

Prevalence of cardiovascular disease in India and its economic impact- A review

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Abstract- Background and Objectives: Cardiovascular diseases have a major share in the incidence of non-communicable diseases. CVD is also one of the leading causes of deaths in India. It has outgrown the boundaries of gender, location of dwelling etc. A number of studies have been conducted time and again to find out the prevalence of cardiovascular disease. This article aspires to collate all the data gathered by such studies conducted after year 2000 and provide an overview of the prevalence of CVDs in India.

Methods: Studies published after 2000 in various national and international journals were reviewed to gather data on prevalence of CVD.

Results: Studies show an increased prevalence of cardiovascular disease in India as compared to other developing countries with recent trends showing incidence in younger age group. It is seen to affect almost all sections of the society from young to old and most affluent to least affluent.

Interpretation: 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.

Conclusion: The prevalence has increased as indicated by studies in the last decade. Projections for future also estimate a similar trend. Need of the hour is to track down and closely monitor the prevalence of disease with maintenance of proper and detailed database at hospital, community and other levels. This shall facilitate in evaluating the effect of corrective measure and health policies also.

Index Terms- Prevalence, Cardiovascular disease, India, Risk factors

I. INTRODUCTION

Cardiovascular diseases (CVD) have been leading cause of morbidity and mortality in India. Recent trends indicate that the disease has escalated to younger age groups also. It has a significant presence in males and females in both urban and rural population¹. The prevalence of its associated risk factors has been found to exist increasingly in the population. With such a fast pace of increasing incidence, a number of epidemiological studies have been carried out in India to trace the prevalence of CVD over time. Some of them have forecasted the future incidence and prevalence of CVD in India. To formulate this review article, original articles in various national and international journals were searched through web. Only those studies which were conducted post 2000 were included. Key words such as "prevalence", "coronary heart disease", "cardiovascular disease", "heart disease", "in India", "risk factors" etc. were used to find articles. This article tries to embody the data collected so far by approximately 10-15 studies fulfilling the reference criteria. This article stands as an effort to develop an overview of the prevalence of CVD over the last decade as observed and quantified by different studies conducted on Indian population.

II. MATERIALS AND METHODS

Journal articles were referred online through PubMed and Google scholar search engines. Original articles from 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 organisations 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 analysed 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 Indian residing in India. A number of studies on migrant Indians were also cited but they were not included in this review.

III. RESULTS

Prevalence: National

Cardiovascular diseases have been gaining importance in India recently because of increased incidence of the disease. It is the first among top 5 causes of deaths in Indian population (rural vs. urban, economically backward vs. developed states, men vs. women and at all stages vs. middle age)². 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 nearly 3% overall prevalence^{3,4}. According to World Bank estimates, CVD had a 31% share in the total burden of disease in 2001⁵. 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^{6,7}.

Prevalence: Regional

Apart from a high overall prevalence, there are regional variations in the prevalence of CVD. The CUPs (no.5)⁸ study found out the overall prevalence of CAD in native South Indian population to be 11% while the age standardised prevalence was computed to be 9%. The overall figure of 11% represents approximately a 10 fold increase in the prevalence of CAD in urban India during the last 40 years. Unadjusted CHD rates have ranged from 1.6% to 7.4% in rural populations and 1% to 13.2% in urban populations². Crude 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 have a prevalence rate of 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%³.

Future trends: Gender, Age groups and Area

Future trend analysis indicated that 60% of the world's patients with heart disease, including CHD, would live in India by 2010¹. The forecast of prevalence rates (in percentage) shows 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. This indicates the 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 both 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 inflicted 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 2000-2015, a similar pattern is estimated wherein more number of females will suffer from CVD at a later age as compared to men¹. Data also suggests 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 increase⁹. This trend can also be observed in term of the number of cases projected as follows:

TABLE I: Forecasting the number of cases (males and females) of coronary heart disease (CHD) in India¹

Year/area	20-29yrs	30-39yrs	40-49yrs	50-59yrs	60-69yrs	Total
2000						
Urban	2,711,501	2,635,019	2,776,974	2,288,412	1,888,199	12,300,104
Rural	1,799,691	2,854,247	3,342,472	3,590,855	3,153,512	14,704,808
Total	4,511,192	5,489,266	6,119,446	5,879,296	5,041,711	27,040,912
2005						
Urban	4,138,045	3,869,904	4,116,830	3,171,320	2,582,790	17,878,889

Rural	2,012,363	3,383,816	4,217,201	4,544,974	3,849,544	18,007,899
Total	6,150,408	7,253,720	8,334,032	7,716,294	6,432,334	35,886,789
2010						
Urban	5,992,412	5,154,766	5,606,731	4,223,273	3,710,938	24,688,119
Rural	2,324,772	3,940,722	5,367,797	5,817,363	4,829,922	22,280,577
Total	8,317,184	9,095,489	10,974,527	10,040,636	8,540,860	46,968,695
2015						
Urban	8,167,924	7,927,846	8,493,463	6,156,089	5,346,975	36,092,297
Rural	2,324,087	4,523,697	5,816,588	6,852,050	5,913,624	25,430,046
Total	10,492,011	12,451,542	14,310,051	13,008,140	11,260,599	61,522,343

CVDs are the largest cause of mortality, accounting for around half of the death resulting from non-communicable diseases (NCDs). Overall, CVDs accounted for around one fourth of all deaths in India in 2008. CVDs are expected to be the fastest growing chronic illness by 2015 growing at 9.2% annually from 2000 onwards. A more worrying fact is that the incidence has gone up significantly for people between ages 25-69 to 24.8%¹⁰. The down ward escalation of CVDs is of primary concern as it is affecting the productive population of India. The present evidence suggests an average mortality of 4% in the age group of 20-49 years and 6% in those above 50 years due to CVD. This may remain the same till 2015 if the current situation continues for the next 10-15 years¹.

According to a WHO report, the current age standardised CVD mortality rates among males and females in India (per 100,000) are 363-443 and 181-281 respectively¹¹. No other data were found that assessed the current/recent prevalence of CVD in India.

IV. ECONOMIC IMPACT

It has been found that over 80% of deaths and 85% of disability from CVD occur in low and middle income countries^{12, 13}. Among these, CVD affects Indians with greater frequency and at a younger age than counterparts in developed countries, as well as many other developing countries. In addition to high rates of mortality, CVD manifests here almost 10 year earlier on an average than other countries in the world, resulting in substantial number of deaths in working age group^{6, 14}. In Western countries where CVD is considered 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^{15,16}. Thus, India suffers a tremendous loss of productivity due to increased prevalence of CHD. The total years of life lost due to total 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 marked¹⁷.

TABLE I: Estimates of total years of life lost due to CVD in 2000 and 2030¹⁷

Country	2000		2030	
	Total years of life lost	Rate per 100,000	Total years of life lost	Rate per 100,000
India	9,221,165	3,572	17,937,070	3,070
Brazil	1,060,840	2,121	1,741,620	1,957

China	6,666,990	1,595	10,460,030	1,863
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Age standardised 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 group¹⁸. According to the INTERHEART STUDY, the median age for the first presentation of acute Myocardial Infarction in South Asian (Bangladesh, India, Nepal, Pakistan, and Sri Lanka) is 53 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 (<40years), irrespective of whether they have migrated to other countries or are resident Asians¹⁴. The latest data estimates the age standardised 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 DALYs¹¹.

V. DISCUSSION AND CONCLUSIONS

The studies referred to 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. Keeping in mind the huge population of India, a prevalence rate of 11% is a disturbing figure, even though in a specific region in India, when translated into numbers. The escalation in the prevalence rates have 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 seem 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 affecting the whole society. 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 affluent¹⁹. There is an increasing trend for reversal in the socio-economic 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 the change in the pattern of dietary habits, lack of health care facilities etc. in the lower strata.

The stark observation of reviewing these studies was that a number of them indicate the incidence of disease in younger age groups. In this regard, an increased prevalence of CVD related risk factors have been reported in this age group owing to lifestyle changes, work routines, culture influences etc. This means that India's productive population is getting affected causing an economic setback to the country. Between 2005 and 2015, India is projected to cumulatively lose USD 236.6 billion because of heart disease, stroke, and diabetes costing 1% of the GDP¹⁰. A 2000 estimate of 9.2 billion productive years of life lost in Indian adults secondary to overall CVD contributes to this economic decline. As CVD rates increase, this estimate will increase by 2030¹⁷.

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)⁴. 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, the study of prevalence studies shows that CVDs are slowly reaching out to all sections of the society. The estimates also indicate a pattern of increase in the incidence of CVD amongst various age groups and across genders. Therefore, a more detailed and continuous check on the prevalence of heart diseases is suggested to know the progress of the epidemic so that appropriate measure can be taken for prevention and control.

REFERENCES

1. Indrayan A. Forecasting Vascular Disease Cases and Associated Mortality in India. Background papers. Burden of disease in India. National Commission on Macroeconomics and Health, Ministry of Health and Family Welfare, Government of India, New Delhi, India. 2005.
2. Gupta R, Gupta S, Sharma KK, Gupta A, Deedwania P. Regional variations in cardiovascular risk factors in India: India Heart Watch. *World Journal of Cardiology*. 2012. 4(4): 112-120.
3. Gupta R, Joshi P, V Mohan V. Epidemiology and Causation of coronary heart disease and stroke in India. *Heart*. 2008; 94:16-26.
4. Census of India 2001. Population Projection for India and States 2001-2026. Report of the Technical Group on Population Projections Constituted by the National Commission on Population, Office of Registrar General and census Commissioner, India. 2006.
5. Peters D, Yazbeck A, Raman G, Sharma R, Pritchett L, Wagstaff A. Raising the sights: Better Health Systems for India's Poor, Washington DC: The World Bank: 2001.
6. Gupta R. Burden of coronary heart disease in India. *Indian Heart Journal*. 2005; 57: 632-8.
7. Gupta R. Coronary heart disease in India: Absolute numbers and economic burden. Rapid response to Ghaffar A, Reddy KS, Singhi M. Burden of non-communicable diseases in South Asia. *British Medical Journal*. 2004; 328: 807-10.
8. Vishwanathan M, Deepa R, Shanthy Rani S, Premlatha. Prevalence of Coronary Artery Disease and Its Relationship to Lipids in a Selected Population in South India. The Chennai Urban Population Study (CUPS No.5). *G. Journal American College of Cardiology*. 2001. Vol.38 (Pt 3): 682-87.
9. Estimation and Causal Analysis. Overview based on 'Choosing Investments in Health' by Dr. Ajay Mahal, Assistant Professor, Harvard School of Public Health, USA for the National Commission on Macroeconomics and Health. NCMH background papers- Burden of Disease in India, 2005.
10. Cardiovascular disease in India. Challenges and way ahead. International Heart Protection summit. 2011.
11. Global Atlas on Cardiovascular Disease Prevention and Control. World Health Organisation, 2011.
12. Reddy KS. Cardiovascular disease in non-western countries. *N Engl J Med* 2004; 350: 2438-40.
13. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation*. 2001; 104: 2746-53
14. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet*. 2004; 364: 937-52.
15. Huffman MD and Engelgau MM. Economic impact of non-communicable diseases in India. *India Health Beat*. 2012; Vol 6(2).
16. Ghaffar A, Reddy KS, Singhi M. Burden of non-communicable diseases in South Asia. *British Medical Journal*. 2004; 328: 807-10.
17. Leeder S, Raymond S, Greenberg H. A Race against Time: The challenge of Cardiovascular Disease in Developing Economies. 2004. Columbia University, New York City New York.
18. Gaziano T, Reddy KS, Paccoud F et al. Cardiovascular Disease. In: Jamison DT, Breman JG, Measham AR et al, eds. Disease control priorities in developing world. Oxford: Oxford university Press, 2006: 645-62.
19. Ghaffar A, Reddy KS, Singhi M. Burden of non-communicable disease in south Asia. *British Medical Journal*. 2004; Vol 328.

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