Economic burden of coronary heart disease in North India

Akashdeep Singh Chauhan, Kanchan Mukherjee

Department of Community Medicine, School of Public Health, Post Graduate Institute of Medical Education and Research, Chandigarh, 1Centre for Health Policy, Planning and Management, School of Health Systems Studies, Tata Institute of Social Sciences, Mumbai, Maharashtra, India

ABSTRACT

Background: The treatment of chronic diseases like coronary heart disease (CHD) is expensive and can consume a significant portion of household’s income, leading to catastrophic effects on families, particularly those of low socioeconomic status.

Methodology: This was a cross-sectional study carried out in a private super specialty hospital and a government tertiary care hospital. Nonprobability purposive sampling method was used to collect primary data from a sample of 102 households; having a member suffering from CHD. Economic burden was assessed regarding average out of pocket (OOP) expenditure and prevalence of distress financing (DF) (borrowings or selling of assets) among the households.

Results: Average OOP expenditure among those having an episode of hospitalization and those who got treated in outpatient department sessions only was INR 243,606 and INR 48,578, respectively. This expenditure was statistically higher (P < 0.5) for richest than the poorest households. However this expenditure as a proportion of annual household consumption expenditure was highest for the poorer than the richest (P < 0.5). Expenses were reported higher for those who got treatment in private hospital as compared to government hospital by 26%. The prevalence of DF came out to be 38.2% with poorest reporting higher percentage of 67% as compared to 4% in richest households.

Conclusion: There is a need to consider the rising OOP expenditure for the treatment of chronic conditions like CHD. There is a need to develop health financing systems that improve the financial risk protection for those requiring treatment.

Key Words: Coping mechanisms, coronary heart disease, distress financing, out of pocket expenditure

Introduction

Cardiovascular diseases (CVDs) have become a major cause of morbidity and mortality in both developing and developed countries alike. Earlier considered to be “diseases of affluence,” and restricted to the developed nations, CVDs, presently have spread its roots to the low and middle-income countries (LMICs). In the year 2012, globally, CVD caused maximum number of deaths, i.e., 17.5 million, which is around 31% of all causes of deaths.[1] This burden was more concentrated in LMICs constituting 74% of the total deaths.[1] Among CVDs, coronary heart disease (CHD) has lead the way, with around 7.3 million deaths, attributing to around 42% of all CVD-related mortality, globally, in 2012.[1]

In India, CVDs have also been attributed to a maximum proportion of total medically certified deaths of around 30%.[2] Further, among CVDs, CHD, has contributed to around one-third of mortality, with more deaths in males (64%) and that too in the economic productive age group of 30–69 years.[2] Further, disability adjusted life years loss due to CHD in India have been predicted...
to increase from 13.27 million to 22.1 million from 2000 to 2020.\textsuperscript{[9]}

The treatment of chronic diseases like CHD is expensive and can consume a significant portion of household’s income since the patients require treatment over a long duration of time (lifetime in most cases) and often needs hospitalization. Further, in countries like India, most of the health care finances are paid out of pocket (OOP) by the households.\textsuperscript{[4,5]} As per National Health Accounts Report 2004–2005, about 71% of health expenditures were financed by households from their pockets.\textsuperscript{[4]} With limited or no welfare safety nets, conditions like CHD can consume a large portion of household’s monthly budget. As per national sample survey organisation for the year 2004, OOP expenditure on the treatment of CVD were so huge that it amounted to 3.3% (INR 846 billion) of India’s GDP for that year.\textsuperscript{[5]} Further, to cope up with such huge expenditure, households might have to undertake relatively risky coping strategies like borrowings or selling of assets to mobilize additional sums of money, leaving them vulnerable to impoverishment.

CHD also negatively impact the economic well-being of households when the disease affects the productive and young household members. CHD mortality in the Indian sub-continent manifests almost 10 years earlier as compared to rest of the world, resulting in a substantial number of CHD caused deaths occurring in the working age group.\textsuperscript{[6]} Around half of CHD-related deaths in India occur in people <70 years of age, whereas only 22% of CHD-related deaths in Western countries occur in this age group.\textsuperscript{[7]} Early mortality and disability in this age group can severely affect a household’s financial well-being.

Keeping this picture in mind, this study was designed to estimate the OOP expenditure incurred and financial strategies undertaken by the households for the treatment of CHD. The study also explores the socioeconomic inequalities in relation to the OOP expenditure incurred and financing mechanisms for the treatment of CHD.

Although some studies have come up with the estimates of economic burden, these have considered the whole range of conditions coming under CVDs.\textsuperscript{[8,9]} Second, other studies have focused on the macro-economic projections or the impact of the CHD on the nation/government as a whole and had neglected the household or individual component.\textsuperscript{[10–12]} This study has focused on the economic impact due to the treatment of CHD on households.

**Methodology**

**Study design and setting**

This was a cross-sectional study conducted in the North Indian city of Chandigarh. A private super specialty hospital and a government tertiary care hospital were selected for the study. Primary data were collected from households; having a member suffering from CHD and taking treatment form either of the two hospitals. Data collection was performed during April 2012 to June 2012.

**Eligibility criteria**

Patients who were diagnosed with CHD in the first half of the year 2010 i.e., during January to June 2010 were considered eligible for the study. As CHD is a chronic disease, treatment can continue for a long duration and mostly for lifetime. Patients require monthly check-ups with regular screening and might have to undergo hospitalizations in the case of an acute condition. As it was assumed that most of the expenditure occurs in the initial years following diagnosis of the disease, a reference period of 2 years following identification of CHD was taken, for estimation of OOP expenditure incurred on the treatment.

**Sampling methodology**

Non-probability purposive sampling method was adopted to select the sample of 102 households having a member suffering from CHD. In private hospital, a list of patients, diagnosed during January to June 2010 was obtained and patients were contacted telephonically to ask for their participation in the study, and those of who agreed, face to face interviews were done during their follow-up visits in the hospital. While in the case of government hospital, due to nonavailability of the list, patients were directly recruited while they came for their regular check-ups in the cardiac outpatient department (OPD) of the hospital. Written informed consent was also obtained before starting of any interview with the patient.

**Data collection**

A semi-structured interview schedule was designed and was pretested. The schedule collected information on the following: Socio-demographic characteristics, medical history, household income and consumption expenditure, type of service provider, treatment undergone, OOP expenditure incurred on the diagnosis and the medical treatment and financial strategies undertaken to cope up with this expenditure.

Data were collected on both direct medical and indirect OOP expenditure. The cost of illness approach was followed...
to quantify the OOP spending into direct and indirect expenditure. Direct expenditure includes all expenditure towards doctor/hospital charges, medicines, diagnostic tests, procedure or surgery, user fees, boarding/loading/ food charges for carer or relatives, and transportation charges. The indirect cost of the treatment includes wage loss of the patient and caregiver during the days of hospitalization. Inpatient and outpatient bills/receipts available with the patients at the time of interview were scrutinized to arrive at an accurate estimate of expenditure.

Data analysis
Data analysis was performed using SPSS version 16 (SPSS Inc., Chicago, IL, USA). Continuous variables are reported as means ± standard deviation. Categorical variables are reported as proportions (%). Continuous variables were compared using t-tests and one-way ANOVA and categorical variables through Chi-square test.

Two years or 24 months OOP expenditure per household incurred on the treatment of the CHD was estimated. The sample was divided into two groups, i.e. those who had an episode of hospitalization during the 2 years reference period and those who were not hospitalized and got their treatment through out-patient visits (OPD) only. In addition, the former group also required OPD sessions both before and after hospitalization; the expenditure incurred on these sessions was calculated separately. The expenditure incurred on the OPD visits occurred regularly at definite intervals of time (expenditure on consultation, screening/diagnostics, and medicines) and thus was considered to be a recurrent expenditure. A monthly interval was taken to estimate this expenditure. Distress financing (DF) which includes borrowing money (both with and without interest) or selling assets as financing strategies to cope up with the OOP expenditure incurred was assessed.

Table 1: Sociodemographic characteristics

| Variable | Category | Frequency (%) |
|----------|----------|---------------|
| Gender   | Male     | 62 (60.8)     |
| Age groups | 20-40   | 6 (5.9)       |
|          | 40-50   | 21 (20.6)     |
|          | 50-60   | 32 (31.4)     |
|          | 60-70   | 31 (30.4)     |
|          | > 70    | 12 (11.8)     |
| Education status | Primary | 27 (26.4) |
|          | Secondary | 20 (19.6)    |
|          | Graduate | 25 (24.4)     |
|          | Graduate and above | 11 (10.8) |
|          | Illiterate | 19 (18.6)    |
| Employment status | Government employee | 15 (14.7) |
|          | Private employee | 13 (12.7)    |
|          | Self employed | 14 (13.7)     |
|          | Retired | 20 (19.6)     |
|          | Farmer | 24 (23.5)     |
|          | Others (jobless, housewife, etc.) | 15 (15.7) |
| Average number of family members | 5.09   |
| Average number of earning family members | 1.89   |
| Income quartiles/groups | Poorest (INR <20,000) | 43 (42.1) |
|          | Poor (INR 20,001-40,000) | 22 (21.5) |
|          | Rich (INR 40,000-60,000) | 18 (17.6) |
|          | Richest (INR >60,000) | 19 (18.8) |
| History of comorbid condition | Diabetes | 19 (18.6) |
|          | Hypertension | 37 (36.2) |
|          | Both | 23 (22.5)     |
|          | None | 12 (11.7)     |
|          | Any other | 11 (10.7)   |
| Hospitalization since last 2 years (because of event of CHD) | Yes | 95 (93.1) |
|          | No | 7 (6.9)        |
| Type of treatment undertaken during in-patient stay | Coronary artery bypass surgery | 24 (25.2) |
|          | Balloon angioplasty | 13 (13.6) |
|          | Balloon angioplasty with stent | 45 (47.3) |
|          | None | 13 (13.6)     |

Average number of earning family members was around 2 for a family size of 5. Thirty-seven patients (36.2%) had a history of hypertension followed by diabetes (18.6%) and 22.5% had both the co-morbidities. A total of 95 (93%) patients were hospitalized (either single or multiple times) during the 2 years period and the remaining 7 (6.9%) were getting treatment through OPD only. Out of the hospitalized cases, 44% underwent balloon angioplasty with stent, 23.5% had coronary artery bypass surgery and 13.7% had balloon angioplasty only [Table 1]. Remaining (13.6%) were simply hospitalized without any procedure being done.

Results

General characteristics
A total of 102 patients who were diagnosed and treated for the event of CHD were enrolled in the study. Out of the total sample: 61% were male, 52% belonged to the age group of 40–60 years, and 55% had an education status of secondary level and above. About 41% were either self-employed or an employee in government or private sector, 23.5% were cultivators, 19.6% were retired and remaining were either jobless or homemakers. The households were divided into income quartiles based on their monthly income as shown in Table 1.
Out of pocket expenditure

Average 2 years OOP expenditure among those having an episode of hospitalization (either single or multiple) was INR 243,606 or 0.24 million [Table 2]. The major component of this expenditure among was in-patient expenses, i.e., 72% and the remaining on outpatient visits [Figure 1]. Among in-patient spending, direct medical expenditure constituted the major part (90%), followed by indirect expenditure (8%) and nondirect medical expenditure (2%). For spending on outpatient visits, expenses on the medicines/drugs were maximum (66%), followed by expenditure on diagnostics (19%) and consultation (15%). Across income groups, OOP expenditure incurred was statistically higher (P < 0.05) for richest as compared to poorest households [Table 2]. However, OOP expenditure as a proportion of annual household consumption expenditure was significantly higher for poorest than richest households. It was seen that OOP expenditure as a proportion of annual household consumption expenditure varied from 80.7% among the poor to 47% in richest households [Table 2]. This proportion was more than 100% among the poorest, as expenditure on health care was more than their annual household expenditure.

The 2 years OOP expenditure among those who got treatment in OPD sessions (nonhospitalized cases) was INR 48,578 or 0.049 million. Expenditure on medicines/drugs constituted the major portion of 57.4% (INR 27,900), followed by that on diagnostics (26%, INR 12,698), consultation (9%, INR 4380), and on transport (7.5%, INR 3600).

Outpatient expenditure among the two groups was also considered regarding monthly recurrent expenditure.
Overall monthly expenditure came out to be around INR 2870 for hospitalized and INR 2024 for the nonhospitalized group. Except the monthly expenditure on medicines (INR 1904 vs. INR 1162.5), expenditure on consultation (INR = 184 vs. INR = 183), diagnostics (INR = 537 vs. INR529) and transport (INR = 158 vs. INR = 150) was almost equal among hospitalized and nonhospitalized group, respectively.

Among the patients recruited, 71 (69.6%) got treated at a private hospital and the remaining at a government hospital (23.5%). The patients who got treated at the private hospital were matched with those who got treatment at private hospitals based on their sociodemographic characteristic, and there was no significant difference reported between the two groups on age, sex, and education levels except for consumption expenditure. Average annual consumption expenditure was significantly higher for patients treated in the private hospitals than private hospitals (INR 413,773 vs. INR 266,228).

The average length of stay during inpatient care was 9.54 days in the private hospital as compared to 8.45 days in government hospital. Average 2 years OOP expenditure was higher in private hospital by 26% and was statistically significant ($P < 0.01$) as shown in Table 3. Specifically, spending on in-patient stay, consultation, and diagnostics were higher in the private facility by 14.8%, 98%, and 43.4% than government hospital. Indirect expenditure and nondirect medical expenditure during in-patient stay and recurrent expenditure on drugs were reported almost same in both the hospitals.

### Coping mechanisms

Every household in the sample used current income or any savings as a source for financing the OOP expenditure incurred on the treatment [Table 4]. Further, among these households, 44.6% also borrowed money and 3% resorted to the selling of assets. Further, 28.4% of the total households had some form of insurance or reimbursement mechanism. Among these, 13.7% of the households had the head of the family working with the state government and thus got their money reimbursed from that department. Likewise, 5.8% had publicly sponsored insurance scheme, 3% had employee’s state insurance scheme and 7% got insured through private health insurance. The prevalence of DF came out to be 38.2%. This prevalence was reported highest in the poorest households, i.e. 67% and lowest of 4% in the richest households [Figure 2].

### Table 3: Out of pocket expenditure in public and private hospital

| Variable                  | Public level facility | Private facility | Overall |
|---------------------------|-----------------------|------------------|---------|
| Number of patients (%)    | 24 (23.5)             | 71 (69.6)        | 102     |
| Number of days of hospitalization | 8.45              | 9.54             | 8.62    |
| In-patient direct expenditure (Rs.) | 142,738           | 167,666          | 159,761 |
| Out-patient expenditure (Rs.) | 240                 | 22,045           | 5892    |
| Expenditure on consultation | 8111               | 14,351           | 13,182  |
| Total outpatient expenditure in (SD) | 151,088            | 204,061          | 178,834 |

SD - Standard deviation

### Table 4: Financing strategies undertaken by the households to cope up with the expenditure

| Coping mechanisms                  | Frequency (%) |
|------------------------------------|---------------|
| Current income and savings         | 102 (100)     |
| Borrowings with interest           | 16 (15.6)     |
| Borrowings without interest        | 40 (39.2)     |
| Selling of assets                  | 3 (2.8)       |
| Insurance/reimbursement (in case of government employee) | 29 (28.4) |

### Discussion

The 2010 WHO Global Status report on noncommunicable diseases (NCDs) showed that the NCDs are the most prevalent cause of mortality worldwide, with 80% of the burden in LMICs. Ischemic heart disease was the fourth largest cause of years of life lost due to premature mortality in 2010, up from its eighth ranking in 1990. The growing health burden of CHD potentially translates into increased economic burden at the household levels, especially in India, as most of the treatment expenses are paid OOP by the households.

This study was undertaken in a north Indian city of Chandigarh to estimate the OOP expenditure incurred by the households having a member getting treatment for CHD. The study used non-probability purposive sampling to select a mixed sample of patients taking treatment either from a public or private sector hospital. Most of the patients (93%) had an episode of hospitalization (either single or multiple) during 2 years after the diagnosis. Among those who were hospitalized incurred an average expenditure of INR 0.24 million and those who got treated in OPD clinics incurred an expenditure of INR 0.048 million. The episode of hospitalization consumed around 76% of the total OOP expenditure and 47% of the annual household’s consumption expenditure.
A study from North India reported mean hospitalization expenditure (due to any cause) among the richest quintile as 4.0, 3.2, and 8.6 times higher than the poorest quintile in Haryana, Punjab, and Chandigarh, respectively. Specifically, in relation to CVDs, study by Rao et al. stated OOP expenditure per hospitalization as 3 times higher among the richest compared to the poorest group. This study showed a similar phenomenon but a bit lower finding as in-patient expenditure among poorest household was 1.7 times higher than the rich counterparts. This may be due to the specific guidelines for the treatment of acute condition of CHD, for which the households had to spend the similar amount for getting treatment based on these guidelines. However for studies as mentioned above, which considered wide range of conditions, for which the rich families, who can afford, can go for costly treatments alternatives or prolonged care and may incur high treatment expenditure as compared to poor families, which tries to substitute care with inferior and cheaper alternatives.

The literature shows that OOP expenditures are regressive: Poorer respondents pay a higher proportion of income on health care, as compare to richest, as shown for various chronic conditions including CVDs. Furthermore, as per previous research, poor households live closer to survival threshold (household’s costs of basic necessities). This study on the same lines showed that OOP expenditure consumed around 47% total consumption expenditure in the richest families. Whereas poorest and poor families had to spend more than 100% and 80% of the consumption expenditure respectively for getting health care. This huge OOP expenditure forces families to adopt risky financial strategies in the form of borrowings (most of the times with interest) or selling of assets, to mobilize additional sums of money, leaving them further vulnerable to impoverishment.

Around 38% of the households had to undertake distress financial activities to cope up with the treatment expenditure, with more prevalence in the poorest households (67%) as compared to the richest (4%).

Findings from other study undertaken in the context of LMICs showed that 40% of the households adopted DF mechanisms to cope up with expenditure incurred during the treatment of CVDs. Also, as per NSS of 2004–2005, comparable findings was observed, which showed borrowing as a financing mechanism to be present in 39% of the respondents followed by selling of assets in 11.4% of the families having a member diagnosed with CVDs.

Considering other chronic conditions such as diabetes, spending on medications/drugs ranged from 32% to 62% of total expenditure in various country settings of Mexico, Pakistan, Sudan, and India. Also, as per NSS, 2009–2010, 68% of the OOP expenditure on out-patient care was on medicines. The findings of this study are on similar terms as recurrent OOP expenditure on drugs was 66% and 57% of the out-patient spending among hospitalized and nonhospitalized group, respectively. The study supports the initiative regarding free drug policy taken from various state governments Rajasthan and Tamil Nadu the replication of which is very much required in other states, which could provide some form of financial support to poor households.

The results of the NSS surveys over the years (1980–2004), shows OOP expenditure to be much higher in the private than in public facilities. This study also reports the similar trend as expenditure by the households in private hospital was 26% higher than in public hospital. Further, most of this difference was due to the expenditure incurred on consultation and diagnostics. This may be due to more charges put in place by the private hospital on these services, which are mostly subsidized in the public sector hospitals in the context of India. However, even after subsidized care, in-patient expenditure in public hospital was higher than private hospital, showing lack of infrastructure regarding instruments or consumables in public hospitals, which the patient had to buy from the market. Furthermore, as per results, patients who visited private hospitals were economically superior to those who visited public facility, raising the affordability issue. Patients from households who could afford the costly treatment tend to visit the facility where better quality is served. In the context of India, low credibility of public health facilities had resulted in the preference of the households towards private facilities.

The weakness or nonexistence of mechanisms to protect households financially from the economic burden of NCDs is, however, probably the most important finding in this study. Poor households are more likely to suffer...
disproportionally from the financial effects of this lack of social protection. To meet the costs, households reported taking unsecured loans, using savings or selling household assets, all of which can lead to longer-term problems for the household. For example, the wider literature suggests that many of the loans taken by households for health expenses are at very high-interest rates that can take generations to repay.[28]

There is a need to create some form of financial risk protection mechanism either in the form of strengthening public health facilities by creating sufficient supply of infrastructure and human resource and raising the quality standards or by creating a prepayment mechanism in the form of social insurance to protect the poor households from financial shocks. Recent initiatives like the roll out of national insurance schemes (e.g., RSBY) and other state health insurance schemes such as RGJAY in Maharashtra, Rajiv Aarogyasri Health Insurance Scheme in Andhra Pradesh, Chief Minister Kalaigaat’s Insurance Scheme in Tamil Nadu, are the step forward.[29]

Limitations
First, the purposive sampling done to select people who are seeking and obtaining treatment, at hospitals, will certainly result in an upward bias in expenditure for the average person with the condition. The people who do not seek treatment or who seek treatment at a lower level of care, implying lower costs, were not selected. Second, smaller sample size taken from a single private and a single public hospital from a single city make the generalizability of results somewhat difficult. As the study was retrospective in nature assessing expenditure during the past 2 years, will certainly result in the recall bias of the respondents.

Conclusion
There is a need to take into consideration from a policy point of view the rising expenditure among households for the treatment of chronic conditions like CHD. Although health promotion, prevention, and early treatment would reduce some of these costs, for those who have developed the disease and required treatment, there is a need to develop health financing systems that improve financial risk protection and help achieve universal health coverage. Policymakers need to ensure that both the health as well as the financial burden is adequately addressed in future reforms.

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Conflicts of interest
There are no conflicts of interest.

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