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Open University

UGHN-117
Public Health and Epidemiology

Block-1

Dimensions of health and Demography as well as epidemiology

Block-2

Epidemiological methods, Communicable & Infectious Diseases and Waste Management

Block-3

Community food protection, food adult-eration and immunization

COURSE INTRODUCTION

The objective of this course is to provide basic introduction of health, its different dimensions, demography, epidemiological methods, different communicable and non-communicable diseases, community food protection and immunization. The aim is to provide the fundamental concepts of public health and epidemiology. The course is organized into following three blocks as under :

Block : 1

It covers the health and its dimensions, demography and epidemiology.

Block : 2

It deals different types of epidemiological methods, communicable, indectious disease and waste management.

Block : 3

It describes the community food protection, life style & community health, food adulteration and immunization.

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BLOCK -1 BLOCK INTRODUCTION

This is the first block (Dimensions and health, demography and epidemiology) of Public Health and Epidemiology. It consists of three units.

Unit 1 : Health and Dimensions of Health

Unit 2 : Community and its Organization

Unit 3 : Public Health, Demography and Epidemiology

The introduction of first block is as under :

This is the first block (Dimensions of Health and Demography as well as Epidemiology) of Public health and Epidemiology. In this block, we have discussed health with its different dimension, demography and epidemiology. Health has a variety of definitions, which have been used for different purposes over time. Health can be promoted by encouraging healthful activities, such as regular physical exercise and adequate sleep, and by reducing or avoiding unhealthful activities or situations, such as smoking or excessive stress. Some factors affecting health are due to individual choices, such as whether to engage in a high-risk behavior, while others are due to structural causes, such as whether the society is arranged in a way that makes it easier or harder for people to get necessary healthcare services. Still, other factors are beyond both individual and group choices, such as genetic disorders.

Demography is the study of the basic demographic processes of fertility, mortality, and migration and their relationships with and consequences for population distributions of various kinds including age and sex composition and the spatial distribution of population. The subfield of social demography examines the intersection of demography with social distributions and dynamics, particularly population composition and differences in demographic distributions by race/ethnicity and socioeconomic status. Demographic analysis draws on specialized data and a specialized set of techniques, methods and models including life table analysis; survival analysis; measurement of demographic rates, ratios, and population composition; stable population theory; decomposition analysis; mathematical and simulation models; and a wide range of related methods and techniques of analysis.

Examples of topics studied include trends in population growth and how it is shaped by the components of fertility, mortality, and migration; spatial distribution of population; immigration; age and sex composition of the population; residential segregation of social groups including racial and ethnic groups and socioeconomic groups; socioeconomic distributions, poverty, and inequality; and how social outcomes of different kinds are impacted by demographic distributions and processes. The first block consists of three units. The first unit is as under :

UNIT- 1 : HEALTH AND DIMENSIONS OF HEALTH

Structure

OBJECTIVES

This is the first unit (Health and Dimensions of Health) of first block (Dimensions of Health, Demography and Epidemiology). Under first unit, we have following objectives. These are as under :

- To know about health and nutrition
- To know the understanding of health and its determinants
- To discuss different types of health dimensions
- To discuss factors affecting human health

1.1 INTRODUCTION

The meaning of health has evolved over time. In keeping with the biomedical perspective, early definitions of health focused on the theme of the body's ability to function; health was seen as a state of normal function that could be disrupted from time to time by disease. An example of such a definition of health is : a state characterized by anatomic, physiologic, and psychological integrity; ability to perform personally valued family, work, and community roles; ability to deal with physical, biological, psychological, and social stress. Then, in 1948, in a radical departure from previous definitions, the World Health Organization (WHO) proposed a definition that aimed higher, linking health to well-being, in terms of physical, mental, and social well-being, and not merely the absence of disease and infirmity. Although this definition was welcomed by some as being innovative, it was also criticized for being vague and excessively broad and was not construed as measurable. For a long time, it was set aside as an impractical ideal, with most discussions of health returning to the practicality of the biomedical model.

In the first decade of the 21st century, the conceptualization of health as an ability opened the door for self-assessments to become the main indicators to judge the performance of efforts aimed at

improving human health. It also created the opportunity for every person to feel healthy, even in the presence of multiple chronic diseases or a terminal condition, and for the re-examination of determinants of health (away from the traditional approach that focuses on the reduction of the prevalence of diseases).

Fig. 1 Good health & good life

1.2 DIMENSIONS OF HEALTH

Dimensions of health consist of 5 elements, Social, Physical, Emotional, Mental and Spiritual. A complete picture of health is provided by all of these five dimensions of health and with the change in any of the dimension, other dimensions are directly or indirectly affected.

1.2.1 Physical - A physical dimension of health is nothing but a physical aspect or bodily aspect of health. This indicates to the progressively traditional meaning of heath as the absence of illness, injury or diseases. Physical health can range in quality with a sequence where a combination of sicknesses like diabetes, cancer, diabetes, hypertension or cardiovascular disease. All these toward one side and an individual who is in ideal physical condition (think health isn't wellness) are on another. Physical health can influence different dimensions of health since the decrease of physical health can cause a reduction in different types of health. Like an individual who all of a sudden gets cold, usually isolated socially on the grounds that it doesn't contaminate others, tries to concentrate on picking up anything or learning. Above all, may feel troubled because of its isolation.

1.2.2 Mental – This aspect of health used to come under the cognitive aspect of health. Although emotional and mental health are interlinked with each other, we will discuss both of them separately. Mental health or well-being is nothing the working of the cerebrum or brain, while the emotional health indicates the general population who have been related to their hormones. Emotional wellness at that point incorporates numerous psychological well-being issues, for example, Dementia and Alzheimer's. It means the ability of a person to think while using his brain. This might be for recalling the information or solving the problems, moreover the main focus is on the person's cognitive aspects.

Other dimensions of health are directly affected by mental health. With the increase in physical activity, there will be a direct increase in mental health activity. Self-esteem is automatically increased when there is an increase in good mental health status. Higher self-esteem then results in an increase in

confidence with respect to the social situation. Emotional Emotional dimension of health consists of emotional state and mood of an individual. When a person is in a good emotional state and in a happy mood, at that point we called that situation as good emotional health. It is directly related to your self-esteem and your ability to control and manage your emotions for maintaining a real view of circumstances. Other dimensions of health are directly affected and are related to emotional health since a person with good dignity is much more positive in a social setting, used to deliver considerably in physical activity and used to make friends very quickly.

1.2.3 Spiritual - The understanding of the overall goal of life is known as spiritual health. Individuals used to find this objective of life through faith or believe system, while other individuals used to make their own purpose. An individual with the purpose of life is known to live a better and healthy life in comparison to those who don't have any purpose. Mental and Emotional health is directly affected by spiritual health because having a goal in your life can make your dreams come true.

1.2.4 Social - When we talk about the social dimensions of health, it is directly linked with the capability of an individual maintain and make an essential relationship of life. High-grade social health doesn't only include making relations, but it also includes maintaining and behaving properly and also maintain socially acceptable measures. The family is the basic social entity of relationship which directly impacts the life of a person. Social networks, close friends, youth leaders, and teachers are also a part of a key relationship and affect the social life of any individual. Rest of the dimensions are also affected by the Social Dimension. For example, if an individual is having a bad social life, it can lead to an issue of the isolated and unwanted purpose of life. Assignment help will provide you thorough guidance on health-related assignments.

Fig. 2 Dimensions of Health & Well-being

1.3 SOCIAL DETERMINANTS OF HEALTH

In Social Dimensions of Health generally, in the context in which a person's life holds great importance both for his health status and the quality of his life, it is rapidly recognized that health is maintained not only through the advancement and application of health science and Improved, rather the efforts and the intelligent lifestyle choices of the person and society. Some of the major determinants of health include physical environment, economic and social environment and the behavior and individual characteristics of a person. Here are some of the factors that will tell anyone that an individual of a society is happy or not :

Social support networks

- Employment/working conditions
- Physical environments
- Healthy child development
- Gender
- Coping skills and personal health practices
- Literacy and Education
- Culture
- Genetics and Biology
- Healthy Child Development

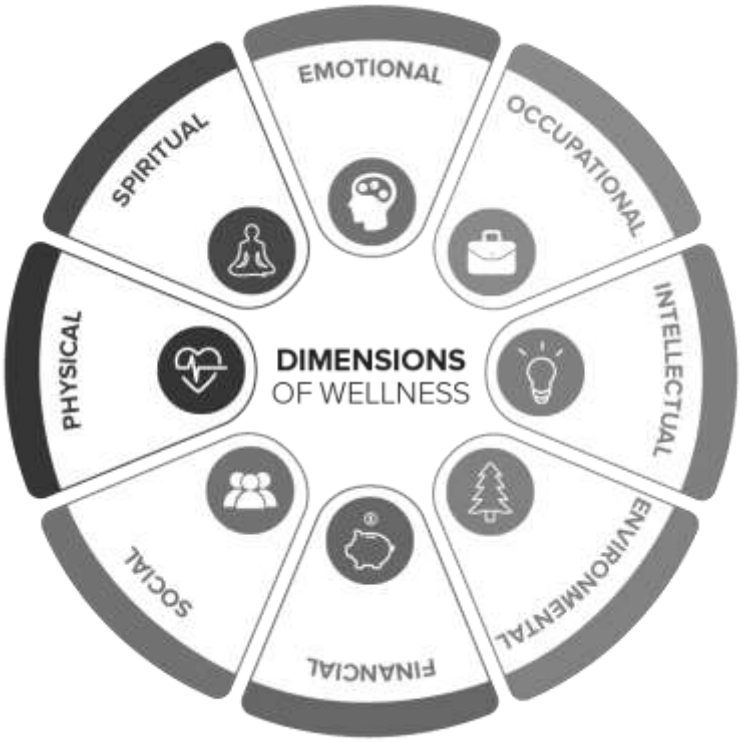

Fig. 3 Dimensions of wellness (Eight Dimensions)

When any doctor is working taking care of any person who is suffering from anxiety disordered, it must be taken care that doctor or professional should be having knowledge of medication for anxiety disorder. The beginning of the treatment is the major challenge that professionals need to find out before starting the treatment. By getting the knowledge of the symptoms of the anxiety disorder, the right beginning of the treatment for an anxiety disorder can find out. Like a good doctor, psychiatrist of professional, he or she should help the individuals who are suffering from an anxiety disorder with the help of therapy that helps them recover.

1.4 COMPONENTS OF PHYSICAL HEALTH

When we talk about dimensions of health, below are the components of physical health that are affected by the lifestyles :

1. Physical Activity - All adults and children need to act physically on a daily basis. This must include a combination of structured exercise and physical exercises in the form of leisure. These leisure exercises include biking, hiking, and walking. A more structured form of exercise includes sports, running and strength training.

2. Diet and Nutrition - In a good diet, which is balanced, there are the musts : fats, proteins, carbohydrates, vitamins. Specific nutrients should be restricted under the supervision of a licensed health professional. Clean water is a good form of fluid, that must be consumed on a regular basis.

3. Medical Self-Care - There are some essential items like lozenges, bandages, and pain-relieving medications and all these can be accessed easily from home. Fever, long term cough and some other diseases must be approached by the help of primary care. When symptoms and signs are important or life-threatening, emergency treatment should be sought.

4. Sleep and Rest - Even though the regular activity is very must important for physical health, making the body to relax is also important. A proper sleep of 7- hours is must in a dark and quiet environment. Change in the duration of sleep must be done in the care of any professional. Systematic activities to prevent or cure health problems and promote good health in humans are undertaken by health care providers. Applications with regard to animal health are covered by the veterinary sciences. The term healthy is also widely used in the context of many types of non-living organizations and their impacts for the benefit of humans, such as in the sense of healthy communities, healthy cities or healthy environments.

In addition to health care interventions and a person's surroundings, a number of other factors are known to influence the health status of individuals. These are referred to as the "determinants of health", which include the individual's background, lifestyle, economic status, social conditions and spirituality; Studies have shown that high levels of stress can affect human health. Just as there was a shift from viewing disease as a state to thinking of it as a process, the same shift happened in definitions of health. Again, the WHO played a leading role when it fostered the development of the health promotion movement in the 1980s. This brought in a new conception of health, not as a state, but in dynamic terms of resiliency, in other words, as a resource for living.

In 1984, WHO revised the definition of health defined it as "the extent to which an individual or group is able to realize aspirations and satisfy needs and to change or cope with the environment. Health is a resource for everyday life, not the objective of living; it is a positive concept, emphasizing social and personal resources, as well as physical capacities. Thus, health referred to the ability to maintain homeostasis and recover from adverse events. Mental, intellectual, emotional and social health referred to a person's ability to handle stress, to acquire skills, to maintain relationships, all of which form resources for resiliency and independent living. This opens up many possibilities for health to be

taught, strengthened and learned.

Since the late 1970s, the federal Healthy People Program has been a visible component of the United States' approach to improving population health. In each decade, a new version of Healthy People is issued, featuring updated goals and identifying topic areas and quantifiable objectives for health improvement during the succeeding ten years, with assessment at that point of progress or lack thereof. Progress has been limited to many objectives, leading to concerns about the effectiveness of Healthy People in shaping outcomes in the context of a decentralized and uncoordinated US health system. Healthy People 2020 gives more prominence to health promotion and preventive approaches and adds a substantive focus on the importance of addressing social determinants of health. A new expanded digital interface facilitates use and dissemination rather than bulky printed books as produced in the past. The impact of these changes to healthy people will be determined in the coming years.

1.5 WHAT IS POSITIVE HEALTH

The goal of today's health care system is generally to bring people who are sick out of illness. This takes them from negative health to a state that is neutral—free from health problems but not necessarily thriving. Positive Health's approach works with the positive-with what is right with you–-and builds on those assets to help achieve and maintain good health.

Positive Health is the scientific study of health assets. A health asset is a factor that produces stronger health, over and above risk factors for disease. Positive Health works to discover which specific health assets produce longer, healthy life, and which health assets lower disease risk and health care costs. The goal is to strive for optimal health —beyond the mere absence of illness. People's are working to identify the health assets that produce stronger health. Potential assets include subjective factors like optimism, functional factors like stable marriage, and biological factors like low blood pressure. Using direct observation and scientific study, we are examining whether and how they influence health outcomes either independently or jointly.

If health assets can be scientifically linked to positive health outcomes, the ultimate goal would be to design interventions that can help build and sustain these assets to help people increase their chances of living a healthier, longer life. Positive Health has the potential to change the way we think about health and health care.

The field of medicine has long focused on the prevention, diagnosis, treatment, and cure of disease. But health is more than the mere absence of disease. The emerging concept of Positive Health takes an innovative approach to health and well-being that focuses on promoting people's positive health ***assets***-strengths that can contribute to a healthier, longer life. The Robert Wood Johnson Foundation's Pioneer Portfolio is funding research to help identify these assets, which might include biological factors, such as high heart rate variability; subjective factors, such as optimism; and functional factors, such as a stable marriage. This research has implications for prevention, health promotion, public health and medicine.

According to Martin Seligman, Positive Health encompasses the understanding that "people desire well-being in its own right and they desire it above and beyond the relief of their suffering." Seligman and a team of researchers are working to identify potential health assets and see if they may reveal a variety of potent, low-cost approaches to enhance well-being and help protect against physical and mental illness. If health assets can be scientifically linked to positive health outcomes, the ultimate goal would be to design interventions that can help build and sustain these assets to help people increase their chances of living a healthier, longer life. The definition of positive health is empirical, and we are investigating the extent to which these three classes of assets actually improve the following health and illness targets :

- Does positive health extend lifespan?
- Does positive health lower morbidity?
- Is health care expenditure lower for people with positive health?
- Is there better mental health and less mental illness?
- Do people in positive health not only live longer but have more years in good health?
- Do people in positive health have a better prognosis when illness finally strikes?
- So the definition of positive health is the group of subjective, biological, and functional assets that actually increase health and illness targets.

1.6 SUMMARY

Under this unit we have summarized health and its dimensions, social determinants of health, components of physical health and positive health etc. The factors influencing the health-illness continuum can be internal or external and may or may not be under conscious control. They are related to the following various human dimensions, and each dimension is interrelated to one other. The Physical Dimension : Age, developmental stage, race, and gender fall within the physical dimension. The individual's health state and lifestyle choices are significantly influenced by these factors and include caring for the body to stay healthy now, and in later life.

The emotionally well person can identify, express, and manage the entire range of feelings and would consider seeking assistance to address areas of concern. The socially well person has a network of support based on interdependence, mutual trust, and respect, and has developed a sensitivity and awareness towards the feeling of others. The spiritually well personseeks harmony and balance by openly exploring the depth of human purpose, meaning, and connection through dialogue and self-reflection. The intellectually well person values lifelong learning and seeks to foster critical thinking, develop moral reasoning, expand worldviews, and engage in education for the pursuit of knowledge.

1.7 TERMINAL QUESTIONS

Q. 1 What do you mean by Dimensions of Health? Explain it.

Answer :----------

Q. 2 Describe the social determinants of health.

Answer :----------

-

Q. 3 Describe the components of physical health.

Answer :----------

-

Q.4 Write short notes on the following.

(a) Physical

(b) Mental

Answer :----------

-

Q.5 What do you mean by positive health**?**

Answer :----------

-

Q.6 Write short notes on the following.

(a) Positive health

(b) Spritual health

Answer :----------

-

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

Unit 2 : COMMUNITY AND ITS ORGANIZATION

Structure

OBJECTIVES

This is the second unit (Community and its Organization) of first block (Dimensions of Health, Demography and Epidemiology). Under second unit, we have following objectives. These are as under :

- To know the concept of community
- To know different types of community
- To discuss dietary organization/healthy diet
- To discuss vulnerable groups and factors affecting health

2.1 INTRODUCTION

A community is a social unit (a group of living things) with a shared socially significant characteristic, such as place, set of norms, culture, religion, values, customs, or identity. Communities may share a sense of place situated in a given geographical area (e.g. a country, village, town, or neighbourhood) or in virtual space through communication platforms. Durable good relations that extend beyond immediate genealogical ties also define a sense of community, important to their identity, practice, and roles in social institutions such as family, home, work, government, TV network, society, or humanity at large. Although communities are usually small relative to personal social ties, community may also refer to large group affiliations such as national communities, international communities, and virtual communities.

The English-language word community derives from the Old French *comuneté*, which comes from the Latin communitas community, public spirit. Human communities may haveintent, belief, resources, preferences, needs, and risks in common, affecting the identity of the participants and their degree of cohesiveness.

2.2 ARCHAEOLOGY

Archaeological studies of social communities use the term community in two ways, paralleling usage in other areas. The first is an informal definition of community as a place where people used to live. In this sense it is synonymous with the concept of an ancient settlement—whether a hamlet, village, town, or city. The second meaning resembles the usage of the term in other social sciences : a community is a group of people living near one another who interact socially. Social interaction on a small scale can be difficult to identify with archaeological data. Most reconstructions of social communities by archaeologists rely on the principle that social interaction in the past was conditioned by physical distance.

Therefore, a small village settlement likely constituted a social community and spatial subdivisions of cities and other large settlements may have formed communities. Archaeologists typically use similarities in material culture—from house types to styles of pottery—to reconstruct communities in the past. This classification method relies on the assumption that people or households will share more similarities in the types and styles of their material goods with other members of a social community than they will with outsiders.

2.3 SOCIOLOGY

In the field of sociology, a community is conceptualized as a group of individuals who share common geographic, social, or cultural characteristics and are bound by a sense of belonging and mutual interdependence. It extends beyond mere proximity to encompass a shared identity, values, and a sense of collective responsibility. Communities can be formal or informal, ranging from small, close-knit neighborhoods to large, complex societies. Sociology emphasizes the role of community in shaping individuals' identities, providing social support, and influencing patterns of social interaction. Community structures play a crucial role in the transmission of cultural norms, the formation of social networks, and the development of social institutions, contributing significantly to the social fabric and dynamics of societies at various scales.

2.4 COMMUNITY DEVELOPMENT

Community development is often linked with community work or community planning, and may involve stakeholders, foundations, governments, or contracted entities including non-government organisations (NGOs), universities or government agencies to progress the social well-being of local, regional and, sometimes, national communities. More grassroots efforts, called community building or community organizing, seek to empower individuals and groups of people by providing them with the skills they need to effect change in their own communities.

These skills often assist in building political power through the formation of large social groups working for a common agenda. Community development practitioners must understand both how to work with individuals and how to affect communities' positions within the context of larger social institutions. Public administrators, in contrast, need to understand community development in the context of rural and urban development, housing and economic development, and community, organizational and business development.

Formal accredited programs conducted by universities, as part of degree granting institutions, are often used to build a knowledge base to drive curricula in public administration, sociology and

community studies. The General Social Survey from the National Opinion Research Center at the University of Chicago and the Saguaro Seminar at the Harvard Kennedy School are examples of national community development in the United States. The Maxwell School of Citizenship and Public Affairs at Syracuse University in New York State offers core courses in community and economic development, and in areas ranging from non-profit development to US budgeting (federal to local, community funds). In the United Kingdom, the University of Oxford has led in providing extensive research in the field through its *Community Development Journal*, used worldwide by sociologists and community development practitioners.

2.5 TYPES OF COMMUNITY

A number of ways to categorize types of community have been proposed. One such breakdown is as follows :

1. **Location-based Communities** - The range from the local neighbourhood, suburb, village, town or city, region, nation or even the planet as a whole. These are also called communities of place.

2. **Identity-based Communities** - The range from the local clique, sub-culture, ethnic group, religious, multicultural or pluralistic civilisation, or the global community cultures of today. They may be included as *communities of need* or *identity*, such as disabled persons, or frail aged people.

3. **Organizationally-based Communities** - The range from communities organized informally around family or network-based guilds and associations to more formal incorporated associations, political decision-making structures, economic enterprises, or professional associations at a small, national or international scale.

4. **Intentional Communities** - A mix of all three previous types, these are highly cohesive residential communities with a common social or spiritual purpose, ranging from monasteries and ashrams to modern ecovillages and housing cooperatives.The usual categorizations of community relations have a number of problems : (1) they tend to give the impression that a particular community can be defined as just this kind or another; (2) they tend to conflate modern and customary community relations; (3) they tend to take sociological categories such as ethnicity or race as given, forgetting that different ethnically defined persons live in different kinds of communities—grounded, interest-based, diasporic, etc.

   In response to these problems, Paul James and his colleagues have developed a taxonomy that maps community relations, and recognizes that actual communities can be characterized by different kinds of relations at the same time :

   1. **Grounded community relations** - This involves enduring attachment to particular places and particular people. It is the dominant form taken by customary and tribal communities. In these kinds of communities, the land is fundamental to identity.

   2. **Life-style community relations** - This involves giving primacy to communities coming together around particular chosen ways of life, such as morally charged or interest-based relations or just living or working in the same location. Hence the following sub-forms :

      1. Community-life as morally bounded, a form taken by many traditional faith-based communities.

      2. Community-life as interest-based, including sporting, leisure-based and business communities which come together for regular moments of engagement.

3. Community-life as proximately-related, where neighbourhood or commonality of association forms a community of convenience, or a community of place .

3. **Projected community relations** - This is where a community is self-consciously treated as an entity to be projected and re-created. It can be projected as through thin advertising slogan, for example gated community, or can take the form of ongoing associations of people who seek political integration, communities of practice based on professional projects, associative communities which seek to enhance and support individual creativity, autonomy and mutuality. A nation is one of the largest forms of projected or imagined community.

In these terms, communities can be nested and/or intersecting; one community can contain another-for example a location-based community may contain a number of ethnic communities. Both lists above can be used in a cross-cutting matrix in relation to each other.

2.6 HEALTH MEANING, CONCEPT AND FACTORS AFFECTING HEALTH

Health is an integral part of our life and it is directly linked to survival. Survival of the fittest is a rule of nature. The quality of life depends upon the Health. So that every person has the right to achieve good health. These rights include access to health care, medical awareness, better standard of living, clean & sanitary water, food grain etc. WHO set a standard of the foundation for rights to health. According to WHO "Health is a state where a person has achieved physical, mental & social well being and the absence of disease or infirmity is not only the thing which defines health. Right to health is a universal right and also a fundamental right equal for everyone without any discrimination.

2.7 CONCEPTS OF HEALTH

An understanding of health is the basis of all health care. Health is not perceived the same way by the all members of a community including various professional groups giving raise to confusion about the Concepts of health;

Biomedical Concept :

- Traditionally health has been considered as an absence of disease means a person is healthy
- This Concept is based on germ theory of disease; Human body - machine, Disease - machine breaks, Doctor - repairs
- This Concept is inadequate because it minimizes the role of the environmental, social and cultural determinants of health.

Ecological Concept :

- Ecologists viewed health as a dynamic equilibrium between man and his environment.
- Man adjusted with his environment healthy.
- Disease maladjustment of the human organism to the environment.

Psychosocial Concept :

- Advancement in social science showed that health is not only a biomedical phenomena, it is also influenced by other social, psychological, cultural, economic and political factors of the people concerned.
- When measuring health we have to consider the above factors.

- Thus health is both a biological and a social phenomenon.

Holistic Concept :

- Holistic model is a combination of all the above models.
- This Concept considered physical, psychological, social, economic, political and environmental factors and its influence on health.
- Person is considered as a whole.
- It focuses on the promotion and protection of health.

Factors affecting health :

Biological factors :

- Pathogenic microorganisms,
- Biological hereditary factors,
- Other factors such as age, sex, growth and development.

Environmental factors :

- Natural factors such as air, water, soil pollution, radiation and noise,
- Social factors such as income, education, political & economic system in the society, social & cultural system and health care services.

Lifestyle factors :

- Good & bad habits,
- Eating habits,
- Culture,
- Beliefs.

Psychosocial factors :

- Psychological functions depends upon emotions and feelings,
- Such as fear, stress, anxiety, tension can lead to hypertension & heart attack and depression can lead to suicide.

Poverty as a factor affecting to health :

- Weak economical status not able to adopt a healthy lifestyle.
- Healthy lifestyle means healthy food, clean water, literacy, routine medical check-up etc.,
- Poverty increases the risk of insufficient, unhealthy & non hygienic foods caused disability, weak stamina and lower growth,
- Lack of knowledge & awareness of diseases and its treatments affecting the health directly.

Use of pesticides is also a factor affecting health :

- Pesticides expose a great risk to human health. It is a chemical substance use in agriculture to save plants from insects and other pets,
- Acute effects means immediately effects to health such as nosia, dysiness, daria, blindness, also

extend to death if intake in huge amount etc.,

- Chronic effects means long term effects slowly slowly effects to health such as cancer, birth defects, neurological disease, endocrine, immunotoxicity, kidney, liver, lungs damage etc.,
- It affects infants, feters, growing children, and pregnant women.

Essential of health :

Availability :

- The State must make provision for a functioning an adequate health care system for the public and individuals throughout its territory such as;
- Safe water and sanitation facilities,
- Medical infrastructure,
- Trained medical professionals,
- Essential drugs.

Accessibility :

- Equally accessible to all with;
- Non discrimination,
- Physical accessibility,
- Affordability,
- Information accessibility like a person's right to look for, receive and convey Information and ideas concerning health.

Quality :

It must be maintained the scientific medical standards such as :

- Trained medical professionals,
- Safe and potable water,
- Scientifically approved hospital equipment etc,.

Acceptability :

- Respectful of medical ethics and culturally appropriate.

International Law Treaties And Conventions Have Set A Specific Work Standard For The Right To Health :

- Universal Declaration of Human Rights 1948,
- International Convention on Economic, Social and Cultural Rights,
- Elimination of all forms of Racial Discrimination 1965, 1979,
- Rights of persons with disabilities,
- Workers and their family right protection 1990,
- Right of child 1989,
- Right to development,

- Right to transboundary movement of Hazardous waste and disposal 1989,
- Protection of juveniles deprived of their liability 1990,
- Child Labour, violence against women oldest person, prisoners rights protected,
- Humanitarian Law,
- Nutritional food,

Providing goods services and health care facilities, plans and policies.

2.8 DIETARY ORGANIZATIONAL/HEALTHY DIET

Key facts

- A healthy diet helps to protect against malnutrition in all its forms, as well as noncommunicable diseases (NCDs), including diabetes, heart disease, stroke and cancer.
- Unhealthy diet and lack of physical activity are leading global risks to health.
- Healthy dietary practices start early in life – breastfeeding fosters healthy growth and improves cognitive development, and may have longer term health benefits such as reducing the risk of becoming overweight or obese and developing NCDs later in life.
- Energy intake (calories) should be in balance with energy expenditure. To avoid unhealthy weight gain, total fat should not exceed 30% of total energy intake (1, 2, 3). Intake of saturated fats should be less than 10% of total energy intake, and intake of trans-fats less than 1% of total energy intake, with a shift in fat consumption away from saturated fats and trans-fats to unsaturated fats (3), and towards the goal of eliminating industrially-produced trans-fats.
- Limiting intake of free sugars to less than 10% of total energy intake (2, 7) is part of a healthy diet. A further reduction to less than 5% of total energy intake is suggested for additional health benefits .
- Keeping salt intake to less than 5 g per day (equivalent to sodium intake of less than 2 g per day) helps to prevent hypertension, and reduces the risk of heart disease and stroke in the adult population .
- WHO Member States have agreed to reduce the global population's intake of salt by 30% by 2025; they have also agreed to halt the rise in diabetes and obesity in adults and adolescents as well as in childhood overweight by 2025.

Consuming a healthy diet throughout the life-course helps to prevent malnutrition in all its forms as well as a range of noncommunicable diseases (NCDs) and conditions. However, increased production of processed foods, rapid urbanization and changing lifestyles have led to a shift in dietary patterns. People are now consuming more foods high in energy, fats, free sugars and salt/sodium, and many people do not eat enough fruit, vegetables and other dietary fibre such as whole grains. The exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs. However, the basic principles of what constitutes a healthy diet remain the same.

For adults

A healthy diet includes the following :

- Fruit, vegetables, legumes (e.g. lentils and beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat and brown rice).

- At least 400 g (i.e. five portions) of fruit and vegetables per day, excluding potatoes, sweet potatoes, cassava and other starchy roots.
- Less than 10% of total energy intake from free sugars, which is equivalent to 50 g (or about 12 level teaspoons) for a person of healthy body weight consuming about 2000 calories per day, but ideally is less than 5% of total energy intake for additional health benefits. Free sugars are all sugars added to foods or drinks by the manufacturer, cook or consumer, as well as sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.
- Less than 30% of total energy intake from fats. Unsaturated fats (found in fish, avocado and nuts, and in sunflower, soybean, canola and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard) and *trans*-fats of all kinds, including both industrially-produced *trans*-fats (found in baked and fried foods, and pre-packaged snacks and foods, such as frozen pizza, pies, cookies, biscuits, wafers, and cooking oils and spreads) and ruminant *trans*-fats (found in meat and dairy foods from ruminant animals, such as cows, sheep, goats and camels). It is suggested that the intake of saturated fats be reduced to less than 10% of total energy intake and *trans*-fats to less than 1% of total energy intake. In particular, industrially-produced *trans*-fats are not part of a healthy diet and should be avoided.
- Less than 5 g of salt (equivalent to about one teaspoon) per day. Salt should be iodized.

2.9 FOR INFANTS AND YOUNG CHILDREN

In the first 2 years of a child's life, optimal nutrition fosters healthy growth and improves cognitive development. It also reduces the risk of becoming overweight or obese and developing NCDs later in life. Advice on a healthy diet for infants and children is similar to that for adults, but the following elements are also important :

- Infants should be breastfed exclusively during the first 6 months of life.
- Infants should be breastfed continuously until 2 years of age and beyond.
- From 6 months of age, breast milk should be complemented with a variety of adequate, safe and nutrient-dense foods. Salt and sugars should not be added to complementary foods.

Practical advice on maintaining a healthy diet

Fruit and vegetables

Eating at least 400 g, or five portions, of fruit and vegetables per day reduces the risk of NCDs and helps to ensure an adequate daily intake of dietary fibre. Fruit and vegetable intake can be improved by :

- always including vegetables in meals;
- eating fresh fruit and raw vegetables as snacks;
- eating fresh fruit and vegetables that are in season; and
- eating a variety of fruit and vegetables.

Fats

Reducing the amount of total fat intake to less than 30% of total energy intake helps to prevent unhealthy weight gain in the adult population. Also, the risk of developing NCDs is lowered by :

- Reducing saturated fats to less than 10% of total energy intake;
- Reducing *trans*-fats to less than 1% of total energy intake; and
- Replacing both saturated fats and *trans*-fats with unsaturated fats *(2, 3)* – in particular, with polyunsaturated fats.

Fat intake, especially saturated fat and industrially-produced *trans*-fat intake, can be reduced by :

- steaming or boiling instead of frying when cooking;
- replacing butter, lard and ghee with oils rich in polyunsaturated fats, such as soybean, canola (rapeseed), corn, safflower and sunflower oils;
- eating reduced-fat dairy foods and lean meats, or trimming visible fat from meat; and
- limiting the consumption of baked and fried foods, and pre-packaged snacks and foods (e.g. doughnuts, cakes, pies, cookies, biscuits and wafers) that contain industrially-produced *trans*-fats.

2.10 SALT, SODIUM AND POTASSIUM

Most people consume too much sodium through salt (corresponding to consuming an average of 9–12 g of salt per day) and not enough potassium (less than 3.5 g). High sodium intake and insufficient potassium intake contribute to high blood pressure, which in turn increases the risk of heart disease and stroke. Reducing salt intake to the recommended level of less than 5 g per day could prevent 1.7 million deaths each year.

People are often unaware of the amount of salt they consume. In many countries, most salt comes from processed foods (e.g. ready meals; processed meats such as bacon, ham and salami; cheese; and salty snacks) or from foods consumed frequently in large amounts (e.g. bread). Salt is also added to foods during cooking (e.g. bouillon, stock cubes, soy sauce and fish sauce) or at the point of consumption (e.g. table salt).

Salt intake can be reduced by :

- limiting the amount of salt and high-sodium condiments (e.g. soy sauce, fish sauce and bouillon) when cooking and preparing foods;
- not having salt or high-sodium sauces on the table;
- limiting the consumption of salty snacks; and
- choosing products with lower sodium content.

Some food manufacturers are reformulating recipes to reduce the sodium content of their products, and people should be encouraged to check nutrition labels to see how much sodium is in a product before purchasing or consuming it. Potassium can mitigate the negative effects of elevated sodium consumption on blood pressure. Intake of potassium can be increased by consuming fresh fruit and vegetables.

Sugars

In both adults and children, the intake of free sugars should be reduced to less than 10% of total energy intake. A reduction to less than 5% of total energy intake would provide additional health benefits. Consuming free sugars increases the risk of dental caries (tooth decay). Excess calories from

foods and drinks high in free sugars also contribute to unhealthy weight gain, which can lead to overweight and obesity. Recent evidence also shows that free sugars influence blood pressure and serum lipids, and suggests that a reduction in free sugars intake reduces risk factors for cardiovascular diseases.

Sugars intake can be reduced by :

- Limiting the consumption of foods and drinks containing high amounts of sugars, such as sugary snacks, candies and sugar-sweetened beverages (i.e. all types of beverages containing free sugars – these include carbonated or non-carbonated soft drinks, fruit or vegetable juices and drinks, liquid and powder concentrates, flavoured water, energy and sports drinks, ready-to-drink tea, ready-to-drink coffee and flavoured milk drinks); and
- Eating fresh fruit and raw vegetables as snacks instead of sugary snacks.

2.11 HOW TO PROMOTE HEALTHY DIETS

Diet evolves over time, being influenced by many social and economic factors that interact in a complex manner to shape individual dietary patterns. These factors include income, food prices (which will affect the availability and affordability of healthy foods), individual preferences and beliefs, cultural traditions, and geographical and environmental aspects (including climate change). Therefore, promoting a healthy food environment – including food systems that promote a diversified, balanced and healthy diet – requires the involvement of multiple sectors and stakeholders, including government, and the public and private sectors.

Governments have a central role in creating a healthy food environment that enables people to adopt and maintain healthy dietary practices. Effective actions by policy-makers to create a healthy food environment include the following :

- Creating coherence in national policies and investment plans – including trade, food and agricultural policies – to promote a healthy diet and protect public health through :
- Increasing incentives for producers and retailers to grow, use and sell fresh fruit and vegetables;
- Reducing incentives for the food industry to continue or increase production of processed foods containing high levels of saturated fats, *trans*-fats, free sugars and salt/sodium;
- Encouraging reformulation of food products to reduce the contents of saturated fats, *trans*-fats, free sugars and salt/sodium, with the goal of eliminating industrially-produced *trans*-fats;
- Implementing the WHO recommendations on the marketing of foods and non-alcoholic beverages to children;
- Establishing standards to foster healthy dietary practices through ensuring the availability of healthy, nutritious, safe and affordable foods in pre-schools, schools, other public institutions and the workplace;
- Exploring regulatory and voluntary instruments (e.g. marketing regulations and nutrition labelling policies), and economic incentives or disincentives (e.g. taxation and subsidies) to promote a healthy diet; and
- Encouraging transnational, national and local food services and catering outlets to improve the nutritional quality of their foods – ensuring the availability and affordability of healthy choices – and review portion sizes and pricing.

Encouraging consumer demand for healthy foods and meals through :

- Promoting consumer awareness of a healthy diet;

- Developing school policies and programmes that encourage children to adopt and maintain a healthy diet;
- Educating children, adolescents and adults about nutrition and healthy dietary practices;
- Encouraging culinary skills, including in children through schools;
- Supporting point-of-sale information, including through nutrition labelling that ensures accurate, standardized and comprehensible information on nutrient contents in foods (in line with the Codex Alimentarius Commission guidelines), with the addition of front-of-pack labelling to facilitate consumer understanding; and
- Providing nutrition and dietary counselling at primary health-care facilities.
- Promoting appropriate infant and young child feeding practices through :
- Implementing the International Code of Marketing of Breast-milk Substitutes and subsequent relevant World Health Assembly resolutions;
- Implementing policies and practices to promote protection of working mothers; and
- Promoting, protecting and supporting breastfeeding in health services and the community, including through the Baby-friendly Hospital Initiative.

2.12 VULNERABLE GROUPS

Children are one of the most vulnerable groups in India. Due to myriads of reasons they are considered vulnerable since they are always down with diseases, lack of education which puts them in perpetual poverty. Some of the reasons behind their vulnerability are listed below.

1. **Poverty** – Children reeling under poverty always face a health crisis due to lack of access to healthcare facilities.
2. **Vaccination** – India has the highest number of deaths of children under 5 years of age. These deaths could be prevented through the administration of vaccines.
3. **Nutrition** – Although India is a rising economic power, more than 30% of the world's malnutrition children live in India. Economic inequality is the major cause of this problem.
4. **Street Children** – Any child living in the streets as a source of livelihood.
5. **Female infanticide** – The definition is the killing of children in the age group 0 – 1 year. The reason behind its existence is poverty, dowry system, lack of support services etc.
6. **Trafficking of Children** – Various reasons for trafficking of children are begging, labour, sexual exploitation. As per the National Crime Records Bureau India has one of the highest volumes of child trafficking.
7. **Child labour** – Some of the industries where child labour is prevalent is the diamond industry, fireworks manufacturing industry, silk manufacturing, carpet weaving, domestic labour, mining industries. Some of the laws enacted by the Government to tackle child labour are the Child Labour (Prohibition and Regulation) Act, Bonded Labour System (Abolition) Act, 1976.

The Vulnerability of Children – Government Schemes to Overcome this Problem

The Government of India has been earnestly trying to overcome the vulnerabilities faced by the children in India. Among the children, girl children face a major brunt of the vulnerabilities due to poverty, illiteracy and lack of healthcare facilities. Hence to alleviate the condition of Girl Child Government has introduced the following schemes.

1. **Beti Bachao Beti Padhao -** This is a Central Government scheme applied across the country. The main objectives are to prevent social ills such as gender-based abortions and to advance the education of girl child throughout the country. The Government focus on the education of girl children is due to the fact that education is the ticket out of poverty.

2. **Sukanya Samriddhi Yojana -** It is Government-backed Savings Scheme for girls children, where girl child is the primary account holder and parents are joint account holders. Contributions would be made for 15 years and the account should be opened before the girl child turns 10 years. This scheme allows for flexible deposit options, high fixed rate of return, tax deduction benefit; maturity amount, interest earned are all exempt from tax; this scheme can be availed across India in all Public sector and private sector banks, India Post office.

3. **Balika Samriddhi Yojana -** This is a scheme provided to mother and girl children living below the poverty line. This scheme is available in both urban and rural areas. After the birth of a newborn baby girl, a mother is provided cash benefit and cash benefit will be provided annually till the girl child reaches 10th standard.

4. **CBSE Udaan Scheme -** This scheme was launched by the Ministry of Human Resources Development with special emphasis on girl children from economically weaker sections. They would be provided online resources or free course materials for class 11 and 12, virtual classes, peer learning, helpline services to clarify doubts, monitoring and tracking of progress, all with the objective of increasing enrollment of girls in prestigious technical higher education colleges in India.

2.13 THE VULNERABILITY OF SENIOR CITIZENS – ISSUES FACED BY SENIOR CITIZENS

There are many issues faced by the senior citizens which makes them a very vulnerable group in India. Some of the causes behind their vulnerability are listed below.

- They lack knowledge about their human rights due to illiteracy.
- Lack of proper nutrition
- Lack of access to healthcare and medicine.
- They do not get respect from family members or people in general.
- Facing loneliness and marginalization.

The vulnerability of Senior Citizens – Government Schemes & Measures to Protect Them

By 2050, it is estimated that the population of Senior Citizens is expected to reach 30 crores. Social protection, pensions, public healthcare systems for this ageing population is going to be a big issue for the Government. Some of the Government schemes are given below.

1. Senior Citizens Saving Scheme (SCSS) – Investments under this scheme are eligible for tax exemptions, this scheme has very high-interest rates, this is offered for people aged above 60 years. This scheme can be availed through public, private banks and the Indian Post Office.
2. Pradhan Mantri Vaya Vandana Yojana (PMVVY) – This scheme is managed by Life Insurance Corporation of India.

3. Varishtha Pension Bima Yojana
4. Rashtriya Vayoshri Yojana – It was launched in 2017, by the Ministry of Social Justice & Empowerment of Government of India.
5. Indira Gandhi National Old Age Pension Scheme – It was launched in 2007 by the Ministry of Rural Development of India.
6. Travel concessions are provided for senior citizens.
7. Housing facilities and recreational facilities are provided.
8. Hospitals provide concessional facilities to senior citizens.
9. The Maintenance and Welfare of Parents and Senior Citizens Act were passed in 2007.

2.14 SUMMARY

Under this unit we have summarized concept of community, types of community, factors affecting health of the community and dietary organizational/healthy diet etc. We all are in a community together, there is no other way and so the health. Community health is the convergence of health care services, economics and social responsibilities. People residing in a particular reason more or less share similar kind of health risks and social and economic conditions. Community health is a medical practice which focuses on people's well-being in a particular geographical area. This essential public health sector covers programs to help neighborhood members in protecting and improving their health, deter the transmission of infectious diseases, and plan for natural disasters.

A healthy diet is a diet that maintains or improves overall health. A healthy diet provides the body with essential nutrition : fluid, macronutrients such as protein, micronutrients such as vitamins, and adequate fibre and food energy. A healthy diet may contain fruits, vegetables, and whole grains, and may include little to no ultra-processed foods or sweetened beverages. The requirements for a healthy diet can be met from a variety of plant-based and animal-based foods, although additional sources of vitamin B12 are needed for those following a vegan diet. Various nutrition guides are published by medical and governmental institutions to educate individuals on what they should be eating to be healthy.

2.15 TERMINAL QUESTIONS

Q.1 What do you mean by concept of community?

Answer :----------

Q.2 Describe the factors, which affecting health of the community.

Answer :----------

Q 3 Describe the dietary organizational.

Answer :----------

Q. 4 Describe the vulnerable groups with examples.

Answer :----------

Q.5 Write short notes on the following.

(a) Community

(b) Vulnerable groups

Answer :----------

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

UNIT-3 PUBLIC HEALTH, DEMOGRAPHY AND PIDEMIOLOGY

Structure

3.1 INTRODUCTION

Public health is the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals. Analyzing the determinants of health of a population and the threats it faces is the basis for public health. The *public* can be as small as a handful of people or as large as a village or an entire city; in the case of a pandemic it may encompass several continents. The concept of health takes into account physical, psychological, and social well-being.

Public health is an interdisciplinary field. For example, epidemiology, biostatistics, social sciences and management of health services are all relevant. Other important sub-fields include environmental health, community health, behavioral health, health economics, public policy, mental health, health education, health politics, occupational safety, disability, oral health, gender issues in health, and sexual and reproductive health. Public health, together with primary care, secondary care,

and tertiary care, is part of a country's overall healthcare system. Public health is implemented through the surveillance of cases and health indicators, and through the promotion of healthy behaviors. Common public health initiatives include promotion of hand-washing and breastfeeding, delivery of vaccinations, promoting ventilation and improved air quality both indoors and outdoors, suicide prevention, smoking cessation, obesity education, increasing healthcare accessibility and distribution of condoms to control the spread of sexually transmitted diseases.

OBJECTIVES

This is the third unit (Public Health, Demography and Epidemiology) of first block (Dimensions of Health, Demography and Epidemiology). Under third unit, we have following objectives. These are as under :

- To know about public health, demography and epidemiology
- To dicuss community health and vital statistics
- To know about determinants of diseases
- To know determinants of health, risk factors, and prevention

There is a significant disparity in access to health care and public health initiatives between developed countries and developing countries, as well as within developing countries. In developing countries, public health infrastructures are still forming. There may not be enough trained healthcare workers, monetary resources, or, in some cases, sufficient knowledge to provide even a basic level of medical care and disease prevention. A major public health concern in developing countries is poor maternal and child health, exacerbated by malnutrition and poverty coupled with governments' reluctance in implementing public health policies.

From the beginnings of human civilization, communities promoted health and fought disease at the population level. In complex, pre-industrialized societies, interventions designed to reduce health risks could be the initiative of different stakeholders, such as army generals, the clergy or rulers. Great Britain became a leader in the development of public health initiatives, beginning in the 19th century, due to the fact that it was the first modern urban nation worldwide. The public health initiatives that began to emerge initially focused on sanitation (for example, the Liverpool and London sewerage systems), control of infectious diseases (including vaccination and quarantine) and an evolving infrastructure of various sciences, e.g. statistics, microbiology, epidemiology, sciences of engineering.

3.2 PURPOSES

The purpose of a public health intervention is to prevent and mitigate diseases, injuries and other health conditions. The overall goal is to improve the health of populations and increase life expectancy.

3.3 CHARACTERISTICS AND COMPONENTS

Public health is a complex term, composed of many elements and different practices. It is a multi-faceted, interdisciplinary field. For example, epidemiology, biostatistics, social sciences and management of health services are all relevant. Other important sub-fields include environmental health, community health, behavioral health, health economics, public policy, mental health, health education, health politics, occupational safety, disability, gender issues in health, and sexual and reproductive health For example, epidemiology, biostatistics, social sciences and management of health services are all relevant. Other important sub-fields include environmental health, community health, behavioral health, health economics, public policy, mental health, health education, health politics, occupational safety, disability, gender issues in health, and sexual and reproductive health.

Modern public health practice requires multidisciplinary teams of public health workers and professionals. Teams might include epidemiologists, biostatisticians, physician assistants, public health nurses, midwives, medical
microbiologists, pharmacists, economists, sociologists, geneticists, datamanagers, environmental health officers (public health inspectors), bioethicists, gender experts, sexual and reproductive health specialists, physicians, and veterinarians. The elements and priorities of public health have evolved over time, and are continuing to evolve. Different regions in the world can have different public health concerns at a given time. Common public health initiatives include promotion of hand-washing and breastfeeding, delivery of vaccinations, suicide prevention, smoking cessation, obesity education, increasing healthcare accessibility and distribution of condoms to control the spread of sexually transmitted diseases.

3.4 ORGANIZATIONS

World Health Organization (WHO)

The World Health Organization (WHO) is a specialized agency of the United Nations responsible for international public health. The WHO Constitution, which establishes the agency's governing structure and principles, states its main objective as "the attainment by all peoples of the highest possible level of health. The WHO's broad mandate includes advocating for universal healthcare, monitoring public health risks, coordinating responses to health emergencies, and promoting human health and well-being. The WHO has played a leading role in several public health achievements, most notably the eradication of smallpox, the near-eradication of polio, and the development of an Ebola vaccine. Its current priorities include communicable diseases, particularly HIV/AIDS, Ebola, COVID-19, malaria and tuberculosis; non-communicable diseases such as heart disease and cancer; healthy diet, nutrition, and food security; occupational health; and substance abuse.

Others

Most countries have their own governmental public health agency, often called the ministry of health, with responsibility for domestic health issues. For example, in the United States, state and local health departments are on the front line of public health initiatives. In addition to their national duties, the United States Public Health Service (PHS), led by the Surgeon General of the United States Public Health Service, and the Centers for Disease Control and Prevention, headquartered in Atlanta, are also involved with international health activities.

3.5 PUBLIC HEALTH PROGRAMS

Most governments recognize the importance of public health programs in reducing the incidence of disease, disability, and the effects of aging and other physical and mental health conditions. However, public health generally receives significantly less government funding compared with medicine. Although the collaboration of local health and government agencies is considered best practice to improve public health, the pieces of evidence available to support this is limited. Public health programs providing vaccinations have made major progress in promoting health, including substantially reducing the occurrence of cholera and polio and eradicating smallpox, diseases that have plagued humanity for thousands of years.

The World Health Organization (WHO) identifies core functions of public health programs including :

- Providing leadership on matters critical to health and engaging in partnerships where joint action is needed;
- Shaping a research agenda and stimulating the generation, translation and dissemination of valuable knowledge;
- Setting norms and standards and promoting and monitoring their implementation;
- Articulating ethical and evidence-based policy options;
- Monitoring the health situation and assessing health trends.

In particular, public health surveillance programs can :

- Serve as an early warning system for impending public health emergencies;
- Document the impact of an intervention, or track progress towards specified goals; and
- Monitor and clarify the epidemiology of health problems, allow priorities to be set, and inform health policy and strategies.
- Diagnose, investigate, and monitor health problems and health hazards of the community

3.6 DEMOGRAPHY

Demography (from Ancient Greek (dêmos) people, society, and (-graphía) writing, drawing, description) is the statistical study of human populations : their size, composition (e.g., race, age), and how they change through the interplay of fertility (births), mortality (deaths), and migration.

Definition

Demography is the scientific study of human populations. Demographers study the size, structure, and distribution of human populations. Demographers often use a variety of statistical methods to analyze changes in various subcomponents of human populations, such as births, deaths, or changes in legal status (for example, marriage, divorce, and migration).

Subdisciplines

Numerous subdisciplines of demography focus on the relationships between the economic, social, cultural, and biological processes influencing a population. These subdisciplines include anthropological, economic, family, historical, mathematical, paleo, spatial, and social demography, as well as bio-demography and population studies.

In Practice

Demographers often make a distinction between basic and applied demography, with the former focused on explaining trends in a population and the latter focused on predicting change. Demographers engage in a variety of tasks associated with understanding how population changes over time will affect a wide variety of outcomes. For example, demographers study census data to determine how increases in elderly populations will affect government capacity to fund social security and other programs. Employment opportunities in demography are not limited to government sectors; nonprofit and for-profit organizations hire demographers to understand how population changes will affect their programs, sales, marketing efforts, and other activities.

3.7 IN DISASTER RESEARCH

Demography has many applications for hazards and disaster research. Demographers may estimate the number of people impacted by a particular disaster or the extent of vulnerability to disasters within a particular population. Demographers often analyze the impacts that disasters will have on the populations in disaster-prone areas.

Demographic analysis examines and measures the dimensions and dynamics of populations; it can cover whole societies or groups defined by criteria such as education, nationality, religion, and ethnicity. Educational institutions usually treat demography as a field of sociology, though there are a number of independent demography departments. These methods have primarily been developed to study human populations, but are extended to a variety of areas where researchers want to know how populations of social actors can change across time through processes of birth, death, and migration.

In the context of human biological populations, demographic analysis uses administrative records to develop an independent estimate of the population. Demographic analysis estimates are often considered a reliable standard for judging the accuracy of the census information gathered at any time. In the labor force, demographic analysis is used to estimate sizes and flows of populations of workers; in population ecology the focus is on the birth, death, migration and immigration of individuals in a population of living organisms, alternatively, in social human sciences could involve movement of firms and institutional forms.

Demographic analysis is used in a wide variety of contexts. For example, it is often used in business plans, to describe the population connected to the geographic location of the business. Demographic analysis (DA) is usually abbreviated as DA. For the 2010 U.S. Census, The U.S. Census Bureau has expanded its DA categories. Also as part of the 2010 U.S. Census, DA now also includes comparative analysis between independent housing estimates, and census address lists at a different key time points.

Patient demographics form the core of the data for any medical institution, such as patient and emergency contact information and patient medical record data. They allow for the identification of a patient and his categorization into categories for the purpose of statistical analysis. Patient demographics include : date of birth, gender, date of death, postal code, ethnicity, blood type, emergency contact information, family doctor, insurance provider data, allergies, major diagnoses and major medical history. Formal demography limits its object of study to the measurement of population processes, while the broader field of social demography or population studies also analyses the relationships between economic, social, institutional, cultural, and biological processes influencing a population.

3.8 EPIDEMIOLOGY

Epidemiology is the study and analysis of the distribution (who, when, and where), patterns and determinants of health and disease conditions in a defined population. It is a cornerstone of public

health, and shapes policy decisions and evidence-based practice by identifying risk factors for disease and targets for preventive healthcare. Epidemiologists help with study design, collection, and statistical analysis of data, amend interpretation and dissemination of results. Epidemiology has helped develop methodology used in clinical research, public health studies, and, to a lesser extent, basic research in the biological sciences.

Major areas of epidemiological study include disease causation, transmission, outbreak investigation, disease surveillance, environmental epidemiology, forensic epidemiology, occupational epidemiology, screening, biomonitoring, and comparisons of treatment effects such as in clinical trials. Epidemiologists rely on other scientific disciplines like biology to better understand disease processes, statistics to make efficient use of the data and draw appropriate conclusions, social sciences to better understand proximate and distal causes, and engineering for exposure assessment.

Epidemiology, literally meaning "the study of what is upon the people", is derived from Greek *epi* 'upon, among', *demos* 'people, district', and *logos* 'study, word, discourse', suggesting that it applies only to human populations. However, the term is widely used in studies of zoological populations (veterinary epidemiology), although the term epizoology is available, and it has also been applied to studies of plant populations (botanical or plant disease epidemiology).

The distinction between epidemic and endemic was first drawn by Hippocrates,[3] to distinguish between diseases that are visited upon a population (epidemic) from those that "reside within" a population (endemic). The term epidemiology appears to have first been used to describe the study of epidemics in 1802 by the Spanish physician Joaquín de Villalba in *Epidemiología Española*. Epidemiologists also study the interaction of diseases in a population, a condition known as a syndemic. The term epidemiology is now widely applied to cover the description and causation of not only epidemic, infectious disease, but of disease in general, including related conditions. Some examples of topics examined through epidemiology include as high blood pressure, mental illness and obesity. Therefore, this epidemiology is based upon how the pattern of the disease causes change in the function of human beings.

3.9 HISTORY

The Greek physician Hippocrates, taught by Democritus, was known as the father of medicine, sought a logic to sickness; he is the first person known to have examined the relationships between the occurrence of disease and environmental influences. Hippocrates believed sickness of the human body to be caused by an imbalance of the four humors (black bile, yellow bile, blood, and phlegm). The cure to the sickness was to remove or add the humor in question to balance the body. This belief led to the application of bloodletting and dieting in medicine. He coined the terms endemic (for diseases usually found in some places but not in others) and epidemic (for diseases that are seen at some times but not others).

Types of studies

Epidemiologists employ a range of study designs from the observational to experimental and generally categorized as descriptive (involving the assessment of data covering time, place, and person), analytic (aiming to further examine known associations or hypothesized relationships), and experimental (a term often equated with clinical or community trials of treatments and other interventions). In observational studies, nature is allowed to take its course, as epidemiologists observe from the sidelines. Conversely, in experimental studies, the epidemiologist is the one in control of all of the factors entering a certain case study. Epidemiological studies are aimed, where possible, at revealing unbiased relationships between exposures such as alcohol or smoking, biological agents, stress, or chemicals to mortality or morbidity. The identification of causal relationships between these exposures and

outcomes is an important aspect of epidemiology. Modern epidemiologists use informatics and infodemiology as a tools.

Observational studies have two components, descriptive and analytical. Descriptive observations pertain to the who, what, where and when of health-related state occurrence. However, analytical observations deal more with the how of a health-related event. Experimental epidemiology contains three case types : randomized controlled trials (often used for a new medicine or drug testing), field trials, and community trials.

3.10 DETERMINANTS OF DISEASES

A determinant is any characteristic that affects the health of a population. Diet, for example, is a determinant of bovine hypomagnesaemia : reduced food intake and low levels of plant magnesium, related to rapid grass growth, are associated with an increased incidence of the disease. Knowledge of determinants facilitates identification of categories of animal that are at particular risk of developing disease. It therefore is a prerequisite for disease prevention, and is an aid to differential diagnosis. This unit discusses the types of determinant and the interactions that can occur between them. Determinants can be classified in three ways, as : primary or secondary; intrinsic or extrinsic; and associated with host, agent or environment. The genetic constitution of a host is its genotype. Genetic diseases generally belong to one of three categories : chromosomal aberrations; Mendelian (simply inherited) disorders; multifactorial disorders.

Public health deals with the well-being of communities, with a focus on disease prevention. This is accomplished through the organized efforts and informed choices of society, organizations, public and private communities, and individuals. In other words, public health professionals first assess the health status of the population, determine the causes of any health problems, design interventions in an attempt to address those problems, and then reassess the population's health to evaluate whether the intervention worked.

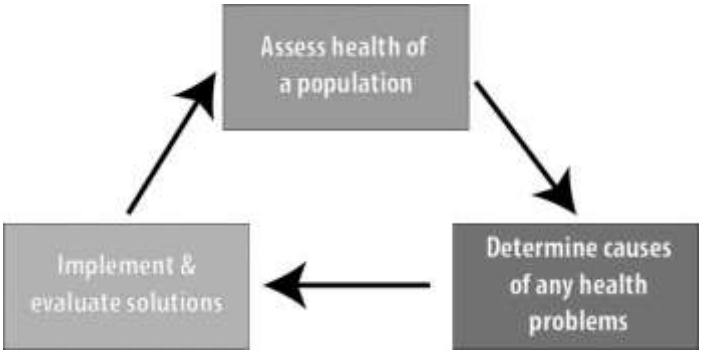

Fig.Public health

Epidemiology is the study of the distribution and determinants of disease or other health-related outcomes in human populations, and the application of that study to controlling health problems. There are several key words and phrases in that definition that relate directly back to the core public health functions. First, epidemiologists are concerned with the distribution of a disease - that is, with describing the pattern of an illness in terms of person, place, and time. This descriptive epidemiology effort is almost always a necessary first step in any public health initiative.

3.11 DETERMINANTS

In addition to who, epidemiologists are also interested in why, which brings us to causes, or determinants. In epidemiology, when we say "cause," we mean "cause or prevent." In other words, a *cause* (determinant) is anything that changes the likelihood that an individual will become diseased. Sometimes a determinant increases this chance (e.g., smoking); other times, a determinant decreases this chance (e.g., exercise). By this logic, both smoking and exercise are "causes" of disease-the former increases the risk of a variety of conditions, and the latter generally reduces risks. In epidemiology, a determinant, or cause, can be anything that meets the criterion of altering one's risk of disease : behaviors, demographics, genetics, environmental contaminants, and so on. Collectively, all determinants of that disease are called the etiology of a disease.

Cause or Disease?

Health behaviors are unique in epidemiology in that they can, depending on context, be both determinants and diseases. For example, smoking causes lung cancer (it's a determinant). However, in an evaluation of a smoking cessation program, smoking is the outcome. The same is true for physical activity, nutrition, etc.

Disease

Much like cause, *disease* is an interesting word in epidemiology—it is used to mean "any health-related condition or outcome. Epidemiologists study all manner of health outcomes. Some are diseases in the traditional, illness sense : measles, HIV, diabetes, and leukemia. Others are definitely health outcomes but aren't a disease per se *:* pregnancy, malnutrition, physical activity, death. Throughout this book, the word disease will be used to refer to any health outcome regardless of whether it is traditionally thought of as a disease in the sense of illness.

Populations

Epidemiologists concern themselves with populations, not individual people. First, a definition : a population is a group of people with a common characteristic. This could be residents of the United States, people with type 1 diabetes, people under age 25 who work full-time, and so on. For epidemiologists, the population is the group of people about whom we wish to be able to say something. For instance, say that we are interested in whether the amount of sleep a student gets is related to his or her grade point average (GPA). If we are mainly interested in this relationship among college students, then our population might be "full-time undergraduates. However, there are a lot of full-time undergraduates in the world; we cannot possibly enroll them *all* into our study. We therefore draw a sample from the target population and do the study with the people in the sample.

Fig : Population

Ideally, the sample will be similar enough to the target population that our results can indeed be generalized back to that population (remember, the target population is the group we want to say something about); therefore, we would work to recruit a diverse sample of students who are similar to the population. We would be hard-pressed to generalize to all full time undergraduates if our study was done only among first-year biology majors. However, note that the generalizability of our sample does not always matter as much as it does in other fields.

3.12 DETERMINANTS OF HEALTH, RISK FACTORS, AND PREVENTION

Determinants of Health

- What makes some people healthy and others unhealthy?
- How can we create a society in which everyone has a chance to live long healthy lives?
- The range of personal, social, economic, and environmental factors that influence health status are known as determinants of health. Determinants of health fall under several broad categories :
    - Social factors
    - Health services
    - Individual behavior
    - Biology and genetics

It is the interrelationships among these factors that determine individual and population health. Because of this, interventions that target multiple determinants of health are most likely to be effective. Determinants of health reach beyond the boundaries of traditional health care and public health sectors; sectors such as education, housing, transportation, agriculture, and environment can be important allies in improving population health.

Policymaking

Policies at the local, State, and Federal level affect individual and population health. Increasing taxes on tobacco sales, for example, can improve population health by reducing the number of people using tobacco products. Some policies affect entire populations over extended periods of time while simultaneously helping to change individual behavior. For example, the 1966 Highway Safety Act and the National Traffic and Motor Vehicle Safety Act authorized the Federal Government to set and regulate standards for motor vehicles and highways. This led to an increase in safety standards for cars, including seat belts, which in turn, reduced rates of injuries and deaths from motor vehicle accidents.

Social

Social determinants of health reflect social factors and the physical conditions in the environment in which people are born, live, learn, play, work and age. Also known as social and physical determinants of health, they impact a wide range of health, functioning and quality of life outcomes. Examples of social determinants include :

- Availability of resources to meet daily needs, such as educational and job opportunities, living wages, or healthful foods.
- Exposure to crime, violence, and social disorder, such as the presence of trash
- Social support and social interactions
- Exposure to mass media and emerging technologies, such as the Internet or cell phones
- Socioeconomic conditions, such as concentrated poverty

- Quality schools
- Transportation options
- Public safety
- Residential segregation

Examples of physical determinants include :

- Natural environment, such as plants, weather, or climate change
- Built environment, such as buildings or transportation
- Worksites, schools, and recreational settings
- Housing, homes, and neighborhoods
- Exposure to toxic substances and other physical hazards
- Physical barriers, especially for people with disabilities
- Aesthetic elements, such as good lighting, trees, or benches

Poor health outcomes are often made worse by the interaction between individuals and their social and physical environment.

For example, millions of people in the United States live in places that have unhealthy levels of ozone or other air pollutants. In counties where ozone pollution is high, there is often a higher prevalence of asthma in both adults and children compared with State and national averages. Poor air quality can worsen asthma symptoms, especially in children.[2]

Health Services

Both access to health services and the quality of health services can impact health. Healthy People 2020 directly addresses access to health services as a topic area and incorporates quality of health services throughout a number of topic areas.

Lack of access, or limited access, to health services greatly impacts an individual's health status. For example, when individuals do not have health insurance, they are less likely to participate in preventive care and are more likely to delay medical treatment.[3]

Barriers to accessing health services include :

- Lack of availability
- High cost
- Lack of insurance coverage
- Limited language access

These barriers to accessing health services lead to :

- Unmet health needs
- Delays in receiving appropriate care
- Inability to get preventive services
- Hospitalizations that could have been prevented

Individual Behavior

Individual behavior also plays a role in health outcomes. For example, if an individual quits smoking, his or her risk of developing heart disease is greatly reduced.

Many public health and health care interventions focus on changing individual behaviors such as substance abuse, diet, and physical activity. Positive changes in individual behavior can reduce the rates of chronic disease in this country.

Examples of individual behavior determinants of health include :

- Diet
- Physical activity
- Alcohol, cigarette, and other drug use
- Hand washing

Biology and Genetics

Some biological and genetic factors affect specific populations more than others. For example, older adults are biologically prone to being in poorer health than adolescents due to the physical and cognitive effects of aging. Sickle cell disease is a common example of a genetic determinant of health. Sickle cell is a condition that people inherit when both parents carry the gene for sickle cell. The gene is most common in people with ancestors from West African countries, Mediterranean countries, South or Central American countries, Caribbean islands, India, and Saudi Arabia.

Examples of biological and genetic social determinants of health include :

- Age
- Sex
- HIV status
- Inherited conditions, such as sickle-cell anemia, hemophilia, and cystic fibrosis
- Carrying the BRCA1 or BRCA2 gene, which increases risk for breast and ovarian cancer
- Family history of heart disease

Social Determinants of Health

Social determinants of health are economic and social conditions that influence the health of people and communities. These conditions are shaped by the amount of money, power, and resources that people have, all of which are influenced by policy choices. Social determinants of health affect factors that are related to health outcomes. Factors related to health outcomes include :

- How a person develops during the first few years of life (early childhood development)
- How much education a persons obtains
- Being able to get and keep a job
- What kind of work a person does
- Having food or being able to get food (food security)
- Having access to health services and the quality of those services
- Housing status

- How much money a person earns
- Discrimination and social support

What are determinants of health and how are they related to social determinants of health?

Determinants of health are factors that contribute to a person's current state of health. These factors may be biological, socioeconomic, psychosocial, behavioral, or social in nature. Scientists generally recognize five determinants of health of a population :

- Genes and biology : for example, sex and age
- Health behaviors : for example, alcohol use, injection drug use (needles), unprotected sex, and smoking
- Social environment or social characteristics : for example, discrimination, income, and gender.
- Physical environment or total ecology : for example, where a person lives and crowding conditions
- Health services or medical care : for example, access to quality health care and having or not having insurance

Other factors that could be included are culture, social status, and healthy child development. Scientists do not know the precise contributions of each determinant at this time.

In theory, genes, biology, and health behaviors together account for about 25% of population health. Social determinants of health represent the remaining three categories of social environment, physical environment/total ecology, and health services/medical care. These social determinants of health also interact with and influence individual behaviors as well. More specifically, social determinants of health refer to the set of factors that contribute to the social patterning of health, disease, and illness.

3.13 COMMUNITY HEALTH

Community health refers to simple health services that are delivered by laymen outside hospitals and clinics. Community health is also the subset of public health that is taught to and practiced by clinicians as part of their normal duties. Community health volunteers and community health workers work with primary care providers to facilitate entry into, exit from and utilization of the formal health system by community members.

Community health is a major field of study within the medical and clinical sciences which focuses on the maintenance, protection, and improvement of the health status of population groups and communities. It is a distinct field of study that may be taught within a separate school of public health or Preventive Healthcare. The WHO defines community health as :

Environmental, Social, and Economic resources to sustain emotional and physical well being among people in ways that advance their aspirations and satisfy their needs in their unique environment.

Medical interventions that occur in communities can be classified as three categories : Primary care, Secondary care, and tertiary care. Each category focuses on a different level and approach towards the community or population group. In the United States, Community health is rooted within Primary healthcare achievements. Primary healthcare programs aim to reduce risk factors and increase health promotion and prevention. Secondary healthcare is related to hospital care where acute care is administered in a hospital department setting. Tertiary healthcare refers to highly specialized care usually involving disease or disability management.

The success of community health programs relies upon the transfer of information from health professionals to the general public using one-to-one or one-to-many communication (mass communication). The latest shift is towards health marketing. Community health services are classified into categories including :

1. Preventive health services such as chemoprophylaxis for Tuberculosis, cancer screening and treatment of diabetes and hypertension.
2. Promotive health services such as Health education, family planning, vaccination and nutritional supplementation
3. Curative health services such as treatment of jiggers, lice infestation, Malaria and Pneumonia.
4. Rehabilitative health services such as provision of prosthetics, Social work, Occupational therapy, Physical therapy, Counselling and other Mental health services.

3.14 FACTORS AFFECTING COMMUNITY HEALTH

Human health is influenced by a number of factors which exist within the individual and society. Some of the important factors which determine health are :

1. **Heredity -** Genes determine the health of an individual from the moment of conception. The genetic makeup cannot be altered. Some diseases like diabetes and mental retardation have a genetic origin. So the health of an individual depends on his genetic constitution.
2. **Environment -** Diseases are caused by changes in environment like air, water, climate etc. The environment is of two types : internal and external. Internal environment relates to each and every tissue, organ, and system of the body and their harmonious functioning. The external environment is the physical, biological and psychological components to which an individual is exposed. The environment has a direct influence on the physical, mental and social well being of an individual.
3. **Nutrition -** Starvation has an adverse effect on health. Good nutrition is essential for normal growth and also for resistance against infection.
4. **Health services -** The aim of health and family welfare services is to treat diseases, prevent illness and promotion of health. Health services like safe water supply and immunization prevent a variety of diseases.

3.15 VITAL STATISTICS

Vital statistics is accumulated data gathered on live births, deaths, migration, foetal deaths, marriages and divorces. The most common way of collecting information on these events is through civil registration, an administrative system used by governments to record vital events which occur in their populations. Efforts to improve the quality of vital statistics will therefore be closely related to the development of civil registration systems in countries. Civil registration followed the practice of churches keeping such records since the 19th century.

A vital statistics system is defined by the United Nations as the total process of (a) collecting information by civil registration or enumeration on the frequency or occurrence of specified and defined vital events, as well as relevant characteristics of the events themselves and the person or persons concerned, and (b) compiling, processing, analyzing, evaluating, presenting, and disseminating these data in statistical form. Civil registration is defined by the United Nations as the continuous, permanent,

compulsory, and universal recording of the occurrence and characteristics of vital events (live births, deaths, fetal deaths, marriages, and divorces) and other civil status events pertaining to the population as provided by decree, law or regulation, in accordance with the legal requirements in each country.

Uses of Vital Statistics

For the people and the nation, vital statistics is of much importance;

1. **For the individual** - Vital statistics have much of use for the individuals, for example, a child's birth certificate, that is being issued by the registering authority, is a crucial document that has the data of date, time, place, and parentage of the child, also it authorized child's identity as the citizen of the respective country. A birth certificate is a legal document that is deployed in various tasks such as for taking admission in school, for obtaining a passport, to migrate in another country, etc. Likewise, a marriage certificate keeps the record of the marital status of a couple, death certificate records the no more existence of a person in the world, etc.

2. For legal usage -Vital statistics are legally extremely beneficiary, such as issued certificates related to birth, death, marriage, divorce, etc are legally important. For example, a death certificate is necessary and an important legal document for the settlement of property of the expired person, for claiming his/her insurance policy, etc.

3. Health and family planning programmes - Related to births and deaths records, vital statistics are used in health and planning programmes under the government system. The causes behind deaths, and the mortality rates of several categories aid in capturing the health conditions of the people. In accordance with this data, the state authority can design health programmes such as malaria eradication, polio and tiny pox vaccine, tuberculosis, etc. Also, the government can launch hospitals, maternity and child welfare centres, etc. according to the requirement of the population.

4. For the study of social circumstances - In order to study the birth and death rate, divorce rate, widow remarriage, widowhood etc, vital statistics are of much use, it reflects the current situation/circumstances of the society as well as its customs and traditions.

5. For administrators and planners - Related to trend and population growth under the various age group and as a whole, vital statistics provide data and information that help planners and administrators for proposing and preparing policies for health, education, housing, transporting and communications, food supplies, etc.

6. For the nation - Vital statistics help in investigating the pollution trends at any instant of time and try to bridge the gap amid two censuses, therefore are very useful for the nation. It is related to the size, composition, distribution, growth of the population. Population projections can be produced using these statistics, and assist in making policies for offering social securities to the people. Even though, the immigration rules and emigration can be formulated on the basis of population growth data. Vital statistics are also useful for upgrading the electoral rolls system and division of constituencies.

3.16 SUMMARY

Under this unit we have summarized the public health, demography, epidemiology and determinants of diseases etc. Public health is the science and art of preventing disease, prolonging life and improving quality of life through organized efforts and informed choices of society, organizations, communities and individuals. The public can be as small as a handful of people or as large as a village or an entire city. The concept of health takes into account physical, psychological, and social well-being. As such, according to WHO, health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Demography is the statistical study of human populations. It examines the size, structure, and movements of populations over space and time. It uses methods from history, economics, anthropology, sociology, and other fields. It is useful for governments and private businesses as a means of analyzing and predicting social, cultural, and economic trends related to population. Epidemiology is the study of the determinants, occurrence, and distribution of health and disease in a defined population. Infection is the replication of organisms in host tissue, which may cause disease. Social determinants of health reflect social factors and the physical conditions in the environment in which people are born, live, learn, play, work and age. Also known as social and physical determinants of health, they impact a wide range of health, functioning and quality of life outcomes.

3.17 TERMINAL QUESTIONS

Q. 1 What do you mean by public health programs? Explain it.

Answer :----------

Q. 2 Describe the demography with its applications.

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Answer :----------

Q. 3 Write short notes on the following.

(a) Demography

(b) Epidemiology

Answer :----------

Q. 4 Describe the community health and its affecting factors.

Answer :----------

Q. 5 Write short notes on the following.

(a) Determinants of Diseases

(C) Community health

Answer :----------

Q. 6 Describe the determinants of diseases.

Answer :----------

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

BLOCK-2

This is the second block (Epedemiological methods, communicable, infectious disease and waste management) of public health and epidemiology. The second block is organized into three units as under :

Unit IV Epidemiological Methods

Unit V Communicable and Infectious Disease Control

Unit VI Community Water and Waste Management

The introduction of second block is as under :

BLOCK -2 : BLOCK INTRODUCTION

Epidemiology is the branch of medical science that investigates all the factors that determine the presence or absence of diseases and disorders. Epidemiological research helps us to understand how many people have a disease or disorder, if those numbers are changing, and how the disorder affects our society and our economy.

The epidemiology of human communication is a rewarding and challenging field. Much of the data that epidemiologists collect comes from self-report-from answers provided by people participating in a study. For instance, an epidemiological study may collect data on the number of people who answer, Yes when asked if someone in their household has trouble hearing. Each person providing such an answer may interpret trouble hearing differently. This means that the results of such a study may be quite different from a study in which actual hearing (audiometric) tests are administered to each person in a household.

Also, many epidemiological estimates try to determine how the number of people affected by a disorder changes over time. The definition of a disorder also tends to change over time, however, making estimates more difficult. Even scientists working in the same field at the same time may not agree on the best way to measure or define a particular disorder.

Unit 4 : EPIDEMIOLOGICAL METHODS

Structure

4.1 INTRODUCTION

Epidemiology is the study and analysis of the distribution (who, when, and where), patterns and determinants of health and disease conditions in a defined population. It is a cornerstone of public health, and shapes policy decisions and evidence-based practice by identifying risk factors for disease and targets for preventive healthcare. Epidemiologists help with study design, collection, and statistical analysis of data, amend interpretation and dissemination of results (including peer review and occasional systematic review). Epidemiology has helped develop methodology used in clinical research, public health studies, and, to a lesser extent, basic research in the biological sciences.

Major areas of epidemiological study include disease causation, transmission, outbreak investigation, disease surveillance, environmental epidemiology, forensic epidemiology, occupational epidemiology, screening, biomonitoring, and comparisons of treatment effects such as in clinical trials. Epidemiologists rely on other scientific disciplines like biology to better understand disease processes, statistics to make efficient use of the data and draw appropriate conclusions, social sciences to better understand proximate and distal causes, and engineering for exposure assessment.

Epidemiology, literally meaning the study of what is upon the people, is derived from Greek epi 'upon, among', demos people, and logos 'study, word, discourse, suggesting that it applies only to human populations. However, the term is widely used in studies of zoological populations (veterinary epidemiology), although the term epizoology is available, and it has also been applied to studies of plant populations (botanical or plant disease epidemiology).

OBJECTIVES

This is the fourth unit (Epidemiological methods) of second block (Epidemiological Methods, Communicable, Infectious Disease and wasre Management). Under fourth unit, we have following objectives. These are as under :

- To know about health and nutrition
- To know the definitions of disease
- To know about epidemiological methods
- To discuss primary and secondary serological and clinical tests

The distinction between epidemic and endemic was first drawn by Hippocrates, to distinguish between diseases that are visited upon a population (epidemic) from those that reside within a population (endemic). The term epidemiology appears to have first been used to describe the study of epidemics in 1802 by the Spanish physician Joaquín de Villalba in Epidemiología Espanola. Epidemiologists also study the interaction of diseases in a population, a condition known as a syndemic. The term epidemiology is now widely applied to cover the description and causation of not only epidemic, infectious disease, but of disease in general, including related conditions. Some examples of topics examined through epidemiology include as high blood pressure, mental illness and obesity. Therefore, this epidemiology is based upon how the pattern of the disease causes change in the function of human beings.

4.2 HISTORY

The Greek physician Hippocrates, taught by Democritus, was known as the father of medicine, sought a logic to sickness; he is the first person known to have examined the relationships between the occurrence of disease and environmental influences. Hippocrates believed sickness of the human body to be caused by an imbalance of the four humors (black bile, yellow bile, blood, and phlegm). The cure to the sickness was to remove or add the humor in question to balance the body. This belief led to the application of bloodletting and dieting in medicine. He coined the terms endemic (for diseases usually found in some places but not in others) and epidemic (for diseases that are seen at some times but not others).

4.2.1 Modern era

In the middle of the 16th century, a doctor from Verona named Girolamo Fracastoro was the first to propose a theory that the very small, unseeable, particles that cause disease were alive. They were considered to be able to spread by air, multiply by themselves and to be destroyable by fire. In this way he refuted *Galen's miasma theory* (poison gas in sick people). *In 1543 he wrote a book De contagione et contagiosis morbis*, in which he was the first to promote personal and environmental hygiene to prevent disease. The development of a sufficiently powerful microscope by Antonie van Leeuwenhoek in 1675 provided visual evidence of living particles consistent with a germ theory of disease.

4.2.2 Basic concepts and tools

Epidemiology is based on two fundamental assumptions. First, the occurrence of disease is not random (i.e., various factors influence the likelihood of developing disease). Second, the study of populations enables the identification of the causes and preventive factors associated with disease. To investigate disease in populations, epidemiologists rely on models and definitions of disease occurrence and employ various tools, the most basic of which are rates.

4.2.3 Epidemiological models

Epidemiologists often use models to explain the occurrence of disease. One commonly used model views disease in terms of susceptibility and exposure factors. In order for individuals to develop a disease, they must be both susceptible to the disease and exposed to the disease. For example, for a person to develop measles (rubeola), a highly infectious viral disease that was once common among children, the individual must be exposed to a person who is shedding the measles virus (an active case) and must lack immunity to the disease. Immunity to measles may be derived from either previously having had the disease or from having been vaccinated against it.

4.3 EPIDEMIOLOGICAL METHODS

Epidemiologic studies may be (1) descriptive, organizing data by time, place, and person; (2) analytic, incorporating a case-control or cohort study; or (3) experimental. Epidemiology utilizes an organized approach to problem solving by : (1) confirming the existence of an epidemic and verifying the diagnosis; (2) developing a case definition and collating data on cases; (3) analyzing data by time, place, and person; (4) developing a hypothesis; (5) conducting further studies if necessary; (6) developing and implementing control and prevention measures; (7) preparing and distributing a public report; and (8) evaluating control and preventive measures.

Another commonly used model, the epidemiologic triad (or epidemiologic triangle), views the occurrence of disease as the balance of host, agent, and environment factors. The host is the actual or potential recipient or victim of the disease. Hosts have characteristics that either predispose them to or protect them from disease. Those characteristics may be biological (e.g., age, sex, and degree of immunity), behavioral (e.g., habits, culture, and lifestyle), or social (e.g., attitudes, norms, and values). The agent is the factor that causes disease. Agents may be biological (e.g., bacteria and fungi), chemical (e.g., gases and natural or synthetic compounds), nutritional (e.g., food additives), or physical (e.g., ionizing radiation).

The environment includes all external factors, other than the host and agent, that influence health. The environment may be categorized as the social environment (e.g., economic, legal, and political), the physical environment (e.g., weather conditions), or the biological environment (e.g., animals and plants). To illustrate the epidemiologic triad, a case of lung cancer may be considered. The host is the person who developed lung cancer. He or she may have had the habit of smoking for many years. The agents are the smoke and the tars and toxic chemicals contained in the tobacco.

4.4 DEFINITIONS OF DISEASE OCCURRENCE

Epidemiologists classify the type of disease cases and frequency of disease occurrence within a population as being either endemic or epidemic. Endemic is defined as the usual occurrence of a disease within a population. In contrast, an epidemic is a sudden and great increase in the occurrence of a disease within a population. It may also be the first occurrence of an entirely new disease. An epidemic can give rise to a pandemic, which is a rapidly emerging outbreak of a disease that affects populations across a wide geographical area. Pandemics often are worldwide in scope. As an illustration of the three types : small numbers of people may be affected by influenza throughout the year in a large city; those individuals would be considered endemic cases of the disease. If the number of people affected by influenza in the same city increases to high levels in the winter, the outbreak would be considered an epidemic. If a new variety of influenza emerges and affects people throughout the world, the outbreak would be considered a pandemic. An example of a pandemic is the influenza pandemic of 1918–19, which spread to countries worldwide and killed an estimated 20 million–50 million people.

Crude, specific, and adjusted rates

Epidemiological rates may be crude, specific, or adjusted (standardized). Crude rates use the total number of disease cases and the entire population in their calculations. Specific rates differentiate cases and populations by cause, age, sex, race, or other factors. Adjusted rates allow for the comparison of populations with different characteristics.

Morbidity and mortality rates

The analysis of morbidity and mortality caused by acute and chronic diseases forms the basis of many epidemiological studies. Morbidity represents the illness, symptoms, or impairments produced by a disease, whereas mortality is death caused by a disease. Acute diseases are those that strike and disappear quickly, within a month or so (e.g., chickenpox and influenza). Chronic diseases are those that are long-term; chronic diseases often are incurable (e.g., many forms of cancer and diabetes mellitus).

Morbidity and mortality rates allow researchers to compare disease cases and deaths to the unit size of population. A rate is a special type of proportion that includes a specification of time, and the numerator of the proportion is included in the denominator. Rates can be expressed in any form that is convenient (e.g., per 1,000, per 10,000, or per 100,000). Infant mortality rates, for example, are typically expressed per 1,000 live births, whereas cancer rates are expressed per 100,000 population.

Incidence and prevalence rates

The occurrence of disease can be measured by using incidence rates and prevalence rates. The incidence rate measures the occurrence of new cases of a disease in a population over a period of time. The incidence rate is an important measure for evaluating disease-control programs and has implications for the future problems of medical care. For example, the calculation of incidence rates of HIV/AIDS provides insight into whether the disease is spreading and whether HIV-prevention programs are working.

The prevalence rate measures the total number of existing cases of a disease in a population at a given point in time or over a period of time. The prevalence rate is a useful indicator of the burden of a disease on the medical and social systems of a geographic region. It is useful only for diseases of long duration (months or years). For example, within countries, prevalence rates can be used to determine the medical, economic, and social burden of AIDS. Prevalence rates vary directly with both incidence and duration of disease. If the incidence of a disease is low but the duration of the disease is long, such as with chronic diseases, prevalence will be large in relation to incidence. Conversely, if the prevalence of a disease is low because of short duration (due to recovery, migration, or death), prevalence will be small in relation to incidence.

4.5 SOURCES OF EPIDEMIOLOGICAL DATA

Epidemiologists use primary and secondary data sources to calculate rates and conduct studies. Primary data is the original data collected for a specific purpose by or for an investigator. For example, an epidemiologist may collect primary data by interviewing people who became ill after eating at a restaurant in order to identify which specific foods were consumed. Collecting primary data is expensive and time-consuming, and it usually is undertaken only when secondary data is not available. Secondary data is data collected for another purpose by other individuals or organizations. Examples of sources of secondary data that are commonly used in epidemiological studies include birth and death certificates, population census records, patient medical records, disease registries, insurance claim forms and billing records, public health department case reports, and surveys of individuals and households.

Descriptive and analytical epidemiology - Descriptive epidemiology is used to characterize the distribution of disease within a population. It describes the person, place, and time characteristics of disease occurrence. Analytical epidemiology, on the other hand, is used to test hypotheses to determine whether statistical associations exist between suspected causal factors and disease occurrence. It also is used to test the effectiveness and safety of therapeutic and medical interventions. The tests of analytical epidemiology are carried out through four major types of research study designs : cross-sectional studies, case-control studies, cohort studies, and controlled clinical trials.

Cross-sectional studies are used to explore associations of disease with variables of interest. For example, a cross-sectional study designed to investigate whether residential exposure to the radioactive gas radon increases the risk of lung cancer may examine the level of radon gas in the homes of lung cancer patients. Cross-sectional studies have the advantage of being inexpensive and simple to conduct. Their main disadvantage is that they establish associations at most, not causality.

Case-control studies start with people with a particular disease (cases) and a suitable control group without the disease and then compare the two groups for their exposure to the factor that is suspected of having caused the disease. Case-control studies are most useful for ascertaining the cause of rare events, such as rare cancers. Case-control studies have the advantages of being quick to conduct and inexpensive, and they require only a small number of cases and controls. Their main disadvantage is that they rely on recall, which may be biased, or on records to determine exposure status.

Cohort studies are observational studies in which a defined group of people (the cohort) is followed over time and outcomes are compared for individuals who were exposed or not exposed to a factor at different levels. Cohorts can be assembled in the present and followed into the future (a concurrent cohort study) or identified from past records (a historical cohort study). The main advantage of cohort studies is that they identify the timing and directionality of events. Their main disadvantages are that they require large sample sizes and long follow-up times. They also are not suitable for investigating rare diseases.

Controlled clinical trials are studies that test therapeutic drugs or other health or medical interventions to assess their effectiveness and safety. A controlled clinical trial compares the outcome of a new drug or intervention given to an experimental group with a control group that does not receive the same drug or intervention. To minimize bias, individuals involved in clinical trials may be randomly assigned to the experimental and control groups. In many countries, new therapeutic agents and medical devices are subject to rigorous controlled clinical trials before they are made available to the public. A major advantage of controlled clinical trials is that they provide unbiased results; however, they are very expensive to conduct.

4.6 SEROLOGICAL TESTS

Serological tests are also known as blood tests. They are an important diagnostic tool in medical science. They measure the levels of different antibodies in the body. They help to determine illnesses, infections, and overall health. This blog features everything you need to know about serological tests, what different serology test mean, and their overall importance in the diagnosis of different diseases. A serological test is a laboratory assay. It is used to measure the presence and concentration of antibodies in the blood. It is a vital tool for various medical and health-related investigations. It is used to diagnose and monitor several infectious diseases. It can also be used to check for the presence of blood clots in the circulation system.

The antibody molecule is an essential protein. It is produced by the body in response to an infection. These molecules are released into the blood. They circulate and attach themselves to the

target protein of the disease. This process helps the body to mount a defence against invading organisms. The presence of antibodies can then be detected by a **serological test.** It measures the amount of these molecules in the sample.

4.7 PRIMARY VS SECONDARY SEROLOGICAL TESTS

Primary serological tests and secondary serological tests are two important methods used in medical diagnosis. Primary serological tests are used to detect the presence of antibodies in a patient's serum. Secondary serological tests are used to confirm the presence of antibodies and determine their type. Primary serological tests can be used for both diagnostic and screening purposes. Secondary serological tests are more commonly used for diagnostic purposes. Primary serological tests can provide a rapid diagnosis, while secondary serological tests require more time and resources to perform. Both primary and secondary serologic testing have their place in modern medicine. But it is important to understand the differences between them when making decisions about which test is best suited for a particular situation.

4.8 DIFFERENT TYPES OF PRIMARY AND SECONDARY SEROLOGICAL TESTS

Serology is the study of serum and other bodily fluids. It is a key part of diagnosing and treating many diseases. There are different types of serological tests, each with its own unique importance. Here is a serology test list compiled for you.

1. Agglutination Test

The first type of serological test is the agglutination test. It is used to identify antigens in a sample. In this test, a reagent containing antibodies is added to a sample of suspected material. If the sample contains the antigen the antibodies will bind to it. They will cause the particles to clump together forming an agglutinate.

2. ELISA (Enzyme-Linked Immunosorbent Assay)

The second type is the enzyme-linked immunosorbent assay (ELISA). It is used to measure the presence of specific antibodies or antigens in a sample. This test uses an enzyme-coated plate containing specific antibodies. They bind to the antigen or antibody in the sample. When the antigen or antibody binds to the specific antibody, the enzyme produces a coloured product that can be measured.

3. Hemagglutination Test

The third type of serological test is the hemagglutination test. It is used to measure the presence of antibodies in a serum sample. In this test, a known amount of red blood cells is mixed with the sample. It is then incubated. If the sample contains antibodies, they will bind to the red blood cells. They will cause them to clump together.

4. Precipitin Test

The fourth type is the precipitin test. It is used to identify antigens in a sample. In this test, a reagent containing an antibody is mixed with the sample containing the antigen. If the sample contains the antigen, the antibody will bind to it. It will also form a visible precipitate that can be seen under a microscope.

5. Western Blot Test

The fifth type is the western blot test. Western blot is another type of **serological test**. It is used to detect the presence of particular proteins in a sample. It is a more involved process than ELISA. It is often used to confirm the diagnosis of certain diseases.

6. Immunofluorescence Assay (IFA)

Immunofluorescence Assay (IFA) is a serological test**.** It uses fluorescent dyes to detect the presence and amount of particular antibodies in a sample. It is usually used to diagnose autoimmune diseases. It is a very sensitive method of detection. Immunofluorescence (IF) is a type of immunohistochemistry technique that utilizes fluorophores to visualize various cellular antigens such as proteins. This technique can be utilized to visualize the localization of various cellular components within cells, tissues as well as in 3D culture-derived cellular spherical structures. Fluorophore, compounds that emit light when exposed to a certain wavelength of light are essential for IF.

To detect protein expression, the biological sample of interest is incubated with an antibody specific to the protein of interest; the antibody may be coupled to a fluorophore (direct fluorescence) or may be detected by a secondary antibody conjugated to a fluorophore (indirect fluorescence). The proteins or antigens can then be visualized by examination under a fluorescent microscope or a confocal microscope depending on the biological question being addressed by this method. This technique is commonly used in clinical practice as well as in research applications to optically determine protein expression and cellular and intracellular localization.

7. Flow Cytometry

Flow cytometry is a technology used to detect and measure particles in a sample. It is used in serological testing to measure the number of antibodies present in a sample. It can also be used to measure the size and number of cells in a sample. Flow cytometry is a technology that provides rapid multi-parametric analysis of single cells in solution. Flow cytometers utilize lasers as light sources to produce both scattered and fluorescent light signals that are read by detectors such as photodiodes or photomultiplier tubes. These signals are converted into electronic signals that are analyzed by a computer and written to a standardized format (.fcs) data file. Cell populations can be analyzed and/or purified based on their fluorescent or light scattering characteristics.

A variety of fluorescent reagents are utilized in flow cytometry. These include, fluorescently conjugated antibodies, DNA binding dyes, viability dyes, ion indicator dyes and fluorescent expression proteins.

Flow cytometry is a powerful tool that has applications in immunology, molecular biology, bacteriology, virology, cancer biology and infectious disease monitoring. It has seen dramatic advances over the last 30 years, allowing unprecedented detail in studies of the immune system and other areas of cell biology.

8. Radioimmunoassay (RIA)

Radioimmunoassay (RIA) is a powerful technique. It is used to measure the concentration of antigens or antibodies in a sample. It is based on the principle of competitive binding, where an antigen present in the sample competes with a labelled antigen for antibody binding sites. The amount of labelled antigen bound to an antibody can then be determined by measuring the radioactivity associated with it. In addition, serological tests are also used to detect previous exposure to a particular infectious agent. This is especially important in the study and management of infectious diseases such as HIV, hepatitis, and tuberculosis. By determining the presence and concentration of antibodies, health professionals can gain important insight into the progression of an

illness, as well as the effectiveness of treatments.

4.9 SUMMARY

Under this unit we have summarized basic concet of epidemiology, epidemiologic methods, different types of serological tests and clinical tests etc. Epidemiology is the study of the determinants, occurrence, and distribution of health and disease in a defined population. Infection is the replication of organisms in host tissue, which may cause disease. A carrier is an individual with no overt disease who harbors infectious organisms. Dissemination is the spread of the organism in the environment. The three major epidemiologic techniques are descriptive, analytic, and experimental. Although all three can be used in investigating the occurrence of disease.

A serological test is typically used to diagnose or monitor infections, autoimmune diseases, and other conditions, such as allergies. It can provide information on the cause and severity of a condition. It can also be used to monitor the effectiveness of treatments. In addition to this, serological tests are also frequently used in pregnancy. This is done to screen for certain infectious diseases that can affect the health of both the mother and the baby. In such cases, these tests can detect the presence of antibodies in the mother's blood. This can provide an indication of exposure to certain diseases. To sum up, serological tests are a vital tool for medical and healthcare investigations. They are used to diagnose and monitor infectious diseases. They can also provide information about previous exposure to specific agents.

4.10 TERMINAL QUESTIONS

Q. 1 What do you mean by epidemiological methods? Explain it.

Answer :----------

Q. 2 Describe different types of primary and secondary serological tests.

Answer :----------

Q. 3 Write short notes on the following.

(a) Primary serological test

(b) Secondary serological test

Answer :----------

Q. 4 Write short notes on the following.

(a) Serological test

(b) Clinical test

Answer :----------

Q. 5 Describe the sources of epidemiological data.

Answer :----------

Q. 6 Write short notes on the following.

(a) Radioimmunoassay (RIA)

(b) ELISA (Enzyme-Linked Immunosorbent Assay)

Answer :----------

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

Unit 5 : COMMUNICABLE AND INFECTIOUS DISEASE CONTROL

Structure

5.1 INTRODUCTION

A communicable disease is one that spreads from one person or animal to another or from a surface to a person. They are the result of pathogens, such as viruses and bacteria. Communicable diseases include colds and flu. Communicable diseases can transmit through contact with bodily fluids, insect bites, contaminated surfaces, water, and foods, or through the air. A communicable disease is any disease that passes between people or animals. People sometimes refer to communicable diseases as infectious or transmissible diseases. Pathogens, including bacteria, viruses, fungi, and protozoa, cause communicable diseases.

Once a pathogen has entered a person's body, it often will begin replicating. The individual may then begin to experience symptoms. Symptoms will vary depending on the disease. Some people will not experience any symptoms. However, they can still transmit the pathogen. Some symptoms are a direct result of the pathogen damaging the body's cells. Others are due to the body's immune response to the infection. Some communicable diseases may be mild, and symptoms pass after a few days. However, some can be serious and potentially life threatening. Symptom severity may vary depending on a person's overall health and immune function.

Infectious diseases or communicable disease are caused by harmful organisms that get into your body from the outside, like viruses and bacteria. Noninfectious diseases aren't caused by outside organisms, but by genetics, anatomical differences, getting older and the environment you live in. You can't get noninfectious diseases from other people, by getting a bug bite or from your food. The flu, measles, HIV, strep throat, COVID-19 and salmonella are all examples of infectious diseases. Cancer,

diabetes, congestive heart failure and Alzheimer's disease are all examples of noninfectious diseases.

OBJECTIVES

This is the fifth unit (Communicable and infectious Disease Control) of second block (Epidemiological Methods, Communicable, Infectious disease and waste Management). Under fifth unit, we have following objectives. These are as under :

- To know about communicable diseases and its types
- To discuss treatment for communicable diseases
- To discuss disinfectants, antiseptic and vector-borne diseases
- To know about epidemiology and its types

5.2 TYPES AND SYMPTOMS

Four main types of pathogens cause infection : Viruses, bacteria, fungi, and protozoa.

Viruses

Viruses are tiny pathogens that contain genetic material. Unlike other pathogens, they lack the complex structure of a cell. To replicate, they must enter the cells of other living beings. Once inside, they use the cell's machinery to make copies of themselves.

Bacteria

Bacteria are microscopic, single-celled organisms. They exist in almost every environment on earth, including inside the human body. Many bacteria are harmless, and some help the body to function. However, bacteria can also cause infections that damage the body.

Fungi

Fungi are a type of organism that includes yeasts, molds, and mushrooms. There are millionsTrusted Source of different fungi. However, only around 300 cause harmful illnesses. Fungal infections can occur anywhere in the body. However, they commonly affect the skin and mucus membranes.

Protozoa

Protozoa are microscopic organisms that typically consist of a single cell. Some protozoa are parasitic, meaning they live on or inside another organism and use the organism's nutrients for their own survival. Parasitic protozoa can cause various diseases.

5.3 COMMON COMMUNICABLE DISEASES

Common viral, bacterial, fungal, and protozoa diseases include :

Rhinoviruses

Rhinoviruses are a group of viruses that are the most commonTrusted Source cause of the common cold. Symptoms of a cold may includeTrusted Source :

- a stuffy or runny nose
- sore throat
- headache

A person can catch a rhinovirus by inhaling contaminated droplets from the cough or sneeze of another person. Similarly, rhinoviruses are spread by people touching their nose, eyes, or mouth after touching items or surfaces that have come into contact with the virus.

Coronaviruses

Coronaviruses are a large group of viruses that affect the respiratory systemTrusted Source. This family includes the SARS-CoV-2 virus. Some coronaviruses can cause common cold and flu symptoms, while others can cause more severe outcomes.

Influenza

Influenza viruses are infections that attack the respiratory system. Some potential symptoms Trusted Source include :

- Fever or chills
- Stuffy or runny nose
- Sore throat
- Cough
- Headaches
- Muscle or body aches
- Fatigue

A person can catch influenza viruses in the same way they may catch rhinoviruses.

HIV (human immunodeficiency virus

HIV attacks the immune system of its host. This makes the person vulnerable to other infections and diseases. A person can contract HIV as a result of contact with blood or other body fluids containing the virus. The symptoms of HIV may develop graduallyTrusted Source and in stages. They can include :

- Fever
- Chills
- Rash
- Mouth sores
- Sore throat
- Swollen lymph nodes
- Night sweats
- Muscle aches
- Fatigue

The only way a person can be certain they have HIV is to have an HIV test. Although there is no cure for HIV, medications can help to keep the virus under control or make it undetectable. Without such treatment, HIV can develop into AIDS. Other medications can help prevent a person from contracting HIV. People at high risk of HIV and those who believe they may have had exposure to it should speak with their primary healthcare professional about these options.

Salmonella and Escherichia coli

Nontyphoidal *Salmonella* and *Escherichia coli (E. coli)* are two different types of bacteria that can infect the digestive system. Another form of salmonella, *Salmonella typhi*, can also cause typhoid. They typically spread through contaminated foods, such as uncooked meats and eggs, unwashed fruits and vegetables, and contaminated water sources. Salmonella can also spread through contact with live animals, including chickens, and through person-to-person contact.

Some symptoms of these infections include :

- Abdominal cramps
- Diarrhea
- Fever
- Headache

Tuberculosis

Tuberculosis (TB) is a serious illness that mainly affects the lungs. The germs that cause tuberculosis are a type of bacteria. Tuberculosis can spread when a person with the illness coughs, sneezes or sings. This can put tiny droplets with the germs into the air. Another person can then breathe in the droplets, and the germs enter the lungs. Tuberculosis spreads easily where people gather in crowds or where people live in crowded conditions. People with HIV/AIDS and other people with weakened immune systems have a higher risk of catching tuberculosis than people with typical immune systems. Drugs called antibiotics can treat tuberculosis. But some forms of the bacteria no longer respond well to treatments.

Symptoms

When tuberculosis (TB) germs survive and multiply in the lungs, it is called a TB infection. A TB infection may be in one of three stages. Symptoms are different in each stage.

Primary TB infection

The first stage is called the primary infection. Immune system cells find and capture the germs. The immune system may completely destroy the germs. But some captured germs may still survive and multiply. Tuberculosis (TB) is a bacterial infection that primarily attacks the lungs. It may cause the following symptoms :

- A cough continuing for more than 3 weeks
- Loss of appetite
- Unintentional weight loss
- Fever
- Chills
- Night sweats

A person can catch TB by inhaling tiny droplets or “aerosols” from the cough or sneeze of a person who has the infection.

Latent TB infection

Primary infection is usually followed by the stage called latent TB infection. Immune system cells build a wall around lung tissue with TB germs. The germs can't do any more harm if the immune system keeps them under control. But the germs survive. There are no symptoms during latent TB infection.

Active TB disease

Active TB disease happens when the immune system can't control an infection. Germs cause disease throughout the lungs or other parts of the body. Active TB disease may happen right after primary infection. But it usually happens after months or years of latent TB infection.

Ringworm

Ringworm is a common fungal infection of the skin. The characteristic symptom of ringworm is a ring-shaped rash. It may be dry, scaly, or itchy.

People may contract ringworm through :

- Close contact with a person who has ringworm
- Sharing towels, bedding, or other personal items with a person who has ringworm
- Close contact with animals with ringworm, typically cats

Without treatment, ringworm may spread to other parts of the body.

Athlete's foot

Athlete's foot is a common fungal infection that affects the skin on the feet. It typically causes sore or itchy white patches between the toes. People can contract athlete's foot through direct contact with someone who has the fungus or surfaces that have been in contact with the fungus. For example, an individual might contract athlete's foot after walking barefoot in locker rooms, showers, or swimming pools.

Plasmodium

The protozoa *Plasmodium genus* causes the tropical disease malaria. The parasite primarily transmitsTrusted Source through mosquito bites.

Malaria causes symptoms such as :

- Fever and chills
- Headaches
- Vomiting
- Diarrhea
- Muscle pains

Without proper treatment, malaria can be life threatening. Vaccination programs are also effectively protecting people from malaria fatalities.

Lyme disease

Lyme disease is a potentially serious infection that black-legged ticks can pass to humans. It is the most commonTrusted Source carrier-spread disease in the United States. The bacteria Borrelia burgdorferi causes the majority of Lyme disease cases. However, the bacteria Borrelia mayonii may also cause the disease.

Symptoms of Lym disease include :

- Headache
- Fatigue
- Fever
- Skin rash

Lyme disease can spread to the joints, heart, and nervous system if a person does not treat it.

5.4 CAUSES

A person may develop a communicable disease after becoming infected by the pathogen. This may happen through :

- direct contact with a person carrying the pathogen
- contact with bodily fluids containing pathogens
- inhaling pathogen-containing droplets from another person's cough or sneeze
- receiving a bite from an animal or insect carrying the pathogen
- consuming contaminated water or foods

5.5 HOW TO PREVENT TRANSMISSION

People can reduce their risk of contracting or transmitting disease-causing pathogens by following the steps below :

- Washing their hands thoroughly and regularly
- Disinfecting surfaces at home often, especially doorknobs and food areas
- Disinfecting personal items such as phones
- Cooking meats, eggs, and other foods thoroughly
- Practicing good hygiene when preparing and handling food
- Avoiding eating spoiled food
- Avoiding touching wild animals
- Receiving available vaccinations
- Taking antimalarial medications when traveling where there is a malaria risk
- Check for ticks and other parasites

5.6 TREATMENT FOR COMMUNICABLE DISEASES

Some communicable diseases cause only mild symptoms that disappear without treatment. Others may cause severe symptoms or potentially life threatening complications. Patients require different treatment depending on disease process and clinical presentation.

Viral infections

Vaccines are a highly effective method for preventing specific viral infections. There are several different types of vaccines. When a person receives a vaccine, they are receiving a form of the virus. The immune system responds by producing antibodies capable of killing an active form of the virus in the future. If a person already has a virus, they may require antiviral medications to keep the virus under control.

Bacterial infections

Bacterial infections can range from mild to life threatening. A person who has a bacterial infection may require a course of antibiotics to help control the infection. These medications can help to kill bacteria or slow them down so the immune system can counteract them. However, many bacteria are developing a resistance to antibiotics, which poses a major health risk. More than 2.8 millionTrusted Source antibiotic-resistant infections occur in the U.S. every year. A person should only ever take antibiotics on a medical recommendation.

Fungal infections

A severe or chronic fungal infection may require prescription antifungal medications and, in rare cases, intravenous medication. However, people can treat many mild infections, such as ringworm and athlete's foot, with over-the-counter topical ointments.

Direct contact

An easy way to catch most infectious diseases is by coming in contact with a person or an animal with the infection. Infectious diseases can be spread through direct contact such as :

1. **Person to person -** Infectious diseases commonly spread through the direct transfer of bacteria, viruses or other germs from one person to another. This can happen when an individual with the bacterium or virus touches, kisses, or coughs or sneezes on someone who isn't infected.

   These germs can also spread through the exchange of body fluids from sexual contact. The person who passes the germ may have no symptoms of the disease, but may simply be a carrier.

2. **Animal to person -** Being bitten or scratched by an infected animal — even a pet — can make you sick and, in extreme circumstances, can be fatal. Handling animal waste can be hazardous, too. For example, you can get a toxoplasmosis infection by scooping your cat's litter box.

3. **Mother to unborn child -** A pregnant woman may pass germs that cause infectious diseases to her unborn baby. Some germs can pass through the placenta or through breast milk. Germs in the vagina can also be transmitted to the baby during birth.

Indirect contact

Disease-causing organisms also can be passed by indirect contact. Many germs can linger on an inanimate object, such as a tabletop, doorknob or faucet handle.

When you touch a doorknob handled by someone ill with the flu or a cold, for example, you can pick up the germs he or she left behind. If you then touch your eyes, mouth or nose before washing your hands, you may become infected.

1. Insect bites

Some germs rely on insect carriers — such as mosquitoes, fleas, lice or ticks — to move from host to host. These carriers are known as vectors. Mosquitoes can carry the malaria parasite or West Nile virus. Deer ticks may carry the bacterium that causes Lyme disease.

2. Food contamination

Disease-causing germs can also infect you through contaminated food and water. This mechanism of transmission allows germs to be spread to many people through a single source. Escherichia coli (E. coli), for example, is a bacterium present in or on certain foods -such as undercooked hamburger or unpasteurized fruit juice.

5.7 CONTAMINATION

Contamination is the presence of a constituent, impurity, or some other undesirable element that renders something unsuitable, unfit or harmful for both physical body, natural environment, workplace, etc.

Types of contamination

Within the sciences, the word contamination can take on a variety of subtle differences in meaning, whether the contaminant is a solid or a liquid, as well as the variance of environment the contaminant is found to be in. A contaminant may even be more abstract, as in the case of an unwanted energy source that may interfere with a process. The following represent examples of different types of contamination based on these and other variances.

Chemical contamination

In chemistry, the term contamination usually describes a single constituent, but in specialized fields the term can also mean chemical mixtures, even up to the level of cellular materials. All chemicals contain some level of impurity. Contamination may be recognized or not and may become an issue if the impure chemical causes additional chemical reactions when mixed with other chemicals or mixtures. Chemical reactions resulting from the presence of an impurity may at times be beneficial, in which case the label contaminant may be replaced with reactant or catalyst.

If the additional reactions are detrimental, other terms are often applied such as toxin, poison, or pollutant, depending on the type of molecule involved. Chemical decontamination of substance can be achieved through decomposition, neutralization, and physical processes, though a clear understanding of the underlying chemistry is required. Contamination of pharmaceutics and therapeutics is notoriously dangerous and creates both perceptual and technical challenges.

Environmental contamination

In environmental chemistry, the term contamination is in some cases virtually equivalent to pollution, where the main interest is the harm done on a large scale to humans, organisms, or environments. An environmental contaminant may be chemical in nature, though it may also be a biological (pathogenic bacteria, virus, invasive species) or physical (energy) agent. Environmental monitoring is one mechanism available to scientists to detect contamination activities early before they become too detrimental.

Agricultural contamination

Another type of environmental contaminant can be found in the form of genetically modified organisms (GMOs), specifically when they come in contact with organic agriculture. This sort of contamination can result in the decertification of a farm. This sort of contamination can at times be difficult to control, necessitating mechanisms for compensating farmers where there has been contamination by GMOs. A Parliamentary Inquiry in Western Australia considered a range of options for compensating farmers whose farms had been contaminated by GMOs but ultimately settled on recommending no action.

Food, beverage, and pharmaceutical contamination

In food chemistry and medicinal chemistry, the term contamination is used to describe harmful intrusions, such as the presence of toxins or pathogens in food or pharmaceutical drugs.

Radioactive contamination

In environments where nuclear safety and radiation protection are required, radioactive contamination is a concern. Radioactive substances can appear on surfaces, or within solids, liquids, or gases (including the human body), where their presence is unintended or undesirable, and processes can give rise to their presence in such places. Several examples of radioactive contamination include :

- Residual radioactive material remaining at a site after the completion of decommissioning of a site where there was a nuclear reactor, such as a power plant, experimental reactor, isotope reactor, or a nuclear powered ship or submarine.
- Ingested or absorbed radioactive material that contaminates a biological entity, whether unintentionally or intentionally (such as with radiopharmaceuticals.
- Escape of elements after nuclear accident, such as the contamination of Iodine-131 and Caesium-137 after the nuclear disaster in Chernobyl, Ukraine.

Note that the term radioactive contamination may have a connotation that is not intended. The term refers only to the presence of radioactivity and gives no indication itself of the magnitude of the hazard involved. However, radioactivity can be measured as a quantity in a given location or on a surface, or on a unit area of a surface, such as a square meter or centimeter. Like environmental monitoring, radiation monitoring can be employed to catch contamination-causing activities before much harm.

Interplanetary contamination

Interplanetary contamination occurs when a planetary body is biologically contaminated by a space probe or spacecraft, either deliberately or unintentionally. This can work both on arrival to the foreign planetary body and upon return to Earth.

Contaminated evidence

In forensic science, evidence can become contaminated. Contamination of fingerprints, hair, skin, or DNA-from first responders or from sources not related to the ongoing investigation, such as family members or friends of the victim who are not suspects-can lead to wrongful convictions, mistrials, or dismissal of evidence.

Contaminated samples

In the biological sciences, accidental introduction of foreign material can seriously distort the results of experiments where small samples are used. In cases where the contaminant is a living microorganism, it can often multiply to dominate the sample and render it useless, as

in contaminated cell culture lines. A similar affect can be seen in geology, geochemistry, and archaeology, where even a few grains of a material can distort results of sophisticated experiments.

Food contaminant detection method

The conventional food contaminant test methods may be limited by complicated/tedious sample preparing procedure, long testing time, sumptuous instrument, and professional operator. However, some rapid, novel, sensitive, and easy to use and affordable methods were developed including :

- Cyanidin quantification by naphthalimide-based azo dye colorimetric probe.
- Lead quantification by modified immunoassay test strip based on a heterogeneously sized gold amplified probe.
- Microbial toxin by HPLC with UV-Vis or fluorescence detection and competitive immunoassays with ELISA configuration.
- Bacterial virulence genes detection reverse-transcription polymerase chain reaction (RT-PCR) and DNA colony hybridization.

5.8 DISINFECTANT

A disinfectant can be defined as an antimicrobial agent that can be applied on the surface of some objects in order to destroy the microorganisms residing on it. It is not necessary that a disinfectant will kill all the microorganisms. It is not as effective as sterilization. The process of sterilization kills all types of living forms but a disinfectant kills only certain types of microbes. It is generally applied to a floor or a drainage system. Most of the popularly used cleaning products used in homes and offices are nothing but disinfectants

How does it destroy the micro-organisms?

A disinfectant is an antimicrobial agent. It is not necessary that a disinfectant will kill all the microorganisms. It is not as effective as sterilization. The process of sterilization kills all types of living forms but a disinfectant kills only certain types of microbes. It is generally applied to a floor or a drainage system. Most of the popularly used cleaning products used in homes and offices are nothing but disinfectants.

5.9 TYPES OF DISINFECTANTS

Some common types of disinfectants include :

1. **Air disinfectants -** It is defined as the chemical substances which are used to kill the microorganisms that are suspended in the air. It can also be called as a disinfectant spray.
2. **Alcohol -** It is seen that alcohols are used as disinfectants. Ethanol is the most common example in this case. Some other examples of disinfectants are, chlorine when it is in the concentration of 0.2 to 0.4 in aqueous solution and sulphur dioxide, which acts as a disinfectant in small concentrations.

Antiseptics

Antiseptics can be defined as antimicrobial agents which can be applied on the body of living organisms to inhibit the action of microbes. They are not injected into the body like the antibiotics, rather they are applied on the surface of the skin to heal the living tissues in case of wounds and cuts. Dettol is the most commonly used antiseptic. It is a mixture of chloroxylenol and terpineol. Iodoform is also used as an antiseptic for wounds.

Types of Antiseptics

Some antiseptics are germicidal in nature, implying that they have the ability to completely destroy microbes. These types of antiseptics are referred to as bacteriocidal antiseptics. Other antiseptics only inhibit the growth of microbes (or prevent the growth of microbes altogether). Such substances are commonly referred to as bacteriostatic antiseptics.

The Difference between Disinfectants and Antiseptics

Disinfectants and antiseptics are both used for killing the microbes but still, there is a difference between them.

- An antiseptic is used for killing the microbes on the living tissues whereas a disinfectant is applied on a non-living object.
- Secondly, the concentration of both differ. We can use the same chemical as a disinfectant and an antiseptic by varying its concentration.
- For example, phenol can be used as an antiseptic if its concentration is 0.2 % but to use it as a disinfectant the concentration should be 1%.
- We can broadly conclude that the cleaning products contain disinfectants and the healing products (for curing the living tissues) contain antiseptics.
- Both are similar in nature but vary in their concentration. Lysol is a disinfectant whereas Dettol is an antiseptic.

5.10 VECTOR-BORNE DISEASES

Vector-borne diseases are caused by the bites of disease-causing pathogens like mosquitoes and ticks. This article looks at the different types of vector-borne diseases and their symptoms, causes, and possible treatment options. Vectors are lifeforms that act as a medium for transmitting infectious germs from animals to humans and in some cases, between humans. These organisms first get infected by the disease-causing pathogens, and once infected, they can transmit the pathogen to humans throughout their life whenever they come in contact with a human host. Diseases transmitted through such vectors are called vector-borne diseases. Some vector-borne disease examples are :

- Malaria
- Dengue fever
- Yellow fever
- Plague
- Japanese encephalitis
- Chikungunya

Vector-borne diseases cause roughly 700,000 deaths worldwide every year. Vectors can carry different types of pathogens, including viruses and bacteria. Tropical and subtropical regions report large numbers of vector-borne diseases that typically affect people living in poorer areas. Diseases like chikungunya and leishmaniasis could cause permanent disabilities and lead to social stigma. Vector-borne diseases happen due to the action of specific pathogens and vectors. Some vector-borne diseases, their disease-causing pathogens, and their vectors are listed below.

- **Chikungunya, dengue, yellow fever, and Zika -** Caused by a virus carried by the Aedes mosquito

- **Malaria -** Caused by a parasite carried by the female Anopheles mosquito
- **Japanese encephalitis and West Nile fever -** Caused by a virus transmitted by the Culex mosquito
- **Chagas disease (American trypanosomiasis) -** Caused by a parasite transmitted by Triatomine bugs
- **Sleeping sickness (African trypanosomiasis) -** Caused by a parasite carried by Tsetse flies
- **Leishmaniasis -** Caused by a parasite carried by sandflies
- **Typhus -** Caused by bacteria transmitted by lice
- **Plague -** Caused by bacteria transmitted by fleas (transmitted from rats to humans)
- **Crimean-Congo hemorrhagic fever -** Caused by a virus transmitted by ticks
- **Lyme disease -** Caused by bacteria transmitted by ticks

Vector-Borne Diseases Symptoms

Symptoms of vector-borne diseases vary depending on the condition and the disease-causing pathogen. Some signs of widely reported vector-borne diseases are as under :

- **Chikungunya -** Symptoms include sudden fever, joint pain, muscle aches, headaches, nausea, fatigue, and skin rashes. Joint pain can last for weeks.
- **Dengue -** Common symptoms include sudden high fever (that can sometimes reach 39°C or 40°C), along with severe headache, pain behind the eyeballs, muscle pain, joint pain, nausea, vomiting, swollen lymph nodes, and rashes.
- **Yellow fever -** Fever, muscle pain (especially in the back), chills, headaches, loss of appetite, and nausea are typical symptoms, which usually disappear after three to four days. Sometimes remission may happen, along with high fever, leading to a dangerous phase with severe symptoms like gastric bleeding, jaundice, dark-colored urine, abdominal pain, and vomiting. Of the cases that enter the dangerous phase, 50% are fatal.
- **Zika virus -** Most people don't have any symptoms. Only 20% of the people show mild symptoms like low fever, conjunctivitis, headache, joint stiffness, muscle pain, and pain behind the eyes. In some cases, it can trigger other neurological conditions like Guillain-Barré syndrome.
- **Malaria -** Symptoms include fever, chills, sweating, headache, nausea, body aches, diarrhea, vomiting, breathing issues, and chest pain. Severe malaria cases could lead to jaundice (yellowing of the skin and the white part of your eyes) and sometimes a coma.
- **Japanese encephalitis -** Initial symptoms in adults include fever, headache, and vomiting. Neurological symptoms, weakness, and movement issues could develop after a few days. Children usually get seizures, and 20% to 30% of people who report brain infections die.
- **West Nile fever -** Some symptoms include fever, headache, fatigue, body aches, nausea, enlarged lymph glands, and skin rashes (in some cases). Usually, 1 out of 150 cases becomes severe, causing neck stiffness, coma, tremors, and paralysis.
- **Plague -** Bubonic plague affects the lymph nodes, causes inflammation and pain, and fills the sores with pus. When the infection spreads to the lungs, it's called pneumonic plague. Signs of this phase include pneumonia with shortness of breath, chest pain, cough, and in some cases, bloody sputum.

- **Typhus -** High fever, headache, chills, coughing, severe muscle pain, and fatigue are common symptom

5.11 ENVIRONMENTAL MICROBIOLOGY

Environmental microbiology is the study of the composition and physiology of microbial communities in the environment. Environmental microbiology, as a discipline began as a somewhat marginal branch of Life Sciences which then transformed into one of the most vibrant and visible areas of contemporary research. Because the environmental microbes affect many aspects of life and can be easily transported between environments, the field of environmental microbiology interacts with several different areas, including soil, aquatic, as well as water quality, bioremediation, occupational health and infection control, food safety, and industrial microbiology.

The initial scientific focus of environmental microbiology was on water quality management and the effect of pathogens in the environment in the context of protection of public health. Water quality continues to be a significant focus in environmental microbiology because new waterborne pathogens continue to emerge. Over time, the focus has been divided into a number of different areas like soil, food, and industrial products. The importance of environmental microbiology continues to grow as new microorganisms continue to emerge in different environmental sources. The quality control of air, water, and land are among the most important aspects of environmental microbiology which directly affects the health of all living beings. Besides, the ecological balance and transfer of energy in the food chain are also studied in environmental microbiology as these are important to maintain the condition of the planet.

As a point where climate change and global warming are becoming important discussions throughout the world, environmental microbiology is considered one of the tools to alleviate the planet from such dreadful conditions. Besides, the techniques developed in environmental microbiology like wastewater management, air purification, and land refills are tools to protect the quality of life. Environmental microbiology, together with other areas like biotechnology and molecular biology forms an interdisciplinary subject that encompasses different avenues of life.

5.12 EPIDEMIOLOGY

Epidemiology is the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems. Every public health worker should be familiar with the basic principles in this definition and how they are useful.

- **Distribution** - Epidemiology is concerned with the frequency and pattern of health events in a population. Frequency includes not only the number of events in a population, but also the rate or risk of disease in the population. Determining the rate of disease occurrences is critical for making valid comparisons across different populations.
- **Determinants** - Epidemiology is also used to search for causes and other factors that influence the occurrence of health-related events. The occurrence of a health-related event is usually related to multiple determinants that should be considered. Examples of determinants include host susceptibility to a disease, and opportunity for exposure to a microorganism, environmental toxin, insect vector or other infected individual that may pose a risk for acquiring disease.
- **Specified populations** - Epidemiologists are concerned with the collective health of people in a community or other area and the impact of health events on that population.

- **Application** - Epidemiology provides data for directing public health action. An epidemiologist uses the scientific methods of descriptive and analytic epidemiology in diagnosing the health of a community, but also must call upon experience and creativity when planning how to control and prevent disease in the community.

Uses of Epidemiology

- Count health-related events
- Describe the distribution of health-related events in the population
- Describe clinical patterns
- Identify risk factors for developing diseases
- Identify causes or determinants of disease
- Identify control and/or preventive measures

Epidemiologic Methods

The three major epidemiologic techniques are descriptive, analytic, and experimental. Although all three can be used in investigating the occurrence of disease, the method used most is descriptive epidemiology.

Descriptive Epidemiology

In descriptive epidemiology, data that describe the occurrence of the disease are collected by various methods from all relevant sources. The data are then collated by time, place, and person. Four time trends are considered in describing the epidemiologic data. The secular trend describes the occurrence of disease over a prolonged period, usually years; it is influenced by the degree of immunity in the population and possibly nonspecific measures such as improved socioeconomic and nutritional levels among the population. For example, the secular trend of tetanus in the United States since 1920 shows a gradual and steady decline.

Analytic Epidemiology

The second epidemiologic method is analytic epidemiology, which analyzes disease determinants for possible causal relations. The two main analytic methods are the case-control (or case-comparison) method and the cohort method. The case-control method starts with the effect (disease) and retrospectively investigates the cause that led to the effect. The case group consists of individuals with the disease; a comparison group has members similar to those of the case group except for absence of the disease. These two groups are then compared to determine differences that would explain the occurrence of the disease. An example of a case-control study is selecting individuals with meningococcal meningitis and a comparison group matched for age, sex, socioeconomic status, and residence, but without the disease, to see what factors may have influenced the occurrence in the group that developed disease.

Experimental Epidemiology

The third epidemiologic method is the experimental approach. A hypothesis is developed and an experimental model is constructed in which one or more selected factors are manipulated. The effect of the manipulation will either confirm or disprove the hypothesis. An example is the evaluation of the effect of a new drug on a disease. A group of people with the disease is identified, and some members are randomly selected to receive the drug. If the only difference between the two is use of the drug, the clinical differences between the groups should reflect the effectiveness of the drug.

Control of disease

Prevention

Most diseases are preventable to a greater or lesser degree, the chief exceptions being the idiopathic diseases, such as the inherited metabolic defects. In the case of those diseases resulting from environmental exposures, prevention is a matter of eliminating, or sharply reducing, the factors responsible in the environment. Because chemicals and other substances and materials originate largely from human activities, prevention ought to be a simple matter of the application of well-established principles of industrial hygiene. In practice, however, this is often difficult to achieve. The infectious diseases may be prevented in one of two general ways :

- ✓ By preventing contact, and therefore transmission of infection, between the susceptible host and the source of infection and
- ✓ By rendering the host unsusceptible, either by selective breeding or by induction of an effective artificial immunity. The nature of the specific preventive measures, and their efficacy, varies from one disease to another.

Quarantine

Quarantine, which is an effective method of preventing transmission of disease in principle, has had only limited success in actual practice. In only a few instances has quarantine achieved prevention of the spread of disease across international borders, and quarantine of individual cases of human disease has long been abandoned as ineffective.

It has not been possible to prevent effectively the dissemination of airborne disease, notably airborne fungal diseases of plants and human diseases of the upper respiratory tract. Nor is disease ordinarily controllable by elimination of reservoirs of infection, such as those that occur in wild animals. There are, however, certain exceptions in which the reservoir of infection can be greatly reduced. For example, chemotherapy of human tuberculosis may render individual cases noninfectious. The slaughtering of infected cattle may reduce the incidence of bovine tuberculosis, while the culling of poultry can reduce the incidence of bird flu.

When infection is spread less directly, through the agency of living vectors or inanimate vehicles, it is often possible to break one or more of the links connecting the susceptible host with the source of infection. Malaria can be controlled effectively by the elimination of the mosquito vector, and louse-borne typhus in humans can be regulated by disinfestation methods. Similarly, diseases spread in epidemic form through the agency of water or milk are controlled by measures such as the chlorination of public water supplies and the pasteurization of milk.

Immunization

Immunization against certain diseases provides immunity and may be used in these instances, particularly when other methods of control are impractical or ineffective. The mass immunization of children in their early years has been highly effective in the control of diphtheria, smallpox, polio, and measles. In addition, hepatitis B immunization of children worldwide has helped control the spread of this highly infectious virus, and the immunization of girls against human papillomavirus is expected to reduce the future incidence of cervical cancer. Under special circumstances, as in certain military populations, it has been possible to control with prophylactic medicinal agents the spread of disease for which effective vaccines have not been developed.

5.13 SUMMARY

Under this unit we have summarized the concept of communicable diseases, infectious diseases, vector-borne diseases, epidemiological principles and contamination etc. Communicable diseases are diseases that can pass from person to person. The pathogens that cause these diseases can spread in various ways, such as through the air, contact with contaminated substances or surfaces, or from animal and insect bites. Many communicable diseases cause mild symptoms that go away without treatment. Others require treatment to prevent them from becoming more serious.

There are steps a person can take to reduce their risk of contracting and transmitting disease-causing pathogens. These include receiving available vaccinations, practicing regular handwashing, and maintaining good hygiene at home. Epidemiology is "the study of disease in populations and of factors that determine its occurrence over time." The purpose is to describe and identify opportunities for intervention. Epidemiology is concerned with the distribution and determinants of health and disease, morbidity, injury, disability, and death in populations. For veterinary epidemiology, this intervention is to enhance not only health but also productivity.

5.14 TERMINAL QUESTIONS

Q.1 What do you mean by communicable diseases? Explain it.

Answer :----------

Q. 2 Describe the vector-borne diseases.

Answer :----------

Q. 3 Describe the types and symptoms of infectious dieases.

Answer :----------

Q. 4 Describe the treatment for communicable diseases.

Answer :----------

Q. **5** Write short notes on the following.

(a) Disinfectants

(b) Antiseptic

Answer :----------

Q. 6. Write short notes on the following.

(a) Immunization

(b) Quarantine

Answer :----------

Q. 7 What do you mean by epidemiology? Explain it.

Answer :----------

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

UNIT 6 : COMMUNITY WATER AND WASTE MANAGEMENT

Structure

6.1 INTRODUCTION

A community is a social unit (a group of living things) with a shared socially significant characteristic, such as place, set of norms, culture, religion, values, customs, or identity. Communities may share a sense of place situated in a given geographical area (e.g. a country, village, town, or neighbourhood) or in virtual space through communication platforms. Durable good relations that extend beyond immediate genealogical ties also define a sense of community, important to their identity, practice, and roles in social institutions such as family, home, work, government, TV network, society, or humanity at large. Although communities are usually small relative to personal social ties, community may also refer to large group affiliations such as national communities, international communities, and virtual communities.

The English-language word community derives from the Old French *comunete*, which comes from the Latin communitas community, public spirit (from Latin *communis*, common). Human communities may have intent, belief, resources, preferences, needs, and risks in common, affecting the identity of the participants and their degree of cohesiveness

OBJECTIVES

This is the sixth unit (Community Water and Waste Management) of second block (Epidemiological Methods, Communicable, Infectious Disease and wasre Management). Under sixth unit, we have following objectives. These are as under :

- To know about community, etiology, and community development
- To know types of community and toxic substances
- To know community wastes and introduction to water
- To discuss solid waste management and liquid waste

6.2 COMMUNITY DEVELOPMENT

Community development is often linked with community work or community planning, and may involve stakeholders, foundations, governments, or contracted entities including non-government organisations (NGOs), universities or government agencies to progress the social well-being of local, regional and, sometimes, national communities. More grassroots efforts, called community building or community organizing, seek to empower individuals and groups of people by providing them with the skills they need to effect change in their own communities. These skills often assist in building political power through the formation of large social groups working for a common agenda. Community development practitioners must understand both how to work with individuals and how to affect communities' positions within the context of larger social institutions. Public administrators, in contrast, need to understand community development in the context of rural and urban development, housing and economic development, and community, organizational and business development.

6.3 TYPES OF COMMUNITY

A number of ways to categorize types of community have been proposed. One such breakdown is as follows :

- **Location-based Communities** - It range from the local neighbourhood, suburb, village, town or city, region, nation or even the planet as a whole. These are also called communities of place.
- **Identity-based Communities** - It range from the local clique, sub-culture, ethnic group, religious, multicultural or pluralistic civilisation, or the global community cultures of today. They may be included as communities of need or identity, such as disabled persons, or frail aged people.
- **Organizationally-based Communities** - It range from communities organized informally around family or network-based guilds and associations to more formal incorporated associations, political decision-making structures, economic enterprises, or professional associations at a small, national or international scale.
- **Intentional Communities** - It is a mix of all three previous types, these are highly cohesive residential communities with a common social or spiritual purpose, ranging from monasteries and ashrams to modern ecovillages and housing cooperatives.

The usual categorizations of community relations have a number of problems : (1) they tend to give the impression that a particular community can be defined as just this kind or another; (2) they tend to conflate modern and customary community relations; (3) they tend to take sociological categories such

as ethnicity or race as given, forgetting that different ethnically defined persons live in different kinds of communities-grounded, interest-based, diasporic, etc

Pneumonia

There is a categorization Pneumonia by which pathogen (virus, bacteria or fungi) caused it and how you got it — community-acquired, hospital-acquired or ventilator-associated pneumonia.

6.4 COMMUNITY-ACQUIRED PNEUMONIA (CAP)

When you get pneumonia outside of a healthcare facility, it's called community-acquired pneumonia. Causes include :

1. **Bacteria -** Infection with *Streptococcus pneumoniae* bacteria, also called pneumococcal disease, is the most common cause of CAP. Pneumococcal disease can also cause ear infections, sinus infections and meningitis. Mycoplasma pneumoniae bacteria causes atypical pneumonia, which usually has milder symptoms. Other bacteria that cause CAP include *Haemophilus influenza*, *Chlamydia pneumoniae* and *Legionella* (Legionnaires' disease).
2. **Viruses -** Viruses that cause the common cold, the flu (influenza), COVID-19 and respiratory syncytial virus (RSV) can sometimes lead to pneumonia.
3. **Fungi (molds) -** Fungi, like *Cryptococcus*, *Pneumocystis jirovecii* and *Coccidioides*, are uncommon causes of pneumonia. People with compromised immune systems are most at risk of getting pneumonia from a fungus.
4. **Protozoa -** Rarely, protozoa like *Toxoplasma* cause pneumonia.

6.5 HOSPITAL-ACQUIRED PNEUMONIA (HAP)

You can get hospital-acquired pneumonia (HAP) while in a hospital or healthcare facility for another illness or procedure. HAP is usually more serious than community-acquired pneumonia because it's often caused by antibiotic-resistant bacteria, like methicillin-resistant *Staphylococcus aureus* (MRSA). This means HAP can make you sicker and be harder to treat.

Healthcare-associated pneumonia (HCAP)

You can get HCAP while in a long-term care facility (such as a nursing home) or outpatient, extended-stay clinics. Like hospital-acquired pneumonia, it's usually caused by antibiotic-resistant bacteria.

Ventilator-associated pneumonia (VAP)

If you need to be on a respirator or breathing machine to help you breathe in the hospital (usually in the ICU), you're at risk for ventilator-associated pneumonia (VAP). The same types of bacteria as community-acquired pneumonia, as well as the drug-resistant kinds that cause hospital-acquired pneumonia, cause VAP.

Treatment

Treatment for pneumonia depends on the cause — bacterial, viral or fungal — and how serious your case is. In many cases, the cause can't be determined and treatment is focused on managing symptoms and making sure your condition doesn't get worse.

Some treatments may include :

- **Antibiotics -** Antibiotics treat bacterial pneumonia. They can't treat a virus but a provider may prescribe them if you have a bacterial infection at the same time as a virus.

- **Antifungal medications -** Antifungals can treat pneumonia caused by a fungal infection.
- **Antiviral medications** - Viral pneumonia usually isn't treated with medication and can go away on its own. A provider may prescribe antivirals such as oseltamivir (Tamiflu, zanamivir or peramivir to reduce how long you're sick and how sick you get from a virus.
- **Oxygen therapy -** If you're not getting enough oxygen, a provider may give you extra oxygen through a tube in your nose or a mask on your face.
- **IV fluids -** Fluids delivered directly to your vein (IV) treat or prevent dehydration.
- **Draining of fluids -** If you have a lot of fluid between your lungs and chest wall (pleural effusion), a provider may drain it. This is done with a catheter or surgery.

6.6 ETIOLOGY

In medicine, etiology refers to the cause or causes of diseases or pathologies.[3] Where no etiology can be ascertained, the disorder is said to be idiopathic. Traditional accounts of the causes of disease may point to the evil eye. The Ancient Roman scholar Marcus Terentius Varro put forward early ideas about microorganisms in a 1st-century BC book titled *On Agriculture*. Medieval thinking on the etiology of disease showed the influence of Galen and of Hippocrates. Medieval European doctors generally held the view that disease was related to the air and adopted a miasmatic approach to disease etiology.

Etiological discovery in medicine has a history in Robert Koch's demonstration that species of the pathogenic bacteria *Mycobacterium tuberculosis* causes the disease tuberculosis; *Bacillus anthracis* causes anthrax, and *Vibrio cholerae* causes cholera. This line of thinking and evidence is summarized in Koch's postulates. But proof of causation in infectious diseases is limited to individual cases that provide experimental evidence of etiology. In epidemiology, several lines of evidence together are required to for causal inference. Austin Bradford Hill demonstrated a causal relationship between tobacco smoking and lung cancer, and summarized the line of reasoning in the Bradford Hill criteria, a group of nine principles to establish epidemiological causation.

Disease causative agent

The infectious diseases are caused by infectious agents or pathogens. The infectious agents that cause disease fall into five groups : viruses, bacteria, fungi, protozoa, and helminths (worms).

6.7 TOXIC SUBSTANCES

A toxin is a naturally occurring organic poison produced by metabolic activities of living cells or organisms. They occur especially as proteins, often conjugated. The term was first used by organic chemist Ludwig Brieger and is derived from the word toxic. Toxins can be small molecules, peptides, or proteins that are capable of causing disease on contact with or absorption by body tissues interacting with biological macromolecules such as enzymes or cellular receptors. They vary greatly in their toxicity, ranging from usually minor (such as a bee sting) to potentially fatal even at extremely low doses (such as botulinum toxin).

Toxins are often distinguished from other chemical agents strictly based on their biological origin. Less strict understandings embrace naturally occurring inorganic toxins, such as arsenic. Other understandings embrace synthetic analogs of naturally occurring organic poisons as toxins, and may or may not embrace naturally occurring inorganic poisons. It is important to confirm usage if a common understanding is critical. Toxins are a subset of toxicants. The term toxicant is preferred when the poison is man-made and therefore artificial. The human and scientific genetic assembly of a natural-based toxin should be considered a toxin as it is identical to its natural counterpart.

The word toxin does not specify method of delivery (as opposed to venom, a toxin delivered via a bite, sting, etc.). Poison is a related but broader term that encompasses both toxins and toxicants; poisons may enter the body through any means - typically inhalation, ingestion, or skin absorption. Toxin, toxicant, and poison are often used interchangeably despite these subtle differences in definition. The term toxungen has also been proposed to refer to toxins that are delivered onto the body surface of another organism without an accompanying wound. A rather informal terminology of individual toxins relates them to the anatomical location where their effects are most notable :

- Genitotoxin, damages the urinary organs or the reproductive organs
- Hemotoxin, causes destruction of red blood cells (hemolysis)
- Phototoxin, causes dangerous photosensitivity
- Hepatotoxins affect the liver
- Neurotoxins affect the nervous system

On a broader scale, toxins may be classified as either exotoxins, excreted by an organism, or endotoxins, which are released mainly when bacteria are lysed. The term biotoxin is sometimes used to explicitly confirm the biological origin as opposed to environmental or anthropogenic origins. Biotoxins can be classified by their mechanism of delivery as poisons (passively transferred via ingestion, inhalation, or absorption across the skin), toxungens (actively transferred to the target's surface by spitting, spraying, or smearing), or venoms (delivered through a wound generated by a bite, sting, or other such action). They can also be classified by their source, such as fungal biotoxins, microbial toxins, plant biotoxins, or animal biotoxins.

Toxins produced by microorganisms are important virulence determinants responsible for microbial pathogenicity and/or evasion of the host immune response. Biotoxins vary greatly in purpose and mechanism, and can be highly complex (the venom of the cone snail can contain over 100 unique peptides, which target specific nerve channels or receptors).[22]

Biotoxins in nature have two primary functions :

- Predation, such as in the spider, snake, scorpion, jellyfish, and wasp
- Defense as in the bee, ant, termite, honey bee, wasp, poison dart frog and plants producing toxins
- The toxins used as defense in species among the poison dart frog can also be used for medicinal purposes

Some of the more well known types of biotoxins include :

- ✓ Cyanotoxins, produced by cyanobacteria
- ✓ Dinotoxins, produced by dinoflagellates
- ✓ Necrotoxins cause necrosis (i.e., death) in the cells they encounter. Necrotoxins spread through the bloodstream. In humans, skin and muscle tissues are most sensitive to necrotoxins. Organisms that possess necrotoxins include :
- ✓ The brown recluse or fiddle back spider
- ✓ Most rattlesnakes and vipers produce phospholipase andvarious trypsin-like serine proteases
- ✓ Most rattlesnakes and vipers produce phospholipase andvarious trypsin-like serine proteases
- ✓ Necrotizing fasciitis (caused by the flesh eating bacterium *Streptococcus pyogenes*) – produces a pore forming toxin

- Neurotoxins primarily affect the nervous systems of animals. The group neurotoxins generally consists of ion channel toxins that disrupt ion channel conductance. Organisms that possess neurotoxins include :
    - ✓ The black widow spider.
    - ✓ Most scorpions
    - ✓ The box jellyfish
    - ✓ Elapid snakes
    - ✓ The cone snail
    - ✓ The Blue-ringed octopus

Health Risks

There are three ways that toxic substances can enter the human body :

- Inhalation
- Skin absorption
- Ingestion

They can cause acute effects (which present immediately upon exposure) and chronic effects (which may take months or years to present symptoms). Inhalation is the most common form of toxic chemical exposure. It occurs when personnel are in contact with airborne toxic substances. Inhaling toxic chemicals can induce intoxication very quickly, leading to both acute and chronic effects. Inhalation can irritate your respiratory tract as well as your eyes, nose and throat. Vapours can cause a range of health issues from nausea, dizziness and drowsiness to unconsciousness and death.

Skin absorption is another health risk associated with working with toxic substances, which can cause serious health problems. Some toxic substances, such as organic solvents and organic pesticides, can be quickly absorbed through your skin and enter your bloodstream. Even a small amount of toxic chemicals accidently splashed onto the skin or splattered onto clothing can cause acute health effects for personnel.

Ingestion is the least common form of toxic substance exposure. It can occur in workplaces when personnel accidently consume toxic substances— such as drinking from an incorrectly labelled bottle which contains toxic chemicals. Ingestion can be in the form of drinking, eating or smoking toxic substances.

Acute effects of toxic chemical exposure usually present themselves immediately. These effects can include headaches, nausea, vomiting, skin irritation and more. Chronic effects are the result of long-term exposure to toxic substances and can appear months and years after the initial exposure. Diseases which are caused by long-term exposure may include life-threatening illnesses such as cancer and lung disease.

Common Toxic Substances

There are many toxic substances that are commonly found in Australian workplaces and laboratories. Examples of toxic substances include methylene chloride, hydrogen peroxide and Sodium Azide.

Methylene chloride

It is a colourless solvent that has a sweet odour. This chemical can cause harm to the central nervous system and irritation to your eyes and skin upon exposure. Methylene chloride can also immediately induce headaches, nausea, dizziness and drowsiness. These symptoms have a severe effect on your coordination. High exposure to methylene chloride can result in death.

Hydrogen peroxide

It is an oxidising agent with toxic properties. It is a very common toxic substance which is used as a bleaching agent, antiseptic and oxidiser. If hydrogen peroxide vapours are inhaled, it can cause severe pulmonary irritation. If it is ingested, it may induce vomiting, stomach aches and gastric distension. If this chemical is ingested in high concentrations it can be life-threatening.

Sodium Azide

It is a rapidly-acting toxic substance that is commonly used as a chemical preservative in laboratories and hospitals. This chemical is a toxic skin irritant that can cause a range of health issues including low blood pressure, headaches and heart failure. If sodium azide is swallowed, inhaled or comes into contact with skin, it can result in a fatality.

Infectious agents

There are many types of infectious agents that pose serious health risks to humans. Infectious agents can enter the body through the mouth or nose or even through bites or wounds. From bacteria to fungi to parasites that live off human bodies, understanding how these agents attack our bodies is the first step in developing treatments and cures for the infections they cause.

People get sick when another organism, big or small, invades their body and infects them. These infectious agents come in all shapes and sizes, and all of them pose different threats to the human body. Some are microscopic, such as bacteria or viruses, which attack human bodies on the cellular level. Others are larger, like fungi, which are unicellular or multicellular organisms that grow on and feed off organic material, including humans. Finally, parasites such as tapeworms can find their way inside the human body and feed on blood and nutrients without killing their host.

Infectious diseases can be caused by :

- **Bacteria.** These one-cell organisms are responsible for illnesses such as strep throat, urinary tract infections and tuberculosis.
- **Viruses.** Even smaller than bacteria, viruses cause a multitude of diseases ranging from the common cold to AIDS.
- **Fungi.** Many skin diseases, such as ringworm and athlete's foot, are caused by fungi. Other types of fungi can infect your lungs or nervous system.

- **Parasites.** Malaria is caused by a tiny parasite that is transmitted by a mosquito bite. Other parasites may be transmitted to humans from animal feces.

6.8 INTRODUCTION TO WATER

This mainly excludes seawater and brackish water, which is water that has more dissolved salts than freshwater, but less than seawater.Freshwater sources include rivers, lagoons, lakes, wetlands, icebergs, glaciers, groundwater, groundwater currents, aquifers, ice caps, and ice fields. These freshwater sources are characterised by a low concentration of dissolved salts, less than 500 parts per million (ppm) of dissolved salts. Fresh water can come from many different sources on earth. While a vast majority of earth's water comes from the oceans that cover almost 70% of the planet's surface and are too salty to drink, there are still plenty of places where fresh water occurs naturally.

Sources of Freshwater

The main sources of water are rain, groundwater, ice, rivers, lakes, streams, and natural reservoirs. We derive water for daily use through these sources. Let us now learn about each of these sources of water in detail.

Rain

An important source of freshwater that is often overlooked is stormwater. This is the product of earth's water that has evaporated into the atmosphere and turned into rain. Making the most of an unlimited supply of freshwater that is sometimes taken for granted, rainwater harvesting is a technology that was employed by ancient civilizations and is currently commonly used in many rural places.

Groundwater

Beneath the surface of the earth lies a great source of freshwater. Groundwater is the largest source of freshwater on the planet and the second largest source of water, along with that present in the oceans. Like the salt water of the sea, most of it cannot be consumed by people or animals. However, a percentage of the groundwater is fresh and can be desalinated and refined in order to provide safe drinking water for the population.

Ice

A major topic of debate surrounding the earth's climate change issues is the melting of the polar ice caps and the shrinking of ice shelves throughout the Arctic. Along with groundwater, ice makes up the second largest source of freshwater on the planet, accounting for just under 2 percent of earth's water. Some of the freshwater preserved in ice, especially in the Antarctic ice sheets, is thousands of years old. As with groundwater and seawater, it is also difficult to use ice water as a source of drinking water, but it is possible.

Rivers, Lakes, Streams, and Natural Springs

As the only natural source of freshwater on earth, rivers, lakes, streams, and natural springs are referred to as surface water sources (0.0014 per cent). Despite the fact that there are millions of freshwater lakes and many kilometres of rivers and streams on the planet, these water sources represent an almost insignificant amount of freshwater. However, they remain vitally important : A large amount

of our drinking water comes from them.Some main water sources images are as below :

Fig. Sources of water

Main uses of water in human life

The importance of water for human beings is not only in its daily use such as washing dishes, personal hygiene, watering plants, etc. There are activities in which water plays a very important role and also becomes an economic and industrial resource. These various uses of water reflect its importance in the development and growth of the human being in all its areas. The below image shows the uses of water for kids to learn.

Fig. Uses of water

1. **Human consumption -** Water is used for drinking, to make the different beverages that man consumes, to prepare food, and in factories where food is processed.
2. **Personal hygiene -** Personal hygiene activities are where water is most wasted : people tend to waste thousands of litres of water when bathing and brushing their teeth. Pisciculture : This is an

activity that refers to the cultivation of fish, that is, their breeding and reproduction. In it are also shellfish and, in general, any aquatic animal.

3. **Agriculture -** The importance of water for this set of activities created by man is fundamental, it is where fruits, vegetables, and grains are grown for human consumption. The land is treated so that it is fertile and can provide food for people and animals.

4. **Industry -** There are different sectors in which the function of water is important. It can be from a technological point to the textile sector that is responsible for the creation of fabrics.

Drinking water

Drinking water or potable water is water that is safe for ingestion, either when drunk directly in liquid form or consumed indirectly through food preparation. It is often (but not always) supplied through taps, in which case it is also called tap water. Typically in developed countries, tap water meets drinking water quality standards, even though only a small proportion is actually consumed or used in food preparation. Other typical uses for tap water include washing, toilets, and irrigation. Greywater may also be used for toilets or irrigation. Its use for irrigation however may be associated with risks. The amount of drinking water required to maintain good health varies, and depends on physical activity level, age, health-related issues, and environmental conditions. For those who work in a hot climate, up to 16 litres a day may be required.

Globally, by 2015, 89% of people had access to water from a source that is suitable for drinking – called *improved water sources*. In sub-Saharan Africa, access to potable water ranged from 40% to 80% of the population. Nearly 4.2 billion people worldwide had access to tap water, while another 2.4 billion had access to wells or public taps. The World Health Organization considers access to safe drinking-water a basic human right. About 1 to 2 billion people lack safe drinking water. Water can carry vectors of disease. Developing countries are most affected by unsafe drinking water.

Sources

Potable water is available in almost all populated areas of the Earth, although it may be expensive and the supply may not always be sustainable. Sources where drinking water is commonly obtained include springs, hyporheic zones and aquifers (groundwater), from rainwater harvesting, surface water (from rivers, streams, glaciers), or desalinated seawater. For these water sources to be consumed safely, they must receive adequate water treatment and meet drinking water quality standards.

Supply

The most efficient and convenient way to transport and deliver potable water is through pipes. Plumbing can require significant capital investment. Some systems suffer high operating costs. The cost to replace the deteriorating water and sanitation infrastructure of industrialized countries may be as high as $200 billion a year. Leakage of untreated and treated water from pipes reduces access to water. Leakage rates of 50% are not uncommon in urban systems. Tap water, delivered by domestic water systems refers to water piped to homes and delivered to a tap or spigot.

Usage for drinking

The recommended daily amount of drinking water for humans varies. It depends on activity, age, health, and environment. In the United States, the Adequate Intake for total water, based on median intakes, is 4 litres per day for males older than 18, and 3 litres per day for females over 18; it assumes about 80% from drink and 20% from food. The European Food Safety Authority recommends 2.0 litres of total water per day for women and 2.5 litres per day for men.

6.9 COMMUNITY WASTES

Community-based waste management programs are collaborations between NGO's, government agencies and impacted communities, to provide the equipment, resources and training necessary to establish an effective waste management program and to run the program independently. Community-based waste management programs often require initial support, guidance and resources from local authorities and/or NGOs.

Community-based waste management programs offer populations in low and middle income countries where there is no, or inadequate, municipal waste management services with a low-cost, effective and engaging waste management system. Such systems encourage : Direct community-member engagement and accountability Tracking of waste collection and reduction segregation of waste at the household level On-site utilization of valuable and reusable items composting of organic waste collection and transportation of waste to a treatment site by a public collection service.

Community wastes management

Recycling and proper hazardous materials disposal is just as important at home as it is in the work place. Cleaners, mercury thermometers, pesticides, gasoline, oil, batteries, etc. pose a hazard to you and your family as well as to the environment. These materials should always be stored in a secured area, away from food, animals and children. Flammable materials, pesticides, fertilizers, herbicides and paints should be stored outside in a shed or in a metal cabinet in a garage. The different resources will help us properly dispose of recyclables and household hazardous material. These drains lead directly to creeks and rivers and could poison the environment as well as our drinking water.

6.10 SOLID WASTE MANAGEMENT (SWM)

Solid waste management (SWM) is a critical aspect of environmental sustainability and public health. It encompasses the collection, transportation, disposal, and recycling of various types of solid waste generated by human activities. With rapid urbanization, industrialization, and population growth, effective solid waste management has become a pressing global concern. In this unit we have discussed a comprehensive overview of solid waste management, including its importance, challenges, strategies, and sustainable solutions.

Importance of solid waste management

Solid waste poses significant environmental, social, and economic challenges if not managed properly. Improper disposal of waste can lead to pollution of land, water, and air, causing harm to ecosystems and human health. It also contributes to the depletion of natural resources and exacerbates climate change through greenhouse gas emissions from landfill sites and waste incineration. Additionally, inadequate waste management infrastructure can lead to aesthetic degradation of communities, negatively impacting tourism and property values. Therefore, effective solid waste management is essential for protecting the environment, public health, and the economy.

6.11 TYPES OF SOLID WASTE

Solid waste can be categorized into various types based on its source, composition, and characteristics. Common types of solid waste include :

1. **Municipal Solid Waste (MSW) -** Generated from households, commercial establishments, and institutions, including organic waste, paper, plastics, glass, metals, and textiles.
2. **Industrial Waste -** Generated from manufacturing processes, construction activities, and industrial facilities, comprising hazardous and non-hazardous materials such as chemicals,

solvents, metals, and electronic waste.

3. **Construction and Demolition (C&D) Waste -** Generated from construction, renovation, and demolition activities, including concrete, wood, metals, asphalt, and plastics.
4. **Hazardous Waste -** Poses a threat to human health and the environment due to its toxic, flammable, corrosive, or reactive properties, including chemicals, batteries, electronic waste, and medical waste.
5. **Agricultural Waste -** Generated from farming and agricultural practices, including crop residues, animal manure, and pesticides.

6.12 CHALLENGES IN SOLID WASTE MANAGEMENT

Despite its importance, solid waste management faces numerous challenges globally, including :

1. **Rapid Urbanization -** The growing urban population leads to increased waste generation, straining existing waste management infrastructure and resources.
2. **Inadequate Infrastructure -** Many regions lack sufficient infrastructure for waste collection, transportation, treatment, and disposal, resulting in illegal dumping and open burning of waste.
3. **Lack of Awareness and Education -** Limited public awareness and education about waste segregation, recycling, and proper disposal practices contribute to improper waste management behaviors.
4. **Financial Constraints -** Insufficient funding and budget allocations for waste management hinder the implementation of effective waste management programs and infrastructure development.
5. **Informal Waste Sector -** The presence of informal waste pickers and scavengers in many developing countries highlights the need for formalization and integration of their activities into the formal waste management system.
6. **Technological Barriers -** Outdated technology and equipment in waste management facilities limit the efficiency and effectiveness of waste treatment and recycling processes.
7. **Pollution and Health Risks -** Improper disposal of waste contaminates soil, water, and air, posing risks to human health and ecosystems through the release of pollutants and pathogens.
8. **Climate Change Impacts -** Landfilling and incineration of waste contribute to greenhouse gas emissions, exacerbating climate change and its associated environmental impacts.

6.13 STRATEGIES FOR SUSTAINABLE SOLID WASTE MANAGEMENT

To address the challenges associated with solid waste management and move towards sustainability, various strategies and approaches can be adopted :

1. **Waste Reduction and Minimization -** Implementing waste reduction initiatives such as source reduction, reuse, and repair to minimize the generation of waste at the source.
2. **Waste Segregation and Recycling -** Promoting waste segregation at the household, commercial, and institutional levels to separate recyclable materials such as paper, plastics, glass, and metals for recycling.
3. **Composting and Organic Waste Management -** Encouraging composting of organic waste such as food scraps, yard waste, and agricultural residues to produce nutrient-rich compost for soil amendment and organic farming.

4. **Extended Producer Responsibility (EPR) -** Implementing EPR policies that hold manufacturers responsible for the end-of-life management of their products, encouraging product design for recyclability and reuse.
5. **Waste-to-Energy (WTE) Technologies -** Investing in waste-to-energy technologies such as incineration, anaerobic digestion, and gasification to convert non-recyclable waste into energy while reducing landfilling and greenhouse gas emissions.
6. **Circular Economy Approaches** - Embracing circular economy principles to promote resource efficiency, closed-loop systems, and sustainable consumption and production patterns, thereby minimizing waste generation and maximizing resource recovery.
7. **Public Awareness and Education -** Conducting public awareness campaigns, educational programs, and community engagement initiatives to promote waste reduction, recycling, and proper waste management practices.
8. **Policy and Regulatory Frameworks -** Developing and enforcing robust policy and regulatory frameworks at the national, regional, and local levels to support sustainable waste management practices, including waste bans, landfill taxes, and recycling mandates.
9. **Public-Private Partnerships (PPPs) -** Fostering collaboration between government agencies, private sector entities, civil society organizations, and communities to leverage resources, expertise, and innovation for integrated solid waste management solutions.
10. **Capacity Building and Technical Assistance -** Providing training, capacity building, and technical assistance to government agencies, waste management professionals, and stakeholders to enhance their skills and knowledge in sustainable waste management practices.

6.14 LIQUID WASTE

Liquid waste is a major problem in the world, due to approximately 71% of the Earth's surface being covered in water. According to the Environmental Protection Agency (EPA), liquid waste is defined as any waste material that passes the definition of a liquid. This means that the material must, pass through a 0.45 micron filter at a pressure differential of 75 psi, according to the EPA's provided definition of a liquid (1). The main producers of liquid waste are animals and human beings as natural excretion of waste is flushed into sewage and waste lines.

Liquid waste can be defined as such Liquids as wastewater, fats, oils or grease (FOG), used oil, liquids, solids, gases, or sludges and hazardous household liquids. These liquids that are hazardous or potentially harmful to human health or the environment. They can also be discarded commercial products classified as Liquid Industrial Waste such as cleaning fluids or pesticides, or the by-products of manufacturing processes. There are general regulatory requirements relating to waste, additional regulations apply to generating, storing, transporting, treating and disposing of hazardous and liquid wastes. Ewaste Disposal is dedicated to the collection, transportation, treatment, recycling, reclamation and disposal of wastewaters.

Why is Liquid Waste Important?

Liquid waste is such an important category of waste management because it is so difficult to deal with. Unlike solid wastes, liquid wastes cannot be easily picked up and removed from an environment. Liquid wastes spread out, and easily pollute other sources of liquid if brought into contact. This type of waste can also soak into objects such as soil and groundwater. This pollution then carries over to pollute the plants we eat, the animals in the ecosystem, as well as the humans within the area of the pollution.

Aging Wastewater Treatment Infrastructure in the U.S.

Wastewater treatment infrastructure in the U.S. has grown slowly over the past years, with only $45 billion of the estimated $271 billion raised for improvements so far. This means that currently 76% of the population in the U.S. are relying on only 14,748 water treatment plants (3). These plants are also becoming less and less efficient each year due to buildup within piping aging equipment. Many of the treatment plants currently in operation cannot keep up with the amount of liquid waste they are receiving, which results in over-spill into lakes and rivers.

6.15 SUMMARY

Under this unit we have summarized the etiology, community development, solid waste management, toxic substances and liquid wastes etc. Etiology is the study of the causes, origins, or reasons behind the way that things are, or the way they function, or it can refer to the causes themselves. The word is commonly used in medicine and in philosophy, but also in physics, biology, psychology, government, geography, spatial analysis and theology in reference to the causes or origins of various phenomena.

Solid waste management is a complex and multifaceted issue that requires holistic, integrated, and sustainable solutions to address effectively. By adopting innovative strategies, leveraging technology, fostering collaboration, and promoting public participation, communities and governments can achieve significant progress towards sustainable solid waste management. However, addressing the challenges of waste management requires concerted efforts A toxic substance is a substance that can be poisonous or cause health effects. People are generally concerned about chemicals like polychlorinated biphenyls (PCBs) and dioxin which can be found at some hazardous waste sites. Liquid waste refers to waste materials that appear in the form of liquid matter. Waste management and the proper disposal of liquid waste are important for maintaining the safety of the environment and production processes.

6.16 TERMINAL QUESTIONS

Q. 1 What do you mean by community development? Explain it.

Answer :----------

Q. 2 What are the challenges in solid waste management? Explain it.

Answer :----------

Q. 3 Describe strategies for sustainable solid waste management.

Answer :----------

Q. 4 Write short notes on the following.

(a) Liquid waste

(b) Etiology

Answer :----------

-

Q. 5 Describe different types of solid waste.

Answer :----------

Q. 6 Write short notes on the following.

(a) Solid waste management (SWM)

(b) Toxic Substances

Q. Answer :----------

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

BLOCK-3

This is the third block (Community food protection, Food adulteration and immunization) on Public Health and Epidemiology. The third block is organized into three units as under :

Unit VII Community Food Protection

Unit VIII Food Adulteration

Unit IX Lifestyle and Community Health

Unit X Immunization

The introduction of third block is as under :

BLOCK – 3 : BLOCK INTRODUCTION

Food Protection protects the safety and security of the new hampshire food supply and prevents foodborne illness and injuries through inspection, enforcement, and education by qualified staff in collaboration with the food industry. Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent food borne. This includes a number of routines that should be followed to avoid potentially severe health hazards. In this way food safety often overlaps with food defense to prevent harm to consumers. The tracks within this line of thought are safety between industry and the market and then between the market and the consumer. In considering industry to market practices, food safety considerations include the origins of food including the practices relating to food labeling, food hygiene, food additives and pesticide residues, as well as policies on biotechnology and food and guidelines for the management of governmental import and export inspection and certification systems for foods.

The implementation of food safety inspection varies across jurisdictions. Some jurisdictions follow a prescriptive approach, setting specific food safety requirements for businesses and using inspection to measure compliance. This compliance-check approach typically involves inspection checklists and numerical scoring or grading systems, which may carry different weights for various non-compliances. Regulatory systems often prescribe actions based on score ranges, such as enforcement measures or adjustments to inspection frequency. The application of food safety inspection also differs in motivating compliance. Traditionally, inspections aimed to identify and report safety deficiencies to food business operators for resolution within a specified timeframe. Regulatory frameworks may include compliance motivators such as monetary penalties and other enforcement measures triggered by inspection findings.

UNIT-7 COMMUNITY FOOD PROTECTION

Structure

7.1 INTRODUCTION

Food safety (or food hygiene) is used as a scientific method/discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness. The occurrence of two or more cases of a similar illness resulting from the ingestion of a common food is known as a food-borne disease outbreak. This includes a number of routines that should be followed to avoid potential health hazards. In this way, food safety often overlaps with food defense to prevent harm to consumers. The tracks within this line of thought are safety between industry and the market and then between the market and the consumer.

In considering industry-to-market practices, food safety considerations include the origins of food including the practices relating to food labeling, food hygiene, food additives and pesticide residues, as well as policies on biotechnology and food and guidelines for the management of governmental import and export inspection and certification systems for foods. In considering market-to-consumer practices, the usual thought is that food ought to be safe in the market and the concern is safe delivery and preparation of the food for the consumer. Food safety, nutrition and food security are closely related. Unhealthy food creates a cycle of disease and malnutrition that affects infants and adults as well.

OBJECTIVES

This is the seventh unit (Community food protection) of third block (Community food protection, Food Adulteration and Immunization). Under seventh unit, we have following objectives. These are as under :

- To know about food protection and food poisoning
- To know the epidemiology of foodborne diseases
- To discuss different types of food contamination
- To know about causes and symptoms of foodborne illness

Food can transmit pathogens, which can result in the illness or death of the person or other animals. The main types of pathogens are bacteria, viruses, parasites, and fungus. The WHO Foodborne Disease Epidemiology Reference Group conducted the only study that solely and comprehensively focused on the global health burden of foodborne diseases. This study, which involved the work of over 60 experts for a decade, is the most comprehensive guide to the health burden of foodborne diseases. The first part of the study revealed that 31 foodborne hazards considered priority accounted for roughly 420,000 deaths in LMIC and posed a burden of about 33 million disability adjusted life years in 2010.

Food can also serve as a growth and reproductive medium for pathogens. In developed countries there are intricate standards for food preparation, whereas in lesser developed countries there are fewer standards and less enforcement of those standards. Even so, in the US, in 1999, 5,000 deaths per year were related to foodborne pathogens. Another main issue is simply the availability of adequate safe water, which is usually a critical item in the spreading of diseases. In theory, food poisoning is 100% preventable. However this cannot be achieved due to the number of persons involved in the supply chain, as well as the fact that pathogens can be introduced into foods no matter how many precautions are taken.

7.2 ISSUES

Food safety issues and regulations concern :

- Food label
- Agriculture and animal husbandry practices
- Food manufacturing practices
- Food additives
- Novel foods
- Genetically modified foods
- Food contamination

7.3 FOOD CONTAMINATION

Food contamination happens when foods are corrupted with another substance. It can happen In the process of production, transportation, packaging, storage, sales, and cooking process. Contamination

can be physical, chemical, or biological.

7.4 PHYSICAL CONTAMINATION

Physical contaminants (foreign bodies) are objects such as hair, plant stalks or pieces of plastic and metal. When a foreign object enters food, it is a physical contaminant. If the foreign objects are bacteria, both a physical and biological contamination will occur. Common sources of physical contaminations are : hair, glass or metal, pests, jewelry, dirt, and fingernails.

Physical food contamination is a hazardous yet natural accident of contaminating food with dangerous objects around the kitchen or production base when being prepared. If kitchens or other places where food may be prepared are unsanitary, it is very likely that physical contamination will occur and cause negative consequences. Dangerous objects such as glass and wire may be found in food which can cause many issues with the individuals who consume it including choking, breaking of teeth and cutting the insides of the body.

Children and the elderly are at the highest risk of being harmed by food contamination due to their weaker immune systems and fragile structures. The most common reasoning for physical contamination to occur is when the food is left uncovered without lids. To prevent such contamination and harm to those consuming food from restaurants, cooks are recommended to wear hair nets, remove jewelry, and wear gloves when necessary, especially over wounds with bandages.

7.5 CHEMICAL CONTAMINATION

Chemical contamination happens when food is contaminated with a natural or artificial chemical substance. Common sources of chemical contamination can include : pesticides, herbicides, veterinary drugs, contamination from environmental sources (water, air or soil pollution), cross-contamination during food processing, migration from food packaging materials, presence of natural toxins, or use of unapproved food additives and adulterants.

7.6 BIOLOGICAL CONTAMINATION

It happens when the food has been contaminated by substances produced by living creatures, such as humans, rodents, pests or microorganisms. This includes bacterial contamination, viral contamination, or parasite contamination that is transferred through saliva, pest droppings, blood or fecal matter. Bacterial contamination is the most common cause of food poisoning worldwide. If an environment is high in starch or protein, water, oxygen, has a neutral pH level, and maintains a temperature between 5°C and 60°C (danger zone) for even a brief period of time (~0–20 minutes), bacteria are likely to survive.

7.7 EPIDEMIOLOGY OF FOODBORNE DISEASES

Over 200 diseases are caused by eating food contaminated with bacteria, viruses, parasites or chemical substances such as heavy metals. This growing public health problem causes considerable socioeconomic impact though strains on health-care systems lost productivity, and harming tourism and trade. These diseases contribute significantly to the global burden of disease and mortality. Foodborne diseases are caused by contamination of food and occur at any stage of the food production, delivery and consumption chain. They can result from several forms of environmental contamination including pollution in water, soil or air, as well as unsafe food storage and processing.

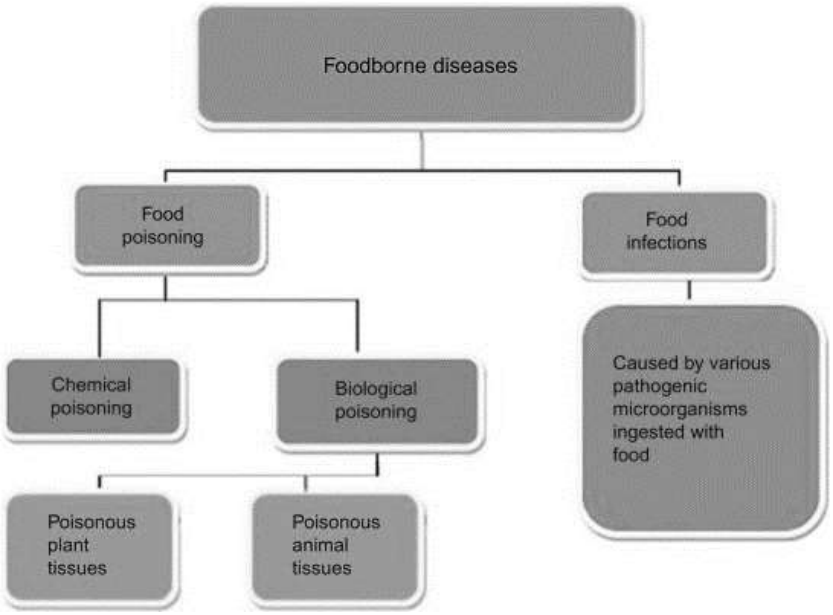

Fig. Foodborne diseases

Foodborne diseases comprise a broad spectrum of diseases and account for a significant proportion morbidities and mortalities worldwide, it is a major public health concern in both developed and developing countries. The exact mortality associated with foodborne illnesses is difficult to determined. However, gastrointestinal illness caused about 2 million deaths worldwide during the year 2005. Various pathogens or toxins can cause more than 250 different foodborne illnesses. Even though the causative agents of most cases of foodborne diseases are unknown, bacteria and viruses are the most likely causative agents from the worldwide. An estimated 9.4 million illnesses, 56,000 hospitalizations, and over 1300 deaths caused by a known pathogen occur every year in the United States.

Foodborne diseases results from the consumption of food contaminated with pathogens such as bacteria, viruses, parasites or with poisonous chemicals or bio-toxins. Majority of the foodborne illness cases are mild and self-limiting, however, severe cases can occur in high risk groups (include infants, young children, the elderly and the immunocompromised persons), resulting in high mortality and morbidity in this group. Determining how to prioritize limited food safety resources across a large number of foods is a big challenge in preventing foodborne illness.

The reporting of foodborne and waterborne diseases in the United States began approximately 80 years ago, beginning in 1925, the US Public Health Service (PHS) published summaries of outbreaks of gastrointestinal illness attributed to milk. In 1938, PHS added summaries of outbreaks caused by all foods. These early surveillance efforts led to the enactment of important public health measures (e.g., the Pasteurized Milk Ordinance) that resulted in decreased incidence of enteric diseases, particularly those transmitted by milk and water. The current system of surveillance for outbreaks of foodborne and waterborne diseases began in 1966. In 2001, CDC implemented a web-based outbreak surveillance system, the Electronic Foodborne Outbreak Reporting System (eFORS).

Developing surveillance for foodborne outbreaks in the United States has posed a formidable challenge. In United States, state and local public health agencies are the frontline for disease surveillance and response activities. A 2010 survey of state foodborne disease capacity identified the need for additional staff to reach full capacity; all respondents reported barriers to investigating foodborne disease outbreaks. However, improved surveillance systems in the United States are detecting

more outbreaks that would previously have been missed because they are widely dispersed.

7.8 CAUSES AND SYMPTOMS OF FOODBORNE ILLNESS

Foodborne illness is caused by consuming contaminated foods or beverages. Many different disease-causing microbes or pathogens can contaminate foods, so there are many different types of foodborne illnesses. Most foodborne diseases are infections caused by a variety of bacteria, viruses, and parasites. Other diseases are poisonings caused by harmful toxins or chemicals that have contaminated food. Of note many foodborne pathogens also can be acquired through recreational or drinking water, from contact with animals or their environment, or through person-to-person spread.

Symptoms of Foodborne Illness

- Common symptoms of foodborne illness are diarrhea and/or vomiting, typically lasting 1 to 7 days. Other symptoms might include abdominal cramps, nausea, fever, joint/back aches, and fatigue.
- What some people call the stomach flu may actually be a foodborne illness caused by a pathogen (i.e., virus, bacteria, or parasite) in contaminated food or drink.
- The incubation period (the time between exposure to the pathogen and onset of symptoms) can range from several hours to 1 week.

Causes of foodborne illness

Commonly recognized foodborne infections are :

- ✓ Campylobacteriosis (*Campylobacter*)
- ✓ Cryptosporidiosis (*Cryptosporidium*)
- ✓ Cyclosporiasis (*Cyclospora* spp.)
- ✓ Giardiasis *(Giardia)*
- ✓ Listeriosis (*Listeria monocytogenes*)
- ✓ Salmonellosis (*Salmonella*)
- ✓ Shigellosis (*Shigella*)
- ✓ Toxoplasmosis (*Toxoplasma gondii*)
- ✓ Vibrio Infection (*Vibrio parahaemolyticus*)
- ✓ Yersiniosis (*Yersinia* species)

Foods associated with foodborne illness

- Raw foods of animal origin, that is, raw meat and poultry, raw eggs, unpasteurized milk, and raw shellfish are the most likely to be contaminated.
- Fruits and vegetables can also be contaminated with animal waste when manure is used to fertilize produce in the field, or unclean water is used for washing the produce.
- Raw sprouts are particularly concerning because the conditions under which they are sprouted are ideal for growing microbes.
- Unpasteurized fruit juices or cider can also be contaminated if there are pathogens on the fruit that is used to make it.

- Any food item that is touched by a person who is ill with vomiting or diarrhea, or who has recently had such an illness, can become contaminated. When these food items are not subsequently cooked (e.g., salads, cut fruit) they can pass the illness to other people.

7.9 FOOD POISONING

Food poisoning, a type of foodborne illness, is a sickness people get from something they ate or drank. The causes are germs or other harmful things in the food or beverage. Symptoms of food poisoning often include upset stomach, diarrhea and vomiting. Symptoms usually start within hours or several days of eating the food. Most people have mild illness and get better without treatment. Sometimes food poisoning causes severe illness or complications.

Symptoms

Symptoms vary depending on what is causing the illness. They may begin within a few hours or a few weeks depending on the cause.

Common symptoms are :

- Upset stomach.
- Vomiting.
- Diarrhea.
- Diarrhea with bloody stools.
- Stomach pain and cramps.
- Fever.
- Headache.

Less often food poisoning affects the nervous system and can cause severe disease. Symptoms may include :

- Blurred or double vision.
- Headache.
- Loss of movement in limbs.
- Problems with swallowing.
- Tingling or numbness of skin.
- Weakness.
- Changes in sound of the voice.

7.10 INFANTS AND CHILDREN

Vomiting and diarrhea can quickly cause low levels of body fluids, also called dehydration, in infants and children. This can cause serious illness in infants. You can take help by health care provider if your child's symptoms include vomiting and diarrhea and any of the following :

- Excessive thirst.
- Little or no urination.
- Weakness.
- Dizziness.

- Diarrhea that lasts more than a day.
- Vomiting often.
- Stools that have blood or pus.
- Severe pain in the stomach or rectum.

Causes

Many germs or harmful things, called contaminants, can cause foodborne illnesses. Food or drink that carries a contaminant is called "contaminated." Food can be contaminated with any of the following :

- Bacteria.
- Viruses.
- Parasites that can live in the intestines.
- Poisons, also called toxins.
- Bacteria that carry or make toxins.
- Molds that make toxins.

Understanding terms

The term food poisoning is commonly used to describe all foodborne illnesses. A health care provider might use these terms to be more specific :

- ✓ Foodborne illnesses means all illnesses from any contaminated food or beverage.
- ✓ Food poisoning means illness specifically from a toxin in food. Food poisoning is a type of foodborne illness.

How food becomes contaminated

Food can be contaminated at any point from the farm or fishery to the table. The problem can begin during growing, harvesting or catching, processing, storing, shipping, or preparing. Food can be contaminated any place it's handled, including the home, because of :

- **Poor handwashing -** Feces that remains on the hands after using the toilet can contaminate food. Other contaminants can be transferred from hands during food preparation or food serving.
- **Not disinfecting cooking or eating areas -** Unwashed knives, cutting boards or other kitchen tools can spread contaminants.
- **Improper storage -** Food left out for too long at room temperature can become contaminated. Food stored in the refrigerator for too long can spoil. Also, food stored in a refrigerator or freezer that is too warm can spoil.

Other sources

Bacteria that cause foodborne illnesses can also be found in swimming pools, lakes, ponds, rivers and seawater. Also, some bacteria, such as E. coli, may be spread by exposure to animals carrying the disease.

Risk factors

Anyone can get food poisoning. Some people are more likely to get sick or have more-serious disease or complications. These people include :

- Infants and children.

- Pregnant people.
- Older adults.
- People with weakened immune systems due to another disease or treatments.

7.11 COMPLICATIONS

In most healthy adults, complications are uncommon. They can include the following.

Dehydration

The most common complication is dehydration. This a severe loss of water and salts and minerals. Both vomiting and diarrhea can cause dehydration. Most healthy adults can drink enough fluids to prevent dehydration. Children, older adults, and people with weakened immune systems or other illnesses may not be able to replace the fluids they've lost. They are more likely to become dehydrated. People who become dehydrated may need to get fluids directly into the bloodstream at the hospital. Severe dehydration can cause organ damage, other severe disease and death if not treated.

Complications of systemic disease

Some contaminants can cause more widespread disease in the body, also called systemic disease or infection. This is more common in people who are older, have weakened immune systems or other medical conditions. Systemic infections from foodborne bacteria may cause :

- **Blood clots in the kidneys -** E. coli can result in blood clots that block the kidneys' filtering system. This condition, called hemolytic uremic syndrome, results in the sudden failure of the kidneys to filter waste from the blood. Less often, other bacteria or viruses may cause this condition.
- **Bacteria in the bloodstream -** Bacteria in the blood can cause disease in the blood itself or spread disease to other parts of the body.
- **Meningitis -** Meningitis is inflammation that may damage the membranes and fluid surrounding the brain and spinal cord.
- **Sepsis -** Sepsis is an overreaction of the immune system to systemic disease that damages the body's own tissues.

Pregnancy complications

Illness from the listeria bacteria during pregnancy can result in :

- ✓ Miscarriage or stillbirth.
- ✓ Sepsis in the newborn.
- ✓ Meningitis in the newborn.

Rare complications

Rare complications include conditions that may develop after food poisoning, including :

- **Arthritis.** Arthritis is swelling, tenderness or pain in joints.
- **Irritable bowel syndrome -** Irritable bowel syndrome is a lifelong condition of the intestines that causes pain, cramping and irregular bowel movements.
- **Guillain-Barre syndrome -** Guillain-Barre syndrome is an immune system attack on nerves that can result in tingling, numbness and loss of muscle control.

- **Breathing difficulties -** Rarely, botulism can damage nerves that control the muscles involved in breathing.

Prevention

To prevent food poisoning at home :

- ✓ **Handwashing -** Wash your hands with soap and water for at least 20 seconds. Do this after using the toilet, before eating, and before and after handling food.
- ✓ **Wash fruits and vegetables -** Rinse fruits and vegetables under running water before eating, peeling or preparing.
- ✓ **Wash kitchen utensils thoroughly -** Wash cutting boards, knives and other utensils with soapy water after contact with raw meats or unwashed fruits and vegetables.
- ✓ **Don't eat raw or undercooked meat or fish -** Use a meat thermometer to make sure meat is cooked enough. Cook whole meats and fish to at least 145 F (63 C) and let rest for at least three minutes. Cook ground meat to at least 160 F (71 C). Cook whole and ground poultry to at least 165 F (74 C).\
- ✓ **Refrigerate or freeze leftovers -** Put leftovers in covered containers in the refrigerator right after your meal. Leftovers can be kept for 3 to 4 days in the refrigerator. If you don't think you'll eat them within four days, freeze them right away.
- ✓ **Cook leftovers safely -** You can safely thaw frozen food three ways. You can microwave it. You can move it to the refrigerator to thaw overnight. Or you can put the frozen food in a leakproof container and put it in cold water on the counter. Reheat leftovers until the internal temperature reaches 165 degrees Fahrenheit (74 degrees Celsius).
- ✓ **Throw it out when in doubt -** If you aren't sure if a food has been prepared, served or stored safely, discard it. Even if it looks and smells fine, it may not be safe to eat.
- ✓ **Throw out moldy food -** Throw out any baked foods with mold. Throw out moldy soft fruits and vegetables, such as tomatoes, berries or peaches. And throw away any nuts or nut products with mold. You can trim away mold from firm foods with low moisture, such as carrots, bell peppers and hard cheeses. Cut away at least 1 inch (2.5 centimeters) around the moldy part of the food.
- ✓ **Clean your refrigerator -** Clean the inside of the refrigerator every few months. Make a cleaning solution of 1 tablespoon (15 milliliters) of baking soda and 1 quart (0.9 liters) of water. Clean visible mold in the refrigerator or on the door seals. Use a solution of 1 tablespoon (15 milliliters) of bleach in 1 quart (0.9 liters) of water.

7.12 VECTOR CONTROL

Vector control is any method to limit or eradicate the mammals, birds, insects or other arthropods which transmit disease pathogens. The most frequent type of vector control is mosquito control using a variety of strategies. Several of the neglected tropical diseases are spread by such vectors.

Importance

For diseases where there is no effective cure, such as Zika virus, West Nile fever and Dengue fever, vector control remains the only way to protect human populations. However, even for vector-borne diseases with effective treatments the high cost of treatment remains a huge barrier to large amounts of developing world populations. Despite being treatable, malaria has by far the greatest impact

on human health from vectors. In Africa, a child dies every minute of malaria; this is a reduction of more than 50% since 2000 due to vector control. In countries where malaria is well established the World Health Organization estimates countries lose 1.3% annual economic income due to the disease. Both prevention through vector control and treatment are needed to protect populations.

As the impacts of disease and virus are devastating, the need to control the vectors in which they carried is prioritized. Vector control in many developing countries can have tremendous impacts as it reduces mortality rates, especially among infants. Because of the high movement of the population, disease spread is also a greater issue in these areas.

As many vector control methods are effective against multiple diseases, they can be integrated together to combat multiple diseases at once. The World Health Organization therefore recommends Integrated Vector Management as the process for developing and implementing strategies for vector control.

Methods

Vector control focuses on utilizing preventive methods to control or eliminate vector populations. Common preventive measures are :

7.13 HABITAT AND ENVIRONMENTAL CONTROL

Removing or reducing areas where vectors can easily breed can help limit their growth. For example, stagnant water removal, destruction of old tires and cans which serve as mosquito breeding environments, and good management of used water can reduce areas of excessive vector incidence. Further examples of environmental control is by reducing the prevalence of open defecation or improving the designs and maintenance of pit latrines. This can reduce the incidence of flies acting as vectors to spread diseases via their contact with feces of infected people.

Reducing contact

Limiting exposure to insects or animals that are known disease vectors can reduce infection risks significantly. For example, bed nets, window screens on homes, or protective clothing can help reduce the likelihood of contact with vectors. To be effective this requires education and promotion of methods among the population to raise the awareness of vector threats.

Chemical control

Insecticides, larvicides, rodenticides, Lethal ovitraps and repellents can be used to control vectors. For example, larvicides can be used in mosquito breeding zones; insecticides can be applied to house walls or bed nets, and use of personal repellents can reduce incidence of insect bites and thus infection. The use of pesticides for vector control is promoted by the World Health Organization and has proven to be highly effective.

Biological control

The use of natural vector predators, such as bacterial toxins or botanical compounds, can help control vector populations. Using fish that eat mosquito larvae, the use of cat fish to eat up mosquito larvae in ponds can eradicate the mosquito population, or reducing breeding rates by introducing sterilized male tsetse flies have been shown to control vector populations and reduce infection risks.

Legislation

In the United States, cities or special districts are responsible for vector control. For example, in California, the Greater Los Angeles County Vector Control District is a special district set up by the state to oversee vector control in multiple cities.

Rodent control

Rats and mice are destructive pests that can spread disease, contaminate food, and destroy property. After a disaster, the number of rats and mice is often reduced, so illness or injuries associated with rats and other small rodents are uncommon in the short term. Rodents that survive a disaster often move to new areas. It will take time for rodents to regroup, reorganize their social behavior, become familiar with their new environment, find safe haven, locate food and water, and memorize their movements. Colony building and reproduction will begin only when their new ecosystem has stabilized. This typically takes 6 to 10 months under favorable conditions. As the rodent population grows and resettles, people have a greater chance of being exposed to the diseases carried by rodents. Rodent urine and dander also contain allergens that can cause allergic reactions or trigger asthma symptoms in sensitive persons and more than 9,000 persons are treated in emergency departments annually for rat or mouse bites.

Indications that rodents are present—aside from seeing either live or dead ones—are rodent droppings, runways, rub marks, and tracks. Other signs include burrows, nests, gnawings, food scraps, rat hair, urine spots, rodent noises, insects that are associated with rodents, odors from urine, or dead rodents. Rats and mice are different animals and methods used to control them will differ. The following recommendations will help residents reduce the risk of disease or personal injury associated with rodents.

Inside the Home

- ✓ Keep food and water covered and stored in rodent-proof containers. A rodent-proof container is made of thick plastic, glass, or metal and has a tight-fitting lid.
- ✓ Keep pet food covered and stored in rodent-proof containers. Allow pets only enough food for each meal, then store or throw out any remaining food. Do not leave excess pet food or water out overnight.
- ✓ Dispose of garbage on a frequent and regular basis. If storing trash and food waste inside the home, do so in rodent-proof containers.
- ✓ Wash dishes, pans, and cooking utensils immediately after use.
- ✓ Remove leftover food and clean up any spilled food from cooking and eating areas.
- ✓ Do not store empty cans or other opened containers with food residues inside the home.
- ✓ When possible, use spring-loaded traps in the home and outside buildings. Use a small amount of chunky peanut butter or other available food as bait. Place traps in a T shape against baseboards or wall surfaces where rodent rub marks, droppings, or rodents have been seen. Keep children and pets away from areas where traps are placed.
- ✓ Glue traps and live traps are not recommended. Glue traps mainly catch juvenile rodents, not breeding adults. Rodents caught in live traps and released will likely reenter the home.

Outside the Home

- ✓ Dispose of debris and trash as soon as possible. Store woodpiles and stacks of lumber or other materials at least 12 inches above the ground and as far away from the home as possible.
- ✓ Store garbage in rodent-proof containers with tight fitting lids.
- ✓ Store grains and animal feed in rodent-proof containers.
- ✓ Remove any food sources, including animal carcasses, that might attract rodents.

- ✓ Haul away trash, abandoned vehicles, discarded tires, and other items that might serve as rodent nesting sites.
- ✓ Keep grass short and cut or remove brush and dense shrubbery that may provide rodents cover and protection.
- ✓ Trim tree limbs or shrubs that overhang or touch buildings.
- ✓ Place spring-loaded traps in outbuildings and in other areas where signs of rodents are found. Do not allow children or pets to play near spring traps.

7.14 SUMMARY

Under this unit we have summarized the epidemiology of foodborne diseases, food contamination, food poisoning, food protection and vector control etc. Food safety is a complex matter that depends on a number of interrelated environmental, cultural, and socioeconomic factors. The purpose of epidemiology and surveillance is to define these factors, how they interact, and their relative importance in foodborne infections. The tools epidemiologists use to study foodborne disease include surveillance of specific infections in humans, monitoring of contamination with specific pathogens in foods and animals, intensive outbreak investigations, collecting reports of outbreaks at the regional or national level, and studies of sporadic infections.

Food Protection protects the safety and security of the New Hampshire food supply and prevents foodborne illness and injuries through inspection, enforcement, and education by qualified staff in collaboration with the food industry. Vector control is a highly effective way to reduce malaria transmission and is a vital component of malaria control and elimination strategies. WHO currently recommends deployment of either insecticide-treated nets (ITNs) or indoor residual spraying (IRS) for malaria vector control in most areas at risk of malaria. Depending on the setting and available resources, these 2 interventions may be supplemented by additional interventions such as larviciding.

7.15 TERMINAL QUESTIONS

Q. 1 What do you mean by epidemiology of foodborne diseases? Describe it.

Answer :----------

Q. 2 Describe different type of food contamination.

Answer :----------

Q.3 Describe the causes and symptoms of foodborne illness.

Answer :----------

Q. 4 Write short notes on the following.

(a) Food contamination

(b) Foodborne diseases

Answer :----------

Q. 5 Describe the food poisoning in infants and children.

Answer :----------

Q. 6 Write short notes on the following.

(a) Food poisoning

(b) Vector control

Answer :----------

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

UNIT 8 FOOD ADULTERATION

Structure

8.1 INTRODUCTION

Food is essential for sustenance of life. We all eat food and gain energy for different metabolic activities. All living organisms need food for growth, work, repair and maintaining life processes. There are different types of food available today in the market, and on a daily basis, we all depend on various food sources, including vegetables, fruits, cereals, pulses, legumes, etc. As we buy fresh veggies and other groceries**,** we might have come across small pebbles in cereals and grains, darkly stained vegetables like cabbage, broccoli, fruits, dark red meat and a lot more.

Adulteration or contamination of natural food products is one of the major challenges in today's society. Despite various actions and penalties, the practice of adding adulterant is quite common in developing countries. There are various methods used for adulterating natural products. Food Adulteration can be defined as the practice of adulterating food or contamination of food materials by adding a few substances, which are collectively called adulterants. Adulterants are the substance or poor quality products added to food items for economic and technical benefits. Addition of these adulterants reduces the value of nutrients in food and also contaminates the food, which is not fit for consumption. These adulterants can be available in all food products which we consume daily, including dairy products, cereals, pulses, grains, meat, vegetables, fruits, oils, beverages, etc.

OBJECTIVES

This is the eighth unit (Food Adulteration) of third block (Community food protection, Food

Adulteration and Immunization). Under eighth unit, we have following objectives. These are as under :

- To know about food adulteration and its prevention
- To know the types and methods of food adulteration
- To know about microbiological contamination
- To discuss food laws and adulteration detection tests

8.2 FOOD ADULTERATION

The process of contaminating food or adding to the food components is a common phenomenon in developing countries. For instance : Milk can be diluted by adding water to increase its quantity and starch powder is often added to increase its solid content. Listed below are the main reasons for adulterating food products :

- Practised as a part of the business strategy.
- An imitation of some other food substance.
- Lack of knowledge of proper food consumption.
- To increase the quantity of food production and sales.
- Increased food demand for a rapidly growing population.
- To make maximum profit from food items by fewer investments.

8.3 METHODS OF FOOD ADULTERATION

Here is a list of most common adulterants which have been added

1. Adding certain chemicals for faster ripening of fruits.
2. Mixing of decomposed fruits and vegetables with the good ones.
3. Adding certain natural and chemical dyes to attract consumers.
4. Mixing of clay, pebbles, stones, sand, and marble chips, to the grains, pulses and other crops.
5. Cheaper and inferior substances are added wholly or partially with the good ones to increase the weight or nature of the product.

Adulteration is an illegal practice of adding raw and other cheaper ingredients to excellent quality products to increase the quantity. Having this adulterated food is highly toxic and leads to several health issues, including certain nutrition deficiency diseases, kidney disorders, and failure of an individual's organ systems, including heart, kidney and liver. Below is a list of a few adulterants added to the food products along with their harmful effects.

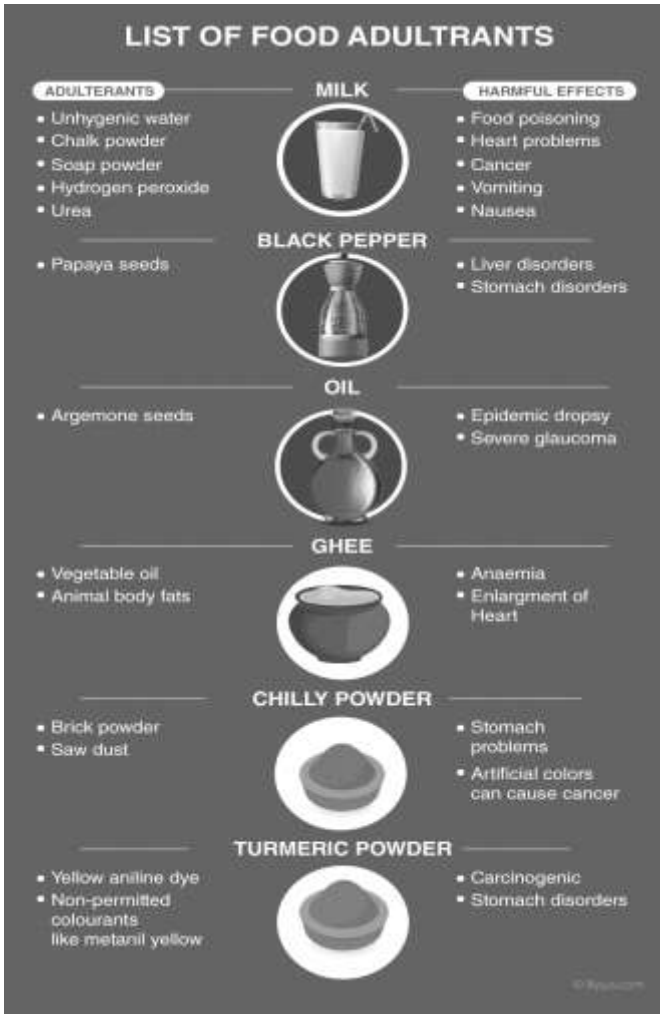

Fig. List of food adulterants

Food Products	Adulterant	Harmful Effects
Milk and Curd	Water and starch powder.	Stomach disorders.
Ghee, Cheese and Butter	Mashed potatoes, Vanaspati and starch powder.	Gastro-intestinal disturbances and other stomach disorders.
Grains	Dust, Pebbles, Stones, Straw, weed seeds, damaged grain, etc.	Liver disorders, Toxicity in the body, etc.
Pulses	Dyes, chemical and Lead Chromate.	Stomach disorders.
Coffee powder	Chicory, tamarind seeds powder.	Diarrhoea.
Tea	Artificial colouring agents.	Liver disorders.
Sugar	Chalk powder, Washing soda, Urea, etc.	Stomach disorders and kidney failure.
Pepper	Dried papaya seeds and blackberries.	Severe allergic reactions including

		stomach and skin irritations.
Mustard seeds	Argemone seeds.	Abdominal contractions, sluggishness and increased excretion.
Edible Oils	Mineral oil, Karanja oil, castor oil and artificial colours.	Gallbladder cancer, allergies, paralysis, cardiac arrest, and increased LDL cholesterol.
Turmeric Powder	Pesticide residues, sawdust, chalk dust, industrial dyes, metanil yellow dye arsenic, lead metal etc.	Cancer and Stomach disorders.
Cinnamon sticks	Cassia bark.	Liver Damage, Low Blood Sugar, Mouth Sores and increased risk of cancer.
Cumin seeds	Coloured grass seeds, sawdust and charcoal dust	Stomach disorders.
Jam, Juice and Candies	Non-permitted dyes including metanil yellow and other artificial food dyes.	These dyes are highly carcinogenic that have the potential to cause different types of cancer.
Jaggery	Washing soda, chalk powder	Vomiting and other Stomach disorders
Honey	Molasses, dextrose, sugar and corn syrups	Stomach disorders
Fruits and Vegetables	Chemical dyes, Malachite green, calcium carbide, copper sulphate and oxytocin saccharin wax.	Stomach disorders, vomiting, and dyes used are highly carcinogenic.
Tomato sauces	Pumpkin pulp, non-edible artificial colours and flavours.	Gastritis and inflammation of vital organs.

8.4 PREVENTION OF FOOD ADULTERATION

According to the National Health Service and Food Research Institute, several food products have been adulterated to increase the quantity and make more profit. This practice of adding adulterants to food products are quite common in all in developing countries and other backward countries. Every year, the 7th of April is celebrated as the World Health Day globally and as per the reports, WHO aims to bring a general awareness about the adulterations of food products, motivate and inspire everybody to have a healthy, balanced diet.

Here are certain safety tips to avoid adulteration

- ✓ Avoid dark coloured, junk and other processed foods.
- ✓ Make sure to clean and store all the grains, pulses and other food products.
- ✓ Wash fruits and vegetables thoroughly in running water before they are used.
- ✓ Check if the seal is valid or not, before buying food products like milk, oil and other pouches.
- ✓ Always make sure to check and buy products having an FSSAI-validated label, along with the license number, list of ingredients, manufactured date, and its expiration.

8.5 FOOD LAWS IN INDIA

1. Introduction - The Food Industry is one of the largest industries in India. The agriculture sector has played a vital role in uplifting the Indian economy as India has a huge potential for agriculture owing to its geographical location. Over the past few years India has also witnessed an increase in the productivity of the Food and Beverage Industry. The activities relatedto food industry includes production, processing and distribution. These activities play a crucial role in the food chain which intensifies the importance of food laws in India .The laws on food include a collection of laws and regulations which govern the food production, its distribution and consumption. These laws aim to protect the consumers and provide effective management of the food industry. It further ensures food safety which is considered as a core aspect for a healthy life and a healthy living.

The food policies in India are framed under a protocol of standards adopted by the international organizations of which India is a member. In India, the Food Safety and Standards Authority of India (FSSAI) is the core body which sets standards for the food to ensure and maintain superior quality of food. The food industry in India is also goverened by e various laws and regulations . which sets a touchstone for proper sanitation, licensing and other necessary permits that are required to be followed by the entities in the business of food.

2. Food Safety and Need of Food Laws - Food is the very crucial aspects for our energy and well-being. Food Safety is one of the important elements which helps to maintain the nutrition level of our body. It ensures higher standards of food without any hazardous and harmful elements . Safe and healthy food can lead to the growth of the human health and can protect the consumers from various diseases. It is important to maintain food safety at every stage. Hence, the higher standard of food should be maintained from production till the stage of consumption. Food Laws were implemented for two reasons

1. Regulation of specification of food and

2. Regulation of hygienic condition of processing/manufacturing.

Food Laws help to raise the standard of living of the consumers and provide a proper legal framework for permitting food licenses and criteria for obatining such permissions. Article 21 of the Indian Constitution,1950 provides every citizen for the right to healthy and safe food. Dealing in any food article that is is considered dangerous to human life is a violation of Article 21 read with Article 47 of the India Constitution. Hence, the states are under the constitutional obligation to safeguards the right to food and also implement the laws to regulate the food policies in India.

3. Laws regulating Food Industry in India -Till date, several laws have been enacted and implemented in India governing the food processing industry. Food Safety laws have gone through significant changes since many years. The FSSAI has played a notable role in bringing about a revolution to the Food Safety Standards in India. In the year 2001, the Supreme Court delivered a landmark judgment in People's Union of Civil Liberties v. Union of India (UOI) and Anr which catered to the issue of hunger amidst plenty in India. A writ petition was filed by the People's Union of Civil Liberties (PUCL) with the concern of death due to starvation despite abundant availability of food in stock.

It also stressed on enforcement of Right to Food as a part of Right of Life which is guaranteed under Funfamental Rights of the Indian Constitution. The Court, in this case, directed several actions ensuring access to food by all thereby uphodling the right to food as a fundamental right. Preceding the enactment of the Food Safety and Standards Act, 2006 (FSS Act) in India, the following food laws, existing prior to it, were repealed and compiled under the roof of the FSS Act. :

1. The Prevention of Food Adulteration Act, 1954 (37 of 1954)

2. The Fruit Products Order, 1955.
3. The Meat Food Products Order, 1973
4. The Vegetable Oil Products (Control) Order, 1947
5. The Edible Oils Packaging (Regulation) Order, 1998.
6. The Solvent Extracted Oil, De oiled Meal, and Edible Flour (Control) Order, 1967.
7. The Milk and Milk Products Order, 1992
8. Any other order issued under the Essential Commodities Act, 1955 (10 of 1955)

The Food Safety and Standards Act,2006 consolidates various Acts and Orders that deals with food-related issues in various Ministries and Departments. The role of any regulatory body cannot be read in isolation but in view that between people's health and safety of life stands a watchdog carrying its function to uphold the fundamental rights of every individual. The Central Government has enacted the FSS Act and formulated various rules and regulations under it that regulates the standards of food products in India :

Food Safety and Standards Act, 2006, Food Safety and Standards Rules, 2011 and the Food Safety and Standards Regulations 2011 – 2019 :

1. The FSS Act,2006 consolidates various acts and order that handle food-related issues in various Ministries and implement the act through food control authorities in various states.
2. FSSA establishes a national regulatory body, Food Safety and Standard Authority of India (FSSAI) as an authority for food safety and quality in India.
3. The FSSAI also regulates and monitor the manufacturing, processing, storage, distribution, sale and import of food to ensure proper consumption of food.
4. The authority is also responsible to contribute to spreading awareness about food safety and framing of regulations to lay down standards and guidelines concerning various aspects of maintaining high standards of food.
5. Apart from the mandate provided in the FSS Act, 2006, the authority is also responsible to coordinate with state government and local authority and promote general awareness about food safety and food standards.

Along with the FSS Act,Rules and Regulations, following are the provision under various laws which deals with food safety :

a) Indian Penal Code, 1860 :

(1) Section 272 and 273 of IPC deals with Food Adulteration. This section states,, Whoever adulterates any article of food or drink, to make such article noxious as food or drink, intending to sell such article as food or drink, or knowing it to be likely that the same will be sold as food or drink, shall be punished with imprisonment of either description for a term which may extend to six months, or with fine which may extend to one thousand rupees, or with both. However, under the FSS Act, the penalty for selling misbranded or sub-standard food at present is between Rs. 3,00,000 to Rs.5,00,000. Whereas, the punishment for unsafe food that resulting in death is life imprisonment and a fine of Rs. 10,00,000 and that for unsafe food resulting in grievous injury or death-like situation is an imprisonment of 6 years and a fine of Rs. 5,00,000.

2) In consequence to the Judgement passed by the Supreme Court in Swami Achyutanand Tirth & Ors. v. Union of India & Ors the Law Commission of India was directed by the Ministry of Home Affairs to examine the amendment to section 272 of IPC. The Law Commission Report

precisely described the existing framework on food safety laws in India and how they have changed, not too long ago to meet the increasing demands of food regulations keeping in view the best practices followed in the world all over.. It suggested amendment of the section to the extent of incorporating huge compensation aspect for victims of adulterated food.

(b) Legal Metrology Act, 2009 :

1. The Act is enacted to enforce the standards of weights and measures, to regulate trade and commerce in weights, measures and other goods which are sold or distributed by weights, measures and number.
2. The legal framework of the act also focuses on ensuring public guarantee from the security and accuracy of weights and measurements.
3. The act requires the manufacturing, packing and selling or importing the commodities in the prescribed manner and non-compliance of rules under the act will attract penalties.
4. The Act also established the Legal Metrology (Packaged Commodities) Rules, 2011 for regulating the pre-packaged commodities in India and also provides regulations relating to labelling.

(**c) The Insecticides Act, 1968**

1. The Act was enacted to regulate the import, manufacture, sale, transport, distribution and use of insecticides and to prevent risk to human beings.
2. This Act has been specifically enacted to ensure availability of quality, safe and efficacious pesticides to the agricultural community of India.
3. It governs the quality and permissible amount of pesticides which can be used in agriculture.

(d) The Environment Protection Act, 1986

1. The Act was enacted with the main objective to provide the protection and improvement of environment.
2. The Act also incorporated the rules for the manufacture, use, import and storage of hazardous microorganism, substances and cells used as foodstuff.
3. As a special feature, the Act also made compulsory for every food plant discharging waste into the mainstream to obtain a No Objection Certificate from the respective State Pollution Board.

(e) Export (Quality Control and Inspection) Amendment Act, 1984

1. The Act facilitates export trade through quality control and inspection before the products are sold to international buyers.

(f) Consumer Protection Act, 2019

1. The Act was enacted to protect the interests of the consumers and establish a mechanism to provide remedy to the consumers. The Consumer Protection Act, 1986 was amended in 2019 to overcome the problems in the earlier act and to cope up with the technological advancement.
2. The Act is also important for the food business operators as they need to be aware of the rights of its consumers under the existing framework of consumer law and comply with all the other laws.

(g) Voluntary Standards and Certification

1. The Bureau of Indian Standards (BIS) formulates Indian Standards in the food processing industry by prescribing standards relating to raw material and their quality, hygienand requirements for packaging and labelling.
2. The Agricultural Products (Grading and Marketing) Act, 1937 provides Grade Standards relating to agricultural and allied activities which are governed by Directorate of Marketing and Inspection (DMI). These are specifically called as Agmarks standards.

The prevention of Food Adulteration Act, 1954 (PFA)

Food adulteration is the addition of contaminants into food items or beverages to increase the quantity and decrease the price of the commodity. It is a major issue in India which lowers the quality of food and leads to serious illnesses in both humans and animals. To curb these problems, it was necessary to form laws that could prevent such contamination. In India, since 1899, the food adulteration laws have been in legislation. Since it was the pre-independence era, states and provinces had their own rules and regulations for the prevention of food adulteration. Some of those acts are –

- The Calcutta Municipal Act, 1923
- The UP Pure Food Act, 1950
- The Punjab Pure Food Act, 1929
- The Bihar Prevention of Food Adulteration Act, 1948

These state or province-specific acts had different laws and regulations that did not have any uniformity. This created a barrier for interstate food promotion and transportation. There was a difference between the methods of analysis, punishment, implementation and standards. This made way for a more centrally organised law for the prevention of food adulteration. Eventually, the Government of India approved the Food Adulteration Committee in 1943. The committee studied and reviewed the subject of Food Adulteration and hence advised for a central legislation. Thus, the Prevention of Food Adulteration Act (PFA) finally came into force in 1954.

The Act : Features

The Prevention of Food Adulteration Act, 1954 extends to the entire country of India and it came into effect on June 15th, 1955. The act defines adulteration or deems an item to be adulterated when –

- If the item sold by the vendor does not meet the standards of the customer or the standards the article purports to be.
- If the item contains any element that lowers the quality of the article.
- If the article has been manufactured or stored in unhygienic conditions.
- If the item contains any element that is unfit for human consumption such as putrid, decomposed or rotten plant or animal substances.
- If the article contains an element taken from a diseased animal.
- If the article contains any poisonous or injurious substances.
- If the container of the article is made up from any injurious substance.
- If any colouring agent other than the prescribed ones are added in the article.
- If the article consists of any prohibited preservative or preservative quantity above the prescribed limit.

- If the quality and purity of the article does not meet the standards set by the committee whether it is injurious or non-injurious to health.

Penalty

Upon violation of the laws found under the act, there are penalties that are levied on the vendor. Let us look at some of those circumstances –

- On breaking the law for the first time the vendor can get imprisoned for a duration of 6 months to 1 year or can be fined with 2000 rupees (depending on the situation).
- On breaking the law for a second time, there can be imprisonment for upto 6 years and also cancellation of licence.
- When an adulterated food is injurious to health, the vendor can be punished under the Section 320 of the penal code.

Responsibilities of Central Government

The prevention of food adulteration act looks to prevent the adulteration of the food and beverage items to be fit for human consumption, except water and drugs. This act gives the central government a variety of responsibilities which are stated below.

- To set up a Central Committee for Food Standards and central food laboratories for analysing and testing all kinds of articles.
- To review the sections of the PFA act along with the central committee for food standards.
- Organising training programmes for different sections of the act.
- Approving the state PFA rules.
- To check on the implementation of rules in states and union territories by collecting frequent reports and visitation.
- Conducting exams for appointing officials as analysts under the act.
- To approve the infant food labels.
- To check the quality of food being imported to India.
- Creating awareness among the consumers.
- To keep a check on the quantity and quality of food laboratories.

Food Inspectors

The central government or the state government can appoint an official representative by notifying them in the official gazette. The food inspector should have qualifications for the post and should not hold any financial position in the article he is investigating. The food inspector is deemed to be a public servant under section 21 of the Indian Penal Code. The food inspector is authorised to collect samples from the vendors and send them to the laboratory for analysis. He/she can stop the article from being sold if it does not meet the food standards.

Food Products Order, (FPO)

The Food Products Order, 1955 was promulgated under Section 3 of the Essential Commodities Act, 1955. The FPO mark full form is the Food Products Order (FPO) mark applied to food products sold in India. The FPO mark is a mandatory certification mark for all processed fruit products sold in India, such as fruit jams, packaged fruit beverages, crushes and squashes, dehydrated fruit products,

pickles, and fruit extracts. The FPO mark guarantees that the food products are manufactured in a hygienic and food-safe environment, ensuring that the product is fit for consumption. The Ministry of Food Processing Industries develops food safety hygiene standards and issues the FPO mark certification to processed food manufacturers. The FPO mark for food products was followed by the Food Safety and Standards (FSS) Act of 2006.

Requirement of Obtaining FPO Mark

In India, the FPO certificate has been effective since 1955, but it became mandatory for manufacturers only after 2006, after the enactment of the FSS Act. FPO mark is necessary to start a fruit processing unit or industry in India. All food processors must have an FPO licence to carry out their operations and abide by the guidelines to continue their food business. The objective of the FPO mark is to regulate the fruits and vegetable processing sector. The government introduced it to guarantee that food products are manufactured hygienically and specific quality standards are maintained. The manufacturers must ensure that the food products manufactured should adhere to the prescribed guidelines and specifications. Thus, it ensures customers' confidence regarding the food products' quality.

Food Products Requiring FPO Mark

- Syrups, synthetic beverages and sharbat
- Vinegar (synthetic or brewed)
- Pickles
- Dehydrated vegetables and fruits
- Crushes, squashes, barley water, barrelled juice, cordials and other beverages containing fruit pulp, juice or nectar
- Jellies, jams and marmalades
- Tomato products, such as sauces and ketchup
- Candied, preserved and crystallised peels and fruits
- Chutneys
- Bottled and canned fruits, pulps, juices and vegetables
- Frozen vegetables and fruits

Documents Required for FPO Mark

The following documents are needed to be submitted to get the FPO certification :

- Demand draft of government fee
- Affidavits
- Partnership deed or memorandum of the company
- Three years of central and sales tax return
- List of machinery and equipment
- PAN number of the company
- Pollution certificate for NOC certificate
- Agreements or order copies for providing goods

- Bank account details of the company

The Food Products Order, 1955 stands repealed by the Food Safety and Standards (FFS) Act, 2006. FPO mark was in action since 1955 and had become a defunct order. In 2006, under the new FSS Act, all previous certificates, registrations and licences (including FPO mark and certificate) lost their legal status. Food Safety and Standards Authority of India (FSSAI) became the sole food standard and regulatory authority for the food industries across India.

Indian Standards Institution, (ISI)

The full form of ISI is the Indian Standards Institute**.** ISI was founded to establish standards for the orderly growth of industries and for maintaining industrial output efficiency. It offers an ISI mark which is a standards-compliance mark for industrial products in India. It is the most common and identified certification mark throughout the Indian sub-continent so far. It was renamed the Bureau of Indian Standards (BIS) in 1987.

The ISI mark is a standards-compliance mark for industrial products in India since 1950. The mark certifies that a product conforms to an Indian standard (IS) developed by the Bureau of Indian Standards (BIS), the national standards body of India. The *ISI* is an initialism of *Indian Standards Institution*, the name of the national standards body until 1 January 1978, when it was renamed to the Bureau of the Indian Standards. The ISI mark is mandatory for certain products to be sold in India, such as electrical appliances including switches, electric motors, wiring cables, heaters, kitchen appliances, etc., and other products like Portland cement, LPG valves, LPG cylinders, automotive tyres, etc. In the case of most other products, ISI marks are optional.

It is very common in India to find products with fake ISI marks. That is, industrial traders cheat customers by affixing ISI marks on the product without actually being certified.[6] Fake ISI marks usually do not carry

(i) The mandatory 7 or 8-digit license number (of the format CM/L-*xxxxxxx*, where *x* signifies a digit from the license number) required by BIS.

(ii) The IS number on top of the ISI mark which signifies the Indian standard a particular product is in compliance with.

For example, if a kitchen grinder's box has a small ISI mark on it with the ISI code of the appliance's wire, one can conclude that the wire is BIS-certified but the appliance itself is not an BIS-certified product. Counterfeiting ISI marks is a punishable offence by the law, but enforcement is uncommon.

History of ISI

- The ISI was founded on January 6, 1947, and in June 1947, Dr Lal C. Verman was the first ISI Director.
- ISI is now known as BIS (Bureau of Indian Standards). It sets the standard of quality for consumer goods and industrial goods. It verifies each product’s quality and standard and gives them a certification mark.
- By 1986 legislation, BIS is permitted to provide certification.
- The ISI label is mandatory for the sale of certain products in India. Any manufacturing company that meets the BIS criteria for its product or service can qualify for ISI certification.

List of general products with Indian Standards Institute marks

- Electrical device
- Packaged drinking water and mineral water

- Processed cereal-based complementary foods
- Kitchen equipment and appliances
- LPG cylinders and LPG valves
- Thermometers
- Portland cement

Agriculture marketing (AGMARK)

AGMARK is a certification mark employed on agricultural products in India, assuring that they conform to a set of standards approved by the *Directorate of Marketing and Inspection* an attached Office of the Department of Agriculture, Cooperation and Farmers Welfare under Ministry of Agricultural & Farmers Welfare an agency of the Government of India. The *AGMARK Head Office at Faridabad (**Haryana**)* is legally enforced in India by the Agricultural Produce (Grading and Marking) Act of 1937 (and amended in 1986). The present *AGMARK* standards cover quality guidelines for 224 different commodities spanning a variety of pulses, cereals, essential oils, vegetable oils, Fruits and Vegetables and semi-processed products like vermicelli.

The term agmark was coined by joining the words Ag to mean agriculture and 'mark' for a certification mark. This term was introduced originally in the bill presented in the parliament of India for the *Agricultural Produce (Grading and Marking) Act*. The entire system of Agmark, including the name, was created by Archibald MacDonald Livingstone, Agricultural and Marketing Advisory to the Government of India, from 1934 to 1941. He was supported by a staff of several hundred. The system was designed to benefit local growers throughout India who were, in the absence of a certification as to quality, exposed to receiving less for their produce from dealers than its true worth.

The Agmark certification is employed through fully state-owned Agmark laboratories located across the nation which act as testing and certifying centres. In addition to the *Central AGMARK Laboratory (CAL)* in Nagpur, there are *Regional AGMARK Laboratories (RALs)* in 11nodalcities(Mumbai, NewDelhi, Chennai, Kolkata, Kanpur, Kochi, Guntur, Amritsar, Jaipur, Rajkot, Bhopal). Each of the regional laboratories is equipped with and specializes in the testing of products of regional significance. Hence the product range that could be tested varies across the centres.

Commodities and tests

The testing done across these laboratories include chemical analysis, microbiological analysis, pesticide residue, and aflatoxin analysis on whole spices, ground spices, ghee, butter, vegetable oils, mustard oil, honey, food grains (wheat), wheat products (atta, suji, and maida), gram flour, soybean seed,jowar,bajra, bengal gram, ginger, oil cake, NON edible oil, oils and fats, animal casings, meat and other food products.

8.6 FOOD ADULTERATION

Food is the basic necessity of life. The food we eat is absorbed by our body and is used to run metabolic processes and sustain life. Food is essential for growth, and various life processes. An array of food in our daily diet includes vegetables, fruits, legumes, pulses, grains, etc. All of these are either consumed raw or made into delicacies and savoured. But, nowadays, you might have seen very thin milk due to mixing with water, white, yellow, or black pebbles in raw pulses, white tiny stones mixed with rice, and so on. This mixing of elements with food items is adulteration.

Adulteration of food commonly defined as “the addition or deletion of any substance to or from food, so that the natural composition and quality of food substance is affected. Adulteration is either intentional by either removing substances to food or altering the existing natural properties of food

knowingly. Unintentional adulteration is usually attributed to ignorance, carelessness or lack of facilities for maintaining food quality. Food Adulterants are the substances which are added to food items for economic and technical benefits but they reduce the value of nutrients in food and also causes the food contamination leads to unfit for consumption. Food adulterants could be available in dairy products, cereal products, meat & eggs, canned & bottled vegetables, fruits & fruit products fats & oils, beverages etc.

As we deal with the overgrowing population, environmental hazards, and depleting natural resources, one of the man-made hazards is the adulteration of food. When food is contaminated with external sources or when its natural composition or quality is changed, it is adulterated. Food adulteration has serious effects on our health. Despite various measures taken by the government, spreading awareness about the hazards of food adulteration is a prevalent practice in many countries. Various methods of food adulteration are deployed by the food industries using various chemical and synthetic substances. The article encompasses the discussion of food adulteration, types, and methods below.

What is Food Adulteration?

Adulteration is a legal offence and when the food fails to meet the legal standards set by the government, it is said to have been adulterated. Food adulteration takes place when intentionally or unintentionally substances that degrade the quality of food are added to it. Thus, food adulteration can be defined as the contamination or adulteration of food or food materials by adding harmful substances to it.

What is adulterant?

The substances that lower the quality of food, when added to it, are called adulterants. It is a substance found within other food substances that hamper the natural quality of the food. The adulterant may be present in any form and in any quantity. Adulterants are mostly harmful and pose the ability to lower the potency of the product. Even if the adulterant is not harmful, it reduces the nutritional value of the food to a greater extent. Some adulterants are also identified as carcinogenic or lethal when exposed to them for a longer period. Different types of adulterants are used to adulterate different types of food.

When is Food Considered Adulterated?

There are some conditions that are required to conclude whether a food is adulterated or not. These points are summarised below.

- A substance that degrades the quality of food or turns it hazardous is added to it.
- Cheaper or low-quality substances are used as a substitute for whole or a few ingredients.
- A constituent of food is partly or wholly taken out, reducing the quality of food.
- It’s made presentable with harmful substances. or its colour is changed to make it look better.
- Anything that depreciates the quality of food is added to or abstracted from it.

Examples of Food Adulteration

Some of the examples of food adulteration are listed below.

- Mixing of pulses with sand particles, pebbles.
- Mixing of milk with water.
- Mixing oil with chemical derivatives or cheaper oils.
- Packing low-quality food products with fresh and high-quality ones.

- These are a few examples of food adulteration.

Reasons for Food Adulteration

For many years, you might have noticed the practice of adding water to milk to increase its quantity and gain more profit from less volume of milk. Similarly, food adulteration is done by food manufacturers and industries for various reasons.

1. Food adulteration is practised as a part of a business strategy to gain more profit by cheaper means.
2. It is also done to make the food presentable and as an imitation of some other food which is more in demand.
3. Food adulteration is many times done by those who do not have a proper understanding of its hazards. Due to a lack of awareness and proper knowledge, it is still widely practised.
4. Adulteration increases the weight of the food, helps gain more profit, and increases sales in cheaper ways.
5. The increasing rate of the population also plays a major role in food adulteration.
6. The inefficiency of government initiatives to control it.

8.7 TYPES OF FOOD ADULTERATION

There are four different types of food adulteration.

- **Intentional Adulteration** - When substances that look similar to the constituents of the food are added to it, to increase its weight and gain more profit. Example- mixing of pebbles, stones, marbles, sand, mud, filth, chalk powder, contaminated water, etc.
- **Incidental Adulteration** - Incidental adulteration occurs due to negligence while handling food. Like residues of pesticides in grains, larvae growth, presence of droppings of rodents, etc.
- **Metallic Adulteration** - The addition of metallic materials into food like lead or mercury is metallic adulteration. It may happen accidentally or even intentionally.
- **Packaging Hazard** - The packing materials in which the food is packed may also interfere and mix with the constituents of the food, leading to packaging hazards.

8.8 METHODS OF FOOD ADULTERATION

Various food adulteration methods are as follows :-

- **Mixing -** Mixing of sand, dust, clay, mud, and pebbles with food particles.
- **Substituting** - Some healthy constituents are replaced by cheaper and low-quality ones, which alter the nutritional values of the food and may even impose a health hazard.
- **Using Decomposed Food -** This method indicates mixing decomposed food with healthy ones. Food that even conceals damage or inferiority of any manner is also considered to be adulterated. Also, the deliberate mixing of healthy food with questionable quality food leads to the final product being adulterated.
- **Additions of Toxic Substance -** Food adulteration also involves the mixing of food with toxic substances to gain higher profit and increase sales. For example, addition of colour, dyes, or harmful unpermitted preservatives.

- **Misbranding -** Altering the manufacturing dates, expiry dates, list of ingredients or misleading ingredient derivatives, and so on.
- **Artificial Ripening -** Adding chemicals to the fruits and vegetables which speed up the process of ripening in them, is also considered food adulteration. For example, mango is ripened with carbide for meeting the commercial demand against supply.

8.9 EFFECTS OF FOOD ADULTERATION

Food adulteration has a great impact on our health. Be it any kind of adulteration, prolonged consumption of this type of food is very harmful to the body. Consuming such food increases the toxicity in the body. As the nutritional value of the adulterated food goes down, such food is no longer nutritive for the body. The addition of chemical adulterants and colours many times proves to be fatal. as they pose an onset of health risks and also carcinogens. Some adulterated food may also affect our internal organs directly leading to heart, kidney, liver, and many more organ disorders and failure.

How to Detect Food Adulteration

Food adulteration has many ill effects on our health. Prolonged consumption of adulterated food may even prove to be lethal. The use of organic food is more trending these days, as organic foods give us the complete nutrition that a particular food is supposed to give. It is not laden with harmful chemicals or polished with toxins like wax. But, due to low productivity, organic food is not always available and is more expensive than the common produce. Therefore, it is important to detect if your food is adulterated. Various home methods can be used to do this.

For example, to determine if milk is adulterated with detergents, take some milk in a bottle along with some water and shake it well. If it settles into a frothy layer, it is pure. If the milk is adulterated, it forms a thick layer. Similarly, if you want to know if milk, sugar, or jaggery is adulterated with chalk powder, take your sample and mix it in a glass of water. Any precipitate at the bottom of the glass indicates the presence of chalk. To determine if the vegetables are polished with colour, soak them in water for some time and you will be able to see the colour getting dissolved in water.

How to Prevent Food Adulteration

Some of the methods of prevention of food adulteration are mentioned below.

- On the industry level, food adulteration can only be checked with strict and stringent laws and government interventions and checks.
- To avoid consuming adulterated food, always make sure that you don’t buy deep or dark-coloured groceries.
- Stop consuming processed food.
- Wash or soak your fruits and vegetables well in water before consuming.
- Canned or tinned foods must be checked for any leakages or puffing before buying.
- In Indian markets, FSSAI is the government license number that stands for food safety. Thus, always make sure to look for FSSAI, a list of ingredients, manufacturing, and expiry dates on the food packs.

8.10 MICROBIOLOGICAL CONTAMINATION AND ADULTERATION

The fact that a food is contaminated with pathogens (harmful microorganisms such as bacteria, viruses, or protozoa) render it adulterated. Generally, for ready-to-eat foods, the presence of pathogens will render the food adulterated. For example, the presence of Salmonella on fresh fruits or vegetables or

in readyto- eat meat or poultry products will render those products adulterated. Let us discuss individual food products adulteration and their side effects

- **Milk**

  Adulterants : Cow/buffalo milk can be adulterated with starch, milk powder and urea

  Health effect : Cancer or acute renal failure

- **Tur dal, Turmeric powder, mixed spices, saffron**

  Adulterants : Metanil yellow, a non-permitted color is a common adulterant in food items like laddu, tur dal and turmeric.

  Health effect : tumor and cancer

- **Ghee**

  Adulterants : Ghee essence is used in vanaspati or cheaper oils and passed off as pure ghee.
  Health effect : Cancer or acute renal failure

- **Sugar and Salt**

  Adulterants : With chalk powder and white sand.

  Health effect : Stomach disorder

- **Tea powder**

  Adulterants : With used tea leaves, dye or artificial colour, iron fillings.

  Health effect : Cancer, tetanus

- **Chilli powder**

  Adulterants : Sudan red, Red brick powder, grit, sand, dirt, non-permitted colors and saw dust.
  Health effect : Stomach disorder, sudan dye is carsinogenic

- **Sweets**

  Adulterants : Metanil yellow

  Health effect : tumor and cancer

- **Mustard seeds and vegetable oil**

  Adulterants : Argemone seeds and argemone oil

  Health effect : Epidemic dropsy

- **Honey**

  Adulterants : Jaggery, Sugar, corn syrup

  Health effect : Obesity, Diabetes , Eyes and nerve damage

8.11 SOME COMMON FOOD ADULTERATION DETECTION TESTS

Food adulteration has now become a burning problem. The adulterants used are so similar to natural foodstuffs that it becomes very difficult for a common man to detect them. A few simple tests can be done to detect adulterants found in common foodstuffs.

Methods for Detection of common adulterants in milk

- **Food :** Milk

  Adulterant : Starch

  Method for detection : Add a few drops of iodine solution. Formation of blue colour indicates the presence of starch.

- **Food :** Milk

  Adulterant : Urea

  Method for detection : Take a teaspoon of milk in a test tube. Add ½ teaspoon of soybean or Pigeon pea powder. Mix up the contents thoroughly by shaking the test tube. After 5 minutes, dip a red litmus paper in it. Remove the paper after ½ a minute. A change in colour from red to blue indicates the presence of urea in the milk.

- **Food : Milk**

  Adulterant : Vanaspati

  Method for detection : Take 3 ml of milk in a test tube. Add 10 drops of hydrochloric acid. Mix up one teaspoonful of sugar. After 5 minutes, examine the mixture. The red colouration indicates the presence of vanaspati in the milk.

- **Food :** Milk

  Adulterant : Formalin

  Method for detection : Take 10 ml of milk in a tests tube and add 5 ml of concentrated sulphuric acid from the sides of the wall without shaking. If a violet or blue ring appears at the intersection of two layers then it shows presence of formalin.

- **Food :** Milk

  Adulterant : Detergent

  Method for detection : Shake 5-10 ml of sample with an equal amount of water, formation of foam indicates the presence of detergent.

- **Food :** Milk

  Adulterant : Synthetic milk

  Method for detection : Synthetic milk has a bitter after taste, gives a soapy feeling on rubbing between the fingers and turns yellowish on heating

8.12 SUMMARY

Under this unit we have summarized the food adulteration, food standards (PFA, AGMARK & ISI), adulterants and food adulteration detection tests etc. Adulteration is a legal offence and when the food fails to meet the legal standards set by the government, it is said to have been adulterated. Food adulteration takes place when intentionally or unintentionally substances that degrade the quality of food are added to it. Thus, food adulteration can be defined as the contamination or adulteration of food or food materials by adding harmful substances to it.consuming. Food safety is the utmost responsibility of every nation. Food laws and policies play a very crucial role in regulating the food industry. It is also important that the laws should be updated with the changing circumstances in the food industry and with the pace of technological development. For example, the inclusion of e-commerce in the Consumer Protection Act,2019 has broadened the scope of the Act which now makes it easier for the consumers to

bring effective actions against the violators.

It is very essential for the government to ensure an adequate supply of essential commodities in the market and avoid shortage in the market. More importantly, proper implementation of laws and upgrading the laws with the changing situations and international standards will help us to make the legal framework of food industry better to attain the aim of food safety in India. The Food Safety and Standards Authority of India (FSSAI) is a statutory body under the administration of the Ministry of Health and Family Welfare, Government of India. It regulates the manufacture, storage, distribution, sale, and import of food articles, while also establishing standards to ensure food safety. The FSSAI was established by the Food Safety and Standards Act, 2006, which consolidated all former acts and orders related to food safety that were previously handled by various ministries and department.

8.13 TERMINAL QUESTIONS

Q. 1 What is food adulteration? Explain it.

Answer :----------

Q. 2 Describe methods of food adulteration.

Answer :----------

Q. 3 Describe types of food adulteration.

Answer :----------

Q. 4 Describe some common food adulteration detection tests

Answer :----------

Q. 5 Write short notes on the following.

(a) Food laws in India

(b) Food adulteration

Answer :----------

Q. 6 How food adulteration can be prevented?

Answer :----------

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna

- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

UNIT 9 LIFE-STYLE AND COMMUNITY HEALTH

Structure

9.1 INTRODUCTION

Lifestyle is a way used by people, groups and nations and is formed in specific geographical, economic, political, cultural and religious text. Lifestyle is referred to the characteristics of inhabitants of a region in special time and place. It includes day to day behaviors and functions of individuals in job, activities, fun and diet.In recent decades, life style as an important factor of health is more interested by researchers. According to WHO, 60% of related factors to individual health and quality of life are correlated to lifestyle (1). Millions of people follow an unhealthy lifestyle. Hence, they encounter illness, disability and even death. Problems like metabolic diseases, joint and skeletal problems, cardio-vascular diseases, hypertension, overweight, violence and so on, can be caused by an unhealthy lifestyle. The relationship of lifestyle and health should be highly considered.

Today, wide changes have occurred in life of all people. Malnutrition, unhealthy diet, smoking, alcohol consuming, drug abuse, stress and so on, are the presentations of unhealthy life style that they are used as dominant form of lifestyle. Besides, the lives of citizens face with new challenges. For

instance, emerging new technologies within IT such as the internet and virtual communication networks, lead our world to a major challenge that threatens the physical and mental health of individuals. The challenge is the overuse and misuse of the technology.

OBJECTIVES

This is the ninth unit (Lifestyle and Community Health) of third block (Community food protection, Food Adulteration and Immunization). Under ninth unit, we have following objectives. These are as under :

- To know about life style and community health
- To know about public education, diet and health development
- To discuss alcohol, cigarette smoking, drugs and AIDS
- To discuss chronic diseases, fats, vitamins and minerals

Therefore, according to the existing studies, it can be said that : lifestyle has a significant influence on physical and mental health of human being. There are different forms of such influences. Consanguinity in some ethnicity is a dominant form of life style that it leads to the genetic disorders. Reformation of this unhealthy life style is a preventing factor for decreasing the rate of genetic diseases. In some countries, the overuse of drugs is a major unhealthy life style. Iran is one of the 20 countries using the most medications. They prefer medication to other intervention. Furthermore, in 15–40% of cases they use medications about without prescription. Pain relievers, eye drops and antibiotics have the most usage in Iran. While self-medications such as antibiotics have a negative effect on the immune system, if the individual would be affected by infection, antibiotics will not be effective in treatment. Overall, 10 percent of those who are self-medicated will experience severe complications such as drug resistance. Sometimes drug allergy is so severe that it can cause death.Finally, variables of lifestyle that influence on health can be categorized in some items :

9.2 COMMUNITY HEALTH

Regardless to your interactions with your colivings you have an impact on your community. It may be good or bad both. We all are in a community together, there is no other way and so the health. Community health is the convergence of health care services, economics and social responsibilities. People residing in a particular reason more or less share similar kind of health risks and social and economic conditions. Community health is a medical practice which focuses on people's well-being in a particular geographical area. This essential public health sector covers programs to help neighborhood members in protecting and improving their health, deter the transmission of infectious diseases, and plan for natural disasters. For example a community may be exposed to pollutants from a nearby factory or waste dumping site or ground water contaminants.

Public wellness programs expand access to preventive health services, include people in decision-making on treatment, and seek reduced hospital costs. Community health is usually confused with population health. However, interrelated but have sufficient differences. Where community health refers the collective efforts of individual or organizations for the better health of a geographically or culturally defined group of people while, population health uses outcome driven approaches for the health benefits of specific group of people typically defined by attribution.

9.3 DIET AND BODY MASS INDEX (BMI)

Diet is the greatest factor in lifestyle and has a direct and positive relation with health. Poor diet and its consequences like obesity is the common healthy problem in urban societies. Unhealthy lifestyle can be measured by BMI. Urban lifestyle leads to the nutrition problems like using fast foods and poor foods, increasing problems like cardiovascular.

Exercise - For treating general health problems, the exercise is included in life style (6). The continuous exercise along with a healthy diet increases the health. Some studies stress on the relation of active life style with happiness.

Sleep - One of the bases of healthy life is the sleep. Sleep cannot be apart from life. Sleep disorders have several social, psychological, economical and healthy consequences. Lifestyle may effect on sleep and sleep has a clear influence on mental and physical health.

Sexual behavior - Normal sex relation is necessary in healthy life. Dysfunction of sex relation is the problem of most of societies and it has a significant effect on mental and physical health. It can be said that dysfunctional sex relation may result in various family problems or sex related illnesses like; AIDS

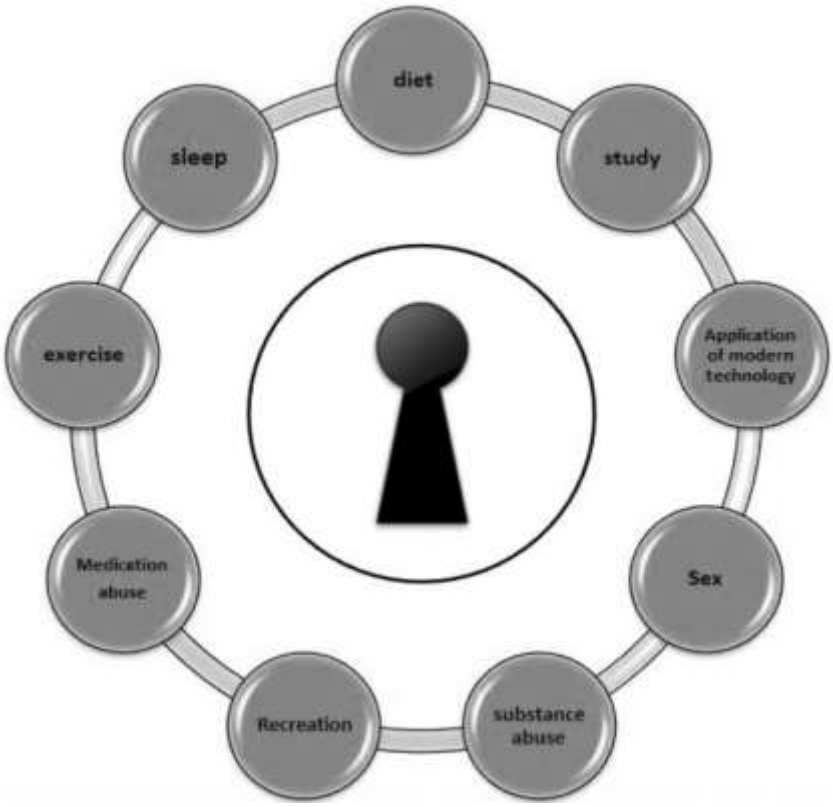

Fig. Nine key factors that forming healthy life style

Substance abuse - Addiction is considered as an unhealthy life style. Smoking and using other substance may result in various problems; cardiovascular disease, asthma, cancer, brain injury. According to the resent studies in Iran, 43% of females and 64% of males experience the use of hubble-bubble. A longitudinal study shows that 30% of people between 18–65 years old smoke cigarette

permanently.

Medication abuse - It is a common form of using medication in Iran and it is considered as an unhealthy life style. Unhealthy behaviors in using medication are as followed : self-treatment, sharing medication, using medications without prescription, prescribing too many drugs, prescribing the large number of each drug, unnecessary drugs, bad handwriting in prescription, disregard to the contradictory drugs, disregard to harmful effects of drugs, not explaining the effects of drugs.

Application of modern technologies : Advanced technology facilitates the life of human beings. Misuse of technology may result in unpleasant consequences. For example, using of computer and other devices up to midnight, may effect on the pattern of sleep and it may disturb sleep. Addiction to use mobile phone is related to depression symptoms.

Recreation - Leisure pass time is a sub factor of life style. Neglecting leisure can bring negative consequences. With disorganized planning and unhealthy leisure, people endanger their health.

Study - Study is the exercise of soul. Placing study as a factor in lifestyle may lead to more physical and mental health. For example, prevalence of dementia, such as Alzheimer's disease is lowerin educated people. Study could slow process of dementia.

Physical Activity and Its Role in Community Health

An unhealthy population strains the community's health organizations and reduces their overall quality of life. Community health should be a priority, but it can be challenging to figure out how to improve it. Learning how to promote physical activity in the community is a crucial part of promoting public health.

Preventing and Managing Chronic Conditions

According to the Centers for Disease Control, physical activity can help prevent chronic conditions. If you already have compromised health, regular exercise can help you manage your symptoms and make you feel better. Physical fitness helps people of all age groups stay healthy and enjoy a better quality of life.

Heart disease - Regular exercise can improve overall heart health and help lower the risk of heart disease progressing. Likewise, exercising strengthens the heart muscle, preventing heart disease.

Arthritis - Physical exercise can reduce the pain caused by arthritis while also improving physical function.

Diabetes -Regular physical exercise can help insulin lower your blood sugar level more effectively.

Asthma : Exercise can sometimes help reduce the frequency of asthma attacks. People with asthma should consult a doctor before making drastic changes to their exercise routine.

Back pain : Low-impact aerobic fitness activities can increase your back strength, improve your range of motion and alleviate discomfort.

Dementia - People who stay active lower their risk of cognitive impairment. Exercise allows more blood to flow through the brain and requires extra concentration and focus.

9.4 IMPROVING MUSCULAR STRENGTH AND COGNITIVE FUNCTION

Physical activity is critical for adults and children. It helps strengthen muscles, bones and cognitive function. You need these things for balance, flexibility, endurance and day-to-day living.

Balance - Stronger muscles can help improve your balance, which reduces the risk of falls and injuries. Balance training is especially vital for older adults, for whom a fall could be risky.

Memory - Getting active and increasing your heart rate can also benefit your brain by sending more blood and oxygen through it.

Stress - Chronic stress can have several adverse effects on the brain. One of the benefits of exercise is the reduction of stress and feelings of depression and anxiety.

Sleep - Regular exercise can even help you sleep better, boosting your health, energy and mood.

Strategies to Increase Physical Activity in the Community

Promoting public health should be a priority for government, public and private organizations.

Design Activity-Friendly Routes - Promoting walking and biking in your community can be easier with activity-friendly routes. When sidewalks, trails and bicycle lanes all easily connect with public transit stops, grocery stores, schools and workplaces, people will be more likely to choose to be active. Activity-friendly routes to popular destinations make travel safer, more accessible and promote walking and biking. Safe routes allow people of all ability levels to access their destinations while getting fresh air and exercise. While creating safe routes to every major destination can seem like a daunting task, there are some routes to prioritize. Routes from residential neighborhoods to nearby schools and health care facilities are an ideal starting point. Then, create paths to parks and other destinations like grocery stores, neighborhoods and workplaces.

9.5 DEVELOP HEALTH, NUTRITION AND EXERCISE INITIATIVES AT SCHOOLS

School-based health approaches help children start being active at an early age. Comprehensive school physical activity programs can help encourage physical activity before, during and after school.

Health initiatives :

Health centers in schools can help address students' complex health needs. However, it can be complicated to implement these programs. Local organizations and community members must cooperate to facilitate collaboration between the school and health sectors. Health initiatives can also include classes or workshops for students to attend. Teach kids the relationship between nutrition, exercise and health.

Nutrition education :

Educating kids about nutrition is a crucial part of improving community health. If kids don't learn about nutrition at home, school is the next best place. Kids should learn about the importance of a balanced diet and have access to healthy foods at lunchtime.

Exercise programs :

Exercise programs at schools can include various components, like physical education classes, recess and classroom activities. Comprehensive physical education classes help kids get the activity they need each day while also teaching them new skills and ways to exercise. Encouraging them to play during recess should also be a priority. Implementing after-school activities is another excellent option. Sports programs can also help kids stay active on the weekends during games or extra practices.

9.6 PUBLIC EDUCATION

Education is one of the vital services that a modern state is expected to provide to its people. It is

a service that every welfare democracy is obliged to give in the most accessible form. In simple terms, privatization of education refers to the state's policy of allowing educational institutions, both higher and lower, to be run by non-state or private parties for monetary benefits. In contemporary times, many liberal democratic countries across the world are increasingly trying to privatize this basic service. The public education system is the primary option for millions of students in India. These institutions have become more important as the pandemic takes a toll on the economy, putting fee-charging schools beyond the reach of many and forcing thousands to move to government schools.

However, education as a public good benefits spread across society in terms of employment, economic prosperity, health and social cohesion. The education system has been commercialized where the buyers purchase the 'education' at prices. Economist Prabhat Patnaik termed the process as 'commoditization of education'. According to him, "the privatization of education which means handing the education sector to profit making entities. It is a desire to attract direct foreign investment. Likewise, in India, policy makers in education sector often talk about 'the striving for excellence, which is nothing other than making education as a commodity.

COVID-induced financial woes have forced parents to shift their wards to public education institutions. About 51% students are in government schools and nearly 10% in aided schools**,** yet there seems to be a bias against such schools amongst wider sections of the middle class.

9.7 ALCOHOL

Alcohol, sometimes referred to by the chemical name ethanol, is a depressant drug that is the active ingredient in fermented drinks such as beer, wine, and distilled spirits (hard liquor). It is one of the oldest and most commonly consumed recreational drugs, causing the characteristic effects of alcohol intoxication. Among other effects, alcohol produces happiness and euphoria, decreased anxiety, increased sociability, sedation, impairment of cognitive, memory, motor, and sensory function, and generalized depression of central nervous system (CNS) function.

Ethanol is only one of several types of alcohol; other alcohols such as methanol and isopropyl alcohol are significantly more toxic. A mild, brief exposure to isopropyl alcohol (which is only moderately more toxic than ethanol) is unlikely to cause any serious harm, but methanol is lethal even in small quantities, as little as 10–15 milliliters. However, several analogues that naturally occur as psychoactive alcohols in alcoholic drinks are less toxic than ethanol. Unlike primary alcohols like ethanol, tertiary alcohols cannot be oxidized into aldehyde or carboxylic acid metabolites, which are often toxic. For example, the tertiary alcohol 2M2B is 20 times more potent than ethanol, and has been used recreationally.

Alcohol has a variety of short-term and long-term adverse effects. Short-term adverse effects include generalized impairment of neurocognitive function, dizziness, nausea, vomiting, and hangover-like symptoms. Alcohol is addictive to humans, and can result in alcohol use disorder, dependence and withdrawal. It can have a variety of long-term adverse effects on health, such as liver and brain damage, and its consumption can cause cancer. The adverse effects of alcohol on health are most important when it is used in excessive quantities or with heavy frequency. However, some of them, such as increased risk of certain cancers, may occur even with light or moderate alcohol consumption. In high amounts, alcohol may cause loss of consciousness or, in severe cases, death. In 2021, there were 2,627 deaths in the US due to alcohol poisoning.

Alcohol works in the brain primarily by increasing the effects of γ-Aminobutyric acid (GABA), the major inhibitory neurotransmitter in the brain; by facilitating GABA's actions, alcohol suppresses the activity of the CNS. The substance also directly affects a number of other neurotransmitter systems including those of glutamate, glycine, acetylcholine, and serotonin. The

pleasurable effects of alcohol ingestion are the result of increased levels of dopamine and endogenous opioids in the reward pathways of the brain. Alcohol also has toxic and unpleasant actions in the body, many of which are mediated by its byproduct acetaldehyde.

Long-term effects

Prolonged heavy consumption of alcohol can cause significant permanent damage to the brain and other organs, resulting in dysfunction or death.

Brain damage

Alcohol can cause brain damage, Wernicke's encephalopathy and Alcoholic Korsakoff syndrome which frequently occur simultaneously, known as Wernicke–Korsakoff syndrome. Lesions, or brain abnormalities, are typically located in the diencephalon which result in anterograde and retrograde amnesia, or memory loss.

Liver damage

During the metabolism of alcohol via the respective dehydrogenases, nicotinamide adenine dinucleotide (NAD) is converted into reduced NAD. Normally, NAD is used to metabolize fats in the liver, and as such alcohol competes with these fats for the use of NAD. Prolonged exposure to alcohol means that fats accumulate in the liver, leading to the term 'fatty liver'. Continued consumption (such as in alcohol use disorder) then leads to cell death in the hepatocytes as the fat stores reduce the function of the cell to the point of death. These cells are then replaced with scar tissue, leading to the condition called cirrhosis.

Birth defects

Ethanol is classified as a teratogen. According to the U.S. Centers for Disease Control and Prevention (CDC), alcohol consumption by women who are not using birth control increases the risk of fetal alcohol syndrome. The CDC currently recommends complete abstinence from alcoholic beverages for women of child-bearing age who are pregnant, trying to become pregnant, or are sexually active and not using birth control.

Cancer

The International Agency for Research on Cancer lists ethanol in alcoholic beverages as a Group 1 carcinogen in humans and argues that There is sufficient evidence and research showing the carcinogenicity of acetaldehyde (the major metabolite of ethanol) which is excreted by the liver enzyme when one drinks alcohol. In 2020, alcohol was estimated to cause 750,000 cases of cancer worldwide, particularly esophagus, liver, and breast cancer.

Other effects

Frequent drinking of alcoholic beverages is a major contributing factor in cases of elevated blood levels of triglycerides.

Alcoholism

Alcoholism or its medical diagnosis alcohol use disorder refers to alcohol addiction, alcohol dependence, dipsomania, and/or alcohol abuse. It is a major problem and many health problems as well as death can result from excessive alcohol use. Alcohol dependence is linked to a lifespan that is reduced by about 12 years relative to the average person. In 2004, it was estimated that 4% of deaths worldwide were attributable to alcohol use. Deaths from alcohol are split about evenly between acute causes (e.g., overdose, accidents) and chronic conditions. The leading chronic alcohol-related condition associated with death is alcoholic liver disease. Alcohol dependence is also associated with cognitive

impairment and organic brain damage. Some researchers have found that even one alcoholic drink a day increases an individual's risk of health problems by 0.4%. Two or more consecutive alcohol-free days a week have been recommended to improve health and break dependence.

Alcohol withdrawal syndrome

Discontinuation of alcohol after extended heavy use and associated tolerance development (resulting in dependence) can result in withdrawal. Alcohol withdrawal can cause confusion, paranoia, anxiety, insomnia, agitation, tremors, fever,nausea,vomiting, autonomic dysfunction, seizures, and hallucinations. In severe cases, death can result. Delirium tremens is a condition that requires people with a long history of heavy drinking to undertake an alcohol detoxification regimen.

9.8 CIGARETTE SMOKING

A cigarette is a narrow cylinder containing a combustible material, typically tobacco, that is rolled into thin paper for smoking. The cigarette is ignited at one end, causing it to smolder; the resulting smoke is orally inhaled via the opposite end. Cigarette smoking is the most common method of tobacco consumption. The term *cigarette*, as commonly used, refers to a tobacco cigarette, but the word is sometimes used to refer to other substances, such as a cannabis cigarette or an herbal cigarette. A cigarette is distinguished from a cigar by its usually smaller size, use of processed leaf, and paper wrapping, which is typically white. Most modern cigarettes are filtered, although this does not make the smoke inhaled from them contain fewer carcinogens and harmful chemicals.

There are significant negative health effects from smoking cigarettes such as cancer, chronic obstructive pulmonary disease (COPD), heart disease, birth defects, and other health problems relating to nearly every organ of the body. Nicotine, the psychoactive drug in tobacco, makes cigarettes highly addictive. About half of cigarette smokers die of tobacco-related disease and lose on average 14 years of life. Every year, tobacco cigarettes kill more than 8 million people worldwide; with 1.2 million of those being non-smokers dying as the result of exposure to second-hand smoke. These harmful effects have led to strict legislation that has prohibited smoking in many workplaces and public areas, regulated marketing and purchasing age of tobacco, and levied taxes to discourage cigarette use.

In the 21st century, a product called an electronic cigarette (also called an e-cigarette or vape) was developed, in which the substance contained within it (typically a liquid solution containing nicotine) is vaporized by a battery-powered heating element, as opposed to being burned. Such devices are commonly promoted by their manufacturers as safer alternatives to conventional cigarettes, although there are some health risks associated with their use. Since e-cigarettes are a relatively new product, scientists do not possess data on their possible long-term health effects.

History

The earliest forms of cigarettes were similar to their predecessor, the cigar. Cigarettes appear to have had antecedents in Mexico and Central America around the 9th century in the form of reeds and smoking tubes. The Maya, and later the Aztecs, smoked tobacco and other psychoactive drugs in religious rituals and frequently depicted priests and deities smoking on pottery and temple engravings. The cigarette and the cigar were the most common methods of smoking in the Caribbean, Mexico, and Central and South America until recent times.

The North American, Central American, and South American cigarette used various plant wrappers; when it was brought back to Spain, maize wrappers were introduced, and by the 17th century, fine paper. By 1830, the cigarette had crossed into France, where it received the name *cigarette*; and in 1845, the French state tobacco monopoly began manufacturing them. The French word made its way

into English in the 1840s. Some American reformers promoted the spelling *cigaret*, but this was never widespread and is now largely abandoned. Cigarettes are sometimes also called a *fag* in British slang.

Constipation

Smoking has become less popular, but is still a large public health problem globally. Worldwide, smoking rates fell from 41% in 1980 to 31% in 2012, although the actual number of smokers increased because of population growth. In 2017, 5.4 trillion cigarettes were produced globally, and were smoked by almost 1 billion people. Smoking rates have leveled off or declined in most countries, but is increasing in some low- and middle-income countries. The significant reductions in smoking rates in the United States, United Kingdom, Australia, Brazil, and other countries that implemented strong tobacco control programs have been offset by the increasing consumption in low income countries, especially China. The Chinese market now consumes more cigarettes than all other low- and middle-income countries combined.

Other regions are increasingly playing larger roles in the growing global smoking epidemic. The WHO Eastern Mediterranean Region (EMRO) now has the highest growth rate in the cigarette market, with more than a one-third increase in cigarette consumption since 2000. Due to its recent dynamic economic development and continued population growth, Africa presents the greatest risk in terms of future growth in tobacco use.

Within countries, patterns of cigarette consumption also can vary widely. For example, in many of the countries where few women smoke, smoking rates are often high in males (e.g., in Asia). By contrast, in most developed countries, female smoking rates are typically only a few percentage points below those of males. In many high and middle income countries lower socioeconomic status is a strong predictor of smoking.

Environmental effects

Cigarette filters are made up of thousands of polymer chains of cellulose acetate, which has the chemical structure shown to the right. Once discarded into the environment, the filters create a large waste problem. Cigarette filters are the most common form of litter in the world, as approximately 5.6 trillion cigarettes are smoked every year worldwide. Of those, an estimated 4.5 trillion cigarette filters become litter every year

Other health concerns

Toxic chemicals are not the only human health concern to take into considerations; the others are cellulose acetate and carbon particles that are breathed in while smoking. These particles are suspected of causing lung damage. The next health concern is that of plants. Under certain growing conditions, plants on average grow taller and have longer roots than those exposed to cigarette filters in the soil. A connection exists between cigarette filters introduced to soil and the depletion of some soil nutrients over time.

Another health concern to the environment is not only the toxic carcinogens that are harmful to the wildlife, but also the filters themselves pose an ingestion risk to wildlife that may presume filter litter as food. The last major health concern to make note of for marine life is the toxicity that deep marine topsmelt and fathead minnow pose to their predators. This could lead to toxin build-up (bioaccumulation) in the food chain and have long reaching negative effects. Smoldering cigarette filters have also been blamed for triggering fires from residential areas to major wildfires and bushfires which has caused major property damage and also death as well as disruption to services by triggering alarms and warning systems.

Degradation

Once in the environment, cellulose acetate can go through biodegradation and photodegradation. Several factors go into determining the rate of each degradation process. This variance in rate and resistance to biodegradation in many conditions is a factor in littering and environmental damage.

9.9 DRUGS

A drug is any chemical substance that when consumed causes a change in an organism's physiology, including its psychology, if applicable. Drugs are typically distinguished from food and other substances that provide nutritional support. Consumption of drugs can be via inhalation, injection, smoking, ingestion, absorption via a patch on the skin, suppository, or dissolution under the tongue.

In pharmacology, a drug is a chemical substance, typically of known structure, which, when administered to a living organism, produces a biological effect. A pharmaceutical drug, also called a medication or medicine, is a chemical substance used to treat, cure, prevent, or diagnose a disease or to promote well-being. Traditionally drugs were obtained through extraction from medicinal plants, but more recently also by organic synthesis. Pharmaceutical drugs may be used for a limited duration, or on a regular basis for chronic disorders.

Pharmaceutical drugs are often classified into drug classes—groups of related drugs that have similar chemical structures, the same mechanism of action (binding to the same biological target), a related mode of action, and that are used to treat the same disease. The Anatomical Therapeutic Chemical Classification System (ATC), the most widely used drug classification system, assigns drugs a unique ATC code, which is an alphanumeric code that assigns it to specific drug classes within the ATC system. Another major classification system is the Biopharmaceutics Classification System. This classifies drugs according to their solubility and permeability or absorption properties.

Psychoactive drugs are substances that affect the function of the central nervous system, altering perception, mood or consciousness. These drugs are divided into different groups like : stimulants, depressants, antidepressants, anxiolytics, antipsychotics, and hallucinogens. These psychoactive drugs have been proven useful in treating wide range of medical conditions including mental disorders around the world. The most widely used drugs in the world include caffeine, nicotine and alcohol, which are also considered recreational drugs, since they are used for pleasure rather than medicinal purposes. All drugs can have potential side effects. Abuse of several psychoactive drugs can cause addiction and/or physical dependence. Excessive use of stimulants can promote stimulant psychosis. Many recreational drugs are illicit and international treaties such as the Single Convention on Narcotic Drugs exist for the purpose of their prohibition.

Medication

A medication or medicine is a drug taken to cure or ameliorate any symptoms of an illness or medical condition. The use may also be as preventive medicine that has future benefits but does not treat any existing or pre-existing diseases or symptoms. Dispensing of medication is often regulated by governments into three categories—*over-the-counter* medications, which are available in pharmacies and supermarkets without special restrictions; *behind-the-counter* medicines, which are dispensed by a pharmacist without needing a doctor's prescription, and prescription only medicines, which must be prescribed by a licensed medical professional, usually a physician.

In the United Kingdom, behind-the-counter medicines are called pharmacy medicines which can only be sold in registered pharmacies, by or under the supervision of a pharmacist. These medications are designated by the letter P on the label. The range of medicines available without a prescription varies

from country to country. Medications are typically produced by pharmaceutical companies and are often patented to give the developer exclusive rights to produce them. Those that are not patented are called generic drugs since they can be produced by other companies without restrictions or licenses from the patent holder.

Pharmaceutical drugs are usually categorised into drug classes. A group of drugs will share a similar chemical structure, or have the same mechanism of action, the same related mode of action or target the same illness or related illnesses. The Anatomical Therapeutic Chemical Classification System (ATC), the most widely used drug classification system, assigns drugs a unique ATC code, which is an alphanumeric code that assigns it to specific drug classes within the ATC system. Another major classification system is the Biopharmaceutics Classification System. This groups drugs according to their solubility and permeability or absorption properties.

Control of drugs

Numerous governmental offices in many countries deal with the control and supervision of drug manufacture and use, and the implementation of various drug laws. The Single Convention on Narcotic Drugs is an international treaty brought about in 1961 to prohibit the use of narcotics save for those used in medical research and treatment. In 1971, a second treaty the Convention on Psychotropic Substances had to be introduced to deal with newer recreational psychoactive and psychedelic drugs.

The legal status of *Salvia divinorum* varies in many countries and even in states within the United States. Where it is legislated against, the degree of prohibition also varies. The Food and Drug Administration (FDA) in the United States is a federal agency responsible for protecting and promoting public health through the regulation and supervision of food safety, tobacco products, dietary supplements, prescription and over-the-counter medications, vaccines, biopharmaceuticals, blood transfusions, medical devices, electromagnetic radiation emitting devices, cosmetics, animal foods and veterinary drugs.

In India, the Narcotics Control Bureau (NCB), an Indian federal law enforcement and intelligence agency under the Ministry of Home Affairs, is tasked with combating drug trafficking and assisting international use of illegal substances under the provisions of Narcotic Drugs and Psychotropic Substances Act.

9.10 ACQUIRED IMMUNODEFICIENCY SYNDROME (AIDS)

Acquired immunodeficiency syndrome (AIDS), is an ongoing, also called chronic, condition. It's caused by the human immunodeficiency virus, also called HIV. HIV damages the immune system so that the body is less able to fight infection and disease. If HIV isn't treated, it can take years before it weakens the immune system enough to become AIDS. HIV is spread through contact with genitals, such as during sex without a condom. This type of infection is called a sexually transmitted infection, also called an STI. HIV also is spread through contact with blood, such as when people share needles or syringes.

It is also possible for a person with untreated HIV to spread the virus to a child during pregnancy, childbirth or breastfeeding. There's no cure for HIV/AIDS. But medicines can control the infection and keep the disease from getting worse. Antiviral treatments for HIV have reduced AIDS deaths around the world. There's an ongoing effort to make ways to prevent and treat HIV/AIDS more available in resource-poor countries.

Symptoms

The symptoms of HIV and AIDS vary depending on the person and the phase of infection.

Primary infection, also called acute HIV

Some people infected by HIV get a flu-like illness within 2 to 4 weeks after the virus enters the body. This stage may last a few days to several weeks. Some people have no symptoms during this stage.

Possible symptoms include :

- ✓ Fever.
- ✓ Headache.
- ✓ Muscle aches and joint pain.
- ✓ Rash.
- ✓ Sore throat and painful mouth sores.
- ✓ Swollen lymph glands, also called nodes, mainly on the neck.
- ✓ Diarrhea.
- ✓ Weight loss.
- ✓ Cough.
- ✓ Night sweats.

These symptoms can be so mild that you might not notice them. However, the amount of virus in your bloodstream, called viral load, is high at this time. As a result, the infection spreads to others more easily during primary infection than during the next stage.

Clinical latent infection, also called chronic HIV

In this stage of infection, HIV is still in the body and cells of the immune system, called white blood cells. But during this time, many people don't have symptoms or the infections that HIV can cause. This stage can last for many years for people who aren't getting antiretroviral therapy, also called ART. Some people get more-severe disease much sooner.

Symptomatic HIV infection

As the virus continues to multiply and destroy immune cells, you may get mild infections or long-term symptoms such as :

- ✓ Fever
- ✓ Fatigue.
- ✓ Swollen lymph glands, which are often one of the first symptoms of HIV infection.
- ✓ Diarrhea.
- ✓ Weight loss.
- ✓ Oral yeast infection, also called thrush.
- ✓ Shingles, also called herpes zoster.
- ✓ Pneumonia.

Progression to AIDS

Better antiviral treatments have greatly decreased deaths from AIDS worldwide. Thanks to these lifesaving treatments, most people with HIV in the U.S. today don't get AIDS. Untreated, HIV most

often turns into AIDS in about 8 to 10 years. Having AIDS means your immune system is very damaged. People with AIDS are more likely to develop diseases they wouldn't get if they had healthy immune systems. These are called opportunistic infections or opportunistic cancers. Some people get opportunistic infections during the acute stage of the disease. The symptoms of some of these infections may include :

- ✓ Sweats.
- ✓ Chills.
- ✓ Fever that keeps coming back.
- ✓ Ongoing diarrhea.
- ✓ Swollen lymph glands.
- ✓ Constant white spots or lesions on the tongue or in the mouth.
- ✓ Constant fatigue.
- ✓ Weakness.
- ✓ Rapid weight loss.
- ✓ Skin rashes or bumps.

Causes

HIV is caused by a virus. It can spread through sexual contact, shooting of illicit drugs or use of shared needles, and contact with infected blood. It also can spread from parent to child during pregnancy, childbirth or breastfeeding. HIV destroys white blood cells called CD4 T cells. These cells play a large role in helping the body fight disease. The fewer CD4 T cells you have, the weaker your immune system becomes.

How does HIV become AIDS?

You can have an HIV infection with few or no symptoms for years before it turns into AIDS. AIDS is diagnosed when the CD4 T cell count falls below 200 or you have a complication you get only if you have AIDS, such as a serious infection or cancer.

How HIV spreads

You can get infected with HIV if infected blood, semen or fluids from a vagina enter your body. This can happen when you :

- **Have sex -** You may become infected if you have vaginal or anal sex with an infected partner. Oral sex carries less risk. The virus can enter your body through mouth sores or small tears that can happen in the rectum or vagina during sex.
- **Share needles to inject illicit drugs -** Sharing needles and syringes that have been infected puts you at high risk of HIV and other infectious diseases, such as hepatitis.
- **Have a blood transfusion -** Sometimes the virus may be transmitted through blood from a donor. Hospitals and blood banks screen the blood supply for HIV. So this risk is small in places where these precautions are taken. The risk may be higher in resource-poor countries that are not able to screen all donated blood.
- **Have a pregnancy, give birth or breastfeed.** Pregnant people who have HIV can pass the virus to their babies. People who are HIV positive and get treatment for the infection during pregnancy can greatly lower the risk to their babies.

How HIV doesn't spread

You can't become infected with HIV through casual contact. That means you can't catch HIV or get AIDS by hugging, kissing, dancing or shaking hands with someone who has the infection. HIV isn't spread through air, water or insect bites. You can't get HIV by donating blood.

Risk factors

Anyone of any age, race, sex or sexual orientation can have HIV/AIDS. However, you're at greatest risk of HIV/AIDS if you :

- **Have unprotected sex -** Use a new latex or polyurethane condom every time you have sex. Anal sex is riskier than is vaginal sex. Your risk of HIV increases if you have more than one sexual partner.
- **Have an STI -** Many STIs cause open sores on the genitals. These sores allow HIV to enter the body.
- **Inject illicit drugs -** If you share needles and syringes, you can be exposed to infected blood.

Complications

HIV infection weakens your immune system. The infection makes you much more likely to get many infections and certain types of cancers.

Infections common to HIV/AIDS

- Pneumocystis pneumonia, also called PCP. This fungal infection can cause severe illness. It doesn't happen as often in the U.S. because of treatments for HIV/AIDS. But PCP is still the most common cause of pneumonia in people infected with HIV.
- **Candidiasis, also called thrush -** Candidiasis is a common HIV-related infection. It causes a thick, white coating on the mouth, tongue, esophagus or vagina.
- **Tuberculosis, also called TB -** TB is a common opportunistic infection linked to HIV. Worldwide, TB is a leading cause of death among people with AIDS. It's less common in the U.S. thanks to the wide use of HIV medicines.
- **Cytomegalovirus -** This common herpes virus is passed in body fluids such as saliva, blood, urine, semen and breast milk. A healthy immune system makes the virus inactive, but it stays in the body. If the immune system weakens, the virus becomes active, causing damage to the eyes, digestive system, lungs or other organs.
- **Cryptococcal meningitis -** Meningitis is swelling and irritation, called inflammation, of the membranes and fluid around the brain and spinal cord, called meninges. Cryptococcal meningitis is a common central nervous system infection linked to HIV. A fungus found in soil causes it.
- **Toxoplasmosis -** This infection is caused by Toxoplasma gondii, a parasite spread primarily by cats. Infected cats pass the parasites in their stools. The parasites then can spread to other animals and humans.
- **Toxoplasmosis can cause heart disease** - Seizures happen when it spreads to the brain. And it can be fatal.

Cancers common to HIV/AIDS

- **Lymphoma -** This cancer starts in the white blood cells. The most common early sign is painless swelling of the lymph nodes most often in the neck, armpit or groin.
- **Kaposi sarcoma -** This is a tumor of the blood vessel walls. Kaposi sarcoma most often appears as pink, red or purple sores called lesions on the skin and in the mouth in people with white skin. In people with Black or brown skin, the lesions may look dark brown or black. Kaposi sarcoma also can affect the internal organs, including the lungs and organs in the digestive system.
- **Human papillomavirus (HPV)-related cancers -** These are cancers caused by HPV infection. They include anal, oral and cervical cancers.

Other complications

- **Wasting syndrome -** Untreated HIV/AIDS can cause a great deal of weight loss. Diarrhea, weakness and fever often happen with the weight loss.
- Brain and nervous system, called neurological, complications. HIV can cause neurological symptoms such as confusion, forgetfulness, depression, anxiety and difficulty walking. HIV-associated neurological conditions can range from mild symptoms of behavior changes and reduced mental functioning to severe dementia causing weakness and not being able to function.
- Kidney disease - HIV-associated nephropathy (HIVAN) is swelling and irritation, called inflammation, of the tiny filters in the kidneys. These filters remove excess fluid and waste from the blood and pass them to the urine. Kidney disease most often affects Black and Hispanic people.
- Liver disease - Liver disease also is a major complication, mainly in people who also have hepatitis B or hepatitis C.

Prevention

There is no vaccine to prevent HIV infection and no cure for HIV/AIDS. But you can protect yourself and others from infection. To help prevent the spread of HIV :

- **Consider preexposure prophylaxis, also called PrEP.** There are two PrEP medicines taken by mouth, also called oral, and one PrEP medicine given in the form of a shot, called injectable. The oral medicines are emtricitabine-tenofovir disoproxil fumarate (Truvada) and emtricitabine-tenofovir alafenamide fumarate (Descovy). The injectable medicine is called cabotegravir (Apretude). PrEP can reduce the risk of sexually transmitted HIV infection in people at very high risk.
- PrEP can reduce the risk of getting HIV from sex by about 99% and from injecting drugs by at least 74%, according to the Centers for Disease Control and Prevention. Descovy hasn't been studied in people who have sex by having a penis put into their vaginas, called receptive vaginal sex.
- Cabotegravir (Apretude) is the first U.S. Food and Drug Administration-approved PrEP that can be given as a shot to reduce the risk of sexually transmitted HIV infection in people at very high risk. A healthcare professional gives the shot. After two once-monthly shots, Apretude is given every two months. The shot is an option in place of a daily PrEP pill.
- Your healthcare professional prescribes these medicines to prevent HIV only to people who don't already have HIV infection. You need an HIV test before you start taking any PrEP. You need to take the test every three months for the pills or before each shot for as long as you take PrEP.

- You need to take the pills every day or closely follow the shot schedule. You still need to practice safe sex to protect against other STIs. If you have hepatitis B, you should see an infectious disease or liver specialist before beginning PrEP therapy.
- Use treatment as prevention, also called TasP. If you have HIV, taking HIV medicines can keep your partner from getting infected with the virus. If your blood tests show no virus, that means your viral load can't be detected. Then you won't transmit the virus to anyone else through sex.
- If you use TasP, you must take your medicines exactly as prescribed and get regular checkups.
- **Use post-exposure prophylaxis, also called PEP, if you've been exposed to HIV-** If you think you've been exposed through sex, through needles or in the workplace, contact your healthcare professional or go to an emergency room. Taking PEP as soon as you can within the first 72 hours can greatly reduce your risk of getting HIV. You need to take the medicine for 28 days.
- **Use a new condom every time you have anal or vaginal sex -** Both male and female condoms are available. If you use a lubricant, make sure it's water based. Oil-based lubricants can weaken condoms and cause them to break.
- During oral sex, use a cut-open condom or a piece of medical-grade latex called a dental dam without a lubricant.
- **Tell your sexual partners you have HIV-** It's important to tell all your current and past sexual partners that you're HIV positive. They need to be tested.
- **Use clean needles -** If you use needles to inject illicit drugs, make sure the needles are sterile. Don't share them. Use needle-exchange programs in your community. Seek help for your drug use.
- **If you're pregnant, get medical care right away -** You can pass HIV to your baby. But if you get treatment during pregnancy, you can lessen your baby's risk greatly.
- **Consider male circumcision -** Studies show that removing the foreskin from the penis, called circumcision, can help reduce the risk of getting HIV infection.

9.11 DIET

Nutritious food is, thus needed to sustain life and activity. Our diet must provide all essential nutrients in the required amounts. Requirements of essential nutrients vary with age, gender, physiological status and physical activity. Dietary intakes lower or higher than the body requirements can lead to under nutrition (deficiency diseases) or over nutrition (diseases of affluence) respectively. Eating too little food during certain significant periods of life such as infancy, childhood, adolescence, pregnancy and lactation and eating too much at any age can lead to harmful consequences. An adequate diet, providing all nutrients, is needed throughout our lives. The nutrients must be obtained through a judicious choice and combination of a variety of foodstuffs from different food groups.

Carbohydrates, fats and proteins are macronutrients, which are needed in large amounts. Vitamins and minerals constitute the micronutrients and are required in small amounts. These nutrients are necessary for physiological and biochemical processes by which the human body acquires, assimilates and utilizes food to maintain health and activity.

9.12 CARBOHYDRATES

Carbohydrates are either simple or complex, and are major sources of energy in all human diets. They provide energy of 4 Kcal/g. The simple carbohydrates, glucose and fructose, are found in fruits, vegetables and honey, sucrose in sugar and lactose in milk, while the complex polysaccharides are

starches in cereals, millets, pulses and root vegetables and glycogen in animal foods. The other complex carbohydrates which are resistant to digestion in the human digestive tract are cellulose in vegetables and whole grains, and gums and pectins in vegetables, fruits and cereals, which constitute the dietary fibre component. In India, 70-80% of total dietary calories are derived from carbohydrates present in plant foods such as cereals, millets and pulses.

Dietary fibre delays and retards absorption of carbohydrates and fats and increases the satiety value. Diets rich in fibre reduce glucose and lipids in blood and increase the bulk of the stools. Diets rich in complex carbohydrates are healthier than low-fibre diets based on refined and processed foods.

9.13 PROTEINS

Proteins are primary structural and functional components of every living cell. Almost half the protein in our body is in the form of muscle and the rest of it is in bone, cartilage and skin. Proteins are complex molecules composed of different amino acids. Certain amino acids which are termed "essential", have to be obtained from proteins in the diet since they are not synthesized in the human body. Other nonessential amino acids can be synthesized in the body to build proteins. Proteins perform a wide range of functions and also provide energy (4 Kcal/g). Protein requirements vary with age, physiological status and stress. More proteins are required by growing infants and children, pregnant women and individuals during infections and illness or stress. Animal foods like milk, meat, fish and eggs and plant foods such as pulses and legumes are rich sources of proteins.

Animal proteins are of high quality as they provide all the essential amino acids in right proportions, while plant or vegetable proteins are not of the same quality because of their low content of some of the essential amino acids. However, a combination of cereals, millets and pulses provides most of the amino acids, which complement each other to provide better quality proteins.

9.14 FATS

Oils and fats such as butter, ghee and vanaspathi constitute dietary visible fats. Fats are a concentrated source of energy providing 9 Kcal/g, and are made up of fatty acids in different proportions. Dietary fats are derived from two sources viz. the invisible fat present in plant and animal foods; and the visible or added fats and oils (cooking oil). Fats serve as a vehicle for fat-soluble vitamins like vitamins A, D, E and K and carotenes and promote their absorption. They are also sources of essential polyunsaturated fatty acids. It is necessary to have adequate and good quality fat in the diet with sufficient polyunsaturated fatty acids in proper proportions for meeting the requirements of essential fatty acids. The type and quantity of fat in the daily diet influence the level of cholesterol and triglycerides in the blood. Diets should include adequate amounts of fat particularly in the case of infants and children, to provide concentrated energy since their energy needs per kg body weight are nearly twice those of adults. Adults need to be cautioned to restrict intake of saturated fat (butter, ghee and hydrogenated fats) and cholesterol (red meat, eggs, organ meat). Excess of these substances could lead to obesity, diabetes, cardiovascular disease and cancer.

9.15 VITAMINS AND MINERALS

Vitamins are chemical compounds required by the body in small amounts. They must be present in the diet as they cannot be synthesized in the body. Vitamins are essential for numerous body processes and for maintenance of the structure of skin, bone, nerves, eye, brain, blood and mucous membrane. They are either water soluble or fat-soluble. Vitamins A, D, E and K are fat-soluble, while vitamin C, and the B-complex vitamins such as thiamin (B), 1 riboflavin (B), niacin, pyridoxine (B), folic 2 6 acid and cyanocobalamin (B) are water- 12 soluble. Pro-vitamin like beta-carotene is converted to vitamin A in the body. Fat-soluble vitamins can be stored in the body while water-soluble

vitamins are not and get easily excreted in urine. Vitamins B-complex and C are heat labile vitamins and are easily destroyed by heat, air or during drying, cooking and food processing.

Minerals are inorganic elements found in body fluids and tissues. The important macro minerals are sodium, potassium, calcium, phosphorus, magnesium and sulphur, while zinc, copper, selenium, molybdenum, fluorine, cobalt, chromium and iodine are micro minerals. They are required for maintenance and integrity of skin, hair, nails, blood and soft tissues. They also govern nerve cell transmission, acid/base and fluid balance, enzyme and hormone activity as well as the blood- clotting processes.

9.16 CHRONIC DISEASES

Chronic diseases are long-lasting conditions that usually can be controlled but not cured. People living with chronic illnesses often must manage daily symptoms that affect their quality of life, and experience acute health problems and complications that can shorten their life expectancy. According to the Centers for Disease Control, chronic disease is the leading cause of death and disability in the United States, accounting for 70% of all deaths. Moreover, chronic conditions such as back pain and depression are often the main drivers of decreased productivity and increased healthcare costs. Data from the World Health Organization show that chronic disease is the major cause of premature death around the world, even in places where infectious disease are rampant. The good news is that through effective behavior change efforts, appropriate medical management, and systematic monitoring to identifying new problems, chronic diseases and their consequences can often be prevented or managed effectively.

CMCD aims to help people prevent and control the effects of their chronic illness by putting them at the center of disease control solutions. When designs for patient education, service delivery, and payment systems all focus on building the capacity of individuals and families to manage disease effectively, disease control improves, health care costs go down, and family well-being gets better.

Characteristics of a Chronic Diseases

Chronic illnesses are mostly characterised by :

- Complex causes
- Many risk factors
- Long latency periods (time between the onset of the illness and feeling its effects)
- A long illness
- Functional impairment or disability.

Most chronic illnesses do not fix themselves and are generally not cured completely.

- Some can be immediately life-threatening, such as heart disease and stroke.
- Others linger over time and need intensive management, such as diabetes.
- Most chronic illnesses persist throughout a person’s life but are not always the cause of death, such as arthritis

Here are some examples of chronic diseases that are included in CMCD’s research agenda :

- Allergies and Asthma
- Alzheimer’s Disease
- Cancer

- Cardiovascular Diseases
- Chronic Back Pain and Other Pain Syndromes
- Depression
- Diabetes
- Epilepsy
- Obesity
- Substance Abuse Disorders

9.17 SUMMARY

Under this unit we have summarized the concept of community health, public education, diet, alcoholism, smoking and AIDS etc. Community health is the convergence of health care services, economics and social responsibilities. People residing in a particular reason more or less share similar kind of health risks and social and economic conditions. Community health is a medical practice which focuses on people's well-being in a particular geographical area. This essential public health sector covers programs to help neighborhood members in protecting and improving their health, deter the transmission of infectious diseases, and plan for natural disasters.

Health education is a profession of educating people about health. Areas within this profession encompass environmental health, physical health, social health, emotional health, intellectual health, and spiritual health, as well as sexual and reproductive health education. Alcoholism is the continued drinking of alcohol despite negative results. Problematic use of alcohol has been mentioned in the earliest historical records, the World Health Organization (WHO) estimated there were 283 million people with alcohol use disorders worldwide as of 2016. The term alcoholism was first coined in 1852, but alcoholism and alcoholic are stigmatizing and discourage seeking treatment, so clinical diagnostic terms such as alcohol use disorder or alcohol dependence are used instead.

9.18 TERMINAL QUESTIONS

Q. 1 What do you mean by life style and community health? Explain it.

Answer :----------

Q. 2 Write short notes on the following.

(a) Cigarette smoking

(b) Chronic diseases

Answer :----------

Q. 3 Write short notes on the following.

(a) AIDS

(b) Diet

Answer :----------

Q. 4 Describe acquired immunodeficiency syndrome (AIDS).

Answer :----------

Q. 5 Write short notes on the following.

(a) Drugs

(b) Alcholism

Answer :----------

Q. 6 What do you mean by drugs? Explain it.

Answer :----------

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

Unit 10 : IMMUNIZATION

Structure

10.1 INTRODUCTION

Immunization, is the process by which an individual's immune system becomes fortified against an infectious agent (known as the immunogen). When this system is exposed to molecules that are foreign to the body, called *non-self*, it will orchestrate an immune response, and it will also develop the ability to quickly respond to a subsequent encounter because of immunological memory. This is a function of the adaptive immune system. Therefore, by exposing a human, or an animal, to an immunogen in a controlled way, its body can learn to protect itself : this is called active immunization. Immunization is the process whereby a person is made resistant to a disease, typically by the administration of a vaccine. Vaccines stimulate the body's own immune system to protect the person against subsequent infection or disease. Immunization prevents diseases, disabilities, and deaths from vaccine-preventable diseases (VPDs), such as cervical cancer, poliomyelitis, measles, rubella, paroditis, diphtheria, tetanus, pertussis, hepatitis A and B, bacterial pneumonias, rotavirus diarrheal diseases and bacterial meningitis.

OBJECTIVES

This is the tenth unit (Immunization) of third block (Community food protection, Food Adulteration and Immunization). Under tenth unit, we have following objectives. These are as under :

- To know about immunization and vaccinations
- To know about childhood immunization schedule
- To discuss birth vaccine, family, foreign travel and immunity
- To discuss dengue, hepatitis, influenza and diptheria

The most important elements of the immune system that are improved by immunization are the T cells, B cells, and the antibodies B cells produce. Memory B cells and memory T cells are responsible for a swift response to a second encounter with a foreign molecule. Passive immunization is direct introduction of these elements into the body, instead of production of these elements by the body itself.

Immunization happens in various ways, both in the wild and as done by human efforts in health care. Natural immunity is gained by those organisms whose immune systems succeed in fighting off a previous infection, if the relevant pathogen is one for which immunization is even possible. Natural immunity can have degrees of effectiveness (partial rather than absolute) and may fade over time (within months, years, or decades, depending on the pathogen).

In health care, the main technique of artificial induction of immunity is vaccination,[1] which is a major form of prevention of disease, whether by prevention of infection (pathogen fails to mount sufficient reproduction in the host), prevention of severe disease (infection still happens but is not severe), or both. Vaccination against vaccine-preventable diseases is a major relief of disease burden even though it usually cannot eradicate a disease. Vaccines against microorganisms that cause diseases can prepare the body's immune system, thus helping to fight or prevent an infection. The fact that mutations can cause cancer cells to produce proteins or other molecules that are known to the body forms the theoretical basis for therapeutic cancer vaccines. Other molecules can be used for immunization as well, for example in experimental vaccines against nicotine or the hormone ghrelin in experiments to create an obesity vaccine.

Immunizations are often widely stated as less risky and an easier way to become immune to a particular disease than risking a milder form of the disease itself. They are important for both adults and children in that they can protect us from the many diseases out there. Immunization not only protects children against deadly diseases but also helps in developing children's immune systems. Through the use of immunizations, some infections and diseases have almost completely been eradicated throughout the World. One example is polio. Thanks to dedicated health care professionals and the parents of children who vaccinated on schedule, polio has been eliminated in the U.S. since 1979. Polio is still found in other parts of the world so certain people could still be at risk of getting it.

10.2 VACCINES FOR CHILDREN

Immunization means protection. The most effective and safe way to protect children from contagious diseases is by vaccination. Vaccines are considered a breakthrough in preventive medicine. Vaccines protect your child’s health by preventing them from contracting severe contagious diseases.

Fig. Vaccinations

10.3 ROUTINE VACCINES PROVIDED FOR BABIES AND CHILDREN

Childhood Immunization Schedule

The childhood schedule of immunizations is the best way to protect your child against many different infections and diseases. The vaccination age chart can help you figure out which vaccines your child needs and when. Vaccines include DTaP, Hib, chickenpox and MMR. The vaccines are safe and vitally important to keep your child safe and healthy.

10.4 WHAT IS THE CHILDHOOD IMMUNIZATION SCHEDULE?

The childhood immunization schedule, or childhood vaccine schedule, is the list of common vaccines the Centers for Disease Control and Prevention (CDC) recommends most children should receive. Immunization is a way to protect your child from getting many different infections and diseases. Many of these illnesses spread easily from child to child and can cause serious health problems. They can even cause death. The childhood immunization schedule is the list of common vaccines the CDC recommends most children should receive.

10.5 WHEN SHOULD MY CHILD GET IMMUNIZED?

Your child should receive their first doses of most vaccines during their first two years of life. They may need several doses of the vaccines to reach full protection. For example, the CDC recommends children receive their first dose of the measles, mumps and rubella (MMR) vaccine at 12 months of age or older. They should then receive a second dose before entering elementary school (about 4 to 6 years of age). Your baby can get their childhood vaccines at their regularly scheduled well-baby checkups.

How many vaccines do children get?

By the age of 15 months, your baby may receive up to 10 different types of vaccines. The American Academy of Pediatrics recommends all healthy babies receive these initial vaccines. Your child may receive additional doses and other vaccines between the ages of 15 months and 16 years old. If your child has a chronic condition or a weakened immune system, their pediatrician may recommend a different schedule.

10.6 WHAT ARE THE DIFFERENT TYPES OF VACCINES?

The following vaccines can help protect your child from serious infection or disease.

Hepatitis B (HepB)

The hepatitis B vaccine can help protect your child against hepatitis B. The newborn vaccine schedule includes three doses of the HepB vaccine. Your newborn will generally receive their first dose within 12 hours of birth. They'll receive their second dose at 1 to 2 months of age and their third dose between 6 and 18 months of age. Slight variations in this schedule are possible based on the birthing parent's hepatitis B surface antigen status and the potential use of combination vaccines.

Rotavirus (RV)

The rotavirus vaccine can help protect your child against rotavirus. Rotavirus is a viral infection that can cause fever, vomiting and diarrhea. Your child will receive the rotavirus vaccine in two (Rotarix®) or three (RotaTeq®) doses, starting at age 2 months.

Diphtheria, tetanus and acellular pertussis (DTaP)

The DTaP vaccine can help protect your child against diphtheria, tetanus and pertussis. Baby vaccines include five doses of the DTaP combination vaccine. Your baby will receive their first dose at 2 months of age and their second at 4 months of age. They'll receive their third dose at 6 months, their fourth dose between 15 and 18 months of age and their fifth dose between 4 and 6 years of age.

Haemophilus influenzae type b (Hib)

The Hib vaccine can help protect your child against the most common type of *Haemophilus influenzae* bacteria. Your child will receive three to four doses of the Hib vaccine, depending on the brand. They'll receive their first dose at 2 months of age and their second dose at 4 months of age. They'll possibly receive a third dose at 6 months of age. They'll then receive their final dose between 12 and 15 months of age. Slight variations in this schedule are possible.

Pneumococcal conjugate (PCV13)

The PCV13 vaccine can help protect your child against pneumococcus bacterial infections. These infections include pneumonia and meningitis. Your child will receive four doses of the PCV13 vaccine. They'll receive their first dose at 2 months of age and their second dose at 4 months of age. They'll receive their third dose at 6 months of age and their fourth dose between 12 and 15 months of age.

Inactivated poliovirus (IPV)

The inactivated poliovirus (IPV) vaccine can help protect your child against infections of polio. Your child will receive four doses of the IPV vaccine. They'll receive their first dose at 2 months of age and their second dose at 4 months of age. They'll receive their third dose between 6 and 18 months of age and their fourth dose between 4 and 6 years of age.

Influenza

The influenza virus vaccine can help protect your child against the flu (influenza). Your child may get the influenza vaccine each year. They may receive one or two doses. They may receive their first dose at 6 months old and their second dose at least 1 month later.

Measles, mumps and rubella (MMR)

The measles, mumps and rubella (MMR) vaccine can help protect your child against measles, mumps and rubella. Your child will receive two doses of the MMR combination vaccine. They'll receive their first dose between 12 and 15 months of age and their second dose between 4 and 6 years of age. The MMR vaccine may be combined with the VAR vaccine (MMRV).

Varicella (VAR)

The chickenpox (varicella) vaccine can help protect your child against chickenpox. Your child will receive two doses of the varicella vaccine. They'll receive their first dose between 12 and 15 months of age and their second dose between 4 and 6 years of age. The varicella vaccine may be combined with the MMR vaccine (MMRV).

Hepatitis A (HepA)

The hepatitis A vaccine can help protect your child against hepatitis A. Hepatitis A is a type of liver disease. Your child will receive the HepA vaccine as a two-dose series. Your child will receive their first dose between 12 and 23 months and their second dose at least six months later.

Human papillomavirus (HPV)

The HPV vaccine can help protect your child against diseases caused by certain types of human papillomavirus (HPV). These diseases include :

- Precancerous cervical, vaginal and vulvar lesions.
- Genital warts.
- Cancers including cervical cancer, anal cancer, penile cancer and head and neck cancer.

If your child is aged 15 or over, they'll receive the HPV vaccine in three doses. They'll receive their second dose two months after their first dose. They'll receive their final dose six months after their first dose. Children who start the HPV vaccine before they turn 15 years old only need two doses, given six to 12 months apart. This is because younger immune systems generate more immunity.

Meningococcal

The meningococcal vaccine can help protect your child against meningococcal disease. Meningococcal disease is a serious bacterial infection that can cause meningitis. Meningitis is severe swelling of your brain and spinal cord. It can also lead to sepsis, a dangerous and potentially life-threatening blood infection.

Other vaccines

Your child's pediatrician may recommend additional vaccines if your child is at a high risk of certain infections or diseases. They'll also provide a revised vaccination schedule if your child has missed any vaccine doses during their recommended time frames.

What ages do kids get shots?

The infant vaccine schedule starts at birth. Your newborn will receive their first shots within their first months of life. Your child may receive certain vaccines within a range of ages. The following represents one recommended child vaccine schedule. Your child's pediatrician may follow different guidelines. You should speak with your child's pediatrician about which vaccines your child should receive and when. The recommended vaccines by age include :

10.7 BIRTH VACCINE

Vaccines for babies include their first doses of Hepatitis B (HepB).

- Hepatitis B (HepB).

1- to 2-month vaccine

- Hepatitis B (HepB).

2-month vaccines

Babies get several shots at 2 months of age. The DTaP vaccine schedule starts at 2 months. Your baby will get their first dose of :

- Rotavirus (RV).
- Diphtheria, tetanus and acellular pertussis (DTaP).
- *Haemophilus influenzae* type B (Hib).
- Pneumococcal conjugate (PCV13).
- Inactivated poliovirus (IPV).

4-month vaccines

For their 4-month shots, babies get a second dose of the vaccines they received at their 2-month appointment. These include :

- Rotavirus (RV).
- Diphtheria, tetanus and acellular pertussis (DTaP).
- *Haemophilus influenzae* type B (Hib).
- Pneumococcal conjugate (PCV13).
- Inactivated poliovirus (IPV).

6-month vaccines

At 6 months of age, your child may start to receive the influenza vaccine annually. In addition, your child may or may not need a third dose of the RV and Hib vaccines, depending on the brand your child's healthcare provider used for their previous doses.

- Influenza.
- Rotavirus (RV).
- *Haemophilus influenzae* type B (Hib).
- Diphtheria, tetanus and acellular pertussis (DTaP).
- Pneumococcal conjugate (PCV13).

6- to 18-month vaccines

The timing of your baby's third dose of these vaccines will depend on their healthcare provider's recommendation. Six- to 18-month shots may include :

- Hepatitis B (HepB).
- Inactivated poliovirus (IPV).

12- to 15-month vaccines

Your child will receive their first dose of MMR and varicella after they've hit their first birthday. Twelve- to 15-month shots include :

- Measles, mumps and rubella (MMR).
- Varicella (VAR).
- *Haemophilus influenzae* type B (Hib).
- Pneumococcal conjugate (PCV13).

12- to 23-month vaccine

Your baby's 12-month vaccines may include the first in a two-dose series of hepatitis A. They may receive the second vaccine at 2 years old.

- Hepatitis A (HepA).

15- to 18-month vaccine

Your baby will receive one shot during this time frame, their fourth dose of DTaP.

- Diphtheria, tetanus and acellular pertussis (DTaP).

4- to 6-year vaccines

Between 4 and 6 years old, your child may receive the following shots :

- Diphtheria, tetanus and acellular pertussis (DTaP).
- Inactivated poliovirus (IPV).
- Measles, mumps and rubella (MMR).
- Varicella (VAR).

11- to 12-year vaccines

Your child gets to wait a bit before their next round of vaccines.

- Tetanus, diphtheria and acellular pertussis (Tdap) booster.
- Human papillomavirus (HPV).
- Meningococcal.

16-year vaccine

Your 16-year-old should receive their second dose of meningococcal.

- Meningococcal.

Are the vaccines safe?

Yes. Vaccines for childhood diseases are very safe. Sometimes, a vaccine will cause mild side effects such as a sore arm or leg or a low fever. A bad side effect isn't likely to happen. Childhood diseases are a greater health risk to children than vaccines are. Ask your child's healthcare provider to tell you about the risks and side effects.

When shouldn’t my child be vaccinated?

In a few cases, it's better to wait to get a vaccine. Some children who are very sick shouldn’t get a vaccine at all. Reasons your child should wait or not get a vaccine may include :

- Being sick with something more serious than a cold.
- Having a bad reaction after the first dose of a vaccine.
- Having sudden jerky body movements (convulsions), possibly caused by a vaccine.

10.8 PASSIVE AND ACTIVE IMMUNIZATION

Immunization can be achieved in an active or passive manner : vaccination is an active form of immunization.

10.8.1 Active immunization

Active immunization can occur naturally when a person comes in contact with, for example, a microbe. The immune system will eventually create antibodies and other defenses against the microbe. The next time, the immune response against this microbe can be very efficient; this is the case in many of the childhood infections that a person only contracts once, but then is immune.

Artificial active immunization is where the microbe, or parts of it, are injected into the person before they are able to take it in naturally. If whole microbes are used, they are pre-treated. The importance of immunization is so great that the American Centers for Disease Control and Prevention has named it one of the Ten Great Public Health Achievements in the 20th Century. Live attenuated vaccines have decreased pathogenicity. Their effectiveness depends on the immune systems ability to replicate and elicits a response similar to natural infection. It is usually effective with a single dose. Examples of live, attenuated vaccines include measles, mumps, rubella, MMR, yellowfever, varicella, rotavirus,and influenza (LAIV).

10.8.2 Passive immunization

Passive immunization is where pre-synthesized elements of the immune system are transferred to a person so that the body does not need to produce these elements itself. Currently, antibodies can be used for passive immunization. This method of immunization begins to work very quickly, but it is short lasting, because the antibodies are naturally broken down, and if there are no B cells to produce more antibodies, they will disappear.

Passive immunization occurs physiologically, when antibodies are transferred from mother to fetus during pregnancy, to protect the fetus before and shortly after birth. Artificial passive immunization is normally administered by injection and is used if there has been a recent outbreak of a particular disease or as an emergency treatment for toxicity, as in for tetanus. The antibodies can be produced in animals, called serum therapy, although there is a high chance of anaphylactic shock because of immunity against animal serum itself. Thus, humanized antibodies produced *in vitro* by cell culture are used instead if available.

10.9 FOREIGN TRAVEL & HEALTH PROBLEMS

Appropriate planning reduces the risks associated with travel, including foreign travel. Prior to travel, patients and their medical providers should review planned itineraries and relevant medical histories, recommended vaccinations, prophylactic measures against infections such as COVID-19, malaria, and traveler's diarrhea, and advice about personal protection measures, including those related to noninfectious threats such as road traffic crashes. For older travelers, the most common

causes of death are heart attack and stroke; for other travelers, the most common cause of death is road traffic accidents.

About 1 in 30 people traveling abroad requires emergency care. Illness in a foreign country may involve significant difficulties. Many US insurance plans, including Medicare, are not valid in foreign countries; overseas hospitals often require a substantial cash deposit for nonresidents, regardless of insurance. Travel insurance plans, including some that arrange for emergency evacuation, are available through commercial agents, travel agencies, and some major credit card companies.

Directories listing English-speaking physicians in foreign countries, US consulates who may assist in obtaining emergency medical services, and information about foreign travel risks are available. Patients with serious disorders should consider pretravel contact or arrangements with an organization that offers medically supervised evacuation from foreign countries. Certain infections are common when traveling to certain areas. Immunizations should be tailored to planned destinations, and advice regarding specific measures for preventing endemic and episodic infections should be given. Carrying medications to treat common infections (eg, upper respiratory infection, traveler's diarrhea) may be helpful.

10.10 VACCINATIONS

Travelers should be current on all routine immunizations, including COVID-19. Some countries require specific vaccinations (see table Vaccines for International Travel). The Centers for Disease Control and Prevention (CDC) website provides general travel and up-to-date immunization information, travel information related to COVID-19, and malaria chemoprophylaxis requirements.

COVID-19

The COVID-19 pandemic has necessitated limitation of travel to and from various countries. Entry requirements (eg, testing, vaccination, quarantine) change frequently, and patients should be advised to check the website of their nation's health agency (eg, CDC in the US) as well as the destination countries for current recommendations.

10.11 DENGUE

Dengue fever is a mosquito-borne viral infection endemic to the tropical regions of the world in latitudes from about 35° north to 35° south. Outbreaks are most prevalent in Southeast Asia but also occur in the Caribbean, including Puerto Rico and the US Virgin Islands, Oceania, and the Indian subcontinent; more recently, dengue incidence has increased in Central and South America. A vaccine for dengue is approved in several countries outside the US, but efficacy is only moderate and varies by dengue immune status, serotype, and patient age; studies are ongoing.

People traveling to endemic areas should try to prevent mosquito bites. Effective personal protection measures include applying DEET or picaridin to exposed skin, applying permethrin to clothing, and sleeping under a permethrin-treated mosquito net if sleeping quarters are not air conditioned (see CDC : Prevent Mosquito Bites). These measures also offer protection from other insect-transmitted diseases including Zika and chikungunya.

Influenza

Influenza is common in international travelers; hence annual influenza vaccines are indicated for all travelers.

Malaria

Malaria is endemic in much of Africa, Asia, Latin America, and other regions. The CDC provides information about specific countries where malaria is transmitted (see Yellow Fever and Malaria Information, by Country), types of malaria, and resistance patterns. Travelers to endemic regions should take preventive measures for malaria, including chemoprophylaxis. Although the RTS,S/AS01 (RTS,S) malaria vaccine is recommended for children living in regions with moderate to high *Plasmodium falciparum* malaria transmission, this vaccine is not recommended for travelers to those regions.

Schistosomiasis

Schistosomiasis is common and is caused by exposure to contaminated freshwater in Africa, Southeast Asia, China, and eastern South America. Risk of schistosomiasis can be reduced by avoiding freshwater activities in areas where schistosomiasis is common. Asymptomatic travelers with freshwater exposure in endemic regions should be screened by serologic testing for antibody to the adult worm at 6 to 8 weeks following their most recent exposure. Alternately, travelers may elect to presumptively treat a potential exposure with praziquantel, at 6 to 8 weeks after the most recent potential exposure : 20 mg/kg orally twice per day for one day (*Schistosoma mansoni*, *S. haematobium*, *S. intercalatum*) or 20 mg/kg 3 times per day for one day (*S. japonicum*, *S. mekongi*).

Traveler’s diarrhea

Traveler’s diarrhea (TD) is the most common health problem among international travelers. TD is usually self-limited, typically resolving in 5 days; however, 3 to 10% of travelers with TD may have symptoms lasting > 2 weeks, and up to 3% of travelers have TD lasting > 30 days. TD lasting < 1 week requires no testing. For persistent TD, laboratory testing is done. Self-initiated treatment is indicated for moderate to severe symptoms, especially if vomiting, fever, abdominal cramps, or blood in the stool are present. Treatment of traveler's diarrhea is with an appropriate antibiotic (eg, azithromycin, 500 mg or one gram once, or 500 mg once a day for 1 to 3 days). Additional measures include loperamide (except in patients with fever, bloody stools, or abdominal pain and in children < 2 years); replacement of fluids; and, in older people and small children, electrolytes (eg, oral rehydration solution). Measures that may decrease the risk of TD include

- Drinking and brushing teeth with bottled, filtered, boiled, or chlorinated water
- Avoiding ice
- Eating freshly prepared foods only if they have been heated to steaming temperatures
- Eating only fruits and vegetables that travelers peel or shell themselves
- Avoiding food from street vendors
- Washing hands frequently
- Avoiding all foods likely to have been exposed to flies

Prophylactic antibiotics are effective in preventing diarrhea, but because of concerns about adverse effects and development of resistance, they should probably be reserved for immunocompromised patients. One option is rifaximin, 200 mg once or twice a day.

Injury and death

Road traffic crashes are the most frequent cause of death of international travelers, with the exception of older adults. Travelers should at all times use a seat belt in vehicles and a helmet when

cycling. Travelers should avoid motorcycles and mopeds and avoid riding on bus roofs or in open truck beds. Drowning is another common cause of death while abroad. Travelers should avoid beaches with turbulent surf and avoid swimming after drinking alcoholic beverages.

Problems after returning home

The most common medical problem after travel is

- Persistent traveler's diarrhea

The most common potentially serious diseases are

- Malaria
- Hepatitis A and B
- Typhoid fever
- Sexually transmitted infections, including HIV infection
- Amebiasis
- Meningitis

People can also acquire lice and scabies after being in crowded living conditions or places where hygienic measures are poor. Some diseases become evident months after a traveler has returned home; a travel history with exposure risks is a useful diagnostic clue when patients present with a puzzling illness. The International Society of Travel Medicine (www.istm.org) has lists of travel clinics. Many of these clinics specialize in assisting travelers who are ill after their return home. For health care practitioners, the Centers for Disease Control provides assistance and information to help patients returning from travel abroad.

10.12 FAMILY

Family**,** a group of persons united by the ties of marriage, blood, or adoption, constituting a single household and interacting with each other in their respective social positions, usually those of spouses, parents, children, and siblings. The family group should be distinguished from a household, which may include boarders and roomers sharing a common residence. It should also be differentiated from a kindred (which also concerns blood lines), because a kindred may be divided into several households. Frequently the family is not differentiated from the marriage pair, but the essence of the family group is the parent-child relationship, which may be absent from many marriage pairs.

Fig. Family

At its most basic, then, a family consists of an adult and his or her offspring. Most commonly, it consists of two married adults, usually a man and a woman (almost always from different lineages and not related by blood) along with their offspring, usually living in a private and separate dwelling. This type of unit, more specifically known as a nuclear family, is believed to be the oldest of the various types of families in existence. Sometimes the family includes not only the parents and their unmarried children living at home but also children that have married, their spouses, and their offspring, and possibly elderly dependents as well; such an arrangement is called an extended family.

Socioeconomic aspects of the family

At its best, the family performs various valuable functions for its members. Perhaps most important of all, it provides for emotional and psychological security, particularly through the warmth, love, and companionship that living together generates between spouses and in turn between them and their children. The family also provides a valuable social and political function by institutionalizing procreation and by providing guidelines for the regulation of sexual conduct. The family additionally provides such other socially beneficial functions as the rearing and socialization of children, along with such humanitarian activities as caring for its members when they are sick or disabled. On the economic side, the family provides food, shelter, clothing, and physical security for its members, some of whom may be too young or too old to provide for the basic necessities of life themselves. Finally, on the social side, the family may serve to promote order and stability within society as a whole.

Historically, in most cultures, the family was patriarchal, or male-dominated. Perhaps the most striking example of the male-dominated family is the description of the family given in the Hebrew Bible, where the male heads of the clans were allowed to have several wives as well as concubines. As a general rule, women had a rather low status. In Roman times the family was still patriarchal, but polygamy was not practiced, and in general the status of women was somewhat improved over that suggested in the Hebrew Bible, although they still were not allowed to manage their own affairs. The Roman family was an extended one. The family as it existed in medieval Europe was male-dominated and extended.

In the West, industrialization and the accompanying urbanization spawned—and continue to spawn-many changes in family structure by causing a sharp change in life and occupational styles. Many people, particularly unmarried youths, left farms and went to urban centres to become industrial workers. This process led to the dissolution of many extended families.

The modern family that emerged after the Industrial Revolution is different from the earlier model. For instance, patriarchal rule began to give way to greater equality between the sexes. Similarly, family roles once considered exclusively male or female broke down. Caring for the home and children, once the exclusive duty of the female, is often a shared activity, as, increasingly, is the earning of wages and the pursuit of public life, once the exclusive domain of the male. The structure of the family is also changing in that some couples choose not to marry legally and instead elect to have their children out of wedlock; many of these informal relationships tend to be of short duration, and this—as well as the rise in levels of divorce—has led to a rapid increase in the number of one-parent households.

Especially in Western cultures, the modern family is today more of a consuming as opposed to a producing unit, and the members of the family work away from home rather than at home. Public authorities, primarily governmental ones, have assumed many of the functions that the family used to provide, such as caring for the aged and the sick, educating the young, and providing for recreation. Technological advancements have made it possible for couples to decide if and when they want to have children.

10.13 SUMMARY

Under this unit we have summarized the concept of immunization, vaccination for child & adult, foreign travel and health problems etc. Immunization, or immunisation, is the process by which an individual's immune system becomes fortified against an infectious agent (known as the immunogen). The most important elements of the immune system that are improved by immunization are the T cells, B cells, and the antibodies B cells produce. Memory B cells and memory T cells are responsible for a swift response to a second encounter with a foreign molecule. Passive immunization is direct introduction of these elements into the body, instead of production of these elements by the body itself.

Vaccines against microorganisms that cause diseases can prepare the body's immune system, thus helping to fight or prevent an infection. The fact that mutations can cause cancer cells to produce proteins or other molecules that are known to the body forms the theoretical basis for therapeutic cancer vaccines. Other molecules can be used for immunization as well, for example in experimental vaccines against nicotine (NicVAX) or the hormone ghrelin in experiments to create an obesity vaccine.

Alcohol is addictive, and heavy long-term alcohol use results in many negative health and social consequences. It can damage all the organ systems, but especially affects the brain, heart, liver, pancreas and immune system. Heavy alcohol usage can result in trouble sleeping, and severe cognitive issues like dementia, brain damage. Physical effects include irregular heartbeat, an impaired immune response, liver cirrhosis, increased cancer risk, and severe withdrawal symptoms if stopped suddenly. These health effects can reduce life expectancy by 10 years. Drinking during pregnancy may harm the child's health, and drunk driving increases the risk of traffic accidents. Alcoholism is also associated with increases in violent and non-violent crime.

10.14 TERMINAL QUESTIONS

Q.1 Describe childhood immunization schedule.

Answer :----------

Q. 2 Describe different types of vaccines.

Answer :----------

Q. **3** Describe active and passive immunization.

Answer :----------

Q. 4 Write short notes on the following.

(a) Active immunization

(b) Passive immunization

Answer :----------

Q. **5** Describe foreign travel & health problems.

Answer :----------

Q. **6** Write short notes on the following.

(a) Vaccinations

(b) Birth vaccine

Answer :----------

FURTHER READINGS

- Biochemistry- Lehninger A.L.
- Textbook of Nutrition and Dietetics Ranjana Mahna
- Biochemistry fourth edition-David Hames and Nigel Hooper.
- Textbook of Biochemistry for Undergraduates - Rafi, M.D.
- Textbook of Nutrition and Dietetics- Monika Sharma

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