Epidemiology

Lec. 1

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Introduction to Epidemiology

Learning Objectives for the Lecture:

At the end of the lecture the student is going to be able to:

1. Define epidemiology and related concepts.
2. Describe the purpose of epidemiology.
3. List the uses of epidemiology.
4. Identify the term of causality and its related terms.
5. Describe the epidemiological triad and the variations among its elements.

Simple Old Definitions

1. Study the occurrence of illnesses.
2. Branch of medical science which treats epidemics (Oxford English Dictionary).
3. Study of epidemics and their prevention (Kuller,1991).

A modern Definition

The **study** of the occurrence and **distribution** of **health-related states** or events in specified **populations** ,including the study of **determinants** influencing such states, and the application of this study to **control** health problems (Last,1995).

Epidemiology as a **study**: means that the use of basic science of public health. It is a discipline based on principles of statistics and research methodologies.

Distribution :means the presentation of frequency of events within groups in a population Such presentation can be used in descriptive epidemiology by which health events can be characterized through the use of (what) for the problem, (when) for the time, (where) for the place, and (who) for affected persons.

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Health-related states : Epidemiology as a science it does not study the infectious diseases only, it is applied to the whole spectrum of health-related events. It includes environmental problems, behavioral problems, and injuries in addition to diseases.

Population : Is one of the most distinguishing characteristics of epidemiology as a science that deals with groups of people rather than with individual patients .

Determinants: Are risk factors and causes of health problem. Through identification of determinants, we move from descriptive epidemiology by the questions of "what" , "where", "when" and "who" to analytical epidemiology when we ask "how" and "why".

Control : Means that epidemiology serves more active roll in using the collected data in developing plans for interventions to control and prevent health problems .

Purpose of Epidemiology:

The primary purpose of epidemiology is to provide a basis of data for developing strategies of diseases control and prevention.

Uses of Epidemiology:

1. Identify risk factors and causes for health problems.
2. Identify (investigate) the nature / extent of health- related events through studying the natural history of health conditions .
3. Designing an intervention for controlling health problems.
4. Evaluate the effectiveness of those interventions.

Causality : refers to the relationship between a cause and its effect. A purpose of epidemiologic study has been to discover causal relationships, so as to understand why conditions develop and offer effective prevention and protection**.**

Causality is based on the idea that one event is the result of other events

1. **Religious Era** (2000-600 B.C.): Disease is caused by divine intervention, as a punishment of or sins or test of faith.
2. **Environmental Era** (400 B.C.): Disease is caused by harmful miasma , or other substances in the environment.

4. **Bacteriologic Era** (1870-1900): Disease is caused by specific bacteriologic agents.
5. **Multiple Causation Era** (1900 to present): Disease is caused by interaction of multiple factors.

Risk: The probability of developing a health problem.

Risk Factors : Variables that influences population' health status and cause a health problem .

The basis of risk may lie on **two trades**:

1. **Susceptibility**: The ability to be affected by factors that contribute to the existence of a health problem.
2. **Potential for exposure** : The likelihood of exposure to factors that contribute to the existence of a health problem.

Population at Risk : Groups of people who have the greatest potential and susceptibility to develop health problems due to the presence or absence of certain contributing factors

The Epidemiological Triangle Model

The epidemiological triad is a guide or a model use to collect data with respect to its elements: Agent, host, and environment. Interaction between those three elements leads to the occurrence of health problems.

The Host

A host is a susceptible human being who harbors and nourishes a disease causing agent.

Susceptibility and response of the agent is influenced by several factors, it is called host-related factors:

1. Genetic inheritance.
2. Physiological function: ex. Mal nutrition, fatigue .

   i.e. Pre-existing disease (hypertension). i.e. Immunity, presence of specific antibodies to diseases.
3. Maturation and aging: ex. Very young and very old. ex. Adolescent.

The Agent : An agent is a factors whose presence or absence can contribute (cause) to a health problem.

Types of Agents:

1. **Biological agents**: Including viruses, bacteria, fungi protozoa , and worms.
2. **Chemical agents**, chemical substances in various forms; lipids, solids, gases, dust , vapors and fumes.
3. **Physical agents**: mechanical forces that cause injury, and atmospheric abnormalities; Ultraviolet , extreme temperature , earthquake .
4. **Nutritional agents**: These are chemicals in nature but they are basic dietary components, their deficiency or excess cause health problems.
5. **Psychological agents**: Any events that produce stress leading to health problem.

The environment :

It refers to all external factors surrounding the host that constitute the context in which he lives and influence the host-agent interaction that may cause a health problem.

Types of Environment:

1. **Physical Environment**: Physical factors which include , air , water , buildings , temperature, and humidity.
2. **Biological Environment** : All living beings.
3. **Social Environment** : Social , cultural and economic influences.

Variations of Host, Agent and Environment:

Epidemics arise when host, agent, and environmental factors are not in balance

- Due to new agent
- Due to change in existing agent (infectivity, pathogenicity, virulence)
- Due to change in number of susceptibles in the population
- Due to environmental changes that affect transmission of the agent or growth of the agent.