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## Out-of-pocket expenditure on diabetes care in an urban population of Tamil Nadu: A community based study

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### Abstract

**Background:** Diabetes is a life-long commitment both to the patient and to the provider. Healthcare cost of diabetes is high since it requires close monitoring to prevent dangerous complications that may further increase the healthcare cost.

**Aim:** To assess the out-of-pocket expenditure on diabetes among diabetic patients in urban Tamil Nadu.

**Methods:** A cross-sectional study was conducted among 180 diabetic patients in Thoothukudi Corporation. Study tool used was a semi-structured interview based questionnaire. Multistage sampling was used.

**Results:** The median quarterly OOPE for the study population was ₹ 1710 with an interquartile range of ₹ 2958. Male gender, higher education and socio-economic status, economical dependency, presence of co-morbidities and complications and hospitalization were significantly associated with increased OOPE on diabetes.

**Conclusion:** Effective intervention should be done at all levels to diagnose the disease early so that occurrence of complications is delayed, thus reducing the household financial burden.

**Keywords:** Healthcare cost, out-of-pocket expenditure, OOPE, diabetes, expenditure

### Introduction

Diabetes Mellitus has been a well-recognised cause for premature death and disability as it increases the risk of vascular, renal, retinal and neuropathic complications. India ranks second worldwide in the prevalence of diabetes<sup>[1]</sup>. This increase in prevalence of this disease could be attributed to rapid urbanization and lifestyle modification.

Diabetes requires close monitoring by the health care providers to prevent premature death and disability. Hence, it is a lifelong commitment both to the patient and to the health care provider. This makes the health-care cost of this disease high pushing many households to poverty.

The cost implications of diabetes to society are multifold and includes direct medical costs (money spent on consultation, investigation, medicines, hospitalization and management and treatment of complications), direct non-medical costs (money spent on transport and on lifestyle modification), indirect costs (income lost due to patients and caregiver due to absenteeism) and intangible costs (pain, anxiety, depression, stress, insecurity, inconvenience, reduced quality of life).

Premature death is also a major consideration since most of these deaths occur among the breadwinners of families. In India, the probability of occurrence of death between the ages 30 years and 70 years from one of the four main non-communicable diseases is 26.2%<sup>[2]</sup>. Most of them belonging to this age group are economically productive.

Nearly 4 out of 5 diabetes people live in low and middle income countries. People from these countries spend majority of their expenses on diabetes from their own pockets<sup>[3]</sup>. In developing countries like India where nearly 65% of the health care expenditure is out-of-pocket, diabetes poses an enormous economic burden on the patients<sup>[4]</sup>. This burden is further aggravated by delayed diagnosis and inadequate treatment.

Although health insurance coverage in India is improving slowly and steadily, only less than one-third of households had health insurance for at least one usual member in the family<sup>[5]</sup>. This further implies that people spend huge amount out-of-pocket for healthcare. Nevertheless, the effectiveness of healthcare remains questionable both at private and public health sectors.

The prevalence as well as the health care cost of diabetes is higher in urban population [6-8]. The objectives of this study was to estimate the quarterly OOPE incurred by diabetic patients among the urban population of Thoothukudi district and to determine various factors that influence quarterly OOPE. Quarterly OOPE can be defined as any expenditure incurred by households as a payment to health practitioners and suppliers of pharmaceuticals, therapeutic appliances, and other goods and services during the last three months due to diabetes [9].

Since high OOPE in low-income groups can lead to poverty, this study also aimed to study the coping mechanisms adopted by households for increasing health-care cost.

**Materials and Methods**

This study was conducted as a community-based cross-sectional study among people with diabetes mellitus in urban areas of Thoothukudi from April 2016 to January 2017. Diabetic patients, more than 18 years of age with at least 3 months elapsed since the diagnosis of the disease and those who were residing in Thoothukudi Corporation were included for the study. Guests of the visited households who were not residents of Thoothukudi Corporation and Gestational Diabetes Mellitus patients were excluded from the study.

A pilot study was done among 40 diabetic individuals in Thoothukudi Corporation for sample size calculation and validation of questionnaire. The pilot study estimated mean quarterly OOPE to be Rs.3208.99, with a standard deviation of Rs. 2095.90. Considering 95% confidence level and allowing for 10% relative precision, sample size was calculated to be 164. Accounting for 10% non-response rate, the study was done among 180 diabetic individuals.

Multi-stage sampling was done. In the first stage, two zones were randomly selected out of four zones in the corporation. In the second stage, five wards were selected randomly from each of the two zones. In the selected wards, a starting point was selected randomly and then by right hand rule, households were surveyed till 18 diabetic patients were reached in each ward. Diabetic patients with history/clinical record for physician diagnosis of the disease and/or on current use of medications for the disease (insulin or oral hypoglycaemic agents) were included for the study.

The study tool was a semi-structured interview-based questionnaire which included the following: socio-demographic details, anthropometric and clinical parameters, disease profile, Health related behaviour, details of expenditure on health care and coping mechanism for increasing health-care expenditure. Ethical approval for the study was obtained from the Institutional Ethics Committee. Field data collection was done after obtaining official permission from the Commissioner of Thoothukudi Corporation.

The purpose of the study was elaborated to the participants and after obtaining informed consent from the participants, one to one interview was done by the primary investigator in local language. To avoid recall bias, participants were given sufficient time to answer. The clinical and expenditure details collected from the participants were crosschecked with proxy sources like bills, medical records, prescription, lab reports and medicine blister packs available at the time of visit. Among the study participants who were hospitalised during the previous three months had all the necessary bills and records for verifications. Nearly 40% of un hospitalised

participants had verifiable bills. In case of unverifiable bills, self-reported expenditure was cross verified with the routine cost of medicine, lab investigations and consultation fee based on the market price.

A total of 180 diabetic patients were interviewed for the study. Data was entered in Microsoft Excel and double checked for any error. Three individuals' data which was found to be incomplete and erroneous were excluded from the study. Data was analysed using Statistical Package for Software Solutions (SPSS) version 16. Due to skewed distribution of the variables, median values and interquartile ranges were reported. Association between quarterly OOPE and a grouping variable was tested using Mann-Whitney U test and Kruskal Wallis test.

**Results**

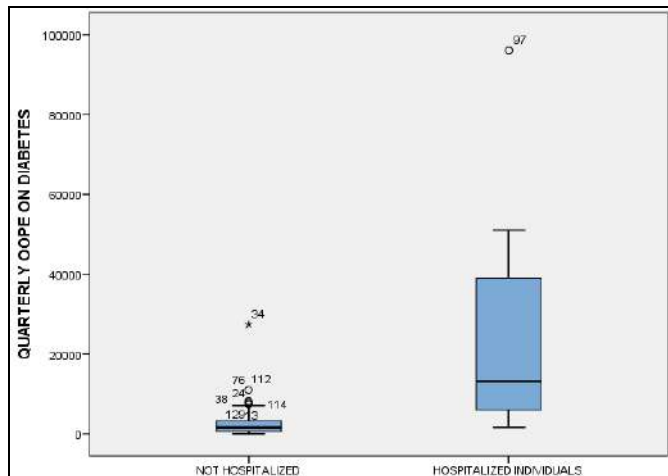
Out of the total number of 177 participants, 49% were male and 51% were female. The mean age of the study population was 56.5 years ± 10.8 years. Nearly 50% of the study population belonged to upper middle socio-economic status, according to B.G. Prasad socio-economic classification based on the Consumer Price Index of May 2016 [10]. While nearly 90% of men were financially independent, only 30% of women were financially independent (p<0.001). The socio-demographic details of the study population was given in table 1.

**Table 1:** Socio-demographic details of the study population (N=177)

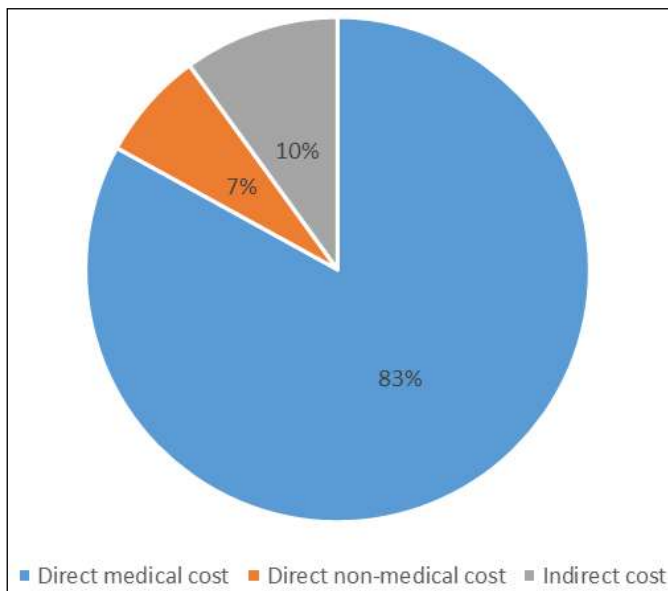
Socio-demographic detail	N (%)
<b>Gender</b>	
Male	87 (49.2%)
Female	90 (50.8%)
<b>Age group</b>	
21 to 30 years	2 (1.1%)
31 to 40 years	12 (6.8%)
41 to 50 years	43 (24.3%)
51 to 60 years	57 (32.2%)
61 to 70 years	46 (26%)
More than 70 years	17 (9.6%)
<b>Marital status</b>	
Married	146 (82.5%)
Widow	24 (13.6%)
Widower	7 (4%)
<b>Educational status</b>	
Illiterate	5 (2.8%)
Primary school	60 (33.9%)
Secondary school	44 (24.9%)
Higher secondary school	20 (11.3%)
Degree or diploma	48 (27.1%)
<b>Financial dependency</b>	
Dependent	105 (59.3%)
Independent	72 (40.7%)
<b>Socio-economic status</b>	
Upper	42 (23.7%)
Upper middle	90 (50.8%)
Lower middle	34 (19.2%)
Upper lower	10 (5.6%)
Lower	1 (0.6%)

The median quarterly OOPE for the study population was estimated to be Rs. 1719 with an interquartile range of Rs. 2958. Among the study population, 10 diabetic individuals were hospitalised for the disease itself or its complications during the last three months. The median quarterly out-of-

pocket expenditure for the hospitalized patients (n=10) was ₹ 13,199.50 with an interquartile range of ₹ 29,823.70. The median quarterly out-of-pocket expenditure for the remaining individuals who were not hospitalized was ₹ 1593 with an interquartile range of ₹ 2689. Figure 1 compares the distribution of quarterly OOPE on diabetes among hospitalized and non-hospitalized individuals.



**Fig 1:** Distribution of OOPE among hospitalized and non-hospitalized participants



**Fig 2:** Pie chart showing the break-up of quarterly OOPE on diabetes

Figure 2 depicts the breakup of quarterly OOPE on diabetes. The median direct medical cost for diabetes among the study population is ₹ 1300 with an interquartile range of ₹ 2553. More than 50% of the direct medical cost was spent for medicines, followed by 24% for investigations, 12% for self-care and 11% for consultation.

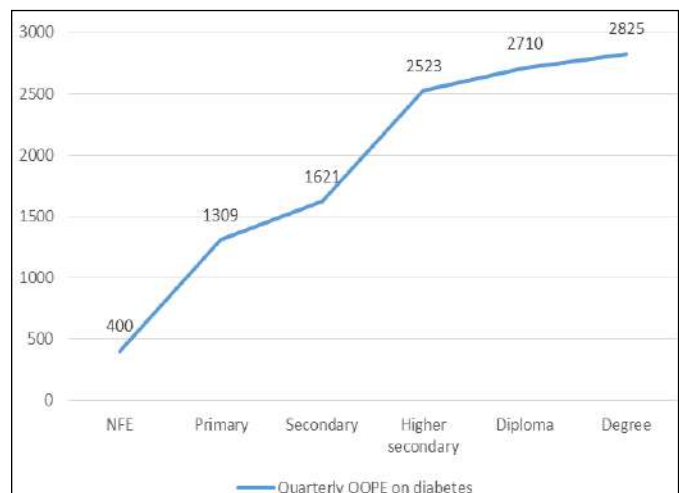
The median direct non-medical cost was ₹ 60 with an interquartile range of ₹ 170. Among 169 study participants who spent money on transportation, the median

transportation cost was ₹ 50 with an interquartile range of ₹ 70. The median expenditure incurred for diet modification by 29 individuals was ₹ 300 with an interquartile range of ₹ 300.

Among the study population, 44 patients and 12 caregivers had man days lost due to diabetes. The median man days lost by the patients was 2 days (IQR – 5 days) and that by the caregivers was 1 day (IQR – 2 days). The median quarterly indirect cost for diabetes due to loss of wages was ₹ 450 with an interquartile range of ₹ 1475.

The total number of families studied were 151, out of which, 125 families had one diabetic patient, 22 families had two diabetic patient and 2 families had three diabetic patients. The proportion of family income spent on diabetes was analysed for 151 families. The average proportion of monthly family income spent on diabetes was 6.4%. Families belonging to upper lower socio-economic spent as much as 7% of the income on diabetes.

The median quarterly OOPE was found to be highest for the participants aged more than 70 years. The median quarterly OOPE for males was ₹ 2387 (IQR - ₹ 2742) and that for females was ₹ 1249.42 (IQR - ₹ 2836). This difference was found to be statistically significant with a p value of 0.01 (Mann Whitney U test). The median quarterly OOPE on diabetes was highest among married males, followed by widower and widows. It was least among married females. It was also found that quarterly OOPE on diabetes increased as the educational level of the participants increased (p value – 0.005, Kruskal Wallis test) (Figure 3). Upper socio-economic class participants spent more on diabetes care when compared to upper lower socio-economic class participants (p value < 0.001, Kruskal Wallis test).



**Fig 3:** Line diagram showing the quarterly OOPE on diabetes and educational status

The median duration of diabetes for the study population was 6 years with an interquartile range of 9 years. Quarterly OOPE on diabetes showed a statistically significant relationship with the duration of the disease since diagnosis, number of co-morbid conditions, number of complications, type of treatment and glycaemic control (see table 2).

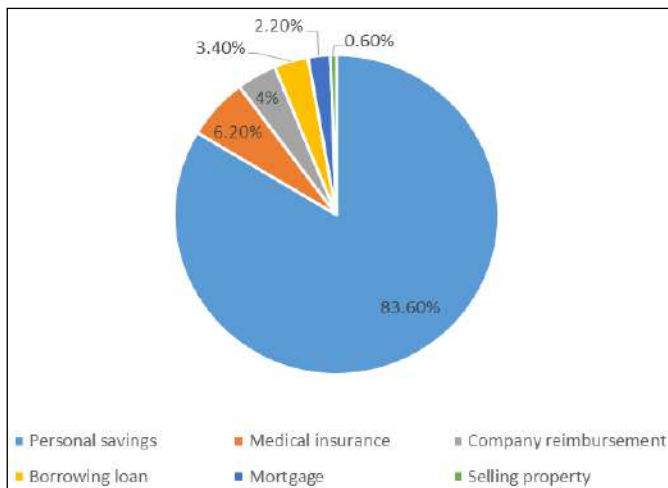
**Table 2:** Association between quarterly OOPE on diabetes and disease profile of the participants

Disease profile	Number of participants (N = 177)	Median quarterly OOPE (IQR) (₹)	p value
Duration of diabetes <sup>2</sup>	Less than 1 year	19 (10.7%)	575 (2090)
	1 to 5 years	60 (34%)	1414.5 (2190)
	5 to 10 years	46 (26%)	2080 (3070)
	10 to 20 years	36 (20.3%)	2629.28 (3878)
	More than 20 years	16 (9%)	3496 (4231)
Diagnosis <sup>1</sup>	Incidental	136 (76.8%)	1710.08 (2965)
	Voluntary	41 (23.2%)	1999 (3064)
Number of co-morbidities <sup>2</sup>	None	85 (48%)	1253.9 (1791)
	One	60 (34%)	2537.9 (4924)
	Two	29 (16%)	2819.5 (3946)
	More than two	3 (2%)	7403.1
Number of complications <sup>2</sup>	None	117 (66.4%)	1235 (2112)
	One	56 (31.6%)	3290.5 (4305)
	Two	4 (2%)	7015 (25867)
Type of treatment <sup>2</sup>	OHA and insulin	13 (7.3%)	4900.36 (4079)
	Insulin alone	8 (4.5%)	4397.63 (3625)
	OHA alone	150 (84.7%)	1551.60 (2591)
Glycaemic control <sup>2</sup>	Not known	16 (9%)	513 (921)
	Good control	82 (46.4%)	2426.35 (3537)
	Poor control	79 (44.6%)	1950 (2932)

1 – Mann-Whitney U test      2 – Kruskal Wallis test

The median quarterly OOPE on diabetes depended significantly on health care provider and frequency of blood glucose testing during the last three months. Participants involving in some type of physical activity was found to be spending significantly more when compared to others (p value – 0.003, Mann-Whitney U test).

For majority (84%) of study population, the coping mechanism for health-care expenditure was personal savings, followed by medical insurance (6%) and company reimbursement (4%). Remaining 6% study population were borrowing loan, mortgage and selling properties for coping increasing healthcare expenditure (Figure 4).



**Fig 4:** Pie chart showing coping mechanisms when healthcare expenditure increase

**Discussion**

The current study was conducted as a community-based cross-sectional study to estimate the quarterly OOPE on diabetes by the urban population. There was almost equal distribution of males and females in the study population [7]. Majority of them (82%) were married as majority of the study participants was between 40-59 years. Since the study was done among urban population, most of them belonged to upper middle and lower middle socioeconomic status.

Only one individual was in the lower socioeconomic status. This was consistent with the previous study results that the prevalence of diabetes had a significant association with monthly income and socio-economic status [6, 7, 11, 12].

The median quarterly OOPE on diabetes among the urban population was found to be ₹ 1719 with an interquartile range of ₹ 2958. Thus, the median annual OOPE on diabetes could be approximately calculated to be ₹ 6,876. This estimate was close to the estimate given by similar community based studies done among urban population [13]. The minor differences in the estimate could be due to inflation. However, this estimate was very low when compared to previous hospital based studies [14]. Geographical differences also play a major role in influencing OOPE on health-care [15].

Majority of studies also showed similar pattern of OOPE on diabetes, with direct cost contributing greatest proportion of OOPE [13, 15, 18]. Medicinal costs contributed to nearly 50% of the total health expenditure [13, 15]. The mean proportion of family income spent on diabetes (6.4%) found in this study was much higher when compared to a study done among high- and middle-income group population in a metropolitan city [13]. This implies that low socio-economic status patients have to spend a larger proportion of their income for diabetes care, which will eventually result in catastrophic health expenditure.

The increase in quarterly OOPE with increasing age and duration of the disease could be due to occurrence of complications and other co-morbidities as the age advances [13-14]. The gender difference observed in the current study could be related to the economic dependency status of women [17-19]. Since more women were unemployed with lower level of education than men, inadequate awareness about the importance of regular monitoring of the disease could also be reason for this gender difference.

The quarterly OOPE for managing complicated diabetes was higher than for uncomplicated disease [13-14, 20-24]. This signifies the need of early diagnosis and treatment of diabetes so that the complications can be prevented or delayed [25]. Higher quarterly OOPE among individuals who had first diagnosed their disease during voluntary blood sugar testing could reflect their good health seeking

behaviour in order to achieve good glycaemic control.

Quarterly OOPE varied significantly with the type of antidiabetic treatment [13-14, 20, 21, 26]. Most of the patients taking insulin as antidiabetic treatment rely heavily on private health sector. This consumes a huge amount from their pockets. Present study implicates the need for supply of insulin and syringes in primary care level.

Current study showed that nearly 58% of study population were involved in some form of physical activity [27]. Quarterly OOPE was significantly higher among those involved in physical activity. This could be due to better health seeking behaviour and the awareness about regular monitoring of blood sugar in these participants. Majority of the participants used their personal savings and income for health-care expenditure [28].

The recommendations of the study are as follows: Accessibility and affordability of quality health services should definitely be improved to benefit low-income groups. Diagnostic procedures are covered under Chief Minister's Comprehensive Health Insurance Scheme (CMCHIS) of Tamil Nadu, which should be effectively used by the people for diagnosing the disease and its complications [29]. Health insurance schemes could cover the ambulatory health-care cost for lower socio-economic status people and economically dependent individuals. Future studies could be done to estimate the indirect cost and intangible cost as well and to analyse the cost-effectiveness of various primary interventions.

The limitations of this study are as follows: 1. Most of the details were self-reported by the participants, which would have led to underestimation or overestimation of quarterly OOPE. 2. Indirect cost due to reduced productivity (income lost to the government or employer) could not be estimated in this study. 3. Since the OOPE of past three months was collected, there could be a possibility of memory bias.

## Conclusion

This community-based study highlighted the high out-of-pocket expenditure incurred by diabetic patients in an urban area of Tamil Nadu. Health-care professionals should be aware of high financial burden due to the disease and the factors that drives the cost. Effective intervention should be done at all levels to diagnose the disease early so that occurrence of complications is delayed, thus reducing the household financial burden.

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