

Heart Disease Epidemiology And Computerized Surveillance Systems

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Introduction

The morbidity and mortality rate of the population in the United States suffering from heart disease is high, and utilization of computerized surveillance systems can effectively assist in the mitigation and diagnosis of the disease before its occurrence. However, the difficulty facing health practitioners with CHD suggests that the occurrence of heart attack is uncertain, and simultaneously, numerous factors are at play, which are beyond the comprehension ability of the practitioners. Although the lack of research in the field suggests that computerized surveillance systems require further research, the utilization of Big Data Analytics, Artificial Intelligence (AI), and the Internet of Things (IoT) is extremely useful in gaining precision during the process of CHD diagnosis and prevention.

Epidemiological Issues in Heart-related Diseases

Epidemiology is a scientific method used for performing an assessment of the diseases and health outcomes in the population; instead of treating patients and individuals as patients, epidemiology collectively refers to them as communities and individuals, respectively. “The Centers for Disease Control and Prevention (CDC)” defines epidemiology as “... the study (scientific, systematic, and data-driven) of the distribution (frequency, pattern) and determinants (causes, risk factors) of health-related states and events (not just diseases) in specified populations (neighbourhood, school, city, state, country, and global” (2016). Subsequently, the CDC mentions the application of the study for the control of health problems. Epidemiological issues include diagnosis, prevention, prognosis, prevalence, aetiology, management, treatment, and early detection (World Health Organization, 2007). Heart diseases are also known as cardiovascular diseases (CVDs), which affect blood vessels or the heart. An increased risk of blood clots due to CVDs is primarily due to fatty deposits in the arteries (atherosclerosis). A few of the critical risk factors associated with CVDs are tobacco hypertension, smoking, and obesity.

The existing literature on CVD suggests that it is the leading cause of mortality around the world (Shi et al., 2016). Heart patients following stroke are at higher risk of “Coronary Heart Disease (CHD)”. One of the major individual contributors to the capitulation of CVDs is the living conditions of people living below the poverty line, coupled with malnutrition across low and middle-income households with an alarming rate of eighty per cent of the target population. Factors responsible for CVDs and CHDs in the elderly and young populations included but were not limited to tuberculosis, obesity,

nutritional disorders, infectious diseases, smoking, high levels of sugar and salt intake in nutrition, excessive alcohol consumption, high blood pressure, human immunodeficiency, and even malaria. Shi et al. (2019) highlight the importance of the Mediterranean diet for the prevention of heart diseases, which is associated with a healthier heart and health and contains high nutrition values within cereals, fruits, nuts, legumes, fish, and unsaturated fats like olive oil and grains.

Prevention and Treatment of Heart Disease

One of the leading causes of mortality and morbidity is “Coronary Heart Disease (CHD)”. The existing literature suggests that understanding risk factors, the availability of inexpensive cholesterol screening at a widespread level, and the availability of effective agents that are cholesterol screening agents in a well-tolerated manner remained effective in reducing the staggering figures for mortality and morbidity rate in the United States within the healthcare sector (LaRosa, 2001). The better understanding of issues and their respective diagnosis methodologies created further controversies regarding the prioritization of the target population for secondary and primary prevention of events, that is, with respect to age and other variables. Amongst agents, LaRosa (2001) argues that the statin class of lipid-lowering agents have both effectiveness and tolerance. The recurrence of coronary events calls for secondary prevention for established CHD and hypercholesterolemia. The controversies of primary prevention for CHD pertain to different age groups of patients; however, patients with diabetes are exceptions, and the primary reason for the need for urgency is the risk of dramatically developing CHD. Although patient groups require different treatment and prevention strategies, ongoing trials are going to resolve the controversies (LaRosa, 2001).

Additionally, there are numerous ways, which mostly include lifestyle changes and steps that a person can take for reduction and prevention of CHD development, including reducing tobacco smoking, limiting alcohol consumption, maintaining a healthy and balanced diet, awareness of risk factors, maintaining a healthy weight of the body, regularity of physical exercise, maintaining healthy blood cholesterol levels, and effectively treating existing medical conditions, such as high blood pressure and type 2 diabetes. The most critical factors for the prevention of CHD are education and self-awareness or mindfulness. On the other hand, test results define the treatment plan for patients with CHD, which includes coronary angioplasty, medication, and surgery for coronary artery bypass. Nevertheless, treatment assists in reducing and eliminating the risk of heart attack and symptoms.



Figure 1: Prevalence of CHD in the United States (overall).

Source: Centers for Disease Control and Prevention (2017-18)

Figure No. 1 shows the data for the prevalence of poor Cardiovascular Health for all available years, which indicates the scarcity of data on the subject matter. As per the statistics, the figures for the years 2007-08, 2009-10, and 2015-16 show a relatively stable graph with a one per cent prevalence percentage with the exception of the second year, which shows a 0.7 per cent figure. Data for gender

and age are not available, and this reflects the need for computerized systems for surveillance purposes within the CHD patient population. In a similar way, data on the age bracket of between 20 and 24 and 45-64 is presented in a graphical manner in Figure 2, which suggests a higher prevalence rate for older people and a lower one for the young population.



Figure 2: Prevalence of CHD in the United States

Source: Centers for Disease Control and Prevention (2017-18)

Computer Surveillance Systems

The existing literature on computer surveillance systems for health disease is scarce; however, Tama et al. (2020) suggest that improving the existing intelligent detection system for CHD is possible with a two-tier classifier ensemble. The occurrence of heart attack events is mostly without any prior symptoms, which brings the debate to CHD detection methods. The utilization of machine learning and big data analytics is extremely useful as an intelligent detection method, which Tama et al. (2020) introduce as a two-tier classifier ensemble. Physicians find it difficult to account for too many factors during the diagnosis process of heart disease, which can effectively be reduced with the assistance of the Internet of Things (IoT) for healthcare services. Abdel-Abdel-Basset et al. (2019) research analysis suggests a novel framework that supplements computer-supported diagnosis, coupled with the Internet of Things, for monitoring and detection of CHD in patients. The author lays out the limitations of the existing healthcare system in the diagnosis of CHS due to defectiveness and ambiguity of information. For example, the introduction of Neutrosophic multi-criteria decision-making (NMCDM) is a technique that can assist physicians during the diagnosis process of CHD.

Population Health Implications

Healthcare applications based on Information and Communication Technologies (ICTs) provide opportunities for healthcare practitioners and patients alike. The neutrosophic multi-criteria decision-making (NMCDM) technique provides an element of precision in the process of diagnosis, which can be effective in reducing the cost and burden of a staggering number of people suffering from CHD within the United States. The introduction of computerized surveillance systems influences the population in numerous ways, which include the utilization of data on symptoms to effectively detect issues of possible heart attack through healthcare applications. The percentage of people suffering from CHD is one per cent of the total population in the United States, and the staggering figures suggest that critical evaluation of computerized surveillance systems can be used effectively for providing service delivery to patients in primary and secondary healthcare settings. The lack of research in the area of computerized surveillance systems suggests an assessment of the existing practice in healthcare settings for the diagnosis and treatment of CHD. One of the benefits of the

utilization of the computerized technique is that it assists the process of diagnosis in an efficient and precise manner, which is difficult for health practitioners and patients alike.

Conclusion & Recommendations

Heart disease rates are high in the United States, and the need for adopting Information and Communication Technologies and combining them with artificial intelligence highlights the adoption of computerized surveillance systems. Nevertheless, the effective method for the prevention of CHD among the masses is the adoption of a healthy routine and diet. The healthcare sector of the United States lacks efficiency, and providing quality service to the population suffering from health diseases raises concerns amongst policymakers for alternative methods of diagnosis and prevention. In the paper, the existing literature highlights the importance of utilizing internet applications for gaining precision in the process of diagnosis, and the lack of utilization deprives the healthcare system of the opportunity to lower the burden and complexity of disease diagnosis and prevention for healthcare physicians. Future informatics strategies for the prevention and detection of heart diseases need to focus on the exploitation of Artificial Intelligence (AI) in conjunction with the Internet of Things (IoT). However, the lack of literature on the computerized surveillance system for CHD suggests that the policymaker's agenda should focus on the utilization of modern tools and techniques for facilitating various stakeholders to the CHD.

References

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