
بسم الله الرحمن الرحيم
In the name of ALLAH
the most Beneficent and the most merciful

INVESTIGATION OF AN EPIDEMIC

- The occurrence of an epidemic always signals some significant shift in the existing balance between the agent, host and environment. It calls for a prompt and thorough investigation of the cases to uncover the factor(s) responsible and to guide in advocating control measures to prevent further spread.

The objectives of an epidemic investigation

- a. to define the magnitude of the epidemic outbreak or involvement in terms of time, place and person.
- b. to determine the particular conditions and factors responsible for the occurrence of the epidemic.
- c. to identify the cause, source(s) of infection, and modes of transmission to determine measures necessary to control the epidemic; and
- d. to make recommendations to prevent recurrence.

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- 1. Verification of diagnosis
- Verification of diagnosis is the first step in an epidemic investigation, as it may happen sometimes that the report may be spurious, and arise from misinterpretation of signs and symptoms by the lay public. It is therefore necessary to have the verification of diagnosis on the spot, as quickly as possible.

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- It is not necessary to examine all the cases to arrive at a diagnosis. A clinical examination of a sample of cases may well suffice. Laboratory investigations wherever applicable, are most useful to confirm the diagnosis but the epidemiological investigations should not be delayed until the laboratory results are available.

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- 2. Confirmation of the existence of an epidemic
- The next step is to confirm if epidemic exists. This is done by comparing the disease frequencies during the same period of previous years. An epidemic is said to exist when the number of cases (observed frequency) is in excess of the expected frequency for that population, based on past experience.

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- Often the existence of an epidemic is obvious needing no such comparison, as in the case of common-source epidemics of cholera, food poisoning and hepatitis A. These epidemics are easily recognized. In contrast the existence of modern epidemics (e.g., cancer, cardiovascular diseases) is not easily recognized unless comparison is made with previous experience.

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- 3. Defining the population at-risk
- (a) Obtaining a map of the area : Before beginning the investigation, it is necessary to have a detailed and current map of the area. If this is not available, it may be necessary to prepare such a map. It should contain information concerning natural landmarks, roads and the location of all dwelling units along each road or in isolated areas.

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- 3. Defining the population at-risk
- The area may be divided into segments, using natural landmarks as boundaries. This may again be divided into smaller sections. Within each section, the dwelling units (houses) may be designated by numbers.

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- (b) Counting the population :
- The denominator may be related to the entire population or sub-groups of a population. It may also be related to total events . For example, if the denominator is the entire population a complete census of the population by age and sex should be carried out in the defined area by house-to-house visits. For this purpose lay health workers in sufficient numbers may be employed.

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- 3. Defining the population at-risk
- Using this technique it is possible to establish the size of the population. The population census will help in computing the much-needed attack rates in various groups and subgroups of the population later on. Without an appropriate denominator of "population at risk" attack rates cannot be calculated.

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- 4. Rapid search for all cases and their characteristics
- (a) Medical survey : Concurrently, a medical survey should be carried out in the defined area to identify all cases including those who have not sought medical care, and those possibly exposed to risk. Ideally, the complete survey will pick up all affected individuals with symptoms or signs of the disorder. Lay health workers may be trained to administer the "epidemiological case sheet" or questionnaire to collect relevant data

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- 4. Rapid search for all cases and their characteristics
- (b) Epidemiological case sheet : The epidemiologist should be armed with an "epidemiological case sheet" for collecting data from cases and from persons apparently exposed but unaffected. The epidemiological case sheet or "case interview form" should be carefully designed to collect relevant information.

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- 4. Rapid search for all cases and their characteristics
- This includes : name, age, sex, occupation, social class, travel, history of previous exposure, time of onset of disease, signs and symptoms of illness, personal contacts at home, work, school and other places; special events such as parties attended, foods eaten and exposure to common vehicles such as water, food and milk; visits out of the community, history of receiving injections or blood products, attendance at large gathering, etc.

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- 4. Rapid search for all cases and their characteristics
- The information collected should be relevant to the disease under study. For example, if the disease is food-borne, detailed food histories are necessary. If the outbreak is large, it may not be possible to interview all the cases (e.g., influenza). In such cases, a random sample should be examined and data collected.

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- 4. Rapid search for all cases and their characteristics
- (c) Searching for more cases: The patient may be asked if he knew of other cases in the home, family, neighbourhood, school, work place having an onset within the incubation of the index case. Cases admitted to the local hospitals should also be taken into consideration.

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- 4. Rapid search for all cases and their characteristics
- The search for new cases (secondary cases) should be carried out everyday, till the area is declared free of epidemic. This period is usually taken as twice the incubation period of the disease since the occurrence of last case.

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- 5. Data analysis
- The data collected should be analyzed on ongoing basis, using the classical epidemiological parameters - time, place and person.
- If the disease agent is known, the characteristics of time, place and person may be rearranged into Agent Host-Environment model.

- a. Time : Prepare a chronological distribution of dates of onset and construct an "epidemic curve". Look for time clustering of cases. An epidemic curve may suggest :
  (a) a time relationship with exposure to a suspected source ,
  (b) whether it is a common-source or propagated epidemic, and
  (c) whether it is a seasonal or cyclic pattern suggestive of a particular infection.

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- 5. Data analysis
- b. Place: Prepare a "spot map" (geographic distribution) of cases, and if possible, their relation to possible sources of infection, e.g., water supply, air pollution, foods eaten, occupation, etc. Clustering of cases may indicate a common source of infection. Analysis of geographic distribution may provide evidence of the source of disease and its mode of spread..

INVESTIGATION OF AN EPIDEMIC (5. Data analysis)

- c. Person : Analyze the data by age, sex, occupation and other possible risk factors. Determine the attack rates/case fatality rates, for those exposed and those not exposed and according to host factors. For example, in most food-borne outbreaks, food-specific attack rates must be calculated for each food eaten to determine the source of infection. The purpose of data analysis is to identify common event or experience, and to delineate the group involved in the common experience.

INVESTIGATION OF AN EPIDEMIC (6. Formulation of hypotheses)

- On the basis of time, place and person distribution or the Agent-Host-Environment model, formulate hypotheses to explain the epidemic in terms of (a) possible source (b) causative agent (c) possible modes of spread, and (d) the environmental factors which enabled it to occur. These hypotheses should be placed in order of relative likelihood. Formulation of a tentative hypothesis should guide further investigation.

INVESTIGATION OF AN EPIDEMIC (7. Testing of hypotheses)

- All reasonable hypotheses need to be considered and weighed by comparing the attack rates in various groups for those exposed and those not exposed to each suspected factor. This will enable the epidemiologist to ascertain which hypothesis is consistent with all the known facts.

INVESTIGATION OF AN EPIDEMIC 7. Testing of hypotheses

- When divergent theories are presented, it is not easy to distinguish immediately between those which are sound and those which are merely plausible. Therefore it is instructive to turn back to arguments which have been tested by the subsequent course of events .

INVESTIGATION OF AN EPIDEMIC (8. Evaluation of ecological factors)

- An investigation of the circumstances involved should be carried out to undertake appropriate measures to prevent further transmission of the disease. Ecological factors which have made the epidemic possible should be investigated such as sanitary status of eating establishments, water and milk supply; breakdown in the water supply system; movements of the human population, atmospheric changes such as temperature,, humidity and air pollution, population dynamics of insects and animal reservoirs.

INVESTIGATION OF AN EPIDEMIC (8. Evaluation of ecological factors)

- The outbreak can be studied in a case control fashion. One of the primary concerns of the epidemiologist is to relate the disease to environmental factors to know the source(s) of infection, reservoirs and modes of transmission

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9. Further investigation of population at risk

- A study of the population at risk or a sample of it may be needed to obtain additional information. This may involve medical examination, screening tests, examination of suspected food; faeces or blood samples, biochemical studies, assessment of immunity status, etc.

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9. Further investigation of population at risk

- The approach may be retrospective or prospective. For example, serological study may reveal clinically in apparent cases and throw light on the pathogenesis of the condition. Healthy individuals (those who are not ill) from the same universe may be studied in a case control fashion. This will permit classification of all members as to :
  a. exposure to specific potential vehicles.
  b. whether ill or not.

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- 10. Writing the report
- The report should be complete and convincing. Information to be included in the final report on an epidemic is given in Table

Information to be included in the final report on an epidemic

Section	Contents
1.Background Geographical location Climatic conditions Demographic status (population pyramid) Socio-economic situation Organization of health services Surveillance and early warning systems Normal disease prevalence. 2. Historical data Previous occurrence of epidemics of the same disease, - locally or elsewhere Occurrence of related diseases, if any - in the same area - in other areas Discovery of the first cases of the present outbreak.	

Information to be included in the final report on an epidemic

3. Methodology of investigations

Case definition

Questionnaire used in epidemiological investigation

Survey teams

Household survey

Retrospective survey

Prospective surveillance

Collection of laboratory specimens

Laboratory techniques.

Information to be included in the final report on an epidemic

4. Analysis of data

Clinical data :

- frequency of signs and symptoms
- course of disease
- differential diagnosis
- death or sequelae rates

Epidemiological data :

-mode of occurrence

-in time

-by place

- by population groups

Modes of transmission :

- source(s) of infection

-route(s) of excretion and portal(s) of entry

-factors influencing transmission

Information to be included in the final report on an epidemic

Laboratory data ;
-isolation of agent(s)
-serological confirmation
- significance of results
Interpretation of data :
- comprehensive picture of the outbreak
- hypotheses as to cause(s)
- formulation and testing of hypotheses by statistical analysis.

5. Control measures
Definition of strategies and methodology of implementation
- constraints
- results
Evaluation : - significance of results
-cost/effectiveness
Preventive measures.


Thanks