

Research Article

Hospitalization, Catastrophic Health Expenditure and Financial Coping Among People Living with Type 2 Diabetes Mellitus: A Secondary Analysis of a Community-Based Urban–Rural Study in India

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ABSTRACT

Background: Type 2 diabetes mellitus requires lifelong healthcare and can impose substantial financial demands on individuals and households. Although routine outpatient care generates continuing expenditure, hospitalization may produce a sudden and disproportionately large financial shock. We undertook a secondary analysis of a previously conducted community-based study to characterize the relationship between hospitalization, catastrophic health expenditure (CHE), and household financial coping among people living with type 2 diabetes mellitus.

Methods: This secondary analysis used data from a community-based cross-sectional study conducted among 360 adults with type 2 diabetes mellitus, comprising 180 participants from an urban field-practice area and 180 from a rural field-practice area. Participants were selected using systematic random sampling. Data were collected through a pre-tested interviewer-administered questionnaire during household visits. Information included demographic characteristics, duration of diabetes, direct and indirect expenditure, hospitalization, catastrophic health expenditure and coping

mechanisms. CHE was defined according to the study's prespecified threshold of out-of-pocket healthcare expenditure exceeding 40% of non-subsistence income. Descriptive comparisons between rural and urban participants were performed using the statistical methods specified in the original study.

Results: Among 360 participants, 116 (32.2%) reported hospitalization during the study period. Hospitalization was reported by 63 (35%) urban and 53 (29%) rural participants. Overall, 97 (26.9%) participants experienced CHE. All participants who experienced CHE had also experienced hospitalization. Consequently, 97 of the 116 hospitalized participants (83.6%) experienced CHE. The proportion experiencing CHE was 30% in the urban group and 24% in the rural group. Mean monthly direct expenditure was INR 516.31 $\pm$ 43.52 in urban participants and INR 408.12 $\pm$ 23.37 in rural participants, while corresponding indirect expenditure was INR 155.62 $\pm$ 15.15 and INR 145.88 $\pm$ 11.42, respectively. Cash savings were the predominant coping mechanism, reported by 72% of urban and 70% of rural participants. Asset sales were reported by 13% and 14%,

respectively, while borrowing was reported by 6% and 7%. No participant reported access to health insurance.

Conclusions: In this community-based population, catastrophic health expenditure was concentrated among participants who had experienced hospitalization. Most affected households relied on accumulated savings to meet healthcare costs, while a smaller proportion sold assets or borrowed money. The findings suggest that preventing diabetes-related complications and strengthening financial protection for inpatient and chronic disease care should be complementary components of diabetes control strategies.

Keywords: type 2 diabetes mellitus; catastrophic health expenditure; hospitalization; out-of-pocket expenditure; financial coping; household expenditure; India; rural health; urban health.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a lifelong metabolic disorder requiring continuing interaction with healthcare services. Treatment commonly involves long-term medication, periodic consultations, laboratory investigations, lifestyle modification and monitoring for complications. As the duration of disease increases, patients may additionally require treatment for cardiovascular, renal, neurological, ophthalmological and other complications [1-3]. The consequences of diabetes are therefore not limited to clinical morbidity. Chronic disease may impose substantial financial costs on households through direct medical expenditure and indirect costs associated with healthcare utilization and loss of productive time. The economic consequences may become particularly severe when acute illness or diabetes-related complications result in hospitalization [4].

This issue is particularly important in India, where households continue to bear a

considerable proportion of healthcare expenditure through out-of-pocket payments. Nationally representative analyses have demonstrated that diabetes-related care can generate substantial financial burden, particularly when inpatient care is required. A recent analysis of nationally representative Indian data reported catastrophic expenditure at multiple thresholds and found that distressed financing was particularly important for inpatient diabetes care. A systematic review of the economic burden of diabetes in India similarly found that complications and hospitalization substantially increase expenditure compared with routine outpatient management [5-8].

Catastrophic health expenditure is important because its consequences may extend beyond the healthcare episode itself. The World Health Organization defines catastrophic health spending using a capacity-to-pay framework; expenditure exceeding 40% of a household's capacity to pay can compromise the ability to meet basic needs. Such financial stress may result in depletion of savings, sale of assets or borrowing. Previous research has documented the economic burden of diabetes in India, but an important practical question remains: *what happens financially to households when diabetes care escalates to hospitalization?* Understanding this transition is particularly relevant for public-health planning because hospitalization may represent a potentially modifiable event through earlier diagnosis, complication screening and effective chronic disease management [3-7].

The present manuscript represents a secondary analysis of data previously collected in a community-based study of diabetes-related expenditure. The original study examined the magnitude of catastrophic health expenditure among rural and urban participants [8]. The present analysis uses the same dataset but focuses

specifically on the intersection between hospitalization, catastrophic expenditure and household coping strategies.

Objective

The primary objective was to characterize the relationship between hospitalization and catastrophic health expenditure among adults with T2DM. Secondary objectives were:

1. To compare hospitalization and CHE between rural and urban participants.
2. To describe direct and indirect expenditure associated with diabetes care.
3. To characterize the financial coping mechanisms used by participants experiencing CHE.
4. To examine the implications of hospitalization-related financial vulnerability for diabetes care and health-system financial protection.

METHODS

Study design

This was a secondary analysis of data obtained from a previously conducted community-based cross-sectional observational study. The parent study included 360 individuals with T2DM from rural and urban field-practice areas associated with Sri Siddhartha Medical College, Tumkur, Karnataka. The original investigation was designed to assess the magnitude of catastrophic health expenditure associated with diabetes.

Study setting

The urban field-practice area consisted of Maralur and Maralur Dinne, under the Urban Health Training Centre, with an approximate population of 18,000. The rural field-practice area consisted of 23 villages surrounding the Rural Health Training Centre at Nagvelli, with a population of approximately 8,223.

Participants

The parent study included permanent residents aged more than 30 years who had been living with T2DM for at least one year.

Patients with type 1 diabetes mellitus and individuals who did not consent to participate were excluded.

Sampling and sample size

The sample size was calculated using: $n = Z^2P(1-P)/e^2$ with a 95% confidence level and the prespecified assumptions described in the parent study. Following adjustment for non-response, 180 participants were enrolled from each setting, producing a total sample of 360 participants. Systematic random sampling was used.

Data collection

Data were collected using a pre-tested questionnaire through face-to-face household interviews. The questionnaire was translated into the local language and piloted among 30 individuals with diabetes to assess reliability and consistency. A second household visit was undertaken when selected participants were unavailable during the initial visit. Variables relevant to the present secondary analysis included:

- age;
- sex;
- educational status;
- duration of diabetes;
- direct expenditure;
- indirect expenditure;
- hospitalization;
- catastrophic health expenditure; and
- mechanisms used to finance catastrophic expenditure.

Definition of catastrophic health expenditure

CHE was defined using the threshold adopted in the parent study: out-of-pocket expenditure exceeding 40% of non-subsistence income. This threshold is consistent with the established capacity-to-pay approach used in international health-financing research.

Financial coping

Participants who experienced CHE were assessed regarding the mechanisms used to

meet healthcare expenditure. The recorded mechanisms included:

1. use of cash savings;
2. sale of assets; and
3. borrowing.

Health-insurance coverage was also recorded.

Ethical considerations

The parent study received Institutional Ethical Committee approval. Written informed consent was obtained from participants, confidentiality was maintained, and study procedures were reported as being consistent with the ethical principles of the Declaration of Helsinki.

Statistical analysis

The parent study used SPSS version 21. Quantitative variables were summarized as means and standard deviations and categorical variables as frequencies and percentages. The original analysis used chi-square testing, one-way ANOVA and unpaired *t*-testing as appropriate, with $P < 0.05$ considered statistically significant. For the present manuscript, descriptive

proportions were additionally calculated from the reported study counts to characterize the proportion of hospitalized participants who experienced CHE. These derived proportions are presented as descriptive estimates and are not interpreted as causal associations.

RESULTS

Participant characteristics

The study included 360 participants, equally divided between rural and urban settings. The mean age was 59.23 ± 6.2 years among rural participants and 62.68 ± 8.4 years among urban participants. Women constituted 61% of the urban population, whereas men constituted 53% of the rural population. Illiteracy was reported in 37% of rural and 33% of urban participants. The duration of diabetes also differed descriptively between the two populations. Approximately 71% of rural participants had diabetes for 1–4 years, whereas approximately 75% of urban participants had diabetes for 5–8 years.

Table 1. Baseline characteristics of study participants

Characteristic	Rural (n=180)	Urban (n=180)
Mean age, years	59.23 ± 6.2	62.68 ± 8.4
Male sex	53%	39%
Female sex	47%	61%
Illiterate	37%	33%
Diabetes duration 1–4 years	71%	—
Diabetes duration 5–8 years	—	75%

Values are reproduced from the parent study; variables for which a complete urban/rural distribution was not reported are not imputed.

Healthcare expenditure

Mean monthly direct expenditure was higher among urban participants than rural participants:

- Rural: INR 408.12 ± 23.37
- Urban: INR 516.31 ± 43.52

Mean indirect expenditure was:

- Rural: INR 145.88 ± 11.42

Table 2. Monthly diabetes-related expenditure

Expenditure	Rural	Urban
Consultation, INR/month	67.27	148.33
Direct expenditure, INR/month	408.12 ± 23.37	516.31 ± 43.52
Indirect expenditure, INR/month	145.88 ± 11.42	155.62 ± 15.15
Combined direct + indirect expenditure, INR/month*	554.00	671.93
Estimated annual direct + indirect expenditure, INR/year*	6,648.00	8,063.16

*

Combined and annual figures are arithmetic derivations from the reported monthly direct and indirect expenditure and should be interpreted as descriptive estimates rather than independently measured outcomes.

Hospitalization and catastrophic health expenditure

A total of 116 participants reported hospitalization during the study period. Hospitalization occurred in:

- 53 (29%) rural participants
- 63 (35%) urban participants

- Urban: INR 155.62 ± 15.15

Consultation expenditure was INR 67.27/month among rural participants compared with INR 148.33/month among urban participants. Among urban participants, medication constituted approximately 64% of direct expenditure. Consultation accounted for approximately 24% of direct expenditure among rural participants and 19% among urban participants.

Overall, 97 participants (27%) experienced CHE and was reported among:

- 43 (24%) rural participants
- 54 (30%) urban participants

Most importantly for the present analysis, the parent study reported that CHE occurred only among participants who had experienced hospitalization. On the basis of these reported counts, 97 of the 116 hospitalized participants experienced CHE, corresponding to 83.6% of hospitalized participants. The corresponding descriptive proportions were:

- Rural: 43/53 = 81.1%
 - Urban: 54/63 = 85.7%
- These figures should be interpreted as descriptive findings within this study
- population and should not be considered evidence that hospitalization independently causes CHE

Table 3. Hospitalization and catastrophic health expenditure

Outcome	Rural n (%)	Urban n (%)	Total
Hospitalization	53 (29%)	63 (35%)	116 (32.2%)
CHE	43 (24%)	54 (30%)	97 (26.9%)
CHE among hospitalized participants*	81.1%	85.7%	83.6%

**Derived from reported counts.*

Financial coping strategies

The majority of participants experiencing catastrophic expenditure relied on cash savings.

Cash savings were used by:

- 126 (70%) rural participants
- 130 (72%) urban participants

Asset sales were reported by:

- 25 (14%) rural participants
- 23 (13%) urban participants

Borrowing was reported by:

- 13 (7%) rural participants

- 11 (6%) urban participants

None of the participants reported access to health insurance.

Table 4. Strategies used to meet catastrophic healthcare expenditure

Coping strategy	Rural n (%)	Urban n (%)
Cash savings	126 (70%)	130 (72%)
Sale of assets	25 (14%)	23 (13%)
Borrowing	13 (7%)	11 (6%)
Health insurance	0	0

DISCUSSION

The principal finding of this secondary analysis is that catastrophic healthcare expenditure was concentrated among participants who had experienced hospitalization. Although only approximately one-third of the overall study population reported hospitalization, virtually all participants experiencing CHE belonged to the hospitalized group. Based on the reported numbers, approximately 84% of hospitalized participants experienced CHE. This finding provides a different perspective on the economic burden of diabetes than simply estimating average expenditure. Routine diabetes care generates continuing costs, but hospitalization appears to represent a potential financial inflection point at which the household's economic exposure becomes substantially greater.

The finding is biologically and economically plausible. Hospitalization may involve investigations, medicines,

procedures, inpatient accommodation, transportation, caregiver time and other expenses that are not captured adequately by routine outpatient expenditure. Diabetes-related complications can further increase the intensity and duration of healthcare utilization. Recent evidence from India supports the importance of inpatient care in diabetes-related financial hardship. A national survey-based analysis found that catastrophic expenditure was substantially more common at lower thresholds and that distressed financing was particularly important among households seeking inpatient diabetes care [5-7].

A 2022 systematic review of the Indian literature similarly reported that complications and hospitalization considerably increase the cost of diabetes care [4-6]. The present study also found that urban participants had higher mean direct and indirect expenditure than rural participants. Mean monthly direct expenditure was

approximately INR 516 in urban participants compared with INR 408 among rural participants. Consultation expenditure showed a particularly large urban–rural difference. The interpretation of this finding requires caution. Higher expenditure does not necessarily mean poorer financial protection. Urban participants may have greater access to healthcare services, different patterns of healthcare utilization, or greater use of paid consultations and medicines. Conversely, lower rural expenditure could potentially reflect lower utilization rather than lower need. Indeed, nationally representative Indian evidence has shown that financial burden varies according to residence, socioeconomic position and the type of healthcare facility used.

The present study's most striking finding from a household-financing perspective is the reliance on savings. Approximately seven in ten participants used cash savings to meet catastrophic healthcare expenditure. Savings can provide immediate protection against debt but are not an unlimited resource. Depletion of savings may leave households less capable of managing subsequent health emergencies, education costs, food expenditure and other essential needs. Asset sales represent a more severe form of financial coping because they may permanently reduce household wealth. In the present population, approximately one in seven participants reported selling assets. Although borrowing was less common, it can create continuing financial obligations and may be particularly harmful when households borrow at high interest rates. These observations emphasize that CHE should not be viewed solely as a measure of expenditure. It is also a marker of household financial vulnerability.

The absence of reported health-insurance coverage among all participants is another important finding. Although the study population was relatively small and

geographically restricted, complete absence of reported insurance coverage suggests a potentially important gap in financial protection within the study setting at the time the data were collected. The findings should nevertheless be interpreted in the context of the age of the dataset and the changing Indian health-financing environment. National health-financing programs and insurance initiatives have expanded since the parent study was conducted. Therefore, the magnitude of insurance coverage observed in this historical cohort should not be assumed to represent the current national situation.

An important strength of the present analysis is that it focuses on a clinically meaningful event that is hospitalization, rather than merely describing average costs. However, the cross-sectional design means that hospitalization and CHE cannot be placed in a temporal causal framework beyond the reported occurrence during the study period. The original study also noted the possibility of recall bias regarding hospitalization and attempted to cross-check hospitalization history with available records [8].

Policy and health-system implications

The findings suggest several potentially important interventions.

1. Prevent avoidable hospitalization

Early identification and management of diabetes complications may reduce the likelihood of severe presentations requiring hospitalization. Strengthening primary-care diabetes management could therefore have both clinical and economic benefits.

2. Improve continuity of outpatient diabetes care

Affordable medicines, regular monitoring and accessible follow-up can reduce barriers to ongoing diabetes management.

3. Strengthen financial protection

Health-financing policies should ensure that chronic disease management

includes meaningful protection against expenditure on medicines, investigations and hospitalization.

4. Address distressed financing

Patients identified as financially vulnerable should be linked to available government-funded health schemes and other social-protection mechanisms.

5. Integrate economic assessment into chronic disease programs

Diabetes programs traditionally emphasize glycemic control and complications. Incorporating questions about affordability, missed treatment because of cost and household financial stress could identify patients at risk of treatment interruption.

Strengths

This analysis has several strengths. First, it uses community-based rather than exclusively hospital-based data, allowing assessment of the financial consequences of diabetes among individuals living in the community. Second, rural and urban populations were studied using the same broad methodology, permitting descriptive comparison. Third, the study collected information on both expenditure and coping strategies, allowing the financial consequences of diabetes to be considered beyond simple monetary expenditure. Fourth, the present secondary analysis focuses on hospitalization and financial coping, providing a distinct health-services perspective compared with the parent publication.

Limitations

Several limitations require explicit acknowledgement. First, this is a secondary analysis of a previously published dataset. The dataset was not originally designed specifically to investigate the relationship between hospitalization and CHE. Consequently, some potentially important explanatory variables were unavailable. Second, because the study is cross-sectional,

the observed concentration of CHE among hospitalized participants does not establish that hospitalization independently caused CHE. Third, hospitalization information was subject partly to recall and may therefore have been affected by recall bias. The original investigators attempted to verify hospitalization where records were available.

Fourth, the study did not provide sufficient data for a contemporary multivariable model of predictors of CHE. It would therefore be inappropriate to report odds ratios or adjusted associations without access to the original individual-level dataset. Fifth, the study was conducted in defined field-practice areas and may not be representative of the wider Indian population. Sixth, the parent study was conducted before substantial changes in India's health-financing landscape. The insurance coverage findings therefore represent the historical study population and should not be extrapolated to present-day national coverage. Finally, the dataset does not allow assessment of some important dimensions of financial hardship, including impoverishment, treatment abandonment, household consumption changes, debt interest rates and long-term asset depletion.

CONCLUSION

Hospitalization represents an important point of financial vulnerability among people living with type 2 diabetes mellitus. In this community-based study population, 97 participants experienced catastrophic health expenditure and all belonged to the group that had experienced hospitalization. Most affected households relied on cash savings, while others sold assets or borrowed money. The findings reinforce the principle that effective diabetes control requires more than clinical management alone. Preventing complications, reducing avoidable hospitalization, ensuring affordable continuity of care and strengthening financial

protection should be pursued together. Because this analysis uses previously collected data, the findings should be regarded as hypothesis-generating rather than definitive evidence of a causal relationship between hospitalization and catastrophic expenditure.

REFERENCES

1. World Health Organization. Global report on diabetes. World Health Organization; 2016.
2. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. International Diabetes Federation; 2021.
3. Sathyanath S, Kundapur R, Deepthi R, et al. An economic evaluation of diabetes mellitus in India: a systematic review. *Diabetes Metab Syndr*. 2022;16(11):102641.
4. Yadav J, Menon GR, John D. Disease-specific out-of-pocket payments, catastrophic health expenditure and impoverishment effects in India: an analysis of National Health Survey data. *Appl Health Econ Health Policy*. 2021;19:769-782. doi:10.1007/s40258-021-00641-9.
5. Nanda S, et al. Financial burden of seeking diabetes mellitus care in India: evidence from a nationally representative sample survey. *Health Care Sci*. 2023. doi:10.1002/hcs2.65.
6. Akhtar S, et al. Economic menace of diabetes in India: a systematic review. *J Diabetes Metab Disord*. 2020. doi:10.1007/s13410-020-00838-z.
7. World Health Organization. Households with out-of-pocket payments greater than 40% of capacity to pay for health care. WHO Global Health Observatory.
8. Rashid A, Nazir S, Mir AR. A community-based survey of catastrophic health expenditure in patients with type II diabetes mellitus in a developing country. *Eur J Pharm Med Res*. 2020;7(7):681-684.