

Epidemiology in the News – the case of COVID-19 pandemic disease

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Abstract: The health indices of nations of the world are determined by the average life expectancy and infant mortality rate of the population. Epidemiology is the branch of public health saddled with the responsibility of determining the causes, distributions, determinants and deterrents of various diseases and health-related conditions that directly or indirectly affect the health indices of the population. The impact of epidemiology is felt in the news on daily basis. A typical case scenario is that due to SARS-CoV-2 (COVID-19), the pandemic virus ravaging the global population. Epidemiology is the branch of public health at the epicenter of the disease detection and its pattern of spread. This short communication study elucidated, the term 'epidemiology', its key roles as preventive and social arm of medicine, and how it is changing the landscape of COVID-19 disease trajectory with respect to agent-host-environment triad model. This was a review of previous and current studies on epidemiology with respect to the trending COVID-19 disease in the news. The resources were drawn from scholarly research articles from Google scholar, PubMed, and MedLine database. In conclusion, we cannot under-estimate the value of epidemiology in public health. The COVID-19 pandemic viral disease is a typical case scenario. The descriptive epidemiologic study of COVID-19 is currently giving the world a sense of direction on the incidence, virulence, fatality rate, and possible interventions to curb this ravaging pandemic viral disease. Both the healthcare and non-healthcare providers are critical stakeholders in creating the news.

Keyword: Epidemiology, SARS-CoV-2, COVID-19, Pandemic, News

Abbreviations: Severe Acute Respiratory Distress Syndrome-Coronavirus-2 sub-type (SARS-CoV-2); Coronavirus disease-19 (COVID-19)

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I. Introduction

Epidemiology is the basic science of social and preventive medicine. It originated from investigations of outbreaks of epidemic diseases such as cholera, plague, scurvy. And is now expanded to include all types of diseases and health-related conditions.¹ Epidemiologists are disease detectives who track disease to discover why it occurs as well as when it happens. The study of epidemiology will not be complete without the likes of John Snow (1813-1858), who led to the discovery of cholera in the 19th century.²

Epidemiologic triad model

In the traditional epidemiologic triad model, there are three vertices used by the epidemiologist. They are the "agent" of the disease (also known as the "cause" or "what" of the triangle), the host of the disease (i.e., the "who" of the triangle), and the "environment" or those external factors that influence or allow disease transmission (i.e., the "where" of the triangle). The 'time factor' in an epidemiologic triad is the intersection point of the three vertices (i.e., the agent, host, and environmental components) of the triangle to give rise to the disease (Figure 1).³ The time components may include the time characteristics, incubation/latency period, the length of the disease process, trends and cycles of the disease (i.e., vector), seasonality of the disease, and how the personal characteristics of the people in the population (i.e., herd immunity) affect the disease trajectory.

The environment is the medium that brings the external agent and the host together. The environment includes the place characteristics, biological, physical and psychosocial environments. In the modified non-infectious epidemiologic triad, causative factors, risk factors, environmental exposures, such as unhealthy

behaviors, unsafe practices or hazardous substances denote the “agent” (Figure 1). The “agent” in this context connotes ‘necessary factor’ which has to be present for morbidity but may not inevitably lead to disease. The ‘agent’ in infectious diseases is usually a bioactive substance (i.e., prion, virus, bacterium, fungus, protozoan) which inevitably lead to disease when conditions are met. Disease occurrence requires a combination of what has been coined “sufficient factors” which denotes a ‘host’ (i.e., individual or group of individuals) susceptible to the agent, and the environment. The susceptibility of the host may be based on personal characteristics (i.e., age, sex, ethnic group, occupation or group/population demographics).³

The epidemiologic triad applies to both infectious and non-infectious diseases. The role of the epidemiologist is to break the connectivity of these vertices; hence, bringing a halt to the spread of diseases.⁴ This mechanism of epidemiology has enabled public health to bring about the desired positive changes in curbing the spread of diseases globally.

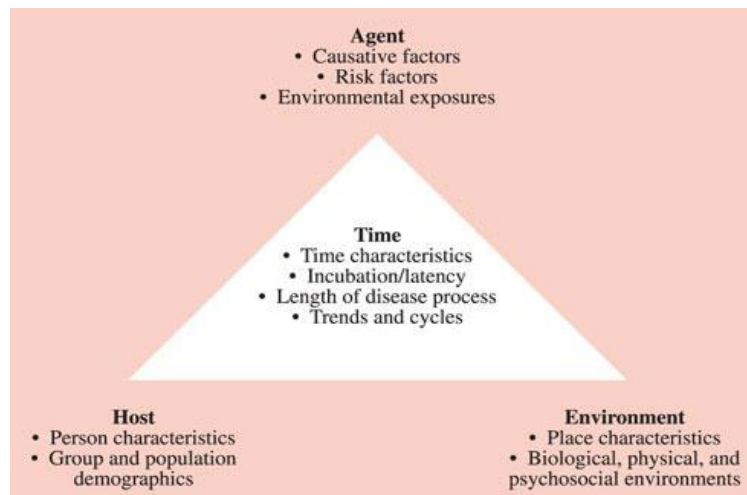


Figure 1: The epidemiologic triad model as modified by Miller.³

The modern epidemiology tries to demystify the ‘what,’ ‘who,’ ‘where,’ ‘when,’ ‘why’ and ‘how’ questions of communicable and non-communicable diseases (NCDs). The case definition of epidemiology in this context is the study of the cause, distribution, determinant, and deterrent of disease, injury, and other health-related condition in a given human population. The definition of ‘agent’ in modern epidemiology is in keeping with both the old triad (chain of infection) and the Miller modified epidemiologic triad models. The examples of agents (or causes) of diseases in this context include, but not limited to: viruses, bacteria, fungi, natural disasters, road traffic accidents, genetics, psychological and idiopathic conditions. The “cause” is also known as the ‘what’ in modern epidemiology. The distribution of disease refers to the person, place and time it occurs (otherwise known as ‘who’, ‘where’ and ‘when’?). The determinants of health-related problem or disease are factors that lead to the outbreak of a disease or health problem (otherwise known as ‘why’?); while deterrents of diseases are factors that can hinder the progress of a disease or health-related condition (otherwise known as the ‘how’?). The deterrents of a disease condition also connote the ‘control measures or interventions’ in public health.⁵

There are three significant types of Epidemiologic studies viz: a) Descriptive study (i.e., study of the pattern of illness based on the person (who), place (where), and time (when)); b) cohort study (i.e., subject-matched observational study which could be retrospective and/or prospective in design); d) Experimental study (i.e., a causal-relationship study which could be clinical/prophylactic/therapeutic trial, and community trial). Most cohort and experimental studies in epidemiology deal on the ‘why’? and ‘how’? (i.e., the determinants and deterrents) questions of disease conditions. They could also be classified as the “intervention” studies. They tend to proffer solutions to the ‘what,’ ‘who,’ ‘where, and when’ questions of descriptive study. There are two types of “how” in epidemiology. The first is “how a disease is caused” – a term known as “aetiopathogenesis.” It is important to note that this first ‘how’ question is synonymous to the ‘why’ question described earlier under ‘disease deterrent’ during the case definition of epidemiology. The second is “how the disease can be controlled”, otherwise known as “intervention.” The term “intervention” could be preventive, protective and curative in public health.⁵

Health questions and issues which relate to health are usually covered daily in news programs, some of which may end with conflicting conclusions. A good number of health-related breaking news in our media or magazines may have one thing or the other to do with epidemiology. Examples include viral hemorrhagic diseases (i.e., Ebola and Lassa fever), which are public health issues, especially in the African continent and the

burning question today, the novel Coronavirus disease (COVID-19), the pandemic virus of this age which is currently causing a global lockdown.⁶

The SARS-CoV-2 (COVID-19) and the News

The novel Coronavirus disease caused by SARS-CoV-2, commonly known as COVID-19, is the current epidemiology in the news from the communicable disease perspective. As at the time of writing this manuscript (04 March 2020), a total of 1,159,515 million people have tested positive to SARS-CoV-2, while more than 62,376 deaths have been recorded globally. Based on these statistics, the case fatality rate (CFR) of COVID-19 is 5.37%, while the infectivity and death rates are 12,742 and 685.45 persons per day, respectively. This is a huge global burden and a call for caution. It is becoming worrisome when a high-income country like the United States of America (North America), where the CFR is 2.69%, is compared with a low-middle-income country such as Nigeria (Africa) where the CFR is 1.90%. This could lead to the next questions: Do race and social environment play any role in COVID-19 disease trajectory?

There is a thread of connectivity between the agent (SARS-CoV-2), the host (man), and the environment in the chain of infection by COVID-19. The ‘how’ on prevention and protection from infection by this agent include education of the target population on the reality of the disease, activation of preventive mechanisms, alerting exposures, breaking the multi-factorial chains of transmission (including restrictions on the sale of wild animals for culinary), legislation on the personal protective equipment (PPE), observing social distancing (i.e., one to two meters), self-isolation and quarantine for those who come in contact with an infected person and those who have tested positive to SARS-CoV-2 agent respectively. Other preventive mechanisms include: maintaining personal and environmental hygiene (i.e., observing hand wash and respiratory etiquettes, use of face mask, and cleaning contaminated surfaces with 65% alcohol-based disinfectant (sanitizer)), screening and treating those who present with symptoms of coronavirus infection (i.e., fever, sore throat, difficulty breathing, atypical pneumonia, etc.) in designated isolation centres (Figure 2). The burden of COVID-19 in the target population would be reduced considerably by breaking the social chain of infection.⁷

II. Conclusion

We feel the impact of epidemiology in the news daily. It plays a crucial role in curbing disease burden by breaking the chain of transmission through a preventive or curative mechanism. This arm of public health detects disease and decides on appropriate intervention. The case of COVID-19 disease is a typical example of the role of epidemiology in the news. The descriptive epidemiologic study of COVID-19 is currently giving the world a sense of direction on the incidence, virulence, fatality rate, and possible interventions to curb this pandemic virus. In epidemiology, both the health-care provider and the non-health-care provider are stakeholders as they work in synergy to create the news. This game-changing role of epidemiology can create a healthy nation.

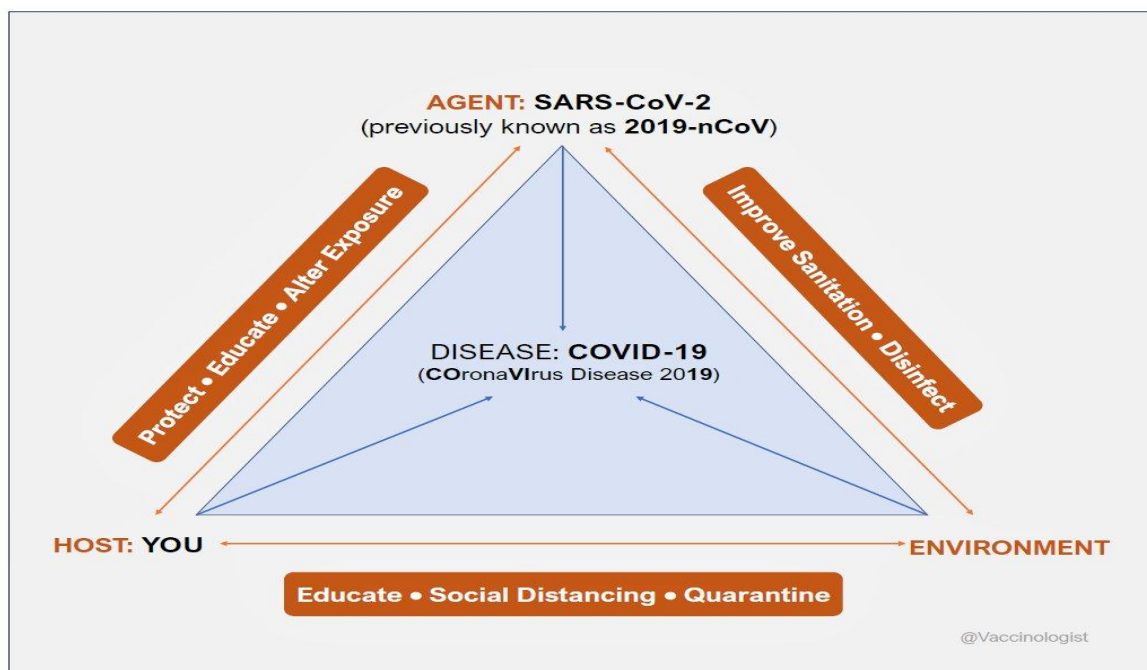


Figure 2 Social Chain of Infection by SARS-CoV-2

Conflict of Interest: The authors have nothing to declare.

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