2024
SUMMARY

COMMUNITY MEDICINE

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ARKAN ACADEMY

Epidemiology

- **Epidemiology** is the study of health-related states or events in specified populations
  - The science of the mass phenomena of infectious diseases or the natural history of infectious diseases. (**Frost 1927**)
  - The science of infective diseases, their prime causes, propagation and prevention. (**Stallbrass 1931**)
  - The study of the distribution and determinants of health-related states or events in specified populations, and the application of the study to the control of health problems". (**J.M. Last 1988**)

Illness: subjective state of not being well
Sickness: social dysfunction

- Components of epidemiology include:
  - **Study:** Systematic collection, analysis and interpretation of **data**
    - ✓ Data acquired from registration (of births, deaths, diseases), population censuses, routine health information systems, surveillance, Investigation of epidemics, sample surveys
  - **Health-related event:** It studies Health, Disease and Injury (answers the question "what")
  - **Specified Population** is the unit of the study
  - **Determinants** (risk factors, causes), answers "how and why" question (analytical epidemiology)
  - **Distribution** involves Frequency and pattern (person, place, time)
    - ✓ **Frequency:** falls in the domain of biostatistics (Prevalence, Incidence rates, Death rate)
    - ✓ **Person distribution:** answers the question "who" (descriptive epidemiology)
    - ✓ **Place distribution:** answers the question "where" (descriptive epidemiology)
    - ✓ **Time distribution:** answers the question "when" (descriptive epidemiology)

Short term fluctuation	Periodic fluctuation	Long–term (Secular trend)
Single such as food poisoning Multiple such as cholera and Minamata disease in Japan	Seasonal such as GI infections in Summer, influenza, West Nile virus Cyclic such as Human coronavirus	Lung cancer, CVD

  - **Application:** It is an applied science (science and practice)

- **Endemic:** **Habitual presence (usual prevalence)** of a disease within a given geographic area
- **Epidemic:** The **occurrence** in a **community or region (Outbreak)**
- **Pandemic:** A **worldwide** epidemic

Disease causation

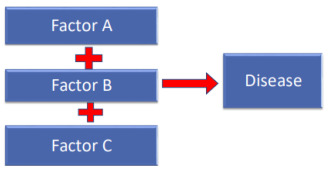
- Cause = etiology = Pathogenesis = Mechanisms = Risk factors
- Hippocratic Theory of disease causes: disease is caused by imbalance among **4 vital humors** (Yellow Bile, Black Bile, Phlegm and Blood) either excessive or deficient
- Henle-Koch Postulates (Germ Theory): The agent is present in every case of the disease, and it does not occur in any other disease (one agent one disease) and it will cause the related disease if this agent is exposed to healthy subjects
  - Louis Pasteur introduced germ theory 1878, that was developed into Henle-Koch postulates

- Classic Epidemiologic Theory: Suppose the epidemiologic triad (agent, environment, host)
  - **Agent:** Chemical, physical and biological causes of disease or injury
    - ✓ Infectious agents differ in their **infectivity** (proportion of exposed persons who become infected), **pathogenicity** (proportion of infected individuals who develop clinically apparent disease), **virulence** (proportion of clinically apparent cases that are severe or fatal)
  - **Environment:** extrinsic factors that affect the agent and the opportunity for exposure
    - ✓ Physical factors such as geology and climate
    - ✓ Biologic factors such as insects that transmit the agent
    - ✓ Socioeconomic factors such as crowding, sanitation, and the availability of health services
  - **Host:** It refers to the characteristics of the human who can get the disease (**intrinsic** risk factors) influenced by behavior and genetic factors

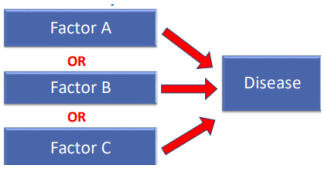
- **Webs of Causation (Multicausality):** Some diseases have multiple contributing causes without a single necessary one (such as cardiovascular disease, cancer)

- Types of Causal Relationships:
  - **Necessary & Sufficient:** The disease can't occur with this cause and as this cause is present the disease always develops

  - **Necessary but not sufficient:** The disease can't occur with this cause but there are multiple factors to cause the disease such as **HIV and cancer**



  - **Sufficient, but not Necessary:** such as benzene and radiation effect on leukemia
  - **Neither Sufficient nor Necessary:** More complex



- **Carrier:** Persons who are infectious without any overt disease (asymptomatic and mild cases)
  - Measles, hepatitis A, influenza patients become infectious few days before onset of symptoms
  - **Chronic carriers** are recovered from the clinical illness (hepatitis B, salmonella typhi)
    - ✓ Mary Mallon (Typhoid Mary), who was an asymptomatic chronic carrier of Salmonella Typhi

- Inapparent Infection
  - Preclinical: disease is not clinically detected but is destined to become clinical disease
  - Subclinical: disease is not detected but he carries the organism or has antibody response
  - Chronic carriers: continue to harbor a pathogen for months after their initial infection

- **Chain of infection:** the sequence of processes of infection transmission
  - **Reservoir:** It is the **habitat** of the agent
    - ✓ Human reservoir: sexually transmitted diseases, measles, mumps, streptococcal infection
    - ✓ Animal reservoir (zoonosis): brucellosis (**cows**, **pigs**), anthrax (**sheep**), plague (**rodents**), trichinellosis or trichinosis (**swine, pigs**), and rabies (**bats, raccoons, dogs**)
    - ✓ Environment reservoir: histoplasmosis and Clostridium botulinum (**soil**), Legionella pneumophila (**water**)

- **Portal of Exit:** is the path by which a pathogen leaves its host
  - ✓ ***Influenza*** viruses and ***Mycobacterium tuberculosis*** exit the respiratory tract
  - ✓ ***schistosomes*** through urine, ***cholera*** vibrios in feces
  - ✓ Sarcoptes scabiei in ***scabies*** *skin*
  - ✓ Cross *Placenta* from mother to fetus (***rubella***, ***syphilis***, ***toxoplasmosis***)
  - ✓ *Cuts or needles in the skin* (***hepatitis B***) or *blood-sucking insects* (***malaria***)

- **Modes of Transmission:**
  - ✓ Direct (person-to-person) includes Direct contact or Droplet spread (such as hepatitis B, influenza)
  - ✓ Indirect transmission, which includes
    1. **Airborne** (**measles**)
    2. **Vehicleborne** such as food (Clostreniam Botulinum, E.coli), water (Hepatitis A, E.coli), biologic products (blood), and fomites
    3. **Vectorborne** (**malaria**)

- Mother to child transmission:
  1. Vertical (inter-generation) transmission of agents from mother directly to baby through **placenta** or **breast milk** before or just after birth
  2. Horizontal (others)

Diseases transmitted from mother to baby include: HIV, Hepatitis C

- **Portal of entry:** Feco-oral, skin (hookworm), mucous (syphilis), blood (hepatitis B, HIV)

- **Susceptible Host:** Susceptibility depends on genetic factors, specific immunity (antibodies), and nonspecific factors (skin, mucous membranes, gastric acidity, cilia in the respiratory tract)
  - ✓ Persons with sickle cell trait are partially protected from a particular type of malaria
  - ✓ Malnutrition, alcoholism, and disease or therapy (chemotherapy) impairs immune response

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