UNIT EIGHT

Epidemic Investigation and Management

Learning Objectives

At the end of this unit the student is expected to:

- Define epidemic

- Identify types of epidemic

- Describe the different steps in the investigation of epidemic

- Discuss the management of epidemic

8.1 Levels of Disease Occurrence

Diseases occur in a community at different levels at a particular point in time. Some diseases are usually present at a predictable level. This is called the **expected level**. But sometimes they occur in **excess of what is expected**. The examples of expected level are endemic and hyper endemic. When the disease occur as epidemic, outbreak, and pandemic it is considered as excess of what is expected.

Definition of terms related to the level of occurrence of disease

1. **Endemic:** Presence of a disease at more or less stable level. Malaria is endemic in the lowland areas of Ethiopia.

2. **Hyper endemic:** Persistently high level of disease occurrence.

3. **Sporadic:** Occasional or irregular occurrence of a disease. When diseases occur sporadically they may occur as epidemic.

4. **Epidemic**: The occurrence of disease or other health related condition in excess of the usual frequency in a given area or among a specific group of people over a particular period of time.

5. **Outbreak**: Epidemics of shorter duration covering a more limited area.

6. **Pandemic:** An epidemic involving several countries or continents affecting a large number of people. For example the worldwide occurrence of HIV/AIDS is a pandemic.

The definition of epidemic indicates that the term can have a broad meaning. It may include any kind of disease or injury including non – infectious diseases. There is no general rule about the number of cases that must exist for a disease to be considered an epidemic. If the number of cases exceeds the expected level on the basis of the past experience of the particular population, then it is an epidemic. It

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is important to note that this level varies for different diseases and different circumstances. An epidemic may cover a small area within a city, or an entire nation or may have a worldwide distribution. It may encompass any time period ranging from few hours (chemical intoxication, bacterial food poisoning), a few weeks (influenza, hepatitis) to several years (AIDS). A disease that remains epidemic over many years eventually may be considered endemic.

8.2 Types of epidemics

Epidemics (outbreaks) can be classified according to the method of spread or propagation, nature and length of exposure to the infectious agent, and duration.

1. Common Source Epidemics:- Disease occurs as a result of exposure of a group of susceptible persons to a common source of a pathogen, often at the same time or within a brief time period. When the exposure is simultaneous, the resulting cases develop within one incubation period of the disease and this is called a **point source epidemic**. The epidemic curve in a point source epidemic will commonly show a sharp rise and fall. Food borne epidemic following an event where the food was served to many people is a good example of point source epidemic. If the exposure to a common source continues over time it will result in a **continuous common source epidemic**. A waterborne outbreak that spreads through a contaminated community water supply is an example of a common source epidemic with continuous exposure. The epidemic curve may

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have a wide peak because of the range of exposures and the range of incubation periods.

2. Propagated/ Progressive Epidemics:- The infectious agent is transferred from one host to another. It can occur through direct person to person transmission or it can involve more complex cycles in which the agent must pass through a vector as in malaria. Propagated spread usually results in an epidemic curve with a relatively gentle upslope and somewhat steeper tail. An outbreak of malaria is a good example of propagated epidemic.

When it is difficult to differentiate the two types of epidemics by the epidemic curve, spot map (studying the geographic distribution) can help.

3. Mixed Epidemics:- The epidemic begins with a single, common source of an infectious agent with subsequent propagated spread. Many food borne pathogens result in mixed epidemics.

8.3 Investigation of an Epidemic

The purpose is to determine the specific cause or causes of the outbreak at the earliest time and to take appropriate measure directed at controlling the epidemic and preventing future occurrence. The following questions should be answered when investigating an epidemic.

- What is the etiological agent responsible for the epidemic?

- What is/are the predominant modes of transmission?

- What specific source/s of disease can be identified?

E.g. human carriers, breeding sites for vectors, etc.

- What specific practices or environmental deficiencies have contributed to the outbreak? E.g. improper food handling, human made breeding sites for mosquitoes.

- What is the chain of events that led to the outbreak?

E.g. accumulation of susceptible hosts in an area.

Uncovering outbreaks

Outbreaks are detected in one of the following ways:

a. Through timely analysis of routine surveillance data

b. Report from clinician.

c. Report from the community, either from the affected group or concerned citizen.

Steps in Epidemic Investigation

There is no fixed step in the investigation of epidemics but the following step can be considered as one option.

1. **Prepare for fieldwork.**

Before leaving for the field you should be well prepared to under take the investigation. Preparations can include:

- Investigator must have the appropriate scientific knowledge, supplies, and equipment to carry out the investigation. It might be difficult for the health extension worker to fully investigate the epidemic, hence, he/she should inform and involve other high level health professionals from the outset.

- collect sample questionnaire.

- arrange transportation and organize personnel matters.

- clarify your and your team role in the field. Arrange where and when to meet them.

2. Verify (confirm) the existence of an epidemic

This initial determination is often made on the basis of available data. Compare the number of cases with the past levels to identify whether the present occurrence is in excess of its usual frequency. Instead of comparing absolute numbers it is advisable to compare rates like incidence rate

3. Verify (confirm the diagnosis).

Always consider whether initial reports are correct. Carry out clinical and laboratory investigations on the reported cases. For example the already collected blood film slides can be seen by laboratory experts to check whether the initial report was correct. It is important to investigate the index case (the first case that comes to the attention of health authorities) and other early cases. The importance of the index case and early cases for diseases that are known to occur in epidemic form, such as relapsing fever, is as an indication to health authorities of the possible start of an outbreak. The sooner the index case and other early cases are investigated, the greater the opportunity to arrest the outbreak at earliest stage possible. The health extension worker requests support from the Woreda Health Office or the nearest Health Center for confirming the diagnosis.

4. Identify and count cases

Prepare "case definition" before starting identification of cases.

Case definition is defined as a standard set of criteria to differentiate between cases and non cases. Cases can be one of the following:

Confirmed / definite: A case with laboratory verification.

Probable: A case with typical clinical features but without laboratory confirmation.

Possible: A case with fewer of typical clinical features.

Cases can better be identified by active case detection using all available means including house to house visits. They can also be identified by stimulated passive case detection, for example by alerting the public about the epidemic and requesting them to report to the nearest health institution when they have signs and symptoms of that disease. The health extension worker can identify and count cases based on the sign and symptoms of the disease.

If there is effective drug for the treatment of that disease, cases can be treated while identifying them. Additionally other control measures can be taken side by side to arrest the epidemic before many people are affected.

5. Describe the epidemic with respect to person, place and time

Each case must be defined according to standard epidemiologic parameters: the date of onset of the illness, the place where the person lives or became ill, and the sociodemographic characteristics (age, sex, education level, occupation).

The tools to be used when characterizing the epidemic are epidemic curve, spot map and attack rates.

Epidemic curve is an important tool for the investigation of disease outbreaks. In epidemic curve the distribution of cases is plotted over time, usually in the form of histogram, with the date of onset of cases on the horizontal axis, and the number of cases corresponding to each date of onset on the vertical axis.

Spot map is a map of locality where the outbreak has occurred, on which the location of cases is plotted. The spot map is often helpful in detecting the source of an outbreak. Mapping disease can be done at kebele, woreda, regional, and national level. One limitation of spot map is that it does not take into account underlying geographic differences in population density. Thus the spot map needs to be supplemented by calculation of place specific attack rates.

Person specific attack rates: The tool that is important for the analysis of disease outbreaks by personal characteristics is person specific attack rates like attack rates by age, sex, occupation, income, religion etc.

6. Identify the causes of the epidemic

All factors that can contribute to the occurrence of the epidemic should be assessed. The epidemic investigating team should try to answer questions like:

Why did this epidemic occur?

Are there many susceptible individuals?

Is the temperature favorable for the transmission of the diseases?

Are there breeding sites for the breeding of vectors? Etc

Confirmation of the diagnosis can be done by using additional tests which are more accurate. In addition to knowing the etiologic agent, more emphasis should be given to identify the risk factors. Investigate the environmental conditions such as food sanitation, suspected breeding sites, animal reservoirs, according to the type of disease outbreak being investigated.

7. Management of epidemic and follow up

Although it is discussed late, intervention must start as soon as possible depending on the specific circumstances. One might aim control measures at the specific agent, source, or reservoir. For example, an outbreak might be controlled by destroying contaminated foods, disinfecting contaminated water, or destroying mosquito breeding sites or an infectious food handler could be suspended from the job and treated.

General principles in the management of epidemics

Management of epidemics requires an urgent and intelligent use of appropriate measures against the spread of the disease. Action to be taken is dependent on the type of the disease as well as the source of the outbreak. However, the actions can be generally categorized as presented below to facilitate easy understanding of the strategies.

A. Measures Directed Against the Reservoir

Understanding the nature of the reservoir is necessary in the selection of an appropriate control methods and their likelihood of success. The following are examples of control measures against diseases with various reservoirs:

Domestic animals as reservoir:

- Immunization. Example – giving anti-rabies vaccine for dogs

- Destruction of infected animals e.g anthrax

Wild animals as reservoir:

post-exposure prophylaxis for human beings- Example: rabies

Humans as reservoir

a. Isolation of infected persons. This is separation of infected persons from non-infected for the period of communicability. This is not suitable in the control of diseases in which a large proportion are inapparent infection (without signs and symptoms) or in which maximal infectivity precedes overt illness.

b. Treatment to make them noninfectious- e.g., tuberculosis.

c. Quarantine- is the limitation of freedom of movement of apparently healthy persons or animals who have been exposed to a case of infectious disease. Usually imposed

for the duration of the usual maximal incubation period of the disease. Cholera, Plague, and yellow fever are the three internationally quarantinable diseases by international agreement.

Now quarantine is replaced in some countries by active surveillance of the individuals; maintaining close supervision over possible contacts of ill persons to detect infection or illness promptly; their freedom of movement is not restricted.

B. Measures that interrupt the transmission of organisms

Action to prevent transmission of disease by ingestion:

i. Purification of water

ii. Pasteurization of milk

iii. Inspection procedures to ensure safe food supply.

iv. Improve housing conditions.

Actions to reduce transmission of respiratory infections

- include ventilation of rooms.

In the case of diseases that involve an intermediate host for transmission, for example schistosomiasis, clearing irrigation farms from snails is an appropriate measure.

C. Measures that reduce host susceptibility

- immunization (vaccination). Example vaccination for meningitis

- Chemoprophylaxis: for example, use of chloroquine to persons traveling to malaria endemic areas.

After the epidemic is controlled, strict follow up mechanisms should be designed so as to prevent similar epidemics in the future.

8. Report of the investigation

At the end prepare a comprehensive report and submit to the appropriate/concerned bodies like the Woreda Health Office. The report should follow the usual scientific format: introduction, methods, results, discussion, and recommendations.

The report should discuss in detail:

- Factors leading to the epidemic.

- Measures used for the control of the epidemic.