EPIDEMIOLOGY

Causality :

Causality refers to the relationship between a cause and its effect .A purpose of epidemiologic study has been to discover causal relationships, so as understand why conditions develop and offer effective prevention . Over the years , however as scientific knowledge of health and disease has expanded, epidemiology has changed its view of causality.

Chain of causation :

As the scientific community 's thinking about disease causation and the tripartite model has grown more complex , epidemiologist have used the idea of a chain of causation . The chain begins by identifying the reservoir (where the causal agent can live and multiply) e.g. with plague, that the reservoir may be other humans ,rats , squirrels , and a few other animals . But with malaria ,infected humans are the major reservoir for the parasitic agents, by bite of an ***Anopheles*** mosquito which spend part of their life cycle in the mosquito 's body ;the mosquitoes in this case is the mode of transmission .

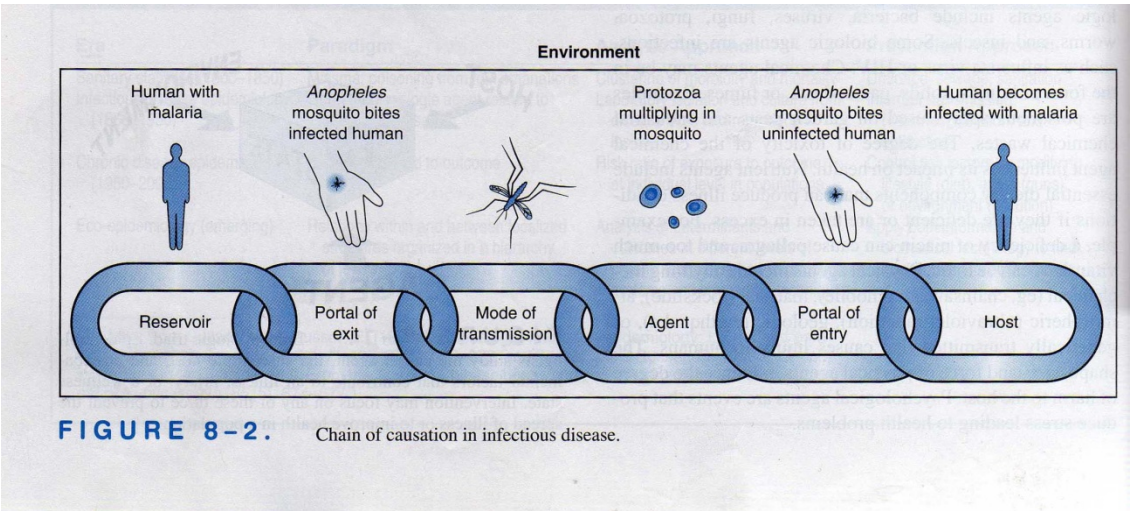

FIGURE 8–2. Chain of causation in infectious disease.

Multiple causation :

A more advanced concept of multiple causation has emerged to explain the existence of health and illness states and provide guiding principles for epidemiologic practice. **Dever's Epidemiological Model** considers the health status of the host and how it is compacted by human biology , life-style , environment , and the health care system. Sometimes referred to a "web of causation "this model attempts to identify all possible influence on the health and illness processes also the problems . e.g. causation for myocardial infarction or infant mortality. As conditions that lead up to this critical situation exist for years and come from many factors ,including heredity , lifestyle , environment ,and the health care system . This is important to recognition of multiple causes provides many points of intervention for prevention , health promotion , and treatments .

Model of causes disease :

There are a number of multiple causation models in epidemiology, such as **Metaphoric - Krieger mode** (1960) , **Dever 's** model 1991. All the models point to the inter play of numerous factors in the presentation of a specific disease. Some of this factors are very easier to change and other are not .

One way of remembering the categories of cause for disease is the acronym used in the model **(BEINGS)** model. Obviously the factors in some of these categories are harder to change than others.

For example Genetic (G) factors remain the most difficult to manipulate, whereas nutritional (N) factors are more easily changed.

BEINGS model of causes disease.

B : Biological factors and behavioral factors.
E : Environmental factors.
I : Immunological factors.
N : Nutritional factors.
G : Genetic factors.
S : Services, social, spiritual factors.

Biological factors (Angels) : (BEINGS)

(Viruses, Bacteria, fungi, and parasites)

Type of biological agents.

1) **Animal origin**

a- Unicellular

e.g. : ***Entameoba histolytica*** = amoebiasis
Plasmodium spp. = malaria
Leshmania tropica = Leshmania
Salmonella typhi = typhoid

b- **Multicellular**

e.g. : Round worm = Ascariasis , Ankylostoma
Flat worm = ***T. Saginata , T. solium***
Tap worm = ***Schistoma***

2) Plant origin

a- unicellular

e.g. : High bacteria = ***Actinomycosis***
Lower bacteria = ***Cocci, Bacilli*** = many diseases
Yeast = Fungi = Many fungal diseases.
Spirochete = Leptospira
Rekettsia = typhus fever disease.

b- Non-cellular

e.g. : Viruses
HBV, HAV, HCV = hepatitis
HIV = AIDS

A- Inheritant factor in relation to the environment :

1) Spore formation.
2) Viability.
3) Antigenicity.
4) Host specificity.
e.g. : Affected human (only) = ***Cholera***
Affected human & animal = ***Sal. Typhimurum***
5) Sensitivity to chemotherapy and antibiotics .

a- Chemotherapy

Some of microorganisms have specific chemotherapy .
e.g. : ***E . histolytica*** (cemitin) .
Plasmodium (chlor0quin) .

b- Antibiotics

Most biological of animal origin are insensitive to antibiotic, while most of biological agent at plant origin are sensitive to antibiotic except viruses, but all of bacteria are either sensitive to antibiotic or resistant.

6) Toxicity

a- **Endotoxin** : produce by microorganisms and remain inside the cell doesn't liberated outside until lyses microorganisms leading to general symptoms fever, headache, join pain.

b- **Exotoxin** : produce by microorganisms and liberated outside during life.

B- It has specificity in it's action :

1- Endotoxin affected GIT
2- Neurotoxin affected nerve cell. e.g. Tetanus, Rabies.
3- Diphtheria exotoxin affected muscle of larynx, heart and nerve ending.
4- Erythrocyte toxin B streptococcus
e.g. : ***Strep. pyogen*** affected RBC Leading to scarlet fever.

C-: Inheritant factor in relation to the host

1- Pathogenicity & Virulence.
2- Invasion & toxicity.
3- Tissue & selectivity.
4- Dose of agent.

Environment factors : (BEINGS)

Environment define as a collection of external condition affected life and development of microorganism also affect human behaviors and society.

Environmental factors in causative disease as :

1- Physical 2- Biological - S 3- Social and habitual 4- Econical

1- Physical factors : divided into :

A- Geological as (soil factors) :

1- Rocky or agricultural increase infections (infectious disease)
2- Amount of nutrient material in the soil
3- Mineral deposit in the soil e.g. sulfa or calcium decrease the growth of microorganisms.
4- Type of water .
a- Underground water (Ph high) affected life and survival in soil. e.g. ***: Clostridium spp***.
b- surface water (ph7)
life and survival
e.g. : ***Shigella , E .coli*** , ***Streptococcus***
5- Sanitation in the area .

B- Geographical factors :

Town decrease infectious disease. Port increase infectious disease.

C- Climate factors :

1- Temperature.
2- Humidity .
3- Air movement.
4- Rain
5- Atmospheric pressure.

These factors important for airborne, a vector, breeding season, and for agent life survival.

e.g. : Increase temp, outdoor increase files contamination of food, increase GIT infection such as summer disease

e.g. : Typhoïde, paratyphoïde, cholera, etc.

2- Biological factors :

Biological factors include plants and animals which live with human by itself it affect :

a- Agent as biological agent either animals or plants origin.
b- Reservoirs as brucellosis in cow .
c- Vectors as arthropod (intermediate host) .

3- Social and habitual

a- population density
b- education
c- transportation

4-Economical factors :

a- poverty

b- bad housing as (sunlight, ventilation etc.)

c- bad sanitation as (no chlorination in water, urination in water, bad sewage etc.)

d- malnourishment causing defect in disease control and increase fatality, decrease diagnosis, decrease treatment, increase complication that increase fatality.

e-product of industrialization result in croup and allergic conditions.

Nutrition Factors : (BEINGS)

1- Type of Nutrition.

2- Affect natural resistance of the body.

3- Causing specific diseases.

1- Type of nutrition :

a- mal-nourishment : qualitative (decrease intake of protein, vitamins, and minerals)

b- under-nourishment : qualitative sarvation leads to deficiency disease.

c- over–nourishment : quantitative leads to obesity (hormonal disturbance)

d- food allergy : deficiency of special enzyme.

e.g. : allergy of egg, beans.

2- Affect natural resistance of the body :

a- decrease natural resistance of the body e.g skin and mucous membrane

b- Increase severity of illness. e.g vit. C deficiency.

3- Causing specific disease .

Protein - kwashiorkor
Mineral : I = Goiter, Ca = Osteomalesia
Fe = Anemia, F1 = Dental cares
Vitamins : Vit A = night blindness
Riboflavin = beriberi
Nicotinic acid = pellagra
B12 = Anemia
Vit D = Rickets
Vit E = Repeated abortion and sterility

Genetic factors : (BEINGS)

Inheritant disease in certain families depend on endocrinological factors or depend on races in jaw-Tb , Negron Tb.
Rheumatoid arthritis, Tb, Rheumatic fever not Inheritant but occurs in families because :

(1) overcrowding (2) malnutrition
(3) low hygiene (4) decrease acquired

Social and habitual factor : (BEINGS)

Habit : Taking row vegetable.
Drinking row milk.
Eating row meat.
Custom : Urination in river.
Swimming once per month
Ignorance : Increase incidence of infections disease.

On other host & factors :

Sex factors :

1 - host antigen contact ship.
2 - decrease phagocytes through pregnancy and menstruation.

Physical factors :

Stress, emotion, pregnancy woman inhibit phagocytes cell and decrease immunity.

Age factor :

(1) Incidence

Incidence depend on exposure (Environment) and person immunity which different in :

a- : Infant : incidence of infection disease is low because of passive Abs from mother.
b- 2 - 4 years : incidence of infection disease high because high Infant exposure and low artificial immunity.

c- 4 - 6 years : out door trauma and infections because intake of food outside with flies and dirt causing typhoid, cholera, staph poisoning.

d- 6 - 14 years : infectious disease due to (1) artificial immunization , (2) sub clinical infection.

e- Puberty : infectious disease due to : (1) artificial immunization, (2) sub clinical infection.

f- Adult & old age : Increase in venereal disease, gonorrhea, AIDS

(1) Adult : Occupational disease ; like cancer bilharzias, Ankylostoma. But woman more than male in exposure.

(2) Old age : decrease exposure, slow metabolism, inhibition of phagocyte

Cyctes, stimulation for any foreign Antigens is low, increase infectious disease .

(3) clinical course of the disease**.**

	Small age	**adult**
Infectious hepatitis	Non icteric	Icteric
Poliomyelitis	Non paralytic	Paralytic
Hemolytic Streptococcus	Fever, scarlet fever	Acute tonsillitis

(3) End result and severity :

Sever and fatal result

Young age-pneumonia, measles.

GLOSSARY

Generation time : the time required to one cell to divide into two cell.

Protozoa : A group of motile generally non photosynthetic, single celled, eukaryotic organisms.

Spore : A specialized reproductive cell.

Aerosol : Material dispersed into the air as a fine mist.

Endospore : A kind of resting cell, characteristic of a limited number of bacterial species that is highly resistant to heat, radiation and disinfectant