

Original Article:**Costs incurred by patients with diabetes mellitus in a tertiary care hospital - a cross sectional study**

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Background: Diabetes mellitus has emerged as a disease with huge economic burden in developing countries. As sparse data are available from South India regarding the costs incurred by patients with diabetes mellitus the present study was conducted.

Methods: In this cross-sectional study, a pre-structured questionnaire had been administered to 80 patients with diabetes mellitus admitted to our tertiary care teaching hospital to assess the direct and indirect costs incurred.

Results: The median [inter quartile range (IQR)] total direct costs incurred by the study subjects was found to be ₹ 8145 (IQR 4600-12150) during hospitalization at the time of the study. The median (IQR) direct costs incurred during two years prior to the study were found to be ₹ 19050 (IQR 12020-55400). The median (IQR) indirect costs incurred due to hospitalization during the study period were ₹ 0 (0-2025).

Conclusions: The present study provides a real-time measurement of the direct and indirect costs incurred by patients with diabetes mellitus. This information could be useful to health administrators to plan providing care for patients with diabetes mellitus.

Key words: *Diabetes mellitus, Complications, Economic burden*

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INTRODUCTION

Diabetes mellitus is a non-communicable disease with many disease related complications. It is expected that, by 2030, diabetes mellitus may afflict up to 79.4 million individuals in India.¹ The resources spent on treating the disease per se and its complications also are on a rise. In 2012, patients with diabetes mellitus in the USA incurred direct and indirect costs of \$176 billion and \$ 69 billion respectively.² According to Costs of Diabetes in Europe Type -2 (CODE-2) sub-study in Italy, average yearly expenditure for a patient with Diabetes was estimated to be 2991 Euro.³ Similarly, in India, mean direct annual costs incurred by in-patients with Diabetes according to Cost of Diabetic illness in India (CODI) was

₹ 12871 and indirect costs were ₹ 9748 and ₹ 16831 for non-earning and earning subjects respectively.⁴ These studies²⁻⁴ show that despite differences in pattern of disease, the costs incurred are high in both developed and developing countries.

So far, studies in India have been conducted either only in urban areas,⁵ or as comparison between urban and rural diabetic population. The present study was conducted in a tertiary care teaching hospital attached to a medical college to assess the costs incurred by patients with diabetes mellitus in a rural area.

MATERIAL AND METHODS

The present study was a cross-sectional study conducted at the teaching hospital attached to

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Consecutive patients with type 2 diabetes mellitus aged over 16 years admitted in the hospital during the period June 2014 - July 2014 were screened to be included in the study. Subjects treated as only out-patients, those with gestational diabetes mellitus, patients aged under 16 years, mentally unstable patients and comatose patients were excluded from the study. Institutional Ethics Committee approval was obtained before commencement of the study.

A written, informed consent was taken from all the study subjects for participation in the study before the questionnaire was administered. The questionnaire consisted of questions on demographic data, reason for hospitalization, type of medication prescribed (oral hypoglycemic drugs, insulin, or both), direct medical costs (expenditures for medical care such as medicines, medical consultations, laboratory expenses, hospital accommodation, transportation costs and co-morbid conditions if any), indirect costs (wages, days), mode of payment of bills was used. The direct costs were calculated in two ways i.e., the costs incurred at the time of study and the costs incurred during two years preceding the study. The presence of complications has been noted as per the clinician's assessment. Diabetic retinopathy was diagnosed on fundus examination; diabetic nephropathy was diagnosed based on urinalysis and 24-hour urine examination as per standard guidelines.⁶

Data regarding the presence of complications like foot complications (ulcers, amputations etc.), renal, ocular (cataract, retinopathy, any treatment taken like laser photocoagulation), other complications such as recurrent infections, hypoglycaemia, fever etc, were recorded. Socio-economic status was also

recorded and subjects classified according to modified Prasad classification.^{7,8} The questionnaire used in this study is an adaptation of a similar questionnaire used in another study from South India.⁸

The study setting being a rural area, both the consent form as well as the questionnaire were translated into Telugu (the vernacular language) and then administered to the participants.

Statistical analysis

Data are presented as percentages in respective categories. Chi-square test was done to determine the association of socio-demographic correlates with the costs incurred. Statistical analysis was done using SPSS version 19 (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.).

RESULTS

Majority of study subjects (53.8%) belong to the age group of 40-60 years followed by the age groups of > 60 years (27.5%); 61 (76.3%) were male. Mean duration of diabetes among the study subjects was 8.2±5 years. Diabetes mellitus related complications were evident in 61 (76.3%), whereas, 19 (23.8%) didn't have complications. Among those with complications, 42.8% had foot complications, found to be highest among other types of complications (Table 1). Of the study subjects, 25% became unemployed due to diabetes related complications. Five of the study subjects were found to have more than one complication of which 3 of them had diabetic foot and nephropathy and 2 were found to have diabetic retinopathy and nephropathy.

Of the 80 study subjects, 51.3% were on oral hypoglycaemic drugs, 28.8% were taking insulin, 18.8% were prescribed both; one patient was not taking any medication. Seventy percent of the subjects belonged to middle class and its sub groups.

Table 1: Distribution of participants according to age, gender, history of complications and types of complications (n=80)

Variable	No. (%)
Age group (years)	
<20	1 (1.3)
20-40	14 (17.5)
40-60	43 (53.8)
>60	22 (27.5)
Gender (n=80)	
Male	61 (76.3)
Female	19 (23.8)
History of complications (n=80)	
No	19 (23.8)
Yes	61 (76.3)
Type of complication (n=61)	
Diabetic Foot	26 (42.8)
Diabetic nephropathy	11 (18)
Diabetic retinopathy	9 (14.8)
Others*	15 (24.6)

*Others include co-morbid conditions, recurrent infections etc.,

All the medical expenses were paid by 82.5% of the study subjects from their personal savings, whereas only 1.3% availed medical insurance and remaining 17.2 % had borrowed loan.

The median [inter quartile range (IQR)] total direct costs was found to be ₹ 8145 (4600-12150) and it was found to be highest for those with foot disease ₹ 11300 (6555-20750) during hospitalization at the time of study (Table 2).

Table 2: Direct costs incurred according to the type of disease related complications expressed in Rupees as median (IQR) (n=80)

Component of Direct costs	Laboratory tests	Medicine costs	Other expenses	Transport charges	Total direct costs
No complication	1800 (1200-4000)	2400 (1500-3460)	750 (0-2860)	150 (60-500)	6920 (3200-9235)
Diabetic foot	2265 (1500-4000)	4350 (2300-11625)	1900 (525-5250)	350 (180-775)	11300 (6555-20750)
Diabetic nephropathy	2400 (2000-3400)	3400 (1600-4500)	2000 (0-2600)	600 (240-1000)	8270 (5000-9400)
Diabetic retinopathy	980 (750-1000)	2000 (1880-2125)	1400 (600-2250)	200 (125-400)	4320 (3245-5490)
Others *	2500 (1076-3250)	3000 (1200-4960)	600 (0-4000)	240 (100-500)	9700 (7590-12200)

*others include co-morbid conditions, recurrent infections etc.,

Of all the components of direct costs incurred during hospitalization at the time of study, the highest was found to be for medicines. The median (IQR) total direct costs incurred during a period of 2 years prior to study was found to be ₹ 19050 (4600-12150).

Significant association was found between gender distribution and the direct costs incurred at the time of study (p<0.0001) (Table 3). The median (IQR) indirect costs incurred at the time of hospitalization (during the study period) was ₹ 0 (0-2025). The median (IQR) number of days lost due to hospitalization (during the study period) was 7 (6-11) days.

Table 3: Association between gender and total direct costs incurred at the time of study

Gender	Total direct cost grouping (Rupees)		Total
	<8000	>8000	
Male	23	38	61
Female	17	2	19
Total	40	40	

Chi square= 15.531;p <0.0001

DISCUSSION

Diabetes mellitus is one of the most expensive non-communicable diseases and the money spent for treatment is higher than other diseases. Studies from developed countries showed a rise in direct costs of Diabetes from US \$11.6

billion in 1986 to \$176 billion in 2012.² Contrary to trends in developed countries, where the majority of diabetics are 65 years or older, most diabetics in the Southeast Asian region are between 45 and 64 years of age, economically most productive age group^{12,14,15} and a similar trend is observed in present study. It was also found that most of the patients belonged to middle-class and its subgroups earning less than ₹ 5000 per month.

The observation that a large proportion of the patients in the present study were having complications of diabetes mellitus was similar to observation reported in other studies conducted in South India.^{10,11} Few studies however did not take into consideration presence or absence of complications.¹⁰

Mean duration of diabetes mellitus is comparable among various studies in India explaining the chronic nature of the disease.^{10,11,15} Drug and medication costs were found to be higher among the direct costs incurred by the patients due majority of them being treated with oral hypoglycaemic drugs both in the present study and other comparative studies.¹¹ This indicates increasing drug costs and a need for generic medicines to cut down the drug costs. The average total indirect costs incurred were less than that estimated by various studies in India.^{9,15} However, the indirect costs incurred by the patients in present study was less than direct costs, similar to various other studies.^{9,15}

The costs incurred by those with foot complications is similar to findings of various studies in India¹¹ and abroad^{16,17} which demonstrate how expensive diabetic foot care is. A majority of patients in this study being able to pay hospital bills from their personal savings indicates that they are being given concessions by the hospital as a part of their welfare schemes.

Coming to socio-demographic parameters, gender distribution was found to be

significantly associated with the direct costs in the present study. The medical expenditure in male participants was higher than that in females. This is probably due to an observation of more number of males reporting to the hospital after disease related complications ensued and thus high expenses.

The cost burden of diabetes on rural population calls for awareness programs and strategies to promote self care, modification of diet and regular check-ups. It also indicates the need to start community based out-reach activities to identify risk groups for diabetes and plan primordial and primary prevention strategies wherever possible.

Short duration of the study, small sample size and problems in calculating indirect costs due to irregular income pattern within an individual are the main limitations of the present study.

Diabetes mellitus being chronic in nature has high scope for development of complications, which would in turn increase physical, social, psychological and economic burden of the disease. The present study provides a real-time measurement of the direct and indirect costs incurred by patients with diabetes mellitus. This information could be useful to health administrators to plan providing care for patients with diabetes mellitus.

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REFERENCES

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004;27:1047-53.

2. American Diabetes Association. Economic Costs of Diabetes in the U.S. in 2012. *Diabetes Care* 2013;36:1033-46.
3. Lucioni C, Garancini MP, Massi-Benedetti M, Mazzi S, Serra G; CODE-2 Italian Advisory Board. The costs of Type-2 Diabetes mellitus in Italy: a CODE-2 sub-study. *Treat Endocrinol.* 2003;2:121-33.
4. Kapur A. Cost of diabetes in India. The CODI study paper presented at the Novo Nordisk. In: Kapur A, Joshi JK, eds. *Diabetes Update Proceedings. Bangalore Communication Workshop (P), 2000;71-7.*
5. Rayappa PH, Raju KNM, Kapur A, Stefan B, Camilla S, Dilip Kumar KM. Economic costs of diabetes Care. The Bangalore Urban District diabetes study. *Int J Diab Dev Countries* 1999; 19:87-96.
6. American Diabetes Association. Standards of medical care in diabetes-2014. *Diabetes Care* 2014;37 Suppl 1:S14-80.
7. Prasad BG. Social Classification of Indian families. *J Indian Med Assoc.* 1961; 37: 250-1.
8. Sharma R. Revision of Prasad's social classification and provision of an online tool for real-time updating. *South Asian J Cancer* 2013;2:157
9. Kumpatla S, Kothandan H, Tharkar S, Viswanathan V. The costs of treating long term diabetic complications in a developing country: a study from India. *J Assoc Physicians India;* 2013;.61:102-9.
10. Akari S, Mateti UV, Kunduru BR. Health-care cost of diabetes in South India: A cost of illness study. *J Res Pharm Pract* 2013;2:114-7.
11. Ramachandran A, Ramachandran S, Snehalatha C, Augustine C, Murugesan N, Viswanathan V, et al. Increasing expenditure on health care incurred by diabetic subjects in a developing country. *Diabetes Care* 2007;30:252-6.
12. S Grover, A Avasthi, A Bhansali, S Chakrabarti, P Kulhara. Cost of ambulatory care of diabetes mellitus: a study from North India. *Postgrad Med J* 2005;81:391-395.
13. Adler NE, Newman K. Socioeconomic disparities in health: pathways and policies. *Health Aff (Millwood)* 2002;21:60-76.
14. Chatterjee S, Riewpaiboon A, Piyathakit P, Riewpaiboon W, Boupaikit K, Panpuwong N et al. Cost of diabetes and its complications in Thailand: a complete picture of economic burden. *Health Soc Care Community.* 2011;19:289-98.
15. Kapur A. Influence Of Socio-Economic Factors On Diabetes Care. *Int J Diab Dev Countries* 2001; 21: 77- 85.
16. Gordois A, Scuffham P, Shearer A, Oglesby A, Tobian JA. The healthcare costs of diabetic peripheral neuropathy in the US. *Diabetes Care* 2003; 26:1790-5.
17. Gordois A, Scuffham P, Shearer A, Oglesby A. The healthcare costs of diabetic peripheral neuropathy in the UK. *Diabetic Foot* 2003; 6:62-73.