Severe AS:
- Aortic velocity >4.0 m/second or mean pressure gradient >40 mm Hg
- Valve area <0.8 cm² or valve area index <0.5 cm²/m²

Severe MS:
- Mitral valve area <1.5 cm² or valve area index <0.6 cm²/m²

Secondary prevention

In RHD it is defined as the continuous administration of specific antibiotics to patients with previous attack of rheumatic fever or a well-documented RHD.

Prophylaxis in pregnant patients with rheumatic heart disease is same as with the other cases except that oral sulfadiazine or sulfasoxazole are contraindicated in pregnancy due to teratogenic effects.

Abbreviations


References


Address for correspondence
Dr. Anand Sagar: E-mail: dranandsagar@hotmail.com

Abstract

Cardiovascular diseases (CVDs) are showing an escalation among the Indian population with a trend of reaching the younger age groups. It is now known to have a major share in the burden of diseases. A number of studies have been conducted time and again to find out the prevalence of CVDs and it has been found that they have a widespread prevalence in India, with regional variations. It is now affecting almost all sections of the society from young to old and most affluent to least affluent. Statistics also show an increased prevalence of CVDs in India as compared to other developing countries. Large scale and widespread incidences show downgrading of the cardiovascular health status of Indians and emergence of CVDs as a chronic manifestation across the population. Future trends predict that in the coming decade CVDs will inflict every section of the population irrespective of age, gender, economic status, and locale. Owing to such a large rate of prevalence, India is set to lose on it is productive population imposing a huge socioeconomic burden.

Key Words

Prevalence, Cardiovascular disease, India, Economic impact

Introduction

With the coming of the age of massive development, India has gone through dramatic lifestyle changes—moving from agrarian diets and active lifestyles to fast foods and sedentary lifestyles in a much shorter span of time than other nations. Consequently, mortality rates related to chronic non-communicable diseases like cardiovascular diseases (CVDs), coronary heart diseases (CHDs), diabetes and stroke have increased rapidly in the last decade with CVDs having a major share. Recent figures suggest that CVDs have outgrown the barriers of gender, locale, and economic status. Moreover, it is affecting the productive population imposing a huge socioeconomic burden. Future forecasts predict a continuing trend in the coming decades, where CVDs will lead to major loss of the productivity owing to the disease-related economic burden in an otherwise beneficial phase of demographic transition. The need of the hour is to track down and closely monitor the prevalence of disease and encounter it with better intervention policies aimed at prevention, control, and treatment of CVD.
human resource pool of the country. At this rate, being one of the youngest nations in the world, India is set to lose its productive population to CVD morbidity and mortality projecting a setback to the economy in an otherwise beneficial phase of demographic transition.

Materials and methods
Journal articles were referred online through PubMed and Google Scholar search engines. Original articles from the journals like Indian Journal of Medical research, Journal of the Association of the Physicians of India, Journal of Cardiovascular Disease Research, and The Internet Journal of Cardiology were studied. Articles published by authors in international journals such as Journal of American College of Cardiology, British Medical Journal, Bio Med Central were also reviewed. Reports of organizations such as World Health Organisation (WHO), National Commission on Macroeconomics and Health (NCMH), a government of India undertaking, Centre for Chronic Disease Control (CCDC), National Cardiovascular Disease Database (supported by Ministry of Health and Family Welfare, Government of India and WHO) were studied to project the data. The keywords used for the search were “prevalence,” “coronary heart disease,” “cardiovascular disease,” “heart disease,” “in India,” “risk factors,” etc. Only those articles that were available in full text format were analyzed to arrive at the data collated. Criteria for selection of articles were the year in which studies were undertaken and published. Studies conducted after year 2000 were referred to. All other studies ranging in the 90s were rejected. Any recent study that presented data on the basis of old studies was also rejected. Only those articles were included that reported prevalence in Indians, residing in India. A number of studies on migrant Indians were also cited, but they were not included in this review.

Results
Prevalence: National
Cardiovascular diseases have been gaining importance in India recently because of increased incidence of the disease over the years. It is the first among top five causes of deaths in Indian population (rural vs. urban, economically backward vs. developed states, men vs. women and at all stages vs. middle age). In 2000, there were an estimated 29.8 million people with CHD in India out of a total estimated population of 1.03 billion or a near 3% of overall prevalence. In 2003, the prevalence was estimated to be 3–4% in rural areas and 8–10% in urban areas according to population based cross sectional surveys. However, in 2008, they were found to be 6% and 12%, respectively. In 2011, World Health Organisation (WHO) reported the age standardized CVD mortality rates among males and females in India (per 100,000) at 363–443 and 181–281, respectively. The country wise statistics of the WHO on non communicable diseases (NCDs) estimates that NCDs account for 53% of the total deaths in India, out of which CVDs have a major share of 24%.

Prevalence: Regional
Apart from a high overall prevalence, there are regional variations in the prevalence of CVD. Unadjusted CHD rates have ranged from 1.6–7.4% in rural populations and 1–13.2% in urban populations. 1 prevalence rate of CHD in urban areas of Northern states such as Jammu and Kashmir, Delhi and Uttar Pradesh, and Western states such as Rajasthan is reported to be around 6–10%. The rates in the rural areas were 6–7% in Jammu and Kashmir, 3–5% in Himachal Pradesh and Punjab among the northern states while in Rajasthan it was 3–5%. In Andhra Pradesh, the overall prevalence of CVDs was found to be 5.4% while the age standardized prevalence rate was 5.1%. Studies conducted in urbanized states of Kerala and Mumbai reported very high CVD mortality rates approaching 500/100,000 for men and 250/100,000 for women. In urban and rural communities of Delhi, the prevalence of CHD was 14.8% (urban) and 9.7% (rural) while in Lucknow district, the overall prevalence was found to be 7.1% in both men and women in urban areas and 3.8% in rural areas. Overall, the mortality is highest in the South Indian states, Eastern and North eastern states and Punjab in both men and women while mortality is lowest in the Central Indian states of Rajasthan, Uttar Pradesh, and Bihar.

Future trends: Gender, age groups and area
The forecast of prevalence rates (in percentage) by the National Commission on Macroeconomics and Health (NCMH) predicted that from 2000 to 2015 the number of urban males in the 20–29 years age group suffering from CHD will be almost double and the females of the same age group will keep up with their pace. Thus, indicating younger age of escalation of CVDs. In fact, the prevalence rate among women is likely to keep pace with that of men in all age groups. When the prevalence rates in the estimated data were compared across age groups, i.e., from 20–69 years in males and females, an increasing trend was observed. Also, it has been estimated that at the later stages of life, more number of women will contribute to the CVD infected population as compared to men. In case of rural men and women, the trend is anticipated to be static in the 20–29 years age group for 2000–2015. However, across age groups, it shows an increase in percentage prevalence in both males and females. On comparing the percentage prevalence of males and females across age groups from 2000 to 2015, a similar pattern is estimated wherein more number of females will suffer from CVD at a later age as compared to men.

Data also suggest that although the prevalence rates of CVD in rural population will remain lower than that of urban populations, they will continue to increase reaching around 13.5% of the rural age group of 60–69 as compared to 22% of urban age group of 60–69. The prevalence rates among younger adults (40 years and above) are also likely to increase. This trend can also be observed in terms of the number of cases projected as follows (Table 1):

Table 1: Forecasting the number of cases (males and females) of coronary heart disease (CHD) in India

<table>
<thead>
<tr>
<th>Year/area</th>
<th>20–29 years</th>
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<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Urban</td>
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<td>3,342,472</td>
<td>3,590,855</td>
<td>3,153,512</td>
<td>14,704,808</td>
</tr>
<tr>
<td>Total</td>
<td>4,511,192</td>
<td>5,489,266</td>
<td>6,119,446</td>
<td>5,879,296</td>
<td>5,041,711</td>
<td>27,040,912</td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>4,138,045</td>
<td>3,869,904</td>
<td>4,116,830</td>
<td>3,711,320</td>
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<td>Rural</td>
<td>2,012,363</td>
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<td>4,544,974</td>
<td>3,849,544</td>
<td>18,007,899</td>
</tr>
<tr>
<td>Total</td>
<td>6,150,408</td>
<td>7,253,720</td>
<td>8,334,032</td>
<td>7,716,294</td>
<td>6,432,334</td>
<td>35,868,789</td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
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<td>5,817,363</td>
<td>4,829,922</td>
<td>22,280,577</td>
</tr>
<tr>
<td>Total</td>
<td>8,317,184</td>
<td>9,095,489</td>
<td>10,974,527</td>
<td>10,040,636</td>
<td>8,540,860</td>
<td>46,968,695</td>
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<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
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NCMH, 2005
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The rising incidence of cardiovascular diseases in India

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#### Prevalence: Regional

Apart from a high overall prevalence, there are regional variations in the prevalence of CVD. Unadjusted CHD rates have ranged from 1.6–7.4% in rural populations and 1–13.2% in urban populations. Prevalence rate of CHD in urban areas of Northern states such as Jammu and Kashmir, Delhi and Uttar Pradesh, and Western states such as Rajasthan is reported to be around 6–10%. The rates in the rural areas were 6–7% in Jammu and Kashmir, 3–5% in Himachal Pradesh and Punjab among the Northern states while in Rajasthan it was 3–5%. In Andhra Pradesh, the overall prevalence of CVDs was found to be 5.4% while the age standardized prevalence rate was 5.1%. Studies conducted in urbanized states of Kerala and Mumbai reported very high CVD mortality rates approaching 500/100,000 for men and 250/100,000 for women.

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### Economic impact

CVD affects Indians with greater frequency and at a younger age than counterparts in developed countries, as the incidence has gone up significantly for people between ages 25–69 to 24.8%. International Heart Protection Group, 2008.

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NCMH, 2005

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well as many other developing countries. In addition to high rates of mortality, CVD manifests here over the same period of time as other countries in the world resulting in substantial number of deaths in working age group. In Western countries where CVD is classified to be a disease of the aged, 23% of CVD deaths occur below 70 years of age while in India 52% of CVD deaths occur below 70 years of age. The economic impact was estimated to be 9 billion dollars in national income from premature deaths due to heart disease, stroke, and diabetes in 2005 alone, with projected estimates of 237 billion dollars by 2053. The total years of life lost due to cardiovascular disease among the Indian men and women aged 35–64 has been estimated to be higher than comparable countries such as Brazil and China. These estimates are predicted to increase by 2030, when differences may be even more marked (Table 2). Thus, India suffers a tremendous loss of productivity due to increased prevalence of CVD.

Table 2: Estimates of total years of life lost due to CVD in 2000 and 2030

<table>
<thead>
<tr>
<th>Country</th>
<th>2000</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total years of life lost</td>
<td>Rate per 100,000</td>
<td>Total years of life lost</td>
</tr>
<tr>
<td>India</td>
<td>9,221,165</td>
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</tr>
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<td>Brazil</td>
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<td>2,121</td>
</tr>
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Age standardized CVD death rates in people 30–69 years old are 180 per 100,000 in Britain, 280 per 100,000 in other countries occurs in this age group. 

The rising incidence of cardiovascular diseases in India

The growing health burden of CVD potentially translates into increased economic burden at both national and household level. Estimates from recent studies indicate that CVD related aggregated ranged from approximately 3 billion dollars in 2004 to 7.5 billion dollars in 2010. CVD affected households experience greater financial hardships as compared to their non-affected counterparts. They spend more on inpatient and outpatient care which results in lower non-medical expenditure per person in the household. There is an estimated loss of 110.64 international dollars per person on non-medical spending. However, this decline is less as compared to the annual inpatient and outpatient out-of-pocket expenditures of the CVD affected households, i.e., an annual equivalent of 5.16 international dollars over a 15 day period. They also have lower employment rates. Such scenario propels the households to use coping mechanisms to protect their non-medical expenditure against the CVD related economic losses. The worst affected are the lower socioeconomic strata household which have to rely on borrowing and sale of assets to meet the expenditure having long-term implications for household economic well-being. Another recent study reported that CVD affected household spent as much as 3.4 million rupees per year on CVD related health expenditure with major shares spent on direct and indirect health costs. The annual wage loss of the patient was approximately 5% of the overall healthcare expenditure on CVD. Majority of such household resorted to spending their savings to meet the healthcare expenditure. An alarming 30% of the household included in the study underwent catastrophic expenditure.

Discussion and conclusions

These figures indicate an alarming rate of prevalence of CVDs in India. In fact, the prevalence in India is higher than other countries of the same region. The escalation in the prevalence has been observed since the last decade and are expected to continue with the same pattern if the current situation prevails. These rates indicate newer patterns of the disease incidence. Prevalence of CVD is likely to affect only high income countries, whereas only 22% of CVD related deaths in India occur in people ≤70 years of age, whereas 52% of CVD related deaths in Western countries occurs in this age group. 

The life expectancy of an average Indian male is 67.3 years and that of females is 69.6 years (as per the estimates for 2011–15). This transition has brought a larger number of people to the age group where the CVDs manifest. Thus, India has a larger population of vulnerable older adults that contribute to the CVD inflicted population.

To conclude, CVDs are slowly reaching out to all sections of the society. Large scale and widespread incidence shows downgrading of the cardiovascular health status of Indians and emergence of CVDs as a national concern across the population. This affects the country’s productivity owing to economic burden in an otherwise beneficial phase of demographic transition. Need of the hour is to track down and closely monitor the prevalence of disease and tackle it with aggressive, effective and efficient intervention policies that aim at prevention, control and treatment of CVDs in all sections of the population. More efforts are needed to encounter the epidemic at the level of risk factor prevalence. Also, more targeted and comprehensive policies need to be extended to the masses for healthcare financing.

References


The rising incidence of cardiovascular diseases in India

Chauhan S, et al

The total years of life lost due to cardiovascular disease in India were estimated to be 9 billion dollars in 2005, along with projected estimates of 237 billion dollars by 2030. The total years of life lost due to cardiovascular disease among the Indian men and women aged 35–64 has been estimated to be higher than comparable countries such as Brazil and China. These estimates are predicted to increase by 2030, when differences may be even more marked (Table 2). Thus, India suffers a tremendous loss of productivity due to increased prevalence of CHD.

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Leeder et al., 2004

Age standardized CVD death rates in people 30–69 years old are 180 per 100,000 in Britain, 280 per 100,000 in China, and 405 per 100,000 in India. Also, 50% of CVD related deaths in India occur in people ≤70 years of age, whereas only 22% of CVD related deaths in Western countries occurs in this age group. Age specific incidence of acute Myocardial Infarction in South Asian (Bangladesh, India, Nepal, Pakistan, Sri Lanka) is 35 years, whereas that in Western Europe, China and Hong Kong is 63 years with more men than women affected. This median age in Asian men and women was also higher (58 and 54 years, respectively). Studies carried out in India and other places suggest that Asians in general and Indians in particular are at increased risk of myocardial infarction at a younger age (< 40 years), irrespective of whether they have migrated to other countries or are resident Asians. The latest data estimates the age standardized burden of CVD (per 100,000) in males to be 3315–4228 DALYs (Disability Adjusted Life Years) while in females it is estimated to be 2584–3438 DALYs.

The growing health burden of CVD potentially translates into increased economic burden at both national and household level. Estimates from recent studies indicate that CVD related aggregated ranged from approximately 3 billion dollars in 2004 to 7.5 billion dollars in 2010.1 CVD affected households experience greater financial hardships as compared to their non-affected counterparts. They spend more on inpatient and outpatient care which results in lower non-medical expenditure per person in the household. There is an estimated loss of 110.64 international dollars per person on non-medical spending. However, this decline is less as compared to the annual inpatient and outpatient out-of-pocket expenditures of the CVD affected households, i.e., an annual equivalent of 5.16 international dollars over a 15 day period. They also have lower employment rates. Such scenario propels the households to use coping mechanisms to protect their non-medical expenditure against the CVD related economic losses. The worst affected are the lower socioeconomic strata household which have to rely on borrowing and sale of assets to meet the expenditure having long-term implications for household economic well-being.2 Another recent study reported that CVD affected household spent as much as 3.4 million rupees per year on CVD related health expenditure with major shares spent on direct and indirect health costs. The annual wage loss of the patient was approximately 5% of the overall household expenditure on CVD. Majority of such household resorted to spending their savings to meet the healthcare expenditure. An alarming 30% of the household included in the study underwent catastrophic expenditure.

Discussion and conclusions

These figures indicate an alarming rate of prevalence of CVDs in India. In fact, the prevalence in India is higher than other countries of the same region. The escalation in the prevalence has been observed since the last decade and are expected to continue with the same pattern if the current situation prevails. These rates indicate newer patterns of the disease incidence. Previously thought to affect only high income countries, CVD burden is now being transferred to the developing countries as evident by its presence in India. Moreover, these rates are seen to be increasing disproportionately as compared to other countries. It is catching up in lower income groups also, in spite of the difference in the lifestyle, culture, etc. indicating the urgency of addressing the associated risk factors. As indicated by the data, the prevalence is now indicated in rural areas, also other than the clichéd urban areas indicating that as the disease matures and gets a stronger grip in the country, it will percolate to all categories of the population and geography. This can be confirmed as recent studies in India show that individuals with lower levels of income or education are at a higher risk suggesting that the prevalence is following the pattern seen with advanced epidemics in developed countries – the highest prevalence is shifting from the affluent to the less affluent.3 There is an increasing trend for reversal in the socioeconomic gradient for CVD (as already manifested in developed nations), with the poor and disadvantaged having equal and sometimes higher, burden of CVD, and its risk factors. This could be due to change in the pattern of dietary habits, lack of healthcare facilities, etc. in the lower strata. This analysis also highlights the need to protect CVD affected households from the economic burden of the disease. The heavy out-of-pocket spending and resorting to coping mechanisms such as borrowing or selling of assets prevails due to limited government financing and other insurance mechanisms that continue to be inadequate. Even though, many programs and policies have been designed to address the issue of financing healthcare, a large part of the affected population either remains uncovered or covered inadequately due to lack of comprehensiveness of the policies or negligibility due to their non-poor status. These coverage gaps call for policies that extend beyond the poor when considering conditions that are expensive to treat. From a long-term perspective, more attention should be paid to prevention and prevention of CVD related risk factors like tobacco consumption, smoking, hypertension, etc. to avoid the situation from growing into a bigger epidemic. The stark observation of the trend of CVD is the incidence of disease in younger age groups. An increased prevalence of CVD related risk factors have been reported in this age group owing to lifestyle changes, work routines, cultural influences, etc. This means that India’s productive population is getting affected causing an economic setback to the country. Between 2000 and 2015, India is projected to cumulatively lose USD 236.6 billion because of heart disease, stroke, and diabetes costing 1% of the GDP. In 2000, in the age group of 35 to 64, India lost 9.2 million years of productive life. As CVD rates increase, this estimate will increase to 17.9 million by 2030.4 This is when the estimates do include the indirect losses, such as losses incurred from not investing the same amount in other areas of human development such as education.

In older age groups, an increased prevalence can be collated to the demographic transition in India with a sharp decline in the death rate as well as the birth rate. The life expectancy of an average Indian male is 67.3 years and that of females is 69.6 years (as per the estimates for 2011–15).5 This transition has brought a larger number of people to the age group where the CVDs manifest. Thus, India has a larger population of vulnerable older adults that contribute to the CVD inflicted population.

To conclude, CVDs are slowly reaching out to all sections of the society. Large scale and widespread incidence shows downgrading of the cardiovascular health status of Indians and emergence of CVDs as a chronic manifestation across the population. This affects the country’s productivity owing to economic burden in an otherwise beneficial phase of demographic transition. Need of the hour is to track down and closely monitor the prevalence of disease and tackle it with aggressive, effective and efficient intervention policies that aim at prevention, control and treatment of CVDs in all sections of the population. More efforts are needed to encounter the epidemic at the level of risk factor prevalence. Also, more targeted and comprehensive policies need to be extended to the masses for healthcare financing.

References


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Abstract
We've been treating diabetes for 70 or 80 years, and despite the fact that 70% of people with diabetes die from heart disease. Our therapies for treating diabetes have not been shown to reduce the very high rate of CV death. Our mainstays of therapy is to get sugars down but that don’t seem to reduce heart attack and stroke and cardiac death. Better control of diabetes mellitus reduces microvascular complications, but has limited effect on macrovascular complications including cardiovascular mortality. It has shown that some new oral antidiabetic drugs may paradoxically increase cardiovascular risk presumably by preventing protective ischemic preconditioning. Rosiglitazone increases risk of myocardial infarction and death possibly by increasing serum triglycerides and LDL-cholesterol levels. Muraglitazar increased risk of cardiovascular death, myocardial infarction, or stroke due to as yet unidentified reasons.

Key Words
• Glitazone
• Metformin
• DPP4 inhibitors
• Cardiovascular events
• Ischemic preconditioning

Introduction
Patients with type 2 diabetes have cardiovascular morbidity and mortality at least four times higher compared to patients without diabetes. Moreover, it is well established nowadays that the cardiovascular risk of diabetic patients without a history of a prior myocardial infarction is similar to the risk of nondiabetic patients who have already had one. Hence, the reduction of cardiovascular risk in type 2 diabetic patients using antidiabetic medication is of great importance.

Address for correspondence
Ms. Shraddha Chauhan
Email: Shraddha.phd11@gmail.com

OHA and heart: Current Perspectives
Dr. A. K. Pancholia, MD, FACC
Head Department of Clinical and Preventive Cardiology, Ahirnath Hospital and Gokuldas Heart Center, Indore, India