

Economic Effect of Coronary Heart Disease on Households – A study in Mumbai

Shah Nehal Pankaj¹, Mukherjee Kanchan²

ABSTRACT

Context: Coronary Heart Disease is the leading cause of mortality worldwide and in India with younger populations increasingly affected. The out-of-pocket (OOP) payment for health care being high in India, the burden of CHD expenditure falls on the households. The study aims to quantify the economic costs due to CHD, their effect on the household's economic status and financial coping mechanisms. **Methods:** A descriptive quantitative cross-sectional study among 204 households with CHD patients in Mumbai during April-May and October-November 2013. Non-probability sampling technique was used and data collection done using semi-structured interview schedule. **Results:** The total annual costs were INR 10180918 and annual direct costs contributed INR9736631. Major costs were on hospitalization (66%) and medicines (19%) of the total household health expenditure on CHD. About 44% households had suffered catastrophic health expenditure (CHE) due to CHD according to the 40% threshold criteria. Catastrophic Health Expenditure was 3.5 times more likely in the Lower income group ($p<0.05$); 4.4 times more likely when visiting a public hospital ($p<0.05$) and 20.6 times more likely when visiting a private hospital ($p<0.01$) as compared to no hospitalisation; 50% less likely for those with health insurance ($p<0.05$). Distress financing i.e. borrowing and selling assets was seen in 26% of the households to cover their costs for CHD treatment. **Conclusions:** Coronary Heart Disease puts significant economic burden on household in an urban city like Mumbai. All income groups incurred CHE implying that CHD is an expensive disease for the rich as well as poor households.

KEY WORDS: coronary heart disease, catastrophic health expenditure, financial coping mechanisms

Shah Nehal Pankaj¹, Mukherjee Kanchan²

¹Senior Research Associate, Centre for Enquiry into Health and Allied Themes, Mumbai

²Professor and Chairperson Centre for Health Policy, Planning and Management School of Health Systems Studies, Tata Institute of Social Sciences, Mumbai.

Correspondence

Nehal Shah P,

6, Vasant Villa, 23, S.N. Marg, Andheri East, Mumbai – 69.

Ph.no: 9869733282

Email: nehalshah30@gmail.com

History

- Submission Date: 18-04-2016;
- Review completed: 30-09-2016;
- Accepted Date: 14-10-2016.

DOI : 10.5530/ijmedph.2016.4.8

Article Available online

<http://www.ijmedph.org/v6/i4>

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INTRODUCTION

Globally, Coronary Heart Disease (CHD) claims lives of 3.8 million men and 3.4 million women each year.¹ Majority of Cardiovascular Disease (CVD) mortality is due to coronary heart disease which is today the topmost cause of death worldwide. Developing Countries bear more than 60% of the global burden of CHD.^{1,2} In India, prevalence of CHD in 2004 was found to be higher in urban areas (11.67 million cases) than rural areas (10.67 million cases) with clear gradient of increasing prevalence from rural to semi-urban to urban population. Pooled estimates of prevalence rates of CHD were calculated at 6.4 per cent in urban areas and 2.5 per cent in rural areas.³

Incidence rates of CVDs have increased in the age group 25 to 69 years leading to a loss in productivity.⁴ CVD is responsible for high number of disability-adjusted life years (DALYs) lost, 10% in low and middle income countries and 18% in high income countries.¹ In India, estimation of total number of DALYs contributed by CHD was about 16 million in 2004.³

The loss in productivity lowers national output and Gross National Income (GNI) affecting economic growth of the country. At an individual level, quality of life and productive potential are reduced. The

disease also strains households economically as they try to meet the high out-of-pocket expenditure (OOP) for treatment.⁵ Moreover, CHD is no longer a disease of the rich, the poor especially in urban areas are equally affected and perhaps suffer from greater mortality due lack of proper healthcare access.⁶

Long term healthcare and high expenditure on treatment and care are characteristic of this disease. Presence of co-morbidities like hypertension, etc. further compounds the expenditure. Burden of OOP expenditure is greatest for the poor and it may push other vulnerable populations into poverty.^{7,8} Households may finance their OOP expenditure through savings, loans, selling assets, insurance or others. Although these financial coping mechanisms help smooth over the health shocks, they decrease household consumption on non-health goods including food, in the present and in the future.⁹

There are many macroeconomic and microeconomic studies done on NCDs and CVDs globally and in India. But research on economic impact of CHD is sparse despite it being the leading cause of mortality in India. Hence, this study was conducted to estimate economic burden of CHD on households in an

Cite this article : Pankaj SN, Kanchan M. Economic Effect of Coronary Heart Disease on Households – A study in Mumbai. Int J Med. Public Health. 2016;6(4):184-8.

urban setting of Mumbai. Main objectives of this research were: (1) To estimate the magnitude of expenditure due to CHD on households in Mumbai (2) To assess the proportion of households incurring catastrophic health expenditure due to CHD (3) To describe the financial coping mechanisms of households to cover healthcare expenditure for CHD.

SUBJECTS AND METHODS

This is a quantitative cross-sectional descriptive study with sample of 204 households. Cost-of-Illness method was used. Households in Mumbai with CHD patients diagnosed during the period of April 1, 2011 to March 31, 2012 were included in the study to reduce recall bias. The sample of respondents was drawn from one Public hospital and two private health facilities and two charitable clinics after taking due prior permission from them. Non-probability convenience sampling technique was used to select patients of CHD from these facilities. A semi-structured interview schedule was designed, pilot tested and administered after taking written informed consent from all the respondents during April-May 2013 and October-November 2013.

Face-to-face exit interview was conducted with the patient and companion at Outpatient Departments (OPD) of the selected health facilities. Respondents were CHD patients themselves or the head of household or any other member of household who was able to give the relevant information. Data for expenditure incurred while seeking healthcare for CHD since onset of the disease and diagnosis was collected.

Unit of analysis was the household of the patient. Data entry and analysis was done in SPSS (Statistical Package for the Social Sciences) and Microsoft Excel 2010. Data related to the costs was collected from onset of the disease to the time of interview. Hence, the annualized costs for different cost heads were calculated by obtaining costs for each month and then multiplying for a year. Cross-tabulations, Chi-Square tests and multivariate logistic regression analysis were carried out to find out factors associated with health spending.

For the study, catastrophic health expenditure (CHE) is defined as "household's financial contributions to the health system exceeding 40% of income after removing the food expenditure."¹⁰ Direct costs measure 'the opportunity costs of resources used for treating a particular illness.' They include medical costs like consultation fees, investigation charges, prescription medicines, hospitalization costs and non-medical costs not directly related to treatment like transportation, food and accommodation costs while seeking healthcare, cost of changing one's lifestyle.¹¹ Indirect costs measure 'the value of resources lost due to a particular illness' i.e. loss of wages of the patient and family while care-giving.¹¹ Human Capital Method was used to measure 'lost production, in terms of loss of wages of patient or the caregiver'.¹¹ Distress Financing is defined as 'financial activities, such as borrowing money or selling assets (property, e.g.), that were directly related to the patient's treatment'.¹² Financial Coping Mechanisms refer to the ways in which households are able to cover their health expenditure like current income, savings, borrowing, selling assets, insurance or gifts.

RESULTS

In the sample, 203 households had one patient and one household had two patients that fit the CHD inclusion criteria. Among 205 patients in sample, 69.8% were male. Majority patients (38.5%) were in the age group of 56-65 years, followed by 46-55 years (28.2%). About 8.3% patients were illiterate and about half had some secondary education. Proportion of retired patients (34.3%) was highest followed by 25.5% salaried employees, 18.1% self-employed, 20.1% housewives and 2% casual labourers.

Average household size was 4.38 members (range 1, 11) and average number of earning members in household was 1.52 (range 0, 4). Average annual household income was INR 3,27,875 with range INR 0-18,00,000. Average per capita monthly income of household was INR 7014 with range INR 0 - 50,000.

Households were categorised into four quartiles of lower (INR 0 -1,26,000), middle lower (INR 1,26,001 - 2,40,000), middle upper (INR 2,40,001 - 4,56,000) and upper income (INR 4,56,001 - 18,00,000) groups for further analysis. Average annual household expenditure was INR 2,07,876 with range INR 24,000 - 7,20,000.

Average time since the onset of illness was 19.5 months. Around 46.8% patients had no co-morbidities. In this sample of CHD patients, nearly 44.4% had hypertension followed by 20% with diabetes. Nearly 15% patients had more than one co-morbid condition, among which hypertension and diabetes were the most common.

Health Expenditure due to CHD

Direct costs (95.6%) were major portion of the health expenditure than indirect costs (4.4%). This is because few patients incurred actual wage loss which is taken as the proxy for loss of productivity.

Within direct costs, majority (66%) was spent on hospitalization despite the fact that not all patients underwent hospitalization. Medicines form nearly 19% of expenditure and are recurring costs for life. Investigation costs and consultation costs contribute 4.7% and 3.1% respectively along with other minor components. Cost of investigations did not include the cost of angiography which was accounted in hospitalization costs decreasing the actual contribution of diagnostics in calculation of health expenditure.

Nearly 41% households visited more than one type of health facility for consultation. Public health facilities were accessed by 67.6%, private by 59.3% and charitable by 17.6% of households. Reasons for visiting more than one type of health facility include second opinion from another physician, unaffordability, convenience, etc. Average cost of consultation was INR 120 in public and INR 584 in charitable facilities. It was highest in private facility with INR 3,971. Average investigation cost in public facility was INR 1,042, in charitable was INR 1,566 and in private was INR 4,029.

Among 205 patients, majority (92.2%) underwent hospitalization. About 41% patients were hospitalized in public and 37% in private hospitals. About 11.2% patients were hospitalized in both public and private hospitals while only 2% were hospitalized in charitable hospitals. Nearly 50%

Table 1: Distribution of Annual Health Expenditure on CHD according to cost heads

Health Expenditure on CHD	Total Annual Cost (in INR)	Percentage
Consultation cost	314174.5	3.1%
Investigations cost	478522.5	4.7%
Hospitalization cost	6699671.2	65.8%
Medicines cost	1948716.0	19.1%
Transportation cost	152040.2	1.5%
Food cost	36833.5	0.4%
Companion cost	39293.8	0.4%
Others	67379.2	0.7%
Direct cost	9736630.9	95.6%
Household Wage Loss (Indirect Cost)	444287.1	4.4%
Total Annual Health Expenditure	10180918	100%

Table 2: Multiple Logistic Regression analysis correlates of Catastrophic Health Expenditure

Independent Variable Correlates	B	Significance	Exp (B)
Income Group			
Upper income group (Reference)			
Income group (overall variable)		0.038	
Lower income group*	1.244	0.031	3.470
Middle Lower income group	0.412	0.442	1.509
Middle Upper income group	-0.222	0.624	0.801
Type of Hospital			
No hospitalization (Reference)			
Hospitalization (overall variable)		0.002	
Public Hospital**	1.479	0.033	4.388
Private Hospital***	3.025	0.000	20.604
Public and Private Hospital****	2.363	0.002	10.624
Others	0.766	0.594	2.152
Health Insurance			
No health insurance (Reference)			
Have some health insurance*****	-0.696	0.049	0.499
Constant	-2.306	0.004	0.100

patients were hospitalized once while 40% twice and 3% thrice for CHD related problems.

Average hospitalization cost in public hospital was INR 13,336; in charitable hospital was INR 24,600 and in private hospital was INR 88,167. Private hospital cost nearly 6 times more than public hospital. Four patients were not prescribed any medicines but advised modification of diet and other lifestyle risk factors and regular check-ups. Average per month cost of medicines was INR 812. Forty-one patients experienced wage loss while twenty-three companions lost wages while accompanying the patient to health facility. Average loss of wages for patients was INR 12430 and for companions was INR 5464. Although this measure is not able to capture loss of productivity completely, it tries to estimate actual monetary loss to household.

Catastrophic Health Expenditure and Financial Coping Mechanisms

About 44% households had incurred CHE due to CHD according to the 40% threshold assumed by this study.

Average health expenditure due to CHD in study sample was INR 79,676.4 with a range INR 300-6,69,000. Median value of total annual health spending was INR 27,235. Most households in lower income groups spent less than median value while those in higher income groups spent more than that.

Households adopt different forms of coping strategies to cover their cost of treatment. Savings (78.9%) were the major form of financial coping mechanism followed by current income (30.4%), insurance (28.9%) and borrowings (25.5%). Few households (7.8%) also had part of their expenditure sponsored by relatives or charitable trusts. Only three households sold assets to finance their out-of-pocket expenditure. Most households relied on more than one financial coping mechanism. In the sample, 26% households had used distress financing to pay for treatment.

Distress financing i.e. borrowing and selling assets was highest (47.2%) in lowest income quartile followed by second income quartile (33.3%). A significant association was found between the income level of the household and distress financing, $X^2(3, N = 204) = 26.47, p < 0.05$.

Catastrophic Health Expenditure and its correlates

Significant association was found between income group and catastrophic health expenditure, $X^2(3, N=204) = 8.76, p = 0.03 (p < 0.05)$. Nearly 60% of lower income quartile experienced CHE. Middle lower and upper income groups had around 40% incidence while middle upper group had slightly lower (33.3%) incidence of CHE. Instead of gradual decrease in CHE with increase in income, the upper income group spent more than middle upper group. This may be because upper income groups prefer visiting expensive private health facilities. Even if they spend more than 40% of their non-subsistence income for CHD, this may not affect their expenditure on essential items.

CHE is highest (79.2%) for those who sought healthcare in both public and private hospitals. CHE was similar in only public (41%) and only private (42.7%) hospitals and was significantly associated with type of hospital visited, $X^2(4, N=204) = 18.39, p < 0.01$.

Health insurance and CHE were found to be significantly associated, $X^2(1, N=204) = 4.4, p < 0.05$. Fewer households (32.2%) with health insurance experienced CHE as compared to households (48.3%) without health insurance.

From multiple logistic regression model, results show that households in lower income group were 3.5 times more likely to experience CHE as compared to upper income group ($p < 0.05$). This is because poorer households are more vulnerable to slight fluctuations in income and expenditure putting them at greater risk of CHE than better-off households. Likelihood of incurring CHE when visiting public hospitals was 4.4 times than as compared to no hospitalization with statistically significant p-value, 0.03 ($p < 0.05$). The reason could be the high cost of medicines not available at public hospitals on which patients spend from their own funds. Likelihood of experiencing CHE was 20.6 times ($p < 0.01$) more when visiting private hospitals and 10.6 times ($p < 0.01$) more when visiting both private and public hospital. Hence, private hospitals are more strongly associated with CHE than public hospitals. For a disease like CHD, public hospitals did not afford much protection against CHE while private hospitals are expensive and put financial burden on the house-

hold. This may be the reason why even upper income group experienced CHE in numbers (40.8%) greater than expected.

Households which had some form of health insurance were 50% less likely to face CHE as compared to those which had none ($p < 0.05$). Most types of health insurance schemes pay for cost of hospitalization which is the major cost head in CHD and hence, mitigating a substantial portion of costs.

DISCUSSION

Literature shows that CVDs are increasingly affecting the working age group in developing countries than the developed ones.^{4,13,14,15} Similarly, this study found that nearly 62% patients were in productive age group of 25-60 years. Consequently, CHD morbidity also has economic implications in terms of direct healthcare costs and loss of productivity. In this study, direct costs (95.6%) were much greater than indirect costs (4.4%). Other Indian studies on CHD and Acute Coronary Syndrome (ACS) have also found that direct costs (92-94%) were much higher than indirect costs (6%) in the total CHD expenditure.^{15,16} But ACS is an acute event requiring hospitalisation and so high direct costs may be expected. Even in CHD, the pattern of costs incurred depends on manifestation of disease ranging from silent angina to ACS. A Korean study found that among the two subtypes of CHD, angina patients had predominantly higher medical costs (74.3%) while myocardial infarction had greater loss of productivity (66.9%) due to premature death.¹⁷

Hospitalization (66%) and medicines (19%) were major direct costs followed by investigation costs (4.7%) and consultation costs (3.1%). In another Indian study, cost of medicines (65%) was the major contributor followed by cost due to dietary changes (22%). But cost of hospitalization was excluded in that study which may be the reason for difference in cost patterns.¹⁵

Incidence of CHE among households due to CHD in our study was 44% assuming 40% non-food expenditure threshold. Literature shows CHE, when taken as 10% of total household expenditure, occurred in 19.6% households in Maharashtra in 2004-05.¹⁸

International evidence shows that although percentage of households facing catastrophic health payments differed across countries from less than 0.01% in Czech Republic to 10.5% in Vietnam, it was greater in middle and low income countries and countries in transition.¹⁰

A multi-country study found that India had the highest out-of-pocket expenditure for CVD for 15 month period. More than 50% households experienced CHE.¹² Other CHD studies in India have found that 30-84% households experienced catastrophic expenditure.^{15,16}

Our study shows that lower income groups tend to spend less while higher income groups tend to spend more on healthcare for CHD. Another NCD study in India found that OOP expenditure on health as a percentage of household expenditure increased with income quintiles. But despite this, the poor experience catastrophic expenditure because their incomes are near to 'survival thresholds' i.e. just enough to provide for food and other basic necessities.¹⁹ Besides, our data shows distress financing (borrowing and selling assets) was significantly associated with income level of household. In comparison, the Kerala study found that majority (41%) had paid through loans, about 14% through savings while 37% had used more than one form of financial coping strategy. Only 8% of the participants had health insurance, out of which about 35% had experienced CHE.¹⁶ In the Jammu study, nearly 65% of households used their savings for treatment while 34% households had some form of health insurance.¹⁵

Catastrophic Health Expenditure was found to be significantly associated with Lower income group (OR 3.5, $p < 0.05$); visiting a public hospital (OR 4.4, $p < 0.05$) and visiting a private hospital (OR 20.6, $p < 0.01$) as

compared to no hospitalisation. CHE was 50% less likely for those with health insurance ($p < 0.05$). In the multi-country CVD study, CHE was found to be correlated with low income group (OR 6.59 [2.23, 19.45]) and lack of private or social health insurance (OR 3.93 [2.23, 19.45]) along with other factors.¹² In the Kerala ACS study, CHE was associated with poor socio-economic status (99% compared to 76% in others) and in those with no health security coverage (93% compared to 62% in others) among other variables.¹⁶

CONCLUSION

The study found that CHD puts significant economic burden on the household in an urban city like Mumbai. Although the study has limitation that results cannot be generalized to Mumbai city. Within the study period of one to two years since diagnosis, cost of hospitalization contributed a major share of the total health expenditure on CHD. All income groups incurred CHE. Hence, CHD is an expensive disease for the rich as well as the poor. Catastrophic health spending was found to be significantly associated with lower economic status, hospitalization and absence of health insurance. More than two-third households had used their savings to manage their health expenditure. In order to mitigate the high out-of-pocket health payments, a greater number in lower income groups had to rely on distress financing i.e. loans and selling assets. Households with health insurance had significant protection from catastrophic health expenditure.

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Cite this article : Pankaj SN, Kanchan M. Economic Effect of Coronary Heart Disease on Households – A study in Mumbai. Int J Med. Public Health. 2016;6(4):184-8.