Emergence and Growing Incidence of Coronary Heart Diseases in India

Bhaswati Chaudhuri, M.Sc¹, Indranil Saha, MD², Binata Nayak, PhD³, Bulbul Thakur, PhD⁴

¹Research Scholar, Department of Home Science (Food and Nutrition Division), University of Calcutta, West Bengal, India.
²Professor, Department of Community Medicine, IQ City Medical College, West Bengal, India.
³Assistant Professor (Stage III), Department of Home Science (Food and Nutrition Division), University of Calcutta, West Bengal, India.
⁴Associate Professor (Ex), Department of Physiology, Raja Peary Mohan College, West Bengal, India.

Abstract: Cardiovascular diseases are one of the most important non communicable diseases (NCDs) affecting people of the developing countries. The World Health Organization (WHO) reported 17.5 million mortality from CVD in 2012 that increased to 17.9 million in 2017. The Register General of India (RGI) estimated occurrence of 29% of death due to CVD in 2013 which was far greater than 15%-20% in 1980s and 1990s. CHD, the most popular form of CVD are suffered by most of the people without considering their age, sex and socioeconomic background. Region wise distribution of CVD in India signifies higher proportionate CVD mortality rate in western and southern region when compared with eastern and north eastern region. The Global Burden of diseases, injuries and risk factor study and Million death study clearly indicates that there is an increasing trend in proportionate CVD mortality over the years. Years of life lost (YLLs) have also been studied by the Million Death study group.

KEY WORDS: cardiovascular disease (CVD), developing countries, years of life lost (YLLs), coronary heart disease (CHD).

I. Introduction

Cardiovascular diseases (CVD) ranked first in causing mortality in the beginning of 21st century with nearly 30% of all deaths occurring in the developing world. The situation was quite different one century back when very few deaths, about 10% were responsible for CVD all over the world [1-3]. According to World Health Organization (WHO) mortality from CVDs in 2012 was 17.5 million worldwide, which escalated to 17.9 million in 2017 ~ 31% of all global deaths. Report also stated that >75% incidence of CVD deaths suffered in low income and middle income countries but there is a sharp decrease in mortality from CHD in high income countries [4-6].
With the advent of industrialization, urbanization, and major social and economic transformations, every country has undergone epidemiological transition earlier or later [7]. It influenced the countries of Europe and North America in the beginning of 20th century and developing countries get influenced by it after 50 years [8]. India, being a huge country with wide socio-economic stratification, epidemiological transition has taken place in different regions at different times, some regions being in early part of transition while some other in later part [9]. Epidemiological transition are divided into five stages, of which first three stages have been given by OmranAR as (i) period of pestilence and famine marked by high fertility rate, infectious diseases clubbed with malnutrition, increased infant and child mortality resulting in >90% death on the other hand <10% death occurred due to CVD. The existence of CVD was in the form of rheumatic heart disease and cardiomyopathies. (ii) Era of receding pandemics (1900-1930) characterized by raise in life expectancy due to reduced infection and malnutrition increased per capita income and decreased infant and child mortality but CVD deaths rose from 10% to 35% than the previous era. Emergence of CHD and stroke must be mentioned during this period along with rheumatic heart disease. (iii) Age of degenerative and human-made diseases (1930-1965) characterized by the growing incidence of death due to non-communicable diseases especially CVD, mortality increased from 35% to 65% out casting diseases from infection and malnutrition. On the other hand average life expectancy increased and the beginning of dietary changes with increased consumption of animal fat, saturated fats, trans fats and hence total calorie intake [10]. Olshansky and Ault added a fourth stage of epidemiological transition named (iv) age of delayed degenerative diseases distinguished by downfall in CHD mortality adjusted according to age due to improvement in therapeutic approaches and preventive measures. It was a period when CVD and cancer are the most popular cause of mortality and morbidity among the population [11].

<table>
<thead>
<tr>
<th>Stage 1 Pestilence and famine</th>
<th>Life expectancy</th>
<th>Proportion of death due to CVD (%)</th>
<th>Dominant form of CVD death</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Malnutrition</td>
<td>35 years</td>
<td>&lt;10</td>
<td>Infectious (RHD)</td>
</tr>
<tr>
<td>• Infectious diseases</td>
<td></td>
<td></td>
<td>Nutritional</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 2 Receding pandemics</th>
<th>Life expectancy</th>
<th>Proportion of death due to CVD (%)</th>
<th>Dominant form of CVD death</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Improved nutrition and public health</td>
<td>50 years</td>
<td>10–35</td>
<td>Infectious (RHD)</td>
</tr>
<tr>
<td>• Chronic disease</td>
<td></td>
<td></td>
<td>Stroke—haemorrhagic</td>
</tr>
<tr>
<td>• Hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 3 Degenerative and man-made diseases</th>
<th>Life expectancy</th>
<th>Proportion of death due to CVD (%)</th>
<th>Dominant form of CVD death</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ↑ fat and caloric intake</td>
<td>&gt;60 years</td>
<td>36–65</td>
<td>IHD*</td>
</tr>
<tr>
<td>• Tobacco use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Chronic disease deaths</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Infections, malnutrition</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 4 Delayed degenerative diseases</th>
<th>Life expectancy</th>
<th>Proportion of death due to CVD (%)</th>
<th>Dominant form of CVD death</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Leading causes of mortality CV and cancer deaths</td>
<td>&gt;70 years</td>
<td>40–50</td>
<td>IHD**</td>
</tr>
<tr>
<td>• Prevention and Tx delays onset</td>
<td></td>
<td></td>
<td>Stroke—Ischaemic</td>
</tr>
<tr>
<td>• Age-adjusted CV death reduced</td>
<td></td>
<td></td>
<td>CHF</td>
</tr>
</tbody>
</table>

* Greater in high socioeconomic groups
** Younger patient—lower socioeconomic status
Elderly—higher socioeconomic status

Olshansky: Circ, 1986
Gaziano: Circ, 2003
Yusuf: Circ, 2005

Figure 2 Stages of Epidemiological Transition (10-11, 26-27)
Currently the period of inactivity and lifestyle diseases prevail, marked by obesity, diabetes mellitus, hypertension, dyslipidemia affecting the people of the world. People are becoming increasingly dependent on labor saving devices resulting in lowering of physical activity both household and leisure time activities, hence adopting sedentary lifestyle as a consequence inviting non communicable diseases along with increased consumption of refined cereals, animal fats, trans fat and saturated fats due to dietary transition in food habits as well [7,12]. Death rates from cardiovascular diseases are increasing day by day and rising incidence of sufferings from coronary heart diseases at an early age creates burden on India from both social and economic standpoint [9, 13].

The primary objective of this article is to highlight the present scenario of death rates from cardiovascular diseases and coronary heart diseases in India gathering information from Register General of India[14, 15], WHO report on non communicable diseases(NCDs)[4,5] and the Global Burden of Diseases, Injuries, and Risk Factors (GBD) study [19,25].

II. Search Methodology

This review is an extensive search of CVD and CHD mortality in India and premature occurrence of CHD among populations in different national and international journals that deals with it. Mortality rates have been obtained from data of Register General of India (RGI) available at a government website [14, 15], burden of non-communicable diseases from WHO data in a report on NCDs [4, 5] and GBD study from their website [19, 25]. Search also includes vivid literature study from PubMed and Google scholar search engines. The key terms used for searching are ‘coronary heart disease India’, ‘cardiovascular diseases India’, ‘prevalence CVD India’, ‘prevalence CHD India’, ‘coronary heart disease epidemiology India’, ‘CHD mortality India’, and ‘Global Disease Burden’. The inclusion criteria consist of almost all data concerned with CVD and CHD mortality in India that follows WHO criteria [16]. Pre and post 21st century data (1965-2018) have been studied to follow the trends in proportionate mortality and also to find out region wise epidemiological transition. Full text articles are reviewed. The exclusion criteria consist of data from migrant Indian study and not from residential Indians by birth.

III. Growing incidence of CVD and CHD mortality in India

In India CVD mortality rates are obtained from the data produced by the office of the RGI periodically (14). It was reported that CVD accounted for 15%-20% of deaths in the country in1980s and 1990 [17] that rose to 20.6% deaths in1990, 21.45% in 1995, 24.3% in 2000, 27.5% in 2005, and 29% in 2013(14). The rising incidence of mortality in CVD among Indians from north to south and east to west, irrespective of gender, and socioeconomic variation has made it alarming for the nation (18). Every year total number of deaths in India is greater than 10.5 million, of which about 20.3% of all deaths in men and 16.9% of all deaths in women are caused by CVD, reported by RGI [18]. It also stated in 2010-2013 that there is an elevation in proportionate death rate in CVD to 23% of total and 32% of adult deaths [15]. Urban rural difference in CVD mortality indicates that in urban areas the percentage in CVD mortality in more developed region is >35% than in less developed rural region as <10% [19]. More developed states of India as western and southern section show higher percentage in proportionate CVD mortality than less developed states like eastern and northeastern region. Human Development Index is lower in northern and northeastern section and higher in western and southern section. Variation in region based Human Development Index signifies a linearity in proportional CVD mortality. It is an indicative of the occurrence of epidemiological transition in those areas as undergone in other countries of the world [7, 8].

Figure 3 Proportionate cardiovascular disease death rates in different geographic regions in India (bars) and regional human development index (line) explains importance of epidemiological transition. (Data used with permission from Register General of India (15).

According to the WHO, non communicable diseases caused 5.87 million mortality worldwide in 2010, male population suffered 1.2 million deaths and women suffered 0.9 million deaths in India [4]. The four main NCDs are CVDs, cancers, diabetes or chronic lung diseases. In 2015 NCDs caused 70% deaths, which are nearly 40 million deaths globally, of which occurrence of mortality in low income countries alone is 37% [20]. Studies
reported that three times rising incidence of mortality from CHD and stroke in low and middle countries (LMIC) compared to high income countries. China also followed a similar pattern between 1973–2006 of increasing mortality from CVD and cancer while decreasing death rates from communicable diseases [21, 22]. WHO reported that the highest cardiovascular mortality rates in the world is in the South Asian region (4). According to age, CVD death rates are different in different countries as in India 349/100,000 men, 265/100,000 women suffered from CVD while in Bangladesh the predominance of CVD is in179/100,000 men and 153/100,000 women, whereas in Pakistan 294/100,000 women faced the sufferings. The occurrence of CVD in USA in men and women are about 170/100,000 and 108/100,000 respectively, the rate clearly states 2-3 times lower than the rate in South Asian countries [4].

According to the Global Burden of Diseases, Injuries and Risk Factors (GBD), India doubled mortality as well as disability from CHD in the last 30 years [23]. The proportionate mortality trend is increasing with 0.62 million death in 1990, 0.78 million in 1995, 0.95 million in 2000, 1.01 million in 2005, and 1.13 million in 2010 [25]. Years of life lost (YLLs) in proportions due to CVD had also been studied as 5.1% in 1990 and 9.8% in 2010. In case of CHD, YLLs doubled from 3.3% in 1990 to 6.7% in 2010 in India [19, 23]. The significance of YLLs implies person dying from a particular disease at an early age. Low to middle income countries are vulnerable to YLLs [6]. The Million Death Study indicated that in 2010 YLLs due to CVD out of a total of 1.89 million deaths, percentage of occurrence in <60 years age was 31% (0.59 million) and percentage of occurrence in <70 years age was 58% (1.09 million) [24].

IV. CONCLUSION

Literature studies on growing incidence of CVD reveals that it emerged as an epidemic in India. South Asian countries are worst affected by the disease. Unless appropriate interventional strategies are taken to reduce the burden, the proportional mortality rate will go on increasing, raising the burden on the nation. Disability caused by the disease is a matter of concern and must be targeted through necessary medical advice and support. Premature occurrence of CVD might decrease years in one’s life (YLLs) that creates a serious impact on society[28].

REFERENCES


**Acknowledgements**

I must acknowledge my indebtedness to Dr. Indranil Saha for his valuable suggestions, and guidance throughout the proceeding of the article. I also take the opportunity to express my sincere gratitude to Dr. Binata Nayak and Dr. Bulbul Thakur for their continuous encouragement and inspiration during the progress of the work.