and can be life threatening.</p>	272

Building and Construction

This chapter describes occupational health and safety issues of workers involved in construction of all structures including buildings, roads, dams, bridges, communication or watch towers, and so on.

BUILDING and construction work includes any work that deals with the construction, alteration, conversion, fitting out, commissioning, renovation, repair, maintenance, refurbishment, demolition, decommissioning or dismantling of a structure. It also includes work on buoys and obstructions to navigation.

The building and construction industry is a major source of employment worldwide, and probably replaces agriculture, as the primary occupation in urban areas. Building construction includes both new buildings as well as maintenance work in existing ones. It also includes all construction activity related projects such as dams, roads and steel and glass structures, amusement park constructions and so on. It comprises several labour-intensive activities, generating many jobs per unit of investment.

The output of the industry worldwide is estimated at around \$3,000 billion per annum. The industry creates employment for more than 110 million people worldwide.

It is estimated that in India about 340 million (92%) workers are in unorganized sector and a large majority next to agriculture are in building and construction.

As per estimates of National Sample Survey (2009-10), there are around 45 million building and other construction workers in India. They are one of the most vulnerable segments of the unorganized sector workers in India.

Distribution of Workforce

Occupations within the informal construction industry range from unskilled labourers to highly-skilled craft workers. Typically, they form a hierarchy, with gang leaders having the highest status. There is evidence to suggest that women informal construction workers are concentrated almost exclusively at the bottom of the hierarchy.

Occupations within the construction industry (listed here in the order of most common first) comprise but are not limited to:

- **Mason** – comprises brick and block laying, concrete finishing, stonemasonry, marble and tile setting and polishing, terrazzo work, and the hod carrier trade.
- **Carpenter** – works mainly with wood and trades such as cabinet making, mill working, frames making, roof sheeting and cladding. Also includes drywall installer/lather, flooring installer, pile driver, millwright, diver, and diver tender.
- **Plumber** – may also include Fire sprinkler installer.
- **Pipefitter**
- **General Labourer** – an unskilled worker proficient with pneumatic tools, hand tools, blasting, smaller heavy equipment or assisting other tradesmen
- **House Painter and Decorator** – This trade also includes Paper Hanger, and may include Glazier or glass worker:
 - Plasterer
 - Truck Driver
 - Carpet Layer
- **Elevator Mechanic** – installs vertical lift and transporting equipment
- **Pile Driver** – a tradesman who installs piles, drills shafts, and constructs certain foundation support elements
- **Water Proofing Worker**
- **Heavy Equipment Operator** – comprises many special function titles, such as Bargeman, Brakeman, Compressor operator, Elevator operator, Engineer Oiler, Forklift operator, Generator, pump or compressor plant operator, Signalman, Switchman, Conveyor operator, Fireman, Skip loader operator, Helicopter radioman, Boring machine operator, Box man or mixer man, Asphalt plant engineer, Batch plant operator, Bit sharpener, Micro tunnel system operator, Pavement breaker operator, Drill Doctor, Drilling machine operator, Rotary drill operator, Canal liner operator, Canal trimmer operator, and so on.
- **Dredger** – may include Lead Dredge man, Operator, Lever man, Tug Operator, Derrick Operator, Spider/Spill Barge Operator, Engineer, Electrician, Chief Welder, Boat Operator, Shore man, Deckhand, Rodman, Scow man, Cook, Mess man, Porter/Janitor, and Oiler.
- **Boilermaker**
- **Sheet Metal Worker** – installs HVAC ductwork and related work
- **Fencer** – a tradesman who builds fences
- **Glass Worker** – installs glass.
- **Insulation Installer** – Includes application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems. Also Hazardous Material Handler.

Building and Construction

- **Power Line Technicians** – High voltage line and substation construction and maintenance trade, trade titles under Power line Technicians: electricians, Digger Machine Operator, Grounds man (labourer waiting for apprenticeship).
- **Site Manager** – Also includes contractor, supplier, shift head, head operator, shift manager, overseer, foreman and other such managerial roles.

Characteristics of Work

- For most of the persons who work in the building and construction industry, their work is of temporary nature and working hours are uncertain. The building and other construction work is characterized by inherent risk to life and limb of workers;
- The construction workers are basically unskilled, migrant, socially backward, uneducated with low bargaining power;
- Piece-work is the predominant wage form for temporary workers in the construction industry. Many are forced to work long hours, while others choose to do so, either because the rates of pay are so low or simply because they want to earn as much as possible while work is available. A 10 to 12-hour day, for six days per week, is the norm (ILO 2001a: 33);
- It is common practice for contractors to provide housing on site for informal construction workers, particularly when they are migrants from the countryside or from overseas. Living conditions deteriorate as subcontractors offer worse conditions than principal employers.

Health Problems and Disease Patterns

Health problems in this industry can be largely classified into:

- Accidents and injuries;
- Health problems due to contact with gas, fumes or chemical substances (such as cement, lime dust, paint, and so on) without proper handling or protective measures;
- Exposure to weather, heat and cold;
- Infections due to cramped spaces, unhealthy surroundings and lack of proper hygienic measures;
- Health problems due to Noise and Vibration;
- Poor Nutrition;
- Addiction;
- Poor living conditions.

Health Condition & Causative Source	Clinical Perspective Page
Accidents and Injuries	
Electric Shocks, Severe Burns Causative Source: Electric Cables	252
Fractures, Crush Injuries and Asphyxia Causative Source: Excavations <ul style="list-style-type: none"> • Being trapped and buried in an excavation owing to the collapse of the sides; • Getting struck and injured by material falling into the excavation; • Falling into the excavation; • Getting trapped in flooding due to unsafe means of access and insufficient means of escape; • Getting crushed or run or run over by vehicles driven into or too close to the edge of an excavation; • Asphyxiating or getting poisoned due to fumes entering the excavation, such as those from diesel or petrol engines. Vehicles <ul style="list-style-type: none"> • Bad driving techniques which include reversing blind; • Carelessness or ignorance of special hazards, e.g. work near overhead power lines or excavations; • Carrying unauthorized passengers; • Poor maintenance of vehicles; • Overloading or bad loading; • Site congestion; • Poor traffic layout. Lack of proper roadways combined with uneven ground and debris.	
Fractures to skull and spine Causative Source: Scaffolding Falls from a height, and similarly of materials and objects, represent the most serious safety risk in the construction industry. A high proportion of deaths are caused by falls.	
Eye damage, skin injuries, burns and the inhalation of toxic gases Cause: Welding and cutting.	257
Allergic and Non-Allergic Contact Dermatitis Causative Source: Painting. Painters are commonly exposed to solvents, the main ones being petroleum solvents, toluene, xylene, ketones, alcohols, esters and glycol ethers. Titanium dioxide and chromium and iron compounds are used widely as paint pigments. Painters in the construction industry and shipyards may also be exposed to asbestos, which is used as paint filler. Exposure to silica may occur during the preparation of surfaces in construction and metal painting.	171
Ulcerations Causative Source: Direct contact with wet cement usually trapped in footwear.	181

Building and Construction

Health Condition & Causative Source	Clinical Perspective Page
<p>Metal fume fever (An Influenza like illness characterised by headache, fever with rigors, myalgia, nausea, vomiting, and malaise. The onset of the illness may usually be after a gap in exposure to Zinc Oxide such as returning to the job after a vacation.)</p> <p>Causative Source: Metallic oxides used in gas welding particularly Zinc Oxide exposure fumes and also to carcinogens present in wood.</p>	205
<p>Polymer Fume Fever (breathing problems, cough, fever, muscle aches and general malaise.)</p> <p>Causative Source: Breathing of fumes of polymers such as Teflon. Teflon is often used in containers and pipe work for reactive and corrosive chemicals. It is also used as a thread seal tape in plumbing applications. Workers who weld, braze or solder on Teflon coated metal – are also at risk.</p>	207
<p>Pneumonia, occupational asthma, reduced lung function Gases and fine particles in welding fume can cause dryness of the throat, tickling, coughing or a tight chest.</p> <p>Causative Source: Chromium Oxide (CrO₃) and Nickel Oxide in stainless steel fume cause asthma.</p>	186
<p>Asbestosis (A chronic inflammatory and fibrosis affecting the parenchyma of the lungs caused by the inhalation and retention of asbestos fibres.)</p> <p>Causative Source: The workers exposed to asbestos are insulator, roofer, brick, block and stone mason, carpenter, plumber, pipe fitter, sheet metal worker, welder and heating & air conditioning installer.</p>	347
<p>Silicosis (Acute phase characterised by shortness of breath, cough, fever, and cyanosis, Chronic silicosis may present as chronic cough and exertional dyspnoea. X-ray investigations may reveal a profusion of small (<10 mm in diameter) opacities, typically rounded, and predominating in the upper lung zones. Sometimes the condition may be accelerated or complicated due to other conditions such as other lung disease, such as tuberculosis, non-tuberculous mycobacterial infection, and fungal infection, certain autoimmune diseases, and lung cancer. X-ray findings show progressive massive fibrosis.)</p> <p>Causative Source: Sand is widely used in the construction industry and the following trades within the construction industry are particularly vulnerable - brick, block & stone mason, concrete or terrazzo worker, and painters who come in contact with sandblast.</p>	191
Illness Due to Unhygienic Workplace Conditions	
<p>Urinary Tract Infections</p> <p>Cause: Holding of urine and improper toilet facilities especially for women.</p>	
<p>Insect Bites</p> <p>Causative Source: Improper and infrequent disposal of garbage.</p>	247
Behavioural Hazards	
<p>Addiction and Substance Abuse</p> <p>Causative source: Illiteracy and socio-economic conditions may be contributing factors.</p>	311

Scavenging

This chapter is related to the occupational health of sweepers, garbage cleaners, waste pickers, sewage cleaners and manual scavengers who are involved in the informal occupation of scavenging.

IN COMMON TERMS A 'SCAVENGER' or a 'Waste picker' is a person who searches for and collects discarded items or a person employed to clean the streets. In addition to the above, there exists another form of scavenging called 'manual scavenging' which consists of the removal of human excreta by hand in public streets, septic tanks or closed gutters and sewage.

All over the world scavenging is a means of income to millions, predominantly in developing countries. This work is generally done by the poor and marginalized sections of society and majority of them are women and children. In addition, in India this occupation is caste driven with the majority population belonging to the backward or Dalit caste. Due to informal nature of the job, it is difficult to estimate the actual strength of workforce. As per some studies, in Ahmedabad city there are an estimated 30,000 waste pickers. Gujarat has over 100,000 waste pickers. Another study estimates that the numbers of waste pickers in Delhi alone would be approximately 100,000. The total population of waste pickers in Pune is estimated to be 6,000. Manual scavenging meanwhile is being carried out nearly 1.2 million people as per the 2011 Census report.

Distribution of Workforce

The people working here can be grouped as per the activities they do as part of scavenging or waste picking:

- Organized workers employed by local municipalities or private bodies to sweep and collect garbage from private and public bins;
- Organized and unorganized workers who clean septic tanks, sewers or clean night soil from dry toilets;
- Unorganized or autonomous waste pickers who rummage through garbage in public bins, roadside gutters and landfills for useful waste to be sold.

In India, the majority of this work is done without any protective gear and under the most inhumane and polluted environments.

Characteristics of Work

- In majority of the cases, there is no formal relationship between the waste pickers and their employer;
- They are autonomous waste pickers who work for themselves or forced by society by virtue of their caste into the occupation e.g. Manual scavenging;
- Majority of them are poor and marginalized;
- Men mostly do the more robust activities like cleaning the sewers and collecting garbage while women and children mostly do the cleaning of toilets and waste picking activities;
 - They are stigmatized by society and do not have access to basic sanitation facilities, healthcare facilities or educational institutions for children;
 - They are exposed to toxic gases like methane or hydrogen sulphide from decomposing landfills or from sewers or gutters;
 - They are exposed to industrial waste in form of sharp metals, bottles, needles, paper which may have become saturated with toxic material, bottles with chemical residue, pesticides, solvents etc;
 - They are exposed to biomedical as well as biological waste from discarded needles, hospital waste, human excreta, animal carcass;
 - Scavenging involve carrying heavy dry/ wet waste loads or biological waste/ night solid in crane baskets to be dumped in common landfills or to outskirts of villages.

Health Problems & Disease Patterns

Waste pickers or scavengers face physical health risk not only in their line of work but also mental health risk due to discrimination from majority of the society who treat them as “untouchables” or lesser individuals. In additions, these individuals are exposed to health risk at their home as well as they live in unhygienic conditions and do not have access to basic facilities of water or sanitation.

Health Condition & Causative Source	Clinical Perspective Page
Respiratory Conditions	
Asthma, and Bronchitis Cause: These arise mainly due to the constant exposure to contaminants and improper burning of garbage making the scavengers exposed to fumes and toxic chemicals.	185
Tuberculosis Causative Factors From constant exposure to dust and fumes and poor immunity due to malnourishment.	197
Pneumonia Causative Source: Due to inhalation of polluted air at dumps and exposure to dust.	186

Health Condition & Causative Source	Clinical Perspective Page
Gastroenterological Conditions	
Acid Peptic Disease (Helicobacter Pylori infection which causes ulcer in stomach and intestine and also may cause stomach cancer). Causative Factors: Contaminated food, water and utensils.	
Campylobacter Infection Causative Factors: Due to consumption of water or food contaminated by human waste.	230
Cryptosporidiosis, Giardiasis, Yersinosis and other parasitic Infections Causative Source: Due to consumption of water or food contaminated by human waste.	241
Viral Gastroenteritis, Hepatitis A, Foot and Mouth Disease (Enterovirus) and Rotavirus infection Causative Source: Due to consumption of water or food contaminated by human waste.	236
Hepatitis C Causative Source: From exposure to infected hospital waste like needles.	
Dysentery and Enteric Fever Causative Source: Shigella and Salmonella infection from exposure to infected hospital waste like needles.	
Injury and Physical Harm	
Cuts and Lacerations Causative Factors: From sharp objects, metals, broken bottles and from lack of protective gear.	
Irritation of Eyes Causative Factors: From exposure to poisonous gases in sewers	
Burns and Smoke inhalation Causative Factors: Due to spontaneous or deliberate burning of garbage in dumps.	208
Neurological and Behavioural Conditions	
Chronic headaches, dizziness, sleepiness Causative Factors: Due to lack of oxygen in the air around landfills.	
Dizziness and Nausea Causative Factors: Due to gases emanating from decomposing waste, more pronounced during the summer months.	

Scavenging

Health Condition & Causative Source	Clinical Perspective Page
Anxiety and depression Causative Factors: Mental trauma due to the daily struggle for livelihood accompanied with the discrimination done by society.	320
Sexual Violence Causative Factors: Due to harassment by police, contractors, other sexual predators.	

Summary

Scavenging seems to be the most neglected and ostracised occupation and there are few serious studies conducted on the health issues afflicting those in the scavenging profession. Their daily exposure to dirt and unhygienic conditions puts them at risk of almost every communicable disease and their exposure to improperly disposed industrial and commercial waste products puts them at risk of serious life threatening illnesses. Primary care providers will do a world of good if they are able to impart knowledge of hygienic practices to people in this occupation.

Carrying of Head Loads, Loaders and Un-loaders

This chapter will deal with occupational health and safety issues of persons who are engaged in the informal occupation of independently working on assignments involving carrying of head loads and loading and unloading of material. Workers in organized industrial units may also be performing these tasks as part of their duties.

THE GROWTH of the informal sector in India has been alarmingly phenomenal and the Ministry of Labour, Government of India, has categorized the unorganized labour force under four groups in terms of Occupation, nature of employment, specially distressed categories and service categories.

Among these, the specially distressed category includes toddy tappers, scavengers, carriers of head loads, drivers of animal driven vehicles and loaders and unloaders.

While there is very little by way of statistical analysis or epidemiological studies, it is widely recognized that the major feature of the especially distressed category is lower real wages. This coupled with poor working and living conditions makes it especially difficult for persons in this sector to take care of themselves and their health problems.

Further, the sector is characterized by preponderance of casual and non-contractual employment, near absence of social security measures or work relations, lack of knowledge of worker rights, denial of minimum wages, and unqualified work status (with respect to education, skill and training). This weakens the workers' bargaining strength making it a low cost means to absorb labour that cannot be absorbed elsewhere. Any attempt to regulate or bring it into an effective legal or institutional framework resisted both by the workers themselves (who see it as a loss of employment opportunity for unskilled or unqualified persons) and by the employers (who view it as a loss of the low labour cost – with no strings attached – advantage).

Distribution of Workforce

While there is very little official data on the percentage of informal or unorganized workers who perform the task of carrying of head loads, loading and unloading, there certainly are some sections that have some organization and worker protection. Carriers of head loads, loaders and unloaders in India may fall broadly into the following four categories:

- Organized labourers who are a recognized part of production or service industries. The most prominent example is that of licensed porters at railway stations and docks. Other examples are loaders and unloaders who are engaged on an exclusive employment basis by movers and packers organizations;
- Production units may not exclusively employ loaders and unloaders but may expect workers to conduct these activities as part of their daily tasks;
- Contract labourers, who are not on the payrolls of the organization but are employed on a regular basis by firms for distribution or delivery. Examples of such firms are carrying and forwarding agencies, furniture shops, transport agencies, and so on. In most cases these workers report to the proprietor or manager daily and inquire about new assignments;
- Migrant labourers, who move from one construction project or factory manufacturing construction materials to another. Sometimes manufacturers of finished goods have a seasonal requirement for unskilled workers such as loaders and unloaders and these migrant workers come in handy. Some migrants also move from one annual fair to the other and visit devotional places on festive days to obtain work;
- Women workers are unusually low in this trade. However they may find work in sand mining units or road construction projects where they may be required to carry head loads of sand or gravel. Some examples of women railway porters are to be found in Rajasthan.

Characteristics of Work

Whatever be the activity the following are the characteristics of the carrying head loads and loading and unloading work:

- Absence of either a formal employment agreement, or a stable income in many cases;
- Poor working conditions and an overwhelming absence of training regarding healthy and ergonomic practices;
- Injuries and mishaps due to lack of protective gear or preventive measures taken while carrying, loading or unloading heavy goods or equipment;
- Poor nourishment and hygiene leading to susceptibility to infections;
- A variety of musculoskeletal disorders and discomfort are seen due to untrained lifting and material handling techniques;

- Physical injuries due to lack of estimation of the worker's capacity for lifting loads;
- Long working hours and poor socio-economic conditions may lead to strain on the body and onset of degenerative conditions.

Health Problems and Disease Patterns

Most of the work involving carrying of head loads, loading and unloading falls in the category of untrained and improper manual material handling and is a major predisposing factor for low back pain and shoulder injuries.

Setting safe limits for manual material handling can be done through the following approaches:

- Epidemiological – determining the incidence of injuries in a given set of persons and analyzing the risk factors for these injuries;
- Biomechanical – estimating the body force applied during carrying of loads or lifting and unloading tasks and comparing them with standard tissue tolerance readings derived from cadaver studies;
- Physiological – estimating the energy requirements for carrying of head loads, loading or unloading tasks and comparing them with the aerobic capacity of the workers;
- Psychophysical – simulating a manual lifting or loading task in a controlled environment in a subject that matches age, physical condition, gender and ethnic group of the target population.

NIOSH Lifting Equation for Tasks that Predominantly Involve Lifting

Such tasks can be analysed by using the National Institute for Occupational Safety and Health (NIOSH) equation that determines the Lifting Index (LI) for any load that needs to be lifted. This is a ratio of the Actual Weight to be Lifted (AWL) with the Recommended Weight Limit (RWL).

$$LI = AWL / RWL$$

An LI of 0 to 1.0 is considered to be safe for lifting or loading purposes.

The RWL on the other hand is a product of several factors such as:

- The Load constant (or the highest RWL that would be possible under ideal conditions);
- The horizontal modifier (the horizontal distance between the ankles and the location of the hand hold at the origin as well as the destination of the lift);
- The vertical modifier (The amount of trunk bending necessary to perform the lift);
- The distance modifier (the vertical distance between the origin and the destination of the lift);
- The frequency modifier (the average lifts per minute); and
- The coupling modifier (an indicator of good, fair or poor grip).

Carrying of Head Loads, Loaders and Un-loaders

The following steps or precautions need to be taken while lifting in order to safeguard health and prevent injury:

- Testing the load and getting help if needed;
- Planning the lift and the path to take;
- Keeping the load as close to the body as possible;
- Pivoting and moving one's feet to acquire a broad base of support and thereby preventing twisting;
- Using smooth and coordinated movements for lifting loads;
- Keeping the back as straight as possible from head (cervical vertebrae) to tail (coccyx).

In most cases, labourers are never trained to lift loads in an ergonomic and healthy manner as a result of which acute injuries and chronic strain on the body leads to the onset of degenerative conditions early in life. While pain is the most overriding complaint, many labourers choose to withstand the pain rather than bear the costs of medical treatment. Some persons may take to alcohol consumption, which is usually more dangerous and life threatening as they procure the cheapest alcohol that is illegally distilled and in some instances may contain methanol which causes blindness, metabolic disturbances that lead to coma and even death.

Health Condition & Causative Source	Clinical Perspective Page
<p>Pain: Low back pain and shoulder pain Causative Source: Improper lifting of heavy loads, unscientific postures and load balancing by the body, failure to keep the back straight, failure to correctly transfer weight to relevant portions of the body during lifting, loading and unloading of heavy articles. Increased frequency of loading and unloading where the joints and muscles are held in unhealthy positions for protracted periods of time, in suboptimal working conditions.</p>	295
<p>Impingement Syndrome of the Shoulder: Shoulder pain along with bursitis and tendinitis. Causative Source: Physical stress due to repeated overuse or sudden overload on the shoulder.</p>	303
<p>Shoulder Dislocation Causative Source: Excessive force applied in any direction may cause a dislocation.</p>	302
<p>Lumbosacral and sacroiliac disc disease: Low back pain, restriction of back motion, S1 radiculopathy. Causative Source: Disproportionate and constant physical stress due to faulty lifting techniques.</p>	304

Driving of Animal-driven and Mechanised Vehicles

This chapter will deal with occupational health and safety issues of drivers who form part of the transport industry – whether operating animal driven vehicles or mechanised ones.

DRIVERS PLAY AN IMPORTANT ROLE in facilitating movement of people, goods and information on the road network. They are also exposed to several risks and hazards such as vibrations, noise, injury, violence, heat, cold, dangerous substances and fatigue.

Each group of drivers comes with their own set of unique problems that are affected by the nature of the vehicle, nature of the work and length of working hours. Quite often, this influences lifestyle changes that lead to susceptibility to a unique set of health problems.

Distribution of Workforce

Drivers in India may be engaged in transport or ferrying passengers. They may be governed under the motor vehicles act if they are using mechanised vehicles. Horse drawn carriages have been deemed illegal in one state (Maharashtra) though they are popular.

Drivers largely fall into the following categories:

- Transport workers – these are again divided into those who transport goods over long distances such as the truck drivers and those who transport goods over smaller distances such as within the city. The second category usually consists of tempos or medium sized commercial vehicles;
- Ferrying people – Those who ferry people over short or long distances fall in this category. This includes the rickshaw drivers who drive cycle rickshaws or automated rickshaw, the bullock cart driven vehicles, the cab drivers who may ferry people within the city or between cities and the bus drivers who either operate public or private transport vehicles.

Characteristics of Work

The following problem areas characterise the working patterns of drivers:

- Professional drivers have a lifestyle that is not conducive to good health. In addition to their exposure to noise and air pollution the job does not provide the same opportunities for social contact as many other jobs, and shift work, unsocial hours etc can disrupt both home life and social activity. Home life and social contacts provide a powerful source of support for those experiencing stress and an absence of this support compounds an already difficult problem. These men are away from their families for long durations, and in the unhealthy environment along the highways they become easy prey for commercial sex workers making them vulnerable to Sexually Transmitted Diseases (STDs) and HIV or AIDS
- Drivers are more likely to have a diet that is not conducive to health than those groups of workers who can return home for an evening meal on a regular basis and take regular meal breaks in a staff canteen. A diet high in fats and carbohydrates and low in fresh fruit, salads and fibre will add to the level of poor health;
- The incidence of smoking and drinking can also create health problems.
- Drivers are exposed to a number of health problems as a direct result of the posture adopted in driving. Sitting in the driving position exerts considerable forces on the spine and can cause a number of problems with the musculoskeletal system in particular backaches, neck problems, pulled muscles, and general stiffness. The driving posture also causes problems for the digestive system;
- Truck drivers are continuously exposed to various types of pollutants especially air pollutants emitted from vehicles and blowing of horn;
- Truck drivers have a higher degree of continuous exposure to low grade Whole Body Vibration (WBV);
- For auto rickshaw drivers the problems encountered were limited and painful mobility of wrists, back pain and poor vision due to cataract and not wearing proper glasses;
- India has a high rate of 18.9 accidents per 1, 00,000 people. Drivers who are usually single breadwinners for their families usually become victims to accidents and fatalities;
- Exposure to fossil fuels and noxious chemicals makes the drivers prone to a large number of respiratory affections;
- Drivers may be prone to systemic problems due to their largely stress related lifestyles.

Health Problems and Disease Patterns

Health hazards of these drivers are described below with their causative sources and manifestations. While accidents and mechanical injuries are the main afflictions that affect people in this occupation, a large effort by many organizations, in recent years, has also focused on Sexually Transmitted Diseases (STDs) and HIV transmission among drivers.

Health Condition & Causative Source	Clinical Perspective Page
Injuries and Physical Harm Conditions	
<p>Road Accidents: The major accident types are:</p> <ul style="list-style-type: none"> • Vehicle Crashes; • People being struck or run over by moving vehicles (e.g. during reversing or coupling); • People falling from vehicles; • People struck by objects falling from vehicles, or vehicles overturning. <p>Causative Source: Each vehicle has its own problems that may contribute to accidents:</p> <ul style="list-style-type: none"> • The reduced braking and evasive abilities of trucks can contribute to situations more often developing into collisions, and the collisions occur at higher speed; • The size and weight of trucks may mean that collisions result in more serious personal injuries than similar collisions involving passenger cars. • Passenger cars may run at high speeds leading to high friction on freeways and expressways causing tyres to burst; • Animal driven vehicles are usually slow and more difficult to manoeuvre. Driving at unnaturally high speeds may cause the vehicle to turn over. <p>Additionally the following conditions may also predispose to accidents:</p> <ul style="list-style-type: none"> • Overloaded, unbalanced load and inadequate cargo securing; • High speed in spite of bad weather; • Unsafe driving due to time pressure, without adequate periods of planned rest for drivers, driving under the influence of alcohol and driving while undertaking distracting or demanding tasks; • Loss of control due to brake failure; • Handling dangerous and inflammable substances. 	
<p>Accidents during coupling and improper loading and unloading of vehicles:</p> <p>Causative Source:</p> <ul style="list-style-type: none"> • The driver did not have any instructions on the loading and unloading process, and handling of the material in question; • The customer had not carried out a risk analysis of the unloading bay; • Failing to ensure that the loading procedure is supervised by a skilled employee; • Using appropriate cargo straps; • Using forklifts for other purposes than intended. 	

Driving of Animal-driven and Mechanised Vehicles

Health Condition & Causative Source	Clinical Perspective Page
<p>Fractures: Usually fractures of the ribs and shoulder may occur during maintenance work</p> <p>Causative Source:</p> <ul style="list-style-type: none"> • Improperly maintaining vehicles and using lifting jacks; • Failure to implement standard safety procedures to maintain the trucks; • No Training and information for workers concerning the safe use of lifting jack. 	
<p>Burns</p> <p>Causative Source:</p> <ul style="list-style-type: none"> • Handling inflammable substances or hot substances such as bitumen; • Explosion of battery or fuel tanks. 	255
Musculoskeletal Conditions	
<p>Pain: Low back pain.</p> <p>Causative Source: Low grade Whole Body Vibration and constantly sitting in one position maybe the main causes.</p>	295
<p>Wrist and hand sprains: Affecting scapho-203lunate ligament.</p> <p>Causative Source: usually seen in drivers of auto rickshaws who have to use the wrist to change gears or raise the acceleration of the vehicles.</p>	
Respiratory Conditions	
<p>Occupational Asthma: Breathlessness with chronic cough and coryza</p> <p>Causative Source: Has been observed to be higher in tempo drivers due to higher exposure to dust and vehicular pollution in urban areas.</p>	185
Circulatory Conditions	
<p>Hypertension</p> <p>Causative Source: Common in truck drivers. Chronic stress seems to be the main cause. Plus eating at roadside eateries that serve food that is oily and salty.</p>	
<p>Anaemia:</p> <p>Causative Source: A poor diet that is low in nutrients.</p>	
Dermatological Conditions	
<p>Pilonidal sinus: usually around the Perianal region.</p> <p>Causative Source: sitting for a long time and hyperidriosis (excessive perspiration) in the area may lead to strands of hair to get struck in injuries leading to the condition.</p>	
Ear, Nose and Throat (ENT) Conditions	
<p>Noise Induced Hearing Loss (NIHL)</p> <p>Causative Source: Peculiarly in Indian conditions - driving is a very noisy affair with a lot of honking and noise emitted from accelerators of poorly maintained vehicles. Noise pollution levels on Indian roads are significantly higher than in other countries.</p>	285

Health Condition & Causative Source	Clinical Perspective Page
Ophthalmological Conditions	
Refractive errors and Early cataract Causative Source: Driving a vehicle is a demanding and strenuous task that requires good visual acuity and sharp reflexes. The visual strain is often increased due to environmental lighting and glare from headlights of other vehicles.	
Gastrointestinal Conditions	
Acid Peptic Disease: Causative Source: Tobacco use and irregular eating habits.	
Infectious Conditions	
Sexually Transmitted Diseases and HIV or AIDS: Causative Source: Truck Drivers are more prone as they travel long distances and are usually away from home and have statistically reported higher rates of intercourse with multiple partners.	

Midwifery and Village Health Work

This chapter will deal with occupational health and safety issues of persons who are engaged as primary care providers of nursing, midwifery, basic interventional services and surveillance and reporting work at the level of providing primary healthcare to the rural population

INDIA HAS DEVELOPED AN EXTENSIVE NETWORK of Primary Health Centres (PHC) and sub-centres (SC) staffed by doctors and Auxiliary Nurse Midwives (ANMs) as well as male health workers to provide basic medical care to huge rural population. At the primary care level in rural healthcare missions, there also exist Multipurpose health workers (MPW) and accredited social health activists (ASHA) who were community health workers instituted by the government of India's Ministry of Health and Family Welfare (MHFW) as part of the National Rural Health Mission (NRHM), with the stated target that once fully implemented, there is to be "an ASHA in every village" in India, a target that translates into 250,000 ASHAs in 10 states.

Distribution of Workforce

Midwifery and village health work in India usually falls into the following categories.

- In the rural health care system, the ANM is the key field level functionary who interacts directly with the community and has been the central focus of all the Mother and Child Health (MCH) and reproductive child health programs. Over the years with changes in program priorities, the role and capacity of the ANM has changed substantially;
- Today, the ANM is far less a nurse and midwife; but a "multi-purpose worker" providing family planning, immunization, sanitation, infectious disease prevention/care and antenatal and post-natal care;
- Today's Multipurpose Worker (MPW) is more involved in family planning and preventive services and the role of midwife has been largely neglected because overemphasis on family planning targets and the addition of infectious disease control programs in the ANM's already busy Schedule has led to neglect of MCH;

- Female community health workers called ASHA (accredited social health activists) are trained to provide basic, first-contact health care and to encourage families to seek pregnancy and child health services;
- Midwifery has seen resurgence and the application of the community health model. Two types of midwifery services are prevalent in India, “Skilled Birth Attendants” (SBAs) who are trained under the NRHM and the Traditional Birth Attendants (TBAs) or dais are seen as “unskilled” but are nevertheless necessary in order to achieve the Millennium Development Goals (MDGs) that India has signed up for especially MDG #4 being to reduce the infant mortality (IMR) by 2/3 and MDG #5 to bring down maternal mortality (MMR) by 3/4;
- The Lady Health Visitors are ANMs who have to monitor and supervise the ANM activities. However there is no insistence that the deliveries should be conducted by the ANMs. But at most places emphasis is put if at all on deliveries by trained TBAs;
- The medical officer at the PHC is also not qualified to supervise the ANM for technical expertise as they themselves are not conducting deliveries or inserting IUDs. The supervision is limited to checking registers and there is no technical support available for the ANM in the field, the main activity being the filling of the monitoring form that collects information on number of domiciliary deliveries attended by ANM/LHV.

Characteristics of Work

Whatever be the activity the following are the characteristics of village health work and midwifery:

- Rural health work exposes the workers to chemical, biological, physical and psychosocial occupational hazards. Rural health workers are constantly in contact with patients that expose them to infections and thus require proper protective measures to reduce their risk of acquisition of disease or injury;
- Healthcare workers constantly interact with patients who may indulge in unsafe behaviour such as coughing, sneezing or spitting in the open thereby transmitting droplet borne infection. They may have to visit or work in environments that are unhealthy and come in contact with abnormal discharges such as vomitus, lochia, sputum or phlegm. They are also expected to deal with amniotic fluid, haemorrhage, manual removal and separation of the placenta, and removal of meconium;
- Healthcare workers are exposed to blood-borne infections which usually expose them to diseases such as HIV, TB, and hepatitis B and hepatitis C.
- Predictors for experiencing hazards included not wearing the necessary Personal Protective Equipment (PPE), not getting access to specific

protection such as immunization against specific diseases during an outbreak, not following standard aseptic procedures, not having access to safety tools and equipment and not availing of post exposure prophylactic treatment;

- Health workers, in general, come in contact with cleaning products, disinfectants, sterilising solutions, detergents and deodorants that may contain toxic active ingredients, such as ammonia, chlorine, phosphates, alkylphenol ethoxylates, formaldehyde, phenolic compounds, propellants, and petroleum solvents, glutaraldehyde, ethylene oxide, formaldehyde, paraformaldehyde, methyl methacrylate, Freon, peracetic acid, or waste anaesthetic gases. Pesticides, rodenticides, and fungicides are also used in hospitals;
- Most exposures occur by skin and eye contact or by inhalation, and may be associated with acute asthma attacks from exposure to chemicals in the environment. Pregnant nurses can face additional risk to their unborn babies from exposure to chemicals, especially sterilizing agents that may increase the risk for spontaneous abortion in pregnant nurses. Nurses with frequent exposure to sterilizing agents and anaesthetic gases were seven to nine times more likely to have children with musculoskeletal defects than their unexposed peers;
- Nurses and community health workers may be exposed to medications such as chemotherapy and antiretroviral drugs; devices containing mercury;
- Long term handling of cleaning agents and protective equipment resulting in exposure to soap and latex may cause irritation and many may also experience allergic reactions on first time exposure;
- Physical injuries such as the prevalence of needle stick injuries exposes personnel to the risk of acquiring or unknowingly transmitting blood borne infection. Exposure to radiation may also have harmful carcinogenic effects;
- Physical injuries such as sprains and strains caused by improper handling of heavy equipment such as beds, stretchers, containers, trolleys and sterilising equipment;
- Nursing has been identified as an occupation that has high levels of stress. Job stress brought about hazardous impacts not only on nurses' health but also on their abilities to cope with job demands;
- Precipitating factors for psychosocial conditions affecting nurses may be working overtime, job related pressures, and working in multiple health facilities;
- A number of people in this profession may experience workplace bullying, verbal and physical abuse, sexual harassment or may even be subjected to violence.

Health Problems and Disease Patterns

Nurses continue to report high levels of job-related injury and illness. Working environment, responsibilities, and duties of nurses put them in the front line of numerous occupational hazards. These occupational hazards along with many other problems such as night shifts and sleep deprivation have changed nursing to a dangerous occupation that may explain the high rate of stopping the work in nursing. Some of these conditions are discussed below.

Health Condition & Causative Source	Clinical Perspective Page
Injuries and Musculoskeletal Conditions	
<p>Needle Stick Injuries: These would also include cuts/wounds/lacerations, sharp related injuries. They may be largely under-reported due to the personnel's lack of knowledge that all injuries had to be reported. These injuries increase the risk of acquiring blood borne infections. Communicable and contagious diseases and exposure to blood-borne pathogens (e.g., HIV, HCV, HBV, etc.) due to needle-stick injuries also threaten the health of nurses. It is estimated that 600000 to 800000 needle-stick injuries occur each year in all healthcare settings.</p> <p>Cause: failure to wear protective gloves. Injections (21%), suturing (17%), and drawing blood (16%) are the main causes of exposures.</p>	366
<p>Pain: A higher incidence of low back pain has been observed. Upper extremity, shoulder, and neck injuries are also common among nurses. It seems that work-related musculoskeletal pain and injuries are common among nurses and midwives all over the world.</p> <p>Causative Source: Most of these pain and injuries are due to lifting and moving patients manually. Pulling, pushing, improper patient handling and poor knowledge and training about bio-mechanics of body movements and adjustments.</p>	304
Respiratory Conditions	
<p>Occupational Asthma: Allergic along with chronic cough</p> <p>Causative Source: Frequent exposure to residues from drug preparation, disinfecting and sterilizing agents (glutaraldehyde and ethylene oxide), housekeeping chemicals, and latex.</p>	185
<p>Pulmonary Tuberculosis</p> <p>Causative Source: Exposure to air-borne infection due to working in close contact with patients who may also have unhealthy practices such as sneezing, coughing and spitting in open spaces.</p>	197
<p>Chronic Obstructive Pulmonary Disease and Respiratory Infections: Severe acute respiratory syndrome (SARS), tuberculosis, and methicillin resistant staphylococcus infection are some infectious diseases that can afflict nurses.</p> <p>Causative Source: Exposure to communicable and contagious diseases due to working in close contact with patients who may have unhealthy practices such as sneezing, coughing and spitting in open spaces.</p>	200

Health Condition & Causative Source	Clinical Perspective Page
Dermatological Conditions	
<p>Allergic Contact Dermatitis: Rash, itching, vesicles, redness, burning and dandruff. In many cases it has been observed that symptoms of skin damage appeared 2 h after starting their duties, and the damage developed within 1–2 weeks.</p> <p>Causative Source: Some of the known sources are:</p> <ul style="list-style-type: none"> • Disinfectants such as chlorine, aldehydes, hydrogenium peroxide and alcohols; • Intensive hand hygiene with soaps and surface antiseptics containing chlorhexidine gluconate and povidone iodine; • Rubber antioxidants or latex allergy. 	171
Psychosocial and Behavioural Conditions	
<p>Stress Related Issues: Anxiety and depression</p> <p>Causative Source: Some of the known sources are:</p> <ul style="list-style-type: none"> • The increasing demands made on the emotional, social, psychological and spiritual resources of the nurse or midwife working in complex political, social, cultural, economic and clinical settings; • Impact of shift work, travelling hours, inhospitable conditions, irregular eating habits and the disturbance of everyday life patterns. 	320
<p>Violence, including Sexual Harassment</p> <p>Causative Source: Many nurses and midwives have reported experiencing verbal abuse and have even reported experiencing physical violence mainly because they work in isolated conditions sometimes in patient’s homes where relatives and family members may have poor understanding of emergencies and may hold the health workers or midwives responsible for undesirable clinical outcomes.</p>	

Domestic Work

This chapter will deal with occupational health and safety issues of Domestic Workers. Domestic workers work in the homes of others for pay, providing a range of services. They sweep and clean; wash clothes and dishes; shop and cook; care for children, the elderly, and the disabled; they provide gardening, driving, and security services. Some live on the premises of their employer. Others work part time, often for multiple employers.

DOMESTIC WORKERS MAKE UP FOUR TO TEN PER CENT of the developing world's total workforce, and, according to the ILO Bureau of Statistics, this number is growing every year. Therefore, domestic work is an important source of employment, especially in poorer parts of the world. Increases in rural poverty and various economic crises have pushed growing numbers of women and girls into the domestic labour market in their own countries and abroad. Many more women than men are drawn into this occupation, not only because domestic work is often considered "women's work," but also because women are less likely to have alternative ways of earning a living.

Another likely scenario that has emerged over the years is of second generation domestic workers. Daughters of domestic workers are also expected to take up the job. In the bigger cities, the husbands of these domestic workers are unemployed or are working in jobs where their wages are not sufficient to support their families.

Distribution of Workforce

Types of domestic workers, based on the hours of work and nature of employment relationship:

- a) Part-time worker or worker who works for one or more employers for a specified number of hours per day or performs specific tasks for each of the multiple employers every day.
- b) Full time worker or a worker who works for a single employer every day for a specified number of hours (normal full day work) and who returns back to her/his home every day after work.
- c) Live-in worker or someone who works full time for a single employer and also stays on the premises of the employer or in a dwelling provided by the employer.

Domestic Work

- d) Seasonal worker – There are workers who are engaged only for selected and limited period. As these are mostly migrants, their interest is to make as much money as possible in a limited time and the aim is to go back to the native places even though in reality this may not occur. These workers are usually relatives of domestic workers who are called to lend an extra helping hand during weddings, festivals, special functions or parties.
- e) Corporate houses often hire or outsource housekeeping work to special agencies that employ domestic workers. These workers though part of an organisation, or have very little to speak of as advantages over unorganised domestic workers.
- f) Event management companies also hire domestic workers mostly on daily wages and most often there is no direct employment contract between the domestic workers and the event management companies. They are nobody's responsibility should any mishap occur during an event.
- g) The last and probably the worst category of employment is the domestic worker who is nothing short of a bonded labourer. Many incidents have come to light where women and children are lured from rural areas by domestic worker agencies who then broker a deal with an employer for “delivering” a worker who is then trapped in the house as a bonded labourer. Unable to escape, such workers are often subjected to isolation and physical abuse.

This is perhaps the only informal sector where it is considered “normal” in many Indian households to have a child worker employed for cleaning the house or doing the dishes

Characteristics of Work

Generally Domestic Work falls under 4 categories:

1. Kitchen Work;
2. Housekeeping and Housecleaning;
3. Clothing Care;
4. Child and Elder Care.

Children as young as seven years old are routinely pressed into domestic service. Child domestic workers (CDWs) are isolated from their families and from opportunities to make friends, finding themselves under the total control of employers whose primary concern is often not in their best interest as children. Despite some children entering domestic work in the hope of continuing their schooling, many are deprived of opportunities for education and are working in conditions that can be considered amongst the worst forms of child labour. Worldwide, the majority of CDWs are girls. Many have been trafficked, or are in debt bondage. Following are the characteristics of the work issues that domestic workers routinely face as part of the work that they do:

- Domestic workers are subjected to continuous periods of work without any substantial period for rest or refreshments in between. When one task gets over they have to take up the other task;

- Physical hazards – Domestic workers have to lift loads without any support, walk over slippery floors, handle extremely hot (flour) or extremely cold (ice) substances and work with electrical equipment without any protective measures. Additionally they have to clean rooms with a lot of dust. They may be also subjected to physical abuse;
- Chemical Hazards – Domestic workers routinely handle several potentially toxic and harmful chemicals as part of their daily activities. These include Diethylene glycol found in window cleaners, formaldehyde found in spray and wick deodorizers, petroleum solvents in floor cleaners, perchloroethylene in spot removers, butyl cellosolve found in all-purpose cleaners and Chlorinated phenols found in toilet bowl cleaners;
- Biological Hazards – Domestic workers usually have to deal with disposal of left over foods or decaying material. They have to clean rooms that are dusty and contain spider webs, fungal growth, or are termite infested. They also have to deal with biological waste when taking care of incapacitated or extremely old people. Additionally many employers give them stale and spoiled food assuming that domestic workers can consume food which is not suitable for their (employer’s) consumption;
- Psychological Abuse – Domestic workers are usually shouted at, scolded for small misdemeanours and usually not treated with dignity or respect. There are certain humiliating practices drawn from the centuries old and inhuman caste system which can still be seen in some instances. Sometimes domestic workers are forbidden from touching certain objects in the households, such as idols of gods and goddesses, certain utensils, and rooms in the house where prayers are offered. In some instances domestic workers are not allowed to enter the house through the kitchen. Domestic workers have to go around the house in order to avoiding getting into the kitchen. Most often domestic workers pretend that it does not affect their self-respect and continue to work suppressing their anger and humiliation. Their work is often devalued or perceived as “no work;”
- Stress – The compulsory drill or routine of domestic work without any respite plus domestic pressures and having to literally do the same back breaking work every day – takes its toll on domestic workers. While at work, domestic workers face severe problems even in attending to nature’s call as most employers won’t let them use their washrooms. Domestic workers who live in the employer’s home have to do everything, from washing, cleaning, ironing clothes, going to market and buying groceries, vegetables and fruits, to feeding and taking care of children and taking care of the elderly. Their duties include serving the needs of all the members of the family, big or small, and they are expected to be on their toes the whole day. They are the first to wake up and the last to go to bed. Some domestic workers who live with the employers have to look after the children even during the night,

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as per the child's Schedule. They are not paid any overtime money for the services rendered during odd hours;

- Sexual harassment and abuse – though not openly spoken about, workers of both sexes may be subjected to harassment or abuse. These matters come to light when complaints are filed and action is taken, which goes to prove the incidence and prevalence of such events.

Health Problems and Disease Patterns

Hazards related to health and safety - are more or less shared by all these activities. Domestic workers are prone to a large variety of health problems. Health hazards of these workers are described below with their causative sources and manifestations.

Health Condition & Causative Source	Clinical Perspective Page
Dermatological Conditions	
Irritant Contact Dermatitis: The degree of damage following irritant exposure depends on the potency of the irritant, the duration of application, the frequency of exposure, occlusion, temperature, anatomical site, and individual susceptibility. Causative Source: Contact with detergents, vegetable juices, wet work or too much exposure to water.	171
Perniosis (Chilblains): Fingers and hands are affected due to capillary beds under the skin. Causative Source: Humidity, working for a long time in water.	169
Paronychia: Nail bed infection from <i>Candida Albicans</i> Causative Source: Hand dermatitis and wet work also predisposes to yeast infection.	219
Allergic Contact Dermatitis: Symptoms subside after skin is no longer in contact with the allergen. Causative Source: Some Domestic workers are prone to skin allergies because of the high use of these detergents.	171
Injuries and Musculoskeletal Conditions	
Contused and lacerated wounds and injuries: Small wounds may worsen and gape due to poor or no first aid or delayed treatment. Cause: Cuts and tears may commonly occur while cutting vegetables, cleaning floors that may contain pieces of broken glass, working with sharp nylon wires, or using brooms that are tied with metallic strings that can loosen out or even while cutting up or opening tin cans.	
Burns and Scalds: Thermal and electrical burns are known to occur as well as scalds. Causative Source: Handling extremely hot substances such as flour or hot water without any protection, working with damaged equipment or machinery such as pressure cookers without gaskets or refrigerators with faulty compressors that may explode.	255

Health Condition & Causative Source	Clinical Perspective Page
<p>Pain: Back pain. Causative Source: Washing, cleaning, bending constantly or adopting unhealthy postures while performing tasks like lifting heavy objects or cleaning ceilings or corners that are not easily accessible.</p>	304
<p>Physical Violence: Bruises, contusions, ecchymosed areas and sometimes even fractures. Causative Source: Signs of physical violence and abuse are apparent and the reasons given by the patient (such as slips or falls or accidental bruising) may not be consistent with the anatomical position and the extent of the injury.</p>	
<p>Sprains and Crush injuries and Fractures: Mostly of wrist, hands and feet. But may even present with fractures of arms or legs. Cause: Usually falling from a height while lifting heavy loads in an awkward manner.</p>	
Infectious Conditions	
<p>Gastroenteritis Shigellosis, Amoebiasis: Diarrhoea and Dysentery. Causative Source: Contaminated water, poor sanitation and hygiene, poor nutrition, and consuming contaminated or partly decayed food.</p>	
<p>Malaria, Dengue and other Mosquito Borne Diseases: Causative Source: Working in damp places or areas with stagnant water or mosquitoes.</p>	
<p>Enteric Fever: Typhoid Causative Source: Consuming contaminated water or food.</p>	
<p>Tuberculosis: Pulmonary or bovine. Causative Source: Living in crowded or cramped places, consuming contaminated milk. Poor hygiene or sanitation. Being exposed to places where people openly spit or snort.</p>	197
Nutritional Conditions	
<p>Anaemia: Haemolytic as well as Hypoplastic. Cause: Deficiencies, infections and constant self-medication with non-steroidal anti-inflammatory drugs (NSAIDs), contact with toxic substances (such as Butyl cellosolve) leads to bone marrow suppression</p>	
<p>Vitamin and Nutritional Deficiencies: Causative Source: Lack of a balanced diet.</p>	
Respiratory Conditions	
<p>Occupational Asthma: Causative Source: Damp houses infested with mites, rodents, cockroaches, and respiratory viruses.</p>	185
<p>Rhinitis, Bronchitis, Upper Respiratory Tract Affection: Associated with mucous membrane irritation and decreased pulmonary function Causative Source: Exposure to Formaldehyde, petroleum solvents and phenols.</p>	277

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Health Condition & Causative Source	Clinical Perspective Page
Behavioural Conditions	
Depression: Cause: Constant humiliation. Isolation from one's family and community; lack of paid vacation and sick or maternity leave; inadequate protection of wages; rape, physical and mental abuse; over-extended working hours; and general lack of benefits.	320
Anxiety: Causative Source: Being constantly on one's toes. Apprehension of losing one's job or being pulled up for mistakes or crimes that they have not committed.	

Barbers' Work

This chapter will deal with occupational health and safety issues of persons who are engaged in the informal occupation of hairdressing and cosmetology treatment.

BARBERS HAVE BEEN AN ESSENTIAL SERVICE in India and in most cases they are a traditional occupation. The community of barbers is called “Nai” or “Hajjam” and in many areas of India, it is recognised as a separate caste and where it isn't it is a family tradition. Traditionally the profession has been associated with hair cutting, hair dressing and shaving male hair. However in recent times the occupation also offers services such as facial bleach or beauty treatment, hair dyeing, ear lobe piercing and head massage. Many hair dressing salons in the cities now offer extended services to women also and are known as unisex salons. Some establishments are also known as beauty salons or beauty parlours. They offer hair cutting services to both males and females and also offer hair removal services such as waxing and threading. They also offer procedures such as manicure (which is a treatment of the hands involving nail and cuticle treatment) and pedicure (which is treatment of the feet which also involves softening of the skin and removal of calluses).

Clubbing all these tasks into a single profession is pertinent as the same levels of exposure to various chemicals is found as well as the nature of work that leads to the same postural problems as well as high risk interaction with infected areas of the body making them prone to infections as well as unknowingly aiding in their spread and transmission.

The entire gamut of services offered has given the profession a new name – skin care specialists.

Distribution of Workforce

Hair care and barber work in India usually falls into the following categories:

- Family establishments in cities, villages and towns. These are traditional barber shops offering hair treatment services to men. These establishments are better equipped to control infections and adopt healthy practices;

Barbers' Work

- Travelling barbers who conduct home visits or visit crematoriums or religious places to perform hair cuts or tonsures. They have a barbers' bag that contains all their equipment. They have limited resources and cannot use new and disinfected equipment for all their customers nor can they take care of their own health in the same degree as people in regular shops and establishments;
- Employment patterns in urban areas are changing and a large number of women have also taken to the profession. A number of institutes offer cosmetology, beauty treatment and hair stylist courses and hair, skin and beauty treatment is now offered in hotels, spas and even shopping malls;
- Organized businesses and franchises have sprung up in cities offering exclusive hair care treatments. They are better equipped but carry some occupational health risks too especially the exposure to chemicals and postural problems.

Characteristics of Work

Whatever be the activity the following are the characteristics of the barbers' work:

- Problems such as constant standing leading to mechanical load on the joints and vulnerability to varicose veins, poor posture because of having to adjust to different body physiques of customers and having to strain the eyes and turn the neck constantly may lead to pain and ophthalmological problems, longer working hours, missed meals, not taking breaks during working, as well as being subjected to extremes of temperatures are some of the other hazards that persons in this profession encounter;
- A variety of chemical products such as shampoos, creams, after shave lotions, astringents such as alum, hair dyes, antiseptics, bleaches, sprays, herbal products, nail paint removers such as acetone, cleaning agents such as hydrogen peroxide and hair conditioners. Apart from the aforementioned chemicals other ingredients present in the products may include (but are not limited to) p-benzenediamine, o-benzenediamine, potassium aluminium sulphate, p-phenylenediamine, Chromium compounds, gaseous hydrocarbon propellants such as mixtures of propane, pentane, butane and isobutane, p-toluenediamine, sodium and potassium hydroxide, toluene-2, 5-diamine, lead and other metallic mixtures, p-aminophenol, selenium compounds, m-aminophenol, parabens, formaldehyde, methylisothiazolinones, ethanol, cetrimide, isopropanol, ammonia, phenols, alcohols, persulphates monoethanolamine, glyceryl monothioglycolate, ammonium thioglycolate, ammonium chloride or ammonium phosphate, carbon dioxide(as gas as well as dry ice) and carbon monoxide;
- The work environment submits the barbers to higher electrical and electromagnetic exposure. Higher humidity and glaring lights are other physical influences that these persons constantly encounter;

- Workers in beauty parlours and hairdressers' and barbers' salons are likely to have contact with blood through processes such as cutting, manicure, pedicure, and skin care. Physical injuries coupled with lack of personal hygiene, ignoring the need for decontamination, disinfection and sterilization of working equipment, improper disposal of waste and unhygienic or absent sanitary conditions contribute to the risks of acquiring and spreading infections to others.

Health Problems and Disease Patterns

Barbers' shops are usually hot beds of infection. In addition to biological materials such as hair, blood and sweat, there are a number of irritant chemicals as well as allergens that are part of the air in barbers' shops.

Customers visiting the barbers' shops are at serious risk of acquiring blood borne infections such as Hepatitis B, Hepatitis C and even HIV. A common problem encountered after a visit to a barbers' establishment is the development of folliculitis known as Barbers' rash. Also called Sycosis Barbae – it spreads over the area of facial hair and may even extend to the hair follicles of the neck. Staphylococcus aureus may be the main infective agent. Failure to use clean and fresh towels and razors, absence of proper disposal of waste especially used blades, hair, solutions and creams and lackadaisical attitude towards personal health and hygiene puts workers in barbers' establishments at risk of developing or acquiring the following conditions:

Health Condition & Causative Source	Clinical Perspective Page
Dermatological Conditions	
<p>Irritant Contact Dermatitis: The degree of damage following irritant exposure depends on the potency of the irritant, the duration of application, the frequency of exposure, occlusion, temperature, anatomical site, and individual susceptibility.</p> <p>Causative Source: This condition occurs when the damage to the skin happens due to:</p> <ul style="list-style-type: none"> Repeated exposure to water, or sweating inside gloves; Contact with shampoos and other irritant chemicals; Friction from hair shafts, scissors, combs and other instruments; Drying the skin with use of hair dryers. 	171
<p>Allergic Contact Dermatitis: Symptoms subside after skin is no longer in contact with the allergen.</p> <p>Causative Source: Some of the known sources are:</p> <ul style="list-style-type: none"> Nickel in jewellery or metallic objects such as belts; Preservatives in shampoos, conditioners, hand creams etc; Hair dyes containing Paraphenylenediamine; Bleaching agents and disinfectants like Hydrogen peroxide and ammonium persulfate; Acid perming solutions containing glyceryl monothioglycolate; Rubber antioxidants or latex allergy. 	171

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Health Condition & Causative Source	Clinical Perspective Page
<p>Bacterial Infections of the Hands: Impetigo, furuncles or folliculitis. Causative Source: Staphylococcus aureus or streptococcus pyrogenes infections of wounds sustained during hair cutting.</p>	215
<p>Paronychia: Nail bed infection from Candida Albicans. Causative Source: Hand dermatitis and wet work also predisposes to yeast infection.</p>	219
<p>Erosio Interdigitalis Blastomycetica: Intertrigo between the fingers. Causative Source: Hand dermatitis and wet work also predisposes to infection.</p>	
<p>Hair Shaft Injuries: Customers' hair may penetrate exposed areas of the skin such as nail beds. Causative Source: Foreign hair particles sometimes penetrate skin like sharp needles and cause irritation, pain and infection.</p>	
<p>Interdigital Pilonidal Sinus: Also called barber's disease. Cause: This disease is caused by short hairs that penetrate the interdigital spaces of the hands.</p>	
Injuries and Musculoskeletal Conditions	
<p>Comb hand injuries: Injuries to the non-dominant hand can be reduced by holding the hair with the index and second fingers of the hand pressed together, one on top of the other. Cause: Scissor and razor wounds to the web between the index and the middle fingers of the non dominant hand.</p>	
<p>Thermal Burns: Affecting fingers and wrist of the non-dominant hand Causative Source: Improper straightening irons and hair dryers</p>	255
<p>Pain: Acute neck pain and back pain. Causative Source: Standing for long periods and adopting awkward postures to aid in hair cutting for customers of different height or physique.</p>	304
<p>Varicose Veins and Varicose Ulcers: Affecting veins of the legs. Causative Source: Standing for long periods.</p>	371
Respiratory Conditions	
<p>Allergic Rhinitis: Additionally Bronchitis, Chronic Cough. Causative Source: Inhalation of substances in the air due to poor ventilation or cleaning or dusting of the premises.</p>	277

Vending on Pavements

This chapter will deal with occupational health and safety issues of Pavement Vendors. These include Hawkers, peddlers, street vendors, pheriwalas. All of them sell articles of daily utility and general merchandise such as vegetables, sweets, cloth, utensils and toys, on footpaths or by going from door to door.

THE TOTAL NUMBER of street vendors in the country is estimated at around 10 million. Some studies estimate that street vendors constitute approximately 2 per cent of the population of a metropolis. Mumbai has roughly 2,50,000 street vendors and Kolkata has nearly 2,00,000. The street vendors market many goods, such as clothes and hosiery, household goods and food items, manufactured by home based workers, who have no other channels of marketing the products that they produce. They also ensure the availability of goods and services at cheaper rates to people.

Currently India has the largest population of street vendors in the world and will likely see a rise in their numbers as rural-urban migration picks up speed in the coming decades. Given that poverty and a lack of urban planning often results in ever-higher numbers of slum dwellers in this country of 1.25 billion people – with 51 percent of people in New Delhi already residing in informal settlements – both local and international development experts say India must prioritize improving the lot of its hawkers and vendors.

Distribution of Workforce

The Government of India has used the term 'urban vendor' as inclusive of both traders and service providers, stationary as well as mobile, and incorporates all other local/region specific terms used to describe them, such as, hawker, pheriwalla, rehri-patri walla, footpath dukandars, sidewalk traders, and more.

Vendors largely fall into the following categories:

- Fixed Location Vendors – these vendors occupy a certain space on the pavement and assume the unofficial status of a shop on the street;
- Weekly Bazaar Vendors – Weekly haats or bazaars are a part of many towns and cities. The location of vendors who participate in weekly haats or bazaars

changes every day. Sometimes vendors occupy areas in front of shops that are closed on their weekly holiday;

- Mobile and Door to door vendors – these vendors are actually hand cart operators who roam from street to street in a locality;
- Mixed pattern vendors – Some of the weekly bazaar vendors may also carry on vending in a fixed location during day time, while some may also carry out mobile door to door vending in addition to vending in weekly bazaars. There also exists a category of vendors who do not make any investment on their own but help other vendors. Such helper vendors may take assets or goods from the principal vendors and sell them door to door for a fixed commission.

Characteristics of Work

In addition to work and income security, the street vendors face other forms of vulnerability at workplaces:

- Vending is full of insecurity and uncertainty, since vendors work at the roadside and accidents may occur at any time;
- Facing police action – a well documented case of a pavement vendor in Mumbai who died after being hit by a policeman (more due to shock rather than fatal injuries) underlines the insecurity that these vendors;
- Working for long hours - A study found that the street vendors work for very long hours (averaging 8-10 hours daily) under extremes of climate, amidst high levels of air and noise pollution, which result in several forms of ailments like hypertension, hyperacidity, or even diseases related to the heart and kidney. Often, many of these diseases are related to stress due to uncertainty of income Female vendors are often observed to be the worst sufferers;
- The workplaces of these vendors being public spaces, there is often no provisioning of basic facilities such as;
 - Shade over head;
 - Availability of drinking water;
 - Washing facility;
 - Toilet facilities;
 - Place to take rest;
 - Access to first aid;
 - Availability of illumination.
- Stress related problems due to long working hours under harsh conditions and no stability of income;
- Exposure to high levels of traffic noise for long periods of time;
- Continuous exposure to air contaminants such as toxic fumes from leaded fuel vehicles released during street vendors long working hours can lead to debilitating health problems;

- A variety of skin diseases due to toxic materials handling or air pollution;
- Vulnerability to cardiovascular problems due to under extremes of climate, amidst high levels of air and noise pollution, plus adaptation to easily available food that has high salt and oil content;
- Poor eating and sleeping habits that lead to vulnerability to circulatory and gastrointestinal affections;
- Poor sanitary and waste disposal conditions make these vendors prone to disease outbreaks and epidemics;
- Poor living conditions – most of the vendors do not have formal accommodation and live in slums and cramped up spaces, making it difficult to escape infectious and contagious diseases.

Health Problems and Disease Patterns

Hazards related to health and safety – are more or less shared by all these activities. Pavement Vendors are prone to a large variety of health problems. Health hazards of these workers are described below with their causative sources and manifestations.

Health Condition & Causative Source	Clinical Perspective Page
Dermatological Conditions	
Irritant Contact Dermatitis: Occupational dermatitis. Causative Source: Several chemicals can cause systemic intoxication following absorption through the skin. Plant foods can be contaminated by pesticides under a great variety of circumstances and at different times preceding their consumption.	171
Allergic Contact Dermatitis: Symptoms subside after skin is no longer in contact with the allergen. Causative Source: Most commonly, inflammatory and keloidal, allergic reaction to para-phenylenediamine in tattoos using henna.	171
Folliculitis and acne form dermatoses Causative Source: Poor personal hygiene and cleansing habits.	180
Injuries and Musculoskeletal Conditions	
Pain: Acute neck pain and back pain. Causative Source: Standing for long and adopting awkward postures.	304
Varicose Veins and Varicose Ulcers: Affecting veins of the legs. Causative Source: Standing for long periods.	371
Respiratory Conditions	
Allergic Bronchitis, Chronic Obstructive Pulmonary Disease: Causative Source: Atmospheric pollution is a characteristic of busy metropolises. Also The greater the exposure to atmospheric pollution, the more likely a health-related problem might arise. Vehicular exhaust emissions, emissions from industrial source, open burning of waste and other material, road and wind-blown dust are known precipitating factors.	200

Vending on Pavements

Health Condition & Causative Source	Clinical Perspective Page
Occupational Asthma: Causative Source: A variety of triggers have been identified. The most common being, the presence of dust or toxic sprays in fruits and vegetables. Packaging materials contain antimony, tin, lead, perfluorooctanoic acid (PFOA), semicarbazide, benzophenone, isopropyl thioxanthone (ITX) and bisphenol A. Naturally occurring toxins can also trigger asthma. They are mycotoxins, phytohaemagglutinin, pyrrolizidine alkaloids, grayanotoxin, mushroom toxins, scombrototoxin (histamine) and ciguatera. Also too much exposure to the sun. Stress also leads to the release of histamine, which can trigger severe broncho-constriction & triggers asthma.	185
Tuberculosis Causative Source: Unhygienic habits such as spitting in the open and drinking adulterated tea (risk of bovine tuberculosis).	197
Circulatory Conditions	
Atherosclerosis Causative Source: Chronic stress leads to plaque build-up in the arteries (atherosclerosis), combined with a high-fat diet and poor living conditions with no scope for exercise.	
Hypertension: Causative Source: A poor diet that is high in salt and oil plus standing for long periods leads to stress. Poverty is stressful. The constant shortage of money, dangerous or unhealthy living situations, the perception of inferiority and the overall feeling of not being in control of one's life all contribute to the higher chronic stress levels.	
Genito-urinary Conditions	
Urinary tract infections (UTIs): serious infections and, in rare situations, renal damage. Causative Source: Adverse health effects that may result from voluntary urinary retention include increased frequency of urinary tract infections. Women generally need to void more frequently than men.	
Ear, Nose and Throat (ENT) Conditions	
Noise Induced Hearing Loss (NIHL) Causative Source: Prolonged exposure to noise pollution causes ailments ranging from mild annoyance, mental tension, headache, fatigue, irritation, hypertension, gastric and psychological problems, low efficiency, and traffic accidents to permanent deafness.	285
Behavioural Conditions	
Depression and Anxiety Causative Source: Recent life events contribute to the onset of psychiatric illness. Stress that is frequent or long-lasting can affect various parts of the body and can contribute to physical health problems. It can also affect one's psychological processes and behaviour by changing one's brain chemistry.	320

Health Condition & Causative Source	Clinical Perspective Page
Gastrointestinal Conditions	
Enteric Fever: Causative Source: Poor hygienic conditions, contact with possible carriers of the disease, Poorly prepared or infected food and drinks.	
Shigellosis, Amoebiasis, Gastroenteritis: Diarrhoea and Dysentery. Causative Source: Poor hygienic conditions, contact with possible carriers of the disease, Poorly prepared or infected food and drinks.	
Helminthiasis Causative Source: Unhygienic habits such as poor nail hygiene, poor washing habits.	341
Acid Peptic Disease Causative Source: Exposure to Helicobacter Pylori through food exacerbated by irregular eating habits.	
Infectious Conditions	
Scabies: Causative Source: Living in cramped spaces, poor control or management of hand and body contact during vending.	248
Mosquito Borne Diseases: Dengue, Malaria, and so on. Causative Source: Poor storage areas that may be infested with mosquitoes. Garbage strewn on the street, which may give rise to mosquito breeding, stagnant pools or puddles of water during monsoon.	
H1 N1 Influenza: Swine Flue. Causative Source: Though direct transmission of a swine flu virus from pigs to humans is occasionally possible, the 2009 H1N1 virus is not zoonotic swine flu, as it is not transmitted from pigs to humans, but from person to person through airborne droplets. Unhygienic habits such as poor nasal hygiene, open sneezing, snorting and spitting and poor washing habits.	

Beedi Making

This chapter will deal with occupational health and safety issues of persons occupied in the beedi manufacturing process. These include beedi rollers who pursue the activities as a household occupation and also workers who are part of cooperative societies involved in beedi making.

THE TOTAL NUMBER of persons involved in beedi making in the country is estimated at around 40 million. The beedi or the bidi is a rolled Tendu leaf (*Diospyros melanoxylon*) in which tobacco flakes are filled. It is an Indian cigarette. Some studies estimate that beedi smoking constitutes approximately 85% per cent of the total tobacco consumption in the country, while others put it between 61 to 73%. The beedi industry operates in 17 states, with over 95% of its production concentrated in 10 states and employs approximately 3.4 million full-time workers. A further 0.7 million were part-time workers. Some sources from the All India Bidi Industry Federation put the figure of the total number of persons employed in beedi rolling at almost 8 million. Beedi workers were also among the lowest paid employees in India. The industry offered only 0.09% of all compensation provided in the manufacturing sector (organised and unorganised).

The beedi workers may earn minimum wages or 'negotiated' wages, which means a lower wage than the minimum government-prescribed wage. This keeps beedi workers in penury, while tying their daily wage to punishing targets of about 1,000 beedis a day causes ill health. West Bengal, Maharashtra, Andhra Pradesh and Karnataka are among India's top bidi-producing states. In West Bengal's district Murshidabad, bidi rolling is pretty much the only livelihood.

The Indian government has initiated several legislations to ensure safety and economic security of workers in the beedi industry. The various measures implemented by the government are:

- Bidi Workers Welfare Fund Act, 1976: Meant to provide basic benefits such as health care, education, insurance, housing assistance, scholarships, drinking water supplies, and provides hospitals and dispensaries across the country for bidi workers;
- Bidi Workers Welfare CESS (Amendment) Act, 1976: Under the CESS collected through excise duty of manufactured beedis, workers receive

benefits from a government fund. However it is applicable only to workers who have a valid ID card and work for registered companies manufacturing more than 2 million beedis per year;

- Employees State Insurance, 1948: Provides health, medical and cash benefits for sickness, maternity, employment-related injury for employees making less than the stipulated amount per month as well as their dependents who are also entitled to pensions in the case of death or employment injury.

Distribution of Workforce

Beedi industry is predominantly a home-based industry in India. This is largely because Manufacturers have significantly shifted from factory-based to home-based production in part to deter bidi worker organization and to avoid appropriate implementation of working condition and welfare laws. However co-operative societies have also come up wherein workers are working together in beedi making process.

Irrespective of whether they work from home or in small manufacturing units, women form the bulk of the workforce engaged in the making of beedis. There are many reports of children, sometimes as young as 5 years old, who are also engaged in beedi rolling work. Some estimates peg the number of women employed to between 60-70% of the workforce and children to be around 15 to 20%.

Bidi workers are largely poor and illiterate. There have been reports wherein Beedi workers of whom quite a large number are women, are treated like bonded labourers who invariably work anywhere between 10 – 16 hours daily and live under deplorable conditions.

Characteristics of Work

The occupational life of Beedi workers are characterized by low wages, piece rated remuneration, lack of social security and absence of organization. The Beedi workers are in the clutches of contractors and sub contractors. The contractors are the suppliers of raw materials as well as collectors of the final products:

- Most workers are given tobacco to roll at home. Protective measures such as masks and gloves are unheard of, and soon enough, they suffer the ill effects of exposure to tobacco flakes and dust;
- Most workers live in one small room where they do the beedi work as also cook, and sleep;
- Awareness of the beedi rollers regarding adverse effects of their occupation and safety measures that has to be taken is very poor;
- Working for long hours – Many workers work for more than eight hours a day to meet their minimum targets;
- In urban areas there may be workshops or organized beedi making units. Many of these places are small airless rooms often without windows, where

Beedi Making

workers are crowded together. They usually sit on damp mud floors. Payment is almost universally made on piece rate basis;

- Many smaller workshops are open day and night. Regular intervals for meals and weekly holidays are generally non – existent;
- Ear, throat and lower respiratory tract infections along with respiratory cancers and tuberculosis. It has been observed that exposure to tobacco dust leads to a six fold higher incidence in respiratory complaints such as cough and breathlessness;
- Many women workers suffer gynaecological problems and pregnancy complications;
- Anemia, musculoskeletal disorders and fatigue are also conditions that predominantly affect beedi workers.

Health Problems and Disease Patterns

Hazards related to health and safety – can be categorized as those occurring due to the nature of work and those occurring due to exposure to tobacco.

Health Condition & Causative Source	Clinical Perspective Page
Dermatological Conditions	
Irritant Contact Dermatitis: Occupational dermatitis. Causative Source: Mainly finger tip thickening due to contact with tobacco dust and Tendu During rolling of beedi nicotine of tobacco powder comes into direct contact with the skin and becomes absorbed through the skin into the blood. Nicotine is harmful to the body since it is carcinogenic in nature and can cause cancer during long exposure.	171
Injuries and Musculoskeletal Conditions	
Pain: Acute shoulder pain neck pain and back pain. Causative Source: High intensity of shoulder, back and neck pain is due to sitting in forward leaning posture and bending head and neck downward for prolonged hours without any back support and arm rest. Anemia, lack of balanced diet and malnutrition may also contribute to the intensity and frequency of pain.	304
Knee, Chest, Elbow and Wrist pain: Causative Source: Postural problems related to sitting on the floor either in cross legged position or with one leg folded and another leg extended position or with both the legs in extended position Sometimes sitting for long periods on the floor with both the legs folded behind at the knee.	304
Respiratory Conditions	
Allergic Bronchitis, Chronic Obstructive Pulmonary Disease: Causative Source: Inhalation of tobacco takes place during blending operation. Blending is usually done in a small room without using any mask and the blenders directly inhales fine dust particles of tobacco.	200

Health Condition & Causative Source	Clinical Perspective Page
<p>Asthma: Cough and Breathlessness.</p> <p>Causative Source: Beedi workers are six times more likely to suffer from respiratory tract affections and infections, than other populations. It has been observed that in most cases of beedi making at home the passive recipient is the child due lack of hygienic awareness in the mother. This is mainly found in cases where the mother feeds her child without washing her hands properly. As a result, the child also becomes affected by tobacco and develops related ailments at an early age.</p>	185
<p>Tuberculosis</p> <p>Causative Source: Unhygienic habits, working in cramped up and unventilated spaces and vulnerability to lower respiratory tract infections contributes to the incidence of tuberculosis.</p>	197
Circulatory Conditions	
<p>Hypertension:</p> <p>Causative Source: Systolic hypertension may occur due to coming in constant contact with tobacco dust.</p>	
Gynaecological and Obstetric Conditions	
<p>Menstrual Disorders and Leucorrhoea: excessive bleeding during menstruation, irregular and painful menstrual cycles, leucorrhoea</p> <p>Causative Source: Poor diet and anaemia may be contributing factors.</p>	
<p>Low Birth Weight</p> <p>Causative Source: A number of factors may contribute to this condition mainly nutritional deficiency (inducing iron & calcium), fatigue, poor hygiene and protective measures taken and the direct influence of tobacco. ASHA workers as well as health care workers and anganwadi workers can sensitize the pregnant women who are beedi rollers about the harmful effects of the tobacco and can also raise awareness about safety measures such as washing hands, wearing mask and gloves, cleaning floor and storing Tendu leaves in dry area.</p>	
Ear, Nose and Throat (ENT) Conditions	
<p>Otitis externa and Otitis media</p> <p>Causative Source: Unhygienic work conditions and contact with tobacco dust and flakes.</p>	280
Behavioural Conditions	
<p>Insomnia and Anxiety</p> <p>Causative Source: Insecure feelings and suicidal ideas. Poor socio-economic conditions and fatigue may be the problems.</p>	320

IV

Selected Occupational Conditions: Clinical Perspectives

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Skin Health Conditions

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| 37.1 Contact Dermatitis | 37.8 Oil Folliculitis (Oil Acne) |
| 37.2 Allergic Contact Dermatitis | 37.9 Chloracne |
| 37.3 Heat Induced Dermatitis | 37.10 Leucoderma |
| 37.4 Tulip Finger Skin Disease | 37.11 Psoriasis |
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SKIN HEALTH CONDITIONS (Occupational Dermatoses) due to work

Clinical Presentation

Skin diseases caused by work form only 2% of all illness and injuries caused by work. But they form 40-50% of all occupational illnesses (When we exclude injuries, which form 96% of all occupationally caused health conditions.)

Approx. 80-90% of all skin disorders are contact dermatitis while 5% are infections. Of all cases of contact dermatitis, 80% are due to skin irritation rather than contact allergy.

Causative Agents

Because large surface areas of the skin are directly exposed to the offending agents, skin is a vulnerable organ. Following is a list of likely causative agents in descending order.

Work related skin conditions can happen in most workplaces though the subsequent headings list the most certain occupations that can predispose to these conditions. They can be very costly, not just through the suffering individuals experience (which can lead to ending their careers), but also because they can be a burden for employers who are left with sickness absence, recruitment, training and compensation expenses.

Work-related skin problems are caused or made worse by exposure to/coming into contact with substances and also through having wet hands for long periods at work. Dermatitis (also known as eczema) is by far the most common, but

urticaria and exposure to the sun can also cause problems. Common agents are given below:

1. Poison Oak
2. Soaps, detergents, cleaning agents
3. Solvents
4. Fibre glass and particulate dust
5. Food products
6. Plastic and raisins
7. Petroleum products from solvents
8. Plant and animal products
(inedible)
9. Agricultural chemicals
10. Infectious agents
11. Metals and their salts
12. Cutting oils and coolants
13. Environmental conditions
14. Textiles, Fabrics, materials
15. Rubbish, dust, sewage

Occupations with Potential Causative Exposure

Animal Handlers/Veterinarians Bacteria, Fungi, Viruses Insecticides/Pesticide Parasites Antibiotics, mercuric chloride	Cement Workers Cement, lime Chromates, cobalt Epoxy resins, resins Moisture Pitch
Basket Weavers Essential Oils Fungi	Construction/Road Building Workers Adhesives, oils, paints Cement, asphalt, tar
Carpenters/Wood workers Bleaches Glues, Oils, Rosin, Synthetic Resins Shellac, Solvents, Lacquers Varnish, Formaldehyde Wood Creosote Gasoline, solvents, resins Pitch Sunlight, cold Glass fibre Herbicides	Farmers/Gardeners Bacteria, Fungi Fertilizers Pesticides Heat, cold, moisture Sunlight Parasites Poison Oak/Ivy Solvents, Paints Vegetables Ragweed Book Binders Formalin Glues, solvents, inks Shellac, Oxalic Acid

Pre-disposing Factors for Developing Skin Irritation

1. Chemical and Physical Properties.
2. Quantitative Aspects of Exposure:
 - Concentration of agent;
 - Duration of Contact;
 - Frequency and number of exposure;

3. Qualitative Aspects of Exposure:
 - Occlusion of substance against skin;
 - Temperature of substance or skin;
 - Pre-existing damage of skin;
 - Anatomical skin site: Eyelids, face, genital skin are more vulnerable.
4. Susceptibility of host:
 - Atopic disease.

CLINICAL PERSPECTIVES

37.1 Contact Dermatitis

1. Most common occupational skin condition.
2. Cutaneous changes:
 - Usually there is inflammation from direct skin exposure;
 - Inflammation is provoked by either or both;
 - i. Irritation (80/90%) majority by chemicals;
 - ii. Allergy (10%);
 - Progression of clinical changes with transudation of serum through the epidermis.
3. Clinical Presentation:
 - Slight to extreme dryness;
 - Chapping;
 - Redness of skin surface or even frank vesicles or blisters.

Progressive tissue destruction may occur with continued exposure. This may happen quickly if the irritant is strong or corrosive or relatively slowly when the irritant is weak but there is frequent and repetitive exposure.

37.2 Allergic Contact Dermatitis

The affected worker is usually exposed for about 1 to 3 weeks to become immunologically sensitized to the substance. These substances act as weak antigens and require a damaged skin to cause allergic response. Allergic response may even occur in other parts of skin, which are away from direct contact. Please note that many sensitizing substances can occur also from domestic exposure also.

The following is a list of common causative agents of Allergic Contact Dermatitis (D-indicates possibility of Domestic exposure)

1. Plants and woods:
 - Poison Oak/Ivy (D);

- Cedar, Cocobolo, Ebony, Mahogany, Pine, and Fir, rosewood, satinwood, teak (all due to essential oils and juices in stem).
- 2. Metals:
 - Nickel (D), Chromate (D), Gold, Mercury.
- 3. Rubber Products:
 - Accelerators (D), Antioxidants (D).
- 4. Plastic Resins:
 - Epoxy resin (D), hardeners, reactive diluents;
 - Phenolic, Formaldehyde, and acrylic resins;
 - Rosin (Colophony) (D).
- 5. Organic Dies:
 - Paraphenylenediamine (D).
- 6. First-aid Skin applications:
 - Neomycine (D), Thimerosal (D), Benzocaine (D).
- 7. Biocides/Germicides):
 - Formaldehyde (D), Parabens (D), Quaternium-15 (D), Formaldehyde releasers, Isothiazolin-3-one derivatives.
- 8. Miscellaneous:
 - Fragrances (D), Ehtylenediamine (D), Antioxidants.

37.3 Heat Induced Dermatitis

How We Perceive Heat

Heat is perceived through the thermoreceptors in the skin. Thermoreceptors are sensory (sense) receptors as well as cutaneous (skin) receptors; that means that they are a sub-type of skin receptors for perceiving touch.

The receptors for perceiving warmth are differentiated from those for perceiving cold by their unmyelinated (unsheathed) fibres and low conduction velocity. The first stage of perceiving is, therefore, through the warmth thermoreceptors in the skin. The electrical signal generated is transmitted via spinal cord to the hypothalamus of the brain. Temperature regulation happens in of the brain. For example, in response to high temperatures (or hot weather), the hypothalamus can signal various parts of the body to help reduce the impact of higher temperature. To this end, the core temperature of the body will drop and the sweating will be triggered to help cool the skin.

Heat can Cause Eczema

High temperatures in the form of hot weather especially when combined with high humidity can cause eczema. Extreme and abrupt changes in temperature can trigger eczema flare-ups especially in children. Observations also indicate that eczema is more common during the summer months than during the winter.

Other causes of heat eczema besides weather include:

- Tight-fitting and non-breathable clothing;
- Long journeys in vehicles that are not well aerated;
- Heated rooms in the house, workplace, school etc.;
- Intense exercises.

Heat-induced eczema breakout can result in the formation of puss-filled blisters on the skin as well as the reddening of the skin. Heat can also trigger inflammation and itching. Besides directly causing eczema, hot temperatures cause the skin to dry out and also trigger sweating. Dry skin and sweating are two known triggers of eczema. When the skin gets dry, it cracks and wrinkles.

These effects of heat on the skin are caused by water loss in skin cells as well as in the deep tissues of the skin. Dryness damages the skin and creates the ideal environment for pathogens and toxins to cause further damage to the skin.

Sweating can also irritate the skin. Instead of moisturizing the skin, sweat washes up irritants to the skin surface where they further aggravate the skin. In addition, the salt content of sweat can also irritate the skin and dry it out.

Treatment

The main goal of treatment is to eliminate the itching which provokes or worsens the other symptoms and causes the most discomfort.

In some very mild cases eczema can be managed by:

- Avoiding likely sources of irritation (triggers);
- Using emollients such as special bath oils and moisturisers;
- Steroids, such as hydrocortisone, reduce the inflammation in response to an allergic reaction. There are different strengths of steroid creams and ointments available on prescription. Care needs to be taken, especially if applying a very strong steroid as it can cause the skin to become thin. These creams should not be put on liberally but instead only the thinnest smear should be applied to the rash. The best time to do this is after a bath, as the skin is more absorbent.

Prevention

There are different techniques for reducing the impact of heat on the skin for eczema patients. Discussed below are the most important advices for avoiding and treating heat-induced eczema. They relate to clothing, bathing, skin care, temperature control, phototherapy and adjusting to sunlight.

Clothing

- Wearing comfortable clothes is the first rule; Light, soft, breathable clothes made out of natural fibres-cotton – are recommended for keeping heat out and encouraging proper ventilation for your skin.

- Avoid synthetic fabrics because these are usually heavy and do not promote proper airflow to help the skin cool.
- Heavy fabrics such as wool may irritate the skin.
- Refrain from wearing thick or many clothes to bed. This is because heat can quickly build up while you are under covers. Heat is not restricted to daytime and night-time sweating can trigger eczema flare-ups too.

Bathing

- Showering helps rinse the skin and can remove other irritants besides sweat.
- Even when it is cold, tepid water instead of warm water should be used.
- To prevent sweat from irritating the skin, showering immediately after exercising or strenuous activities is recommended. Besides a full-body bath, rinsing the skin after exposing it to potential irritants such as pollen and sand is recommended.
- Swimming should be done with care as the chlorine in pool water can irritate the skin.
- Where taking bath is impossible, apply wet, cold compresses to the area of the skin affected by eczema to help keep it clean, moisturized and cool.
- Drink water when it is hot. Even when indoors, heat can still dry out the skin. Drinking water keeps the body and skin hydrated as well as to help lower the body's core temperature.
- Avoid caffeinated drinks because caffeine is a diuretic that promotes water loss through urination.

Skin Care

Advise patients the following:

- The moisture on skin, after taking a bath, gets removed by towelling or through evaporation;
- It is important to lock in moisture in the skin immediately after taking a bath;
- Moisturizers (hypoallergenic) are effective for lowering the temperature of the skin and for preventing skin dryness through water loss;
- Using a hypoallergenic sunscreen is also important.

Temperature Control

- While it may not be able to control temperatures outdoors, the range of temperature indoors is usually within control.

Phototherapy, Sunlight and Eczema

Even though the increased hours of sunlight during the summer can trigger eczema, sun exposure can also help in the treatment of the skin condition.

In fact, health experts regularly recommend increased sun exposure and phototherapy in the treatment of eczema. And this advice is backed by strong support from multiple clinical studies. Therefore, it may seem paradoxical that sunlight, a heat source, can both heal and trigger eczema.

37.4 Tulip Finger Skin Disease

Tulip fingers are a cutaneous condition, a combined allergic and irritant contact dermatitis caused by contact with tulip bulbs. Tulip bulbs, as well as other parts of the plant, especially the flowers, contain substances that can bring about severe dermatitis. People affected by this condition are those, for example, who have to handle tulip bulbs a great deal. The tulip bulb dermatitis (“tulip finger,” “tulip itch,” “tulip nails”) is characterized by eczema-like changes in the skin of the contact surfaces of the hand, especially finger tips, and by damage to the nails (increased brittleness). On the red, swollen skin fissure and scaling may develop.

Causes

The causative allergens are substances located in the outer layers of the bulbs and are known as tuliposides. In the plant, they are protective antibiotics. Chemically, they are esters of glucose. On hydrolysis, tuliposides are converted to lactones called tulipalins (for example, tuliposide A – A-methylene – Γ -hydroxybutyric acid) converts to tulipalin A (α -methylene- Γ -butyrolactone). Although tulipalin occurs throughout the tulip plant, the bulb and the pistils contain the highest concentrations. Tulipalin penetrates vinyl latex gloves, but not nitrile gloves.

Comment

Today’s cultivated tulips are said to be derived from *Tulipa gesnerana*. Today, tulip cultivars number approximately 2500. Although allergic reactions to tulip bulbs are extremely common in commercial handlers, reactions to cut flowers also occur. The hard skin of the bulb, the tecta, seems to be both irritating and the source of the antigen that causes tulip finger. Bulbs are handled in separating “bulblets” and in sorting and preparing bulbs for shipping. Sometimes specialty growers remove the bottom part of the tecta to promote early, synchronized growth. Dust particles in the workplace also may be a source of airborne dermatitis.⁸ Bruynzeel⁴ says that workers know of tulip finger, but because they are seasonally employed, they handle the problem by stopping work and do not seek medical attention. The published percentages of affected workers in the industry are unreliable because the condition is underreported.

The bulb contains more antigen than other parts of the plant: less is found in the leaves and stem, and the least is found in the petals. Fingertip dermatitis is common in persons sensitive to tulip bulbs and cut flowers, as well as in those who break out in reaction to *Alstroemeria*. Some nursery workers also experience dermatitis of the forearms, face, and neck. Contact dermatitis to tulip is common among workers in the bulb industry.

Treating Skin Irritation

These are the general guidelines for the treatment of Skin allergy and/or irritation:

- *First rule of thumb:* avoid further irritation. Thorns and spines can cut skin. Exposure to tiny hairs or fibres can cause red bumps or patches, swelling, pain, or itching;
- *Clean the wound.* Wash the skin with mild soap and water right away. Avoid rubbing alcohol, which can irritate skin;
- *Remove any remaining spines or barbs.* Use tweezers to remove visible thorns. For tiny hairs one method is to apply cellophane tape, and then peel it off-along with any remaining barbs;
- *Ease pain and itching.* A simple method to calm irritated skin is to use a cool water compress. A hydrocortisone cream or antihistamine may be prescribed to relieve itching and discomfort;
- *Soothe skin with moisture-rich creams.* With just a cut or scratch, pure petroleum jelly applied to the cut provides a little extra moisture that seems to aid in wound healing;
- *Cover with a bandage.* This can help provide a little extra protection during the day, then you can remove the bandage to let it air out at night;
- *Monitor the area* for signs of infection.

Prevention

- Because the allergen penetrates latex and vinyl gloves, protective nitrile gloves should be used when handling tulips and *Alstroemeria*.
- Sensitive retail florists need a safe work area where other workers are not likely to leave surfaces contaminated by the allergen.
- Avoidance of direct and indirect contact with all genera containing the allergen is recommended.

NON-ECZEMATOUS OCCUPATIONAL DERMATOSIS

A small number of skin conditions are non-eczematous but some of them can have serious implications

37.5 Contact Urticaria

Skin contact with certain substances, even within a short period up to 30 minutes can cause a wheal and flare reaction. The substance can be an irritant, allergen or of unknown nature; most frequent being allergic in nature. Healthcare workers can get it from rubber latex gloves and the allergic reaction can range from contact Urticaria, conjunctivitis, rhinitis to asthma and rarely anaphylaxis. A soluble protein called “hevin” seems to be responsible. Such proteins may also be present in fruits and vegetables, e.g. banana, sweet pepper, potato, Kiwi and tomato. Even corn starch powder of gloves can cause reaction. Particularly those with atopic tendency are vulnerable.

Other common causes may be cow dander and food stuffs.

37.6 Photo Dermatitis

Photo dermatitis is an abnormal skin reaction to sunlight, or more specifically to ultraviolet (UV) rays. It can be acute (sudden) or chronic (ongoing). Photo dermatitis occurs when body’s immune system reacts to UV rays. Exposed worker may develop a rash, blisters, or scaly patches. Exposure levels and reactions differ for every person.

Several factors can make skin sensitive to UV rays:

- An inherited tendency to photosensitivity;
- Taking certain medications;
- Exposure to plants in the Apiaceal or Umbelliferae family, including weeds and edible plants, such as hogweed, cowbane, carrot, parsnip, dill, fennel, celery, and anise;
- People with fair and light skin, albinos, and also those with green or blue eyes may be at greater risk;
- People with lupus, porphyria, or polymorphous light eruptions;
- In general exposure to UV rays for more than 30 minutes increases the risk, particularly between 11 am to 2 pm as 50% of the UV radiation is emitted during this time.

Signs and Symptoms

Signs of photo dermatitis include:

- Itchy bumps, blisters, or raised areas;
- Lesions that resemble eczema;
- Hyper-pigmentation;
- Outbreaks in areas of skin exposed to light;

- Pain, redness, and swelling
- Chills, headache, fever, and nausea
- Long-term effects include thickening and scarring of the skin and an increased risk of skin cancer, if the cause is genetic.

Causes

Photo dermatitis can have several causes, including:

- Diseases, such as lupus or eczema, that also make skin sensitive to light
- Genetic or metabolic factors (inherited diseases or conditions, such as pellagra, caused by lack of niacin and vitamin B-3)
- Diseases, such as polymorphic light eruptions, characterized by sensitivity to sunlight
- Reactions to chemicals and medications

In reaction to UV rays, certain chemicals and drugs can cause sunburn, an eczema-like reaction, or erythema. The reaction may be related to an allergy, or it may be a direct toxic effect from the substance. Below are examples of substances or circumstances that may trigger one or the other type of reaction:

Direct Toxic Effect

- Antibiotics, such as tetracycline and sulphonamides.
- Antifungals, such as Griseofulvin.
- Coal tar derivatives and psoralens, used topically for psoriasis.
- Retinoids, such as tretinoin and medications containing retinoic acid, used for acne.
- Non steroidal anti-inflammatory drugs (NSAIDs).
- Chemotherapy agents.
- Sulfonylurea, oral medications used for diabetes.
- Anti malarial drugs, such as quinine and other medications, used to treat malaria.
- Diuretics.
- Antidepressants, such as the tricyclics, used for depression.
- Antipsychotics, such as phenothiazines.
- Anti-anxiety medications, such as benzodiazepines.

Allergic Reactions

- Fragrances.
- Sunscreens with PABA.
- Industrial cleaners that contain salicylanilide.
- Lavender.

Risk Factors

People who are most at risk include:

Skin Health Conditions

- People with fair to light skin, or those with red or blond hair and green or blue eyes; tend to be most sensitive, regardless of their racial or ethnic background;
- People with lupus, porphyria, or polymorphous light eruptions;
- People with exposure to UV rays for 30 minutes to several hours increases risk as does exposure between 11 a.m. to 2 p.m. (50% of UV radiation is emitted during this time).

Treatment

A physical examination and a detailed history of patient's exposure to chemicals, drugs and UV rays are essential along with relevant blood and urine tests to detect any related diseases. Allergy tests may help identify substances that may trigger or worsen the condition.

Treatment Plan

For blisters or weepy eruptions, apply cool, wet dressings. With certain types of photo dermatitis, use phototherapy (controlled exposure to light for treatment purposes) to desensitize the skin or to help control symptoms.

Drug Therapies

For extremely sun sensitive people, prescribe azathioprine to suppress the immune system. Short-term use of glucocorticoids may help control eruptions. For those who cannot be treated with phototherapy, hydroxychloroquine, beta-carotene, or nicotinamide may be prescribed.

Nutrition and Supplements

In absence of some nutrients, skin can become sensitive to sunlight. Pellagra, for example, is caused by a niacin deficiency and leads to photosensitivity. Other nutrients, particularly antioxidants and flavonoids, may help protect skin against sun damage in healthy people. Antioxidants help protect skin from damage. Recent studies suggest that antioxidants, especially beta-carotene, may help lessen the symptoms of photo dermatitis.

Nutritional deficiencies may be treated with the following supplements:

- A multivitamin daily containing the antioxidant vitamins A, C, E, D, B-complex vitamins, and trace minerals such as magnesium, calcium, zinc, and selenium;
- B-complex vitamin, 1 tablet daily;
- Vitamin C, 1 to 3 gm daily, as an antioxidant;
- Vitamin D, 200 to 400 I.U. daily.

Prevention

Physician should advise the patients the following to prevent photo dermatitis:

- Limit sun exposure, especially intense midday sun.
- Use PABA-free sunscreens that protect against UVA and have a sun protection factor (SPF) of 30 to 50.
- Cover up with a long sleeved shirt, long pants, and a wide brimmed hat.
- Give alternative drugs if patient is using any product that causes sun sensitivity.

37.7 Protein Contact Dermatitis

Workers handling animals and food can get hand dermatitis. Cooks, shepherds, farmers, and veterinarians are likely to be affected.

37.8 Oil Folliculitis (Oil Acne)

Hairy skin of the back of the hands, arms, thighs and other parts can be affected by irritation of hair follicles by petroleum oils. Open comedones (Black heads) appear because of mechanical blockage of follicles. Inflammatory papules and pustules may also develop. Major sufferers are operatives working on metals and machinery. Personal Hygiene and workplace cleanliness may prevent this.

37.9 Chloracne

Distinct from oil acne, this condition is caused by cutting oils and is also called 'Halogenacne.' Polychlorinated aromatic hydrocarbons (of specific molecular structure), brominated, iodinated and fluorinated homologues are the causative agents.

37.10 Leucoderma

Various chemicals used in the workplace including their residues can cause depigmentation of the skin. The main culprits are phenols, catechols and hyaloquinones. Depigmented white patches may appear due to systemic absorption, not only at the contact site but also on other distant sites and are like idiopathic vitiligo. Apparently the chemicals affect the pigmentary system and melanin production.

37.11 Psoriasis

Any inflamed area of the skin can develop Psoriasis, particularly in a person who is predisposed. One has to look for causes of allergic or contact dermatitis at home or workplace to prevent psoriasis. Once diagnosed, one has to handle prevention of flare ups by advising prevention of scrapes, cuts, bumps and infections, decrease in workplace stress, maintaining skin hygiene and using humidifiers.

37.12 Scleroderma

Skin conditions similar to scleroderma may be caused by exposure to vinyl chloride monomer, silica dust, organic solvents and epoxy resins.

37.13 Ulcerations

Hexavalent chromium compounds and wet cement are two major causative substances causing ulcerations, both being irritants rather than allergens. Workers on chrome plating work get ulcers on their hands due to contact with chromic acid. Quite often nasal septum ulceration and perforation may occur.

Cement ulcers or burns are caused by direct contact with wet cement usually trapped in footwear. Symptoms take only a few hours to appear. Worker and employer education with properly fitting protection may prevent this condition.

Clinical Outcomes for Dermatoses Conditions

It is observed that only, approximately 25% patients get complete resolution to become symptom free; 50% improve but do get flare-ups and the remaining 25% develop chronic persistent eczema. Workmen, about 30/40% who took alternative or modified work also had similar outcome! Allergic dermatitis has slightly better prognosis than irritant dermatitis.

Prevention

Awareness is the first step for prevention of occupational dermatosis and their causative substances.

Prompt diagnosis and recognition of the causative agent can help physician or paramedic staff to make the worker and his employer aware. Only then further steps can be taken for preventing further outbreaks:

1. Contact dermatitis – replacing the irritant substance if possible.

2. Protective clothing – gloves, boots, aprons – carefully chosen depending on the nature of the irritant.
3. Workers wearing such protection should be made aware of irritant substances getting trapped within these protective clothing:
 - a. Barrier creams;
 - b. Varnishing creams;
 - c. Water repellent;
 - d. Oil and solvent repellent;
 - e. Fonic exchangers for acid/alkaline exposures.

In most situations, White Petroleum (Vaseline) is as effective as any barrier cream.

Physicians and paramedics can do well to advise employers to do the following simple, systematic and comprehensive programme:

- Create awareness in workers and employers;
- Substituting offending substances if possible;
- Engineering controls wherever possible;
- Personal protection with proper clothing and barrier creams;
- Personal and environmental hygiene;
- Motivational steps to promote safe workplaces;
- Regular health screening.

Respiratory System Conditions

- | | |
|--|--|
| 38.1 Occupational Asthma | 38.9 Tuberculosis |
| 38.2 Grain Dust Asthma | 38.10 Bovine Tuberculosis |
| 38.3 Mushroom Workers' Lung
(Extrinsic Allergic Alveolitis) | 38.11 Chronic Obstructive Pulmonary
Disease |
| 38.4 Wheat Weevil Disease | 38.12 Metal Fume Fever |
| 38.5 Organic Toxic Drug Syndrome | 38.13 Polymer Fume Fever |
| 38.6 Silicosis | 38.14 Smoke Inhalation |
| 38.7 Siderosis | 38.15 Valley Fever |
| 38.8 Baritosis | 38.16 Asphyxia |

It can be estimated that the incidence of occupational diseases may be about one case per 1,000 workers annually as the average. Among all occupational diseases, some 10 to 30 per cent are occupational lung diseases. Occupational lung diseases belong among the most serious work-related diseases.

Some of the commonest production processes associated with respiratory hazards are given below:

- 1. Blending and Mixing processes:**
 - *Agriculture:* Production of dry animal fodder leads to organic (vegetable, proteins) dust;
 - *Chemical industry:* Here the respiratory hazards are irritants, allergens;
 - *Construction industry:* Processes such as asbestos or cement production lead to pollution of the surroundings with mineral dust (silica, cement, asbestos);
 - *Food industry:* Flour mills and bakeries release flour dust.
- 2. Crushing and Sizing processes:** lead to release of dust, which is a major respiratory hazard. Dust can be:
 - Mineral (silica, coal, asbestos, other minerals);
 - Organic (flour mills).
- 3. Handling and Transport** of solids in powder form – lead to release of dust of the material handled or transported.

4. **Machinery:** Processes involving lathes, drills, planing or milling machines lead to airborne particles and cutting oil mist.
5. **Mining:** (drilling, blasting, conveyor transport of the material) releases (silica, coal, asbestos, other minerals into the air in the mines.
6. **Surface treatment:**
 - Abrasive blasting releases dust (silica, metal);
 - Acid or alkali treatment causes release of Acid mist and Nitrogen dioxide.
7. **Degreasing:** (removing grease, oil, etc.) with chlorinated hydrocarbons (e.g. perchloro-ethylene). Thermal decomposition of chlorinated solvents (even through cigarette smoking) may form phosgene, hydrogen chloride and chlorine.
8. **Textile fibre processes:** such as carding, spinning and weaving release dust from cotton, flax or hemp.
9. **Welding and Metal cutting:** releases metal fumes, oxides of nitrogen and flux particulate matter.

Respiratory Problems Due to Air Pollutants

Dissolved gases and vapours react with the bronchial or lung tissue, or pass through the alveolar wall into the bloodstream and are distributed in the body. The deposited particles are subject to the clearance mechanisms of the lungs which are able to eliminate most of the particles in the trachea and bronchi.

However alveoli have no similar mucociliary clearance. Insoluble particles deposited in this area are engulfed by large phagocytic cells (macrophages). But certain dust, such as silica or asbestos, damages and kills the macrophages and may be found free in the lung tissue. Respiratory problems that arise due to air pollutants are discussed below.

Irritative Lung Injuries

Substances such as chlorine, fluorine, sulphur dioxide, phosgene, oxides of nitrogen, mists of acids or alkali, fumes of cadmium, dust of zinc chloride, vanadium pentoxide and mechanical irritants in high quantities (such as dust) cause burning in the eyes, nose and throat. They may also cause chest pain and coughing and mucosal inflammation as is evident in tracheitis and bronchitis.

High concentrations of chemical irritants may penetrate deep into the lungs and cause lung oedema or inflammation (chemical pneumonitis).

Dust which has no chemical irritative properties can also mechanically irritate bronchi.

Hypersensitivity Reactions

Hypersensitivity reactions can occur as a result of repeated contact with the agent. There are two main types of these reactions: bronchial asthma and extrinsic allergic alveolitis.

38.1 Occupational Asthma

Occupational asthma caused by sensitising agents and irritants is characterised by: (a) acute reversible obstruction of the airways caused by bronchoconstriction, airway oedema or inflammation; and (b) mucous excretion induced by exposure to agents inherent in the work processes. Clinically, these disorders do not differ from other types of asthma.

Clinically this condition may present with the following symptoms and signs.

- Transitory chest tightness;
- Shortness of breath;
- Wheezing and lung functional impairment.

In an already sensitised individual, the asthmatic reaction usually starts within a few minutes after exposure, but delayed reaction some four to eight hours after exposure – i.e. after the shift or at night – may also occur, sometimes in combination with the immediate reaction. Recovery may take more than 24 hours. Irritants act by causing direct tissue injury.

This covers a group of conditions caused due to a hypersensitivity reaction to inhaled dust which especially contains material of fungal origin. The most common type of such dust and the conditions associated with them are given below:

1. Mouldy hay (Farmer's lung);
2. Mouldy bagasse (Bagassosis);
3. Mushroom compost (Mushroom picker's lung);
4. Cork dust (Suberosis);
5. Maple bark (Maple bark disease – Pneumonitis);
6. Redwood sawdust (Sequoiosis);
7. Wood pulp (Wood dust pneumonitis);
8. Mouldy barley (Malt worker's lung – Aspergillosis);
9. Mouldy straw (Aspergillosis);
10. Pigeon, parrot and other bird droppings (Bird breeder's lung);
11. Animal hair (Pneumonitis);
12. Coffee bean (Pneumonitis);
13. Paprika (Paprika splitter's lung);
14. Cheese Particles (Cheese washer's lung).

In the acute and sub-acute clinical presentation, symptoms include: headache, fever, nausea, vomiting, chest tightness, breathlessness and coughing. In some cases, chest X-rays show small opacities distributed throughout the middle and lower areas of the lungs.

Chronic disease may develop after repeated acute episodes. The clinical presentation is dyspnoea and lung function impairment. Chest X-rays show the development of diffuse interstitial pulmonary fibrosis.

38.2 Grain Dust Asthma

Grain dust is the dust produced from the harvesting, drying, handling, storage or processing of barley, wheat, oats, maize or rye and includes any contaminants or additives within the dust (e.g. bacteria, endotoxins, fungal spores, insects and insect debris, pesticide residues).

Health risks are also likely to arise from exposure to dusts produced by other types of grain, e.g. rice, sorghum, pulses (such as soya bean), peas and various oilseeds (such as rapeseed).

Clinical Presentation may include the following respiratory symptoms and signs.

- Rhinitis;
- Coughing and breathing difficulties;
- Asthma (coughing, wheezing and chest tightness);
- Chronic;
- COPD – Chronic Obstructive Pulmonary Disease (includes chronic bronchitis and chronic asthma).

Occupational Pneumonia

Ozone inhalation, formalin dust inhalation, and Chlorine inhalation are known to be the main factors that predispose the development of occupational pneumonia. However a number of chemicals such as fuel, insecticides and pool chemicals are also known to be responsible. The inhalation of metal fumes such as ferrous and chromium fumes also predisposes to the development of pneumonia. This pneumonia is non-contagious and reversible – if detected and treated early – in most cases.

38.3 Mushroom Worker’s Lung (Extrinsic Allergic Alveolitis)

This is a type of hypersensitivity pneumonitis that is known to occur due to exposure to mushroom spores (*Micropolyspora faeni*). This disease shares several characteristics with a variety of other occupational respiratory diseases, where over 300 allergens have been described, including:

- Farmer’s lung;
- Malt worker’s lung;
- Maple bark stripper’s lung;
- Peat moss worker’s lung;
- Wood pulp worker’s lung; and
- Wood trimmers lung.

The mushroom industry has been associated with a high incidence and therefore extrinsic allergic alveolitis is mostly synonymous with Mushroom Worker's Lung (MWL). It was first described in Iceland in 1874.

The severity of symptoms varies depending on the duration of the exposure. The lung symptoms result from the body's immune system reacting to exposure to the bacteria in the airborne mushroom particles. Chronic exposure can lead to progressive lung symptoms which can gradually lead to symptoms such as weight loss and eventually lung scarring and possibly even respiratory failure in severe cases. Acute exposure results in symptoms such as fever, chills and shortness of breath and body aches.

Symptoms and Signs

Acute type

Symptoms commence within hours after exposure to the sensitising antigen and resolve within a few hours or days depending on the level of exposure.

They are similar to influenza and are characterised by fever, dry cough and dyspnoea. There may also be feeling of tightness in the chest associated with malaise, chills, headache, anorexia and generalised body pain.

Signs include fever, tachypnoea and bibasal fine inspiratory crackles.

In very severe cases, patients may develop life-threatening respiratory failure with cyanosis, respiratory distress at rest and high fever.

Sub-acute or Intermittent type

This may occur after a history of repeated acute attacks. Symptoms can either present as recurrent pneumonia or as productive cough that is gradual in onset and progresses to dyspnoea, fatigue, anorexia, and weight loss.

Severe episodes can be life-threatening and after removal of exposure, the condition can take weeks or months for symptoms to resolve.

Chronic type

The chronic form usually manifests as weight loss and gradual diminution of exercise tolerance due to dyspnoea.

Even after removal of exposure to the antigen, there may only be partial improvement of symptoms.

Cyanosis and clubbing may develop along with tachypnoea, respiratory distress and inspiratory crackles over the lower lung fields. Eventually there may be chronic hypoxaemia and pulmonary hypertension with right heart failure.

There may also be acute exacerbations in those with chronic disease. In some cases, severe toxic effects can occur, such as pulmonary oedema, pneumonitis and death. The effects are often heat dependent, and where Teflon is heated to over 450°C, the fumes can cause acute lung injury.

Diagnosis

Diagnosis is made based on the following criteria:

- Exposure to a known offending antigen;
- Positive precipitating antibodies to the offending antigen;
- Recurrent episodes of symptoms;
- Inspiratory crackles on physical examination;
- Symptoms occurring 4-8 hours after exposure;
- Weight loss;
- Broncho-alveolar lavage usually shows lymphocytosis with the CD4/CD8 ratio reduced to less than 1;
- Trans-bronchial or open lung biopsy may show characteristic histopathological features.

Treatment

In the acute form, simply avoiding further exposure will usually result in recovery without medication.

In acute severe cases with significant respiratory distress and/or the presence of cyanosis, consider immediate referral to hospital for further assessment. Supplemental oxygen should be given to treat hypoxaemia.

In less severe acute cases, or in the chronic form, avoidance of exposure to the allergen should be the first recourse; this may require a change of job. Corticosteroids may be indicated for the treatment of severe acute and sub-acute forms and for chronic forms that are severe or progressive. However they cannot substitute removal exposure to the offending antigen.

In advanced chronic disease, pulmonary fibrosis can still progress and death can occur despite aggressive corticosteroid therapy. Treatment in chronic or residual disease is largely supportive.

Complications

- Spontaneous pneumothorax.
- Pulmonary fibrosis.
- Emphysema.
- Respiratory failure.
- Cor pulmonale.

Prognosis

Early recognition and control of exposure is essential to the outcome.

In acute and sub-acute forms, lung function may recover completely when exposure to the antigen stops. However, this may take several years for sub-acute forms.

Bird fancier's lung has a worse prognosis than farmer's lung.

The chronic form may be progressive and irreversible and result in debilitating fibrotic lung disease with high mortality rates.

Prevention

- Health and Safety measures at work, including wearing appropriate protective equipment and adequate air filters and ventilation.
- Avoiding activities that provoke the illness. (Bird fancier's lung).
- Adequate maintenance of hot tubs, humidifiers, heating, ventilation and air-conditioning equipment.

38.4 Wheat Weevil Disease

This is an immediate immune complex-mediated hypersensitivity pneumonitis of humans caused by inhalation of flour usually infested with the wheat weevil (*Sitophilus granaries*).

The wheat weevil is a common pest in stored grain, and a common kitchen pest and is associated with all kinds of whole grain. Besides the grain weevil, there are two other almost indistinguishable species of weevil that are important pests of grain: the rice weevil (*S. oryzae*) and the maize weevil (*S. zeamais*). Cross reactivity to these species may also be possible.

Symptoms and Signs

Although grain weevil can be found in homes, it has been reported primarily as an occupational allergen, and one of the causes of 'Millworker's asthma', 'grain-worker's asthma' and 'Farmer's lung'.

Symptoms may range from allergic rhinitis to productive cough and chest tightness and wheezing when exposed to mill dust. Housewives and cooks may also report excessive sneezing when cooking using flour.

Diagnosis

Skin-testing with weevil and mixed flour extract is often positive showing precipitating antibodies to the offending antigen.

The forced expiratory volume in one second (FEV1) shows significant reductions when the patient is subjected to inhalation of weevil extract. (Provocation inhalation test)

It is important to differentiate baker's allergy, as it is evident that many other factors in the baker's environment besides grain weevil may cause allergy, including flour components (e.g. wheat or other grain proteins), baking-improving additives (e.g. fungal enzymes), and bakery-infesting pests (mites and other insects).

Treatment

Short-term treatment is with corticosteroids; long-term treatment is antigen avoidance.

Treatment of acute or sub-acute hypersensitivity pneumonitis is with corticosteroids, usually prednisone 60 mg po once/day for 1 to 2 wk, then tapered over the next 2 to 4 wk to 20 mg once/day, followed by weekly decrements of 2.5 mg until the drug is stopped. This regimen relieves initial symptoms but does not appear to alter long-term outcome. Treatment of chronic hypersensitivity pneumonitis is usually with longer courses of prednisone 30 to 40 mg po once/day with tapering dependent on clinical response.

38.5 Organic Dust Toxic Syndrome

Organic dust toxic syndrome (ODTS), also called “Grain fever,” “toxic alveolitis” and “pulmonary mycotoxosis” is a common non-infectious febrile illness that is seen after inhalation exposure to organic dust. This problem occurs in a variety of work settings, but has been reported most often in individuals working in various aspects of agricultural production.

The initial response to inhalation of organic dust consists of lung inflammation and a self-limiting systemic inflammatory reaction, usually lasting several days. Medical treatment is not required in most cases. However, people who have experienced ODTS symptoms are at increased risk both for respiratory symptoms with subsequent exposures to organic dust, and for developing chronic bronchitis.

Epidemiology

Organic dust toxic syndrome was initially described in farmers heavily exposed to organic dust while unloading silos (Silo-unloader’s disease). It has also been reported in persons handling stored grain, particularly grain that appeared to be heavily contaminated with bacteria or moulds.

Pig farmers are also at increased risk for developing ODTS. The use of wood shavings as bedding in hog barns is clearly a risk factor. Exposure to mouldy straw or wood chips in other farm settings has been linked to this illness. Symptoms of ODTS have also been reported in individuals who work with poultry, handle compost, and sort garbage or process cotton.

Symptoms and Signs

Fever is the most common symptom followed by non-productive cough, fever, chills, malaise, chest tightness, and headache. If medical attention is sought, auscultation of the thorax may be unremarkable. Alternatively, rales may be heard. Lung function test results may be normal or may show mild restriction and decrease in the diffusing capacity for carbon monoxide. Thoracic radiographs are often normal, but may show

minimal interstitial infiltrates. Oxygen saturation level is in the normal range. The complete blood count (CBC) is often remarkable for leukocytosis with neutrophilia.

On very rare occasions respiratory failure may occur secondary to the inflammatory response of ODTS.

Diagnosis

Seeing an elevated white blood cell count may cause the medical care provider to incorrectly conclude that the illness is infectious in nature. The history and CBC result of patients with ODTS may also be confused with those of acute hypersensitivity pneumonitis, also known as farmer's lung. However, patients with acute farmer's lung are more likely to have radiographic abnormalities, low blood oxygen levels, and restriction and a low diffusing capacity for carbon monoxide on lung function testing. Measuring serum allergic precipitins (ie, IgG antibodies to antigens in the agricultural setting that commonly cause farmer's lung) may also be useful in making the distinction between ODTS and farmer's lung.

Treatment

The symptoms of ODTS are usually self limiting, and many affected persons do not seek medical care. The recommended treatment for ODTS-associated fever and myalgia is acetaminophen or non steroidal anti-inflammatory agents. The rare individual who develops respiratory failure should be managed with supportive care.

Prevention

The use of respirators can reduce endotoxins exposure by more than 90% in otherwise healthy, normal individuals. Use of engineering controls and best-management practices for maintaining good air quality is also essential.

38.6 Silicosis

Exposure to large amount of free silica can pass unnoticed because, silica is odourless, non-irritant and does not cause any immediate noticeable effect and hence is confused with ordinary dust. Chronic exposure to silica predisposes to tuberculosis.

Crystalline silica is a known human carcinogen.

Occupations at Risk

Mining and tunnelling, the sand stone industry, stone quarrying and dressing, granite industry, grinding of metals, sand blasting, iron and steel foundries, silica milling, flint crushing and manufacture of abrasive soaps are some of the occupations related

to silica exposure. Some occupations such as slate pencil industry and agate grinding industry carry high risk of silicosis. Other noteworthy occupations at risk are ceramic and potteries industry, sand grinding work and foundries.

Pathogenesis

Silica particles in some manner (not yet fully known) cause increased permeability of the digestive vacuole of alveolar macrophages leading to their auto-digestion. The dying macrophages liberate a fibroblast stimulating factor, which causes increased formation of collagen tissue. Autoimmunity is probably responsible in the evolution of the later stages of silicosis.

Clinical Features

The acute phase is characterised by shortness of breath, cough, fever, and cyanosis.

Excessive sputum production is due to bronchial catarrh brought about by chronic dust exposure and sometimes it is due to secondary bacterial infection of the devitalized lungs. Chest pain and haemoptysis indicate the possibility of complication like tuberculosis.

Chronic silicosis may present as chronic cough and exertional dyspnoea.

Another subtype is accelerated silicosis wherein the disease develops within 5 to 10 years after exposure. Inflammation, scarring, and symptoms progress faster in accelerated silicosis than in simple silicosis.

Patients with silicosis are at a high risk of acquiring tuberculosis. Other complications include:

- *Infections*: Fungal or mycobacterial infections are believed to result when the lung scavenger cells (macrophages) that fight these diseases are overwhelmed with silica dust and are unable to kill mycobacteria and other organisms;
- *Systemic Sclerosis (Scleroderma)*: Silica exposure has been associated with systemic sclerosis (scleroderma that involves skin changes and injury to the joints: most obvious changes are seen on the skin, particularly over the fingers and face;
- *Silica-Associated Lung Cancer*: Lung cancer has been associated with pre-existing silicosis. However, lung cancer may also occur in persons exposed to silica in the absence of silicosis.

X-ray investigations may reveal a profusion of small (<10 mm in diameter) opacities, typically rounded, and predominating in the upper lung zones. Sometimes the condition may be accelerated or complicated due to other conditions such as other lung disease, such as tuberculosis, non-tuberculous mycobacterial infection, and fungal infection, certain autoimmune diseases, and lung cancer. X-ray findings show progressive massive fibrosis.

There is no specific treatment for silicosis, therapy being directed largely at the complications of the disease.

Prevention

The process of the control of silicosis consists of dust control measures; and medical measures.

- Use of protective masks;
- Isolation and enclosure of the sources of dust;
- Use of wet methods;
- Exhaust fans;
- Humidification of the workplace;
- Regular medical examinations as part of medical surveillance measures;
- Moving vulnerable populations to other tasks.

38.7 Siderosis

Siderosis of the lung is generally assumed to be a benign condition, not associated with respiratory symptoms. A review of the literature suggests that this assumption may be incorrect, and that siderosis may lead both to symptomatic and functional changes. It is known that iron ore miners have raised lung cancer mortality, but this has been attributed to smoking, or exposure to tars or radon. Mortality studies among iron workers show, however, that an association exists between working with iron and death, both from lung cancer and other respiratory causes. A number of surveys indicate that welding is associated with obstructive airways disease.

The effect of the welding fume on respiratory function and symptoms can be as great as that of smoking. Iron has also been shown to cause fibrosis in some cases. Small functional changes of restriction and loss of lung compliance are often due to iron alone. The fibrosis may be enhanced by associated silica exposure. A number of constituents of welding fume could, along with iron, contribute to pulmonary changes. The presence of siderosis may act as a good marker of exposure to fume and any resulting disability.

Causes

Siderosis as stated is caused by chronic exposure to iron oxide fumes at the workplace. This disease is usually found in welders and miners. Iron foundry workers and hematite miners are also at increased risk for developing Siderosis.

Symptoms

Siderosis usually does not cause any symptoms. It can be considered as a benign form of pneumoconiosis. It has still not been completely established whether Siderosis causes any symptoms, because if any symptoms are caused it is usually due to other medical conditions similar to Siderosis.

Diagnosis

Siderosis/Welder's Lung can easily be diagnosed with the help of radiographic studies:

- *X-rays*: Chest x-rays will show extremely minute nodules seen mostly in the middle-third part of the lungs or the lower lungs. These nodules disappear after exposure to the offending metal is removed;
- *CT scan*: A CT scan of the chest will show minute nodules with extremely fine branching lines distributed diffusely in the lung.

Treatment

Siderosis is preventable disease condition. Since this disease does not cause any significant symptoms hence no medications are given to treat this disease. In case of some respiratory illness as a result of this disease, bronchodilators or corticosteroids may be given to free up the airways.

Prevention

The main way to prevent development of Siderosis is to eliminate exposure to iron oxide fumes. In case of professional welders or miners, they need to make sure to take appropriate safety measures when they start working like wearing a facemask. Apart from this the following steps can be taken:

- Adequate ventilation of the workplace;
- The employer should make sure that all workers get regular checkups with the physician so as to detect any lung damage early and slow down the progression of the disease process.

38.8 Baritosis

Baritosis is a benign pneumoconiosis of the lungs, which usually develops in people who are exposed chronically to Barium Sulphate Dust. These Barium Sulphate particles can be present in the lungs for quite some time before presentation of symptoms of Baritosis. Baritosis causes abnormal symptoms, physical signs, incapacity for work, interference with lung function, or liability to develop pulmonary or bronchial infections or other thoracic disease. Baritosis is nonfibrotic forms of pneumoconiosis like Siderosis and stannosis.

Causes

- *Occupational Exposure*: Exposure to barium dust- As stated, people working in industries where barium dust is utilized in huge amounts, especially those who are involved in manufacturing paints, are at increased risk for developing Baritosis, as they inhale Barium Dust chronically. In the

initial stages, there may be no symptoms to speak of but as the disease progresses, respiratory symptoms start to creep in, as the barium Dust settles in the lungs.

- *Dental Technicians:* Baritosis is been observed in dental technician after several years of exposure to barium dust.

Symptoms in Short Term Exposure

- *Asymptomatic:* The short-term exposure often causes minimum symptoms for few days and later patient is asymptomatic, though Chest X-Ray may show radiopaque shadows of barium dust.
- *Dry Cough:* The dust does cause mild inflammatory changes within alveolar and bronchiolar mucosa resulting in dry cough.
- *Incidental Radiological Study:* Barium is highly radio opaque and hence when radiographs are taken, there will be observation of dense distinct opacities on the radiographs. The distribution of these opacities is usually uniform and once the exposure reduces these opacities decrease in numbers. Hilar lymph nodes are often radiopaque and mildly enlarged.
- Symptoms in Long Term Exposure
- *Dry Cough:* Long-term exposure causes wide spread deposits of barium dust in lungs and alveoli. The deposits cause inflammations of the mucosal membrane resulting in initial dry cough.
- *Cough with Expectoration:* The long-term exposure of barium dust causes persistent alveolar and bronchiolar inflammation resulting in cough with expectoration.
- *Short of Breath and Wheezing:* The persistent inflammation of bronchioles and alveoli causes mucosal oedema and thickening followed by wheezing and shortness of breath. The symptoms of wheezing and shortness of breath are caused by bronchospasm and alveolar oedema.
- *Frequent Sniffing and Nasal Irritation:* In few cases barium deposits in nasal mucosa causes irritation of nasal mucosal membrane. The barium deposits in nasal mucosa causes nasal irritation. Patient often complaints of sneezing and nasal itching.
- *Radiological Evidence:* The abnormalities seen on x-ray images gradually clear as the exposure to barium is reduced.

Diagnosis

X-Ray: Discrete uniform multiple tiny peripheral opacities are observed in plain X-Ray of the lungs.

Occasional radiopaque shadow may be 3 to 4 mm in diameter.

The barium particles are seen on x-ray images as opaque shadows, although this is a rather benign medical condition and does not cause any significant symptom or discomfort. Radio opaque hilar lymph nodes are rarely enlarged.

CT scan and MRI: Mediastinal and small peripheral radio opaque shadow are better analyzed using thin-section computed tomography (CT) or MRI studies.

Histopathology: Rarely in few cases diagnosis is confirmed by histopathological studies to rule out fibrotic lesions or giant cell interstitial pneumonia caused by hard metal pneumoconiosis.

Pulmonary Function Tests

1. *Normal Results* – The pulmonary function test is normal in early stages.
2. *Abnormal Results* – The pulmonary function test is abnormal in patient suffering with advanced wide spread Baritosis. What Are Treatments For Baritosis?

Treatment

Eliminate Exposure:

The most effective treatment once the diagnosis is confirmed is to eliminate the exposure to barium dust.

Expectorant:

The persistent cough should be treated with expectorant. Expectorant helps to soften mucosa and helps to cough out the sputum and barium particles.

Cough Suppressants:

Irritation of throat and dry cough is treated with cough suppressants. Alveolar and bronchial inflammation is treated with Non-steroidal anti-inflammatory drugs (NSAIDs).

Prevention

In case if an individual is working in the above mentioned industries then the following safety measures can be taken:

- In case if a worker comes in contact with barium dust, then the worker should wash the affected area thoroughly by applying soap and water;
- If there is a risk for exposure to barium dust, then before starting work and after finishing work, the clothes should be changed and the employer should provide work clothes for its employees;
- Worker should wear mask all the time during working hours and around the working place.

38.9 Tuberculosis

Infecting Organism

The most important causative agent of tuberculosis (TB) is *Mycobacterium tuberculosis*. *M. Tuberculosis* – together with *M. bovis*, *M. africanum* and *M. Microti* – forms the '*M. tuberculosis* complex', within the genus *Mycobacterium*. This genus also includes non-tuberculous mycobacteria *M. leprae* and *M. Avium*.

An important feature of *M. tuberculosis* is that after infection it can remain latent in the body for a long time. Under favourable conditions, these bacteria can start multiplying and cause clinical disease.

M. tuberculosis can develop resistance to drugs. When active TB is not correctly treated, it can result in multidrug-resistant (MDR) TB and extensively drug-resistant (XDR) TB. MDR TB is defined as TB bacteria that are resistant to at least isoniazid and rifampicin. XDR TB means that, in addition to isoniazid and rifampicin, the TB bacteria are resistant to any Fluoroquinolones and at least one of three injectable second-line drugs, Capreomycin, Kanamycin and Amikacin.

Clinical Features and Sequelae

Infection with *M. tuberculosis* is asymptomatic. The symptoms which manifest when TB develops are usually not very specific but there is tiredness, listlessness, loss of weight, sub-febrile body temperature and night sweating:

- Pulmonary TB, usually a cough has been present for weeks or even months, possibly accompanied by haemoptysis;
- Localisation in the vertebral column can give back pain and also present itself as an abscess with vertebral collapse;
- Lymphadenitis usually presents itself by painless lymph node enlargement in the neck. Blood in the urine (hematuria) can present as the only symptom of TB of the kidney;
- In cases of co-infection with HIV, the clinical presentation can be less typical. Atypical presentation-disseminated forms of TB- are usually seen in a more advanced stage of the HIV infection.

Risk Groups

Tuberculosis remains a common infection causing an important disease burden.

Vulnerable populations include individuals from high incidence countries, prisoners, contacts of contagious patients, persons who have previous had TB, drug addicts, alcoholics, illegal immigrants and the homeless.

Transmission

Humans are the main reservoir for *M. tuberculosis*. Transmission of TB is aerogenic. After coughing, sneezing, speaking or singing, infected sputum droplets can dry and form into droplet. These droplet nuclei can float in the air for a longer period and penetrate into the alveoli of the host after inhalation.

The lifetime risk of developing TB for people outside of the risk groups is approximately ten per cent. For HIV-infected persons this risk is much higher.

In general, in patients with a positive Ziehl-Neilson slide and/or positive culture of their sputum, the start of coughing complaints is considered to be the starting of infectiousness.

The incubation period varies between eight weeks to a lifetime.

The greatest chance of progressing to disease is within the first two years after infection.

The level of contagiousness of TB patients depends on the concentration of bacteria in the sputum, the severity of the cough and the coughing by the patient. In general, the closer and/or more frequent the contact, the higher the chance of transmission. Characteristics of the place of contact may also play an important role.

Usually, intimate contacts are at the highest risk of being infected. HIV positive status also predisposes to acquiring opportunistic infection.

Management and Treatment

Notification of TB cases is compulsory in most countries. Respiratory TB cases require infection control precautions until infectivity has been eliminated by effective treatment; this often requires two weeks treatment with effective drugs.

Contact investigation can be performed no sooner a TB patient is diagnosed to identify secondary cases of TB and/or newly infected persons. This reduces the chance of further transmission. Newly infected persons can be offered prophylactic treatment in order to reduce their chance of progression from latent to active disease.

The treatment of active TB has two phases: an initial intensive phase and a continuation phase. The recommended standard regimen by the WHO for all new cases is an intensive phase of two months with isoniazid, rifampicin, pyrazinamide and ethambutol and a continuation phase of four months with isoniazid and rifampicin.

Drug resistance is increasing in many countries, and treatment failure and relapse are strongly associated with initial drug resistance. Individual risk factors include history of previous treatment for TB, recent contact with drug-resistant case and HIV infection.

Persons at a high risk for developing TB should be given prophylactic treatment.

Prevention

The vaccine currently available is the BCG-vaccine (Bacille Calmette Guérin). This is a live, weakened strain of *M. bovis*. It mainly gives protection against severe forms of the disease, like meningitis TB and miliary TB, in children under five years of age.

The World Health Organization (WHO) advises BCG-vaccination for all newborns in countries with a high incidence of TB. BCG-vaccination should not be given to the immune-suppressed (e.g. HIV, leukaemia, chemotherapy) due to the increased risk for complications. Also, BCG-vaccination during pregnancy should be avoided, even though no harmful effects on the foetus have been observed. Practising cough hygiene will decrease the spread of all types of infections that are spread through the air.

Preventing the transmission of the disease is the foundation for effective TB control programmes. Early diagnosis and immediate effective treatment of people with contagious TB is essential. Many factors have been shown to be associated with a delay in diagnosis including old age, low education/awareness, poverty, negative sputum smear, extra pulmonary TB, female sex and a history of immigration. On the other hand the condition is also over diagnosed in endemic areas.

Compliance to the treatment regime is a problem and is directly related to multi-drug resistant tuberculosis.

38.10 Bovine Tuberculosis

Mycobacterium bovis, is a slow-growing, aerobic bacterium and the causative agent of tuberculosis in cattle (known as *Bovine TB*); related to *M. tuberculosis*—the bacterium which causes tuberculosis in humans—*M. bovis* can also jump the species barrier and cause tuberculosis in humans and other mammals.

Pathogenesis

M. bovis is usually transmitted to humans by infected milk, although it can also spread via aerosol droplets. Actual infections in humans are nowadays rare in developed countries. However, in areas of the developing world where pasteurisation is not routine, *M. bovis* is a relatively common cause of human tuberculosis.

Bovine TB is a chronic infectious disease which affects a broad range of mammalian hosts, including humans, cattle, deer, llamas, pigs, domestic cats, wild carnivores (foxes) and omnivores (rodents); it rarely affects sheep. The disease can be transmitted in several ways; for example, it can be spread in exhaled air, sputum, urine, faeces and pus, so the disease can be transmitted by direct contact, contact with the excreta of an infected animal, or inhalation of aerosols, depending on the species involved.

Control

The disease is found in cattle throughout the world, but many countries have been able to reduce or limit the incidence of the disease. Most cattle with TB will be culled.

Mycobacterium bovis can be transmitted from human to human and from human to cattle, but such occurrences are rare.

Treatment

M. bovis is innately resistant to pyrazinamide; therefore, the standard treatment is isoniazid and rifampicin for 9 months.

38.11 Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease (COPD), also known as chronic obstructive lung disease (COLD), and chronic obstructive airway disease (COAD), among others, is a type of obstructive lung disease characterized by chronically poor airflow. It typically worsens over time. The main symptoms include shortness of breath, cough, and sputum production. Most people with *chronic bronchitis* have COPD.

Tobacco smoking is the most common cause of COPD, with a number of other factors such as air pollution and genetics playing a smaller role. In the developing world, one of the common sources of air pollution is from poorly vented cooking and heating fires. Long-term exposure to these irritants causes an inflammatory response in the lungs resulting in narrowing of the small airways and breakdown of lung tissue known as *emphysema*. The diagnosis is based on poor airflow as measured by lung function tests. In contrast to asthma, the airflow reduction does not improve significantly with the administration of medication.

COPD can be prevented by reducing exposure to the known causes. This includes efforts to decrease rates of smoking and to improve indoor and outdoor air quality. COPD treatments include quitting smoking, vaccinations, rehabilitation, and often inhaled bronchodilators and steroids. Some people may benefit from long-term oxygen therapy or lung transplantation. In those who have periods of acute worsening, increased use of medications and hospitalization may be needed.

Symptoms

The most common symptoms of COPD are sputum production, shortness of breath and a productive cough. These symptoms are present for a prolonged period of time and typically worsen over time.

Cough

A chronic cough is often the first symptom to occur. When it exists for more than three months a year for more than two years, in combination with sputum production and without another explanation, there is by definition chronic bronchitis. This condition can occur before COPD fully develops.

Breathlessness

Shortness of breath is often the symptom that bothers the patients; it may take longer to breathe out than to breathe in. The shortness of breath is worse on exertion of a prolonged duration and worsens over time. In the advanced stages it occurs during rest and may be always present. It is a source of both anxiety and a poor quality of life in those with COPD.

Other Features

Chest tightness may occur but is not common and may be caused by another problem. Those with obstructed airflow may have wheezing or decreased sounds with air entry on examination of the chest with a stethoscope. A barrel chest is a characteristic but relatively uncommon sign of COPD, Tripod positioning may occur as the disease worsens.

Advanced COPD leads to cor pulmonale, and leads to symptoms of leg swelling and bulging neck veins. COPD often occurs along with a number of other conditions. In those with severe disease a feeling of always being tired is common.

Causes

The primary cause of COPD is tobacco smoke, with occupational exposure and pollution from indoor fires being significant causes in some countries. Typically these exposures must occur over several decades before symptoms develop. A person's genetic makeup also affects the risk.

Smoking

The primary risk factor for COPD globally is tobacco smoking. Of those who smoke about 20% will get COPD and of those who are lifelong smokers about half will get COPD. In non-smokers, second hand smoke is the cause of about 20% of cases. Women who smoke during pregnancy may increase the risk of COPD in their child.

Occupational Exposures

Intense and prolonged exposure to workplace dusts, chemicals and fumes increase the risk of COPD in both smokers and non smokers. Workplace exposures are believed to be the cause in 10–20% of cases. A number of industries and sources have been implicated, including high levels of dust in coal mining, gold mining, and the cotton textile industry, occupations involving cadmium and Isocyanates, and

fumes from welding. Working in agriculture is also a risk. Silica dust exposure can also lead to COPD, with the risk unrelated to that for silicosis. The negative effects of dust exposure and cigarette smoke exposure appear to be additive or possibly more than additive.

Air pollution

Poorly ventilated cooking fires, often fuelled by coal or biomass fuels such as wood and animal dung, lead to indoor air pollution and are one of the most common causes of COPD in developing countries; health effects being greater among women due to more exposure. They are used as the main source of energy in 80% of homes in India, China and sub-Saharan Africa.

People who live in large cities have a higher rate of COPD compared to people who live in rural areas. Areas with poor outdoor air quality, including that from exhaust gas, generally have higher rates of COPD. The overall effect in relation to smoking, however, is believed to be small.

Genetics

Genetics play a role in the development of COPD. It is more common among relatives of those with COPD who smoke than unrelated smokers.

Other Factors

The risk is greater in those who are poor, due to poverty itself or other risk associated factors. There is tentative evidence that those with asthma and airway hyperreactivity are at increased risk of COPD.

Exacerbations

An acute exacerbation is commonly triggered by infection or environmental pollutants, or sometimes by other factors such as improper use of medications. Infections appear to be the cause of 50 to 75% of cases. Environmental pollutants, personal smoke and second hand smoke increases the risk. Exacerbations occur more commonly in winter.

Diagnosis

The diagnosis of COPD should be considered in anyone over the age of 35 to 40 who has shortness of breath, a chronic cough, sputum production, or frequent winter colds and a history of exposure to risk factors for the disease. Various investigations should then be performed to confirm the diagnosis.

Spirometry

Two main components are measured to make the diagnosis: the forced expiratory volume in one second (FEV₁), which is the greatest volume of air that can be breathed

out in the first second of a breath, and the forced vital capacity (FVC), which is the greatest volume of air that can be breathed out in a single large breath. A FEV₁/FVC ratio of less than 70% in someone with symptoms of COPD defines a person as having the disease.

Other tests

A chest X-ray and complete blood count may be useful to exclude other conditions at the time of diagnosis. Characteristic signs on X-ray are over expanded lungs, a flattened diaphragm, increased retrosternal airspace, and bullae. A high-resolution computed tomography scan of the chest may show the distribution of emphysema throughout the lungs and can also be useful to exclude other lung diseases. An analysis of arterial blood is used to determine the need for oxygen; this is recommended in those with an FEV₁ less than 35% predicted those with a peripheral oxygen saturation of less than 92% and those with symptoms of congestive heart failure.

Management

There is no known cure for COPD, but the symptoms are treatable and its progression can be delayed by reducing risk factors, managing stable COPD, preventing and treating acute exacerbations, and managing associated illnesses. The only measures that have been shown to reduce mortality are smoking cessation and supplemental oxygen. Stopping smoking decreases the risk of death by 18%. Other recommendations include influenza vaccination (yearly) pneumococcal vaccination (every 5 years), and reduction in exposure to environmental air pollution.

Exercise

Pulmonary rehabilitation is a program of exercise, disease management and counselling. In those who have had a recent exacerbation, pulmonary rehabilitation appears to improve the overall quality of life and the ability to exercise, and reduce mortality. Breathing exercises in and of themselves appear to have a limited role. Pursed lip breathing exercises may be useful.

Bronchodilators

Inhaled bronchodilators are the primary medications used and result in a small overall benefit. There are two major types, β_2 agonists and anticholinergics; both exist in long-acting and short-acting forms. They reduce shortness of breath, wheeze and exercise limitation, resulting in an improved quality of life. If long-acting bronchodilators are insufficient, then inhaled corticosteroids are added. There are several short-acting β_2 agonists available including salbutamol and terbutaline. They provide some relief of symptoms for four to six hours. Long-acting β_2 agonists are often used as maintenance therapy and appear safe in COPD with adverse effects such as shakiness and heart palpitations.

Corticosteroids

Corticosteroids are usually used in inhaled form but may also be used as tablets to treat and prevent acute exacerbations. While inhaled corticosteroids (ICS) have not shown benefit for people with mild COPD, they decrease acute exacerbations in those with either moderate or severe disease. When used in combination with a LABA they decrease mortality more than either ICS or LABA alone.

Other medication

Long-term antibiotics, specifically those from the macrolide class such as erythromycin, reduce the frequency of exacerbations in those who have two or more a year. Mucolytics may help to reduce exacerbations in some people with chronic bronchitis.

Oxygen

Supplemental oxygen is recommended in those with low oxygen levels at rest (a partial pressure of oxygen of less than 50–55 mmHg or oxygen saturations of less than 88%). In this group of people it decreases the risk of heart failure and death if used 15 hours per day and may improve people's ability to exercise. In those with normal or mildly low oxygen levels, oxygen supplementation may improve shortness of breath.

Surgery

For those with very severe disease, surgery is sometimes helpful and may include lung transplantation or lung volume reduction surgery. Lung volume reduction surgery involves removing the parts of the lung most damaged by emphysema allowing the remaining, relatively good lung to expand and work better. Lung transplantation is sometimes performed for very severe COPD, particularly in younger individuals.

Prognosis

COPD usually gets gradually worse over time and can ultimately result in death. It is estimated that 3% of all disability is related to COPD. The overall number of years lived with disability from COPD has increased.

Prevention

Most cases of COPD are potentially preventable through decreasing exposure to smoke and improving air quality. Annual influenza vaccinations in those with COPD reduce exacerbations, hospitalizations and death.

Smoking cessation

Keeping people from starting smoking is a key aspect of preventing COPD. In those who smoke, stopping smoking is the only measure shown to slow down the worsening of COPD, even at a late stage of the disease.

Occupational Health

A number of measures have been taken to reduce the likelihood that workers in at-risk industries – such as coal mining, construction and stonemasonry – will develop COPD. Examples of these measures include: the creation of public policy, education of workers and management about the risks, promoting smoking cessation, checking workers for early signs of COPD, use of respirators, and dust control. Effective dust control can be achieved by improving ventilation, using water sprays and by using mining techniques that minimize dust generation.

Air Pollution

Both indoor and outdoor air quality can be improved, which may prevent COPD or slow the worsening of existing disease.

One key effort is to reduce exposure to smoke from cooking and heating fuels through improved ventilation of homes and better stoves and chimneys. Proper stoves may improve indoor air quality by 85%. Using alternative energy sources such as solar cooking and electrical heating is effective.

38.12 Metal Fume Fever

Metal fume fever, also known as brass founders' ague, brass shakes, zinc shakes, galvie flu, metal dust fever, or Monday morning fever, is an illness caused primarily by exposure to certain fumes. Workers breathe in fumes from chemicals such as zinc oxide (ZnO) or magnesium oxide (MgO), which are themselves created by heating or welding certain metals, particularly galvanized steel. Other common sources are fuming silver, gold, or platinum metals. Chromium is also a hazard, from stainless steel. Cadmium, present in some older silver solder alloys can, in extreme cases, cause loss of consciousness within a matter of minutes.

Signs and Symptoms

The signs and symptoms are nonspecific but are generally flu-like including fever, chills, nausea, headache, fatigue, muscle aches, joint pains, and lack of appetite, shortness of breath, pneumonia, chest pain, blood pressure change, and cough. A sweet or metallic taste in the mouth may also be reported along with a dry or irritated throat which may lead to hoarseness. Symptoms of a more severe metal toxicity may also include a burning sensation in the body, shock, no urine output, collapse, convulsions, shortness of breath, yellow eyes or yellow skin, rash, vomiting, watery or bloody diarrhoea or low or high blood pressure, which require prompt medical attention. Flu-like symptoms will normally disappear within 24 to 48 hours. It often takes one to three weeks to fully recover.

Cause

Metal fume fever is due to the inhalation of certain metals, either as fine dust or most commonly as fumes. Simple compounds of the metals, such as their oxides, are equally capable of causing it. The effects of particularly toxic compounds, such as nickel carbonyl, are not considered as a mere metal fume fever.

Exposure usually arises through hot metalworking processes, such as smelting and casting of zinc alloys, or welding of galvanized metals. If the metal concerned is particularly high-risk, then cold sanding processes may also cause it, even though the dose is lower. This may also occur with electroplated surfaces or metal-rich anti-corrosion paint, such as cadmium passivated steel or zinc chromate primer on aluminium aircraft parts.

The most plausible mechanism accounting for the symptoms involves a dose-dependent release of certain cytokines, an event which occurs by inhaled metal oxide fumes which injure the lung cells. This is not an allergic reaction, though allergic reactions to metal fumes can occur.

There will be people who don't get ill but some welders do get ill from breathing welding fume. Some may be ill for only a short time; others may get permanent illnesses like asthma. A few welders get so ill they have to stop welding and find a new career.

A lung infection can lead to severe and sometimes fatal pneumonia. Modern antibiotics usually stop the infection. Exposure to welding fume in the past does not increase the chances of you getting pneumonia now.

Stainless steel fume has chromium oxide (CrO₃) and Nickel Oxide in it. Both these chemicals can cause asthma.

Metal fume fever does not usually have any lasting ill effects.

Overall lung capacity and the ease at which man can breathe out (peak flow) are affected by prolonged exposure to welding fume. The effects tend to get worse through the working week but gradually improve when not exposed (e.g. over the weekend).

Diagnosis

Diagnosis primarily depends upon a full occupational history and by close collaboration between primary and secondary health care personnel. Diagnosis of metal fume fever can be easily missed, as the complaints are non-specific, resemble a number of other common illnesses, and presentation occurs typically 1–4 days after the exposure. When respiratory symptoms are prominent, metal fume fever may be confused with acute bronchitis or pneumonia.

Physical examination findings vary among persons exposed, depending largely upon the stage in the course of the syndrome during which examination occurs. Patients may present with wheezing or crackles in the lungs. They typically have

an increased white blood cell count, and urine, blood plasma and skin zinc levels may be elevated. Chest X-ray findings may also be present.

An interesting feature of metal fume fever involves rapid adaptation to the development of the syndrome following repeated metal oxide exposure. Workers with a history of recurrent metal fume fever often develop a tolerance to the fumes. This tolerance, however, is transient, and only persists through the work week. After a weekend hiatus, the tolerance has usually disappeared. This phenomenon of tolerance is what led to the name 'Monday Fever'. Sometimes workers may notice this tolerance phenomena themselves and report it.

Treatment

Treatment of mild metal fume fever consists of bed rest, hydrate with plenty of water, and symptomatic therapy (e.g. aspirin for headaches) as indicated. In the case of non-allergic acute lung injury in the setting of metal fume fever, a standard or even recommended approach to treatment has not been studied.

Prevention

Prevention of metal fume fever in workers who are at potential risk (such as welders) involves avoidance of direct contact with potentially toxic fumes, improved engineering controls (exhaust ventilation systems), personal protective equipment (respirators), and education of workers regarding the features of the syndrome itself and proactive measures which can be taken to prevent its development.

38.13 Polymer Fume Fever

Polymer fume fever or fluoropolymer fever, also informally called Teflon flu, is an inhalation fever caused by the fumes released when polytetrafluoroethylene (PTFE, known under the trade name Teflon) is heated to between 149°C and 232°C. When PTFE is heated above 232°C the pyrolysis products are different and inhalation may cause acute lung injury. Symptoms are flu-like (chills, headaches and fevers) with chest tightness and mild cough. Onset occurs about 4 to 8 hours after exposure to the pyrolysis products of PTFE. A high white blood cell count may be seen and chest x-ray findings are usually minimal. Polymer fume fever was first described in 1951.

If the product is heated to temperatures above 450° C, acute pulmonary injury is possible (including non-cardiogenic pulmonary oedema and significant lung injury). Studies have shown that preheating a Teflon pan can create surface temperatures as high as 736° C in as little as three minutes and 20 seconds.

Symptoms

Polymer fume fever is usually a self- limited systemic illness, presenting with only minor respiratory symptoms. Symptoms usually begin well after the exposure. It is

not uncommon for delay of symptom onset to reach the eight-hour mark. The extent to which the Teflon was heated is a significant determining factor of the extent and danger of symptoms.

In some cases, severe toxic effects can occur, such as pulmonary oedema, pneumonitis and death. The effects are often heat dependent, and where Teflon is heated to over 450°C, the fumes can cause acute lung injury.

The most common complaints, however, are flu-like symptoms with typical onset between four to eight hours after exposure. Victims of fluoropolymer fume inhalation will often experience chills, headaches, and fevers, with chest tightness and a mild cough. Onset is around 4 to 8 hours after exposure to the pyrolysis products of PTFE. Symptoms may include the following:

- Fever
- Chills
- Nausea
- Headache
- Fatigue
- Muscle pain
- Sweating
- Cough
- Malaise
- Joint pain
- Chest tightness

Symptoms usually resolve within 24 to 48 hours. The incidence of Polymer Fume Fever can be significantly higher in cigarette smokers.

Treatment

With limited exposure, treatment should be supportive, addressing the presenting symptoms. In higher temperature exposures that result in significant symptoms of pulmonary injury, a patient may present with non-cardiogenic pulmonary oedema. In these situations, treatment is focused on the presenting condition; follow standard treatment guidelines.

38.14 Smoke Inhalation

Smoke inhalation is the primary cause of death for victims of indoor fires.

Smoke inhalation injury refers to injury due to inhalation or exposure to hot gaseous products of combustion. This can cause serious respiratory complications. It is estimated that 50–80% of fire deaths are the result of smoke inhalation injuries, including burns to the respiratory system. The hot smoke injures or kills by a combination of thermal damage, poisoning and pulmonary irritation and swelling, caused by carbon monoxide, cyanide and other combustion products.

Signs and Symptoms

Symptoms range from coughing and vomiting to nausea, sleepiness and confusion. Burns to the nose, mouth and face; singed nostril hairs; and difficulty

breathing /carbonaceous sputum (burned saliva) are also signs of smoke inhalation injury. Approximately one third of patients admitted to burns units have pulmonary injury from hot smoke inhalation. The death rate of patients with both severe burns and smoke inhalation can be in excess of 50%.

Any person with apparent signs of smoke inhalation should be immediately evaluated by a medical professional such as a paramedic or physician. Advanced medical care may be necessary to save the life of the patient, including mechanical ventilation, even if the person is conscious and alert. Pending advanced intervention, the patient should be brought into fresh air and given medical oxygen if available.

Treatment

Treatment consists of humidified oxygen, bronchodilators, suction, endotracheal tube and chest physiotherapy. There is no role for routine treatment of smoke inhalation with either antibiotics or steroids. Treatment depends on the severity of the smoke inhalation.

Nebulised Heparin and Acetylcysteine

Inhalation therapy with nebulised heparin and acetylcysteine is usually started and continued for five to seven days during the hospital stay.

Oxygen therapy

Carbon monoxide (CO) is always presumed to be a complication in smoke inhalation. The initial approach to presume CO poisoning involves administering supplemental oxygen at a fraction of inspired oxygen (FiO₂) of 100 percent and then the use of hyperbaric oxygen (HBO) therapy is evaluated by physicians.

38.15 Valley Fever

Coccidioidomycosis commonly known as “valley fever”, is a mammalian fungal disease caused by *Coccidioides immitis* or *Coccidioides posadasii*. *C. immitis* is a dimorphic saprophytic fungus that grows as a mycelium in the soil and produces a spherule form in the host organism. This fungus is dormant during long dry spells, and then develops as a mould with long filaments that break off into airborne spores when it rains. The spores are swept into the air by disruption of the soil, such as during construction and farming.

Coccidioidomycosis is a common cause of community acquired pneumonia; Infections usually occur due to inhalation of the spores after soil disruption. The disease is not contagious. In some cases the infection may recur or be permanent.

Signs and Symptoms

Most people infected with the fungi have minimal to no symptoms. Of those who do develop symptoms, nearly all develop symptoms resembling bronchitis or pneumonia that resolve over a matter of a few weeks. Notable signs and symptoms include a profound feeling of tiredness, fever, cough, headaches, rash, muscle pain, and joint pain. The classic triad of Coccidioidomycosis known as “desert rheumatism” includes the combination of fever, joint pains, and erythema nodosum.

Some people do not recover from the initial acute infection and develop a chronic lung infection or widespread disseminated infection (affecting the tissues lining the brain, soft tissues, joints, and bone). Severe lung disease may develop in HIV-infected persons.

Complications

Serious complications may occur in patients with weakened immune systems, including severe pneumonia, lung nodules, and possible disseminated form, where the infection spreads throughout the body. The disseminated form of Coccidioidomycosis can devastate the body, causing skin ulcers, abscesses, and bone lesions, and swollen joints with severe pain, heart inflammation, urinary tract problems, and inflammation of the brain’s lining, which can lead to death.

Diagnosis

Coccidioidomycosis diagnosis relies on a combination of an infected person’s signs and symptoms, findings on radiographic imaging, and laboratory results. It is commonly misdiagnosed as bacterial pneumonia. The fungal infection can be demonstrated by microscopic detection of diagnostic cells in body fluids, exudates, sputum and biopsy-tissue.

An indirect demonstration of fungal infection can be achieved also by serologic analysis detecting fungal antigen or host IgM or IgG antibody produced against the fungus. The available tests include the tube-precipitin (TP) assays, complement fixation assays, and enzyme immunoassays. ELISA is sensitive and thus used for screening.

Imaging

Chest x-rays rarely demonstrate nodules or cavities in the lungs but these images commonly demonstrate lung opacification, pleural effusion, or enlargement of lymph nodes. Computed tomography scans of the chest are better able to detect these changes than chest x-rays.

Treatment

Significant disease develops in less than 5% of those infected and typically occurs in those with a weakened immune system. Mild asymptomatic cases often do

not require any treatment. Those with severe symptoms may warrant anti-fungal therapy.

On the whole, oral Fluconazole and intravenous amphotericin B are used in progressive or disseminated disease, or in immune-compromised individuals; Itraconazole or Ketoconazole may be used for milder disease. Fluconazole is the preferred medication for coccidioidal meningitis, due to its penetration into CSF.

Prevention

Currently there are no completely effective preventive measures available for people who live or travel through Valley fever endemic areas. Recommended preventive measures include avoiding airborne dust or dirt, but this does not guarantee protection against infection. People in certain occupations may be advised to wear face masks. Currently, recommended prevention measures can include raising both surveillance and awareness, respirator protection for persons engaged in agriculture, construction and others working outdoors in the endemic areas. Dust control measures such as planting grass and wetting the soil.

38.16 Asphyxia

Asphyxia is a condition of the body that occurs from severely inadequate oxygen supply or excessive carbon dioxide to the body. It is usually a result of disruption in breathing or insufficient oxygen supply. Without oxygen nerve cells in the brain can survive only up to four minutes, usually leading to unconsciousness, and death. There are many causes of asphyxia, which all generally lead to hypoxia. Response will vary on the cause of asphyxia.

Causes

Sometimes, it may be quite obvious when one is suffering from asphyxiation. Asphyxia can be caused by any of the following:

- Airway obstruction:
 - Choking from food, blood, vomit or broken teeth;
 - May also occur in unconscious victim when the tongue falls to the back of the throat;
 - Chest compression or collapsed lung, from road accidents or any penetrating injury to the chest;
 - Drowning or near drowning;
 - Gas poisoning.
- Carbon monoxide poisoning from home appliances releasing fumes or released by car exhaust or other toxic fumes;
- Electrical accidents;
- Strangulation;

- From attempted suicide by hanging or attempt to kill another person by placing grasping the neck;
- Suffocation;
- Severe asthma attack or bronchitis;
- Whooping cough.

Signs and Symptoms

Any of the following symptoms can lead to asphyxia:

- Difficulty and/or noisy breathing, which may ultimately lead to cessation;
- Rapid pulse;
- High blood pressure (hypertension);
- Cyanosis of the face;
- Swollen veins on the head and neck;
- Convulsions;
- Paralysis;
- Slowly losing consciousness.

Complications

Although there are only a few numbers of possible complications from asphyxia, they are, nonetheless, severe and sometimes, irreversible:

- Coma;
- Brain death;
- Death.

First Aid Management

It is necessary to give first aid and if necessary, CPR, to any patient who is at risk of asphyxia. Steps will vary per scenario. To increase chances of survival of patients and know how to give appropriate first aid, it is highly encouraged to enrol in first aid courses.

- Have someone call for emergency medical services immediately.
- Choking:
 - Perform Heimlich Manoeuvre (which will vary in adults, children, and pregnant women) to remove the object;
- Drowning:
 - Safely remove the victim from the water;
- Gas poisoning:
 - Get the victim into fresh air only if it is safe to go in the place. Evacuate anyone else in the same establishment;
- Suffocation:
 - Remove anything blocking the airway, such as plastic bags immediately;
- Strangulation:
 - Remove the object used to strangle immediately;

Respiratory System Conditions

- Asthma attack:
 - Assist the victim to sit upright and assist to medication.
- For all victims of asphyxiation:
 - Loosen any tight clothing, especially around the neck;
 - Check for airway, breathing and circulation;
 - If the victim is unconscious and not breathing with no pulse, perform CPR. To do CPR;
 - Place own hand on the middle's chest and entangle the second hand on top of the first. Give 30 chest compressions, followed by 2 rescue breaths;
 - To give a rescue breath, tilt the chin upward and backwards to prevent any obstruction in the airways. Pinch nostril of casualty and seal the mouth of the victim using own mouth;
 - Repeat cycle of 30 chest compressions and 2 rescue breaths until signs of circulation are perceived.
- If the victim has pulse but not breathing, give rescue breaths.
- Do not leave victims of asphyxia alone at all times, even if consciousness is regained.

Occupational Infections and Infestations

- | | |
|---|--|
| 39.1 Boils and Abscesses (Staphylococcal Infections) | 39.16 Trichinosis |
| 39.2 Candidiasis of Skin Folds | 39.17 Ascariasis |
| 39.3 Tinea Capitis | 39.18 Tapeworm Infestation |
| 39.4 Paronychia | 39.19 Hook Worm Infestation |
| 39.5 Lyme disease | 39.20 Insect Bite or Sting |
| 39.6 Anthrax | 39.21 Hypersensitivity after Mosquito Bite |
| 39.7 Tetanus | 39.22 Caterpillar Dermatitis |
| 39.8 Q Fever | 39.23 Dermatitis Linearis |
| 39.9 Campylobacteriosis | 39.24 Scabies |
| 39.10 Avian Influenza | 39.25 Tick bite |
| 39.11 Rotavirus Infection | 39.26 Lice Infestation |
| 39.12 Foot-And-Mouth Disease | 39.27 Skin Diseases Caused by Jellyfish, MEMO, Coral and Sea Anemones |
| 39.13 Kyasanur Forest Disease | |
| 39.14 Rabies | |
| 39.15 Cryptosporidiosis | |

A large number of infections and infestations afflict people because of their occupation. Reasons might include increased susceptibility or repeated exposure or an occupational hazard that has not been managed by the usual protective and preventable processes known and available.

OCCUPATIONAL INFECTIONS GENERALLY FALL into the following aetiological categories

1. Contact with infected living animal.
2. Contact with contaminated animal product.
3. Tick, flea, or mite bite.
4. Contact with human or animal waste.
5. Contact with infected patient or blood.
6. Raise dust containing the pathogen.

The general occupations in the informal sector that are most vulnerable are:

1. Animal husbandry – (animal breeders, caretakers, ranchers, hunters, trappers, Poultry workers, cattle breeders, slaughterers, butchers).

2. Forestry (Gatherers, log workers, wood cutters, trappers).
3. Agriculture (Farmers, Farm workers).
4. Health workers, pest control workers, meat packers, sewer workers.

The affections may range from the trivial boils and abscesses to the more serious ones such as Avian Influenza.

39.1 Boils and Abscesses (Staphylococcal Infections)

Staphylococcal infections are a group of infections caused by the bacterium *Staphylococcus*, also referred to as “staph infections”. Staph bacteria can cause a wide range of infections, from relatively minor skin infections such as boils, to more serious infections of the blood, lungs and heart. There are many types of Staphylococci, but most infections are caused by a group called *Staphylococcus aureus*. This group of bacteria includes Methicillin-resistant *Staphylococcus aureus* (MRSA), which is resistant to certain antibiotics that are commonly used for staph infections, such as Flucloxacillin.

It also includes PVL-*Staphylococcus aureus*, which produces a toxin called Pantone-Valentine leukocidin (PVL), which kills leucocytes and can cause recurrent skin infections, such as boils and abscesses.

Types of Staph Infections

Staph infections can be broadly classified into two groups: skin and soft tissue infections, and invasive infections.

Skin and Soft Tissue Infections: Most infections are relatively minor and only affect the skin or underlying tissue.

Boils – red, painful lumps on the skin; usually develop on the neck, face, armpit or buttocks:

- *Impetigo* – a highly contagious skin infection; mainly affects children, which can cause sores, blisters and crusts to develop on the skin;
- *Cellulitis* – an infection of the deep layers of the skin, which can cause affected areas to quickly become red, painful, swollen and hot;
- *Skin abscess* – a collection of pus that appears as a painful lump under the surface of the skin;
- *Folliculitis* – an infection of a hair follicle which causes an itchy pus-filled vesicle;
- *Wound infections* – an infection of a cut or graze or surgical wound, causing redness, swelling, pain and pus;
- *Staphylococcal Scalded Skin Syndrome (SSSS)* – a more serious condition that mainly affects babies and young children, where staph bacteria release a toxin that damages the skin, leading to extensive blistering that looks like the skin has been scalded.

Invasive infections: In a small number of people, a staph skin infection can lead to a more serious, invasive infection deeper within the body. Examples include:

- *Septic arthritis* – a joint infection that causes pain, swelling, redness and tenderness in affected joints;
- *Osteomyelitis* – a bone infection, usually affecting one of the legs, causing bone pain, restricted movement, and swelling, redness and warmth in the affected area;
- *Pneumonia* – an infection of the lungs that causes persistent coughing, breathing difficulties and chest pain; this often occurs after a viral illness such as flu;
- *Endocarditis* – an infection of the inner lining of the heart, causing fever, chest pain, coughing, weakness and dyspnoea;
- *Sepsis* – an infection of the blood that causes a high fever, rapid pulse and rapid breathing;
- *Toxic shock syndrome* – where bacteria release toxins into the blood, which can cause a sudden fever, vomiting, diarrhoea, fainting, dizziness, confusion and a rash.

Causes

Staph bacteria are common and in one third people these bacteria are commensals in skin, inside nose and on the surface of their armpits and buttocks. However, the bacteria can cause problems if they enter the body through a break in the skin, such as a cut or graze, burn or insect bite. They can also get into the body via medical equipment, such as urinary catheters, openings in the skin where drips are inserted and feeding tubes.

Staph bacteria are usually spread between people through close skin contact or by sharing contaminated objects, such as towels or toothbrushes. Occasionally, they can be spread in droplets in the coughs and sneezes of someone carrying the bacteria. Food contaminated with staph bacteria can cause food poisoning.

Risk Factors

Staph skin infections are common, particularly among children, teenagers and young adults. Invasive infections are much rarer. Infection can affect healthy people, but risk of more serious infections tends to affect those who:

- Have a weakened immune system because of an underlying medical condition or a side effect of treatment, such as chemotherapy;
- Use medical equipment that goes directly inside their body, such as a urinary catheter;
- Have experienced severe trauma to the skin, such as a deep wound or a major burn;

Treatment

Some minor staph infections, including minor boils and food poisoning, don't need specific treatment and will get better on their own within a few days or weeks.

In some cases, antibiotic tablets or creams may be recommended to treat the infection, and may need a minor procedure to drain any pus from under the skin, using a needle or scalpel.

Until the infection clears up spreading the infection to other people must be avoided. These include hands washing regularly, not sharing objects that could become contaminated, regularly cleaning any pus off the skin, and covering the infected area with a dressing.

Invasive staphylococcal infections will often require treatment in hospital. The infection will usually be treated with antibiotic injections for several days.

Prevention

Chances of developing staph infections are reduced by:

- hand washing with soap and water regularly;
- keeping any cuts clean and covered;
- not sharing towels, washcloths, bed linen, toothbrushes and razors;
- ensuring that food is both properly cooked and properly chilled.

39.2 Candidiasis of Skin Folds

Candida infection (candidiasis) can cause or aggravate Intertrigo, an inflammatory rash arising in body folds.

Types of Candidal Intertrigo

Candidiasis may affect the following sites:

- Between toes (athlete's foot), this may also be due to Tinea pedis, dermatitis, psoriasis or soft corns. The skin is moist, white and peeling;
- Web spaces of the hands. This is more common in warm climates and in those with frequently wet hands such as gardeners and housewives. The skin is moist, white, peeling and uncomfortable. The condition is sometimes called "Erosio Interdigitalis Blastomycetica";
- Under breasts (sub mammary), in the groin or between the buttocks. The onset of bright red irritable skin is usually abrupt and may peel. The moist skin fold is cracked and sore. There are usually tiny surface "satellite" spots, blisters or pustules;
- Napkin dermatitis. Babies frequently develop candidal napkin dermatitis especially if treated with broad-spectrum antibiotics (e.g. for an ear infection) or if prone to irritant nappy rash.

Diagnosis

Microscopy and culture of skin swabs and scrapings aid in the diagnosis of candidal Intertrigo. However, Candida may secondarily infect an underlying skin disorder such as psoriasis.

General Measures *(to be recommended to patients)*

- Correct predisposing factors where possible particularly Occupational risks;
- Keep the affected skin clean and dry. Wash daily. Take care to dry between the toes and in the skin folds; use a hair dryer if necessary. Use your own towel;
- *Antiseptics:* Dequalinium chloride lozenges for oral candidiasis.

Prevention of Reinfection

Fungal spores can survive long periods. To reduce the chance of Reinfection, please advise patients:

- Do not share towels, sheets or personal clothing;
- Avoid walking bare foot;
- Avoid long periods wearing the same clothing, or wearing occlusive clothing such as wet weather gear and nylon pantyhose;
- Wear open-toed sandals when possible. Avoid long periods in occlusive footwear;
- Use antifungal foot powder e.g. Miconazole to be sprinkled in the shoes.

39.3 Tinea Capitis

Tinea capitis is a fungal infection of the scalp. It is also called ringworm of the scalp. Related skin infections may also be found in a man's beard, groin, between the toes (athlete's foot) and other sites on the skin.

Causes

Fungi are germs that can live on the dead tissue of the hair, nails, and outer skin layers. Tinea capitis is caused by mould-like fungi called dermatophytes. The fungi grow well in warm, moist areas. A Tinea infection is more likely if a patient has:

- minor skin or scalp injuries;
- does not bathe or wash hair often;
- wet skin for a long time (such as from sweating).

Tinea capitis, or ringworm, can spread easily. It most often affects children and goes away at puberty. However, it can occur at any age.

Persons can catch Tinea capitis if they come in direct contact with an area of ringworm on someone else's body. If you touch items such as combs, hats, or clothing that have been used by someone with ringworm. The infection can also

be spread by pets, particularly cats. The infection is highly contagious. The fungus can also spread through the air.

Symptoms

Tinea capitis may involve part or the entire scalp. The affected areas:

- Are bald with small black dots, due to hair that has broken off;
- Have round, scaly areas of skin that are red or swollen (inflamed);
- Have pus-filled sores called kerions;
- May be very itchy.

Patient may have a low-grade fever of around 100 to 101°F (37.8 to 38.3°C) or swollen lymph nodes in the neck. Tinea capitis may cause hair loss and lasting scars.

Examination and Tests

Look at patient's scalp for signs of Tinea capitis. A special test that uses a lamp called a Wood's lamp can help diagnose a fungal scalp infection.

Take a swab of the area and send it for a culture. It may take up to 3 weeks to get these results. Rarely, a skin biopsy of the scalp will be required.

Treatment

Tinea capitis is usually treated oral antifungal medicines, including Griseofulvin, Terbinafine and Itraconazole.

Treatment of carriers

If the child has an anthropophilic infection, all family members should be examined for signs of infection. Brushings of scaly areas of the scalp should be taken for mycology. Sometimes it is best for the whole family to be prophylactically treated

Steps patients can do at home include:

- Keeping scalp clean;
- Washing with a medicated shampoo, such as one that contains Ketoconazole or selenium sulfide. Other family members and pets should be examined and treated, if necessary.

Prognosis

It may be hard to get rid of Tinea capitis. Also, the problem may come back after it is treated. In many cases it gets better on its own after puberty.

39.4 Paronychia

A Paronychia is a nail disease that is an often-tender bacterial or fungal infection of the hand or foot where the nail and skin meet at the side or the base of a finger or toenail. The infection can start suddenly (acute Paronychia) or gradually (chronic

Paronychia). Paronychia is commonly misapplied as a synonym for whitlow or felon.

Paronychia may be divided as follows:

- *Candidal Paronychia* is an inflammation of the nail fold produced by *Candida albicans*;
- *Pyogenic Paronychia* is an inflammation of the folds of skin surrounding the nail caused by bacteria. Generally acute Paronychia is a Pyogenic Paronychia as it is usually caused by a bacterial infection.

Signs and Symptoms

The skin typically presents as red and hot. These infections can be painful.

Pus is usually present, along with gradual thickening and browning discoloration of the nail plate.

Cause

Occupational Risk: Barbers, Scavengers, farmers

Acute Paronychia is usually caused by bacteria. Claims have also been made that the popular acne medication, isotretinoin, has caused Paronychia to develop in patients. Paronychia is often treated with antibiotics, either topical or oral. Chronic Paronychia is most often caused by a yeast infection of the soft tissues around the nail but can also be traced to a bacterial infection. If the infection is continuous, the cause is often fungal and needs antifungal cream or paint to be treated. Risk factors include repeatedly washing hands and trauma to the cuticle such as from biting.

Herpes whitlows are frequently found among dentists and dental hygienists. Prosector's Paronychia is a primary inoculation of tuberculosis of the skin and nails, named after its association with prosectors, who prepare specimens for dissection. Paronychia around the entire nail is sometimes referred to as *Runaround Paronychia*.

Painful Paronychia in association with a scaly, erythematous, keratotic rash (papules and plaques) of the ears, nose, fingers, and toes, may be indicative of acrokeratosis paraneoplastica, which is associated with squamous cell carcinoma of the larynx.

Paronychia can occur with diabetes, drug-induced immunosuppression, or systemic diseases such as pemphigus.

Treatment

When no pus is present warm soaks for Acute Paronychia is reasonable, antibiotics such as Clindamycin or Cephalexin are also often used, the first being more effective in areas where MRSA is common. If there are signs of an abscess (the presence of pus) drainage is recommended.

Chronic Paronychia is treated by avoiding whatever is causing it, and applying a topical antifungal and a topical steroid. In those who do not improve following these measures oral antifungals and steroids may be used or the nail fold may be removed surgically.

39.5 Lyme disease

History

Lyme disease was reported in Haryana in 2014 by Jairath V, Sehrawat M, Jindal N, Jain V K and Aggarwal P

Causes and Risk Factors

Lyme disease, sometimes referred to as Lyme infection, is a bacterial illness, transmitted to humans by the bite of deer ticks (*Ixodes* ticks) carrying a bacterium known as *Borrelia burgdorferi*. *B. burgdorferi* bacteria cause Lyme disease. The bacteria have a complex life cycle, spending part of their life in the deer tick and part in some mammals such as mice and deer.

Humans are not a part of the bacterium's life cycle but can become infected when bitten by the tick. Lyme disease is not contagious and cannot be passed from person to person.

Symptoms and Signs

- The initial infection can occur with minimal or no signs or symptoms. But many people experience a flu-like primary illness or a characteristic rash several days to a few weeks following a tick bite. This rash may feel warm to the touch but is rarely itchy or painful.
- The rash is a red rash that grows in size daily. Called erythema migrans, it typically begins as a red spot, circular or oval, and expands over a period of days to weeks to form a large round lesion, at least 5 cm across.
- Multiple secondary lesions can occur that are a reaction to the infection and are not due to multiple tick bites. All of these lesions can enlarge to the size of a football. This growth in size of the red spots on the skin is characteristic of Lyme disease.
- As it grows, the rash can remain red throughout, although it often can develop a clear central area. In a minority, it may take on the appearance of a target with multiple rings (alternating red with clear skin). This is known as a bull's-eye lesion.
- Left untreated, signs and symptoms of the primary illness usually will go away on their own within a few weeks, although the rash may recur.

Complications

The organs affected later in the course of the disease may lead to the following conditions and complications:

- Facial palsy is paralysis of the facial nerve that causes the facial muscles to be uneven. This may get better without treatment;
- Meningitis causes headache, fever, and stiff neck;

- Nerve inflammation causes pain, numbness, and tingling in the arms or legs;
- Shooting pains may interfere with sleep and cause insomnia;
- Muscle weakness;
- Encephalitis causes learning difficulties, confusion, and dementia;
- Intermittent episodes of arthritis last about a week and usually involve the knee or wrist. These may recur over periods of weeks to months;
- Carditis results in heart palpitations, which can also result in dizziness or passing out.

Diagnosis

A diagnosis of Lyme disease is based on a careful and detailed history and a complete physical examination supported by laboratory testing when appropriate:

- Information about patient's outdoor exposure in an area with a high tick population;
- Physical examination findings are important, especially the presence of erythema migrans;
- Measure size of the rash and then re-measure one to two days later. Erythema migrans usually exhibits an increase in size of the rash, often expanding by about ½ inch every day;
- Blood tests for antibodies (absent in early days) to the bacteria if a laboratory can perform it; a screening test (Lyme ELISA or IFA) and, if that test is positive or equivocal, a more specific test (Western blot) may be done;
- Once a Lyme blood test is positive, it will remain positive for a long time even with successful treatment. Repeat blood tests after treatment are not helpful in determining further care;
- Complications may need hospital treatment.

Treatment and Medications

- Lyme disease is treated with oral antibiotics including doxycycline, penicillins, or erythromycin. In early stages, the disease can be curable with just this antibiotic treatment.
- Pregnant women are usually treated with penicillins or erythromycin. Doxycycline is generally avoided as it may affect the development of the foetus.
- Doctors may treat late-stage cases of neurological, heart, or arthritic Lyme disease with intravenous antibiotics in the hospital or as an outpatient.

Prevention

There is currently no vaccine available to prevent Lyme disease; however, there are three approaches to preventing Lyme disease.

Avoidance of tick bites: Advice to patients:

- Try to stay out of woodlands and brush areas where the tick thrives, especially during the peak season of summer and early fall;

- Wear light-coloured garments that will create barriers to the tick attaching to the skin and biting;
- If you notice a bite, watch for symptoms about three weeks;
- Ticks attach to areas that are warm and moist, such as groin, armpits, neck and hairline and underside of breasts in women.

Prognosis

When treated early, the prognosis for most people with Lyme disease is rapid improvement and minimal complications from the disease. Later stages of illness are avoided by effective treatment of early Lyme disease. People with later stages of the disease may also do well when they are diagnosed soon after their later-stage symptoms first occur. A small percentage of people with Lyme disease do not fully recover have a condition called post-treatment Lyme disease syndrome (PTLDS), in which symptoms of fatigue, pain, or joint and muscle aches last for more than six months following treatment; other effects may be residual facial palsy or residual knee pain, chronic muscle and joint pains, fatigue, and concentration difficulties.

39.6 Anthrax

Anthrax is an acute disease caused by the bacterium *Bacillus anthracis*. Most forms of the disease are lethal, and it affects mostly animals. It is contagious and can be transmitted through contact or consumption of infected meat. Effective vaccines against anthrax are available, and some forms of the disease respond well to antibiotic treatment. People of any age may be affected. Most cases are mild and go away with treatment. Anthrax, however, can be lethal. There are several ways anthrax can cause illness. These are the three main ways anthrax affects humans:

- Cutaneous anthrax causes a characteristic sore on the skin and results from exposure to the spores after handling sick animals or contaminated animal wool, hair, hides, or bone meal products. It is an occupational hazard for veterinarians, farmers, and people who handle animal products. Humans are relatively resistant, but the spores may gain access through even tiny breaks in the skin. Cutaneous anthrax is easy to cure if it is treated early with appropriate antibiotics;
- Inhalational anthrax results from breathing anthrax spores into the lungs. People who handle animal hides infested with spores may develop inhalational anthrax, known as wool sorter's disease. Earliest symptoms resemble those of a respiratory infection such as mild fever and sore throat. The organisms multiply and may spread toxins via bloodstream to many other organs. Infection may spread from the liver, spleen, and kidneys back into the bloodstream, thus causing an overwhelming infection and death.

This type of infection (known as septicemic anthrax) most commonly follows inhalational anthrax;

- Gastrointestinal anthrax results from eating meat products that contain anthrax. Gastrointestinal anthrax is difficult to diagnose. It can produce sores in the mouth and throat. A person who has eaten contaminated products may feel throat pain or have difficulty swallowing. Other symptoms can include nausea, loss of appetite, bloody diarrhoea, and fever. This form of anthrax has a very high death rate.

Diagnosis

Various techniques are used for the direct identification of *B. anthracis* in clinical material. To confirm the organism is *B. anthracis*, rapid diagnostic techniques such as polymerase chain reaction-based assays and immunofluorescence microscopy may be used.

Treatment

Anthrax cannot spread directly from person to person, but a person's clothing and body may be contaminated with anthrax spores. Effective decontamination of people can be accomplished by a thorough wash-down with antimicrobial soap and water. Waste water should be treated with bleach or other antimicrobial agent.

Antibiotics

Early antibiotic treatment of anthrax is essential; delay significantly lessens chances for survival. Treatment for anthrax infection and other bacterial infections includes large doses of intravenous and oral antibiotics, such as Fluoroquinolones (ciprofloxacin), doxycycline, erythromycin, vancomycin, or penicillin. FDA-approved agents include ciprofloxacin, doxycycline, and penicillin. In possible cases of pulmonary anthrax, early antibiotic prophylaxis treatment is crucial to prevent possible death.

Existing drugs are effective if treatment is started soon enough.

Prevention & Control

Effective decontamination of articles can be accomplished by boiling them in water for 30 minutes or longer. Chlorine bleach is ineffective in destroying spores and vegetative cells on surfaces, though formaldehyde is effective. Burning clothing is very effective in destroying spores. After decontamination, there is no need to immunize, treat, or isolate contacts of persons ill with anthrax unless they were also exposed to the same source of infection.

If death occurs from anthrax, the body should be isolated to prevent possible spread of anthrax germs. Burial does not kill anthrax spores.

Site Cleanup and Decontamination

Anthrax spores can survive for very long periods of time in the environment after release. Chemical methods for cleaning anthrax-contaminated sites or materials may use oxidizing agents such as peroxides, ethylene oxide, chlorine dioxide, peracetic acid, ozone gas, hypochlorous acid, sodium persulfate, and liquid bleach products containing sodium hypochlorite. Non oxidizing agents shown to be effective for anthrax decontamination include methyl bromide, formaldehyde, and metam sodium. These agents destroy bacterial spores.

Chlorine dioxide has emerged as the preferred biocide against anthrax-contaminated sites.

Using the catalyst method, a complete destruction of all anthrax spores can be achieved in less than 30 minutes; trace amounts of a nontoxic catalyst composed of iron and tetraamido macrocyclic ligands are combined with sodium carbonate and bicarbonate and converted into a spray. The spray formula is applied to an infested area and is followed by another spray containing tert-butyl hydroperoxide.

39.7 Tetanus

Tetanus, also known as *lockjaw*, is an infection characterized by muscle spasms. In the most common type the spasms begin in the jaw and then progress to the rest of the body. These spasms usually last a few minutes each time and occur frequently for three to four weeks. Spasms may be so severe that bone fractures may occur. Other symptoms may include fever, sweating, headache, trouble swallowing, high blood pressure, and a fast heart rate. Onset of symptoms is typically three to twenty one days following infection. It may take months to recover. About 10% of those infected die. Tetanus is caused by an infection with the bacterium *Clostridium tetani*, which is commonly found in soil, dust and manure. The bacteria generally enter through a break in the skin such as a cut or puncture wound by a contaminated object. They produce toxins that interfere with muscle contractions, resulting in the typical symptoms.

Signs and Symptoms

Tetanus often begins with mild spasms in the jaw muscles — also known trismus. The spasms can also affect the facial muscles resulting in an appearance called risus sardonicus (a grinning expression produced by spasm of the facial muscles seen in Tetanus and certain types of poisoning). Chest, neck, back, abdominal muscles, and buttocks may be affected. Back muscle spasms often cause arching, called opisthotonos (a form of spasm in which the head and heels are bent backward and the body bowed forward). Sometimes the spasms affect muscles that help with breathing, which can lead to breathing problems.

Prolonged muscular action causes sudden, powerful, and painful contractions of muscle groups, which is called “tetany”. These episodes can cause fractures and muscle tears. Other symptoms include drooling, excessive sweating, fever, hand or foot spasms, irritability, difficulty swallowing, suffocation, heart attack, breathing problems, irregular heartbeat, and uncontrolled urination or defecation.

The episodes can also cause destruction of elements of the nervous system through viral cell exchange.

With treatment about 10% of people who contract tetanus die. The mortality rate is higher in unvaccinated people and people over 60 years of age.

Incubation period

The incubation period of tetanus may be up to several months, but is usually about eight days. In general, the farther the injury site is from the central nervous system, the longer the incubation period. It has been observed that the shorter the incubation period, the more severe the symptoms. On the basis of clinical findings, four different forms of tetanus have been described.

Generalized Tetanus

Generalized tetanus is the most common type of tetanus, representing about 80% of cases. The generalized form usually presents with a descending pattern. The first sign is trismus, or lockjaw, and the facial spasms called risus sardonicus, followed by stiffness of the neck, difficulty in swallowing, and rigidity of pectoral and calf muscles. High temperature, sweating, elevated blood pressure, and episodic rapid heart rate may be observed. Spasms may occur frequently and last for several minutes with the body shaped into a characteristic form called opisthotonos. Spasms continue for up to 4 weeks, and complete recovery may take months. Sympathetic overactivity (SOA) is common in severe tetanus and manifests as labile hypertension, tachycardia, dysrhythmia, peripheral vasculature constriction, profuse sweating, fever, increased carbon dioxide output, increased catecholamine excretion and late development of hypotension. Death can occur within four days.

Other three types of tetanus are:

1. Neonatal Tetanus

Neonatal tetanus is a form of generalized tetanus that occurs in newborns, usually those born to mothers who themselves have not been vaccinated. If the mother has been vaccinated against tetanus, the infants acquire passive immunity and are thus protected.

2. Local Tetanus

Local tetanus, generally milder, is an uncommon form of the disease, in which patients have persistent contraction of muscles in the same anatomic area as the injury. The contractions may persist for many weeks before gradually subsiding.

3. Cephalic Tetanus

Cephalic tetanus is the rarest form of the disease and is limited to the muscles and nerves in the head. It usually occurs after trauma to the head area, including skull fracture, laceration, eye injury, dental extraction, and Otitis media, but it has been observed from injuries to other parts of the body. Paralysis of the facial nerve is most frequently implicated, which may cause lockjaw, facial palsy, or ptosis and may progress to a more generalized form of the disease. Due to its rarity, clinicians may be unfamiliar with the clinical presentation.

Causes

Tetanus is caused by the tetanus bacterium *Clostridium tetani*. It is more common in hot, damp climates with soil rich in organic matter.

Tetanus is often associated with rust, especially rusty nails. Objects that accumulate rust are often found outdoors, or in places that harbour anaerobic bacteria, but the rust itself does not cause tetanus nor does it contain more *C. tetani* bacteria. The rough surface of rusty metal merely provides a prime habitat for *C. tetani* endospores to reside. An endospore is a non-metabolizing survival structure that begins to metabolize and cause infection once in a favourable environment. Because *C. tetani* is an anaerobic bacterium, it and its endospores thrive in environments that lack oxygen.

Tetanus is an international health problem. The disease occurs almost exclusively in persons unvaccinated or inadequately immunized. In agricultural areas, a significant number of human adults may harbour the organism.

Diagnosis

There are currently no blood tests for diagnosing tetanus. The diagnosis is based on the presentation of tetanus symptoms and does not depend upon isolation of the bacterium.

The “spatula test” is a clinical test for tetanus that involves touching the posterior pharyngeal wall with a soft-tipped instrument and observing the effect. A positive test result is the involuntary contraction of the jaw (biting down on the “spatula”) and a negative test result would normally be a gag reflex attempting to expel the foreign object. The spatula test had a high specificity (zero false-positive test results) and a high sensitivity (94% of infected patients produced a positive test).

Treatment

Mild tetanus

Mild cases of tetanus can be treated with:

- Tetanus immunoglobulin (TIG), also called tetanus antibodies or tetanus antitoxin. It can be given as intravenous therapy or by intramuscular injection;

- Metronidazole IV for 10 days;
- Diazepam oral or IV.

Severe tetanus

Severe cases will require admission to intensive care. In addition to the measures listed above for mild tetanus:

- Human tetanus immunoglobulin injected intrathecally (increases clinical improvement from 4% to 35%)
- Tracheotomy and mechanical ventilation for 3 to 4 weeks. Tracheotomy is recommended for securing the airway because the presence of an endotracheal tube is a stimulus for spasm
- Magnesium, as an intravenous (IV) infusion, to prevent muscle spasm
- Diazepam as a continuous IV infusion
- The autonomic effects of tetanus can be difficult to manage (alternating hyper- and hypotension hyperpyrexia/hypothermia) and may require IV Labetalol, Magnesium, Clonidine, or Nifedipine

Drugs such as diazepam or other muscle relaxants can be given to control the muscle spasms. In extreme cases it may be necessary to paralyze the patient with curare-like drugs and use a mechanical ventilator.

In order to survive a tetanus infection, the maintenance of an airway and proper nutrition are required. High-caloric diet maintenance is required because of the increased metabolic strain brought on by the increased muscle activity. Full recovery takes 4 to 6 weeks.

Prevention

Unlike many infectious diseases, recovery from naturally acquired tetanus does not usually result in immunity to tetanus. Even a lethal dose of Tetanospasmin is insufficient to provoke an immune response.

Tetanus can be prevented by vaccination with tetanus toxoid. Adults should receive a booster vaccine every ten years, and standard care practice in many places is to give the booster to any patient with a puncture wound who is uncertain of when he or she was last vaccinated, or if he or she has had fewer than three lifetime doses of the vaccine. The booster may not prevent a potentially fatal case of tetanus from the current wound, however, as it can take up to two weeks for tetanus antibodies to form.

Post-Exposure Prophylaxis

Tetanus toxoid can be given in case of a suspected exposure to tetanus. In such cases, it can be given with or without tetanus immunoglobulin. It can be given as intravenous therapy or by intramuscular injection.

39.8 Q Fever

Q fever is a worldwide disease with acute and chronic stages caused by the bacteria *Coxiella burnetii*. Cattle, sheep, and goats are the primary reservoirs although a variety of species may be infected. Organisms are excreted in milk, urine, and faeces of infected animals. During birthing the organisms are shed in high numbers within the amniotic fluids and the placenta.

The organism is extremely hardy and resistant to heat, drying, and many common disinfectants which enable the bacteria to survive for long periods in the environment.

Infection of humans usually occurs by inhalation of these organisms from air that contains airborne barnyard dust contaminated by dried placental material, birth fluids, and excreta of infected animals. Other modes of transmission to humans are rare. Humans are often very susceptible to the disease, and very few organisms may be required to cause infection.

Symptoms

Q fever can cause acute or chronic illness in humans, who usually acquire infection after contact with infected animals or exposure to contaminated environments. The acute symptoms will usually develop within 23 weeks of exposure; but only in about half of them!

The following is a list of symptoms commonly seen with acute Q fever, in any combination: high fevers, severe headache, general malaise, myalgia, chills and/or sweats, non-productive cough, nausea, vomiting, diarrhoea, abdominal pain and chest pain. Most persons with acute Q fever infection recover; others may experience serious illness with complications that may include pneumonia, granulomatous hepatitis, myocarditis, and central nervous system complications.

Pregnant women may be at risk for preterm delivery or miscarriage.

Chronic Q fever is a severe disease occurring in <5% of acutely infected patients. It may present within 6 weeks after an acute infection, or may manifest years later. The three groups at highest risk for chronic Q fever are pregnant women, immunosuppressed persons and patients with a pre-existing heart valve defects. Endocarditis, and aortic aneurysms and infections of the bone, liver or reproductive organs are the major form of chronic disease.

Diagnosis

It is challenging for doctors to diagnose and treat. The symptoms, not specific, vary from patient to patient. Treatment is more effective if started in the first 3 days of symptoms. Diagnostic tests for antibodies will appear negative in the first 7-10 days and hence to be treated based on clinical suspicion alone and patient's history and

physical examination. Employment in high risk occupations such as veterinarians or farmers can be helpful in making the diagnosis. After making a clinical diagnosis treatment must begin.

Treatment

Doxycycline is the first line treatment for all adults, and for children with severe illness. Treatment should be initiated immediately whenever Q fever is suspected. Use of antibiotics other than doxycycline or other tetracyclines is associated with a higher risk of severe illness. Doxycycline is most effective at preventing severe complications from developing if it is started early in the course of disease.

If the patient is treated within the first 3 days of the disease, fever generally subsides within 72 hours. Failure to respond to doxycycline suggests it is not Q fever. Severely ill patients may require longer periods before their fever resolves. There is no role for prophylactic antimicrobial agents in preventing Q fever after a known exposure.

Prognosis

Although the majority of people with acute Q fever recover completely, a post-Q fever fatigue syndrome has been reported to occur in 10-25% of some acute patients. This syndrome is characterized by constant or recurring fatigue, night sweats, severe headaches, photophobia (eye sensitivity to light), pain in muscles and joints, mood changes, and difficulty sleeping.

Prevention

The following measures should be used in the prevention and control of Q fever:

- Educate the public on sources of infection;
- Appropriately dispose of placenta, birth products, foetal membranes, and aborted fetuses at facilities housing sheep and goats;
- Use only pasteurized milk and milk products if possible;
- Quarantine animals if required;
- Ensure that holding facilities for sheep should be located away from populated areas;
- Counsel persons at highest risk for developing chronic Q fever.

39.9 Campylobacteriosis

Campylobacteriosis is an infection by the *Campylobacter* bacterium, most commonly *C. jejuni*. It is among the most common bacterial infections of humans, often a food borne illness. It produces an inflammatory, sometimes bloody, diarrhoea or dysentery syndrome, mostly including cramps, fever and pain.

Causes

Campylobacteriosis is caused by *Campylobacter* bacteria. The disease is usually caused by *C. jejuni*, a bacterium normally found in cattle, swine, and birds, where it is non pathogenic, but the illness can also be caused by *C. coli* (also found in cattle, swine, and birds), *C. upsaliensis* (found in cats and dogs) and *C. lari* (present in seabirds in particular).

One effect of Campylobacteriosis is tissue injury in the gut. The sites of tissue injury include the jejunum, the ileum, and the colon. *C jejuni* appears to achieve this by invading and destroying epithelial cells.

C. jejuni can also cause a latent autoimmune effect on the nerves of the legs, which is usually seen several weeks after a surgical procedure of the abdomen. The effect is known as an acute idiopathic demyelinating polyneuropathy (AIDP), i.e. Guillain–Barré syndrome, in which one sees symptoms of ascending paralysis, dysaesthesias usually below the waist, and, in the later stages, respiratory failure.

Some strains of *C jejuni* produce a cholera-like enterotoxin, which is important in the watery diarrhoea observed in infections. The organism produces diffuse, bloody, oedematous, and exudative enteritis. In a small number of cases, the infection may be associated with haemolytic uremic syndrome and thrombotic thrombocytopenic purpura through a poorly understood mechanism.

Transmission

The common routes of transmission for the disease-causing bacteria are faecal-oral, person-to-person sexual contact, ingestion of contaminated food (generally unpasteurized (raw) milk and undercooked or poorly handled poultry), and waterborne (i.e., through contaminated drinking water). Contact with contaminated poultry, livestock, or household pets, especially puppies, can also cause disease.

Chicken and livestock farmed for meat are the main source of Campylobacteriosis.

Campylobacter species are sensitive to hydrochloric acid in the stomach. Exposure to bacteria is often more common during travelling, and therefore Campylobacteriosis is a common form of travellers' diarrhoea.

Epidemiology

Campylobacter is one of the most common causes of human bacterial gastroenteritis.

A large animal reservoir is present as well, with up to 100% of poultry, including chickens, turkeys, and waterfowl, having asymptomatic infections in their intestinal tracts.

Infected chicken faeces may contain up to 10^9 bacteria per 25 grams, and due to the installations, the bacteria are rapidly spread to other chickens.

Symptoms

The prodrome is fever, headache, and myalgia, lasting as long as 24 hours. Incubation period is 2–6 days. These are diarrhoea (as many as 10 watery, frequently bloody, bowel movements per day) or dysentery, cramps, abdominal pain, and fever as high as 40°C. In most people, the illness lasts for 2–10 days. This is classified as invasive/inflammatory diarrhoea, also known as bloody diarrhoea or dysentery.

There are other diseases showing similar symptoms. For instance, abdominal pain and tenderness may be very localized, mimicking acute appendicitis. Furthermore, *Helicobacter pylori* are closely related to *Campylobacter* and cause peptic ulcer disease.

Diagnosis

Campylobacter organisms can be detected by performing a Gram stain of a stool sample with high specificity and a sensitivity of ~60%, but are most often diagnosed by stool culture. Faecal leukocytes should be present and indicate the diarrhoea to be inflammatory in nature.

Treatment

The infection is usually self-limiting, and in most cases, symptomatic treatment by liquid and electrolyte replacement is enough in human infections.

Antibiotics

Antibiotic treatment is controversial, and has only a marginal benefit on the duration of symptoms, and should not be used routinely.

Erythromycin can be used in children, and tetracycline in adults. Erythromycin rapidly eliminates *Campylobacter* from the stool without affecting the duration of illness.

Anti motility agents, such as Loperamide, can lead to prolonged illness or intestinal perforation in any invasive diarrhoea, and should be avoided.

Prognosis

Campylobacteriosis is usually self-limited without any mortality if proper hydration is maintained. However, there are several possible complications.

Complications

Complications include toxic mega colon, dehydration and sepsis in young children (< 1 year of age) and immunocompromised people. It may become chronic without a distinct acute phase as a long period of sub-febrile temperature and asthenia; eye damage, arthritis, endocarditis may develop. Occasional deaths occur in young, previously healthy individuals because of dehydration, and in persons who are elderly or immunocompromised.

Some individuals develop Guillain–Barré syndrome, in which the nerves that join the spinal cord and brain to the rest of the body are damaged, sometimes permanently.

Prevention

The World Health Organization recommends the following:

- Food should be properly cooked and hot when served;
- Consume only pasteurized or boiled milk and milk products, never raw milk products;
- Boil drinking water or disinfect it;
- Wash hands thoroughly and frequently with soap, especially after using the toilet and after contact with pets and farm animals;
- Wash fruits and vegetables thoroughly, especially if they are to be eaten raw. Peel fruits and vegetables whenever possible;
- Food handlers, professionals and at home, should observe hygienic rules during food preparation;
- Prevent cross-contamination in the kitchen by using separate cutting boards for foods of animal origin and other foods and by thoroughly cleaning all cutting boards, countertops, and utensils with soap and hot water after preparing raw food of animal origin;
- If you are served undercooked poultry food in a restaurant, do not consume it but report it to the management;
- Professional food handlers should immediately report to their employer any fever, diarrhoea, vomiting or visible infected skin lesions.

39.10 Avian Influenza

Key Facts

- Avian influenza (AI), commonly called bird flu, is an infectious viral disease of birds.
- Most avian influenza viruses do not infect humans; however some, such as A(H5N1) and A(H7N9), have caused serious infections in people.
- Outbreaks of AI in poultry may raise global public health concerns due to their effect on poultry populations, their potential to cause serious disease in people, and their pandemic potential.
- Reports of highly pathogenic AI epidemics in poultry, such as A(H5N1), can seriously impact local and global economies and international trade.
- The majority of human cases of A(H5N1) and A(H7N9) infection have been associated with direct or indirect contact with infected live or dead poultry.
- Controlling the disease in animals is the first step in decreasing risks to humans. Avian influenza (AI) is an infectious viral disease of birds (especially wild water

fowl such as ducks and geese), often causing no apparent signs of illness. AI viruses can sometimes spread to domestic poultry and cause large-scale outbreaks of serious disease. Some of these AI viruses have also been reported to cross the species barrier and cause disease or subclinical infections in humans and other mammals.

AI viruses are divided into 2 groups based on their ability to cause disease in poultry: high pathogenicity or low pathogenicity. Highly pathogenic viruses result in high death rates (up to 100% mortality within 48 hours) in some poultry species. Low pathogenicity viruses also cause outbreaks in poultry but are not generally associated with severe disease.

Clinical Features in Humans

The case fatality rate for A(H5N1) and A(H7N9) virus infections in people is much higher compared to that of seasonal influenza infections. The A(H7N9) virus particularly affects people with underlying medical conditions.

In many patients, the disease caused by the A(H5N1) virus follows an unusually aggressive clinical course, with rapid deterioration and high fatality. Like most emerging disease, A(H5N1) influenza in humans is not well understood.

The incubation period for A(H5N1) avian influenza may be longer than that for normal seasonal influenza, which is around 2 to 3 days. Current data for A(H5N1) infection indicate an incubation period ranging from 2 to 8 days and possibly as long as 17 days. An incubation period ranging from 2 to 8 days, with an average of five days. WHO currently recommends that an incubation period of seven days be used for field investigations and the monitoring of patient contacts.

Initial symptoms include high fever, usually with a temperature higher than 38°C, and other influenza-like symptoms (cough or sore throat). Diarrhoea, vomiting, abdominal pain, chest pain, and bleeding from the nose and gums have also been reported as early symptoms in some patients.

One feature seen in many patients is the development of lower respiratory tract early in the illness. Respiratory distress, a hoarse voice, and a crackling sound when inhaling are commonly seen. Sputum production is variable and sometimes bloody. Complications of A(H5N1) and A(H7N9) infection include hypoxemia, multiple organ dysfunction, and secondary bacterial and fungal infections.

Antiviral Treatment

Evidence suggests that some antiviral drugs, notably oseltamivir, can reduce the duration of viral replication and improve prospects of survival.

In suspected cases, oseltamivir should be prescribed as soon as possible (ideally, within 48 hours following symptom onset) to maximize its therapeutic benefits. However, given the significant mortality currently associated with A(H5N1) and A(H7N9) infection and evidence of prolonged viral replication in this disease, administration of the drug should also be considered in patients presenting later in the course of illness. The use of corticosteroids is not recommended.

In cases of severe infection with the A(H5N1) or A(H7N9) virus, clinicians may need to consider increasing the recommended daily dose or/and the duration of treatment.

In severely ill A(H5N1) or A(H7N9) patients drug absorption may be impaired. This possibility should be considered when managing these patients. Moreover, most A(H5N1) and A(H7N9) viruses are predicated to be resistant to adamantane antiviral drugs, which are therefore not recommended for use.

Risk Factors for Human Infection

The primary risk factor for human infection appears to be direct or indirect exposure to infected live or dead poultry or contaminated environments, such as live bird markets. Controlling circulation of the A(H5N1) and A(H7N9) viruses in poultry is essential to reducing the risk of human infection. Given the persistence of the A(H5N1) and A(H7N9) viruses in some poultry populations, control will require long-term commitments from countries and strong coordination between animal and public health authorities.

There is no evidence to suggest that the A(H5N1) and A(H7N9) viruses can be transmitted to humans through properly prepared poultry or eggs. A few A(H5N1) human cases have been linked to consumption of dishes made of raw, contaminated poultry blood. However, slaughter, defeathering, handling carcasses of infected poultry, and preparing poultry for consumption, especially in household settings, are likely to be risk factors.

Human Pandemic Potential

Influenza pandemics (outbreaks that affect a large proportion of the world due to a novel virus) are unpredictable but recurring events that can have health, economic and social consequences worldwide. With the growth of global trade and travel, a localized epidemic can transform into a pandemic rapidly, with little time to prepare a public health response.

The A(H5N1) and A(H7N9) AI viruses remain two of the influenza viruses with pandemic potential, because they continue to circulate widely in some poultry populations, most humans likely have no immunity to them, and they can cause severe disease and death in humans.

In addition to A(H5N1) and A(H7N9), other animal influenza virus subtypes reported to have infected people include avian H9, and swine H1 and H3 viruses. H2 viruses may also pose a pandemic threat. Therefore, pandemic planning should consider risks of emergence of a variety of influenza subtypes from a variety of sources.

WHO Response

WHO, in its capacity for providing leadership on global health matters, is monitoring avian influenza very closely, developing and adjusting appropriate interventions in

collaboration with its partners. Such partners include animal health agencies and national veterinary authorities responsible for the control and prevention of animal diseases, including influenza.

39.11 Rotavirus Infection

Rotaviruses are a leading cause of severe diarrhoeal disease and dehydration in infants and young children throughout the world. Most symptomatic episodes occur in young children between the ages of 3 months and 2 years. The virus spreads rapidly, presumably through person-to-person contact, airborne droplets, or possibly contact with contaminated toys.

Symptoms usually appear approximately two to three days after infection, and include projectile vomiting and very watery diarrhoea, often with fever and abdominal pain. The first infection is usually the worst one.

There is no specific drug treatment for rotavirus infection, although oral rehydration therapy is recommended. There are now two new rotavirus vaccines to prevent severe rotavirus disease.

39.12 Foot-And-Mouth Disease

Foot-and-mouth disease (FMD) or hoof-and-mouth disease (*Aphthae epizooticae*) is an infectious and sometimes fatal viral disease that affects cloven-hoofed animals, including domestic and wild bovids. The virus causes a high fever for two or three days, followed by blisters inside the mouth and on the feet that may rupture and cause lameness.

Because FMD rarely infects humans, but spreads rapidly among animals, it is a much greater threat to the agriculture industry than to human health.

Causes

Occupation: Foot-and-mouth disease has severe implications for animal farming, since it is highly infectious and can be spread by infected animals through aerosols, through contact with contaminated farming equipment, vehicles, clothing, or feed, and by domestic and wild predators. Its containment demands considerable efforts in vaccination, strict monitoring, trade restrictions, and quarantines, and occasionally the killing of animals. Susceptible animals include cattle, water buffalo, sheep, goats, pigs, antelope, deer, and bison. It has also been known to infect hedgehogs and elephants. Humans are very rarely infected.

The virus responsible for the disease is a picornavirus, the prototypic member of the genus *Aphthovirus*. Infection occurs when the virus particle is taken into a

cell of the host. The cell is then forced to manufacture thousands of copies of the virus, and eventually bursts, releasing the new particles in the blood. The virus is genetically highly variable, which limits the effectiveness of vaccination.

Symptoms and Signs

The incubation period for foot-and-mouth disease virus has a range between one and 12 days. The disease is characterized by high fever that declines rapidly after two or three days, blisters inside the mouth that lead to excessive secretion of stringy or foamy saliva and to drooling, and blisters on the feet that may rupture and cause lameness. Adult animals may suffer weight loss from which they do not recover for several months, as well as swelling in the testicles of mature males, and in cows, milk production can decline significantly. Though most animals eventually recover from FMD, the disease can lead to myocarditis and death, especially in newborn animals. Some infected ruminants remain asymptomatic carriers, but they nonetheless carry FMDV and may be able to transmit it to others. Pigs cannot serve as asymptomatic carriers.

Transmission

The FMD virus can be transmitted in a number of ways, including close-contact animal-to-animal spread, long-distance aerosol spread and fomites, or inanimate objects, typically fodder and motor vehicles.

The clothes and skin of animal handlers such as farmers, standing water, and uncooked food scraps and feed supplements containing infected animal products can harbour the virus, as well.

Cows can also catch FMD from the semen of infected bulls. Control measures include quarantine and destruction of infected livestock, and export bans for meat and other animal products to countries not infected with the disease.

Just as humans may spread the disease by carrying the virus on their clothes and bodies, animals that are not susceptible to the disease may still aid in spreading it.

FMD vaccines must be highly specific to the strain involved. Vaccination only provides temporary immunity that lasts from months to years.

39.13 Kyasanur Forest Disease

Kyasanur forest disease (KFD) is a tick-borne viral hemorrhagic fever endemic to South Asia. The disease is caused by a virus belonging to the family *Flaviviridae*, which also includes yellow fever and dengue fever. The disease was first reported from Kyasanur Forest of Karnataka in India in March 1957. The disease first manifested as an epizootic outbreak among monkeys killing several of them in the year 1957. Hence the disease is also locally known as **Monkey Disease** or **Monkey Fever**.

Transmission

There are a variety of animals thought to be reservoir hosts for the disease, including porcupines, rats, squirrels, mice and shrews. The vector for disease transmission is *Haemaphysalis spinigera*, a forest tick. Humans contract infection from the bite of nymphs of the tick.

Presentation

The disease has a morbidity rate of 2-10%, and affects 100-500 people annually.

The symptoms of the disease include a high fever with frontal headaches, followed by haemorrhagic symptoms, such as bleeding from the nasal cavity, throat, and gums, as well as gastrointestinal bleeding.

An affected person may recover in two weeks time, but the convalescent period is typically very long, lasting for several months. There will be muscle aches and weakness during this period and the affected person is unable to engage in physical activities.

Treatment and Prevention

Prophylaxis by vaccination, as well as preventive measures like protective clothing, tick control, and mosquito control are advised. An attenuated live vaccine is now available. Specific treatments are not available.

39.14 Rabies

Key facts

- Rabies is a vaccine-preventable viral disease which occurs in more than 150 countries and territories.
- Dogs are the source of the vast majority of human rabies deaths.
- Rabies elimination is feasible by vaccinating dogs.
- Infection causes tens of thousands of deaths every year, mostly in Asia and Africa.
- 40% of people who are bitten by suspect rabid animals are children under 15 years of age.
- Immediate wound cleansing with soap and water after contact with a suspect rabid animal can be life-saving.
- Every year, more than 15 million people worldwide receive a post-bite vaccination to prevent the disease; this is estimated to prevent hundreds of thousands of rabies deaths annually.

Rabies is an infectious viral disease that is almost always fatal following the onset of clinical signs. In more than 99% of human cases, the rabies virus is transmitted

by domestic dogs. Rabies affects domestic and wild animals, and is spread to people through bites or scratches, usually via saliva.

Rabies is present on all continents except Antarctica, but more than 95% of deaths occur in Asia and Africa.

Rabies is a neglected disease of poor and vulnerable populations whose deaths are rarely reported and where human vaccines and immunoglobulin are not readily available or accessible. It occurs mainly in remote rural communities where children between the age of 5–14 years are the most frequent victims.

Prevention

Eliminating rabies in dogs

Rabies is a vaccine-preventable disease. Vaccinating dogs is the most cost-effective strategy for preventing rabies in people. Dog vaccination will drive down not only the deaths attributable to rabies but also the need for PEP as a part of dog bite patient care.

Preventive immunization in people

The same safe and effective vaccines can be used for pre-exposure immunization. This is recommended for people spending a lot of time outdoors, especially in rural areas. Pre-exposure immunization is also recommended for people in certain high-risk occupations such as laboratory workers dealing with live rabies virus and other rabies-related viruses (lyssaviruses), and people involved in any activities that might bring them professionally or otherwise into direct contact with bats, carnivores, and other mammals in rabies-affected areas. As children are considered at higher risk because they tend to play with animals their immunization could be considered.

Symptoms

The incubation period for rabies is typically 1-3 months, but may vary from <1 week to >1 year. The initial symptoms of rabies are fever and often pain or an unusual or unexplained tingling, pricking or burning sensation (paraesthesia) at the wound site. As the virus spreads through the central nervous system, progressive, fatal inflammation of the brain and spinal cord develops.

Two forms of the disease can follow. People with furious rabies exhibit signs of hyperactivity, excited behaviour, hydrophobia and sometimes aerophobia. After a few days, death occurs by cardio-respiratory arrest.

Paralytic rabies accounts for about 30% of the total number of human cases. This form of rabies runs a less dramatic and usually longer course than the furious form. The muscles gradually become paralyzed, starting at the site of the bite or scratch. A coma slowly develops, and eventually death occurs. The paralytic form of rabies is often misdiagnosed, contributing to the under-reporting of the disease.

Diagnosis

No tests are available to diagnose rabies infection in humans before the onset of clinical disease, and unless the rabies-specific signs of hydrophobia or aerophobia are present, the clinical diagnosis may be difficult.

Transmission

People are usually infected following a deep bite or scratch by an infected animal. Dogs are the main host and transmitter of rabies. Human deaths following exposure to foxes, raccoons, skunks, jackals, mongooses and other wild carnivore host species are very rare.

Transmission can also occur when infectious material – usually saliva – comes into direct contact with human mucosa or fresh skin wounds. Human-to-human transmission by bite is theoretically possible but has never been confirmed.

Post-exposure Prophylaxis (PEP)

Post-exposure prophylaxis (PEP) means the treatment of a bite victim that is started immediately after exposure to rabies in order to prevent rabies infection. This consists of:

- Local treatment of the wound, initiated as soon as possible after exposure;
- A course of potent and effective rabies vaccine that meets WHO standards; and
- The administration of rabies immunoglobulin, if indicated.
- Effective treatment soon after exposure to rabies can prevent the onset of symptoms and death.

Local treatment of the wound: This involves first-aid of the wound that includes immediate and thorough flushing and washing of the wound for a minimum of 15 minutes with soap and water, detergent, povidone iodine or other substances that kill the rabies virus.

Recommended PEP: Depending on the severity of the contact administering with the suspected rabid animal, administration of PEP is recommended as follows:

Categories of contact with suspect rabid animal	Post-exposure prophylaxis measures
Category I – touching or feeding animals, licks on intact skin	None
Category II – nibbling of uncovered skin, minor scratches or abrasions without bleeding	Immediate vaccination and local treatment of the wound
Category III – single or multiple transdermal bites or scratches, licks on broken skin; contamination of mucous membrane with saliva from licks or contacts with bats.	Immediate vaccination and administration of rabies immunoglobulin; local treatment of the wound

All category II and III exposures assessed as carrying a risk of developing rabies require PEP. This risk is increased if:

- the biting mammal is a known rabies reservoir or vector species;
- the animal looks sick or displays an abnormal behaviour;
- a wound or mucous membrane was contaminated by the animal's saliva;
- the bite was unprovoked; and
- the animal has not been vaccinated.

In developing countries, the vaccination status of the suspected animal alone should not be considered when deciding whether to initiate prophylaxis or not.

WHO Response

WHO – in close collaboration with the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE) and the Global Alliance for Rabies Control – is raising awareness of and commitment to overcoming this persistent zoonosis in endemic countries.

Great strides have been made in the Philippines, South Africa and Tanzania where a project is underway as part of a Bill & Melinda Gates Foundation project led by the WHO. The key towards sustaining and expanding the rabies programmes to new territories and countries has been to start small, demonstrate success and cost-effectiveness, and ensure community engagement.

Stockpiles of dog and human rabies vaccine have had a catalytic effect on rabies elimination efforts in countries.

Rabies transmitted by dogs has been eliminated in many Latin American countries, including Chile, Costa Rica, Panama, Uruguay, most of Argentina, the states of São Paulo and Rio de Janeiro in Brazil, and large parts of Mexico and Peru.

Many countries in the WHO South-East Asia Region have embarked on elimination campaigns in line with the target of regional elimination by 2020. Bangladesh launched an elimination programme in 2010 and, through the management of dog bites, mass dog vaccination and increased availability of vaccines free of charge, human rabies deaths decreased by 50% during 2010-2013.

PARASITIC INFESTATIONS DUE TO OCCUPATIONAL AETIOLOGY

39.15 Cryptosporidiosis

Cryptosporidiosis is an intestinal illness caused by a microscopic parasite called *Cryptosporidium*.

Symptoms

The incubation period may range from one to 12 days with an average of seven days.

The most common symptom is diarrhoea, which is usually watery. It is often accompanied by abdominal cramping, nausea, vomiting, fever, headache and loss of appetite. Some people infected with *Cryptosporidium* may not become ill.

In healthy individuals with normal immune systems, signs and symptoms generally persist for two weeks or less. However, immunocompromised persons may have severe and long lasting illness.

Transmission

Cryptosporidium is shed in the faeces of infected humans and animals. Because cryptosporidiosis is transmitted by the faecal-oral route, people become infected by ingesting the organism from infected people who have diarrhoea, people with poor personal hygiene. *Cryptosporidium* can be spread by person-to-person or animal-to-person contact and by drinking contaminated water. Infected individuals can shed the organism in their stool for several weeks even after they recover from the illness. Presence of immunity appears to be unclear and can have recurrent illness.

Diagnosis

It is diagnosed by identifying the parasite during a microscopic examination of the stool.

Treatment

There is no specific treatment for cryptosporidiosis. However, some patients may respond to certain antibiotics. Oral liquids or intravenous fluids are sometimes necessary if dehydration occurs. Anti-diarrhoeal drugs which reduce the motion of the intestines may provide some temporary improvement.

Prevention & Control

Chances of acquiring and spreading the infection can be achieved by thoroughly washing hands after using the toilet, changing diapers of babies or coming into contact with faecal material in any way. Because cattle are a common source of *Cryptosporidium*, raw milk should be avoided. Make sure to wash hands thoroughly after contact with cattle.

39.16 Trichinosis

Trichinosis (also called trichinellosis) is a disease that can affect both animals and humans. It is caused by small nematodes (roundworms) of the *Trichinella* species. Infective larvae are transferred (from host-to-host) by the consumption of raw or undercooked infected meat.

Trichinella have a worldwide distribution and are common in many wildlife populations. All mammals are susceptible to infection, but the number

of larvae required for infection varies according to the genetic makeup of the parasite and the host species. In many countries human trichinosis has been associated with the consumption of improperly or uncooked meat from infected swine.

Risk Factor

The risk to public health is considered to be low. This risk assessment is based on several factors including surveillance results, modern farm management techniques and the absence of outbreaks.

The risk of infection can be eliminated through the proper cooking of meat.

Clinical Features

Clinical signs of trichinosis in animals are not easily recognized. The severity of human trichinosis is dependent upon the number of infected larvae ingested, the species of *Trichinella*, and the immune status of the human host. Commonly observed signs, which appear 5 to 15 days after exposure, may include:

- Abnormal fear of light;
- Facial swelling;
- Fever;
- Gastrointestinal upset;
- Headaches;
- Muscle pain; and
- Skin rash.

Inflammation of the heart muscle and the brain, if they occur, are serious and may be life-threatening.

Transmission

Trichinosis is acquired by eating raw or undercooked meat that contains *Trichinella* larvae. Domestic animals can be infected by the consumption of infected raw tissues. In poorly managed farm operations, cycles of transmission can easily be established.

Diagnosis

Most infections in animal species (domestic and wild) are undiagnosed.

Treatment

The objective is to prevent the ingestion of viable *Trichinella* cysts. Treatment in humans is unpredictable, but consists of using antihelmintics as well as corticosteroids. Treatment must occur within a short timeframe of ingestion of infected meat in order to target the adult worm. The later the treatment occurs, the higher the probability that the person will harbour viable larvae in their muscles for years.

Prevention

It is important to note that most species of *Trichinella* found in wildlife are resistant to freezing, and, therefore are not eliminated using the freezing guidelines developed for pork; instead this meat needs to be well cooked. People must avoid uncooked meat and poultry products.

39.17 Ascariasis

Ascaris Lumbricoidis is a worm that infests the Human Intestine. It is also called Round Worm. It is 2 to 4 mm thick and 15 to 30 mm in length.

The worm lays eggs which are passed out through faeces of the infested person. The fertilized egg when deposited on the soil develops larva inside it over 10 to 40 days. Infection occurs when this incubated egg containing larvae is inadvertently ingested. This usually occurs through consumption of fresh vegetables, which are grown in fields manured by night soil. It may also occur with ingestion of contaminated water. Children playing in the mud, may contract the infestation by putting dirty fingers in the mouth.

When the egg reaches the duodenum, the larvae hatch out. They penetrate the intestinal mucosa and reach the portal vessels from where they are carried to the liver. Being carried via the Inferior Vena Cava and Right Heart, they reach the Lungs within 4 days. Here they grow for the next 10 to 15 days. They then pierce the lung capillaries and the Alveolar wall. Entering the alveoli, they crawl up the respiratory tract. At the throat they are swallowed down into the Gastro Intestinal Tract. On reaching the small intestine, they grow and develop into adult worms. After about 6 to 12 weeks, they begin laying eggs. They have a life span of 12 to 20 months.

Persons may experience an allergic pneumonia like reaction as the larva reaches the respiratory tract. Once the worm reaches the intestine, the person may experience improper digestion of food, malabsorption of food leading to Protein Energy Malnutrition. Occasionally person may experience symptoms of Intestinal Obstruction as the lumen of the intestine gets blocked by worms. The worms may wander up and down the GI Tract and can cause obstruction in the biliary duct, pancreatic duct etc.

Treatment

Drugs like Pyrantel Palmoate, Albendazole, Mebendazole, and Piperazine Citrate are effective.

Prevention

- Faecal contamination of soil must be eliminated

- Proper composting of Night soil must be carried out before it is used as manure
- Vegetables and garden crops must be treated by water containing Iodine 200ppm for 15 minutes as this kills eggs and larvae of Ascaris.

39.18 Tapeworm Infestation

Tapeworms are intestinal worms which may be a few mm long to meters long. Just like a tape they are flat and long. They are of various types – *T. saginata* (Beef Tapeworm), *T. solium* (Pork Tapeworm), *E. granulosus* (Dog Tapeworm), and *D. latum* (Fish Tapeworm).

Infection is through the oral route. It may occur by ingestion of undercooked beef pork or fish. It may also occur due to consumption of raw vegetable that are grown in soil contaminated with faeces of infected person. Dog tape worm infestation may occur because of contamination of food by unwashed hand after tending dogs or by consumption of raw vegetables grown in areas contaminated with dog faeces.

Eggs of beef tape worm and fish tapeworm when ingested by man grow into worms that live in the intestine. They attach to the walls of the intestine and obtain their nutrition there. Person may have vague abdominal discomfort, indigestion. Worms might be notices crawling out of the anus or during stools.

In the case of pork tapeworm and dog tapeworm, the eggs hatch in the intestine into larve. These penetrate the intestinal wall and enter the venules and are carried into the systemic circulation. They get entrapped in the muscles and other organs where they form cystecercous. Cystecercous forming in the Brain manifests as Epilepsy. In the eye it initially causes blurring of vision and progresses to blindness.

Treatment of Intestinal worms:

Praziquantel is the drug of choice. It is given as a single dose at 10 mg/kg.

T Niclosamide is given as 4 tablets given in the morning on an empty stomach in a single dose.

These may be followed by a mild purgative 2 to 3 hours later.

Treatment of Cystecercosis:

Treatment varies on the site of Cystecercous formation.

Tab Albendazole 400 mg can be given twice a day with a fatty meal upto 28 days.

Tab Praziquantel is given 50 mg/kg/day in three divided doses for 15 days.

Prevention

- Eating fish/meat that is cleaned and well cooked.
- Eating vegetables grown in clean soil and that too after washing or cooking.
- Maintaining local hygienic practices such as washing hands before contact with food.
- Proper disposal of night soil to avoid contamination of cultivation land.
- De worming of dogs.

39.19 Hook Worm Infestation

These worms (*Ankylostoma duodenale* and *Necotar americans*) are human parasites, commonly found in southern India. They live in the small intestine of an infected person. It is around 10 mm in length and 0.5 mm thick.

Eggs are passed in faeces of the infected person and are deposited on the soil. After 2 days the larva hatches out of the egg. It feed on bacteria and other organic matter and grows in size. By the fifth day it reaches the infective stage. When a person walks barefoot on soil containing larvae, these larvae penetrate the skin and enter the subcutaneous tissue. Usual sites of entry are skin between the toes, dorsum of foot and medial aspect of the sole. In farmers and miners, the larvae may penetrate the skin of the hand.

From the subcutaneous tissue, the larvae enter the venules and are carrier to the heart and thereafter to the lungs. Here they break out of the capillaries and reach the alveoli. Migrating up the respiratory tract they cross over to the pharynx at the epiglottis and are swallowed.

On reaching the small intestine (jejunum/duodenum) they attach themselves to the gut mucosa and there grow into adults.

They utilize the gut epithelial cells and plasma for their nutrition. Blood if sucked by the worm is excreted by it undigested. The worm shifts from one site to another, the site from where it detaches continues to bleed for some time even after the detachment because of an anticoagulant which the worm secretes. The blood loss occurring (0.8 cc per day) is significant to cause Iron Deficiency Anaemia. Adult worms lay eggs that are excreted in the faeces.

Person suffering from Hookworm infestation experiences, a reddish raised rash at the site where the larva has entered the skin. This may last for 2 weeks.

When there is heavy infestation, pneumonia like symptoms may develop.

Due to chronic blood loss, Iron Deficiency Anaemia may develop which may manifest as dullness, lassitude, decreased working and learning capacities. Pallor may be observed.

Hypoprotienemia may develop due to loss of protein or malabsorption. This may cause exertional dyspnoea, palpitation, dizziness and generalized puffy oedema.

The Anaemia and Hypoprotienemia may complicate into cardiac failure.

Treatment:

Mebendazole and Pyrantel Palmoate are the drugs of choice to treat Hook worm infestation.

Anaemia may be treated by Oral Iron. Packed cell transfusion may be required in severe Anaemia.

Prevention

- Proper disposal of night soil
- Use of footwear and gloves
- Treatment of all patients and carriers in an affected area simultaneously.

Skin Diseases Caused by Arthropods

Basic Categories of Arthropods

Here are some basic examples of arthropods sorted by the non-extinct subphyla:

Chelicerata: horseshoe crabs, spiders, scorpions, sea spiders and mites

- *Myriapoda*: millipedes, centipedes, pauropods and symphylans (glasshouse or garden centipedes)
- *Crustacea*: brine shrimp, barnacles, lobsters, crabs, shrimp and remipedes
- *Hexapoda*: insects and three orders of entognatha: collembola, proturans and diplura

Arthropods in workplace or at home can cause various cutaneous symptoms, including blistering and contact dermatitis, allergic reaction and secondary infection. Pathogens transmitted by insects may cause systemic symptoms. Infestation by arthropods or insects may not only result in cutaneous symptoms, but various pathogens carried by arthropods and other noxious animals can infect humans.

39.20 Insect Bite or Sting

Insect bite is a general term for the dermatitis that is caused by the bite or sting of a mosquito, gnat, horsefly, bee or other insects. It is thought to be an allergic reaction to the salivary components that the insect discharges while sucking blood or to the venom of stings. The severity of the clinical symptoms depends largely on the age of the patient and the severity of allergic reaction. Itching and erythema appear immediately after an insect bite. There are two major clinical types of insect bites:

- Immediate hypersensitivity, in which symptoms subside in 1 to 2 hours; and

- Delayed hypersensitivity, in which erythema or blistering may occur 1 to 2 days after a bite;
- Treatments are topical steroid application for eruptions, and oral antihistamines for itching lesions. A bee sting may sometimes cause an anaphylactic reaction.

39.21 Hypersensitivity after Mosquito Bite

After a mosquito bite, an allergic reaction occurs against the protein in the salivary components of the mosquito, sometimes leading to systemic symptoms such as high fever, liver dysfunction and lymph node enlargement, and cutaneous symptoms including blistering. Later, swelling, induration, necrosis and ulceration occur. During the course of hypersensitivity to mosquito bite, the histopathological symptoms may resemble those of hydroa vacciniforme.

39.22 Caterpillar Dermatitis

The irritating hair of larval moths and butterflies (caterpillars) cause caterpillar dermatitis. The affected site has tingling pain. Punctate, itching erythema is followed by a red wheal that progresses to vesicles and papules.

39.23 Dermatitis Linearis

The hemolymph of the beetle *Paederus fuscipes* Curtis comes into contact with the skin, causing dermatitis linearis. 2-3 days after contact, characteristic linear skin lesions, reddening, vesicles, swelling, burning sensation and sharp pain occur.

39.24 Scabies

It is an infestation caused by the mite *Sarcoptes scabiei* var. *hominis*. Multiple papules occur. Intense itching is present, worsening at night. The genitalia, trunk and interdigital areas are most frequently involved. It is characterized by “tunnels” (burrows) in the interdigital area. It may be transmitted by bedclothes or skin-to-skin contact.

Scabies patients can't sleep due to itching. Scratching of the skin lesions may lead to formation of eczematous plaques. When the interdigital areas

and palms are involved, there may be slightly elevated, greyish-white linear lesions (mite burrows) several millimetres long where female insects lay eggs.

Benzyl benzoate, topical g -benzenehexachloride and oral ivermectin are the main treatments.

39.25 Tick bite

Tick bite is caused by ixodid (hard) ticks. Because ticks of the family Ixodidae tend not to be felt when crawling on human skin, they are able to attach insidiously to the face, arms or even the trunk or genitals of humans. The bite tends to be painless. The main symptoms are inflammation around the bite, erythema, oedematous swelling, bleeding and blistering. The mouthpart is firmly fixed in the skin while sucking blood. A tick that has sucked its fill of blood falls off from the body. *Borrelia* spirochetes may be transmitted by a tick bite, leading to Lyme disease. Ixodidae are 2 mm to 8 mm long and tend to inhabit grasslands or woods. They burrow into the skin of humans and animals to suck blood. If a tick is forcefully pulled while sucking blood, it may tear, leaving the mouthpart in the skin. This can lead to foreign-body granuloma. The whole tick, including the mouthpart, should be removed by either inserting scissors into the bite spot or punching the site out with the tick attached.

Oral administration of tetracycline 1 week after removal is advised as a prophylactic against Lyme disease. Topical application of ointments containing sulfur, crotamiton and benzyl benzoate is helpful. It is important to apply the ointment to the entire body skin below the neck of all family members and partners, regardless of whether they are symptomatic. Oral ivermectin has become available and it is extremely effective, requiring only one administration a day. Antihistamines may be used. Thorough laundering and sun drying of bedclothes is recommended.

39.26 Lice Infestation

Allergic reaction is induced by a louse that parasitizes human skin to suck blood, causing intense itching. Lice are host-specific and spend their entire life on the host. The three main causative lice of pediculosis are *Pediculus capitis* (head lice, 2 mm to 4 mm long, inhabiting head hair), *Pediculus humanus* (clothing or body lice, 2 mm to 4 mm long, inhabiting clothing), and *Pthirus pubis* (pubic or crab lice, 1 mm long, inhabiting pubic hair). It is impossible to distinguish between *Pediculus capitis* and *Pediculus humanus* by appearance. A louse parasitizes a hair shaft and lays eggs on the hair. The eggs incubate for about 1 week. The lice mature and suck

human blood. In most cases, intense itching begins 1 to 2 months after infection. Eruptions do not usually occur.

39.27 Skin Diseases Caused by Jellyfish, MEMO, Coral and Sea Anemones

An eruption may be caused by the sting of jellyfish, coral or sea anemones in the ocean. Some marine organisms sting humans with the nematocysts on their tentacles or otherwise injure human skin by contact. Systemic symptoms may be severe. Powders are helpful treatments. The family members and sexual partners are also treated to avoid “ping-pong” infestation, in which the disease repeatedly rebounds from untreated to treated persons.

Emergencies and Systemic Disorders

- | | | | |
|-------------|-----------------------|--------------|-------------------------------|
| 40.1 | Electric shock | 40.7 | Scorpion Sting/Bite |
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This chapter discusses life threatening or critical conditions that may arise at the workplace or due to conditions or circumstances that workers in the informal sector are subjected to. It also discusses physical injuries, traumatic conditions, metabolic disorders, illnesses caused due to contact with substances and conditions affecting multiple systems.

A **WORKPLACE EMERGENCY** IS an unforeseen situation that threatens your employees, customers, or the public; disrupts or shuts down your operations; or causes physical or environmental damage. In the informal sector there exist no protocols in place to deal with an emergency. Even organised businesses do not think to plan for emergencies and fail to execute drills and practice sessions.

The doctor may be the first person to see the affected individual in most cases and no first aid may have been given to the affected individuals. Sometimes multi-systemic disorders such as green tobacco sickness can be misdiagnosed and treated differently without understanding the occupational exposure to substances and circumstances. This chapter also deals with conditions of this type.

40.1 Electric shock

Electric shock is the expression is used to describe an injurious exposure to electricity and it means the physiological reaction or injury caused by electric current passing

through the human body. Contact of body part with any source of electricity that causes a sufficient current through the skin, muscles, or hair can produce electric shock.

Very small currents can be imperceptible. Larger current passing through the body may make it impossible for a shock victim to let go of an energized object. Still larger currents can cause fibrillation of the heart and damage to tissues. Death caused by an electric shock is called electrocution.

An electrical injury can travel through the nervous system and burn out tissue in patches along the way. This can leave bizarre symptoms anywhere on the body and may lead to complex regional pain syndrome. Wiring or other metalwork which is at a hazardous voltage which can constitute a risk of electric shock is called “live”, as in “live wire”.

Mechanism

The minimum current a human can feel at least 1 mA (rms) of AC at 60 Hz, while at least 5 mA for DC. At around 10 milliamperes, AC current passing through the arm of a 68-kilogram (150 lb) human can cause powerful muscle contractions; the victim is unable to voluntarily control muscles and cannot release an electrified object (“let go threshold”).

The current more than 30 mA ^[6] of AC (rms, 60 Hz) or 300 – 500 mA of DC can cause fibrillation which leads to cardiac arrest; A sustained electric shock from AC at 120 V, 60 Hz is an especially dangerous source of ventricular fibrillation because it usually exceeds the let-go threshold, while not delivering enough initial energy to propel the person away from the source.

Signs and Symptoms

Burns

Second-degree burn after a high tension line accident

Heating due to resistance can cause extensive and deep burns. Damage due to current is through tissue heating. Voltage levels of 500 to 1000 volts tend to cause internal burns due to the large energy source. For most cases of high-energy electrical trauma, heating in the deeper tissues along the extremity will reach damaging temperatures in a few seconds.

Ventricular Fibrillation

A domestic AC power supply voltage (110 or 230 V), 50 or 60 Hz current through the chest for a fraction of a second may induce ventricular fibrillation at currents as low as 30 mA, while with DC current, 300 to 500 mA is required. If not immediately treated by defibrillator fibrillation is usually lethal. Above 200 mA, muscle contractions are so strong that the heart muscles cannot move at all, but these conditions prevent fibrillation.

Neurological Effects

Repeated or severe electric shock which does not lead to death has been shown to cause neuropathy.

When the current path is through the head, it appears that, with sufficient current applied, loss of consciousness almost always occurs swiftly.

Pathophysiology

Body Resistance

The voltage necessary for electrocution depends on the current through the body and the duration of the current. The current drawn depends on the resistance of the body. The resistance of human skin varies from person to person and fluctuates between different times of day. High-voltage electrical energy quickly breaks down human skin, reducing the human body's resistance to 500 Ohms.

Point of entry:

- *Macroshock*: Current across intact skin and through the body. Current from arm to arm, or between an arm and a foot, is likely to traverse the heart, therefore it is much more dangerous than current between a leg and the ground. This type of shock by definition must pass into the body through the skin.
- *Microshock*: Very small current source with a pathway directly connected to the heart tissue. The shock is required to be administered from inside the skin, directly to the heart i.e. a pacemaker lead, or a guide wire, conductive catheter etc. connected to a source of current. This is a largely theoretical hazard as modern devices used in these situations include protections against such currents.

Lethality

Electrocution

The term “electrocution,” coined about the time of the first use of the electric chair in 1890, originally referred only to *electrical execution* and not to accidental or suicidal electrical deaths. However, since no English word was available for non-judicial deaths due to electric shock, the word “electrocution” eventually took over as a description of all circumstances of electrical death.

The lethality of an electric shock is dependent on several variables:

- Current. The higher the current, the more likely it is lethal. Since current is proportional to voltage when resistance is fixed, high voltage is an indirect risk for producing higher currents;
- High voltage (over about 600 volts). In addition to greater current flow, high voltage may cause dielectric breakdown at the skin, thus lowering skin resistance and allowing further increased current flow;
- Duration. The longer the duration, the more likely it is lethal-safety switches may limit time of current flow;

- Pathway. If current flows through the heart muscle, it is more likely to be lethal.

Medical Treatment

Treatment of electric shock depends on the severity of the burns or the nature of other injuries found:

- Burns are treated according to severity.
 - Minor burns may be treated with topical antibiotic ointment and dressings.
 - More severe burns may require surgery to clean the wounds or even skin grafting.
 - Severe burns on the arms, legs, or hands may require surgery to remove damaged muscle or even amputation.
- Other injuries may require treatment.
 - Eye injuries may require examination and treatment by an ophthalmologist
 - Fractures require splinting, casting, or surgery to stabilize the bones.
 - Internal injuries may require observation or surgery.

Prevention

Steps to prevent electrical injury depend primarily on the age of people involved.

Children

- For children younger than 12 years, most electrical injuries are caused by power cords and extension cords. Replace any cords that have broken or cracked external covering and any cord that has exposed wire:
 - Do not allow children to play with any electrical cord;
 - Limit use of extension cords and be sure the cord is rated for the current used;
 - Use outlet covers to protect infants from exploring electrical outlets;
- Update old, ungrounded electrical outlets to grounded (3-prong) systems. Replace outlets near any water (sink, tub) with fused (GFCI) outlets;
- In children older than 12 years, most electrical injuries result from exploring and activities around high-power systems. Explain to children the dangers of electric shocks.

Adults: Following advice may be given.

- Use of common sense can help reduce electrical injury. People working with electricity should always check that the power is off before working on electrical systems. Avoid use of any electrical device near water;
- Use caution when outdoors during a thunderstorm with lightning. Protect yourself from lightning strikes by seeking shelter in a sturdy building or crouching low and stay away from trees and metal objects.

Prognosis

Recovery from electric shock depends on the nature and severity of the injuries. The percentage of the body surface area burned is the most important factor affecting prognosis.

If someone who has received an electric shock does not suffer immediate cardiac arrest and does not have severe burns, he or she is likely to survive. Infection is the most common cause of death in people hospitalized following electrical injury.

Electrical damage to the brain may result in a permanent seizure disorder, depression, anxiety, or other personality changes.

40.2 Thermal Burns

Thermal burn is a type of burn resulted from making contact with heated objects, such as boiling water, steam, hot objects, hot cooking oil and fire. Scalds are the most common type of thermal burn suffered by children, but for adults thermal burn is most commonly caused by fire. Burns are generally classified from first degree up to fourth degree, or as minor, moderate, and major, based almost solely on the depth and size of the burn.

Pathophysiology

There are three or four degrees of burns, in ascending order of severity and depth.

According to Jackson's thermal wound theory, there are three zones of major burn injury, shaped usually like a bull's-eye:

1. **Zone of coagulation** is the centre area of the wound, where all tissues are damaged there.
2. **Zone of stasis** surrounds the coagulation area, where some tissues are not damaged.
3. **Zone of hyperaemia** is the unburned area surrounding zone of stasis, but it is red due to increased blood flow through inflammatory response.

Factors

- The minimum temperature where skin can suffer burn in a finite amount of time is 44°C.
- From 44° to 51°C (111° to 124°F), the rate of burn increases by approximately quadruple with each Celsius degree risen, from six hours down to six seconds.
- The burn would develop in less than a second if the exposure temperature is at least 70°C.

Resistance

There are skin factors that offer resistance to burns. A person who is more burn resistant would require higher temperature and longer exposure to burn as badly than a less resistant person.

Thicker skin would offer more insulation from heat. External factors on the skin like hair, moisture or oils can also help ease and delay the burn. Another factor is skin circulation, which is used to dissipate heat imprinted on the skin.

Causes*Hot Liquids and Steam*

Scalding is a type of thermal burn caused by boiling water and steam. Scalds are commonly caused by accidental spilling of hot liquids, having temperature of water too high in baths and showers, steam from boiling water or heated food, and getting splattered by hot cooking oil. Scalding causes usually a first- or second-degree burn, but third-degree burn can sometimes result from prolonged contact.

Fire

Fire causes about 50% of all cases of thermal burns. The most frequent event is during house fires, where 85% of all fire deaths took place there. Fireworks are another notable cause of fire burns, especially by adolescent males on festival days like Diwali. In forest regions getting burned by wildfires is common. If clothing the person wears catches fire, third-degree burns can develop in the matter of just few seconds.

Hot Objects

Solid hot objects can also cause contact burns. Such burns imprinted on the skin usually form the pattern that resembles it. Sources of burns from solid objects include ashes and coal, irons, soldering equipment, frying pans and pots, light bulbs, and exhaust pipes.

Prevention

Education is an important tool for adults and children on how to prevent getting burned by fire or getting scalded. In that act, fire-fighters and community leaders are often employed in workplaces, schools and clinics.

Treatment

The household method of treating a minor burn is cooling the burn using cool water or applying antiseptic onto it. The pain or inflammation can effectively be treated using acetaminophen (paracetamol), or ibuprofen. Ice, butter, cream and ointment cannot be used since they can worsen the burn.

If person is on fire, he/she must be told to stop, drop, and roll, cover them with heavy blanket, wool, coat, or rug. Then water should be poured onto the victim to cool them down. Burned clothing stuck to the skin must not be removed. CPR can be performed on victim and be sent to a hospital if the burn is severe enough. Severe burn patients are often treated through trauma resuscitation, airway management, fluid resuscitation, blood transfusion, wound management, and skin grafting, as well as the use of antibiotics.

Outcome

About 95% of people hospitalized for thermal burns survive. Survival rates increased steadily over the last half century due to advances in treating burns as well as more trustful burn centres. The risks of death caused by burns are greater for:

- people older than 60 years of age;
- burns covering over 40% of the body; and
- patients suffering inhalation injury.

Epidemiology

Burn Triage and Treatment – Thermal Injuries

General Information

After a chemical mass casualty incident, trauma with or without burns is expected to be common.

Burn therapy adds significant logistical requirements and complexity to the medical response in a chemical mass casualty incident. Burns complicating physical injury and/or chemical injury decrease the likelihood of survival.

Burn experts are needed to optimize burn care

Diagnosis of Burns

Definition: A burn is the partial or complete destruction of skin caused by some form of energy, usually thermal energy.

Burn severity is dictated by

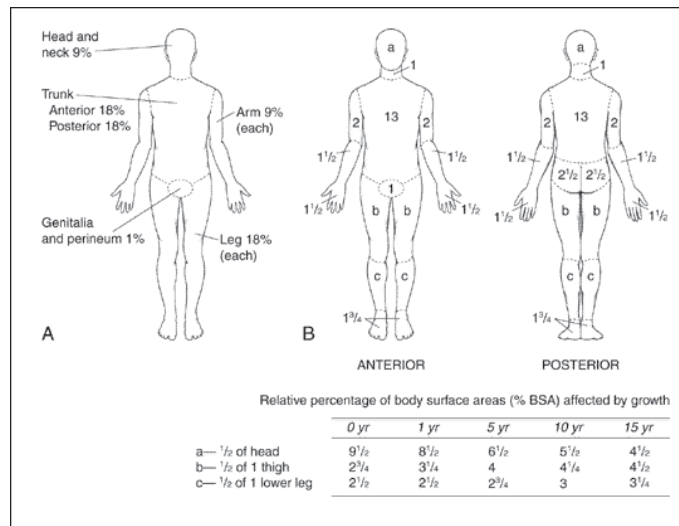
- Percent total body surface area (TBSA) involvement.
- Burns >20-25% TBSA require IV fluid resuscitation.
- Burns >30-40% TBSA may be fatal without treatment.

In adults: “Rule of Nines” is used as a rough indicator of % TBSA Rule of Nines for Establishing Extent of Body Surface Burned:

Anatomic Surface	% of total body surface
Head and neck	9%
Anterior trunk	18%
Posterior trunk	18%
Arms, including hands	9% each
Legs, including feet	18% each
Genitalia	1%

In children, adjust percents because they have proportionally larger heads (up to 20%) and smaller legs (13% in infants) than adults; Palmar hand surface is approximately 1% TBSA.

Estimating Percent Total Body Surface Area in Children Affected by Burns



(A) Rule of “nines”

(B) Lund-Browder diagram for estimating extent of burns (Adapted from The Treatment of Burns, edition 2, Artz CP and Moncrief JA, Philadelphia, WB Saunders Company, 1969)

Depth of burn injury (deeper burns are more severe)

- Superficial burns (first-degree and superficial second-degree burns):
 - First-degree burns;
 - Damage above basal layer of epidermis;
 - Dry, red, painful (“sunburn”);
- Second-degree burns:
 - Damage into dermis;
 - Skin adnexa (hair follicles, oil glands, etc.) remain;

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- Heal by re-epithelialisation from skin adnexa;
- The deeper the second-degree burn, the slower the healing (fewer adnexa for re-epithelialisation);
- Moist, red, blanching, blisters, extremely painful;
- Superficial burns heal by re-epithelialisation and usually do not scar if healed within 2 weeks.

Deep burns (deep second-degree to fourth-degree burns)

- Deep second-degree burns (deep partial-thickness):
 - Damage to deeper dermis;
 - Less moist, less blanching, less pain;
 - Heal by scar deposition, contraction and limited re-epithelialisation.
- Third-degree burns (full-thickness):
 - Entire thickness of skin destroyed (into fat);
 - Any colour (white, black, red, brown), dry, less painful (dermal plexus of nerves destroyed);
 - Heal by contraction and scar deposition (no epithelium left in middle of wound).
- Fourth-degree burns:
 - Burn into muscle, tendon, bone;
 - Need specialized care (grafts will not work);
 - Deep burns usually need skin grafts to optimize results and lead to hypertrophic (raised) scars if not grafted.

Diagnosis of CO poisoning

- Non diagnostic:
 - PaO₂ (partial pressure of O₂ dissolved in serum);
 - Oximeter (difference in oxy- and deoxyhemoglobin);
 - Patient colour (“cherry red” with poisoning).
- Diagnostic:
 - Carboxyhemoglobin levels;
 - <10% is normal;
 - >40% is severe intoxication.

Treatment

- Remove source.
- 100% oxygen until CO levels are <10%.

Circulation

- Obtain IV access anywhere possible.
- Unburned areas preferred.
- Burned areas acceptable.

- Central access more reliable if proficient.
- Cut-downs are last resort

Resuscitation in burn shock (first 24 hours)

- Massive capillary leak occurs after major burns.
- Fluids shift from intravascular space to interstitial space.
- Fluid requirements increase with greater severity of burn (larger % TBSA, increase depth, inhalation injury, associate injuries – see above).
- Fluid requirements decrease with less severe burn (may be less than calculated rate).
- IV fluid rate dependent on physiologic response.
- Place Foley catheter to monitor urine output.
- Goal for adults: urine output of 0.5 ml/kg/hour.
- Goal for children: urine output of 1 ml/kg/hour.
- If urine output below these levels, increase fluid rate.

Preferred fluid: Lactated Ringer's Solution as it is isotonic, cheap and easily stored

Important Note:

Patient with Burns >30-40% TBSA may be fatal without treatment. It is imperative that all Burn cases including Burns >20-25% TBSA, except superficial be transferred to a Burn Centre or the nearest hospital without wasting time after starting IV Lactated Ringer's Solution.

40.3 Anaphylaxis

In most cases, people with allergies, when triggered by an allergen develop mild to moderate symptoms, such as watery eyes, a runny nose or a rash. But sometimes, exposure to an allergen can cause a life-threatening allergic reaction known as *anaphylaxis*. This severe reaction occurs when an over-release of body's internal chemical substances put the person into shock. Allergies to food, insect bites, medicines and latex are most frequently associated with anaphylaxis.

A second anaphylactic reaction, known as a biphasic reaction, can occur as long as 12 hours after the initial reaction. Just because an allergic person has never had an anaphylactic reaction in the past to an offending allergen, doesn't mean that one won't occur in the future. A person, who had an anaphylactic reaction in the past, is at risk of future reactions.

Symptoms

Anaphylaxis symptoms occur suddenly and can progress rapidly. The early symptoms may be mild, such as a runny nose or a skin rash. These symptoms can quickly lead to more serious problems, including:

- Trouble breathing
- Hives or swelling
- Throat tightness
- Hoarse voice
- Nausea
- Vomiting
- Abdominal pain
- Diarrhoea
- Dizziness
- Fainting
- Low blood pressure
- Rapid heart beat
- Feeling of sinking
- Sudden attack of extreme pruritus
- Cardiac arrest

Management and Treatment

An anaphylactic reaction should be treated immediately with an injection of adrenaline. Sometimes two injections may be necessary to control symptoms.

Even if the first reaction is mild, future reactions might be more severe. Patients as well as their families must be explained about anaphylaxis in detail and educated about the seriousness of this condition so that they can deal with such an occurrence effectively, should it happen to occur in the future.

Prevention

Patient awareness and education about the following points may make them safe in future. Here are some tips to be given to the patient for reducing the risk of anaphylaxis:

1. Know the allergen. If one has had anaphylaxis in the past, it's very important to know what started the reaction. The most common triggers are:
 - Food: peanuts, walnuts and pecans, fish, shellfish, cow's milk and eggs;
 - Latex: found in disposable gloves, intravenous tubes, syringes, adhesive tapes and catheters. Health care workers and people who work with natural latex are at higher-risk for latex-induced anaphylaxis;
 - Medication: penicillin, aspirin and non-steroidal anti-inflammatory drugs such as ibuprofen;
 - Insect bites: with bees, wasps, hornets, and fire ants.
2. Avoid the allergen if known. Avoidance is the most effective way to prevent anaphylaxis.
3. Be prepared. Prompt recognition of the signs and symptoms of anaphylaxis is critical. If you unexpectedly come into contact with your trigger, you should consider it as an emergency and contact the doctor.

40.4 Hypovolemia

Hypovolaemic shock, also known as hemorrhagic shock, is a life-threatening condition that results when body will lose more than 20 percent of body's blood or fluid supply. This severe fluid loss makes it impossible for the heart to pump a sufficient amount of blood to body. Hypovolaemic shock can lead to organ failure. This condition requires immediate emergency medical attention.

Causes

Hypovolaemic shock results from significant and sudden blood or fluid losses within body's body. Blood loss of this magnitude can occur because of:

- bleeding from cuts or wounds
- bleeding from blunt traumatic injuries due to accidents or seizure activity
- internal bleeding from the digestive tract or due to a ruptured ectopic pregnancy

In addition to actual blood loss, the loss of body fluids can cause a decrease in blood volume. This can occur in cases of:

- excessive or prolonged diarrhoea
- severe burns
- protracted and excessive vomiting
- excessive sweating

When heavy bleeding occurs, there isn't enough blood that carries oxygen and other essential substances flow to the organs in body. When body loses these substances faster than it can replace those, organs in body begin to shut down. As body's heart shuts down and fails to circulate enough blood through body, the symptoms of shock occur. Blood pressure drops and there is a severe drop in body temperature, which can be life-threatening.

Symptoms

The symptoms of Hypovolaemic shock vary with the severity of the fluid or blood loss. However, all symptoms of shock are life-threatening and need emergency medical treatment. Internal bleeding symptoms may be hard to recognize until the symptoms of shock appear, but external bleeding will be visible. Symptoms of hemorrhagic shock may not appear immediately. Older adults may not experience these symptoms until the shock progresses significantly.

Symptoms include:

- Anxiety;
- Blue lips and fingernails;
- Low or no urine output;
- Profuse sweating;
- Shallow breathing;
- Dizziness;
- Light headedness;
- Confusion;

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- Chest pain;
- Loss of consciousness;
- Low blood pressure;
- Rapid heart rate;
- Weak pulse.

The sign of external haemorrhaging is bleeding profusely at the site of injury. Signs of internal haemorrhaging include:

- Abdominal pain;
- Blood in the stool;
- Black, tarry stool (melena);
- Blood in the urine;
- Vaginal bleeding (heavy, usually outside of normal menstruation)
- Vomiting blood;
- Chest pain;
- Abdominal swelling.

Diagnosis

There are often no advance warnings of shock. Instead, symptoms tend to arise only when it is almost a critical condition. A physical examination can reveal signs of shock, such as low blood pressure, feeble pulse and tachycardia. A person experiencing shock may also be less responsive when asked questions. Heavy bleeding is immediately recognizable, but internal bleeding sometimes isn't found until signs of hemorrhagic shock appear. In addition to physical symptoms, a variety of testing methods described below may be used in the hospital:

- Blood test for electrolyte imbalances and kidney function;
- Computerized tomography (CT) scan or ultrasound to visualize body organs;
- Echocardiogram to measure heart rhythm;
- Endoscopy to examine the oesophagus and other gastrointestinal organs;
- Right heart catheterization to check how blood is circulating;
- Urinary catheterization to measure the amount of urine in the bladder.

Emergency Care and First Aid

Untreated Hypovolaemic shock will lead to death. Hypovolaemic shock is a medical emergency. Try to start IV fluids immediately and prepare to transfer the patient immediately to a hospital if you observe a person experiencing shock symptoms. Until ambulance arrives:

- Have the person lie flat with their feet elevated about 12 inches. Don't elevate the head.
- Refrain from moving the person if you suspect a head, neck, or back injury.
- Keep the person warm.
- Refrain from giving the person fluids by mouth because of the risk of choking.

Remove any visible dirt or debris from the injury site. Do not remove embedded glass, a knife, stick, arrow, or any other object stuck in the wound. If the area is clear of debris and no visible object protrudes from it, tie a tourniquet around the

site of injury to minimize blood loss. Apply pressure to the area. Cover the injury with bandage.

Treatment

Once at a hospital, a person suspected of having Hypovolaemic shock will receive fluids or blood products via an intravenous line. Doctors may also administer medications that increase the heart's pumping strength. These include:

- Dopamine;
 - Dobutamine;
 - Epinephrine;
 - Norepinephrine
- Close cardiac monitoring, as well as monitoring body's kidney function, will determine the effectiveness of the treatment you receive.

Complications

A lack of blood and fluid in body's body can lead to the following complications:

- Damage to organs such as body's kidney or brain;
- Gangrene of the arms or legs;
- Heart attack.

The effects of Hypovolaemic shock depend on the speed at which the patient is losing blood or fluids and the amount of blood or fluids he is losing. The extent of body's injuries can also determine body's chances for survival. If patient has chronic medical conditions such as diabetes or heart, lung, or kidney disease, these conditions can increase the likelihood of more complications.

Prognosis

Common complications of hemorrhagic shock include:

- Kidney damage;
- Other organ damage;
- Death.

Some patients may also develop gangrene due to decreased circulation to the limbs. This condition may lead to amputation of the affected limb/s. Overall, body's outlook will depend on the amount of blood lost and the type of injury was sustained. The outlook is best in healthy patients who haven't had severe blood loss.

40.5 Sepsis

Sepsis is a life-threatening illness caused by patient's body's response to an infection. Patient's immune system protects him from many illnesses and infections, but it's also possible for it to go into overdrive in response to an infection.

Sepsis develops when the chemicals the immune system releases into the bloodstream to fight an infection cause inflammation throughout the entire body instead. Severe cases of sepsis can lead to septic shock, which is a medical emergency.

Causes

Any infection can trigger sepsis, but the following types of infections are more likely to cause sepsis:

- Pneumonia;
- Abdominal infection;
- Kidney infection;
- Bloodstream infection;
- Possible reasons for the increase in cases of sepsis include;
- An aging population because sepsis is more common in seniors;
- An increase in antibiotic resistance;
- An increase in the number of people with illnesses that weaken their immune systems.

Risk Factors

Although some people have a higher risk of infection, anyone can get sepsis. People who are at risk include:

- Young children and seniors;
- People with weaker immune systems, such as those with HIV or those in chemotherapy treatment for cancer;
- People being treated in an intensive care unit (ICU);
- People exposed to invasive devices, such as intravenous catheters or breathing tubes.

Symptoms

There are three stages of sepsis: sepsis, severe sepsis, and septic shock. Sepsis can happen while patient is still in the hospital recovering from a procedure, but this isn't always the case. It's important to seek immediate medical attention if he has any of the below symptoms. The earlier the treatment, the greater are patient's chances of survival.

1. Sepsis

Symptoms of sepsis include:

- A fever above 101°F or a temperature below 96.8°F;
- Heart rate higher than 90 beats per minute;
- Breathing rate higher than 20 breaths per minute;
- Probable or confirmed infection;

Patient must have two of these symptoms before a doctor can diagnose sepsis.

2. Severe Sepsis

Severe sepsis occurs when there is organ failure. He must have one or more of the following signs to be diagnosed with severe sepsis:

- Patches of discoloured skin;
- Decreased urination;
- Changes in mental ability;
- Low platelet (blood clotting cells) count;
- Problems breathing;
- Abnormal heart functions;
- Chills due to fall in body temperature;
- Unconsciousness;
- Extreme weakness.

3. Septic Shock

Symptoms of septic shock include the symptoms of severe sepsis, plus a very low blood pressure.

Serious Effects

Although sepsis is potentially life-threatening, the illness ranges from mild to severe. There's a higher rate of recovery in mild cases. Septic shock has a 50 percent mortality rate. Having suffered severe sepsis once increases patient's risk of a future infection.

Severe sepsis or septic shock can also cause complications. Small blood clots can form throughout patient's body. These clots block the flow of blood and oxygen to vital organs and other parts of patient's body. This increases the risk of organ failure and tissue death (gangrene).

Diagnosis

Patient's blood is checked for complications like:

- Infection;
- Clotting problems;
- Abnormal liver or kidney function;
- Decreased amount of oxygen;
- An imbalance in minerals called electrolytes that affect the amount of water in patient's body as well as the acidity of patient's blood;
- Depending on patient's symptoms and the results of patient's blood test, patient's doctor may order other tests, including:
 - A urine test (to check for bacteria in patient's urine);
 - A wound secretion test (to check an open wound for an infection);
 - A mucus secretion test (to identify germs responsible for an infection);

- If patient's doctor can't determine the source of an infection using the above tests, patient's doctor may order an internal view of patient's body using one of the following:
 - X-rays to view the lungs;
 - Computed tomography (CT) scans to view possible infections in the appendix, pancreas, or bowel area;
 - Ultrasounds to view infections in the gallbladder or ovaries;
 - Magnetic resonance imaging (MRI), which can identify soft tissue infections.

Treatment

Sepsis can quickly progress to septic shock and death if it is left untreated. Medications to treat sepsis include:

- Antibiotics via IV to fight infection;
- Vasoactive medications to increase blood pressure;
- Insulin to stabilize blood sugar;
- Corticosteroids to reduce inflammation;
- Painkillers.

Severe sepsis may also require large amounts of IV fluids and a respirator for breathing. Dialysis might be necessary if the kidneys are affected. In some cases, surgery may be needed to remove the source of an infection. This includes draining a pus-filled abscess or removing infected tissue.

Prognosis

It is important to remember that sepsis is a medical emergency. Every minute and hour counts, especially since the infection can spread quickly. There is no one symptom of sepsis, but rather it has a combination of symptoms.

40.6 Snakebite

Snakebite is an injury caused by the bite of a snake. It often results in two puncture wounds from the animal's fangs. Sometimes poisoning from the bite may occur. Snakes bite for the purpose of hunting and of protection. Snakes commonly involved in poisonings include the elapids, vipers, and sea snakes. The majority of snake species do not have venom and kill their prey by squeezing them. Venomous snakes can be found on every continent. Determining the type of snake that caused a bite is often not possible.

The number of snakebites that occur, most commonly in Africa, Asia, and Latin America, each year may be as high as five million. Rural areas are more greatly affected.

Symptoms and Signs

The most common symptom of all snakebites is overwhelming fear, which contributes to other symptoms, including nausea and vomiting, diarrhoea, vertigo, fainting, tachycardia, and cold, clammy skin. Media and folklore have created a hype surrounding snakebites, and people may have unwarranted thoughts of imminent death.

Dry snakebites and those inflicted by a non-venomous species can still cause severe injury. There are several reasons for this: snakebite may become infected, with the snake's saliva and fangs sometimes harbouring pathogenic microbial organisms, including *Clostridium tetani*. Infection is often reported with viper bites whose fangs are capable of deep puncture wounds. Bites may cause anaphylaxis in certain people.

Most cases of snakebite whether by a venomous snake or not, will have some type of local effect. Bite may result in redness, swelling, and severe pain at the area, within up to an hour. Vomiting, trouble seeing, tingling of the limbs, and sweating may result. Most bites are on the hands or arms. Fear following a bite is common with symptoms of a fast heart rate and feeling faint. The venom may cause bleeding, kidney failure, a severe allergic reaction, tissue death around the bite, or breathing problems. Bites may result in the loss of a limb or other chronic problems. The outcome depends on the type of snake, the area of the body bitten, the amount of venom injected, and the health conditions of the person. Problems are often worse in children than adults.

Bites by vipers and some cobras may be extremely painful, with the local tissue sometimes becoming tender and severely swollen within five minutes. Symptoms may become more life-threatening over time, developing into hypotension, tachypnea, severe tachycardia, severe internal bleeding, altered sensorium, kidney failure, and respiratory failure.

Venom emitted from some types of cobras, almost all vipers and some sea snakes causes necrosis of muscle tissue. Muscle tissue will begin to die throughout the body, a condition known as rhabdomyolysis. Rhabdomyolysis can result in damage to the kidneys as a result of myoglobin accumulation in the renal tubules. This, coupled with hypotension, can lead to acute renal failure, and, if left untreated, eventually death.

Risk Factors

Risk factors for bites include working outside with one's hand such as in farming, forestry, and construction.

Cause

In the developing world most cases of snakebite occur in those who work outside such as farmers, hunters, and fishermen. They often happen when a person steps on

the snake or approaches it too closely. The type of snake that most often delivers serious bites depends on the region of the world. In South Asia it was previously believed that Indian cobras, common kraits, Russell's viper and carpet vipers were the most dangerous; other snakes, however, may also cause significant problems in this area of the world.

Pathophysiology

Since envenomation is completely voluntary, all venomous snakes are capable of biting without injecting venom into a person, called "dry bite". Some dry bites may also be the result of imprecise timing on the snake's part, as venom may be prematurely released before the fangs have penetrated the person. Even without venom, some snakes can deliver damaging bites.

Snake venom

Snake venom is produced in modified parotid glands normally responsible for secreting saliva. It is stored in structures called alveoli behind the animal's eyes, and ejected voluntarily through its hollow tubular fangs. Venom is composed of hundreds to thousands of different proteins and enzymes, all serving a variety of purposes, such as interfering with a prey's cardiac system or increasing tissue permeability so that venom is absorbed faster. Venom in many snakes affects virtually every organ system in the human body and can be a combination of many toxins, including cytotoxins, hemotoxins, neurotoxins, and myotoxins, allowing for an enormous variety of symptoms.

Prevention

Prevention of snake bites can involve wearing protective footwear, avoiding areas where snakes live, and not handling snakes. Snakes are most likely to bite when they feel threatened, are startled, are provoked, or when they have been cornered.

Snakes are likely to approach residential areas when attracted by prey, such as rodents. Regular pest control can reduce the threat of snakes considerably. It is beneficial to know the species of snake that are common in local areas, or while travelling or hiking. Southern Asia in particular is populated by many dangerous species of snake. Being aware of — and ultimately avoiding — areas known to be heavily populated by dangerous snakes is strongly recommended.

The use of a flashlight at night can be helpful. Snakes may also be unusually active during especially warm nights when ambient temperatures exceed 21°C. It is advised not to reach blindly into hollow logs, flip over large rocks, and enter old cabins or other potential snake hiding-places. When rock climbing, it is not safe to grab ledges or crevices without examining them first, as snakes are cold-blooded and often sunbathe atop rock ledges.

It is also important to avoid snakes that appear to be dead; a snake's detached head also can immediately act by reflex and potentially bite. The induced bite can be just as severe as that of a live snake. Dead snakes are also incapable of regulating the venom they inject, so a bite from a dead snake can often contain large amounts of venom.

Treatment

It is not an easy task determining whether or not a bite by any species of snake is life-threatening. The outcome of all snakebites depends on a multitude of factors: the size, physical condition, and temperature of the snake, the age and physical condition of the person, the area and tissue bitten (e.g., foot, torso, vein or muscle), the amount of venom injected, the time it takes for the person to find treatment, and finally the quality of that treatment.

Treatment partly depends on the type of snake. Washing the wound with soap and water and holding the limb still is recommended. Trying to suck out the venom, cutting the wound with a knife, or using a tourniquet is not recommended. Antivenom is effective at preventing death from bites; however, antivenoms frequently have side effects. The type of antivenom needed depends on the type of snake involved. When the type of snake is unknown, antivenom is often given based on the types known to be in the area. In some areas of the world getting the right type of antivenom is difficult and this partly contributes to why they sometimes do not work. An additional issue is the cost of these medications. Antivenom has little effect on the area around the bite itself. Supporting the person's breathing is sometimes also required.

40.7 Scorpion Sting/Bite

Scorpions are closely related to spiders, ticks, and mites. Scorpions have two pincers, 8 legs and an elongated body with a tail composed of segments. The last tail segment contains the stinger that transmits a toxin to the victim. Most scorpions are harmless. Out of about 2000 species, only about 25-40 species can inject enough venom to cause serious or lethal damage to humans. One of the more venomous or potentially dangerous species is bark scorpion.

Scorpion stings are painful, and they can be fatal, particularly to children. Scorpions may sting more than once; the stinger, located at the end of the tail segment is usually not lost or left in the person's tissue after a sting. Scorpions hunt at night and hide along rocks or trees during the days. Homes built in arid or desert regions commonly have scorpions in them.

Scorpion Sting Symptoms

In general, the sting usually causes discomfort that slowly decreases over time. The discomfort, described below, usually ranges from moderate to severe:

- A person who has been stung by a scorpion may feel a painful, tingling, burning or numbing sensation at the sting site;
- The reaction at the sting site may appear mild. Rarely, a person experiencing a serious reaction may develop severe symptoms throughout the body;
- Severe symptoms include widespread numbness, difficulty swallowing, a thick tongue, blurred vision, roving eye movements, seizures, salivation, and difficulty breathing. These symptoms constitute a medical emergency;
- Death may occur.

What causes the symptoms?

The cause of the scorpion's sting symptoms is a barb or stinger that contains a protein toxin (venom). The venom is responsible for the symptoms. The venom contains a mixture of neurotoxin, protein inhibitors, and other substances. The types differ from species to species.

Treatment

In most scorpion stings of adults, treatment is simply supportive and can be done at home. However infants, small children and the elderly must be immediately seen by a doctor as severe reactions can occur in these categories.

- Wash the sting with soap and water and remove all jewellery because swelling of tissue may impede the circulation if it not allowed expanding;
- Apply cool compresses, usually 10 minutes on and ten minutes off of the site of the sting;
- Acetaminophen (Tylenol) 1-2 tablets every 4 hours may be given to relieve pain. Local Xylocaine injection may be given to relieve intense pain;
- Antibiotics are not helpful unless the sting area become secondarily infected;
- Do not cut into the wound or apply suction;
- In case the patient experiences severe symptoms listed above needs immediate treatment in an emergency department;
- Continuously apply ice to the sting area;
- Antivenom therapy is not available.

Prevention

Many scorpion stings can be prevented by taking precautions such as shaking out clothing and shoes to dislodge any scorpions, wearing clothing that covers the body (for example, wearing gloves and tucking in pant legs into boots may limit exposure). Many commercially used pesticides may make some scorpions sluggish and easier to kill before they can sting. Experts suggest that if a scorpion is seen or felt on the

skin, it is better to brush it off quickly instead of slapping at it because the scorpion will likely sting if the slap does not kill it.

40.8 Heat Illness

Heat Illness can be deadly. Every year, thousands of workers become sick from exposure to heat, and some even die. Heat illnesses and deaths are preventable. Employers are responsible for providing workplaces that are safe from excessive heat.

Heat illness or heat-related illness is a spectrum of disorders due to environmental heat exposure. It includes minor conditions such as heat cramps, heat syncope, and heat exhaustion as well as the more severe condition known as heat stroke.

Occupations at Risk

Any worker exposed to hot and humid conditions is at risk of heat illness, especially those doing heavy work tasks or using bulky protective clothing and equipment. Some workers might be at greater risk than others if they have not built up a tolerance to hot conditions, *including new workers, temporary workers, or those returning to work after a week or more off*. This also includes everyone during a heat wave.

Industries most affected by heat-related illness are: agriculture; construction; trade, transportation and utilities; building, grounds maintenance; landscaping services; and support activities for oil and gas operations.

Types of Heat Illness and Symptoms

The body normally cools itself by sweating. During hot weather, especially with high humidity, sweating isn't enough. Body temperature can rise to dangerous levels if precautions are not taken such as drinking water frequently and resting in the shade. Heat stroke requires immediate medical attention and can result in death. A number of heat illnesses exist including:

- *Heat stroke*: Defined by a body temperature of greater than 40°C (104°F) due to environmental heat exposure with lack of thermoregulation. Symptoms include dry skin, rapid, strong pulse and dizziness;
- *Heat exhaustion*: Can be a precursor of heatstroke; the symptoms include heavy sweating, rapid breathing and a fast, weak pulse;
- *Heat syncope*: Fainting as a result of overheating;
- *Heat oedema*: is a cutaneous condition characterized by dependent oedema from vasodilatory pooling. Heat causes the blood vessels to dilate, so body fluid moves into the hands or legs by gravity. The balance of salt in the body is also a risk factor for heat oedema. If salt loss is less than normal, the increased salt level draws fluid into the hands and legs.

Older adults have an increased risk of heat oedema, especially if they have other medical conditions that affect their circulation. People visiting hot climates from colder climates may also have an increased risk of heat oedema;

- *Heat cramps*: Muscle pains that happen during heavy exercise in hot weather;
- *Heat rash*: Skin irritation from excessive sweating;
- *Heat tetany*: Usually results from short periods of stress in intense heat. Symptoms may include hyperventilation, respiratory problems, numbness or tingling, or muscle spasms.

Treatment

Mild disease can be treated with fluids by mouth. In more significant disease spraying with mist and using a fan is useful. For those with severe disease putting them in lukewarm water is recommended if possible with transport to a hospital.

Prevention

Prevention includes avoiding medications that can increase the risk of heat illness (such as Anti-hypertensives, diuretics and anticholinergics), gradual adjustment to heat and sufficient fluids and electrolytes.

Employers should establish a complete heat illness prevention program that includes providing workers with water, rest and shade; gradually increasing workloads and allowing more frequent breaks for new workers or those who have been away for a week or more to build a tolerance for working in the heat (acclimatization), planning for emergencies, training workers about heat-related illnesses and its prevention; and monitor workers for signs of illness.

To prevent heat related illness and fatalities Workers should be advised to:

- Drink water every 15 minutes, even if you are not thirsty;
- Rest in the shade to cool down;
- Wear a hat and light-coloured clothing;
- Learn the signs of heat illness and what to do in an emergency;
- Keep an eye on fellow workers.

It is advisable to implement a work schedule to allow getting used to the heat gradually.

40.9 Green Tobacco Sickness

Green tobacco sickness (GTS) is not well documented and often underreported health condition affecting those working with the green tobacco plant. Many of those who experience GTS are not able to interpret their ailment or its cause. It is

a form of nicotine poisoning that may be contracted by handling wet, fresh, green tobacco leaves. The nicotine from the plant mixes with the moisture on the leaves, and then upon contact, the nicotine is absorbed through the worker's skin, causing acute nicotine poisoning and its associated symptoms.

Symptoms

The characteristic symptoms of GTS are nausea, vomiting, weakness, dizziness, stomach cramps, difficulty breathing, paleness, excessive sweating, and headache. Fluctuations in blood pressure and heart rate may be observed. These symptoms are similar to those caused by heat stress and pesticide exposure, and that is why GTS is often misdiagnosed. Symptoms may appear in as early as one hour after starting work and can last from 12 to 48 hours. This sickness is usually not life threatening, and only severe cases require medical attention due to extreme dehydration from fluid loss associated with vomiting. GTS is debilitating, resulting in discomfort.

Pathogenesis

Nicotine in tobacco plants, is soluble in water, exudes on to the surface of the leaves by rain, dew or perspiration. Nicotine is then absorbed through the skin, passes directly into the bloodstream and is distributed throughout the body. The nicotine affects part of the brain, causing reflex vomiting, and excites nerves in the gastrointestinal tract that bring about nausea and abdominal cramping.

Risk Factors

Some risk factors identified for GTS are:

- Age;
- Environmental conditions;
- Personal tobacco use; and
- Type of labour performed. Labourers working in hot, wet conditions are more likely to develop GTS because the wetness and high humidity causes nicotine to reside on the surfaces of the leaves while the high ambient temperature increases skin absorption;
- Some tasks – a greater risk of developing GTS. Harvesting tobacco involves the most risk, followed by burning.

If harvesting is done by hand, the workers hold cut leaves close to their body, where the nicotine-laden sap oozing from the severed stems soaks their clothing, allowing the nicotine to reside on their skin for long periods of time. Direct or prolonged contact of nicotine with the skin increases the workers' risk of contracting the illness. Additionally, cuts and abrasions associated with manual tobacco labour provide another direct route of nicotine entry into the bloodstream.

Treatment

The initial treatment of nicotine poisoning may include the administration of activated charcoal to try to reduce gastrointestinal absorption. Treatment is mainly supportive and further care can include control of seizures with the administration of a benzodiazepine, intravenous fluids for hypotension, and administration of atropine for bradycardia. Respiratory failure may necessitate respiratory support with rapid sequence induction and mechanical ventilation, haemodialysis, haemoperfusion or other extracorporeal techniques do not remove nicotine from the blood and are therefore not useful in enhancing elimination. Acidifying the urine could theoretically enhance nicotine excretion, although this is not recommended as it may cause complications of metabolic acidosis.

Prognosis

The prognosis is typically good when medical care is provided and patients adequately treated are unlikely to have any long-term sequelae. However, severely affected patients with prolonged seizures or respiratory failure may have ongoing impairments secondary to the hypoxia. It has been stated that if a patient survives nicotine poisoning during the first 4 hours, they usually recover completely.

COLD RELATED INJURIES

40.10 Hypothermia

It occurs because of a potential dangerous fall in body temperature due to prolonged exposure to cold temperature. The body temperature falls below 95F. while working in cold temperatures, heat is lost from the body. The major portion of heat is lost from the skin and the lungs.

The body constricts the blood vessels to decrease the blood flow to the skin. Shivering is induced to produce heat. Activity of Internal Organs like Heart and Liver also produce Heat. When the external temperature is cold beyond the body's ability to generate heat, hypothermia sets in.

40.11 Frostbite

Frostbite is actual freezing of the tissue or body part. Areas involved often are the ears, nose, fingers and toes. The skin becomes pale or waxy white or grey. There is numbness. There is tingling sensation in the affected parts. There is pain. These symptoms are due to decreased blood flow due to vasoconstriction.

Treatment

- Person suffering from frostbite should be cared for by a specialist.
- Before that he must be moved to a warm area.
- The wet tight clothes should be removed.
- One must avoid walking on frostbitten toes and feet.
- The affected areas must be placed in warm water not greater than 40°C.
- After warming the affected area should be wrapped in sterile gauze, the finger and toes being kept separate.

Prevention from Cold Related Injuries

- Persons should be made aware of signs of frostbite.
- Fluid intake should be increased even if thirst is not felt.
- Avoid intake of Alcohol.
- Head should be kept covered as 50% of Body heat is lost from the head.
- Ear and face should be covered. Scarf will protect cold air from entering lungs.
- Boots should be waterproof.
- Use several layers of clothing.
- Minimise sitting or squatting in the cold as these postures decrease blood circulation.
- Take frequent breaks in a warm area.
- Schedule outdoor activities between 10 am and 3 pm because it is the warmest part of the day.
- Avoid muscle strain by doing stress exercises.

Diseases of the Ear, Nose and Throat

41.1 Rhinitis

41.2 Nasal Polyps

41.3 Sinusitis

41.4 Otitis Media

41.5 Tinnitus

41.6 Noise Induced Hearing Loss

Most of the diseases of the ear nose and throat are due to inhalation of toxic, irritant, or allergic substances at the workplace. They are related to respiratory illnesses and may progress to serious forms of respiratory disease if unchecked or untreated.

41.1 Rhinitis

There are two types of rhinitis: allergic and non-allergic.

Allergic Rhinitis

In allergic rhinitis immune system mistakenly identifies a typically harmless substance called an allergen as an intruder. The immune system responds to the allergen by releasing histamine and chemical mediators that typically cause symptoms in the nose, throat, eyes, ears, skin and roof of the mouth. Seasonal allergic rhinitis (hay fever) is most often caused by pollen carried in the air during different times of the year in different parts of the country.

Allergic rhinitis can also be triggered by common indoor allergens such as the dried skin flakes, urine and saliva found on pet dander, mould, droppings from dust mites and cockroach particles. This is called perennial allergic rhinitis, as symptoms typically occur year-round.

In addition to allergen triggers, symptoms may also occur from irritants such as smoke and strong odours, or to changes in the temperature and humidity of the air. This happens because allergic rhinitis causes inflammation in the nasal lining, which increases sensitivity to inhalants.

Many people with allergic rhinitis are prone to allergic conjunctivitis (eye allergy). In addition, allergic rhinitis can make symptoms of asthma worse for people who suffer from both conditions.

Non-allergic Rhinitis

One third of the people with rhinitis does not have allergies. Non-allergic rhinitis usually afflicts adults and causes year-round symptoms, especially runny nose and nasal congestion. This condition differs from allergic rhinitis because the immune system is not involved.

Symptoms

Allergic rhinitis symptoms include:

- Itching in the nose, roof of the mouth, throat, and eyes;
- Sneezing;
- Stuffy nose (congestion);
- Runny nose;
- Tearing eyes;
- Dark circles under the eyes.

Hay fever symptoms tend to flare up in the spring and fall. Perennial allergic rhinitis symptoms are year-long.

Diagnosis

An allergist/immunologist can diagnose specific allergens that trigger allergic rhinitis, or to determine if the symptoms are non-allergic. The allergist will take a thorough health history followed by allergy testing. Skin tests or blood tests are the most common methods for determining allergic rhinitis triggers.

Treatment & Prevention

If a specific allergen is diagnosed, a plan to avoid allergens that trigger symptoms must be explained to the patient. For example, if he is allergic to dust mites or indoor mould, he should avoid exposure to them. For outdoor allergies such as pollen, avoidance measures include limiting outdoor activities during times of high pollen counts.

Standard treatment includes nasal corticosteroid sprays, antihistamine pills, nasal antihistamine sprays or decongestant pills.

The treatment options for non-allergic rhinitis include nasal corticosteroids, nasal antihistamines and nasal saline formulations. If nasal congestion is a major problem, oral decongestants or sprays can be used.

The majority of allergy medications for seasonal allergic rhinitis (hay fever) work best if started before tree pollen are in the air each spring and allergy symptoms develop.

41.2 Nasal Polyps

Nasal polyps are polypoidal masses arising mainly from the mucous membranes of the nose and paranasal sinuses. They are overgrowths of the mucosa that frequently accompany allergic rhinitis, and are freely movable and not tender.

Signs and symptoms

Nasal polyps are usually classified into *antrochoanal* polyps and *ethmoidal* polyps. Antrochoanal polyps arise from the maxillary sinuses and are the much less common, ethmoidal polyps arise from the ethmoidal sinuses. Symptoms of polyps include nasal congestion, sinusitis, anosmia (loss of smell), and secondary infection leading to headache. They may be removed by surgery, but are found to recur in about 70% of cases. Sinus surgery requires a great amount of precision as this involves risk of damage to orbit matter.

Types

There are two major types of nasal polyps.

1. Antrochoanal

- Single, Unilateral;
- Can originate from maxillary sinus;
- Usually found in children.

2. Ethmoidal

- Bilateral;
- Usually found in adults.

Nasal polyps consist of hyperplastic oedematous connective tissue with some seromucous glands and inflammatory cells (mostly neutrophils and eosinophils) with respiratory epithelium, sometimes with metaplastic squamous epithelium on the surface.

Nasal polyps should be distinguished from nasal papillomas, which are benign epithelial tumours and have more serious consequences.

Causes

The pathogenesis of nasal polyps is unknown. Nasal polyps are most commonly thought to be caused by allergy and rarely by cystic fibrosis. No respiratory or allergic trigger can be demonstrated. Nasal mucosa, particularly in the region of middle meatus becomes oedematous due to collection of extracellular fluid causing polypoidal change. Polyps which are sessile in the beginning become pedunculated due to gravity and excessive sneezing.

Initially surface of nasal polyp is covered by ciliated columnar epithelium, but later it undergoes metaplastic change to squamous type on atmospheric irritation.

Submucosa shows large intercellular spaces filled with serous fluid.

There are various diseases associated with polyp formation:

- Chronic rhinosinusitis;
- Asthma;
- Aspirin-induced asthma;
- Cystic fibrosis;
- Kartagener's syndrome;
- Young's syndrome;
- Churg-Strauss syndrome;
- Nasal mastocytosis.

Exposure to some forms of chromium can cause nasal polyps and associated diseases. Chronic rhinosinusitis is a common chronic medical condition that can be classified into presenting either with nasal polyposis or without. Chronic rhinosinusitis with nasal polyposis can be divided into eosinophilic chronic rhinosinusitis, which include allergic fungal rhinosinusitis and aspirin-exacerbated respiratory disease, or nasal polyps associated with neutrophilic inflammation that is primarily characterized by cystic fibrosis.

41.3 Sinusitis

Sinusitis, also known as a sinus infection or rhinosinusitis, is inflammation of the sinuses resulting in symptoms. Common signs and symptoms include thick nasal mucous, a plugged nose, and pain in the face. Other signs and symptoms may include fever, headaches, poor sense of smell, sore throat, and cough. The cough is often worse at night. Serious complications are rare.

It can be due to infection, allergies, air pollution, or structural problems in the nose. Most cases are due to a viral infection. A bacterial infection may be present if symptoms last more than ten days or if a person worsens after starting to improve. Recurrent episodes are more likely in people with asthma, cystic fibrosis, and poor immune function. X-rays are not typically needed unless complications are suspected. In chronic cases confirmatory testing is recommended by either direct visualization or computed tomography.

Some cases may be prevented by hand washing, avoiding smoking, and immunization.

Signs and Symptoms

Headache/ facial pain or pressure of a dull, constant, or aching sort over the affected sinuses is common with both acute and chronic sinusitis. This pain is typically localized to the involved sinus and may worsen when the affected person bends over or when lying down. Pain often starts on one side of the head and progresses to both sides. The thick nasal discharge is usually green in colour and may contain pus (purulent) and/or blood. Often a localized headache or toothache is present, and it is these symptoms that distinguish a sinus-related headache from other types of headaches, such as tension and migraine headaches. Another way to distinguish

between toothache and sinusitis is that the pain in sinusitis usually is worsened by tilting the head forwards and with valsalva maneuvers.

Sinus infections can also cause middle ear problems due to the congestion of the nasal passages. Post-nasal drip is also a symptom of chronic sinusitis. Halitosis is often stated to be a symptom of chronic sinusitis. Theoretically, there are several possible mechanisms of both objective and subjective halitosis that may be involved.

Causes

Both smoking and second hand smoke are associated with chronic sinusitis. Maxillary sinusitis may also be of dental origin and constitutes about 20% of all cases of maxillary sinusitis, given the close proximity of the teeth and the sinus floor. Once an odontogenic infection involves the maxillary sinus, it is possible that it may then spread to the orbit or to the ethmoidal sinus. Complementary tests based on conventional radiology techniques and modern technology may be indicated, based on the clinical context.

Acute: Acute sinusitis is usually precipitated by an earlier upper respiratory tract infection, generally of viral origin, other than rhinoviruses. If the infection is of bacterial origin, the most common three causative agents are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*. Other sinusitis-causing bacterial pathogens include *Staphylococcus aureus* and other streptococci species, anaerobic bacteria and gram negative bacteria. Viral sinusitis typically lasts for 7 to 10 days, whereas bacterial sinusitis is more persistent. Acute episodes of sinusitis can also result from fungal invasion, typically seen in patients with diabetes or other immune deficiencies, can be life-threatening. Chemical irritation can also trigger sinusitis, commonly from cigarette smoke and chlorine fumes. Rarely, it may be caused by a tooth infection.

Chronic: By definition chronic sinusitis lasts longer than three months and can be caused by many different diseases that share chronic inflammation of the sinuses as a common symptom. Symptoms of chronic sinusitis may include any combination of the following: nasal congestion, facial pain, headache, night-time coughing, an increase in previously minor or controlled asthma symptoms, general malaise, thick green or yellow discharge, feeling of facial 'fullness' or 'tightness' that may worsen when bending over, dizziness, aching teeth, and/or bad breath. Often chronic sinusitis can lead to anosmia, the inability to smell objects.

Diagnosis

Acute: Bacterial and viral sinusitis are difficult to distinguish. Symptoms last less than 10 days: generally considered viral sinusitis; Symptoms last more than 10 days- bacterial sinusitis. Imaging by X-ray, CT or MRI is generally not recommended unless complications develop. Classically, the increased pain when tilting the head forwards separates sinusitis from pulpitis.

Chronic: For sinusitis lasting more than 12 weeks a CT scan is recommended. Nasal endoscopy and clinical symptoms are also used to make a positive diagnosis. A tissue sample for histology and culture scan also be collected and tested. Allergic fungal sinusitis (AFS) is often seen in people with asthma and nasal polyps. In rare cases, sinusoscopy may be made.

Treatment

Recommended treatments for most cases of sinusitis include rest and drinking enough water to thin the mucus. Antibiotics are not recommended for most cases. Breathing low-temperature steam such as from a hot shower or gargling can relieve symptoms. There is tentative evidence for nasal irrigation. Decongestant nasal sprays containing oxymetazoline may provide relief, but these medications should not be used for more than the recommended period. Longer use may cause rebound sinusitis. It is unclear if nasal irrigation, antihistamines, or decongestants work in children with acute sinusitis.

Antibiotics: Most sinusitis cases are caused by viruses and resolve without antibiotics. However, if symptoms do not resolve within 10 days, amoxicillin is a reasonable antibiotic to use first for treatment with amoxicillin/clavulanate being indicated when the person’s symptoms do not improve after 7 days on amoxicillin alone. Antibiotics are specifically not recommended in those with mild/moderate disease during the first week of infection due to risk of adverse effects, antibiotic resistance, and cost. Amoxicillin-clavulanate is the initial treatment of choice for bacterial sinusitis. Fluoroquinolones, clarithromycin or a tetracycline like doxycycline, are used in those having allergies to penicillins. A short-course (3–7 days) of antibiotics seems to be just as effective as the typical longer-course (10–14 days) of antibiotics for those with clinically diagnosed acute bacterial sinusitis without any other severe disease or complicating factors.

Corticosteroids: For unconfirmed acute sinusitis, intranasal corticosteroids have not been found to be better than a placebo either alone or in combination with antibiotics. For cases confirmed by radiology or nasal endoscopy, treatment with corticosteroids alone or in combination with antibiotics is supported. There is only limited evidence to support short treatment with oral corticosteroids for chronic sinusitis with nasal polyps.

Surgery: For chronic or recurring sinusitis, referral to an otolaryngologist may be indicated, and treatment options may include nasal surgery. Surgery should only be considered for those people who do not benefit with medication.

In patients with chronic sinusitis sinus washout confers no additional benefits over antibiotics alone.

The benefit of Functional Endoscopic Sinus Surgery is its ability to allow for a more targeted approach to the affected sinuses, reducing tissue disruption, and minimizing post-operative complications. Another recently developed treatment is balloon sinuplasty. This method, similar to balloon angioplasty used to “unclog”

arteries of the heart, utilizes balloons in an attempt to expand the openings of the sinuses in a less invasive manner.

41.4 Otitis Media

Otitis Media (OM) is any inflammation of the middle ear. It is very common in children.

There are several subtypes

- Acute Otitis Media;
- Otitis Media with Effusion;
- Chronic Suppurative Otitis Media;
- Adhesive Otitis Media.

Signs and Symptoms

AOM implies rapid onset of disease associated with one or more of the following symptoms:

- Otolgia;
- Otorrhea;
- Headache;
- Fever;
- Irritability;
- Loss of appetite;
- Vomiting;
- Diarrhoea;
- Otitis Media with Effusion.

Symptoms that may be indicative of Otitis Media with Effusion include the following:

- Hearing loss;
- Tinnitus;
- Vertigo;
- Otolgia.

Chronic Suppurative Otitis Media is a persistent ear infection that results in tearing or perforation of the eardrum. Adhesive Otitis Media occurs when a thin retracted ear drum becomes sucked into the middle ear space and stuck.

Diagnosis

Otitis Media with Effusion does not respond to antibiotic treatment. It is critical for clinicians to be able to diagnose the condition. Doing so will avoid unnecessary use of antibiotics to prevent adverse effects of medication and antimicrobial resistance.

Otoscopy remains the standard examination technique for patients with suspected Otitis Media. In addition to a carefully documented examination of the external ear and tympanic membrane, clinician should carefully examine head and neck region.

Every examination should include an evaluation and description of the following four TM characteristics:

- **Colour:** A normal tympanic membrane is a translucent pale gray; an opaque yellow or blue TM is consistent with middle ear effusion;

- **Position:** In Acute Otitis Media, the tympanic membrane is usually bulging; in Otitis Media with Effusion, the tympanic membrane is typically retracted or in the neutral position;
- **Mobility:** Impaired mobility is the most consistent finding in patients with Otitis Media with Effusion;
- **Perforation:** Single perforations are most common.

Adjunctive screening techniques for OM include tympanometry, which measures changes in acoustic impedance of the Tympanic membrane/middle ear system with air pressure changes in the external auditory canal, and acoustic reflectometry, which measures reflected sound from the Tympanic membrane; the louder the reflected sound, the greater the likelihood of an middle ear effusion.

Management

Most cases of Acute Otitis Media improve spontaneously. Standard treatment is managed with antibiotics and analgesics. Management of Acute Otitis Media should include an assessment of pain. Analgesics, particularly acetaminophen and ibuprofen, should be used to treat pain whether antibiotic therapy is or is not prescribed. Cases not responding to standard treatment need specialist treatment that may be preceded by culture and antibiotic sensitivity test of the discharge. Surgical alternatives should also be considered.

An allergist, audiologist, immunologist, or a speech therapist may be consulted, if traditional ENT and primary care measures have failed to check recurrent occurrences.

41.5 Tinnitus

Tinnitus is the hearing of sound when no external sound is present. The word tinnitus is from the Latin *tinnire* which means “to ring”. It is often described as a ringing, clicking, hiss or roaring. Rarely, unclear voices or music are heard. The sound may be soft or loud, low pitched or high pitched and appear to be coming from one ear or both. Tinnitus comes on gradually. The sound may cause depression, anxiety or concentration interference in some people.

Tinnitus is not a disease but a symptom that can result from a number of causes, the most common causes being noise-induced hearing loss. Other causes include: ear infections, disease of the heart or blood vessels, Meniere’s disease, brain tumours, exposure to certain medications, a previous head injury and earwax. It is more common in those with depression.

The diagnosis is usually based on the person’s description. Tinnitus can be interfering with a person’s life. An audiogram and neurological exam are a part of the diagnosis if certain problems are found, medical imaging such as with MRI may

be recommended. Those who have tinnitus that occurs with the same rhythm as their heartbeat also need further testing.

Prevention involves avoiding loud noise if there is an underlying cause, treating it may lead to improvements. Typically, management involves talk therapy. Hearing aids may help. There are no effective medicines. It is common, affecting about 10-15% of people; most tolerate it well but a significant problem in only 1-2% of people.

41.6 Noise Induced Hearing Loss

Noise-induced hearing loss (NIHL) is hearing decrease caused by loud sound. Continual exposure to more than 85 decibels may become dangerous resulting in the over-stimulation of the hearing cells leading to cell death. The two types of loss are either intense noise incident, or gradually, over time due to exposure to noise.

Occupational hearing loss is one of the most common occupational diseases affecting up to 33% of workers overall. Occupational exposure to noise causes 16% of adult disabling hearing loss worldwide. Some occupations that are most susceptible to hearing loss:

- Agriculture;
- Mining;
- Construction;
- Manufacturing;
- Work in saw mills;
- Work in oil mills;
- Utilities;
- Transportation;
- Military;
- Musicians;
- Aeronautical industry.

Mechanism

NIHL occurs when too much sound intensity is transmitted into and through the auditory system. An acoustic signal from an energy source, such as a radio, enters into the external auditory canal, and is funneled through to the tympanic membrane (eardrum). The tympanic membrane acts as an elastic diaphragm and drives the ossicular chain of the middle ear system into motion. Then the middle ear ossicles transfer mechanical energy to the cochlea by way of the stapes footplate hammering against the oval window of the cochlea. This hammering causes the fluid within the cochlea (perilymph and endolymph) to push against the stereocilia of the hair cells, which then transmit a signal to the central auditory system within the brain. When the ear is exposed to excessive sound levels or loud sounds over time, the overstimulation of the hair cells leads to heavy production of reactive oxygen species, leading to oxidative cell death. In animal experiments, antioxidant vitamins have been found to reduce hearing loss even when administered the day after noise exposure.

Types

Acoustic Trauma

NIHL caused by acoustic trauma refers to permanent cochlear damage from a one-time exposure to excessive sound pressure. This form of NIHL commonly results from exposure to high-intensity sounds such as explosions, gunfire, a large drum hit loudly, and firecrackers.

Temporary and permanent hearing loss:

- **PTS (Permanent Threshold Shift):** the part of the hearing loss subsequent to an acoustic trauma that will never be recovered. PTS is measured in decibels.
- **TTS (Temporary Threshold Shift):** the hearing loss that will be recovered after a couple of days. Also called auditory fatigue. TTS is measured in decibels too. TTS imperceptibly gives way to PTS.

Symptoms

In addition to hearing loss, other external symptoms can be:

- Tinnitus;
- Some pain in the ear;
- Hyperacusis;
- Dizziness, vertigo; in case of vestibular damages, in the inner-ear.

Gradually developing NIHL

Gradually developing NIHL refers to permanent cochlear damage from repeated exposure to loud sounds over a period of time. Unlike NIHL from acoustic trauma, this form of NIHL does not occur from a single exposure to a high-intensity sound pressure level. Gradually developing NIHL can be caused by multiple exposures to any source of excessive volume. The U.S. Department of Labour's Occupational Safety and Health Administration (OSHA) states that exposure to 85 dB(A) of noise, known as an exposure action value, for more than eight hours per day can result in permanent hearing loss. Every increase of 10 decibels SPL results in a doubling of intensity, meaning hearing loss can occur at a faster rate. Therefore, gradually developing NIHL occurs from the combination of sound intensity and duration of exposure.

Treatment

There are currently no medical options for NIHL from noise-exposure which occurred more than a week previously.

Prevention

NIHL can easily be prevented through the use of some of the most simple, widely available and economical tools. This includes but is not limited to ear protection

(i.e. earplugs and earmuffs), education, and hearing conservation programs. Earplugs and earmuffs can provide the wearer with at least 5 to 10 dB SPL, and up to 20 dB, of attenuation. However, use of earplugs is only effective if the users have been educated and use them properly Workplace standards. The Occupational Safety and Health Administration (OSHA) describes standards for occupational noise exposure and states that an employer must implement hearing conservation programs for employees if the noise level of the workplace is equal to or above 85 dB(A) for an averaged eight-hour time period. OSHA also states that “*exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.*” Additionally Employees are required to wear hearing protection when it is identified that their eight-hour time weighted average (TWA) is above the exposure action value of 90 dB.

Ophthalmological Conditions

42.1 Keratoconjunctivitis

42.2 Aesthenopia/Eye Strain

42.3 Nyctalopia/Night-Blindness

42.4 Progressive Gradually Declining Vision

The eyes are most often affected by long hours of strain as well as coming into contact with noxious agents and irritant substances. They may also be affected as part of systemic or infectious diseases or conditions.

42.1 Keratoconjunctivitis

Keratoconjunctivitis sicca (KCS) also called dry eye syndrome (DES) or keratitis sicca is an eye disease caused by eye dryness, which, in turn, is caused by either decreased tear production or increased tear film evaporation. KCS is the most common eye disease, affecting 5-6% of the population. Prevalence rises in postmenopausal women in the elderly.

Signs and Symptoms

Typical symptoms of Keratoconjunctivitis sicca are dryness, burning and a sandy-gritty eye irritation that gets worse as the day goes on. Symptoms may also be described as itchy, scratchy, stinging or tired eyes. Other symptoms are pain, redness, a pulling sensation, and pressure behind the eye. There may be a feeling that something, such as a speck of dirt, is in the eye. The resultant damage to the eye surface increases discomfort and sensitivity to bright light. Both eyes usually are affected.

There may also be a stringy discharge from the eyes. Although it may seem strange, dry eye can cause the eyes to water. This can happen because the eyes are irritated. One may experience excessive tearing but these reflex tears will not improve the condition as they do not have the lubricating qualities.

Because blinking coats the eye with tears, symptoms are worsened by activities in which the rate of blinking is reduced due to prolonged use of the eyes. These activities include prolonged reading, computer usage, driving, or watching TV. Symptoms increase in windy, dusty or smoky (including cigarette smoke) areas, in dry environments, high altitudes including airplanes, on days with low humidity,

and in areas where an air conditioner (especially in a car.), fan, heater, or even a hair dryer is being used. Symptoms reduce during cool, rainy, or foggy weather and in humid places, such as in the shower.

Most people who have dry eyes experience mild irritation with no long-term effects. However, if the condition is left untreated or becomes severe, it can produce complications that can cause eye damage, resulting in impaired vision or (rarely) in the loss of vision.

Symptom assessment is a key component of dry eye diagnosis – to the extent that many believe dry eye syndrome to be a symptom-based disease.

Causes

Any abnormality of any one of the three layers of tears produces an unstable tear film, resulting in symptoms of keratitis sicca.

Decreased tear or excessive evaporation: Keratoconjunctivitis sicca is usually due to inadequate tear production from lacrimal hyposecretion or to excessive tear evaporation. The aqueous tear layer is affected, resulting in aqueous tear deficiency (ATD). The lacrimal gland does not produce sufficient tears to keep the entire conjunctiva and cornea covered by a complete layer.

Causes include idiopathic, congenital alacrima, xerophthalmia, lacrimal gland ablation, and sensory denervation. In rare cases, it may be a symptom of collagen vascular diseases, including Relapsing polychondritis, rheumatoid arthritis, granulomatosis with polyangiitis, and systemic lupus erythematosus. Sjögren's syndrome and other autoimmune diseases are associated with aqueous tear deficiency.

Drugs

Isotretinoin, sedatives, diuretics, tricyclic antidepressants, antihypertensives, oral contraceptives, antihistamines, nasal decongestants, beta-blockers, phenothiazines, atropine, and pain relieving opiates such as morphine can cause or worsen this condition. Infiltration of the lacrimal glands by sarcoidosis or tumours, or post radiation fibrosis of the lacrimal glands can also cause this condition.

Additional causes: Aging is one of the most common causes of dry eyes because tear production decreases with age. Several classes of medications have been hypothesized as a major cause of dry eye, especially in the elderly. Dry eye may also be caused by thermal or chemical burns, or (in epidemic cases) by adenoviruses. Diabetics are at increased risk for the disease.

Many people who wear contact lenses complain of dry eyes. Dry eyes also occur or get worse after LASIK and other refractive surgeries, in which the corneal nerves are cut during the creation of a corneal flap. An eye injury or other problem with the eyes or eyelids, such as bulging eyes or a drooping eyelid can cause Keratoconjunctivitis sicca. Disorders of the eyelid can impair the complex blinking motion required to spread tears. Eye injury or disease leading to Boehm Syndrome may be exacerbated by dry eyes.

Abnormalities of the lipid tear layer caused by blepharitis and rosacea, and abnormalities of the mucin tear layer caused by vitamin A deficiency, trachoma, and certain topical medications are causes of Keratoconjunctivitis sicca.

Diagnosis

Dry eyes can usually be diagnosed by the symptoms alone. Tests can determine both the quantity and the quality of the tears. Diagnostic tests are highly specialised and may be left to the specialists.

Prevention

There is no way to prevent Keratoconjunctivitis sicca. Complications can be prevented by use of wetting and lubricating drops and ointments.

Treatment

A variety of approaches can be taken to treatment. These can be summarised as: avoidance of exacerbating factors, tear stimulation and supplementation, increasing tear retention, and eyelid cleansing and treatment of eye inflammation.

General measures: Dry eyes can be exacerbated by smoky environments, dust and air conditioning and by our natural tendency to reduce our blink rate when concentrating. Purposefully blinking, especially during computer use and resting tired eyes are basic steps that can be taken to minimise discomfort. Rubbing one's eyes can irritate them further, so should be avoided. Conditions such as blepharitis can often co-exist and paying particular attention to cleaning the eyelids morning and night with mild soaps and warm compresses can improve both conditions.

Environmental control: Dry, drafty environments and those with smoke and dust should be avoided. This includes avoiding hair dryers, heaters, air conditioners or fans, especially when these devices are directed toward the eyes. Wearing glasses or directing gaze downward, for example, by lowering computer screens can be helpful to protect the eyes when aggravating environmental factors cannot be avoided. Using a humidifier - especially in the winter - can help add moisture to the dry indoor air.

Rehydration: For mild and moderate cases, supplemental lubrication is the most important part of treatment.

Artificial tears: Application of artificial tears every few hours can provide temporary relief.

Additional options: Lubricating tear ointments can be used during the day, but they generally are used at bedtime due to poor vision after application. They contain white petrolatum, mineral oil, and similar lubricants. They serve as a lubricant and an emollient. Application requires pulling down the eyelid and applying a small amount (0.25 in) inside. Depending on the severity of the condition, it may be applied from every hour to just at bedtime. It should never be used with contact lenses. Specially designed glasses that form a moisture chamber around the eye may be used to create additional humidity.

Medication: Inflammation occurring in response to tears film hypertonicity can be suppressed by mild topical steroids or with topical immunosuppressants such as Restasis (cyclosporin). Elevated levels of tear NGF can be decreased with 0.1% prednisolone.

Cyclosporin: Topical cyclosporin (topical cyclosporin A, tCSA) 0.05%.

42.2 Aesthenopia/Eye Strain

Aesthenopia or eye strain is an ophthalmological condition that manifests itself through nonspecific symptoms such as fatigue, pain in or around the eyes, blurred vision, headache and occasional double vision. Symptoms often occur after reading, computer work, or other close activities that involve tedious visual tasks.

When concentrating on a visually intense task, such as continuously focusing on a book or computer monitor, the ciliary muscle tightens. This can cause the eyes to get irritated and uncomfortable. Giving the eyes a chance to focus on a distant object at least once an hour usually alleviates the problem.

A CRT computer monitor with a low refresh rate (<70Hz) or a CRT television can cause similar problems because the image has a visible flicker. Aging CRTs also often go slightly out of focus, and this can cause eye strain. LCDs do not go out of focus and are less susceptible to visible flicker.

Causes

Sometimes, Aesthenopia can be due to specific visual problems, for example, uncorrected refraction errors or binocular vision problems such as accommodative insufficiency or heterophoria. It is often caused by the viewing of monitors such as those of computers or phones.

Treatment

While preventative measures, such as taking breaks from activities that cause eye strain are suggested, there are certain treatments which a person suffering from the condition can take to ease the pain or discomfort that the affliction causes. Perhaps the most effective of these is to remove all light sources from a room, and allow the eyes to relax in darkness. Free of needing to focus, the eyes will naturally relax over time, and relieve the discomfort that comes with the strain.

42.3 Nyctalopia/Night-Blindness

Nyctalopia or night-blindness is a condition making it difficult or impossible to see in relatively low light. It is a symptom of several eye diseases. Night blindness may exist from birth, or be caused by injury or malnutrition (for example, a lack of vitamin A). It can be described as insufficient adaptation to darkness.

The most common cause of Nyctalopia is retinitis pigmentosa, a disorder in which the rod cells in the retina gradually lose their ability to respond to the light. Patients suffering from this genetic condition have progressive Nyctalopia and eventually their daytime vision may also be affected. In X-linked congenital stationary night blindness, from birth the rods either do not work at all, or work very little, but the condition doesn't get worse. Another cause of night blindness is a deficiency of retinol, or vitamin A, found in fish oils, liver and dairy products.

The opposite problem, the inability to see in bright light, is known as *hemeralopia* and is much rarer. Since the outer area of the retina is made up of more rods than cones, loss of peripheral vision often results in night blindness. Individuals suffering from night blindness not only see poorly at night, but also require extra time for their eyes to adjust from brightly lit areas to dim ones. Contrast vision may also be greatly reduced.

Rods contain a pigment called rhodopsin. When light falls on rhodopsin, it undergoes a series of conformational changes ultimately generating electrical signals which are carried to the brain via the optic nerve. In the absence of light, rhodopsin is regenerated. The body synthesizes rhodopsin from vitamin A, which is why a deficiency in vitamin A causes poor night vision.

Causes

- Retinitis pigmentosa.
- Retinal detachment.
- Certain medications, such as phenothiazines.
- Oguchi disease (also called congenital stationary night blindness is an autosomal recessive form of congenital stationary night blindness associated with fundus discoloration and abnormally slow dark adaptation).
- Pathological myopia.
- Cataract.
- Refractive surgery (LASIK, photorefractive keratectomy, radial keratotomy).
- Sorsby's fundus dystrophy (Macular degeneration).
- Vitamin A deficiency.
- Choroideremia (a rare X-linked recessive inherited disorder giving rise to retinal disease and eventual blindness, resulting from degeneration of the choriocapillaris of the choroid and of the retinal pigment epithelium of the retina.)

42.4 Progressive Gradually Declining Vision

There are a number of reasons why a patient's vision may be gradually declining. In others, subtle loss of vision only picked up on routine screening. When the patient presents, it is important to take a thorough history, as the patient's perception of visual impairment may be different to doctor. Visual impairment can have a profound impact on psychosocial well-being.

Many causes of gradual visual loss can be diagnosed on history and examination alone with only the most basic additional investigations.

History

A routine history is mandatory and will often guide you to a possible cause. Specifically ask about:

- The nature of the problem:
 - Unilateral versus bilateral;
 - Blurred vision: whether this is the whole field, close, distance or both;
 - Restricted visual field: often noted following difficulties in driving, knocking into things at the periphery of vision;
 - Distorted rather than blurred vision (e.g., dent in printed words, door/window frames, objects appearing smaller or larger). If so, check with an Amsler grid Distortion of straight lines indicates serious macular pathology and needs urgent referral;
 - Bits of visual field missing altogether: central versus peripheral; establish what the remainder of the vision is like.
- Occupation:
 - Nature of work; Indoor or outdoor; exposure to sunlight or Ultraviolet radiation.
- Onset:
 - Note when the problem occurred and whether there were any significant health issues at that time;
 - Ask how it was first noticed. Unilateral visual loss might have gone unnoticed until the patient closed the other eye;
- Progression: ask whether there has been a slow and steady decline; whether there have been step-wise drops in visual acuity, or whether the problem has been intermittent. If intermittent, think of transient ischaemic attacks (TIAs) or impending acute angle-closure glaucoma;
- Ask whether there have been any associated factors. For example, pain (very important), redness, or visual phenomena - e.g., haloes, flashes of light, new floaters. These symptoms usually merit an urgent referral;

- Ask whether there are any precipitating factors. Specifically ask about changes over the course of a day and whether vision is better in the day or at night;
- Other important aspects of the history include the past ocular history, medical history, family history, medication and social history;
- Are there implications with regard to their work or driving?

Examination

Primary Care professional may not be competent to carry out a complete Ophthalmic and Neurological examination and hence in case of suspicion of progressively declining vision, patient should be referred to a specialist.

Causes of Gradual Vision Loss

Scenarios that need urgent attention are:

- Where vision might be preserved by prompt treatment – for example;
- Suspected AMD – particularly if there is distorted vision or rapid change;
- Diabetic retinopathy;
- Where sinister pathology is suspected;
- Where the loss is bilateral;
- Where there is pain, a red eye, or there are additional visual symptoms – e.g., flashes;
- Where visual deterioration has been relatively rapid, is progressing, or there is a new deterioration;
- Monocular patients or those who already have poor vision in one eye. Any vision loss in the ‘good’ eye requires urgent assessment.

Work Related Physical and Musculoskeletal Disorders

43.1 Cumulative Trauma Disorders

43.2 Carpal Tunnel Syndrome

43.3 Tenosynovitis

43.4 Cervicobrachial Syndrome

43.5 Shoulder Dislocation

43.6 Impingement Syndrome of Shoulder

43.7 Sacroiliac Joint Disease

Physical and musculoskeletal conditions are mainly responsible for most workplace absences. The risk of physical loads, repetitive actions, unhealthy postures, long standing and strenuous physical activity leading to chronic fatigue makes persons vulnerable to a number of physical and musculoskeletal conditions.

Musculoskeletal conditions include a wide variety of diseases that vary from acute onset and short duration to lifelong disorders. They are a diverse group with regard to patho physiology but are linked anatomically and by their association with pain and impaired physical function.

43.1 Cumulative Trauma Disorders

Cumulative trauma disorders (CTDs) are injuries of the musculoskeletal and nervous systems that may be caused by repetitive tasks, forceful exertions, vibrations, mechanical compression (pressing against hard surfaces), or sustained or awkward positions. Cumulative trauma disorders are also called regional musculoskeletal disorders, repetitive motion disorders (RMDs), overuse syndromes, repetitive motion injuries, or repetitive strain injuries. These painful and sometimes crippling disorders develop gradually over periods of weeks, months, or years.

The following disorders may be seen in all occupations which create above-mentioned work conditions:

- **Carpal Tunnel Syndrome:** a compression of the median nerve in the wrist that may be caused by swelling and irritation of tendons and tendon sheaths.
- **Tendinitis:** an inflammation or irritation of a tendon. It develops when the tendon is repeatedly tensed from overuse or unaccustomed use of the hand, wrist, arm or shoulder.

- **Tenosynovitis:** an inflammation (swelling) or irritation of a tendon sheath associated with extreme flexion and extension of the wrist.
- **Low Back Disorders:** these include pulled or strained muscles, ligaments, tendons, or ruptured disks. They may be caused by cumulative effects of faulty body mechanics, poor posture, and/or improper lifting techniques.
- **Synovitis:** an inflammation (swelling) or irritation of a synovial lining (joint lining). DeQuervain's Disease - a type of synovitis that involves the base of the thumb.
- **Bursitis:** an inflammation (swelling) or irritation of the connective tissue surrounding a joint, usually of the shoulder.
- **Epicondylitis:** elbow pain associated with extreme rotation of the forearm and bending of the wrist. The condition is also called tennis elbow or golfer's elbow.
- **Thoracic Outlet Syndrome:** compression of nerves and blood vessels between the first rib, clavicle (collar bone), and accompanying muscles as they leave the thorax (chest) and enter the shoulder.
- **Cervical Radiculopathy:** a compression of the nerve roots in the neck.
- **Ulnar Nerve Entrapment:** a compression of the ulnar nerve in the wrist.

Symptoms

- Numbness.
- Decreased Joint Motion.
- Swelling.
- Burning.
- Pain.
- Weakness.
- Redness.
- Clumsiness.
- Tingling.
- Cracking or popping of joints.
- Aching.

The above symptoms may involve the upper and lower back, shoulders, elbows, wrists, or fingers. If symptoms last for at least one week, or they occur on many occasions one should suspect CTD.

Treatment

Usually the best treatment for CTDs is rest from the activities that caused the problem, or a change in work practices. It is important to know that treatment is more successful if the disorder is diagnosed early. Next step may be treatment by a Physiotherapist. Medical treatment will vary for each type of CTD. The following are some standard treatments:

- Wrist splint to keep wrist from bending;
- Cold and hot baths;
- Anti-inflammatory medications;
- Steroid injections;
- Physical and/or occupational therapy;
- Surgery in advanced cases.

It is important to remember that each individual and each injury is different. If the disorder is work-related, then the job or work station may also have to be changed. Otherwise, even after successful treatment, the same problems can occur again.

Some selected disorders have been described in detail in the following sections of this chapter.

43.2 Carpal Tunnel Syndrome

Epidemiology and Aetiology

- More common in women.
- Typical presentation at age 30-50.
- Associated with gout, pregnancy, the pill, premenstrual state, rheumatoid arthritis, diabetes, acromegaly, obesity, amyloidosis.
- Some believe that jobs that involve repetitive flexing of the wrist may be involved.
- RSI – repetitive strain injury. There is usually another underlying diagnosis.
- Most cases are ideopathic.

Pathology

Compression of the median nerve as it passes through the carpal tunnel (under the flexor retinaculum)

Signs and symptoms

- These are the signs of median nerve compression.
- Wasting of the thenar eminence is often a late sign.
- Parasthesia of the lateral 3½ fingers (thumb, forefinger and middle finger).
- Pain/tingling in the lateral 3 fingers.
- Pain is often worse at night and may wake the patient. It is often a burning or aching sensation.
- The median nerve also supplies the lateral part of the palm but typically, this is spared as this branch of the median nerve does not pass through the carpal tunnel.

Examination

- Look for wasting of the thenar eminence.
- Check sensation on the lateral 3½ fingers.
- Physical Signs Of Carpal Tunnel Syndrome.
 - Tinel’s sign Elicitation: Tap over the median nerve as it passes through the carpal tunnel in the wrist Positive response: A sensation of tingling in the distribution of the median nerve over the hand;

- Phalen’s manoeuvre Elicitation: Allow wrists to fall freely into maximum flexion and maintain the position for 60 seconds or more Positive response: A sensation of tingling in the distribution of the median nerve over the hand.

Investigations

Diagnosis is usually clinical, but occasionally in difficult cases, nerve conduction may be performed.

Management

- Conservative – occasionally simple life-style changes (e.g. placement of computer keyboard) may be beneficial.
- Pain relief – is typically in the form of NSAIDs

43.3 Tenosynovitis

Tenosynovitis is the inflammation of the fluid-filled sheath (called the synovium) that surrounds a tendon. Symptoms of tenosynovitis include pain, swelling and difficulty moving the particular joint where the inflammation occurs. When the condition causes the finger to “stick” in a flexed position, this is called “stenosing” tenosynovitis, commonly known as “trigger finger”. This condition often presents with coexisting tendinitis.

Causes

Tenosynovitis most commonly results from the introduction of bacteria into a sheath through a small penetrating wound such as that made by the point of needle or thorn. Repeated use of hand tools can precede the condition, as well as arthritis or injury. Tenosynovitis sometimes runs in families and is generally seen more often in males than in females. The causes for children are even less well known and have a recurrence rate of less than 1-5% after treatment. Tenosynovitis is also linked to infectious arthritis caused by bacteria such as *Neisseria gonorrhoeae*.

Diagnosis

A physical examination shows swelling over the involved tendon. The doctor may elicit pain on examination by touch or stretch the tendon or have the patient move the muscle to which it is attached.

Treatment

Treatment for tenosynovitis depends on the severity of the inflammation and location. Mild tenosynovitis causing small scale swelling can be treated with non-steroidal anti-inflammatory drugs (NSAIDs) such as Naproxen, ibuprofen or diclofenac taken

to reduce inflammation and as an analgesic. Resting the affected tendons is essential for recovery; a brace is often recommended. Physical or occupational therapy may also be beneficial in reducing symptoms.

More acute cases are treated with cortisone injections, then a course of non steroidal anti-inflammatory drugs (NSAIDs) such as paracetamol and ibuprofen for pain.

Outpatient surgery can be done to enlarge the synovium. The sprained tendon or limb is splinted for a week or so. The goal of surgery is to open up space around the swollen tendon to prevent further swelling and to relieve pain. The size and location of the scar will vary, depending on the type of procedure.

Prevention

There are a number of suggestions that can help to reduce the likelihood of suffering from tenosynovitis. Many of them are common sense measures.

Tenosynovitis is a condition that can be brought about by sustained repetitive motions, particularly in the fingers, hands and arms. Therefore, if the patient plays sport or his occupation dictates that he will be intensively and repetitively moving joints then he should seek to mitigate the repetitive movements. Sportsmen should avoid excessive exercise.

Tenosynovitis can be brought on by cuts becoming infected and infecting the tendon and tendon sheath so it is important that all cuts and wounds are treated hygienically and to the best standard possible.

If a person has suffered from tenosynovitis in the past then he may wish to consider muscle strengthening physiotherapy.

If job involves repetitive movements he may speak with his employer to ensure that they try to lessen the risk of a repetitive strain injury. Particular measures to be advised to the employer are:

- Ensuring that the workstation is ergonomically designed;
- Regular rest periods to be given if high strain repetitive tasks are being carried out;
- Work areas should be designed so that they are the right height and angle for the user;
- The correct tools should be used at all times with the minimum of pressure exerted to do the job required;
- Share intensive work between employees;
- All workers should be correctly trained to do their job so that there is a minimum of risk.

43.4 Cervicobrachial Syndrome

Cervicobrachial syndrome is a nonspecific term describing a combination of pain, numbness, weakness, and swelling in the region of the neck and shoulder. This diagnosis of objectively unexplainable symptoms was used as a synonym for the symptoms of many workers in the Australian epidemic of “repetitive strain injury”. The definition of “cervicobrachial syndrome” is probably unique to the doctor who uses the term. It may be that an alternate, objectively documentable diagnosis is present, but most often the diagnosis of “cervicobrachial syndrome” refers to symptoms for which there is no proven diagnosis.

Diagnosis

History:

- Pain and fatigue of the wrist, forearm, shoulders, and neck;
- A swelling sensation in the hands;
- Pins and needles; and heaviness or numbness of the upper extremity;
- Pain increased by activity and relieved by rest. It may also increase at night, and individual may report difficulty sleeping;
- Sensation of wearing gloves;
- Headaches may accompany other symptoms.

Occupation individuals may describe being engaged in manual work with continuous, repetitive tasks, including computer keyboard work, writing, manipulating small objects, or moving objects onto conveyor belts. Occupations involving lifting or overhead work may be reported, as well as tasks that require holding the same neck position for extended periods.

Physical examination: The arms, shoulders, and neck usually appear normal but are painful to touch, and the neck may be stiff with limited range of motion, particularly on neck extension. Individuals may have poor posture with rounded shoulders and stooped head and neck. Raising the arm (abduction) may increase pain response. Observation of possible asymmetry of the upper chest, including the clavicle, may reveal abnormalities indicative of prior fracture or anatomical defect.

Clinical Tests:

(to reproduce symptoms)

1. Adson manoeuvre, where the head is placed in extension and bent to the side while the individual holds his or her breath and the physician observes for symptoms and pulse reduction.
2. Hyper abduction of the arm, or elevated arm stress test may also produce symptoms and loss of pulse.

Investigations

- Radiographic images are taken primarily to rule out objectively verifiable causes for the symptoms. Plain X-rays may also identify first rib abnormalities or the presence of accessory ribs. Current or prior cervical root injury, herniated disc, bone spurs may be evaluated by MRI or CT imaging, including CT myelography. Electrodiagnostic tests (EMG, NCV) are used to identify or rule out nerve damage. Doppler ultrasound may be used to identify interrupted blood flow to the involved arm.
- Psychological testing and evaluation often reveal psychosocial stressors. Polysomnogram testing may be done to evaluate reported sleep disturbances.
- There are no criteria for this diagnosis, since it represents a collection of symptoms for which there is no known cause.

Treatment

Treatment is conservative and symptomatic:

- Pain and sleep disorders are relieved with medications;
- A cervical collar or wrist splints may be used briefly to support the muscles.
- Physical therapy (e.g., deep heat, ultrasound, electric stimulation, postural correction, strength and endurance exercises) may decrease symptoms and improve function;
- Increase daily exercise activity, especially stretching exercises of the neck and shoulder. Spinal manipulation and mobilization combined with progressive active exercise may be helpful. Improvement in posture may be an important goal of physical therapy M;
- Management of chronic pain may include use of muscle relaxants or Nonsteroidal anti-inflammatory drugs (NSAIDs), which can reduce pain and the irritability associated with pain, enhancing results of conservative treatment. If vascular compression is identified, physicians may prescribe vasodilators or calcium-channel blockers.

Prognosis

Recovery from cervicobrachial syndrome may be complete, partial, or very limited. If the cause of the syndrome is nonspecific, treatment will be less focused, and the outcome will be uncertain. Chronic pain and related disability can be complicated by psychological issues. A better outcome is expected when the diagnostic workup is comprehensive, diagnostic findings are specific for an objectively verifiable disorder.

Rehabilitation

- The primary goals of rehabilitation are to decrease pain and to increase function. Rehabilitation for cervicobrachial syndrome varies with the aetiology of the pain. Reduction of pain – may be achieved through thermal modalities used in

conjunction with pharmacological management instructed in gentle exercises. Initial exercises may include isometrics, stretching, and gentle range of motion. Spinal manual therapy might be beneficial in reducing symptoms when combined with active treatment.

- Postural training, accordingly, should be initiated as soon as tolerated by the individual. Strengthening and stabilization exercises of the neck, shoulders, and upper trunk Once symptoms are relieved and range of motion is restored.
- Cervical traction has been shown to be beneficial for neck pain when done in conjunction with such exercises. However, traction must be carefully administered to avoid an adverse response home exercise program. Instruct the individual how to care for and protect the neck from recurrence of symptoms. Traction should always be preceded and succeeded by an X-ray examination and counselling about the procedure, its benefits and supplementation with exercise and posture – must be done.

Ability to Work (Return to Work Considerations)

Ergonomic changes in the workplace are advised to work more comfortably. They can be as simple as changing the size of a ballpoint pen, providing a chair that takes weight off the forearms. Retraining or a new job may be helpful for cases that do not respond to treatment. Adjustments that support better work posture can increase comfort and enhance recovery. Physical therapy is an important component of treatment, and regular time off may be needed to receive therapy. Heavy lifting or repetitive overhead motion may need to be restricted or eliminated.

43.5 Shoulder Dislocation

A dislocated shoulder occurs when the humerus separates from the scapula at the glenohumeral joint. The shoulder joint has the greatest range of motion of any joint in the body and as a result is particularly susceptible to subluxation and dislocation. Approximately half of major joint dislocations seen in emergency departments involve the shoulder. Partial dislocation of the shoulder is referred to as subluxation.

Signs and Symptoms

Mechanisms of injury are usually traumatic but may vary. Mechanisms may include sports, assaults, falls, seizures, throwing an object, reaching to catch an object, forceful pulling on the arm, reaching for an object, turning over in bed, or combing hair.

- Significant pain, sometimes felt along the arm past the shoulder;
- Inability to move the arm from its current position, particularly in positions with the arm reaching away from the body and with the top of the arm twisted toward the back;

- Numbness of the arm;
- Visibly displaced shoulder. Some dislocations result in the shoulder appearing unusually square;
- No palpable bone on the side of the shoulder.

Diagnosis

Specific mechanisms or historical facts may be suggestive of certain types of dislocations; throwing a ball or a punch or forceful pulling of the arm with an anterior dislocation and axial loading of an extremely abducted arm with inferior dislocation.

A diagnosis of shoulder dislocation is often suspected based on patient history and physical examination. Radiographs confirm the diagnosis. Most dislocations are apparent on radiographs showing incongruence of the glenohumeral joint. Posterior dislocations may be hard to detect on standard AP radiographs, but are more readily detected on other views. For repeated dislocations, an MRI scan can assess soft tissue damage.

Treatment

Prompt medical treatment should be sought. The shoulder is kept in its current position by use of a splint or sling. A pillow between the arm and torso may provide support and comfort. Strong analgesics are needed to allay the pain and the distress.

43.6 Impingement Syndrome of Shoulder

Impingement syndrome is a common shoulder condition seen in active adults. This condition is closely related to shoulder bursitis and rotator cuff tendinitis; may occur alone or in combination.

Mechanism

Unlike in other parts of the body in the shoulder region the muscle and tendons are surrounded by bone. Underneath that bone is the rotator cuff, a group of muscles and tendons that we use to lift the arm up overhead. The rotator cuff is sandwiched between the arm bone and acromion. This unique arrangement of muscle and tendon between bones contributes to the development of impingement syndrome (shoulder bursitis, rotator cuff tendinitis).

When an injury to the rotator cuff occurs, it responds by swelling much the way an ankle does when it is sprained. However, because the rotator cuff is surrounded by bone, its swelling causes a number of events to occur. The pressure within the tendon increases, resulting in compression and loss of blood flow in the capillaries. When the blood flow is reduced, the tendon tissue begins to fray much like a rope. As the tissue swells, it results in the classic features of a pain. Pain is made worse

by actions such as reaching up behind the back and reaching up overhead. Pain during the night from this shoulder condition may cause a loss of sleep, and can be a sign of a more serious injury to the rotator cuff, including the development of a small tear or hole in the tendon. This is what is known commonly as a rotator cuff tear.

Symptoms

There is difficulty reaching up behind the back, pain when the arms are extended above the head, and weakness of the shoulder. In cases of complete tearing of the rotator cuff, patients have very significant weakness and sometimes cannot raise their arm against gravity. In addition, some patients will have a rupture (tear) of their biceps muscle tendon as part of this continuing impingement process.

Diagnosis

A careful medical history followed by a physical examination may suggest the diagnosis. X-rays are helpful to rule out arthritis and may show changes in the bone that show the injury of the rotator cuff. There may be bone spurs or changes in the normal contour of the bone where the rotator cuff normally attaches. If a small amount of an anaesthetic is injected into the space under the acromion and if it relieves the pain a diagnosis of impingement syndrome may be made.

Treatment

Treatment for impingement syndrome includes ice, anti-inflammatory medications, and a systematic physiotherapy. Ice should be applied to the shoulder for 20 minutes once or twice a day. Some patients find that ibuprofen or naproxen is helpful on an as-needed basis.

The most important treatment for impingement syndrome is physiotherapy.

In cases of severe pain, a cortisone injection may be helpful in reducing symptoms. If the patient still has symptoms after all of this treatment, an MRI may be necessary in order to rule out a rotator cuff tear. If the patient does tear his or her rotator cuff, surgery may be necessary.

In summary, impingement syndrome is a common condition in the shoulders of active adults, particularly as they get older. Treatment without surgery usually relieves symptoms. In advanced, long-standing cases, the rotator cuff tendon can tear, in which case the patient may need surgery.

43.7 Sacroiliac Joint Disease

The sacroiliac (SI) joint is a firm, small joint that lies at the junction of the spine and the pelvis. The sacroiliac joint does not move much, but it is critical to transferring the load of upper body to lower body.

Symptoms

Sacroiliac joint inflammation can be a difficult problem to diagnose for a few reasons:

- The SI joint is not easily palpated or manipulated;
- Tests tend not to isolate just the SI joint;
- Studies (X-Rays, MRIs, CAT Scans, Bone Scans) are often normal;
- Several other problems (back pain, sciatica, hip arthritis) can cause similar symptoms. It is always better to rule out all other differential diagnosis before clinching the decision in favour of Sacroiliac Joint Disease.

Diagnosis

The first method of diagnosis is to feel for the joint and see if the sacroiliac area is tender. Certain tests can place pressure across the joint, and may indicate a problem in that region. One test, called the FABER test, is done by lying down, flexing the hip, abducting the leg, and externally rotating the hip. This manoeuvre places pressure directly across the sacroiliac joint.

If the diagnosis is still unclear, an injection into the SI joint can be diagnostic. In this procedure, anaesthetic (like novacaine) is injected into the SI joint. If the injection alleviates the symptoms, then the test is positive for the sacroiliac joint as a source of the problem. This test may be performed in conjunction with a cortisone injection for treatment of SI joint problems.

Treatment

Sacroiliac joint inflammation tends to respond well to conservative therapy. The first step in treatment is to avoid the activities that cause symptoms. For athletes and people working in certain occupations, this may mean avoiding their sport or alter the work to let the inflammation subside. An anti-inflammatory (NSAID) medication can help to minimize the inflammation. It is important to understand that the anti-inflammatory drug is not used as an analgesic but rather to decrease the inflammation. Even if the pain goes away, the anti-inflammatory properties of these medications may still be effective. Physiotherapy is the last step in conservative treatment. A physiotherapist can help strengthen the muscles around the SI joint and low back and help increase flexibility around the joint.

If all these treatments fail, an injection of cortisone into the joint may be effective. The cortisone injection delivers a more powerful anti-inflammatory medication directly into the sacroiliac joint itself. Because the SI joint is deeper within the body than most joints, the cortisone injections are usually given under live X-Ray guidance in a hospital setting.

When all of these non-surgical treatments have failed to relieve the pain, SI joint fusion, thorough a minimally invasive approach can be helpful in some patients.

Neurological and Behavioural Conditions

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This chapter deals with conditions that directly affect neurological function or behavioural aspects of the person. Most of these affections are directly or indirectly affected or influenced by the work the person is engaged in.

44.1 Toxic Encephalopathy

Toxic encephalopathy is a degenerative neurologic disorder caused by exposure to toxic substances like organic solvents. Exposure to toxic substances can lead to a variety of symptoms, characterized by an altered mental status, memory loss, and visual problems.

Toxic encephalopathy can be caused by various chemicals, including commonly used in daily life. Toxic encephalopathy can permanently damage the brain and currently, treatment is mainly symptomatic.

Signs and Symptoms

“Encephalopathy” is a general term describing brain malfunctions and “toxic” asserts that the malfunction is caused by toxins on the brain. The most prominent

characteristic of toxic encephalopathy is an altered mental status. Toxic encephalopathy has a wide variety of symptoms, which can include:

- memory loss;
- small personality changes/increased irritability;
- insidious onset of concentration difficulties;
- involuntary movements;
- fatigue;
- seizures;
- arm strength problems, and
- depression.

Risk Factors

Neuro-behavioural effects of occupational exposure to organic solvents exist among construction painters. The condition may also be referred to as substance-induced persistent dementia. Acute intoxication symptoms include light headedness, dizziness, headache and nausea, and regular cumulative exposure to these toxic solvents over a number of years puts the individual at high risk for developing toxic encephalopathy.

A thorough and standard diagnostic process is paramount with toxic encephalopathy, including a careful occupational history, medical history, and standardized imaging/neurobehavioral testing.

Causes

Chemicals, such as lead, that could instigate toxic encephalopathy are sometimes found in everyday products such as cleaning products, building materials, pesticides, air fresheners, and even perfumes. These harmful chemicals can be inhaled or applied. The substances diffuse into the brain rapidly, as they are lipophilic and readily transported across the blood–brain barrier. This is a result of increased membrane solubility and local blood flow, with central nervous system (CNS) solvent uptake being further increased with high levels of physical activity.

When they are not detoxified immediately, the symptoms of toxic encephalopathy begin to emerge. However, in chronic situations, these effects may not become severe enough to be noticed until much later. Increased exposure time and increased concentration of the chemicals will worsen the effects of toxic encephalopathy, due to the associated structural CNS damage and direct functional impairment consequences.

Treatment

Treatment is mainly for the symptoms that toxic encephalopathy brings upon victims, varying depending on how severe the case is. Diet changes and nutritional supplements may help some patients. To reduce or halt seizures, anticonvulsants may be prescribed. Dialysis may be needed in some severe cases.

Management of affected individuals consists of immediate removal from exposure to the toxic substance(s), treatment of the common clinical manifestation of depression if present, and counselling for the provision of life strategies to help cope with the potentially debilitating condition.

Prognosis

Toxic encephalopathy is often irreversible. If the source of the problem is treated by removing the toxic chemical from the system, further damage can be prevented, but prolonged exposure to toxic chemicals can quickly destroy the brain. Residual cognitive impairment (primarily attention and information-processing impairment resulting in dysfunction in working memory) can continue for up to 10 years following cessation of exposure. Severe cases of toxic encephalopathy can be life threatening.

44.2 Alzheimer’s Disease

Alzheimer’s disease is the most common form of dementia and accounts for approximately 60% of all dementia cases. There is no cure for Alzheimer’s disease, nor any proven ways to prevent its onset. Treatment focuses on support and managing symptoms. The condition is ultimately fatal.

Causes

In Alzheimer’s disease, brain cells start to deteriorate. The body attempts to stop this process by producing a protein called amyloid. However, amyloid deposits build up in the brain, leading to further deterioration. These deposits of amyloid are referred to as “plaques” and cause the brain cells to shrivel up and form “tangles”, which in turn lead to changes in the brain structure and cause the brain cells to die. The formation of plaques and tangles also prevents the production of neurotransmitters. Over time the loss of brain cells causes the brain to shrink.

There is no known cause for Alzheimer’s disease but it is now believed that a combination of environmental and genetic risk factors triggers an abnormal biological process in the brain that, over decades, results in Alzheimer-type dementia. Though 1 in 20 cases may occur under the age of 65, increasing age ups the risk.

Risk Factors

- Identified risk factors for developing the condition include:
- Increasing age
- Down’s syndrome

- History of a head injury
- Risk factors for blood vessel disease such as smoking
- Family history of Alzheimer's disease
- Obesity
- High blood pressure
- High cholesterol
- Insulin resistance.
- There is some evidence of a slightly higher prevalence of Alzheimer's disease in females than males.
- Research studies have indicated that the following factors may play an important role in the development of the condition:
 - Genetic factors, such as the presence of, or changes to, certain genes.
 - Environmental factors, such as long term exposure to some environmental solvents e.g.: pesticides, glues and paints.
 - The role of autoimmune factors and certain viruses are also being studied.

Signs and Symptoms

The degenerative changes that occur with Alzheimer's disease affect the areas of the brain that control thought, memory and language resulting in gradual signs and symptoms related to a person's behaviour and mental function. Often, physical functions such as bowel and bladder control are also affected. With Alzheimer's disease there is great individual variability as to the nature of symptoms experienced and the speed at which deterioration occurs. For each person the types of behaviour change and the length of time symptoms are different. The symptoms typically develop quite slowly. The time between the onset of the disease and death can range from five to 20 years.

Symptoms commonly experienced during the early stages of Alzheimer's disease include:

- Mild forgetfulness – especially short-term memory loss;
- Mood changes, including irritability and anxiety;
- Difficulty processing new information and learning new things;
- Loss of spontaneity and initiative;
- Confusion about time and place;
- Communication difficulties;
- Decline in ability to perform routine tasks;
- As Alzheimer's disease progresses the following symptoms may develop;
- Increasing short-term memory loss and confusion;
- Difficulty recognising family and friends;
- Shorter attention span and feelings of restlessness;
- Difficulty with reading, writing and numbers;
- Possibly neglectful of hygiene;
- Loss of appetite;

- Personality changes (e.g.: aggression, significant mood swings);
- Requires increasing assistance with daily tasks;
- Towards the later stages of the disease the following symptoms may be experienced;
- Inability to understand or use speech;
- Incontinence of urine/faeces;
- Inability to recognise self or family;
- Severe disorientation;
- Increasing immobility and sleep time.

The changes brought about by Alzheimer's disease can be increasingly difficult for family members and friends. It is particularly difficult as the person's condition deteriorates and they become unable to recognise their own family members!

Although a person loses many abilities as the disease progresses, it is helpful to focus on the abilities that do remain, such as the senses of touch and hearing and the ability to respond to emotion.

Diagnosis

There is no single test to diagnose Alzheimer's disease. Diagnosis involves a full assessment of medical and psychiatric history to rule out other possible causes. Therefore a variety of tests are required to obtain a conclusive diagnosis, which may include:

- A neurological and physical examination;
- Blood and urine tests;
- Brain scans: CT scanning or MRI and PET scan if possible;
- Mental status assessment to determine the level of mental deterioration;
- Caregiver interview to determine the level of dependency.

Treatment

As there is no known cure for Alzheimer's disease, treatment focuses on managing symptoms and supporting the person and their family. This may include:

- Treating medical conditions that may contribute to confusion or physical decline e.g.: lung disease or anaemia;
- Encouraging stimulating activities in order to encourage the person to continue their normal activities as much as possible;
- Providing memory aids and memory triggers such as calendars and written reminders;
- Encouraging social interaction to help prevent feelings of loneliness and depression;
- Family/caregivers assistance;
- Encouraging regular routine to reduce confusion;
- Not smoking.

Medications

Medications such as sleeping tablets and tranquillisers may help to control symptoms such as sleeplessness and agitation but may cause increased confusion.

A group of medications called cholinesterase inhibitors have shown some effectiveness in slowing the progression of the condition in some people. These medications help prevent the breakdown of acetylcholine, a neurotransmitter responsible for memory.

More recently, another drug memantine has become available. Memantine works in a different way to the cholinesterase inhibitors, aiming to prevent the entry of an excess amount of calcium into brain cells. Higher than normal levels of calcium in the brain cells causes damage to them and also prevents them from receiving signals from other brain cells.

Research continues into the development of other medications for the treatment of Alzheimer's disease.

Prevention

There are no proven ways to prevent the development of Alzheimer's disease. Leading a healthy lifestyle can reduce the risk of Alzheimer's disease. Regular physical activity and exercise may have a general protective effect on brain health and may slow progression of Alzheimer's disease.

Substance Abuse

A drug is a substance that when taken into the living organism, may modify one or more of its functions. Psychoactive drugs are capable of altering mental functioning. Major dependence producing drugs are:

1. Alcohol;
2. Opioids (Opium, Heroin);
3. Cannabinoids (Cannabis);
4. Cocaine;
5. Amphetamine;
6. Hallucinogens (LSD, Phencyclidine);
7. Sedatives and Hypnotics (Barbiturates);
8. Inhalants;
9. Nicotine;
10. Other stimulants (Caffeine).

Patterns of Drug Use Disorder:

1. Acute Intoxication: associated with high level of drug in blood. Disturbance in level of consciousness, cognition, perception, mood, behaviour.
2. Withdrawal state:
 - Symptoms which occur when drug is totally or partially withdrawn, usually after repeated or high doses;

- Short lasting syndrome, usual duration is few hours to days;
 - May be complicated by convulsions or delirium.
3. Dependence Syndrome: Characterised by strong desire to take the Psychoactive Drug:
- Harmful Use;
 - Continued use of drug despite awareness of harmful medical/social effect of the drug;
 - Pattern of physically hazardous use of drug (driving during intoxication);
 - Prevalence rates were as follows: Alcohol (21.4%) was the primary substance used (apart from tobacco) followed by cannabis (3.0%) and opioids (0.7%).

44.3 Alcohol Use Disorders

Psychiatric Symptoms of Alcoholism

Phase of acute Intoxication: is associated with a brief period of excitation followed by Generalised nervous system depression.

There is progressive loss of self control with disinhibited behaviour. Bipolar and anxiety disorders are also known to be associated with alcoholism. Mental and emotional symptoms of alcoholism exist long before physical complications appear.

Laboratory markers of Alcohol Dependence:

1. Sr GGT is raised TO 40 IU/l in 80% of Alcohol dependant individuals. GGT returns to normal within 48 hrs of abstinence. An increase of GGT of more than 50% in an abstinent individual signifies resumption of heavy drinking.
2. MCV (Mean Corpuscular Volume) is more than 92fl (normal range 80-90fl) in about 60% of the alcohol dependant individuals. MCV takes weeks to return to normal values after abstinence.
3. Other Lab Markers include Alkaline Phosphatase, ASL, ALT, Uric Acid, Blood Triglycerides, Creatinine kinase.
4. Blood Alcohol Concentration and Breath Analyser can be used for purpose of identification.

Withdrawal symptoms

Apart from neurological and physical symptoms, there may be delirium tremens, Alcoholic Hallucinosi. Hallucinations may be auditory, visual, and tactile. Tactile hallucinations are feeling of insects crawling over the body. Recovery during abstinence is within 3 to 7 days. In some cases recovery from hallucinations may be prolonged to about 6 months.

Neuro Psychiatric Complications

1. Wernicke's encephalopathy: it is an acute reaction to severe deficiency of thiamine. Symptoms are disorientation, confusion, disturbances in recent memory.
2. Korsakoff's psychosis: this follows Wernicke's encephalopathy. There are gross memory disturbances with confabulation and loss of insight.
3. Marchiafava- Bignami Disease occurs due to alcohol related nutritional deficiency.
4. Apart from other symptoms there is deterioration of personality and intellectual functioning.

Treatment

1. Detoxification: It is the treatment of withdrawal symptoms. Some patients may require hospitalisation. Benzodiazepines like Chlordiazepoxide or Diazepam are used; Thiamine is used in dose of 100 mg twice a day parenterally for 3 to 5 days, followed by oral course for 1 month. Dehydration should be treated.
2. Treatment of Alcohol Dependence:
 - Behaviour Therapy;
 - Psychotherapy: Education about risks of continuing Alcohol use, Advise to resume personal responsibility for change, opportunity to choose option for change;
 - Group Therapy with Alcoholics Anonymous;
 - Deterrent Agents: Disulphiram prevents oxidation of acetaldehyde to acetate. Treatment is usually done in hospital after a challenge test with alcohol to demonstrate its unpleasant and dangerous side effect. Usual dose of disulphiram is 250-500 mg/day in first week and 250 mg/day subsequently for maintenance treatment. Effects begin within 12 hours of first dose and last for 7 to 10 days after last dose;
 - Treatment of underlying psychiatric conditions, if any;
 - Psychosocial rehabilitation.

44.4 Opioid Use Disorder

Morphine, Heroin are examples of opioids commonly used. Acute intoxication is characterised by apathy, decreased blood pressure, respiratory activity, body temperature, pinpoint pupils. Withdrawal effects are seen within 12-24 hours and peak at 24-72 hours and subside within 7 days. Symptoms include, lacrimation, rhinorrhea, pupillary dilatation, sweating, diarrhoea, yawning, increased heart rate, increased temperature, muscle cramps, anxiety, nausea, vomiting.

Complications: CNS degenerative effects due to contaminants, infections due to intravenous use, social complications due to drug-peddling and criminal activities.

Laboratory Tests: Naloxone challenge test precipitates withdrawal symptoms. Urinary opioids' testing is also useful.

Treatment

1. Opioids Overdose: Naloxone, Naltrexone combined with general care and supportive treatment.
2. Detoxification:
 - Use of substitute drugs like methadone. Patient is then gradually tapered off from methadone which is less addicting and has milder withdrawal symptoms;
 - Clonidines, Naltrexone with Clonidine, Buprenorphine are tried.
3. Maintenance: Methadone, Nalorphine, Psychotherapy, Behaviour Therapy, Motivational Enhancement Therapy, Group Therapy, Psychosocial Rehabilitation.

44.5 Cannabis Use Disorder

Bhang: is a preparation of cannabis has been used as an intoxicant for centuries in festivals such as Holi or Shivratri. **Ganja** is another preparation from Indian Hemp, and is commonly smoked.

Acute Intoxication: Mild impairment of consciousness, orientation, increased heart rate, euphoria, loss of inhibitions, photophobia, lacrimation dry mouth, increased appetite. There are perceptual disturbances like depersonalization, derealisation, and increased sensitivity to music. Hallucinations are seen in severe intoxication. Flash back phenomenon may occur where person may experience these symptoms even later when there is no current usage of cannabis.

Complications

1. Transient short lasting psychiatric disorders like acute anxiety, paranoid psychosis, hysterical fugue state, suicidal ideation, hypomania, schizophrenia like state, acute organic psychosis, depression.
2. Chronic usage may cause lethargy, apathy, loss of interest, memory impairment, relapse of schizophrenia, mood disorders, Hemp Insanity.

Treatment

Withdrawal Symptoms are very mild. Management consists of supportive and symptomatic treatment. Psychotherapy and Psycho education are important.

44.6 Cocaine Use Disorder

Cocaine is used orally, intranasally or parenterally. It produces a rush of pleasurable sensations. Symptoms of cocaine use are: pupillary dilatation, tachycardia, hypertension, sweating, nausea, vomiting, hypomanic picture. Withdrawal shows mild physical dependence, but very strong psychological dependence.

Complications: acute anxiety reaction, uncontrolled compulsive behaviour, psychotic episodes, persecutory delusions, tactile and other hallucinations, delirium. High doses of cocaine can lead to seizures, respiratory depression, cardiac arrhythmias, coronary artery occlusion, myocardial infarction, lung damage, GI necrosis, perforation of nasal septum.

Treatment

1. Overdose: oxygenation, muscle relaxants, intravenous thiopentone, intravenous diazepam intravenous propranolol, haloperidol for treatment of psychosis.
2. Chronic use: management of underlying psychopathology dopamine agonist like bromocriptine, amantadine reduces craving for cocaine, desipramine, imipramine, and trazodone, supportive psychotherapy, behaviour therapy.

44.7 Amphetamine Use Disorder

It is a powerful CNS stimulant. Laboratory investigations: urinary levels of amphetamines.

Symptoms of intoxication: paranoid hallucinatory syndrome – visual hallucinations, absence of thought disorder, fearful emotional response, presence of confusion. Amphetamine induced psychosis resolves in 7 days of urinary clearance of amphetamines. Chronic amphetamine intoxication leads to severe compulsive craving for the drug, high degree of tolerance. Common pattern is heavy use for several days followed by stopping of drug use. Tactile hallucinations may sometimes occur.

Withdrawal Symptoms

The withdrawal symptoms are – Depression, apathy, fatigue, hypersomnia alternating with insomnia, agitation and hyperphagia. Detoxification from amphetamines should always occur under the trained supervision of medical personnel in a safe environment.

Treatment

Acute Intoxication: treated symptomatically. Acidification of urine with oral NH_4Cl 500 mg every 4 hours, facilitates elimination of Amphetamines.

Withdrawal: Hospitalisation for severe depression, anti-depressant, Supportive psychotherapy.

44.8 LSD Use Disorder

This drug produces effects by action on 5HT Levels in the brain. No physical dependence or withdrawal symptom seen, flash backs can occur sometimes, Psychological withdrawal can occur, pattern of usage is occasional use followed by long period of abstinence.

Intoxication Symptoms

Depersonalisation, Derealisation, intensification of perceptions, illusions, hallucinations, pupillary dilatation, tachycardia, sweating, tremors, incoordination, palpitations, raised temperature, piloerection, giddiness, anxiety, depression.

Treatment

Symptomatic management with anti-anxiety, anti-depressant, anti-psychotic medication along with supportive psychotherapy.

44.9 Barbiturate Use Disorder

It has sedative hypnotic and anxiolytic use. Acute intoxication symptoms: irritability, increased productivity of speech, liability of mood, disinhibited behaviour, slurring of speech, incoordination, attention and memory impairment, ataxia. This condition may resemble alcohol intoxication.

Withdrawal

Is worst at 72 hrs after last dose. Restlessness, tremors, hypertension, seizures, psychosis and coma followed by death can occur.

Treatment

Symptomatic treatment for intoxication. For withdrawal, Phenobarbital substitution therapy, supportive treatment of associated psychiatric disorders like depression.

44.10 Benzodiazapine Use Disorder

It has a sedative hypnotic action. Acute intoxication symptoms resemble alcohol intoxication. Chronic intoxication causes tolerance to sedative and hypnotic actions.

Excessive usage can lead to respiratory depression, coma and death. Chronic use causes amnestic syndrome withdrawal syndrome characterised by anxiety, irritability, tremors, insomnia, Vomiting, weakness, postural hypotension and seizures.

Treatment

Symptomatic. In case of coma caused by overdose, Flumazenil can be used in a dose of 0.3 to 1.0 mg IV over 1 to 2 minutes.

44.11 Inhalants or Volatile Solvent Use Disorder

Gasoline (petrol), glues, aerosols, thinners, varnish removers, industrial solvents. Active ingredients are toluene, benzene, acetone, halogenated hydrocarbons. It's usage is seen in lower socio-economic groups, rag pickers in Mumbai and Delhi.

Intoxication symptoms: euphoria, belligerence, dizziness, slurring of speech, apathy, impaired judgement, decreased reflexes, ataxia, nystagmus, incoordination, coma. Death can occur due to respiratory depression, cardiac arrhythmia or asphyxia.

44.12 Phencyclidine Use Disorder

It is a dissociative anaesthetic agent. It is called peace pill or angel dust. It is taken orally, intravenously or by snorting.

Symptoms of intoxication: impulsiveness, agitation, impaired social judgement, assaultiveness, perceived numbness and inability to move, catatonic syndrome, delirium, stupor, paranoid hallucinatory psychosis, mania or depression.

Withdrawal

Craving, social withdrawal, anxiety, depression, impaired cognitive functions.

Treatment

Symptomatic treatment, gastric lavage, isolation, use of anti convulsants, anti psychotics.

44.13 Nicotine Use Disorders

Nicotine is often used in form of smoking. Used in schizophrenia and depression. Stress and the emotional responses associated with it like anxiety and irritation are known to be attenuated by smoking. These effects are however short lived. Impairment of mood tends to occur in a repetitive cycle between each cigarette smoked. It can cause cardiovascular disease, respiratory disease and cancer.

44.14 Caffeine Use Disorder

Caffeine Intoxication occurs if consumption is 250 mg/day or more. Symptoms of Intoxication: restlessness, nervousness, excitement, insomnia, flushed face, diuresis, GI disturbance, muscle twitching, rambling flow of thoughts and speech, tachycardia, cardiac arrhythmia, period of inexhaustibility and psychomotor agitation. These symptoms are accompanied by clinically significant distress or disability in social, occupational or other areas of functioning.

44.15 Distress as A Result of Poverty

The World Health Organization report on Mental Health states Mental Health Disorders occur in persons of all genders, ages and backgrounds. No group is immune to mental disorders, but the risk is higher among the poor, homeless, the unemployed, persons with low education. The link is complex and is influenced by numerous factors.

Studies have shown that the risk of having a major depressive disorder is twice as likely in the lowest socioeconomic group as compared to the highest socioeconomic group. Common mental disorders like Anxiety and depression are reported to be most prevalent amongst those with the lowest material standard of living, especially amongst those with long term experience of poverty. Poverty and Socio Economic problems have been cited as one of the most important factors causing emotional distress.

Relationship between mental disorders and poverty

Poverty brings along with it lack of opportunity, reduced availability and accessibility to resources and a greater likelihood of experiencing difficult events. The resultant distress may manifest in a variety of presentations including emotional states such

as low mood, sadness, frustration or discontent. It may also manifest as a physical symptom for which there is no identifiable cause. Person going through poverty, experiences difficulty in relationship with family and friends, feeling bored, feeling a failure, perception of being looked down upon, feeling depressed. Unreliable source of income and risk of loss of house and lands are likely to precede mental illnesses like depression and anxiety making poverty an important risk factor for mental illness. Lack of education and employment are factors that are a part of a vicious cycle in poverty.

Limited resources result in reduced opportunity for education that prevents access to most professional jobs, increases vulnerability and insecurity and contributes to persistently low socio economic levels. The prevalence of mental health disorders is known to be higher in individuals with lower education levels.

Poverty results in reduced opportunity for reasonable housing and accommodation that influence emotional wellbeing. Chronic poverty is associated with lower levels of family support, alcoholism, fear of crime and violence, abuse, higher rates of family desertion in males. Psychologically there is stigma, social isolation, exclusion, shame and humiliation of poverty.

There are perceived feelings of hopelessness, fatalism, lack of control over their circumstances, orientation of life towards the present rather than the future, and lower level of satisfaction with life. These characteristics perpetuate the poverty that induces them.

Relative Poverty

It is dissatisfaction with ones lot in life compared to others. It may occur due to increase in socioeconomic inequality. It increases the incidence of anxiety and depression. Being in debt is also a particular source of stress and worry.

Working Poor

Unemployment is a source of stress. So is working poverty. It is represented by financial deficiency and restricted standard of living. It adversely affected the psychological well being. Insecurity of income flow is associated with common mental disorders. The suicides among farmers are attributed to the impact of financial insecurity resulting from the inability of the small scale farmer to cope with the economic challenge of rapid globalization. A sudden fall in the socioeconomic status of an individual may result in acute and extreme distress and even suicidal attempts. Chronic deprivation is associated with helplessness, hopelessness and poor socio-emotional wellbeing.

Poverty affects children. Children from low income families have higher levels of depression; engage in anti social behaviour like bullying, being cruel, breaking things, cheating, telling lies, than children of advantaged households. They also show poorer cognitive performance. Adolescents are likely to engage in drug, alcohol

usage at earlier ages, engage in sexual activity earlier, have mental health problems and lower academic achievements. Externalized behaviour is seen in boys evidenced by defiance, impulsivity, hyperactivity and aggression. Internalized behaviour is seen in girls evidenced by withdrawal, dysphoria, and anxiety.

Due to poverty quality of parenting is lower. Ability of the parent to provide supportive, consistent behaviour is diminished as their vulnerability to life events increases. Parental mental health and behaviour in turn affects the well being of the child. Females experiencing poverty are at greater risk of developing mental disorders.

44.16 Suicide and Deliberate Self Harm

Suicide is a type of deliberately induced self harm with the intension to cause death. Attempted suicide is an unsuccessful suicidal act with a non fatal outcome. Suicidal gesture is an attempted suicide where the person performing the action never intends to die by the act. However in some persons death may accidentally occur during the act.

80% of people who commit suicide, give definite warnings or clues about their suicidal intensions. Most suicidal persons are undecided about dying or living Suicidal person is suicidal only for a limited period of time. All suicidal persons are not necessarily mentally ill.

Suicide occurs due to domestic stress, failure in love, dowry issues, illegitimate pregnancy, family disputes, loss of a loved one through death and social isolation.

Suicides in farmers may occur due to financial stresses, debts, loss of crop, failure of water supply etc.

Suicide may also be caused by underlying Psychiatric Diseases like Depression, Alcoholism/Drug Dependence, Schizophrenia.

44.17 Depression

Depression is a Psychiatric disorder. It is characterized by a persistent sadness of mood or loss of interest/pleasure in almost all activities throughout the day. The depressed mood varies little from day to day and does not change with change of environment. There is decrease in ability to work. Person experiences hopelessness, helplessness and worthlessness. One may experience difficulty in thinking, concentration, inability to decide. There may be repetitive intrusive thoughts about pessimistic ideas and death. Person may be noticed to be restless, irritable and frustrated. Person may experience vague symptoms like heaviness of head, vague bodyache, reduced energy, easy fatigability. Appetite may be disturbed.

Alcoholism/Drug Dependence

Person is said to be dependent on a substance if use of the substance takes on a much higher priority for an individual than other activities which once had a higher priority value.

The person may experience a strong desire to take the substance. He may experience difficulty in controlling the substance taking behaviour. He may experience withdrawal symptoms when use of the substance has ceased or reduced. He may experience tolerance (i.e. greater dose of the substance is required to produce the same effect). He may progressively neglect other alternative pleasurable interests. He may persistently continue to use the substance despite evidence of harmful consequences to his health. This may occur with Alcohol, Narcotic Drugs, Tobacco, etc.

44.18 Schizophrenia

Schizophrenia is a Mental Disease in which person's thought, speech, understanding, feeling, movement and interaction with other people and things is altered. Person does not notice any abnormality with himself. Person may develop illogical thinking. His speech becomes disjointed. He may be noticed to have delusions that are auditory or visual. The emotions may be affected. Movements may be increased or decreased.

Prevention

- Take all suicidal threats and attempts seriously.
- Remove all means of inflicting self harm from surrounding (e.g. rope, knife, drug, firearms) Search the patient thoroughly.
- Keep patient under surveillance.
- Counsel and guide the person.
- Treatment of underlying Psychiatric Disorder if any, by a Qualified Psychiatrist.
- Follow up care after the episode.
- Electro Convulsive therapy is the treatment of choice for patients with major depression having suicidal risks.
- Treatment of Alcoholism:
 - Person should be educated about the risk of continuing alcohol use. He must be asked to be personally responsible for change and must be given choice of options towards effecting the change;
 - Group Therapy like volunteer self help groups like Alcoholics Anonymous;
 - Use deterrent agents like Disulphiram in Hospital setting 250mg/day;
 - Use of Anti Craving agent like Acamprosate, Naltrexone, Fluoxetine.

Occupational Neoplastic Disease

- | | | | |
|------|------------------------------|-------|-------------------|
| 45.1 | Skin Cancer | 45.9 | Lung Cancer |
| 45.2 | Melanoma | 45.10 | Kidney Cancer |
| 45.3 | Lip Cancer | 45.11 | Bladder Cancer |
| 45.4 | Myeloma | 45.12 | Prostate Cancer |
| 45.5 | Hodgkin's Lymphoma (HL) | 45.13 | Testicular Cancer |
| 45.6 | Non-Hodgkin's Lymphoma (NHL) | 45.14 | Stomach Cancer |
| 45.7 | Leukemia | 45.15 | Pancreatic Cancer |
| 45.8 | Nasal and Sinus Cancer | 45.16 | Brain Tumours |

Occupational cancer is caused wholly or partly by exposure to a cancer causing agent (carcinogen) at work place.

Introduction

Cancer is not a single disease with a single cause or treatment. It develops when cells in the body grow in an uncontrolled and abnormal way. Numerous types of cancer occur from occupations of workers, each with its own characteristics, nomenclature and treatment. Different types of cancer have their different sets of causes. Occupational cancers can affect any organ of the body like lungs, or the skin or liver. An individual's cancer risk is influenced by a combination of factors including personal habits such as smoking and alcohol consumption, genetics, personal characteristics such as sex, ethnicity, age, exposure to carcinogens in the environment and so on.

Statistics

Cancers due to occupational causes are a leading cause of work-related death worldwide. Asbestos related diseases alone account for at least 100,000 deaths worldwide each year. It is estimated that almost 40 times more deaths are attributable to occupational cancer than to road accidents.

It is difficult to determine a true figure for occupational cancers because of the latent nature of the disease. An individual might be exposed to a cause of cancer and not develop any noticeable symptoms until many years later. With current work patterns of people moving between different job roles and industries, it can be difficult to determine a specific exposure or cause.

Causes

Occupational cancer is caused by exposure to carcinogens in the workplace. There are three different types of occupational carcinogens:

1. *Biological carcinogens* – some micro-organisms such as viruses have been known to cause cancer, either by damaging cells directly or by decreasing the body's ability to control abnormal cells (Hepatitis B, HIV viruses etc.)
2. *Chemical carcinogens* – Many chemicals are known to be carcinogenic. These chemicals may occur naturally, such as asbestos, be manufactured like vinyl chloride, or be by-products of industrial processes, e.g. polycyclic aromatic hydrocarbons.
3. *Physical carcinogens* – agents such as ionising and ultraviolet (UV) radiation have the potential to cause cancer. Examples of ionising radiation include X-rays and alpha, beta and gamma radiation. Some of bands of ultraviolet radiation such as UV-B, UV-C etc, are known to cause skin cancer.

Certain occupational circumstances, such as working as a painter or as a welder are also associated with increased risks of some cancers. In addition,

Occupational cancer can arise from exposure to many substances or from certain occupational circumstances such as the ones mentioned in the following table. The degree of exposure cannot be precisely determined however in most cases exposure is an indication of risk. The practitioner, as part of eliciting occupational history, should routinely ascertain working conditions particularly with respect to exposure to these agents.

Substances	Type of Cancer
Asbestos fibres	Colorectal, larynx, lung, ovary, pharynx, stomach cancers, mesothelioma
Wood dusts	Nasopharynx, sinonasal cancers
UV radiation from sunlight	Skin cancers
Metalworking fluids and mineral oils	Bladder, lung, sinonasal, skin cancers
Silica dust	Lung cancer
Diesel engine exhaust	Bladder, lung cancers
Coal tars and pitches	Non-melanoma skin cancer
Arsenic	Bladder, lung, skin cancers
Dioxins	Lung cancer
Environmental tobacco smoke (passive smoke)	Lung cancer
Naturally occurring radon	Lung cancer
Tetrachloroethylene	Cervix, non-Hodgkin's lymphoma, oesophagus cancers
Work as a painter	Bladder, lung
Work as a welder	Lung cancer, melanoma of the eye
Shift (night) work	Breast cancer

The International Agency for Research on Cancer (IARC) lists over 50 known causes of workplace cancer, and also other possible substances.

Types of Occupational Cancers

Cancers associated with occupational exposure include:

Type of Cancer	Carcinogens	Occupation
Bladder cancer	Arsenic; aromatic amines; coal tars and pitched, diesel engine exhaust; metalworking fluids and mineral oils;	Work as a hairdresser or barber; work as a painter; work in the rubber industry
Breast cancer	Ionising radiation; ethylene oxide	Shift (night) work
Colon and rectal cancer	Asbestos, ionising radiation	
Kidney cancer	Arsenic, cadmium; trichloroethylene	Coke production
Laryngeal cancer	Sbestos; strong inorganic acid mists including sulphuric acids	Work in the rubber industry;
Leukaemia	Benzene, ethylene oxide, formaldehyde, ionising radiation, non-arsenical insecticides	
Lung cancer	Arsenic; asbestos; beryllium; cadmium; chromium; coal gasification, coal tar and pitches, cobalt; diesel engine exhaust, dioxins; inorganic lead mineral oils; nickel; work as a painter; natural radon in workplaces; ionising radiation, silica; strong inorganic acid mists	Coke production; iron and steel foundry work, rubber production; work as a welder
Bone cancer	Ionising radiation	
Brain and other CNS cancers	Ionising radiation	
Melanoma of the eye		Welding
Mesothelioma	Asbestos	
Nasal and sinus cancer	Chromium, formaldehyde, leather dust, nickel, wood dust	Textile industry
Non-Hodgkin's disease	Non-arsenical insecticides, tetrachloroethylene, trichloroethylene	Work as a hairdresser or barber; work as a painter
Non-melanoma skin cancer	Coal tars and pitches, mineral oils, solar radiation	
Oesophageal cancer	Soot; tetrachloroethylene	
Pharyngeal cancer	Asbestos	
Stomach cancer	Asbestos	

Symptoms

Detecting most cancers early means that treatment is more likely to be successful. Symptoms of cancer could include:

- A lump anywhere on the body;
- Changes to a mole;
- A cough that won't go away;
- Increasing breathlessness and wheezing;
- Abnormal bleeding;
- A change in bowel movements;
- Unexplained weight loss;
- Persistent aches and pains;
- Excessive tiredness (fatigue).

It may take many years for symptoms of cancer to be noticeable and these usually differ depending on the type of cancer.

Occupational cancers are a leading cause of work-related death and despite their devastating effects; cancer-causing agents are still used in the workplace. While developed nations are adopting innovative working practices and introducing stringent laws to control exposure to those substances or use less harmful ones, the same cannot be said for all of the developing nations.

Prevention & Control Measures

Thousands of people die each year from cancer due to occupational causes. According to the World Health Organization (WHO), 20-30 per cent of males and 5-20 per cent of females in the working-age population could have been exposed to an occupational lung cancer risk during their working lives. Therefore, it's important to correctly identify carcinogens used in the workplace and put adequate control measure in place to reduce the risk of exposure and harm. This can be achieved by Employers with Government agencies:

- Identifying any possible carcinogenic substances being used in the workplace;
- Identifying the likely level of exposure and possible emissions or spread of carcinogenic substances;
- Determining whether a less harmful substance could be used or produced;
- Looking into engineering controls to completely enclose the process of using or handling of the carcinogenic substance if it can't be substituted;
- Looking at engineering controls or processes to reduce exposure such as partial enclosure and local exhaust ventilation if total enclosure isn't possible;
- Using PPE – this is an important part of the control programme, but it must not be the sole element and must be used in combination with other controls;
- Keeping stocks in closed and clearly labelled containers in secure areas;
- Ensuring any waste or emissions are correctly controlled.

Risk Management Programme

Experts provide a template model in its **five steps** to risk assessment:

1. Identify the hazards;
2. Decide who might be harmed and how;
3. Evaluate the risks and decide on precautions;
4. Record your findings and implement them;
5. Review your assessment and update if necessary.

Early Intervention and Immediate Corrective Action

Early intervention for all work-related ill health is a key aspect of ensuring the best outcome for both employee and employer. Health surveillance and monitoring for symptoms can help in early detection and some primary actions. Many cancers can be prevented by reducing exposure to carcinogens. Some cancers can be detected early, treated and cured.

If someone has suspected occupational cancer, it's important to protect them from further exposure to carcinogens and other substances or tasks that could make their condition worse or adversely affect their treatment, while the causes of their symptoms are investigated.

If cancer is diagnosed, exposure to carcinogens and other substances that could make the condition worse or affect the outcome of treatment must be controlled. If controls are not sufficient or changes to the work process can't reduce exposure enough, then consider moving the employee to a different area or changing their duties.

Immediate Medical Advice

Under ideal circumstances, if a worker develops any symptoms, he should be seen by a doctor. The scope of this manual is too limited to give even general guidelines to the primary care physicians on treating cancer except to advise them to refer the patient to a hospital explicitly mentioning his occupational history and likely carcinogen exposure at his workplace.

In an informal industry setting it is unlikely that the employer will provide these facilities. He should at least provide information about his work and the substances he worked with or been exposed to in current or previous jobs.

If cancer-related symptoms are detected in the workforce, employers should review the systems they use to control exposure to known carcinogens and develop a protection programme if they don't have one already.

Advice for Employers

Primary care professionals will serve the cause if they can take employers in confidence and give the following advice:

Occupational Neoplastic Disease

If employees have been diagnosed with a work-related illness it's important to investigate any potential exposure or breakdown in your controls to prevent further exposure. You should also adopt a pragmatic approach when dealing with an employee with health problems. Remember occupational cancer can be caused by an exposure some years earlier so you might need to consider where the employee previously worked and what they did. You should:

- Recognise early signs of distress and low morale in the employee;
- Support the employee by listening to their health concerns in private;
- Liaise closely with the employee during their planned or unplanned absence from work;
- Seek competent help from a medical practitioner, human resources department etc.;
- Assist in return to work procedures;
- Provide suitable and flexible work options and discuss these with the employee before making any decision;
- Provide ongoing support to enable the employee to feel safe and productive.

Health Surveillance Programme

A health surveillance programme involves obtaining information and watching out for early signs of work-related ill health in employees exposed to certain health risks. It means putting in place certain procedures to achieve this, usually performed at least once a year and under the supervision of a health professional. These procedures can include:

- Initial health assessment;
- Medical examination;
- Self-examination;
- Health questionnaire;
- Exposure records;
- Maintaining health records for employees.

Determine whether any of the substances or tasks in your industry will require health surveillance. If a doctor confirms that your employee is suffering from an occupational cancer, you must report it to the Medical Inspector of Factories.

Most cancers that are routinely associated with specific occupations are discussed here. However cancer can also have genetic causes or may occur due to exposure that may not be associated with one's occupation or work environment.

45.1 Skin Cancer

Skin cancer is the most common malignancy responsible for 2% of cancer deaths each year and Melanoma accounts for 80% of skin cancers.

Risk Factors

- Age.
- Fair skin.
- Sunburn.
- Outdoor Occupations, e.g. Farmers, bricklayers.
- Exposure to carbon containing compounds.
- Asbestos, Arsenic.
- Ionizing radiation.
- Non-solar UV radiation – e.g. welders.

Presentation

There may be, in a sun-exposed area, a solitary papule/nodule, often eroded at the centre, or crusty, purulent or bleeding and has ‘fleshy’ appearance. It may resemble giant warts but may be painful. It is also related to smoking, and may be present on the lower lip.

Treatment

Surgical excision with wide skin margins gives 95% cure rates.

High risk tumour sites like lips, anus need larger excision to reduce the risk of metastasis, which are rare in any case. Lymph nodes need to be removed.

- Usually nodular.
- May be erythematous, or non-pigmented.
- May be plaque-like.
- May be ulcerated.
- They can sometimes crust over, and apparently undergo some healing and reduction in size, but generally, enlargement is slowly progressive.

45.2 Melanoma

Melanoma, the most serious type of skin cancer, develops in the melanocytes cells that produce melanin — the pigment that gives the skin its colour. Melanoma can also form in eyes and, rarely, in internal organs (intestines).

The exact cause of all melanomas is not clear, but exposure to ultraviolet (UV) radiation from sunlight increases risk of developing melanoma. Avoidance of exposure to UV radiation can help reduce risk of melanoma.

The risk of melanoma seems to be increasing in people under 40, especially women. Knowing the warning signs of skin cancer can help ensure that cancerous changes are detected and treated before the cancer has spread. Melanoma can be treated successfully if it is detected early.

Symptoms

Melanomas can develop anywhere on body. They most often develop in areas that have had exposure to the sun, such as back, legs, arms and face. Melanomas can also occur in unexposed areas like the soles of feet, palms of hands and fingernail beds. These hidden melanomas are more common in people with darker skin.

The first melanoma signs and symptoms often are:

- A change in an existing mole;
- The development of a new pigmented or unusual-looking growth on skin.

Melanoma doesn't necessarily begin as a mole. Normal moles are generally a uniform colour with a distinct border separating the mole from surrounding skin. They're oval or round and usually smaller than about 6 mm in diameter. Most people have between 10 and 45 moles; some may even disappear with age.

To help patient identify characteristics of unusual moles that may indicate melanomas or other skin cancers, think of the letters ABCDE:

- **A is for asymmetrical shape;**
- **B is for irregular border;**
- **C is for changes in colour;**
- **D is for diameter.** A mole larger than about 6 mm;
- **E is for evolving.** Changes over time in size or colour or shape.

Cancerous (malignant) moles vary greatly in appearance. Some may show all of the changes listed above, while others may have only one or two unusual characteristics.

Hidden melanomas

Melanomas can also develop in areas of body that have little or no exposure to the sun, such as the spaces between toes and on palms, soles, scalp or genitals. These are sometimes referred to as hidden melanomas because they occur in places most people wouldn't think to check. When melanoma occurs in people with darker skin, it's more likely to occur in a hidden area. Hidden melanomas include:

- **Melanoma under a nail:** It is more common people with darker skin pigment;
- **Melanoma in the mouth/digestive tract/urinary tract or vagina:** Difficult to detect;
- **Melanoma in the eye:** Most often in the uvea.

Causes

Melanoma occurs due to abnormality in the melanocytes. Normally, healthy new skin cells push older cells toward surface, where they die and fall off. But when some cells get DNA damage, they may begin to grow uncontrollably to form cancerous mass. It is likely that a combination of environmental and genetic factors, exposure to ultraviolet (UV) radiation causes melanoma.

Risk Factors

- Fair skin.
- A history of sunburn.
- Excessive ultraviolet (UV) light exposure.
- Living closer to the equator or at a higher elevation.
- Having many moles or unusual moles.
- A family history of melanoma.
- Weakened immune system.

Tests

Skin cancer screening

Patient and doctor may consider screening options such as:

- Skin exams by a trained professional.
- Skin exams patient do at home.
- Diagnosing melanoma

The only way to accurately diagnose melanoma is with a biopsy by a specialist. Biopsy procedures to diagnose melanoma: Punch biopsy / Excisional biopsy / Incisional biopsy.

Melanoma stages

Cancer experts assign a stage to melanoma. Melanoma is staged using the Roman numerals I through IV. A stage I melanoma is small and has a very successful treatment rate. But the higher the numeral, the lower the chances of a full recovery. By stage IV, the cancer has spread beyond skin to other organs, such as lungs or liver.

Treatment

The best treatment for patient depends on the size and stage of cancer, overall health, and personal preferences.

Treating early-stage melanomas – Usually treated by surgical excision. A very thin melanoma may be removed entirely during the biopsy; no further treatment. For people with early-stage melanomas, this may be the only treatment needed.

Treating melanomas that have spread beyond the skin: If melanoma has spread beyond the skin, treatment options may include:

- *Surgery to remove affected lymph nodes:* Additional treatments before or after surgery also may be recommended.
- *Chemotherapy:* Chemotherapy can be given intravenously, orally or both so that it spreads throughout body.
- *Radiation therapy:* Radiation therapy may be recommended after surgery to remove the lymph nodes; sometimes used to help relieve symptoms of melanoma.
- *Biological therapy:* Boosts immune system to help body fight cancer. Side effects are similar to those of the flu, including chills, fatigue, fever, headache and

muscle aches. Biological therapies used to treat melanoma include interferon and interleukin-2, ipilimumab (Yervoy), nivolumab (Opdivo), and pembrolizumab (Keytruda).

- *Targeted therapy:* Targeted therapy uses medications designed to target specific vulnerabilities in cancer cells.

Prevention

Patient can reduce risk of melanoma and other types of skin cancer if he is advised to:

- **Avoid the sun during the middle of the day;**
- **Avoid exposure to Sunlight as practicable as possible;**
- **Become familiar with skin so as to notice changes.** Examine skin regularly for new skin growths or changes in existing moles, freckles, bumps and birthmarks;
- **Wear sunscreen year-round.** Advise a broad-spectrum sunscreen with an SPF of at least 15 to be applied sunscreen generously, and reapply every two hours — or more often if patients are perspiring;
- **Wear protective clothing.** Encourage workers to cover skin with dark, tightly woven clothing that covers arms and legs;
- **Wear Sunglasses.**

45.3 Lip Cancer

The lips are not uncommon, but often overlooked site for Non-Melanoma Skin Cancers (NMSC), including the two most common skin cancers, Basal and Squamous Cell Carcinoma (BCC and SCC). Lip cancer is the most frequently occurring in fair-skinned males over the age of 50, nearly 1% of all cancers. Males are 3-13 times more likely to develop lip cancers, likely due to occupation-related sun exposure combined with greater tobacco and alcohol use. A higher proportion of upper lip cancer occurs in females compared to males. The lower lip is approximately 12 times more likely to be affected, owing to its greater exposure to sunlight. Up to 95 percent of NMSCs on the lower lip are SCCs. Given their highly visible site, the majority of lip cancers are easily detectable and treatable at an early stage.

The most common treatments are surgery, radiation, and cryotherapy (freezing with liquid nitrogen), with cure rates for early lesions nearing 100 percent. Although cancers of the lip have relatively low rates of spread to nearby lymph nodes and distant sites, the relapse rate after treatment can range from 5-35 percent, and the mortality associated with large or recurrent SCC of the lip is as high as 15 percent. Once these cancers spread to local lymph nodes, five-year survival rates decrease to approximately 50 percent.

Risk Factors

Lip cancer has been associated with smoking, alcohol consumption, and immune-suppression. Emerging data implicate Human Papilloma Virus (HPV) in certain oral cancers, but it has not to date been found to be a major cause of lip cancers. The most important risk factor by far is cumulative UV exposure, which is associated with up to 90 percent of all NMSCs. Workers who work outdoors have three times increased risk of lip cancer, even after accounting for a history of smoking.

Immuno-suppressed populations in particular must remain extremely vigilant about lip cancer. Kidney transplant patients have a 30-fold increased risk due to use of immunosuppressive anti-rejection drugs. People receiving higher doses of immune-suppressants tend to develop more NMSCs than those on lower doses and patients with HIV also demonstrate higher skin cancer risk. Immuno-compromised patients, especially those with chronic sun exposure (which further suppresses the immune system), must be monitored closely.

Treatment

When detected and treated early, lip cancer is almost always curable. However, large or recurrent cancers increase the risk for local and distant spread. For several reasons, including greater conservation of healthy tissue and an extremely high cure rate, Mohs¹ micrographic surgery is commonly used to treat lip tumours. Mohs surgery involves removing thin layers of skin tissue, which are then colour-coded, mapped, and microscopically examined. If malignant cells are detected, more tissue from the affected area is removed. This process is repeated until no more cancer can be found.

Mohs surgery offers the highest cure rate of any treatment modalities for primary or recurrent lip tumours, with cure rates of 90-100 percent. Tumours often extend beyond what the naked eye can detect, but Mohs surgery allows targeted removal of malignant cells while sparing normal skin. This permits optimum functional and cosmetic results.

Prevention

Regularly using photo-protective lip blocks (lip products that contain sunscreen) reduces the risk of lip cancer. But while photo-protective lip blocks can be effective in reducing UV exposure, most people do not apply them properly. Additionally,

¹ Mohs surgery, also known as chemosurgery, developed in 1938 by a general surgeon, Frederic E. Mohs, is microscopically controlled surgery used to treat common types of skin cancer. During the surgery, after each removal of tissue and while the patient waits, the tissue is examined for cancer cells. That examination informs the decision for additional tissue removal. Mohs surgery is one of the many methods of obtaining complete margin control during removal of a skin cancer using frozen section histology. Mohs surgery allows for the removal of a skin cancer with very narrow surgical margin and a high cure rate. The cure rate with Mohs surgery cited by most studies is between 97% and 99.8% for primary basal cell carcinoma, the most common type of skin cancer.

many commercially available photo-protective lip blocks may be poorly absorbed and can be broken down quickly by UV light, losing their effectiveness — two compelling reasons for frequent reapplication.

It is critical to create awareness and caution in workers to exercise careful sun protection through a combination of sun avoidance and shade-seeking; frequent application of a high-SPF lip block; and careful monitoring of skin changes.

Cancers of the Circulatory System

Cancers and circulatory diseases are the two topmost workplace killers accounting for 32% and 26% deaths respectively. Cancers of the circulatory system occupy a unique cusp that is the intersection of these two categories. This category also includes cancers of the immune and the lymphatic systems.

45.4 Myeloma

Myeloma is a malignant disease of the plasma cells of the bone marrow. Plasma cells, which proliferate in this disorder, interfere with the normal production of other blood cells. The malignant plasma cells also produce aberrant antibodies which accumulate to cause hyper-viscosity, amyloidosis and renal failure.

Myeloma is regarded as incurable, but it can be brought into remission with various treatment modalities, including, steroids, chemotherapy, thalidomide and stem cell transplants.

Epidemiology

It is a disease of the elderly, with a slight male predominance and accounts for 1% of all cases of malignant diseases. Incidence increases over the age of 80, more common in Africans and less common in Asians.

Causes

- Genetic.
- Environmental or occupational – significant exposure in agricultural, food and petrochemical industries, and long-term exposure to hair dyes.
- Monoclonal Gammopathy of Unknown Significance (MGUS) – about 19% of individuals suffering with this form of myeloma develop multiple myeloma within 2 to 19 years.
- Radiation, e.g. survivors of the atomic bombing of Nagasaki during World War II (WWII).

Pathology

There is monoclonal proliferation of certain plasma cells, i.e. mature, activated B cells, leading to the formation of abundant immunoglobulins. Plasma cell levels in the blood are increased and massively raised in the bone marrow. Any such disturbance in the regulation of bone remodelling can result in multiple bone abnormalities. There is increased osteoclast activity with no corresponding increase in osteoblast activity, which culminates in pathologic fractures and hypercalcaemia. The bone abnormalities appear as lytic lesions. Lytic lesions appear as “black holes” within bony structures on X-ray, MRI and CT. They typically occur in the skull and vertebrae.

Clinical Features

- **Bone destruction** – this often leads to fracture of the long bones, and vertebral collapse. This can cause spinal cord compression, as well as hypercalcaemia.
- **Bone marrow infiltration** – this results in anaemia, neutropaenia, thrombocytopaenia. These along with the overproduction of Bence-Jones proteins can lead to hyperviscosity.
- **Renal impairment** – deposition of light chains in the renal tubules, hypercalcaemia and hyperuricaemia.
- **Reduced normal immunoglobulin** – reduction in antibody production leads to impaired humoral immunity, tendency to acquire recurrent infections, particularly of the respiratory tract.

Symptoms

- Bone pain – most commonly backache as a result of vertebral involvement in 60% of patients.
- Anaemia.
- Recurrent infections.
- Renal failure – in 20-30% of patients.
- Hypercalcaemia.
- Hyperviscosity – rare.
- Bleeding – rare.

Often patients can be asymptomatic, and the discovery of the disease is only made with routine blood tests.

Diagnosis

Two of the following factors should be present:

- Paraproteinaemia OR Bence-Jones proteins;
- Radiologic evidence of lytic lesions, e.g. pepperpot skull;
- Increase in bone marrow plasma cells >30%;

- >1g of light chains excreted per day;
- Monoclonal band of Ig in the serum or monoclonal light chains in the urine on electrophoresis.

Treatment

Treatment is aimed at preventing the main causes of death:

- Infection;
- Renal failure;
- Haemorrhage.

Bone pain is one of the major symptoms.

Specific therapy

- Long term use of bisphosphonates helps to reduce progression of the disease.
- Chemotherapy can be initiated with prednisolone and melphalan. This has a response rate of about 50%.
- Complete remission is never attained, and patients will relapse when treatment is stopped.
- Newer techniques have increased the duration and level of remission, even though a cure is not still possible. This generally involves high dose melphalan, and peripheral blood stem cell rescue – this is often given alongside dexamethasone.
- Supportive therapy
- Anaemia should be corrected; this often involves blood transfusion and/or EPO.
- Patient should have yearly flu vaccines, and all infections should be promptly treated with antibiotics.
- Bone pain can either be treated by NSAIDS – but beware of long term use as it can cause renal impairment – or more rapidly by radiotherapy.
- Pathological fractures can be prevented by orthopaedic surgery. The bones affected by lytic lesions can be pinned through a procedure known as kyphoplasty.
- Infection may be prevented with prophylactic antibiotic use, or in the case of active infection, immunoglobulin replacement therapy may be helpful.

Prognosis

Median survival is 5 years; some patients may survive 10 years. 1/3 people will die within the first 3 months of diagnosis. Younger patients tend to receive more intensive treatment, and may survive longer.

Lymphomas

Lymphomas are of two types; **Hodgkin's and Non-Hodgkin's**. Lymphoid leukaemia may also exist, and the distinction between these and lymphomas can be difficult.

45.5 Hodgkin's Lymphoma (HL)

This is a rare condition with incidence of 2.5-4 per 100 000; Male: female is 1.5:1 occurs mostly in the third decade, and another peak between the ages of 50-70.

Aetiology

There is some evidence linking this disease to mononucleosis infections. These are infection of the monocytes of the blood, and the term is an umbrella term; It is more common in people from small families and well-educated backgrounds.

Pathology

The hallmark cell of HL is the Reed-Sternberg cell (lacunar histiocytes). These are **giant malignant cells** seen on light microscopy. They have multi nuclei, and are often referred to being 'owl like'.

Classical HL

Nodular Sclerosing

- Accounts for 70% of all HL.
- Most common in young women.
- In particular involves the lymph nodes of the mediastinum and neck.
- There are many 'fibrotic bands' present.

Lymphocyte Rich HL

- Accounts for 5% of all HL.
- Typically has an infiltrate of lots of small lymphocytes, and Reed-Sternberg cells.
- Most common in men.

Mixed Cellularity

- Accounts for about 25% of all HL.
- There is a mixed infiltrate of lymphocytes, eosinophils, neutrophils, and histocytes.
- Reed-Sternberg cells are present, but there are no fibrotic bands.
- More common in the elderly (the second peak of the disease described in epidemiology).
- No fibrotic bands.
- Associated with 'B symptoms' with a worse prognosis: These are seen in both Hodgkin's and non-Hodgkin lymphoma. They include: drenching sweats, Fever, Weight loss.
- Stage B disease often requires chemotherapy (as opposed to stage 'A' disease – where you just monitor the condition).

Lymphocyte depleted

- There is a lack of infiltrate, but again, Reed-Sternberg cells are present; however, in this case, the cells are slightly different, and called ‘popcorn cells.’ These cells tend not to express CD30, and express other CD antigens (20, 45 and 79a).
- This has very poor prognosis.
- This is associated with HIV.

Pathogenesis

The main points are that B cells no longer express Ig, and they no longer undergo the process of programmed cell death so they become massive large cells, that no longer perform their original function.

Clinical Features

Enlarged lymph nodes – these are usually rubbery, and most commonly found in the cervical region, usually supra-clavicular region and neck. The nodes can fluctuate in size.

- Patients with nodular sclerosing disease may have asymptomatic enlarged mediastinal masses, although sometimes these can cause respiratory symptoms, such as cough and breathlessness.
- In about 10% of cases there are isolated sub-diaphragmatic nodes.
- Spread occurs to adjacent nodes. Spread to other tissues is rare.
- Nodes are also often found in the axilla and inguinal regions.
- The size of the nodes can increase and decrease spontaneously.

Enlarged spleen/liver

- May be present, but not be indicative of the lymphoma B symptoms – fever, drenching night sweats, weight loss of >10% body weight.
- Other vague symptoms – pruritis, fatigue, anorexia.
- Symptoms due to the involvement of other organs – e.g. if the lung become involved there may be breathlessness and cough.

Treatment

Curative treatment is almost always recommended, and often successful.

Early stage treatment: The treatment of choice is irradiation with/without chemotherapy:

- 70% of patients are cured in this way, and of those who aren’t, half can be cured with further combination chemotherapy, thus 85% of these patients are cured.
- There is increased incidence of breast cancer (in young women), lung cancer (in smokers) and cardiac disease, following irradiation. The radiation can also affect fertility. Also don’t forget lung fibrosis as a complication of radiotherapy.
- The chemotherapy is typically given in 4 week cycles, with the drugs being given IV on days 1 and 15. It is usually an outpatient procedure to give the therapy.

Acute Side Effects

- Hair loss, or alopecia, is a fairly common but reversible.
- Nausea and vomiting.
- Low blood counts, or myelosuppression.
- Allergic reactions.
- Neuropathy Numbness in tips of fingers and toes - temporary or permanent.

Delayed Side Effects

- Infertility.
- Pulmonary toxicity.
- Cardiac toxicity, or cardiomyopathy.
- Secondary malignancies. Patients cured of Hodgkin lymphoma remain at increased risk of developing other secondary cancers. Survivors of Hodgkin's Lymphoma have a risk of developing another cancer that is 2 to 3 times that of people who didn't have the disease. The chances being more than 20% (or 1 in every 5 cases) in the first 20 years after treatment.

45.6 Non-Hodgkin's Lymphoma (NHL)

These are malignant tumours of lymphoid tissue that do not contain Reed-Sternberg cells; 70% are B cell in origin and 30% are T cell in origin. The name 'NHL' encompasses a very wide range of conditions. Not all conditions involve the lymph nodes.

Epidemiology

- The incidence increases with age – the median age of presentation is 55-75.
- The incidence is roughly 15 per 100 000, and is rising (over the last 20-30 years).
- There is a slight male predominance.
- Incidence is much higher in developing countries, due to prevalence of human lymphotropic T cell virus.

Causes

The cause is basically unknown. There is very wide geographical variation, which probably indicates environmental factors are involved.

- Associated with the EBV virus – Burkitt's lymphoma.
- Also associated with the T cell lymphotropic virus.
- Increased incidence of HL and more NHL in patients with AIDs.
- *H pylori* increases the incidence of gastric MALT lymphoma.
- Compression syndromes can occur as a result of NHL, and can often be the initial presenting complaint. Examples include; gut obstruction, ascites, SVC obstruction, spinal cord compression.
- lymphomas also occur as a result of congenital immunodeficiency and transplantation.

Pathogenesis

Generally speaking, the lymphomas of non-dividing mature lymphocytes are low grade, and the one of lymphoblasts are much more aggressive.

Clinical Features

- Superficial lymphadenopathy – painless, superficial lymph node enlargement.
- Systemic symptoms – the ‘B’ symptoms – fever, sweats, anorexia, weight loss.
- Extranodal presentation (25%) – e.g. compression symptoms; GI tract, testes, brain, thyroid, skin. Hepatosplenomegaly. It could also present in the oropharynx and skin.
- Pancytopenia – can be due to bone marrow involvement. Pancytopenia is basically ‘anaemia’ of white cells, red cells and platelets – so all of these are reduced! So there can be anaemia, neutropaenia (increased infections) and decreased platelets, leading to increased bleeding.

General Prognosis

Low grade NHL – will follow a relapsing and remitting course; with an overall median survival of 10 years. They are generally not curable. Low grade NHL is capable of transforming to high grade NHL, 45% of cases survival is worse.

High Grade NHL

- Much more aggressive, but also more likely to be cured.
- 80% of patients will initially respond to treatment.
- 35% will be disease free at 5-years.
- Quite deadly without treatment.
- Types include; Burkitt’s lymphoma, lymphoblastic lymphoma, diffuse, large B-cell lymphoma.

MALT (Mucosa Associated Lymphoid Tissue)

Most commonly occurs in the stomach, but not always. In MALT tissue there is an abnormally large collection of lymphocytes, and macrophages. These have positioned themselves to be in a good position to intercept any antigens they come into contact with. In the case of gastric MALT, it is associated with H-pylori infection, and eradication of the infection will often cure the condition.

Treatment

Low grade

Basically it depends on the sub-type present. There are loads of sub-types, and each disease would need discussing on the best course of action. If it is symptomless, then it is likely no treatment will be given and it will just be monitored. Radiotherapy may often be curative in localised disease.

Chlorambucil – a chemotherapeutic agent is successful. Remissions are maintained with α -interferon or rituximab

High grade

A chemotherapy regimen may be used. Monoclonal antibodies can be useful for B cell lymphomas, and have greatly improved prognosis – being the only major advance in treatment in the last 30 years.

Survival

The histology is important in determining survival. Prognosis is worse if, at presentation, age >60, bulky/widespread/disseminated disease, raised lactate dehydrogenase. 5 year survival is roughly about 30% for high grade disease and 50% for low grade disease, but this is very variable.

45.7 Leukaemia

Leukaemia is a cancer which starts in blood-forming tissue, usually the bone marrow. It leads to the over-production of abnormal white blood cells, the part of the immune system which defends the body against infection.

Mechanism of Blood Cell Formation

Blood cells are formed in the bone marrow. Blood-forming stem cells divide to produce either more stem cells or immature cells that become mature blood cells over time. A blood stem cell may become a myeloid stem cell or a lymphoid stem cell.

A myeloid stem cell becomes one of three types of mature blood cells:

1. Red blood cells that carry oxygen and other substances to all tissues of the body.
2. Platelets that form blood clots to stop bleeding.
3. Granulocytes (white blood cells) that fight infection and disease.

A lymphoid stem cell becomes a lymphoblast cell and then one of three types of lymphocytes:

- ‘B’ lymphocytes that make antibodies to help fight infection
- ‘T’ lymphocytes that help B lymphocytes make the antibodies that help fight infection
- Natural killer cells that attack cancer cells and viruses.

Leukaemia affects white blood cells and can be classified either by the type of white cell affected (myeloid or lymphatic) or by the way the disease progresses (acute or chronic). Acute and chronic do not refer to how serious the disease is but to how rapidly it progresses.

Types of Leukaemia

There are four main types of leukaemia:

1. Acute Myeloid Leukaemia (AML) – Rapidly developing, affects myeloid cells (granulocytes).
2. Chronic Myeloid Leukaemia (CML) – Slowly developing, affects myeloid cells (granulocytes).
3. Acute Lymphoblastic Leukaemia (ALL) – Rapidly developing, affects lymphocytes.
4. Chronic Lymphocytic Leukaemia (CLL) – Slowly developing, affects lymphocytes.

Acute leukaemia progresses rapidly, unless effectively treated but it can often be cured with standard treatments, such as bone marrow transplants, especially in younger and/or fitter patients.

Chronic leukaemia progresses slowly but, although it can be treated and managed, it is not usually possible to cure chronic leukaemia with standard treatments.

In most cases of leukaemia there is no obvious cause. However, it is important to understand that:

Leukaemia is not a contagious condition and is not inherited.

Risk Factors

- **Age** – most forms of leukaemia are more common in older people. The main exception to this is ALL in which peak incidence is in children.
- **Gender** – leukaemia is generally more common in males.
- **Genetics** – although leukaemia is not an inherited disease, there is a slightly higher chance that close relatives of patients may develop some forms of leukaemia. The risk is still very small and there is no cause for anxiety or for screening tests.
- **Chemical exposure** – being exposed to some chemicals and high levels of radiation may increase the chance of developing leukaemia. These factors account for only a very small proportion of all cases.

Some forms of leukaemia are seen more commonly in people who have other bone marrow disorders. The most common disorders which behave in this way are myelodysplastic syndrome (MDS) and the myeloproliferative neoplasms (MPN).

Aplastic anaemia is not a form of cancer but may be associated with cancers affecting the bone marrow, such as **leukaemia**.

Signs and Symptoms

There are no specific signs or symptoms of any type of leukaemia which would allow a doctor to make a diagnosis without laboratory tests.

In all types of leukaemia, symptoms are more commonly caused by lack of normal blood cells than by the presence of abnormal leucocytes. As the bone marrow becomes full of leukaemia cells, it is unable to produce the large numbers of normal blood cells which the body needs. This leads to:

- Anaemia – due to lack of RBCs;
- Weakness, tiredness, shortness of breath, light-headedness, palpitations;

- Infections – due to lack of normal leucocytes;
- Infections are more frequent, more severe and last longer;
- Fever, malaise, and sweats;
- Purpura (small bruises in skin), heavy periods in women, nosebleeds, bleeding gums;
- Bleeding and bruising – due to lack of platelets.

Clinically diagnosed leukaemia can be confirmed only by laboratory tests. The results of a simple blood count will usually indicate leukaemia. Most patients with leukaemia will have a bone marrow test to confirm the diagnosis and to help to determine the type of leukaemia. More specialised tests are often done at the same time.

Usually, a chest x-ray will be taken as well as scans, to look for swollen lymph nodes, or other affected sites. Liver and kidney function tests will be performed. In some, but not all, types of leukaemia cerebrospinal fluid (CSF) sample is examined because some kinds of leukaemia cells can get into the nervous system. Some repeat blood tests and scans will check for the response to treatment and any complications.

Treatment

Some patients need only “active monitoring”. This is mainly relevant for patients with CLL. Some patients with CLL will never need to receive treatment for their leukaemia. Patients on watch and wait can be subjected to an incredibly anxious time. Almost all patients with CML or with acute leukaemia will start treatment soon after diagnosis.

Acute leukaemia is often curable with standard treatments. Chronic leukaemia is usually not curable, but treatable. Although most patients with chronic leukaemia have a good initial response to treatment the condition will sometimes have a relapse and are treated again. The main ways in which leukaemia is treated are:

- Chemotherapy – cell-killing drugs. Steroids are normally used along with chemotherapy for lymphoid leukaemia;
- Radiation therapy – usually only for stem cell transplant or local disease e.g. in spleen;
- Targeted therapy – drugs which specifically recognise and kill leukaemia cells;
- Biological therapy – treatments which use the immune system to destroy leukaemia cells. Often these use antibodies against markers on the leukaemia – these are known as monoclonal antibodies;
- Stem cell transplant – Younger/fitter patients may be given a bone marrow transplant. This may be done using own healthy stem cells or stem cells from a donor. This is most commonly done for acute leukaemia if chemotherapy does not cure the disease.

Cancers of the Respiratory Tract

The respiratory tract consists of the organs that conduct air and gases and also of the tissues that actually play a part in respiration or gaseous exchange. The respiratory tract is the most susceptible to carcinogens at the workplace. Therefore cancers due to occupational exposure to carcinogens affect both zones.

The respiratory tract comprises the upper airways and lower airways. The upper airways or upper respiratory tract consists of the nose and nasal passages, the paranasal sinuses, the pharynx, the larynx and the vocal cords. The lower airways include the trachea, bronchi and bronchioles. The lungs the bronchioles, alveolar ducts, alveolar sacs, and alveoli make up the respiratory zone of the respiratory tract. This chapter will therefore cover cancers that occur throughout the extent of all the tissues and organs of the respiratory tract.

45.8 Nasal and Sinus Cancer

Nasal and sinus cancer affects the nasal cavity and the sinuses. A specific type of cancer, called nasopharyngeal cancer, affects this area.

Symptoms

The most common symptoms of nasal and sinus cancer are similar to viral or bacterial infections, such as the common cold or sinusitis, and include:

- a persistent blocked nose, which usually only affects one side – up to 90% of people with nasal or sinus cancer experience a blockage;
- Epistaxis;
- a decreased sense of smell;
- mucus running from the nose or down the throat;
- Other symptoms often appear at a later stage, and include;
- pain or numbness in the face, particularly the cheek or above the eye;
- enlarged lymph nodes in the neck;
- partial loss of vision or double vision;
- proptosis (a bulging eye);
- severe headaches.

Diagnosis

If a cancer or growth is suspected the case should be referred to an ear, nose and throat (ENT) consultant or to a hospital.

Tests

- a nasal endoscopy – where a long, thin, flexible tube with a camera and a light source is inserted through your nose to examine the area;

- imaging studies – such as a chest X-ray, CT scan or MRI scan;
- a biopsy to send for examination – this may be done during an endoscopy, or fine needle aspiration (FNA) may be used if there is a lump.

Risk Factors

Nasal and sinus cancer is rare. However, several factors are known to increase the risk of developing the condition, including:

- Your gender – men are much more likely to develop nasal and sinus cancer than women;
- Smoking – higher risk of developing several types of cancer, including nasal and sinus cancer;
- Exposure to certain substances through work, including wood dust, leather dust, nickel, formaldehyde and cloth fibres;
- Human Papilloma Virus (HPV) – a large group of viruses that affect the skin and moist membranes, such as the mouth and throat.

Risk may also be increased if there is a history of sinus or nose problems, or previous non-Hodgkin's lymphoma.

Treatment

Treatment is best handled by a head and neck oncology surgery team at the hospital. The best treatment for nasal and sinus cancer depends on several factors, including the stage of the cancer.

Treatment usually is a combination of:

- Surgery – which can be performed using open surgery or the nose endoscopic microsurgery;
- Radiotherapy – using high-energy radiation to shrink a tumour before surgery or destroy small amounts of a tumour that may be left after surgery;
- Chemotherapy – using medicine to help shrink a tumour before surgery or reduce the risk of the cancer recurring after surgery;
- Biological therapy – a newer type of medication known as monoclonal antibodies help to prevent cancer from spreading.

Radiotherapy and chemotherapy can also be used to treat a tumour without surgery. In some cases, chemotherapy may be combined with radiotherapy.

Prognosis

Overall, 35-60% of people with nasal and sinus cancer will live for at least five years after diagnosis. However, the outlook for nasal and sinus cancer can vary, depending on where the cancer is located and how far it has spread (the stage) before it is diagnosed and treated.

Nearly everyone who is diagnosed very early will live for at least five years afterwards. If the cancer is diagnosed at an advanced stage, only 20-30% of people will live for at least five years after diagnosis. However, this very much depends on the type of cancer, as well as individual factors.

Cancer of the nasal cavity generally has a better outlook than cancer of the sinuses.

45.9 Lung Cancer

When we talk about lung cancer, we must appreciate that 95% of lung cancers are carcinoma of the bronchus, 2% are alveolar tumours and 3% are benign or less invasive malignant tumours. The vast majority of these are primary, and related to smoking, however, you can also get lung secondaries from cancer of the breast, kidney, uterus, ovary, testes and thyroid.

The prognosis is extremely poor depending on the type of tumour present; 1 year survival is about 20% and 5 year survival is about 5%.

Epidemiology

This is the most common cancer worldwide, increased 3-fold since 1950; the male to female ratio is 3:1.

Causes

- Smoking causes 90% of cases.
- Living in an urban, as opposed to a rural area.
- Passive smoking increases the risk 1.5 times.
- Asbestos: There are three colours of asbestos – white, blue and brown – blue is the worst Risk starts when the asbestos is broken up – as this releases the fibres. It usually causes a specific type of tumour – mesothelioma.
- Arsenic (in batteries and paints and fertilizer).
- Iron oxide.
- Chromium.
- Petroleum products.
- Oil.
- Coal mining – it is not actually the coal; it is the haemotite (iron ore) and silica that causes the cancer Radiation.
- Radon.
- Scarring – e.g. post TB.

Tumours associated with occupational factors tend to be adenocarcinomas.

Smoking as a risk factor:

Never Smoked	1%
Smoker	43%
Ex-Smoker (after 10 years)	2-10%
Exposure to asbestos	5%
Smoker and exposed to asbestos	90%

After 10 years of stopping the risk is greatly reduced, but it never reaches that of non-smokers.

Tumours arising in a main bronchus tend to present earlier than those arising in a small bronchus – because they will cause far greater symptoms at an early stage. 80% of tumours are in the lobar bronchi – the rest are in larger bronchi.

Presentation

Typically, respiratory symptoms that do not respond to other standard treatments (e.g. cough that doesn't respond to antibiotics)

Persistent symptoms

- Change in nature of chronic 'smoker's cough'.
- History of smoking.
- Isolated incidences of haemoptysis.
- Weight loss.
- Decreased appetite – as a result of the inflammatory reaction that the tumour induces – particularly TNF that is released.
- Hoarseness of voice – involvement of the vocal chords of left recurrent laryngeal nerves.

Examination

- This is usually normal, unless there is significant bronchial obstruction, or the tumour has spread (e.g. to pleura; pleuritic pain, supraclavicular nodes; palpable or mediastinum). Tumours in large bronchi may cause collapse of the lung, or obstructive emphysema.
- There may be absent breath sounds and dullness to percussion at the lung base in cases where there is phrenic involvement – as this will cause unilateral raising of the diaphragm.
- Involvement of the pleura may not only cause pleuritic chest pain, but also a pleural rub, and signs of pleural effusion.
- Always check the axillary lymph nodes when you suspect lung cancer, because they can metastasise to here early!
- Screening programs have been tried in USA, but none have been proven to improve outcome. CT screening programs may be useful in the future.

Treatment and Prognosis

As is the case for many conditions, treatment is best planned by the Multi-disciplinary Team.

Prognosis is poor. As a general rule: 20% of cases will survive to 12 months; 6% will survive to 5 years.

Treatment

Operable tumours are the ones that tend to be asymptomatic and are discovered incidentally. Usually, lung cancer presents with a complication; e.g. pleural effusion, metastatic pain.

Surgery as a treatment option is typically rare.

Asbestosis and Mesothelioma

Asbestos is a naturally occurring fibre, which is relatively inert, as well as being fireproof, and a good insulator. In developed countries it was used widely to insulate buildings during the mid 20th Century. Several types of asbestos fibre exist, varying by the quality of the individual fibres. These types exist in three colours – white, blue and brown. Blue is the most dangerous clinically. Its fibres are up to 50 mm long, but only 1-2 nanometres wide. Asbestos fibres are easily inhaled, but then become lodged in the lung. The properties of the fibres means they are particularly difficult to destruction by normal body mechanisms.

Maximum risk of inhaling the fibres occurs if worker is involved in cutting and breaking up sheets of asbestos.

Use of asbestos in many countries of the world is now prohibited. There is still a risk for workers in the construction industry, particularly those involved with the demolition of old buildings that used asbestos. It takes 20-40 years between inhalation of fibres and development of mesothelioma.

Smoking and asbestos fibres have a synergistic effect - thus the risk of bronchial carcinoma when having worked with asbestos and having smoked is greater than the sum of the two individual risks.

Asbestosis	Mesothelioma
It is a fibrosis of the lung tissue secondary to exposure to asbestos.	Can result from only light exposure to asbestos fibres.
It is a progressive condition that will present 5-10 years after exposure.	It is progressive and patients will have a restrictive pattern on pulmonary function tests.
Causes severe reduction in lung function and progressive dyspnoea.	Often presents with pleural effusion and progressive dyspnoea.
Restrictive pattern. There may also be finger clubbing, and bilateral end-inspiratory crackles.	There may also be chest wall pain and ascites due to abdominal involvement.
X-ray findings – dark streaks, honeycomb appearance (honeycomb lung).	Intercostal nerves and hilar lymph nodes may be invaded.
There is no curative treatment, although steroids are often prescribed (little evidence for their use).	The median survival is around two years from presentation.

Cancers of the Genito Urinary System

In males, the Genito urinary system also comprises the prostate, the penis and the testicles whereas in females, the vagina, the cervix and the uterus, the uterine ligaments, the fallopian tubes and the ovaries are included. The commonest cancers affecting the Genito urinary system are considered here. The Male reproductive system is predominantly affected.

45.10 Kidney Cancer

The two most common types of kidney cancer are Renal Cell Carcinoma (RCC) and Transitional Cell Carcinoma (TCC) of the renal pelvis. These names reflect the type of cell from which the cancer developed. The different types of kidney cancer develop in different ways, meaning that the diseases have different long term outcomes, and need to be staged and treated in different ways. RCC is responsible for approximately 80% of primary renal cancers, and UCC accounts the majority of the remainder.

Types of Renal Cancer

- Squamous cell carcinoma
- Juxtaglomerular cell tumour (reninoma)
- Angiomyolipoma
- Bellini duct carcinoma
- Clear-cell sarcoma of the kidney
- Mesoblastic nephroma
- Wilms' tumour usually seen in children under the age of 5.
- Mixed epithelial stromal tumour

Cancer of the kidney may also be secondary, the result of metastasis from a primary cancer elsewhere in the body.

Signs and Symptoms

The most common signs and symptoms of kidney cancer are a mass in the abdomen and/or hematuria. Other symptoms may include tiredness, loss of appetite, weight loss, fever and heavy sweating, and persistent pain in the abdomen. However, many of these symptoms can be caused by other conditions, and there may also be no signs or symptoms in a person with kidney cancer especially in the early stages of the disease.

Causes

Risk of kidney cancer increases with smoking; double the risk of the disease; regular use of NSAIDs such as ibuprofen and naproxen, which may increase the risk by

51% or may not; obesity; faulty genes; a family history of kidney cancer; having kidney disease that needs dialysis; being infected with hepatitis C; and previous treatment for testicular cancer or cervical cancer.

There are also other possible risk factors such as kidney stones and high blood pressure, which are being investigated.

Pathophysiology

Kidney cancer originates in the kidney in two principal locations: the renal tubule and the renal pelvis. Most cancers in the renal tubule are renal cell carcinoma and clear cell adenocarcinoma. Most cancers in the renal pelvis are transitional cell carcinoma.

Treatment

Treatment for kidney cancer depends on the type and stage of the disease. Surgery is the mainstay of treatment and it usually doesn't involve chemotherapy and radiotherapy, as kidney cancers often do not respond to these treatments.

If the cancer has not spread, it will usually be removed by surgery. Sometimes this involves removing the whole kidney, which is called nephrectomy but most tumours are amenable to partial nephrectomy. There is currently no evidence that body-wide medical therapy after surgery where there is no known residual disease, that is, adjuvant therapy, helps to improve survival in kidney cancer. If the cancer can't be cured with surgery, sometimes doctors may use other techniques such as cryotherapy or radiofrequency ablation. However these are not yet used as standard treatments for kidney cancer.

Other treatment options include biological therapies (drug treatments that use natural substances from the body; the use of immunotherapy like interferon and interleukin-2. Immunotherapy has the potential to induce complete remissions or durable partial remissions in a few patients.

In Wilms' tumour (a type of kidney cancer that affects children), chemotherapy, radiotherapy and surgery are the accepted treatments, depending on the stage of the disease when it is diagnosed.

Most often surgery determines the true extent of the tumour and the subsequent line of treatment.

45.11 Bladder Cancer

Bladder cancer is any of several types of cancer arising from the epithelial lining of the urinary bladder. Rarely the bladder is involved by non-epithelial cancers, such as lymphoma or sarcoma. It is a disease in which abnormal cells multiply without control in the bladder.

The most common type of bladder cancer recapitulates the normal histology of the urothelium and is known as transitional cell carcinoma or more properly urothelial cell carcinoma.

Symptoms

Bladder cancer characteristically causes blood in the urine. Hematuria is the most common symptom in bladder cancer. This blood in the urine may gross/macroscopic hematuria or microscopic hematuria.

Other possible symptoms include pain during urination, frequent urination, or feeling the need to urinate without being able to do so. These signs and symptoms are also caused by non-cancerous conditions, including prostate infections, over-active bladder and cystitis. Bladder or ureteric stones, infection, kidney disease, kidney cancers and vascular malformations also cause hematuria.

Patients with advanced disease refer pelvic or bony pain, lower-extremity oedema, or flank pain. Rarely a palpable mass can be detected on physical examination.

Causes

Tobacco smoking is the main known contributor to urinary bladder cancer; there is a linear relationship between smoking and risk, and quitting smoking reduces the risk. Passive smoking has not been proven to be involved.

Occupations

30% of bladder tumours probably result from occupational exposure in the workplace to carcinogens such as benzidine. 2-Naphthylamine, which is found in cigarette smoke, has also been shown to increase bladder cancer risk.

Occupations at risk are bus drivers, rubber workers, motor mechanics, leather (including shoe) workers, blacksmiths, machine setters, and mechanics. Hairdressers are thought to be at risk as well because of their frequent exposure to permanent hair dyes. Benzidine was also a regular ingredient in some paints putting painters at risk.

Prevention

High consumption of fruits and vegetables overall, or yellow or green leafy vegetables and adequate consumption of water showed little correlation between cancer reduction.

Diagnosis

Cystoscopy of the bladder through the urethra allows diagnosis and by biopsying suspicious lesions. The gold standard for diagnosing bladder cancer is biopsy obtained during cystoscopy. Sometimes it is an incidental finding during cystoscopy. Urine cytology can be obtained in voided urine or at the time of the cystoscopy (“bladder washing”). Cytology is not very sensitive.

There are newer non-invasive urine bound markers available as aids in the diagnosis of bladder cancer, including human complement factor H-related protein, high-molecular-weight carcinoembryonic antigen, and nuclear matrix protein 22 (NMP22). A Hexvix/Cysview guided fluorescence cystoscopy (blue light cystoscopy, Photodynamic diagnosis), as an adjunct to conventional white-light cystoscopy. A visual detection needs to be followed by transurethral surgery.

Treatment

The treatment of bladder cancer depends on how deep the tumour invades into the bladder wall. Superficial tumours (those not entering the muscle layer) can be “shaved off” using an electrocautery device attached to a cystoscope, which in that case is called a resectoscope. The procedure is called transurethral resection of bladder tumour – TURBT – and serves primarily for pathological staging. In case of non-muscle invasive bladder cancer the TURBT is in itself the treatment, but in case of muscle invasive cancer, the procedure is insufficient for final treatment.

Immunotherapy by intravesicular delivery of Bacillus Calmette–Guérin (BCG) is also used to treat and prevent the recurrence of superficial tumours. BCG immunotherapy is effective in up to 2/3 of the cases at this stage, and in randomized trials has been shown to be superior to standard chemotherapy. Patients whose tumours recurred after treatment with BCG are more difficult to treat. Many physicians recommend cystectomy for these patients.

Untreated, superficial tumours may gradually begin to infiltrate the muscular wall of the bladder. Tumours that infiltrate the bladder require more radical surgery where part or the entire bladder is removed (a cystectomy) and the urinary stream is diverted into an isolated bowel loop (called an ileal conduit or Urostomy). Skilled surgeons can create a substitute bladder from a segment of intestinal tissue.

A combination of radiation and chemotherapy can also be used to treat invasive disease. It has not yet been determined how the effectiveness of this form of treatment compares to that of radical ablative surgery. Photodynamic diagnosis may improve surgical outcome on bladder cancer.

For muscle invasive urothelial urinary bladder cancer there are a number of treatment options. Gold standard is radical cystectomy as mentioned. In males this usually includes also the removal of the prostate and in females; ovaries, uterus and parts of the vagina.

45.12 Prostate Cancer

By the age of 80, >80% of men are likely to get prostate cancer, the second most common cancer in men. Asian men are less likely to suffer from prostate cancer. Mostly Adenomas they appear in peripheral area of the gland. While other

cancers cause osteoporosis, this cancer causes osteosclerosis and will mostly spread to the bones.

Causes

Prostate cancer is unlikely to appear in men below the age of 40. There is a genetic factor responsible. The disease is very slow to progress and average life-expectancy after diagnosis is approximately 5-10 years.

Clinical Features

Enlargement of gland will result in lower urinary tract obstruction. There is nocturia with poor flow of urine. Weight loss and bony pain are symptoms of metastatic spread – particularly to the bones. Digital rectal examination shows irregular hard prostate.

Investigations

Patient with prostate cancer can also have a normal PSA! PSA is likely to be markedly raised in metastatic disease.

Transrectal ultrasound of prostate (TRUS), with biopsy can confirm the diagnosis and help in staging.

10-15% of apparently benign prostate may turn out malignant. Bone metastasis can be seen on X-ray as osteosclerotic lesions. Metastasis of the axial skeleton are detected with radionuclide bone scans.

Spread

Prostate disease can spread to Bones, Lymph nodes, Bladder, Rectum and Seminal vesicles.

Treatment

- Finasteride – a 5 α -reductase drug, which inhibits the production of dihydrotestosterone from testosterone, may be given prophylactically. There is a high risk of sexual dysfunction.
- Radical prostatectomy – total removal of the prostate. Done ‘open’ or laparoscopically cure rate is 90%. This is generally recommended for patients with a greater than 10 year life expectancy; after treatment the PSA level is monitored. It should reduce to almost 0 after a radical prostatectomy. If it does not, this is a sign that the cancer has metastasised.
- Radiotherapy – this, along with prostatectomy are the only curative treatments for prostate cancer.
- Androgen suppression – this is the main treatment for non-localised disease. Androgen suppression drugs: Luteinising hormone releasing hormone antagonists – these stop the release of luteinising hormone, and thus the production of testosterone.
- Castration

45.13 Testicular Cancer

Testicular cancer develops in the testicles. Not all lumps on the testicles are tumours, and not all tumours are malignant. There are many other conditions, such as testicular microlithiasis, epididymal cysts, and appendix testis (hydatid of Morgagni), which may be painful but are non-cancerous.

Testicular cancer has one of the highest cure rates of all cancers with an average five-year survival rate of 95%. If the cancer has not spread outside the testicle, the 5-year survival is 99% while if it has grown into nearby structures or has spread to nearby lymph nodes, the rate is 96% and if it has spread to organs or lymph nodes away from the testicles, the 5-year survival is around 74%. Even for the relatively few cases in which cancer has spread widely, chemotherapy offers a cure rate of at least 80%.

Signs and Symptoms

One of the first signs of testicular cancer is often a lump or swelling in the testes. Symptoms may also include one or more of the following:

- a lump in one testis which may or may not be painful;
- sharp pain or a dull ache in the lower abdomen or scrotum;
- a feeling often described as “heaviness” in the scrotum;
- breast enlargement (gynecomastia) from hormonal effects of β -hCG;
- low back pain due to the cancer spreading to the lymph nodes along the back.

It is not very common for testicular cancer to spread to other organs, apart from the lungs. If it has, however, the following symptoms may be present:

- dyspnoea, cough or hemoptysis from metastatic spread to the lungs;
- a lump in the neck due to metastases to the lymph nodes.

Diagnosis

The main way testicular cancer is diagnosed is via a lump or mass inside a testis. More generally, if a young adult or adolescent has a single enlarged testicle, which may or may not be painful, this should give doctors reason to suspect testicular cancer.

Other conditions may also have symptoms similar to testicular cancer:

- Epididymitis or epididymoorchitis
- Hematocele
- Varicocele

The nature of any palpated lump in the scrotum is often evaluated by scrotal ultrasound, which can determine exact location, size, and some characteristics of the lump. The extent of the disease is evaluated by CT scans, which are used to locate metastases.

The differential diagnosis of testicular cancer requires ultrasound of both testicles and the scrotum as it might help distinguish between a lump or a fluid filled cyst, which is less likely to be cancer.

Other options include examining the histology of tissue obtained from an inguinal orchiectomy. A biopsy should not be performed, as it raises the risk of spreading cancer cells into the scrotum.

Inguinal orchiectomy is the preferred method because it lowers the risk of cancer cells escaping. Blood tests are also used to identify and measure tumour markers that are specific to testicular cancer such as:

- AFP (alpha feta protein)
- HCG (human chorionic gonadotrophin)
- LDH (lactate dehydrogenase)

Treatment

The three basic types of treatment are surgery, radiation therapy, and chemotherapy.

Surgery is performed by urologists; radiation therapy is administered by radiation oncologists; and chemotherapy is the work of medical oncologists.

Testicular Removal

The initial treatment for testicular cancer is surgery to remove the affected testicle (orchiectomy). Since only one testis is typically required to maintain fertility, hormone production, and other male functions, the afflicted testis is almost always removed completely in a procedure called inguinal orchiectomy (almost never removed through the scrotum).

Adjuvant Treatment

Since testicular cancers can spread, patients are usually offered adjuvant treatment – in the form of chemotherapy or radiotherapy – to kill any cancerous cells that may exist outside of the affected testicle depending largely on the histology of the tumour.

Radiation Therapy

Radiation may be used to treat stage 2 seminoma cancers, or as adjuvant (preventative) therapy in the case of stage 1 seminomas. Radiation is ineffective against and is therefore never used as a primary therapy for non seminoma.

Chemotherapy

Non-seminoma: Chemotherapy is the standard treatment for non-seminoma when the cancer has spread to other parts of the body.

Lymph node surgery may also be performed after chemotherapy to remove masses left behind particularly in the cases of large non seminomas.

Use of chemotherapy as an alternative to radiation therapy in the treatment of seminoma is increasing, because radiation therapy appears to have more significant long-term side effects.

Since seminoma can recur decades after the primary tumour is removed, patients receiving adjuvant chemotherapy should remain vigilant and not assume they are cured 5 years after treatment.

Prognosis

Treatment of testicular cancer is one of the success stories of modern medicine, with sustained response to treatment in more than 90% of cases, regardless of stage. In most patients with testicular cancer, the disease is cured readily with minimal long-term morbidity. While treatment success depends on the stage, the average survival rate after five years is around 95%, and stage 1 cancers cases (if monitored properly) have essentially a 100% survival rate (which is why prompt action, when testicular cancer is a possibility, is extremely important).

Cancers of the Gastrointestinal System

The conditions discussed under this head are stomach cancer and pancreatic cancer.

45.14 Stomach Cancer

Stomach cancer, also known as gastric cancer, is cancer developing from the lining of the stomach. Early symptoms may include heartburn, upper abdominal pain, nausea and loss of appetite. Later signs and symptoms may include weight loss, yellow skin and whites of the eyes, vomiting, difficulty swallowing, and blood in the stool among others. The cancer may spread from the stomach to other parts of the body, particularly the liver, lungs, bones, lining of the abdomen and lymph nodes.

The most common cause is infection by the bacterium *Helicobacter pylori*, which accounts for more than 60% of cases. Certain types of *H. pylori* have greater risks than others. Other common causes include eating pickled vegetables and smoking. About 10% of cases run in families and very few are due to genetic syndromes.

Symptoms

Stomach cancer is often either asymptomatic or may cause only nonspecific symptoms in its early stages. By the time symptoms occur, the cancer has often reached an advanced stage and may have also spread to other, perhaps distant, parts of the body. Stomach cancer can cause the following signs and symptoms:

- Early cancers: indigestion or heartburn.
- Abdominal discomfort and loss of appetite, especially for meat.

- Advanced Gastric cancers: weakness, fatigue, bloating of the stomach after meals, abdominal pain in the upper abdomen, nausea and occasional vomiting, diarrhoea or constipation. Further enlargement may cause weight loss or bleeding with vomiting blood or having blood in the stool, the latter apparent as melena and sometimes leading to anaemia.
- Dysphagia suggests a tumour in the cardia or extension of the gastric tumour into the oesophagus.
- Note that these can be symptoms of other problems such as a stomach virus, gastric ulcer, or tropical sprue.

Causes

Gastric cancer is a multifactorial disease. *Helicobacter pylori* infection is an essential risk factor in 65–80% of gastric cancers, but only 2% of people with *Helicobacter* infections develop stomach cancer. The mechanism by which *H. pylori* induces stomach cancer potentially involves chronic inflammation, or the action of *H. pylori* virulence factors. Epstein–Barr virus is responsible for 84,000 cases per year.

Smoking significantly increases the risk of developing gastric cancer (mostly in the upper part near the oesophagus). There is increased risk with alcohol consumption as well. Dietary factors are not proven causes, but some foods like smoked foods, salt and salt-rich foods, red meat, processed meat, and pickled vegetables are associated with a higher risk of stomach cancer. On the other hand, fresh fruit and vegetable intake, citrus fruit intake, and antioxidant intake are associated with a lower risk of stomach cancer. A Mediterranean diet is also associated with lower rates of stomach cancer, as is regular aspirin use. There is a correlation between iodine deficiency and gastric cancer.

Gastric cancer shows a male predominance of 2:1 in its incidence possibly due to protective effect of Oestrogen in women. 10% of cases show a genetic component. Susceptibility for gastric cancer can increase with obesity because of gastroesophageal reflux disease.

Other factors associated with increased risk are AIDS, diabetes, pernicious anaemia, chronic atrophic gastritis, and intestinal metaplasia.

Diagnosis

After a careful medical history and a physical examination laboratory studies are carried out. The patient may also have one or all of the following exams:

- Gastroscopic exam is the diagnostic method of choice. It is relatively painless and is also able to pinpoint the location of the lesion with a high degree of accuracy. It also aids in subsequent surgical removal.
- Upper GI series (may be called barium roentgenogram).
- Computed tomography or CT scanning of the abdomen may reveal gastric cancer, but is more useful to determine invasion into adjacent tissues, or

the presence of spread to local lymph nodes. Wall thickening of more than 1 cm that is focal, eccentric and enhancing favours malignancy.

- Abnormal tissue seen in a Gastroscopic examination will be biopsied, and is then sent to a pathologist for histological examination under a microscope to check for the presence of cancerous cells. A biopsy, with subsequent histological analysis, is the only sure way to confirm the presence of cancer cells.

A number of cutaneous conditions are associated with gastric cancer. A condition of darkened hyperplasia of the skin, frequently of the axilla and groin, known as acanthosis nigricans, is associated with intra-abdominal cancers such as gastric cancer. Other cutaneous manifestations of gastric cancer include *tripe palms* (a similar darkening hyperplasia of the skin of the palms) and the Leser-Trelat sign, which is the rapid development of skin lesions known as seborrheic keratoses.

Various blood tests may be done including a Complete Blood Count (CBC) to check for anaemia, and a faecal occult blood test to check for blood in the stool.

Treatment and Management

Surgery

Cancer of the stomach is difficult to cure unless it is found at an early stage. Unfortunately, because early stomach cancer causes few symptoms, the disease is usually advanced when the diagnosis is made. Treatment for stomach cancer may include surgery, chemotherapy, and/or radiation therapy.

Surgery remains the only curative therapy for stomach cancer. Of the different surgical techniques, Endoscopic Mucosal Resection (EMR) is a treatment for early gastric cancer (only involving the mucosa) that has been pioneered in Japan.

Those with metastatic disease at the time of presentation may receive palliative surgery.

Chemotherapy

The use of chemotherapy to treat stomach cancer has no firmly established standard of care. Unfortunately, stomach cancer has not been particularly sensitive to these drugs, and chemotherapy, if used, has usually served to palliatively reduce the size of the tumour, relieve symptoms of the disease and increase survival time.

Radiation

Radiation therapy may also be used to treat stomach cancer, often as an adjuvant to chemotherapy and/or surgery.

Prognosis

The prognosis of stomach cancer is generally poor, due to the fact the tumour has often metastasised by the time of discovery and the fact that most people with the

condition are elderly at presentation. The five-year survival rate for stomach cancer is reported to be less than 10 percent.

Prevention

Getting rid of *H. pylori* in those who are infected decreases the risk of stomach cancer, at least in those who are Asian. A diet high in fruits, mushroom, garlic, soybeans, and green onions is associated with a lower risk of stomach cancer.

Low doses of vitamins from a healthy diet decrease the risk of stomach cancer. Reducing salted or smoked foods considerably decreases the risk of stomach cancer.

45.15 Pancreatic Cancer

Pancreatic cancer arises when cells in the pancreas begin to multiply out of control and form a mass. These cancer cells have the ability to invade other parts of the body. There are a number of types of pancreatic cancer. The most common, *pancreatic adenocarcinoma*, accounts for about 85% of cases.

These adenocarcinomas start within the part of the pancreas which makes digestive enzymes. Several other types of cancer, which collectively represent the majority of the non-adenocarcinomas, can also arise from these cells. One to two in every hundred cases of pancreatic cancer is neuroendocrine tumour, which arise from the hormone-producing cells of the pancreas. These are generally less aggressive than pancreatic adenocarcinoma.

Symptoms

The cancerous tissues grow very rapidly in the pancreas without giving rise to any symptoms until it progresses to a critical stage. In later stages, there could be several symptoms like:

- Upper abdominal pain.
- Yellowing of the skin and eyes (jaundice).
- Loss of appetite.
- Vomiting and nausea.
- Dark urine.
- Enlarged lymph nodes.
- Back pain.
- Sudden weight loss.
- Pale coloured stools.
- Diarrhoea.
- Itching of the skin.
- Depression.

As the organ is located near the stomach, symptoms of the digestive system often predominate in case of pancreatic cancer.

Causes and Risk Factors

Genetic mutation of pancreatic cells is thought to be the main cause of this disease. Pancreatitis and diabetes could be the two major factors that may have a role to play in the onset of this disease. Other factors include:

- **Smoking:** Studies have proved that smoking increases the risk of pancreatic cancer. The risk is nil if patient has quit smoking for more than ten years.
- **Obesity:** People with a BMI higher than 30 were found to have a high chance of getting pancreatic cancer. Also, people who exercise more frequently were at a lower risk as compared to those who lead an inactive lifestyle.
- **Diseases:** It is believed, but not proved, that people with diabetes are at a high risk of pancreatic cancer. Also a family history of pancreatic cancer or genetic syndromes such as BRCA2 gene mutation, Lynch syndrome and Familial Atypical Mole-Malignant Melanoma (FAMMM).

Diagnosis

CT scan and MRI scan are the most common diagnostic tests recommended. Apart from this, other techniques include endoscopy and tissue biopsy, to confirm the cancer.

- **CT (computerized topography) scan:** It analyzes the internal structures of pancreas for diagnosing traumatic injuries, tumours or an infection.
- **MRI (magnetic resonance imaging):** In this, a beam of radio waves and magnetic fields is sent through the body to detect a defect in pancreas. It gives an accurate image of the organ and structures within, thus helping in getting a clear idea of cancerous cells and the extent of the growth.
- **Endoscopy:** It is a non-surgical procedure that involves examination of the stomach or digestive tract.
- **Biopsy:** Fine needle aspiration biopsy or exfoliative cytology study may not be useful. Instead, a small piece of the pancreatic tissue is surgically removed. The sample is sent for microscopic examination to detect the presence of cancerous cells.

Treatment

As in other cases of cancer treatment, the treatment options available for pancreatic cancer are:

- **Surgery:** If the pancreatic cancer has not spread to the nearby organs, surgical removal of part or whole of the pancreas is the most preferred option. This is mostly followed by chemotherapy and biopsies to rule out the recurrence of the cancer.
- **Whipple procedure:** Surgical removal of the head of the pancreas along with a small part of the small intestine, bile duct, and gall bladder. Internal bleeding or infection after the surgery can occur. It takes a long time to recover and thus, care should be taken even after the patient is discharged from the hospital.

- **Distal pancreatectomy:** The tail of the pancreas that is cancerous is removed. Although it carries a risk of bleeding and infection; the possibility is very less as compared to Whipple procedure. In some cases, it also includes complete removal of the spleen.
- **Radiation therapy:** In case the cancerous cells have migrated to the surrounding tissues or organs, radiation therapy is recommended. It involves passing a beam of ionizing radiation through the body to kill the tumour cells.
- **Chemotherapy:** This treatment option is recommended if the cancer has spread to nearby organs and can be controlled with the help of medication. However, if the cancerous cells have migrated to nearby organs and not far away from the site of origin, chemotherapy is used in combination with radiation therapy for effective results.
- **Targeted drug therapy:** It is most widely used in case of advanced pancreatic cancer (cancer that has spread to distant parts of the body). It targets specific abnormalities within the cancerous cells thus aiding in the treatment of the cancer.

In most cases, a combination of these therapies is recommended, depending upon the staging of the disease, health and nutritional status of the patient, evidence of other systemic diseases, severity of the cancer and extent of malignancy.

Prevention and Screening

Apart from not smoking, experts recommend keeping a healthy weight, and increasing consumption of fruits, vegetables, and whole grains, while decreasing consumption of red and processed meat. There was evidence that consumption of **citrus fruits** and curcumin (the active ingredient of turmeric) reduced risk of pancreatic cancer. It has been proved, through surveys and scientific studies that whole grains, folate, selenium, and non-fried fish possibly also had a beneficial effect.

Screening is important as the five year survival rate is 5% because over 80% of the patients are diagnosed in advanced disease stages. Apart from those with hereditary or familial history: advancing age, obesity, smoking, diabetes, and non-genetic chronic pancreatitis are all associated with pancreatic cancer.

45.16 Brain Tumours

A brain tumours or intracranial neoplasm occurs when abnormal cells from within the brain. This chapter deals mainly with tumours that start within the brain. All types of brain tumours may produce symptoms that vary depending on the part of

the brain involved. These may include headaches, seizures, problem with vision, vomiting, and mental changes. The headache is classically worst in the morning and goes away with vomiting. More specific problems may include difficulty in walking, speaking and with sensation. As the disease progresses unconsciousness may occur.

Signs and Symptoms

Signs and symptoms of a brain tumour mainly depend on the size of the tumours and its location.

Symptoms of both primary and secondary brain tumours can be divided into three main categories:

1. **Consequences of increased intracranial pressure:** Large tumours or tumours with oedema lead to elevated intracranial pressure which clinically produces into headaches, vomiting, somnolence, coma, dilation of the pupil on the side of the lesion papilledema. However, even small tumours obstructing the passage of cerebrospinal fluid can also present such symptoms. Increased intracranial pressure may result in brain herniation of certain parts of the brain, such as the cerebellar tonsils or the temporal uncus, resulting in lethal brainstem compression.
2. **Dysfunction:** Results from damage either through compression or infiltration of tumours caused to surrounding brain structures. Any type of focal neurologic symptoms may occur, such as impaired judgment, memory loss, lack of recognition, spatial orientation disorders), personality or emotional changes, hemiparesis, hypoesthesia, aphasia, ataxia, visual field impairment, impaired sense of smell, impaired hearing, facial paralysis, double vision, dizziness, but more severe symptoms might occur too, such as paralysis on one side of the body hemiplegia or impairment in swallowing. These symptoms may also be caused by a large variety of neurologic conditions e.g. stroke, traumatic brain injury. What counts, however, is the location of the lesion and the functional systems (e.g. motor, sensory, visual, etc.) it affects.
3. **Irritation:** abnormal fatigue, weariness, absences and tremors, but also epileptic seizures.

A benign brain tumour may be present for some years and be asymptomatic. Others might present ambiguous and intermittent symptoms like headaches and vomiting or weariness and so be mistaken for gastrointestinal disorders. In these cases secondary symptoms need to be looked into.

Causes

Aside from exposure to vinyl chloride or ionizing radiation, there are no known environmental factors associated with brain tumours. Mutations and deletions of so-called tumours suppressor genes, such as P53, are thought to be the cause of some forms of brain tumours. Inherited conditions, such as Von Hippel–Lindau disease,

multiple endocrine neoplasia, and neurofibromatosis type 2 carry a high risk for the development of brain tumours. The World Health Organization has classified mobile phone radiation as “possibly carcinogenic”.

Diagnosis

Most of the brain is separated from the blood by the Blood-Brain Barrier (BBB), which exerts a restrictive control as to which substances are allowed to pass. Therefore many tracers that reach tumours in the body very easily would only reach brain tumours once there is a disruption of the BBB. Thus the disruption of the BBB, which can be detected by a MRI and CT, is regarded as the main diagnostic indicator for malignant gliomas, meningiomas, and brain metastases.

The presence of a combination of symptoms and the lack of corresponding clinical indications of infections or other causes would warrant redirect diagnostic investigation towards the possibility of an intracranial neoplasm.

The diagnosis will often start by taking a medical history noting medical antecedents, and current symptoms. Clinical and laboratory investigations will serve to exclude infections as the cause of the symptoms. Examinations in this stage may include the eyes, otolaryngological and electrophysiological examinations. The use of electroencephalography (EEG) often plays a role in the diagnosis of brain tumours.

Obstruction of the passage of CSF from the brain may cause signs of increased intracranial pressure manifesting in headaches, vomiting, or an altered state of consciousness. Endocrine dysfunctions should alarm doctors to think of brain tumours.

A bilateral temporal visual field defect, or dilatation of the pupil, and the occurrence of cognitive and behavioural impairment like impaired judgment, memory loss, lack of recognition, spatial orientation disorders, personality or emotional changes, hemiparesis, hypoesthesia, aphasia, ataxia, visual field impairment, impaired sense of smell, impaired hearing, facial paralysis, double vision, or more severe symptoms such as tremors, paralysis on one side of the body hemiplegia, or (epileptic) seizures in a patient with a negative history for epilepsy, should raise the possibility of a brain tumours.

Imaging

Medical imaging plays a central role in the diagnosis of brain tumours. Early imaging methods—invasive and sometimes dangerous— such as pneumo-encephalography and cerebral angiography have been abandoned in favour of non-invasive, high-resolution techniques, especially Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) and PET scans.

Types

Tumours can be benign or malignant, can occur in different parts of the brain, and may be primary or secondary. A primary tumour is one that has started in the brain, as opposed to a metastatic tumour, which is something that has spread to

the brain from another part of the body. The incidence of metastatic tumours in brain is 4 times more prevalent than primary tumours. The most common primary brain tumours are:

- Gliomas (50.4%);
- Meningiomas (20.8%);
- Pituitary adenomas (15%);
- Nerve sheath tumours (8%).

Treatment

Given the location of primary solid neoplasms of the brain in most cases treatment must begin early. Various types of treatment are available depending on neoplasm type and location and may be combined to give the best chances of survival:

- Surgery: complete or partial resection of the tumours with the objective of removing as many tumours cells as possible;
- Radiotherapy: the most commonly used treatment for brain tumours; the tumour is irradiated with beta, x rays or gamma rays;
- Chemotherapy: is a treatment option for cancer, however it is seldom used to treat brain tumours as the blood-brain barrier prevents the drugs from reaching the cancerous cells. Chemotherapy can be thought of as a poison that prevents the growth and division of all cells in the body including cancerous cells. This causes significant side effects;
- A variety of experimental therapies are available through clinical trials;
- Survival rates in primary brain tumours depend on the type of tumours, age, functional status of the patient, the extent of surgical tumours' removal and other factors such as immune status of the patient or the presence of associated systemic illnesses.

Prognosis

The prognosis depends on the type of cancer. Medulloblastoma has a good prognosis but glioblastoma multiforme has a median survival of only 12 months even with aggressive chemo-radiotherapy and surgery. Brainstem gliomas have the poorest prognosis with most patients dying within one year despite therapy. However, one type, focal brainstem glioma in children, seems open to exceptional prognosis with long-term survival.

Miscellaneous Occupational Diseases

46.1 Male Infertility

46.2 Needle stick and Sharps Injuries

46.3 Goitre

46.4 Varicose Veins

46.5 Gangrene

These are conditions that have not been classified into any systemic or patho-physiological category

46.1 Male Infertility

Reproduction is a simple and natural experience for most couples. However, for some couples it is very difficult to conceive. A man's fertility generally relies on the quantity and quality of his sperm. If the number of sperm a man ejaculates is low or if the sperm are of a poor quality, it will be difficult, and sometimes impossible, for him to cause a pregnancy. Male infertility is diagnosed when, after testing both partners, reproductive problems have been found in the male.

Infertility is a widespread problem. For about one in five infertile couples the problem lies solely in the male partner. In most cases, there are no obvious signs of infertility. Intercourse, erections and ejaculation will usually happen without difficulty. The quantity and appearance of the ejaculated semen generally appears normal to the naked eye. Medical tests are needed to find out if a man is infertile.

Causes

Sperm production problems:

- Chromosomal or genetic causes
- Undescended testes
- Infections
- Torsion
- Varicocele
- Medicines and chemicals
- Radiation damage
- Unknown cause

Blockage of sperm transport:

- Infections
- Prostate-related problems
- Absence of vas deferens
- Vasectomy

Sexual problems:

- Retrograde or premature ejaculation
- Failure of ejaculation
- Erectile dysfunction
- Infrequent intercourse
- Spinal cord injury
- Prostate surgery
- Damage to nerves
- Some medicines

Hormonal problems:

- Pituitary tumours
- Congenital lack of LH/FSH

Sperm antibodies:

- Vasectomy
- Injury or Epididymitis

Occupational Exposure:

The main categories known to adversely affect male fertility include:

- Heavy metals, solvents, pesticides and other agricultural materials, radiation, heat and welding;
- In recent decades, the industrial world has become inundated with an ever-increasing number of chemical and physical agents about whose toxicity in general, and toxicity on the male reproductive system, very little is known;
- Psychological stress, in addition to being a result of infertility problems, can also be a cause for decreased fertility.

Diagnosis

If a couple has been trying for a pregnancy without success, they should have some initial tests. Both partners should be tested. Diagnosis can involve a medical history, a physical examination and a semen analysis to check the number, shape and movement of sperm in the ejaculate. Blood tests may also be done to check the levels of hormones that control sperm production. Genetic investigations and testicular biopsies are sometimes done.

Treatment

Over 12% infertile men have a treatable condition, and after treatment, couples can become pregnant naturally. In some cases assisted reproductive technologies (ART), such as IVF (in vitro fertilisation) is recommended. ART do not cure or treat the cause of infertility but they can help couples achieve a pregnancy, even if the man's sperm count is very low. Intracytoplasmic sperm injection (ICSI) is a form of IVF where a single sperm is placed directly into each egg by piercing the outer covering of the egg. ICSI is particularly helpful for men with poor sperm production.

Prevention

Patients are advised to avoid cigarette smoking, excess alcohol, sexually transmitted infections, heat stress from tight fitting underwear, and anabolic steroids (taken for body building or sporting purposes) as these factors can be harmful to the production of sperm.

If patient is working in an occupation that may affect fertility, it's important to wear protective clothing and follow all occupational health and safety guidelines. Couples trying to conceive to are advised avoid exposure to any possibly harmful chemicals.

Healthy men in their 70s and beyond can still father children; however the time taken for a partner to become pregnant is longer when a man is middle-aged or older.

46.2 Needle stick and Sharps Injuries

Protecting health-care workers - preventing needle stick injuries.

The World Health Report 2002, that of the 35 million health-care workers, 2 million experience percutaneous exposure to infectious diseases each year. It further notes that 37.6% of Hepatitis B, 39% of Hepatitis C and 4.4% of HIV/AIDS in Health-Care Workers around the world are due to needle stick injuries.

Needle stick & Sharps Injuries

Needle stick injuries are wounds caused by needles that accidentally puncture the skin and a hazard for people who work with hypodermic syringes and other needle equipment. These injuries can occur at any time when people use, disassemble, or dispose of needles. When not disposed of properly, needles can become concealed in linen or garbage and injure other workers who encounter them unexpectedly.

“Sharps” include needles, as well as items such as scalpels, lancets, razor blade, scissors, metal wire, retractors, clamps, pins, staples, cutters, and glass items.

These injuries transmit infectious diseases, especially blood-borne viruses as described above. Accidental punctures by contaminated needles can inject hazardous fluids into the body through the skin. There is potential for injection of hazardous drugs, but contact with infectious fluids, especially blood, is by far the greatest concern. Even small amounts of infectious fluid can spread certain diseases effectively.

Sharps can create a cut in the skin which allows contact between blood, and fluids. The risk of infection after exposure to infected blood varies by blood borne

Miscellaneous Occupational Diseases

pathogen. Injuries have transmitted many other diseases to healthcare workers, laboratory researchers, and veterinarian staff. The diseases include:

- Blastomycosis.
- Brucellosis.
- Cryptococcosis.
- Diphtheria.
- Cutaneous gonorrhoea.
- Herpes.
- Malaria.
- Mycobacteriosis.
- Mycoplasma caviae.
- Rocky Mountain spotted fever.
- Sporotrichosis.
- Syphilis.
- Staphylococcus aureus.
- Streptococcus pyogenes.
- Toxoplasmosis.
- Tuberculosis.

Many of these diseases were transmitted in rare, isolated events. They still demonstrate, however, that needle stick and sharps injuries can have serious consequences.

How do needle stick injuries occur?

Injuries involving hollow-bore needles:

During or after disposal: 22%

- In transit to disposal.
- Improper disposal.

During disposal

- Transfer/process specimens.
- Pass/transfer equipment.

After use, before disposal: 19%

- Activation of safety feature.
- During clean up.
- Recap needle.

During use: 52%

- Access IV line.
- Insertion or removal of needle.
- Collision with sharp or worker.
- Other.

Injuries involving solid sharps:

During or after disposal: 3%

- In transit to disposal.
- During disposal.

After use, before disposal: 15%

- Sharp left in unusual location.
- During clean up.

During use of the item: 70%

- Processing specimen.
- Handle, pass, and transfer equipment or specimen.
- Collision with sharp or worker.
- Suture needle handling.
- Manipulate sharp in patient.
- Other.

Equipment design, nature of the procedure, condition of work, staff experience, recapping and disposal have all been mentioned as factors that influence these occurrences.

Prevention

Preventing injuries is the most effective way to protect workers. A comprehensive sharps injury prevention program would include:

- Recommended guidelines;
- Improved equipment design;
- Effective disposal systems;
- Employee training;
- Safe recapping procedures, where necessary;
- Surveillance programs.

Workers who use sharps require education and training as part of a sharps injury prevention program. Workers should be educated in how to protect themselves during use and to protect others who may encounter the device during or after procedures.

Experts recommend that:

- Needles should not be recapped. Used items should be placed immediately in a designated puncture-resistant container that is easily accessible at the point-of-care;
- Healthcare workers should cover open skin areas or lesions on hands and arms with a dry dressing at all times. Hand hygiene is still essential;
- Eyes, nose, and mouth should be protected if splashes with blood or body fluids are anticipated;
- First-aid should be immediate if there has been exposure to blood or body fluids. Report to employer. First-aid will include:
 - Thoroughly rinsing the injury site with running water, and gently cleaning with soap and water if possible;
 - Eyes, nose, or mouth should be flushed with running water;
 - Non-intact skin should be rinsed thoroughly.

PHAC also refers to the CDC “Workbook for designing, implementing and evaluating a sharps injury prevention program” as an example of a program. This workbook uses a hierarchy of control approach, including:

Elimination – find ways to eliminate or reduce needle use during procedures, medication delivery, and specimen collection

Engineering controls – remove or isolate the hazard by using sharps disposal containers or other devices that have an integrated injury prevention feature. Safety devices must be chosen with care as no one device or strategy will work in every situation.

Work-practice controls – Steps that can be taken to reduce injuries include using instruments to grasp needles or load/unload scalpels, avoiding hand-to-hand passage

of sharps, separating sharps from other waste, not carry garbage or linen bags close to the body, etc.

Personal Protective Equipment (PPE) – PPE should be used as the last control approach, where appropriate.

In situations where recapping is considered necessary, develop safe approaches which workers can follow. Workers should never move an exposed needle tip towards an unprotected hand. Recap by laying the cap on a flat surface and scoop it onto the tip of a syringe held in one hand. Keep the free hand away from the sheath and well behind the exposed needle.

In addition, all workers at risk should be aware that there is a vaccine available for Hepatitis B.

How should sharps be disposed of?

An effective system for disposing of used needles and sharps is crucial to preventing injuries. Have disposal containers readily available.

Workers should place needles in wide-mouth, puncture-proof containers. Locate disposal containers specifically where needles and sharps are used to make safe disposal possible. Replace the containers before they are completely filled – sharps containers should be removed and replaced when they are three quarters full. Make sure they are sealed, collected, and disposed of in accordance with local regulations for biomedical waste.

All staff should report every incident in which they find needles or sharps left at the bedside or thrown into the regular garbage.

What steps are involved with a surveillance program?

Surveillance programs that provide in-depth analysis of accidents are an important tool for obtaining information. The goals of these programs should include:

- Determining the rate of injuries;
- Investigating the factors that cause the injuries;
- Ensuring that injured workers receive proper treatment;
- Identifying areas in which the prevention program needs improvement;
- Leading to practical strategies for dealing with the problem.

46.3 Goitre

A goitre (sometimes spelt “goiter”) is an abnormal swelling of the thyroid gland that causes a lump to form in the neck.

There can be many possible causes, including an under- or overactive thyroid gland, iodine deficiency and, rarely, thyroid cancer. Goitre can also occur in case of Euthyroid – or a perfectly normal thyroid gland.

The Thyroid Gland

The thyroid gland is a small butterfly-shaped gland in the neck, just in front of the trachea. It produces thyroid hormones, which help regulate the body's metabolism. The thyroid gland is not usually noticeable, but if it swells, it produces a lump on the neck known as goitre.

The size of goitre can vary from person to person. In most cases, the swelling is small and doesn't cause any symptoms. However, in more severe cases, the swelling can increase significantly and affect breathing and swallowing.

Causes

Goitres can have several possible causes, including:

- Hyperthyroidism;
- Hypothyroidism;
- Pregnancy and the menopause;
- Iodine deficiency.

Diagnosis

A physical examination must be done to see if the thyroid gland is swollen. This is followed by thyroid function tests, to see how well the thyroid gland is working. Thyroid function tests measure the blood level of certain hormones to show whether there is an underactive or overactive thyroid, both of which are associated with goitre.

Treatment

The treatment for goitres depends on the underlying cause. If the goitre is small and isn't causing any problems, a wait-and-watch approach is usually recommended.

Other possible treatments include radioiodine treatment and thyroid surgery.

Although most goitres are usually benign (non-cancerous), it is estimated that in 1 in 20 cases they may be a sign of thyroid cancer.

Risk Factors

Goitres can affect anyone, but they're more common in women and people over 40.

Risk factors for goitres include:

- **Sex** – women are more likely to have thyroid problems and develop a goitre;
- **Age** – the risk of developing a goitre increases with age;
- a lack of iodine in the diet;
- **Occupation** – Salt Pan workers;
- **Pregnancy and menopause** – for reasons that are unclear, the risk of having thyroid problems increases during pregnancy and the menopause;
- **Medication** – some types of medication, such as lithium and immune-suppressants, increase your risk.

- **Exposure to Radiation** – having radiation treatment to your neck or chest area, or being exposed to radiation, also increases your risk of developing goitre. Exposure to radiation can happen inadvertently and not just as a result of radiotherapy. Therefore not only X-ray technicians, but also scavengers who may handle radiation emitting material are at risk.

46.4 Varicose Veins

Varicose veins are gnarled, enlarged veins. Any vein can become varicose, but the veins most commonly affected are those in legs and feet because standing and walking upright increases the pressure in the veins.

For many people, varicose veins and spider veins are simply a cosmetic concern. For other people, varicose veins can cause aching pain and discomfort and sometimes more-serious problems. Varicose veins may cause some other circulatory problems.

Varicose veins usually don't cause any pain. Signs most commonly visible are:

- Veins that are dark purple or blue in colour
- Veins that appear twisted and bulging
- In severe cases:
 - Pain or heavy feeling in legs;
 - Burning, throbbing, muscle cramping and swelling in calf muscles;
 - Worsened pain after sitting or standing for a long time;
 - Itching around one or more of your veins;
 - Spotting – also called varicose eczema where dirty brown or rusty brown patches of discolouration may develop. This happens when the pressure in the veins of the legs (venous pressure) increases;
 - Skin ulcers near ankle, a serious form of vascular disease that requires immediate treatment.

Causes and Risk Factors

- **Age** – In older age veins lose elasticity causing them to stretch. The valves in veins may become weak, allowing blood that should be moving toward heart to flow backward. Blood pools in your veins and your veins enlarge and become varicose. The veins appear blue because they contain deoxygenated blood.
- **Sex** – Women are more likely to develop the condition. Hormonal changes during pregnancy, pre-menstruation or menopause may be a factor. Female hormones tend to relax vein walls. Taking hormone replacement therapy or birth control pills may increase risk of varicose veins.
- **Pregnancy** – Some pregnant women develop varicose veins. Pregnancy increases the volume of blood in body, but decreases the flow of blood from legs to pelvis. Varicose veins of pregnancy generally improve without treatment within three months after delivery.

- **Family History** – If other family members had varicose veins, there’s a greater chance.
- Obesity.
- Standing or sitting for long periods of time.
- Occupations with Risk of Varicose Veins:
 - Office Workers;
 - Nurses;
 - Factory Workers;
 - Hairstylists;
 - Policemen;
 - Postmen.

Complications

- **Ulcers** – Extremely painful ulcers may form on the skin near varicose veins, particularly near the ankles. Ulcers are caused by long-term fluid build-up in these tissues, caused by increased pressure of blood within affected veins. A discoloured spot on the skin usually begins before an ulcer forms.
- **Blood clots** – Occasionally, veins deep within the legs become enlarged. In such cases, the affected leg may swell considerably and may indicate a blood clot-thrombophlebitis.

Diagnosis

- Occupational history followed by physical examination is the first step.
- Ultrasound test to see the functioning of valves in veins or any evidence of a blood clot. This is non-invasive test.

Treatment

Self-care – Exercising, losing weight, not wearing tight clothes, elevating legs, and avoiding long periods of standing or sitting — can ease pain and prevent varicose veins from getting worse.

Compression stockings – Wearing compression stockings is often the first approach to try before moving on to other treatments. Compression stockings are worn all day. They steadily squeeze your legs, helping veins and leg muscles move blood more efficiently.

Additional treatments for more-severe varicose veins – If the patient does not respond to self-care, compression stockings, or if your condition is more severe, one/more of following treatments will be required:

- **Sclerotherapy** – In this procedure, small- and medium-sized varicose veins are injected with a solution that scars and closes those veins. In a few weeks, treated varicose veins should fade.
- **Laser surgeries** – Laser surgery works by sending strong bursts of light onto the vein, which makes the vein slowly fade and disappear. No incisions or needles are used.
- **Catheter-assisted procedures** – A catheter into an enlarged vein and heats the tip of the catheter. As the catheter is pulled out, the heat destroys the

vein by causing it to collapse and seal shut. This procedure is usually done for larger varicose veins.

- **Vein stripping** – This procedure involves removing a long vein through small incisions. This is an outpatient procedure for most people. Removing the vein won't adversely affect circulation in leg.
- **Ambulatory phlebectomy** – Smaller varicose veins are removed through a series of tiny skin punctures. Only the parts of your leg that are being pricked are numbed in this outpatient procedure. Scarring is generally minimal.
- **Endoscopic vein surgery** – This operation is indicated only in an advanced case involving leg ulcers. This procedure is performed on an outpatient basis.

46.5 Gangrene

Gangrene or gangrenous necrosis is a type of necrosis caused by a critically insufficient blood supply. This potentially life-threatening condition may occur after an injury or infection, or in people suffering from any chronic health problem with blood circulation. The primary cause of gangrene is reduced blood supply to the affected tissues, which results in cell death. Diabetes and long-term smoking increase the risk of suffering from gangrene. Gangrene is a non-communicable disease.

There are different types of gangrene with different symptoms, such as dry gangrene, wet gangrene, gas gangrene, internal gangrene and necrotizing fasciitis. Treatment depends on the underlying cause, and can include resection, debridement (or, in severe cases, amputation) of the affected body parts, antibiotics, revascularization (via a vascular bypass or angioplasty), or hyperbaric oxygen therapy. It can rarely include medical therapy to stop vascular spasm or the production of cold-induced vascular obstruction by cold-precipitated cryoglobulins.

Cause

Gangrene is caused by a critically insufficient blood supply (e.g., peripheral vascular disease) or infection. It is associated with diabetes and long-term tobacco smoking. This condition most commonly occurs in the lower extremities (legs and feet).

Types

Dry Gangrene

Dry gangrene is a form of coagulative necrosis that develops in ischemic tissue, where the blood supply is inadequate for tissue viability. It is often due to peripheral artery disease, but can be due to acute limb ischemia. The limited oxygen in the ischemic limb limits putrefaction and bacteria fail to

survive. The affected part is dry, shrunken and dark reddish-black. The line of separation usually brings about complete separation, with eventual falling off (called auto amputation) of the gangrenous tissue if it is not removed surgically, a process.

Dry gangrene is the end result of chronic ischemia without infection. If ischemia is detected early, when there are ischemic wounds rather than gangrene, the process can be treated by revascularization (via vascular bypass or angioplasty). However, once gangrene has developed, the affected tissues are not salvageable.

Diabetes mellitus is a risk-factor for peripheral vascular disease and thus for dry gangrene, but if poorly controlled it is also a risk factor for wet gangrene.

Wet Gangrene

Wet, or infected, gangrene is characterized by thriving bacteria and has a poor prognosis due to septicemia resulting from the free communication between infected fluid and circulatory fluid. In wet gangrene, the tissue is infected by saprogenic microorganisms which cause tissue to swell and emit a fetid smell. Wet gangrene usually develops rapidly due to blockage of venous and/or arterial blood flow. The affected part is saturated with stagnant blood promoting rapid growth of bacteria. The toxic products formed by bacteria are absorbed, causing systemic manifestation of septicaemia and finally death. The affected part is oedematous, soft, putrid, rotten and dark.

Because of the high mortality associated with infected gangrene, an emergency salvage amputation, such as a guillotine amputation, is often needed to limit systemic effects of the infection. Such an amputation can be converted to a formal amputation, such as a below or above knee amputation.

Gas Gangrene

Gas gangrene is a bacterial infection that produces gas within tissues. Gas gangrene is caused by bacterial exotoxin-producing clostridial species, which are mostly found in soil, and other anaerobes such as *Bacteroides* and anaerobic streptococci. These environmental bacteria may enter the muscle through a wound and subsequently proliferate in necrotic tissue and secrete powerful toxins. These toxins destroy nearby tissue, generating gas at the same time. Infection spreads rapidly as the gases produced by bacteria expand and infiltrate healthy tissue in the vicinity. Because of its ability to quickly spread to surrounding tissues, gas gangrene should be treated as a medical emergency. Progression to toxemia and shock is often very rapid.

Other Types of Gangrene

- Necrotizing fasciitis is an infection that spreads deep into the body along tissue planes.

- Noma is a gangrene of the face.
- Fournier gangrene is a type of necrotizing fasciitis that usually affects the genitals and groin. Venous limb gangrene may be caused by heparin-induced thrombocytopenia and thrombosis
- Severe mesenteric ischemia may result in gangrene of the small intestine.
- Severe ischemic colitis may result in gangrene of the large intestine. Predisposing conditions are hernia, volvulus and intussusceptions.

Treatment

The method of treatment is generally determined by the location of affected tissue and extent of tissue loss. The best treatment for gangrene is revascularization of the afflicted organ, which can reverse some of the effects of necrosis and allow healing. Other treatments include antibiotic therapy, wound care, debridement and surgical amputation.

Hyperbaric oxygen therapy (HBOT) treatment is used to treat gas gangrene. HBOT increases pressure and oxygen content to allow blood to carry more oxygen to inhibit anaerobic organism growth and reproduction. A regenerative medicine therapy was developed by Dr. Peter DeMarco to treat gangrene using procaine and PVP for diabetic patients to avoid amputations. Growth factors, hormones and skin grafts have also been used to accelerate healing for gangrene and other chronic wounds.

Angioplasty should be considered if severe blockage in lower leg vessels (tibial and peroneal artery) leads to gangrene.

Prognosis

Most amputations are performed for ischemic disease of the lower extremity. Of dysvascular amputations, 15-28% of patients undergo contralateral limb amputations within 3 years. Of elderly persons who undergo amputations, 50% survive the first 3 years.

The Prevention and Control of Occupational Diseases

NATURE OF OCCUPATIONAL DISEASES AFFECTS their management due to long latency periods from time of exposure to symptoms of illness and challenges in attributing an illness to occupational exposure. Reduction of the burden and incidence of occupational diseases and injuries through effective strategies rests on responsible behaviour of the employers and employees for safe and healthy workplaces, through information and awareness of workplace hazards and enforcement of regulatory instruments.

Responsibilities

Employers must comply with the requisite OHS Act & Regulations, and develop safety systems to inform, train, and protect workers from workplace hazards. Workers have a responsibility to protect their own health and safety. It is essential that workers are informed about the hazards and follow instructions, report hazardous conditions, and properly use all safety equipment/devices/clothing and adhere to safe work practices.

Physicians – They detect occupational disease by evaluating patients' symptoms, diagnosing their medical conditions, considering whether it is work-related, and giving appropriate treatment and advise about control.

Nurses – Occupational health nurses play an important role in monitoring the trends of occupational disease, planning appropriate interventions, and evaluating prevention programs.

Prevention of Occupational Diseases & Illnesses

Design and implement preventive measures at all three levels of prevention:

- Primary prevention aims to reduce the occurrence of disease by eliminating the cause of disease for example use of asbestos-free products, benzene-free solvents, or solvent-free paints (powdered paints or water-based paints) to

eliminate the risk of carcinogenicity or reducing exposure to safe levels that prevent it from causing damage, for example reducing noise at its source to levels that do not cause noise-induced deafness;

- Secondary prevention to identify and treat health problems as early as possible, often before symptoms have developed in order take corrective action, for example regular monitoring of blood lead levels among lead exposed workers, regular audiograms among workers exposed to high levels of noise in the work environment;
- Tertiary prevention is to avoid complications of and disability from illnesses; and
- Injuries or to provide rehabilitative and palliative care. Tertiary prevention aims to minimize the consequences in persons who already have disease and depends on proper and appropriate treatment.

Control of Hazards at the Workplace

Successful prevention of occupational disease could be achieved by controlling exposure to harmful agents to what are considered as safe and permissible levels. This is a form of primary prevention as it is directed at efforts to prevent damage by controlling exposure to safe levels. There are several mechanisms for the control of exposure at the workplace.

Implementing Primary Prevention at an Organizational Level

The following paragraphs describe implementing primary prevention measures with substitution, engineering, and administrative controls like changes in work practices.

Substitution of a Hazardous Process

Substitution of the hazard with a less toxic alternative is a feasible option. Another method could be the substitution of the hazard to a form that reduces risk of exposure. Substitution carries certain risks because substitute materials may not have been adequately tested for adverse health effects and may be hazardous.

Therefore, substitution with a seemingly safer substance should be considered only a first step. There are many ways in which substitution of a process can be accomplished, as illustrated by the following examples:

- Giving medications orally or, if possible, with transdermal patches can reduce needle stick injuries among health care workers;
- Mixing chemicals in enclosed structures or bags can reduce dermal or inhalational exposures to hazardous substances;
- In degreasing operations, a less toxic solvent such as 1,1,1-trichloroethane can be used, instead of the more toxic trichloroethylene or tetrachloroethane.

Installation of Engineering Controls and Devices

Designing and redesigning of the process to minimize exposure are some possible control measures. Often more feasible than substitution, this approach includes a wide range of options to reduce hazards, such as:

- Automation, or segregation of a work process.
- Use of dampeners or mufflers to reduce vibration or noise.
- Suppressing the substance by processes such as ‘wetting’ of dusty operations.
- Installing ventilation exhaust systems to remove hazardous dusts.
- Applying appropriately designed soundproofing materials to reduce loud noises.
- Redesign of the workstation or process to reduce unnecessary and repetitive bending, or to prevent excessive stretching to the limit of the range of movement of the workers, can minimize ergonomic hazards.
- Constructing enclosures to isolate hazardous processes.
- Installing hoists to eliminate manual lifting of containers or parts.

Ergonomic improvements to the workplace can reduce the risk of musculoskeletal disorders among the workers. Although installation of engineering controls and devices can involve substantial initial capital expenditure, it often saves money by reducing use of materials, toxic and other material wastes, and costs of disease, injury, and lost productivity.

Administrative Controls

Some changes can be introduced to reduce or eliminate risks in work processes, including alternative work practices and are generally more effective than those that rely primarily on behaviour change. For example, dust exposures can be significantly reduced by using wet mops to clean floors in place of dry sweeping. For example, a change from piece-rate work with incentive wages to hourly-rate work reduces inappropriate physical and mental pressure on workers and musculoskeletal disorders.

Primary Prevention at an Individual Level

Primary prevention at an individual level potentially reduces the adverse effects of workplace hazards, without removing the source of the problem.

Education and Training

Providing information about adverse effects of potential exposures conveyed in a user-friendly manner has several benefits, including empowering workers and raising awareness of people outside the workplace, including children and their parents. The training of workers in how to recognize work hazards, how to work safely and reduce their risks, and what to do in the event of an emergency or when occupational diseases occur, is another important aspect of prevention since it influences their

safety behaviour. Those that are not aware of hazards will not take health and safety precautions necessary to protect themselves and others. For example, metalworkers are often exposed to skin contact with coolants and soluble oils and can have variable skin contact with coolants with varying manifestations.

Personal Protective Equipment

The use of personal protective equipment is often widely practised and is relatively inexpensive and useful for situations of short-term or occasional exposure to occupational hazards. It is important to recognize that PPE should be used only when there is no alternative method to control a hazard. Use of personal protective equipment (PPE), such as respirators, earplugs, gloves, and protective clothing, or safety devices such as helmets, safety belts will continue to be necessary for some workplaces where PPE is the only available protective measure though, at times, it may be cumbersome, limit visibility or communication with other workers.

However, protective devices have to be properly selected to be effective against specific hazards, for example, the choice of an appropriate glove for use with a particular solvent. Workers have to be trained to use the equipment correctly and to ensure that it is working effectively, such as respirator fit testing in the use of respirators and need higher compliance or its protective effects may be less than desired. Finally, protective devices have to be properly maintained and replaced when necessary.

Administrative Measures

Administrative controls may be a viable alternative and could take the form of job rotation, or even temporary job reassignment. For example, set hours for noise restriction at workplace or reduction in occupational exposure by spending limited amounts of time in areas with potential hazardous exposure though this approach may distribute hazardous exposure to more workers. Engineering approaches, though may be safer and more effective. Another administrative measure is use of pre-placement examinations to avoid assigning new workers to jobs in which their personal risk factors place them at higher risk.

Secondary Prevention

Screening and Surveillance

Screening and surveillance can identify the need for control measures to prevent further hazardous exposures. Screening seeks to identify disorders in an asymptomatic individual to avoid adverse health outcome whereas, surveillance is designed to obtain and analyze, information on disorders that have already occurred. They can play an active role in education by informing people about potentially hazardous

exposures and ways of minimizing them such as by advocating for improved ventilation systems and, if necessary, using respirators or other PPE.

Selected Hazards and their Control Measures

- **Musculoskeletal disorders** – Ergonomic reengineering of tools and workplace, decrease of weight of loads, job rotation among repetitive and non-repetitive tasks.
- **Pesticide-related conditions** – Substitution with less toxic substances, adequate protective equipment, training on prevention of pesticide exposures, administrative restrictions on working in fields where exposure may occur.
- **Traumatic injuries** – Safe cutting tools, use of roll-over protection systems in tractors, training and enforcement of safe use of equipment.
- **Respiratory conditions** – Substitution with less toxic materials, use of respirators if indicated, administrative controls to remove sensitised workers from exposure.
- **Dermatitis** – Substitution with less toxic materials, use of gloves or barrier creams if indicated, administrative controls to remove sensitised workers from exposure.
- **Infectious diseases** – Improved sanitation & housing facilities, personal hygiene, food and water hygiene, improved medical care screening and treatment services.
- **Cancer** – Substitution with less hazardous substances, protective clothing and sunscreen, administrative controls to limit exposure.
- **Eye conditions** – Use of protective eyewear, dust control.
- **Mental disorders** – Improved working and housing conditions, availability of mental health services.
- **Heat-related illness** – Educating employers and workers on the hazards of working in hot environments, implementing heat stress management measures.

Prevention and Control of Occupational Accidents

The basic accident prevention activities are as follows:

- Elimination of the hazard from the machine, method, material or facility structure or, control or containment of the hazard by enclosing or guarding it at its source;
- Training of operating personnel to be aware of the hazard and to follow safe job procedures, use of personal protective equipment to shield from the hazard;
- Planning and implementation of a safety and health inspection programme by the operating supervisors and field safety personnel to identify potential hazards, and control accident and fire hazards;
- Guidance in accident investigation to determine the accidents cause and to prevent recurrence;
- Analysis of data on illness and accidents for the purpose of instituting corrective action and to determine accident trends.

Control of Electrical Hazards

Many accidents occur due to defective electrical apparatus, especially portable electrical apparatus, e.g. sockets, plugs and flexible cable. All switches must have approved voltage and amperage rating compatible with intended use. Circuit breakers should be used when needed. All electrical equipment must be inspected and maintained regularly.

Control of Fire Hazards

Ordinary fire results from the combination of fuel, heat and oxygen. Common fire hazards include smoking, flammable liquids, naked flames, poorly maintained and overheating machines, electrical wiring, static electricity, welding and soldering equipment. The principles of fire control are to:

- Prevent ignition and store chemicals and explosive materials properly;
- Install and use fire alarms, provide fire extinguishing equipment and regularly inspect and maintain it;
- Train every worker to use the available fire control equipment;
- Inspect the workplace at regular intervals for fire risks;
- Conduct regular fire drills and cooperate with the local fire brigade.

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BOHS for Informal Industry through Primary Care Providers: A New Paradigm, a Crusade.

WHO Constitution, Declaration of Alma Ata, Health for all strategy, WHO's Global Healthy Work Approach (HWA) and the meetings of the WHO collaborating Centres in Occupational Health have reiterated the importance of preventing occupation-related ill-health, occupational diseases and safety issues at all levels and have emphasized upon the primary health care model for extending these services to those deprived. WONCA (*World Organisation of Family Physicians*) and the ICOH (*International Commission on Occupational Health*) have made a joint statement on workers and their families and took a pledge "to work with other partner organizations . . . to address the gaps in services, research, and policies for the health and safety of workers and to better integrate occupational health in the primary care setting, to the benefit of all workers and their families."

Of the 1.3 billion population in India, over 63% belong to the productive age group i.e. of the total workforce of over 457 million workers in India, over 92% work in the informal economy. Highest proportion of workers (58%) is seen in agriculture. Informal sector refers to all unlicensed, self-employed or unregistered economic activity involving the following occupations; small and marginal farmers, landless agricultural labourers, share croppers, fishermen, those engaged in animal husbandry, beedi rolling, building and construction workers, leather workers, weavers, artisans, salt workers; workers in brick kilns, stone quarries, saw mills, and oil mills; bonded, migrant, contract and casual labourers; Toddy tappers, scavengers, carriers of head loads, drivers of vehicles, loaders; and Midwives, domestic workers, barbers, pavement vendors, and handcart operators.

India carries a large burden of occupationally-caused injuries and diseases; out of 11 million cases of occupational diseases in the world 1.9 million cases occur in India; Indian workers suffer 17 million (17% of the world) occupational non-fatal injuries; and 45,000 fatal injuries (45% of the total deaths in world).

It is obvious that with meagre figures of human resource capacity development of qualified specialists in occupational health, it may take a few decades to meet today's requirement. Over last few years, since the concept of BOHS was universally accepted and promoted, IAOH was seized with the idea of achieving concrete steps for introducing and implementing it in India. The principal objective of IAOH is its social responsibility and obligation towards the country as the largest NGO in the discipline of Occupational and Environmental Health.

IAOH have to come to a definitive plan to actually prepare a manual for primary care providers to learn, refer and provide Basic Occupational Health Services to the workers of informal industry to whom they are easily accessible.

This is the crusade whose time has come.



IAOH

Indian Association of Occupational Health
Basic Occupational Health Services Initiative



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