

Linkages between Hypertension and Coronary Heart Disease in India: Evidence from India Human Development Survey-2 (2011–2012)

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Abstract

Background: Cardiovascular diseases (CVDs) are the leading causes of death globally (nearly 17.5 million deaths/year). Hypertension and coronary heart disease (CHD) are two of the most important CVDs. There is a dearth of studies at a large scale in India to ascertain the factors as well as social differentials in the prevalence of heart disease associated with hypertension. This paper attempts to bridge the gap in the relevant area. **Methodology:** Secondary analysis of the data obtained from India Human Development Survey (IHDS), conducted in two rounds in 2004–2005 and 2011–2012, was done ($n = 147,201$). Bivariate and logistic regression analyses have been used. **Results:** In India, the prevalence for CHD is 1.1% for 2011–2012. Findings showed that persons with hypertension are 11 times (odds ratio [OR] = 11.58, $P < 0.01$) more likely to be affected by CHD among adults (15 and above years) as compared to nonhypertensive adults. When the odds are adjusted for socioeconomic and demographic variables, hypertensives are found to be 5 times more likely (OR = 5.096, $P < 0.01$) to be having CHD as compared to nonhypertensives. **Conclusions:** The unadjusted odds of suffering from CHD when hypertension is a predictor are much higher than when the odds are adjusted for socioeconomic and demographic variables. Along with hypertension, age, education, and place of residence have also been found to be important determinants of CHD.

Keywords: Cardiovascular diseases, coronary heart disease, hypertension, India

INTRODUCTION

The global burden of disease for cardiovascular diseases (CVDs) such as hypertension is escalating mainly due to a rapid health transition in the developing countries. CVDs are the leading causes of death worldwide. In 2012, it claimed the lives of an estimated 17.5 million people, a share of 31% of all the global deaths.^[1] Moreover, around 3 quarters of the deaths occur in low- and middle-income countries, underlining the severity of the problem in developing countries. About 82% of the 16 million deaths below the age of 70 years are in less economically developed countries, out of which 37% are caused due to CVDs.^[1] CVDs are caused by disorders of the heart and blood vessels, including coronary heart disease (CHD) (heart attacks), cerebrovascular disease (stroke), raised blood pressure (hypertension), peripheral artery disease, rheumatic heart disease, congenital heart disease, and heart failure. The burden of noncommunicable diseases is increasing faster in

developing countries than developed nations.^[2] CHD has plenty of risk factors, smoking and hypertension being important among them.^[3]

Hypertension is a major risk factor for CVD.^[4,5] Among major CVDs, hypertension is the leading risk factor for morbidity and mortality in the world.^[6] However, the prevalence of hypertension varies largely in different parts of the world. In 2008, an estimated 978 million adults or about 28% of the world's adult population had uncontrolled hypertension. The prevalence of hypertension is generally higher in

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economically developed countries (about 333 million in developed countries), but it is also emerging in developing countries (about 639 million).^[7] With the progression of the epidemiological transition, nations modernize causing a substitution of deaths caused by infectious and parasitic diseases by those caused by heart diseases, hypertension, chronic respiratory diseases, and cancers. In India, the prevalence of self-reported hypertension is 5.5% whereas the prevalence of diagnosed hypertension is 26.3%.^[8]

The prevalence of hypertension increases with age and is a treatable risk factor for other old age causes of morbidity, for example, stroke, ischemic heart disease, renal insufficiency, and even dementia.^[9-11] Previous studies have suggested a higher burden of heart disease in developing countries as compared to their high-income equivalents.^[12] There is a dearth of studies at a large scale in India to ascertain the factors as well as social differentials in the prevalence of heart disease associated with hypertension.

METHODOLOGY

India Human Development Survey (IHDS) was conducted in two rounds in 2004–2005^[13] and 2011–2012,^[14] respectively. The survey canvassed questions on a wide range of topics such as household, individual, medical facilities, nonresident family members, primary school, birth history, village data, and crop production. The individual questionnaire module was selected and the basic information (age, gender, religion, caste, occupation, BMI, place of residence, wealth quintile) and information on noncommunicable morbidities such as the presence of hypertension and CHD have been examined. The total sample size was 147,201.

To understand the linkages between hypertension and CHD, a set of predictor variables, divided into three categories, namely, demographic, socioeconomic, and behavioral variables, have been used. Logistic regression analysis has been used to ascertain the linkages between CHD and hypertension.

RESULTS

Table 1 gives the prevalence of CHD in the adults aged 15 years and above as well as the odds of suffering from CHD. It has been found that the overall prevalence for CHD is 1.1% for 2011–2012 with 1% of males and 1.1% of females affected with the condition. Among urban places of residence, 1.4% of those aged above 15 years are affected with the corresponding percentage being 0.8% for those from rural areas.

Logistic regression to calculate unadjusted odds of suffering from CHD among adults aged more than 15 years reveals that when hypertension is a predictor, being hypertensive makes the population 11 times more likely (odds ratio [OR] = 11.581, $P < 0.01$) to have CHD as compared to those who are nonhypertensive. However, when the odds are adjusted for socioeconomic and demographic variables, those who are hypertensive are found to be 5 times more likely (OR = 5.096,

$P < 0.01$) to be having CHD as compared to those who are nonhypertensive [Table 1].

DISCUSSION

The overall self-reported prevalence of CHD in the population aged 15 years and above is 1.1% in 2011–2012 (IHDS) [Table 1]. The unadjusted odds of suffering from the disease when hypertension is a predictor are much higher than when the odds are adjusted for socioeconomic and demographic variables. High blood pressure is also a key determinant for a higher risk of stroke, particularly hemorrhagic, which in turn is a risk factor for CHD, in Asian populations.^[15] Different observational studies conducted previously have found strong associations between blood pressure and stroke risk and estimated the potential health benefits of lowering the blood pressure in terms of lowering stroke occurrence.^[16,17] Previous studies such as the one conducted by the Eastern Stroke and CHD Collaborative Project have found strong continuous associations of diastolic blood pressure and risk of stroke (hemorrhagic and nonhemorrhagic).^[15] The implication of such findings, as is strengthened by earlier studies' findings, is that the lowering of blood pressure across wide populations has the potential to induce large declines in stroke in those populations.^[15] Body mass index is also found to be an important factor in its prevalence as a higher prevalence is found in overweight or obese people. Causes of this problem may include easy availability and low cost of calorie-dense foods and rapidly spreading sedentary lifestyles among children. It has been argued that obesity epidemic is similar to the tobacco epidemic and both are driven by industry interests.^[18] The findings are consistent with a study conducted by Gupta and Gupta, 2009, regarding hypertension, place of residence, and lifestyle factors being major contributors to the development of CHD.^[19] Education, being a summary measure of initial life exposure and experiences, results in better occupation leading to better income, reduction in chances of unstable migration, and better-coping abilities.^[20] Hence, the present study has utilized education as a determinant of socioeconomic status as it remains unchanged after early childhood and factors such as social changes or childhood illnesses are unlikely to influence it.^[20] Multiple factors are associated with a greater prevalence of cardiovascular risks among low socioeconomic status subjects such as social disorganization, adverse early life events, disadvantageous social gradient, unemployment, stressful environment at work, low social support, unhealthy and irregular dietary habits, poverty, and health behaviors such as smoking.^[20-23] The present study does not show a significantly greater occurrence of CHD among the lower socioeconomic quintiles. According to sociologists, the inverse association of cardiovascular risk with socioeconomic status is not unidirectional always, due to the functioning of health as a selective mechanism.^[24,25] In the Whitehall II study, the conclusion was obtained regarding social causation affecting cardiometabolic health in midlife while health-related selection was found to be

Table 1: Prevalence and logistic regression odds ratios of coronary heart disease among adults aged 15 years and above by their background characteristics in India, Indian Human Development Survey, 2011-2012

Background characteristics	Prevalence of CHD (%)	Sample size	Exp (B)	95% CI	
				LL	UL
Gender					
Male [®]	1	72,149	1		
Female	1.1	75,052	1.356	0.997	1.845
Place of residence					
Rural [®]	0.8	94,789	1		
Urban	1.4	52,412	1.406***	1.119	1.767
Religion					
Hindu [®]	0.9	118,858	1		
Muslim	1.5	18,479	1.547***	1.165	2.055
Others	1.2	9863	1.044	0.654	1.667
Caste					
General [®]	1.4	42,973	1		
OBC	0.9	59,710	0.822	0.65	1.041
SC/ST	0.6	42,253	0.56***	0.412	0.762
Others	1.7	1925	1.239	0.566	2.711
Age					
15-34 [®]	0.1	69,296	1		
35-50	1	42,028	3.634***	2.134	6.189
>50	2.5	35,877	8.462***	5.034	14.222
Marital status					
Married [®]	1.1	98,523	1		
Not married [§]	0.6	48,675	0.777	0.563	1.074
Education					
No education [®]	1.1	42,422	1		
Primary or lower	1.4	21,898	1.094	0.812	1.474
Class 6 to secondary	0.9	51,552	1.132	0.844	1.518
Till class 11 or higher	0.7	31,119	1.582	1.087	2.301
BMI categories					
Underweight [®]	0.5	21,945			
Normal weight	0.9	51,222			
Overweight/obese	2.1	17,912			
Wealth quintile					
Poorest quintile [®]	0.9	24,072	1		
Poor quintile	0.8	24,656	1.088	0.759	1.56
Middle quintile	0.8	28,971	1.136	0.803	1.606
Rich quintile	1.2	32,714	1.081	0.765	1.527
Richest quintile	1.2	36,788	1.225	0.863	1.737
Hypertension					
No [®]	0.7	140,927	1		
Yes	7.4	6274	5.096***	3.983	6.522
Total	1.1	147,201			

CHD: Coronary heart disease, CI: Confidence interval, LL: Lower limit, UL: Upper limit, BMI: Body mass index, *** $P < 0.01$, ** $P < 0.05$, * $P < 0.10$, [®] is the reference category, §: Unmarried or married but no gauna/divorced/separated

operating in the younger ages.^[26] Prospective studies are needed for confirmation on these lines. Large inequities in incomes, education levels, and socioeconomic status existing in India^[27] lead to poor health status.^[28] In the USA and Western Europe, cardiovascular mortality and risk factors have declined significantly in higher socioeconomic groups with high educational levels while no change has been observed in the lower socioeconomic groups.^[29] Whether India will exhibit similar trends is an issue which will need much more evaluation than has been studied till date. Most of the studies conducted rely on self-reported data for information on CVD morbidity. Reliance on only self-reported data for the study is a serious limitation. In addition to the self-reporting bias, another limitation of the survey data was that it did not include asymptomatic patients among those who were ailing, thereby leading to the problem of undercounting. The national level estimates tend to be based on a thin sample, particularly when disaggregated by socioeconomic groups. From the perspective of policy implications, a disproportionate emphasis on only cardiovascular risks is also deemed to be impractical as it would lead to shifting of the focus from health concerns of the poor to those of the middle class and rich in India.^[30]

CONCLUSIONS

The present study illustrates the fact that factors such as hypertension, educational status, BMI, and wealth quintile are important markers of CHD. These factors, coupled with higher tobacco and alcohol consumption, thereby put the population at a greater risk for CHD. Assessment of the policies launched recently and more research in the field of inequality and expenditure is the need of the hour. Promotion of a healthy lifestyle and mass awareness regarding the risks of CHD are also relevant steps in this direction.

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Conflicts of interest

There are no conflicts of interest.

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