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Research Article

A RESEARCH METHODOLOGY IN EPIDEMIOLOGICAL STUDY

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Abstract

The study of health and disease in a specific population, including its causes, manifestations, and distribution, is known as epidemiology. The reproduction of organisms in host tissue is called infection, which can lead to illness. A carrier is a person who carries infectious germs but does not exhibit any apparent symptoms. The spread of the organism in its surroundings is known as dissemination. The etiologic agent, the mode of transmission (by contact, by a shared vehicle, by air or a vector), and the host are the three main factors that contribute to disease occurrence.Epidemiologic studies may be (1) descriptive, organizing data by time, place, and person; (2) analytic, incorporating a case-control or cohort study; or (3) experimental. This method can potentiallystudy the diseases, their distribution, severity, prevalence and incidence ratio at a particular place in a specific time.

Keywords: Epidemiology, Prevalence, Incidence, Descriptive research, Health epidemic

INTRODUCTION

Epidemiology is mainly focused on the study of disease distribution (where, when, why), their patterns, and the determinants of the health and state of disease in a particular demography. Epidemiology word is widely used in medical terminology. It is the foundation of public health and makes policy decisions and practices based on evidence by identifying factors that risk disease and prey for preventive health care[1]. (wiki) Epidemiology-related ideasstudy health and disease in a specific population, including its causes, manifestations, distribution, and management. The descriptive science of epidemiology involves calculating rates or quantifying the incidence of disease within a given community. The attack rate, which is the number of disease cases divided by the population in which the cases have occurred, is the most frequently researched. Before the etiology of an illness is found, epidemiology can accurately characterize many aspects of its occurrence. Determining the dimensions of an illness, including risk factors, is one of the objectives of epidemiologic investigations to create the best control strategies. The chain of infection, the three primary epidemiologic techniques, and how to look into an epidemic are all covered in this paper. Accurately interpreting illness occurrence data requires a targeted and sensitive surveillance program. Nearly all nations have a national disease monitoring program that regularly gathers data on several diseases. Although the caliber of these initiatives varies, valuable information is generallycollected that is crucial for creating preventative and control strategies. According to an international agreement, three diseases cholera, plague, and yellow fever will be reported to the World Health Organisation in Geneva, Switzerland. The United States has an agreement between the U.S. Public Health Service, the Centers for Disease Control and Prevention (CDC), and the state health officers of all 50 states to report to the CDC the occurrence of 51 diseases weekly and an additional ten diseases from the states on an annual basis.

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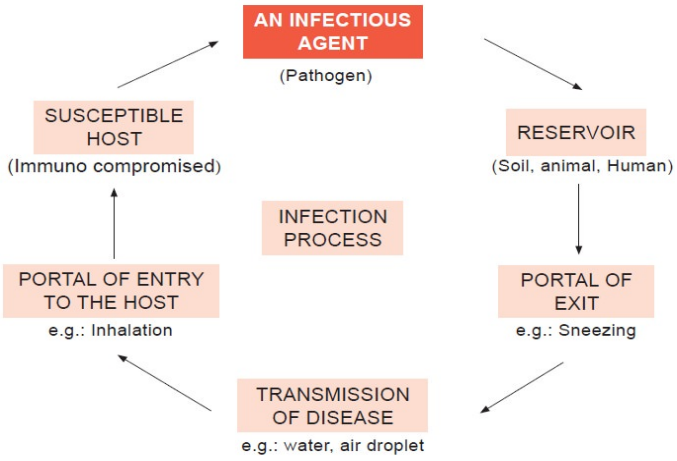
Chain of infection

The etiologic agent, the mode of transmission, and the host are the three elements that cause infection and are combined to form the chain of infection. These relationships need to be described before any control or preventative measures are suggested. An assessment of environmental elements that could impact the development of disease is necessary.



Etiologic Agent

Any microbe with the ability to cause infection could be the etiologic agent. An agent's capacity to cause disease is referred to as its pathogenicity; the virulence and invasiveness of the organism are further characteristics that define pathogenicity. The term "virulence" describes the degree of infection, which can be described by stating the infection's morbidity (disease incidence) and mortality (death rate). The plague agent Yersinia pestis, which nearly invariably produces severe disease in the vulnerable host, is an example of a highly virulent organism. Any microbe with the ability to cause infection could be the etiologic agent. An agent's capacity to cause disease is referred to as its pathogenicity; the virulence and invasiveness of the organism are further characteristics

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Method of Transmission

The agent travels from the source to the host via the transmission technique. The four main ways that a virus can spread are through contact, a shared vehicle, the air, or a vector. In contact transmission, the infectious agent is dispersed through airborne droplets, indirect routes, or direct contact. Also known as person-to-person transmission, direct contact transmission occurs when organisms are transferred directly from the source to the vulnerable host without needing an intermediary object. One instance is the spread of the hepatitis A virus through hand-to-hand contact. When organisms are transferred from an inanimate source to a host through an inanimate object, this is known as indirect transmission. As an illustration, consider the spread of Pseudomonas bacteria between people using shaving brushes. The term "droplet spread" describes organisms that move less than three feet very short distances through the atmosphere to reach a host. Agents conveyed by a common inanimate vehicle are referred to as common-vehicle transmission, and exposure to such agents might result in many cases. This group covers illnesses where the agents of infection are not only medicines and parenteral fluids but include food or water. Salmonellosis transmitted through food, shigellosis transmitted through water, and bacteremia brought on by intravenous fluid use contaminated with a gram-negative organism are a few examples. Airborne transmission, the third transmission mode, describes the spread of infection by dust or droplet nuclei. The particles must travel more than three feet through the air from the source to the host to be considered fully airborne. The residue left over when fluid from droplets evaporates is known as a droplet nucleus. These particles are light enough to travel more than three feet from their source and can float in the air for extended periods. The main way tuberculosis spreads is through the air; a coughing patient may produce aerosols of droplet nuclei containing tubercle bacilli. Dust particles can potentially hold infectious organisms, which could resuscitate and spread to hosts. Arthropods serve as the vectors in the fourth mode of transmission, known as vector-borne transmission. Transmission of vectors can occur inside or externally. When organisms are conveyed mechanically on the vector such as Salmonella germs that contaminate flies' legs external, or mechanical, transmission takes place. When the organisms are carried inside the vector, internal transmission takes place. The carriage is referred to as harborage if the pathogen remains unchanged while inside the vector. Biologic transmission is the other type of internal transmission. When an organism passes via a vector, such as malaria parasites in a mosquito vector, it undergoes biological changes. Various routes can be used to spread an infectious pathogen. For instance, food is a frequent vehicle by which Salmonella can spread, as can contact with a human carrier. All four avenues are potential means of transmission for Francisella tularensis.

Host

The host is the third component in the infection chain. The organism can use the gastrointestinal tract, genitourinary tract, skin, mucous membranes, lungs, and placenta to enter a host. Meningococci that enter the host through the mucous membranes can still produce meningitis. However, this is not always the case. The ensuing illness frequently corresponds with the site of entry. Disease development in a host is influenced by both non-specific and particular host defense systems, as well as agent features. The skin, mucous membranes, secretions, excretions, enzymes, the inflammatory response, genetics, hormones, diet, behavioral patterns, and the existence of other illnesses are examples of nonspecific defense mechanisms. Certain defense mechanisms, or immunity, can be produced artificially by active or passive immunization or naturally through exposure to the infectious agent. Any link in the infection chain is susceptible to environmental influences. Low humidity can damage mucosal membranes, air velocity can help droplet nuclei travel through the air, temperature can help or hinder organisms' ability to multiply at their reservoir, and UV radiation can kill germs. It is critical to assess the impact of environmental factors in any illness inquiry. Environmental control measures are often implemented based less on epidemiologic evidence and more on sentiment. It ought to be evident that many factors interact to cause sickness (Table 9-2). Here is an outline of a few of these factors.

Epidemiologic Method

The three main methods used in epidemiology are experimental, analytical, and descriptive. While any of the three can be utilized to look into disease occurrence, descriptive epidemiology is the most frequently employed approach. Following the description of a disease's basic epidemiology, specialized analytical techniques can be applied to investigate the illness further, and a particular experimental strategy can be created to test a hypothesis.

1. Descriptive Epidemiology

Descriptive epidemiology gathers information about the disease's occurrence from all pertinent sources using various techniques. Next, the information is compiled by person, place, and time. When characterizing the epidemiologic data, four-time trends are taken into account. The term "secular trend" refers to the occurrence of disease over an extended period, typically years; it is impacted by the population's level of immunity and potentially nonspecific factors like improving socioeconomic and dietary conditions. For instance, according to secular trends, a slow and consistent drop in tetanus cases has been observed in the United States since 1920. The periodic trend is the second time trend. The periodic trend, which is a brief alteration in the general secular trend, might point to a shift in the antigenic properties of the pathogen. For instance, there is an alteration in the antigenic structure of common influenza. Because the population lacks natural protection, there is a cyclical increase in clinical influenza every two to three years due to a virus. Furthermore, an increase in the incidence of the disease can arise from a reduction in the general immunity of a population or a subset of it (a phenomenon referred to as herd immunity). This is seen in certain vaccine-preventable diseases when there are recurring drops in the immunization rate within a specific community. The seasonal trend is the third time trend. This pattern shows how seasonal variations in environmental factors that improve the agent's capacity for replication or transmission lead to variations in disease incidence. For

instance, outbreaks of foodborne illness are more common in the summer because of the bacterial growth-promoting conditions. When the monthly incidence of salmonellosis is analyzed, this pattern becomes apparent. The epidemic occurrence of the disease is the fourth temporal trend. An epidemic is a marked rise in frequency brought on by common conditions that facilitate spread. Three distinct locations must be considered when describing epidemiologic data by place: the individual's location at the time the disease manifested, the source of the infection where the source contracted the illness, and the source itself where the etiologic agent was introduced. As a result, a person who has eaten food at a restaurant may develop a severe illness at home during a food poisoning outbreak. It's possible that the undercooked chicken in the car was contaminated on a chicken farm. It is crucial to consider these distinctions when trying to stop more cases. The afflicted individual is the third focus of descriptive epidemiology. Age, sex, occupation, personal habits, socioeconomic level, immunization history, the existence of the underlying disease, and other relevant variables should all be recorded. After the descriptive epidemiologic data have been examined, the characteristics of the epidemic ought to be sufficiently evident to identify further research areas.

2. Analytic Epidemiology

Analytic epidemiology, which examines illness determinants for potential causal relationships, is the second epidemiologic technique. The two primary analytical techniques are the case-control (or case-comparison) approach and the cohort method. The case-control approach looks into the cause of the effect (illness) after starting with the effect. Individuals with the disease comprise the case group, whereas those who do not have the disease make up the comparison group. The differences between these two groups are then compared to see if they could account for the disease's occurrence. Choosing people with meningococcal meningitis and a comparison group that is matched for age, sex, socioeconomic position, and place of residence is an example of a case-control study, but without the disease, to see what factors may have influenced the occurrence in the group that developed the disease. The cohort method is the second analytical technique. It investigates two groups prospectively: a group that has been in contact with the suspected causal factor under investigation and a similar group that has not. Upon observing both groups, the factor's effect ought to become evident. Observing two comparable groups of people one made up of people who had blood transfusions and the other who did not is an example of a cohort technique. One can establish a correlation between blood transfusions and hepatitis by looking at the prospective incidence of hepatitis in both groups. In other words, if the transfused blood contained the hepatitis B virus, the recipient cohort should have a higher incidence of hepatitis than the nontransfused cohort. The case-control approach is more affordable, reproducible, and easier to conduct than the cohort approach. On the other hand, bias could be introduced during the selection of the two groups, it might be challenging to omit subclinical cases from the comparison group, and patients' memories of past events might be inaccurate. Cohort studies have the advantage of being more accurate in data collection and providing a direct estimate of the disease risk resulting from factor exposure; nevertheless, they are more costly and require longer to undertake. Another analytic method is the cross-sectional study, in which a population is surveyed over a limited period to determine the relationship between a disease and variables present at the same time that may influence its occurrence.

3. Experimental Epidemiology

The experimental approach is the third epidemiologic method. An experimental model is built with a hypothesis and modified by one or more carefully chosen elements. The theory will either be proven true or false, depending on how the manipulation turns out. Assessing a novel drug's impact on an illness is one instance. A subset of the diseased population is identified, and a random selection process is used to determine who gets the medication. The clinical differences between the groups should indicate the drug's efficacy if the sole distinction between the two is how it is used.

Conclusion

An epidemic investigation outlines the elements contributing to a disease outbreak; suitable controls and preventative measures can be found if the conditions around the illness's emergence are established. When conducting an epidemic investigation, information will be gathered, sorted by person, place, and time, examined, and conclusions are made. So, three main epidemiologic methods are found. These methods are beneficial to several kinds of research.This method can potentially study the diseases, their distribution, severity, prevalence and incidence ratio at a particular place in a perticular time.

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