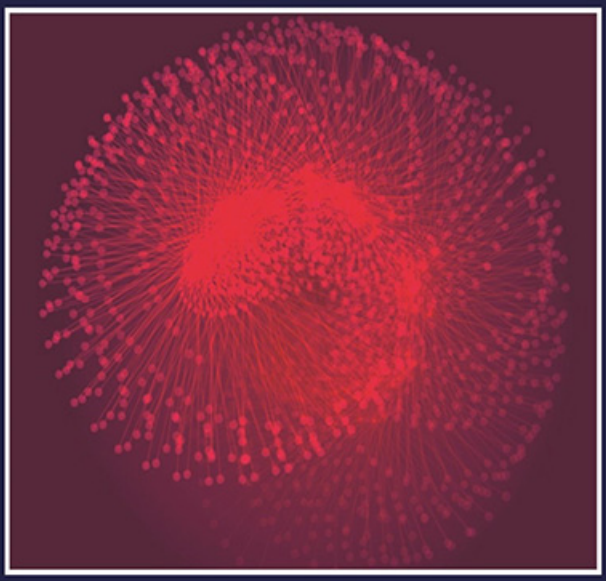
EPIDEMIOLOGY MADE EASY®



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Chapter 1

Principles of Epidemiology

Epidemiology is a basic skill for every healthcare personnel. Moreover, it is very interesting to learn and apply the skills of epidemiology.

This book will introduce the topic of epidemiology in a very simple, logical and interesting manner and is like reading a story book.

As the student will read through the pages, the foundations of Epidemiology will gradually build up and get strengthened, so that one doesn't have to cram up anything.

For the purpose of a quick revision before an exam, one can go through the 'Review' given at the end of each chapter.

So let's begin……

EPIDEMIOLOGY

Epi = Among, **Demos** = People, **Logos** = Study

Epidemiology is concerned with the study of disease in populations of people.

An epidemiologist strives to determine if there has been an increase or decrease of the disease over the years, whether one geographical region has a higher rate of the disease compared to another and also if the characteristics of persons diagnosed with the disease (under study) are different from persons who are free of the same disease.

Note that epidemiology is concerned with the study of distribution and causation not only of 'disease' but also of 'health' and 'health related events', as also 'Facts of Life' (e.g. Health facility use by people, impact of health services etc.)

It is more concerned with well being of the society as a whole rather than that of an individual.

Definition (as given by John M. Last, in 1988)

"The study of **distribution** and **determinants** of health related states or events in **specified** populations and the **application** of this study to control the health problems."

Note that the important terms in the above definition have been highlighted. Let us consider each one separately.

1. ***Frequency:*** Frequency measures of the **amount** of disease, disability etc. The information is expressed in the form of 'Rates' and 'Ratios'.

   Only when you calculate the rate / ratio in different populations, can you compare the disease amount among them.

   By knowing the rates of disease in different populations or subgroups of the same population you can have a clue to the etiology, e.g. it was observed that the frequency of AIDS was more in the groups of commercial sex workers, their customers, I/V drug addicts, etc. This pointed finger at an infectious etiology and finally HIV was isolated.
2. ***Distribution:*** Disease occurs in patterns, i.e. time pattern, place pattern and person pattern.

   Let us take the example of diabetes. By measuring the frequency in the Indian population we came to know that it is more common in the urban areas than in the rural area (Place distribution). Also we found out that it is more prevalent in the affluent society as compared to slums in the urban area (Person distribution). Measurements made in the same population year after year has brought out that the prevalence has been increasing. So we know that the disease frequency was lesser in the past and is rising with time (Time distribution).

Recognition of these patterns is known as 'studying the distribution of the disease'.

This is also known as describing the disease in Time, Place and Person. In the above example, it gives us a clue to the etiology (Hypothesis) that it has something to do with the modern lifestyle.

A study which thus describes the disease is called a 'Descriptive study'.

3. ***Determinants of the disease:*** How are the affected eople different from the non-affected? What are the special characteristics of the population which has a higher rate of the disease? These characteristics may be the cause of the disease in question or they may increase the chances of exposure to the cause (in which case these characteristics can be called as 'Risk Factors' as they increase the risk of getting exposed to the cause of the disease).

   E.g. in the case of poliomyelitis, the disease was found to have a higher incidence in under-5 population, population living in unhygienic conditions, with low coverage of routine immunization, high rate of illiteracy and more.

   It was found to be having a lower incidence in the adults, the educated, population with high immunization coverage, etc.

   These identified characteristics of the population with a higher incidence are the *determinants* of polio, i.e. these determine the distribution of polio.

4. ***Specified population:*** The distribution and the determinants discussed above apply strictly to the population which has been studied. They may or may not be fit for extrapolation to other populations.

5. ***Application:*** The ultimate aim of epidemiology is to eliminate or reduce the health problem under study. Once we know of the determinants of the disease, we can modify them to achieve this objective, e.g. in the above case of poliomyelitis, if levels of hygiene are improved, safe water and sanitation provided, immunization coverage improved in the affected population, the incidence of the disease will come down.

   Unless we ***use*** the knowledge gathered from the epidemiological studies to reduce human suffering, the knowledge remains incomplete.

   Remember that the above discussion relates not only to diseases but also to disability, death, health and health-related events. But for convenience we will mostly use the term 'disease' henceforth.

AIMS OF EPIDEMIOLOGY

These are enumerated below and will be explained one by one.

1. Describing the disease and health related events in a specific population.
2. Understanding causation of disease
3. To provide data for planning and implementation and evaluation of health services

Describing the Disease and Health Related Events in a Specific Population (Community Diagnosis)

To know about the local disease patterns—

Suppose you are practicing in your country but suddenly you are asked to provide health care in another country.

Wouldn't you like to know about the type of diseases prevalent there and what is each disease's burden in the population, before you take your position there? You would like to check the various sources of such information. How has the information which is there, generated? How do we know that PEM is more common in India and Sarcoidosis in the West?

This type of information is generated out of surveys done on that population. This survey is a type of Epidemiological Study.

Also, finding out the disease patterns, risk factors, environmental hygiene, factors responsible for the prevalence of various diseases, etc. in a particular community is known as 'Community Diagnosis'. It means that you are diagnosing the community regarding health related factors.

It means to describe the distribution and magnitude of health and disease problems in specified human populations.

Understanding Causation of Disease

By comparing the incidence / prevalence of a particular disease in different groups of people we may get a clue to the etiology of the disease.

We may note that the disease is more common in a particular group of people with a particular behavior, a particular exposure or a particular characteristic which is absent or less seen in other groups which are having a lower incidence of the disease.

This gives us a clue that the particular characteristic is the cause or is somehow related to the cause of the disease under study.

To Provide Data for Planning, Implementation and Evaluation of Health Services

Suppose you and two of your friends are given the responsibility of improving the health of villagers in one remote village each. Your performance will be judged against each other and the best performer will be given some incentive.

What is the next logical step? How can the authorities judge your performance and even more difficult, compare the three of you?

First of all the three of you would like to do a basic survey to provide yourself with basic information regarding the prevalent diseases in the community and other health related factors, so that you will establish the clinic equipped to handle mostly these. No clinic can be expected to keep facilities for ALL the diseases affecting mankind.

Thus, based on the local disease pattern you will PLAN your clinic and the run it to achieve your goal.

After some time of running the clinic (Let's say 6 months), you would like to do another survey to know if your clinic has made any impact. Thus you would look for any reduction in the disease load (incidence / prevalence).

If you have made an impact, you would happily continue your clinic till the time you are evaluated by the authorities.

If the desired reduction is not there, then you will look for ways to improve. You might have to make some changes to your clinic and then after some time repeat the survey to see if you are on the right track now.

Even the authorities will evaluate you in a similar manner. They will conduct yet another survey to see the incidence and prevalence and compare the results with your first survey.

This will enable them to judge how much reduction in the disease load, have you been able to achieve as compared to your friends.

The above is an example of how an epidemiological survey is done to provide data based on which the health service (your clinic) is planned and established.

This data also served as a baseline to compare the results of the next survey. This next survey which tells you about your performance is called as 'evaluation' of the health service (which is your clinic in this example). Based on the evaluation, new changes are introduced into the health services followed by re-evaluation later on. This cycle of planning and evaluation is thus continuous, leading to improvement in the health of the community.

Based on this kind of epidemiological information, we know the health problems of our country and therefore launched specific control programs for tackling these.

That's why different countries have national/state programs for different diseases depending on the disease pattern in individual countries. Even different states of a country can have different programs depending on the disease prevalence in each state.

After the above discussion one can understand that the ultimate goal of epidemiology is to: (i) Reduce the health problems, and (ii) Promote well-being and health through a series of continuous planning and evaluation.

Chapter 2

Basic Concepts in Epidemiology

IMPORTANCE OF CLEAR DEFINITIONS AND CRITERIA

As is evident, vague definitions may falsely increase or decrease the reported disease frequency.

If the disease frequency (load) measured is not correct, all of the steps which follow next are rendered useless. For example, we want to compare the frequency of coronary heart Disease (CHD) in rural and urban areas and then look for the differences in the environmental factors which differ in the two settings. But if the non-cases are included as cases or true cases are not identified there will be false comparison, e.g. we report the rural prevalence as 4% when it actually was 1%, and urban prevalence also is found to be around 4%, we will conclude that the rural and urban lifestyle has no effect on the prevalence of CHD.

Hence, we must have well defined and clear-cut criteria for whom to include as a case and whom to consider as free from the disease under study (non-case).

TYPES OF DATA/VARIABLE

Qualitative Data

This means that the variable can be either absent or present. We can count the people who have the attribute under study. The results obtained are expressed as Ratio, Proportion, Percentage or a Rate. Hence, 'Incidence' 'rates', 'Prevalence' rate, 'Attack' rate, etc. can be applied to Qualitative data only.

For example, we want to know the measles immunization coverage in under-5 population in a City-'A'. A child may either be vaccinated or not-vaccinated. We can count the

vaccinated ones and say that, (let's assume) 555 out of a sample of 1000 children have been vaccinated, i.e. 55.5%.

If we want to compare the immunization coverage of city 'A' with city 'B', we can compare the percentages of immunized children in both the cities.

Let us say in city B, 505 out of a sample of 1000 children are immunized. Hence, city 'B' has coverage of 50.5%.

City 'A'- 55.5% City 'B'- 50.5%

Visual impression is that city 'B' has a lower immunization coverage compared to city 'A'. But visual impression is not what counts in epidemiology.

Hence, we compare the percentages of the immunized in both the cities (a type of qualitative data) using either

a. Chi-square χ^2 test (using actual numbers, viz. 555 / 1000 and 505 / 1000)

Or

b. Standard Error of Proportion. (using the percentages of both the cities)

Only then the results of these tests will tell us if city 'B' actually has a lower coverage.

We will discuss the above two tests later.

Quantitative Data

Each member of the study group has a value of the attribute, e.g. systolic BP, height in cm, pulse rate, etc.

Every one has some value. It is uncommon to be totally absent in any member. It has to be measured in each member of the group and then expressed as the MEAN of the whole group. This Mean (along with Standard Deviation) is the value which represents the whole study group. Percentage or proportion is not possible. The data is summarized as Mean, Range, Standard Deviation (SD), etc.

EPIDEMIOLOGY MADE EASY®

Epidemiological skills are essential for every worker related to medical and affiliated fields. Hence, Epidemiology is an important part of the undergraduate teaching in Medicine, Dentistry, Nursing, Veterinary Sciences and alternative medicine courses.

The students often find Epidemiology to be very difficult to understand and more so to reproduce answers in the examinations. This book has been designed to tackle this problem. The chapters are presented in the form of lectures aimed to make the students feel as if a teacher is by their side and explaining each topic to them in simple language.

For the purpose of reproducing answers in the examination, a 'Review' is presented at the end of each chapter. This 'Review' is in the textbook format and provides the language that can be used to answer questions in theory or oral exams.

JAYPEE BROTHERS

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