Epidemiology

Communicable disease:

Communicable disease are infectious disease when the source of infection is human (man) e.g. measles, mump, hepatitis, AIDS, but some times not human e.g. brucellosis, toxoplasmosis, tetanus. Period of communicability is the time of transfer of pathogenic microorganism to form disease.
Types of communicable disease:

1- Pathogenic microorganisms transmitted through mucous membrane stick on it and causing fever e.g. Diphtheria, measles, mumps.
2- Late incubation period- clinical course- convalescent- post convalescent period. (few days- several weeks) e.g poliomyelitis, typhoid.
3- Disease transmitted by sucking of arthropod period (the period when the microorganism found in blood) e.g malaria, Leshmania, typhus fever, yellow fever.

Communicable disease occur in every country, every urban and rural area, and in every neighborhood from the very rich to the very poor. Nurses who provide care in combating communicable disease must have a basic understanding of epidemiology infection control, microbiology, medicine, public health and nursing. Furthermore the community nurse must be have knowledge of the legal system which mandates prevention and control of communicable disease locally, nationally, and worldwide.

Nurses must also have knowledge of effective support system that can use by individuals families and communities.

Today the public health community face new challenge the resurgence old disease such as measles, and tuberculosis and the new disease such as AIDS (acquired immunodeficiency syndrome by HIV and Ebola virus, required health professional to be alert, conscientious monitors of the public health, and control and need reach the level of disease control because of:

1- Disease spread through contact with an infected person or partial.
2- Environmental factors such as waste, garbage and stagnant water also facilitate for spread disease.
3- Unhealthy persons such as, weak, malnourished, or with poor hygiene are at greater risk of disease.

E.g. communicable disease such as chickenpox, measles, diphtheria, Tb, AIDS, scarlet fever, tetanus etc. Today quarantine, sanitary precaution, and travel restriction remain methods of communicable disease control.

Communicable disease & Route of Agents:

Community health nurses must be alert to screen high-risk groups, be aware of current treatment, and be able to identify the signs of drug resistance in clients. In addition, community health professionals must take an active role in educating practitioners and the public alike concerning the prudent use of antimicrobial drugs to reduce the emergence of drug-resistant strains. Several an epidemic diseases are
effected human which difficult to control and caused by different microorganisms and transmitted in different methods such as: Pneumococcal Pneumonia, Influenza, Poliomyelitis, Measles, Mumps, Varicella (chickenpox), Tuberculosis (Tb), Sexually Transmitted Diseases (STDs), Hepatitis (HBV, HCV, HAV, HDV, and HEV), AIDS, Lyme Disease, West Nile Virus (WNV) etc.

Applied of epidemiologic Principles and Methods:

Epidemiology began as the study of communicable disease affecting large population. Although the scope of epidemiology has expanded to include noncommunicable disease and other health-related issues, epidemiologic principles are still the backbone of communicable disease control.

Preventing communicable disease begins with knowledge about the links in the chain of infection. The relationships and interactions among the infectious agent (causative microorganism), the host (human or animal incubating the agent), and the environment (i.e., the epidemiology triangle) are important. Communicable disease control depends on discovering the weak link in the triangle and developing measures that attack and reduce or eliminate that threat. Control efforts include prevention activities and efforts to reduce the seriousness of an illness as measured by severity, the length of illness, the cost of treatments, the short- and long-term effects, and the risk of death.

Communicable Disease Investigation:

In accordance with epidemiologic principles, communicable disease investigation involves five steps:

1. Identify the disease.
2. Isolated the causative agent.
3. Determine the method of transmission.
4. Establish the susceptibility of the population at risk.
5. Estimate the impact on the population.

With this knowledge, public health officials can plan an effective intervention program. The community health nurse contributes to investigation effort at every level. The nurse in direct client care may be the first to identify the onset of a communicable disease, to determine new victims and their relationship to known victims (contact cases), and to discover patterns in the spread of the communicable disease. Nurses are currently involved with other health care professionals in population-focused investigation and intervention program design as:
**Causative agent.**
Pathogenicity, invasiveness, virulence and active inactive dose.

**Means of transmission.**
Direct or indirect contact, source to a new host or carrier droplets etc.

**Characteristic of host.**
Immunity defense mechanisms include tears, skin, mucus, saliva and cilia –hairs in nose. Also as natural or artificial immunity. Active or passive immunity.

**Environment.**
Communicable disease control as Temperature, humidity radiation, pressure, and ventilation. By this can all be used to decrease the transmission of infectious disease. Crowding, famine, and mobility of people increase the possibility of spreading disease.

![Diagram of transmission of communicable disease](image-url)

**Figure 8-6** Transmission of communicable disease.
Disease Investigation
- Establish diagnosis
- Identify specific agent
- Describe according to person, place and time
- Identify source of agent
- Identify mode of transmission
- Identify susceptible populations

Epidemiology and Clinical Practice
- Clinical practice dependent on epidemiology
- Epidemiology defines natural history of disease
- Even descriptive information is useful

The Epidemiologic Approach
- Multistep process
- First - determine association
- Then prove causation
- Not all associations are causal
- Examine validity, false assumptions-
  ✓ e.g. - fluoride in water
**1-Respiratory Route:**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Causative agent</th>
<th>Incubation period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chickenpox</td>
<td>Varicella-Zoster Virus (VZV)</td>
<td>14-16 days</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>Corynebacterium diphtheria</td>
<td>2-5 days</td>
</tr>
<tr>
<td>Pertusis</td>
<td>Bordetella pertussis</td>
<td>6-20 days</td>
</tr>
<tr>
<td>Whooping cough</td>
<td></td>
<td></td>
</tr>
<tr>
<td>German measles</td>
<td>Rubella virus, Rubivirus</td>
<td>14-21 days</td>
</tr>
<tr>
<td>(rubella)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles/rubella</td>
<td>Rubella virus (paramyxovirus)</td>
<td>9-12 days</td>
</tr>
<tr>
<td>Mumps</td>
<td>Mumps virus</td>
<td>16-18 days</td>
</tr>
<tr>
<td>Tuberculosis (TB)</td>
<td>Myco. tuberculosis</td>
<td>(d) several weeks</td>
</tr>
<tr>
<td>Influenza</td>
<td>virus, (flu)</td>
<td>1-2 days</td>
</tr>
<tr>
<td>Mononucleosis</td>
<td>Epstein- Barr virus (EPU)</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Kissing disease</td>
<td>Hemophilus influenzae</td>
<td>less than 10 days</td>
</tr>
<tr>
<td>Influenza</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erthema infectious</td>
<td>Illness rash</td>
<td>Week-months</td>
</tr>
<tr>
<td>Scarlet fever</td>
<td>B- hemolytic</td>
<td>3-6 days</td>
</tr>
<tr>
<td></td>
<td>Streptococcus</td>
<td></td>
</tr>
</tbody>
</table>

**2-Integumetary Route:**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Causative agent</th>
<th>Incubation period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impetigo</td>
<td>Group A</td>
<td>4-10 days</td>
</tr>
<tr>
<td></td>
<td>Streptococcus or Staphylococcus</td>
<td></td>
</tr>
<tr>
<td>Pediculosis</td>
<td>Parasitic lice</td>
<td>Lice 10 days</td>
</tr>
<tr>
<td>Scabies</td>
<td>Parasitic mite</td>
<td>Long as eggs or mites are alive</td>
</tr>
<tr>
<td>Tetanus</td>
<td>Clostridium tetani</td>
<td>Ally 8 days</td>
</tr>
</tbody>
</table>

**3- Gastrointestinal Route:**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Causative agent</th>
<th>Incubation period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poliomyelitis</td>
<td>Poliovirus</td>
<td>6-20 days</td>
</tr>
<tr>
<td>Salmonellosis</td>
<td>Salmonella typhi or</td>
<td>7-10 days</td>
</tr>
</tbody>
</table>
Sal. paratyphi
Shigella spp.
(week) depend
on serotype
(round worms and
pinworms)
Toxoplasmosis
( protozoa )
Toxoplasma gondii
Long periodic
Liver parasites: round worms and pinworms

Hepatitis A ( HAV )
Hepatitis A virus
15-40 days

4- Serum Route:
Hepatitis B ( HBV )
Hepatitis B virus ( HBV )
1-6 months
AIDS
Human immunodeficiency
Virus ( HIV )
2-10 years Before AIDS

5- Sexually Transmitted Route:
Herpes
Herpes simplex
virus ( HSV-1 )
2-12 days After exposure
(HSV-2)
(CMV)
Cytomegalovirus ( Mononucleosis )
Papiloma virus
Venereal warts or HPV
Neisseria gonorrhea
Gonorrhea
2 days-3 weeks
Chlamydia
Chlamydia spp.
5 days- longer
Syphilis
Treponema pallidum
3-6 weeks

Disease:
Disease is Latin word mean dis = lack, ease = power mean lack of power or discomfort.
Disease defines as abnormal state in which body physiology can't restore body comfort. Any disease result from end of two forces:

1- force of agent depend on:
a- type of agent.
b- virulence factor of agent
c- dose of infected agent.

2- Force of host depend on:
a- non specific resistance.
b- natural immunity
c- acquired immunity.
<table>
<thead>
<tr>
<th>Force of host</th>
<th>Force of agent</th>
<th>End results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>Very low</td>
<td>No disease</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>{Subclinical without}</td>
</tr>
<tr>
<td>Mild</td>
<td>Mild</td>
<td>{Sign and symptom}</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td>{Moderate or sever}</td>
</tr>
<tr>
<td>Very low</td>
<td>Very high</td>
<td>Fulminate (very sever)</td>
</tr>
<tr>
<td>Low</td>
<td>Rapid exotoxin</td>
<td>death</td>
</tr>
</tbody>
</table>

End result of the disease:

1. Complete recovery.
2. Clinical case (carrier).
3. Recovery with defect.
4. Death.

Incubation period start from the entrance of micro-organisms to the body until the appearance of sign a symptoms, (clinical cores of disease the appearance of sign and symptoms).

Vectors:

A vectors are a biological or inanimate source that aids in the transmission of infection from one host to another. Types of vectors:

1. **Arthropods**:
   - Fleas, mosquitoes, flies, and ticks.
   - e.g. : malaria disease by mosquitoes.
   - Leishmania by sand fly.

2. **Birds**:
   - e.g. : *Salmonella typhymurum* cause food poisoning.
   - *Toxoplasma gonidi* cause Toxoplasmosis.

3. **Lower vertebrate.**:
   - Frogs, Turtles  ---------  *Salmonella*

4. **High vertebrate**:
   - e.g. goat and sheep cause Brucellosis by *B melitensis*, and *B. abortus*

4. **Inanimate objects**:
   - e.g. : Fungal by soil or spores.
*Clostridium tetani* in soil cause tetanus.  
*Clostridium perfringens (welchii)* cause gas gangrene  
*Aspergillus flavus & Bacillus anthracis* cause disease by aerosol into lungs.  
Vectors also transmitted by:  
- **Biological**.  
  Where the vector (mosquito) actively, participates is the life cycle of the pathogen i.e. as malaria.  
- **Mechanical**.  
  Where the vector becomes contaminated through mechanical contact with an infected source as *Chlamydia trachomatis* (trachoma carried on the feet of flies from one eye to another.  
- **Format**  
  A mechanical transmission where the agent is an inanimate object (bedding for scabies).

**Entry of pathogens:**  
The extent of the spread of an infection agent in the body and length of time between exposure to the agent on onset of disease symptoms which called "Incubation period. e.g. typhoid fever disease many as 10,000 peoples that exposure in 1963 in Switzerland by drinking water contaminated with *Sal. typhi* the cause of the disease the long I.P. of the disease 10-14 days allowed widespread.

**The route of any infectious agent:**  
1. Respiratory tract system  
   e.g.: viruses inhaled an reach mucous membrane of the nose, throat, trachea such as mumps, measles, *Streptococcus*, etc.  
2. **Digestive tract.**  
   The pathogens entry and spread by fecal/oral routes such as *Clostridium perfringens (welchii)*, *Salmonella typhi*, *Strep. spp.*.  
3. **Urinary Tract.**  
   e.g.: The importance of *coliform bacilli* in urinary infections as: *E. coli*, Klebsiella, Proteus.  
4. Genital tract:  
   e.g.: Infectious from person to person by sexual contact as venereal disease such as Gonococcus infection by *Neisseria gonorrhea*, Trichomoniasis disease by *Trichomonas vaginilis* or Syphilis cause by *Treponema palladium*.  
5. Through skin.:  
   More pathogens entry to human via skin cause many disease by contamination with infectious agents.
e.g. Gas gangrene cause by *Clostridium welchii* or *Cl. tetani*, *Staph. aureus*, *Smallpox virus*, *Herpes virus*.

**Parasitism:**

Parasitism a characteristic mode of microorganism to live in or on another organism depending directly on it for food and shelter.

Parasite is microorganism live in or on the organism depending directly on it for food and shelter.

**Types of Parasitism:**

1. Commensal microorganism live in or on the organism depending on it by food or shelter and doesn't injured his tissue.
2. Pathogenic microorganism live in or on the organism depending on it by food and shelter and injured it's tissues.
3. Symbiosis that microorganisms live in or on the organism depending on it by food and shelter and both of them retain advantage e.g. E-coli in large intestinal.
**GLOSSARY**

**Pandemic**: a world wide epidemic for example Pandemic cholera

**Outbreak**: Increase in number of infected individual increase above endemic incidence in short period at time. e.g. gastrointestinal outbreak.

**Nosocomial infection**: An infection acquired during hospitalization.

**Pathogen**: An organism that can cause disease.

**Pathogenesis**: The process by which disease develops.

**Pathogenic**: Disease causing.

**Contamination**: pathogenic microorganisms on the outer surface of human, soil, vegetable, food.

**Reservoir**: source of a disease – producing organism.

**Spore**: a specialized reproductive cell.

**Toxic**: poisonous.

**Chemotaxis**: Movement of an organism in response to chemical in the environment.

**DNA**: (Deoxyribonucleic acid). The macromolecules in the cell carrier the genetic information.

**Generation time**: The time required for one cell to divide into two cells bacteria.

**Protozoa**: A group of motile generally non photo synthetic, single celled eukaryotic organism.

**Adhesion**: A carbohydrate specific binding protein used for adherence.

**Capsule**: A gelatinous structure that surrounds some bacteria.