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Assessment of Cost Attributed to the Management of Diabetes Mellitus

	
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ABSTRACT

Background: The prevalence of Diabetes mellitus (DM) is increasing every year, which imparts a high burden on economic growth. However in developing countries like India, change in lifestyle and diet, diabetes has emerged as an important public health concern. This study is intended to evaluate the direct-medical and non medical cost. **Method:** A prospective observational study was carried out over a period of six months from February 2018 to July 2018 in the department of Endocrinology, PSG Hospitals, in Coimbatore, Tamil Nadu, India with the aim to determine the average cost per month for the management of DM. **Result:** DM patients who visits out-patient department spent Rs 3,544/month for their DM management. Further, this cost increases when they got admitted due to DM and its complication management. The type of DM, gender, age does not have any impact on the total average expenditure of management of DM. Drug costs contributes more for the patients who visits out-patient department whereas in-hospital charges contributes more for patients who got admitted for DM and its complication management. **Conclusion:** As per per-capita income of India, patient spent for disease management is above 50% of income, which becomes a great burden to individual.

INTRODUCTION

India stands with the second-highest number of people living with Diabetes Mellitus (DM) spent around 3% of the global total expenditure on DM management. DM imposes a high economic burden on individuals and families, national health systems and countries; thus it represents a significant obstacle to sustainable economic development ^[1]. WHO reports, in 2012 public health care funding was lower in India than other countries in South East Asia. Financing and delivery of health care in India has been left largely to the private sector. Only 19 percent of the country's population was covered by central and state government sponsored health insurance ^[2]. Due to lack of access to health insurance and publicly-available medical services, people living in low- and middle income countries pay a larger out-of-pocket share of health expenditure than those living in high-income countries ^[1].

The assessment of the economic impact of DM in India is important because not enough efforts were taken to tackle the disease. Increased prevalence of DM in India affects the economic productivity of the country and earning ability of an individual ^[3]. And also, the management of DM and its complications could be expensive as it poses a major obstacle to strengthen the Indian health care system and Governments plan to achieve universal health coverage by 2022. The burden of DM on total health care expenditure is increasing, therefore, it will have an important consequences on the sustainability of health care financing ^[4].

Various studies are being conducted, in which periodically the average cost spent for the DM management is increasing ^{[5] [6] [7]}. Additionally, the presence of DM related complications shown to have multiplicative effect on patients' management costs. So it is necessary to realize the cost effective measures of DM management.

Present study is conducted in a tertiary care hospital in urban setup and estimated the average cost per month contributed for DM management which is estimated by the cost of routine care including consultation charges, laboratory test cost, drug cost, medical device cost, transportation and dietary cost.

METHODOLOGY

A prospective observational study which was approved by Institutional Human Ethical Committee to conduct at the Department of Endocrinology, PSG Hospitals, multi specialty

hospital, Coimbatore, Tamil Nadu, India. The study was conducted for the period of 6 months from February 2018 to July 2018.

Regardless of gender and type of DM, outpatients who came for DM consultation and its complication consultation, patients who got admitted for management of DM complications were included in the study. Critically ill patients, gestational diabetes, those who are not willing to participate in the study and who got admitted for the management of co-morbidities were excluded in the study.

Hospital Information System, Patient Medical Record and direct patient interviews were the sources of data collection. Both direct medical and direct non medical cost were collected in which direct costs includes consultation fees, laboratory tests, medicine cost and personal medical device cost. Direct non medical cost includes transportation and dietary costs of the patient and accompanying member per month.

Data was entered and analyzed by using Microsoft Excel 2007 and Statistical Package for Social Sciences (SPSS) Version 16.0 for windows. P-value <0.05 with 95% confidence interval was considered to be statistically significant. Independent T-tests, Chi-square test, ANOVA were used for analysis.

RESULT

A total of 321 patients were enrolled in our study in which 60% were male and 40% were female. The average age of the patient is 54 ± 5 years. 19% have type 1 DM and 81% have type 2 DM. Based on patients Body Mass Index (BMI), 43.6% of the patients were overweight, followed by 42.4% of patients were with normal BMI and 11.5% were obese, 1.9% were underweight and 0.6% were extremely obese. 47.5% of patients falls under the duration category of 1 – 5 years of DM, followed by 32.5 % under 6 – 10 years, 16.5 % under 11 – 20 years and 2.3 % under >20years.

The integral part of glycemic treatment in DM patients is Self Monitoring of Blood Glucose (SMBG), which gives a high impact on glycemic control and in preventing or delaying the complications of DM [8]. In this study, 53.5% of the patients monitor Glucose only at the Hospital during their review and 28.9% of them monitor glucose in the laboratory outside the hospital. 6.5% of the patients monitor only at Home, 3.1% of them monitor glucose both at home and outside laboratory.

Among the total population, 158 patients visits out-patients department for consultation, 82 patients were admitted for the DM complication management and 81 patients got admitted for DM management.

Patients with DM spent average direct cost Rs 3,544 ± 1,379/month for their management. Among the total direct costs of DM patients, the drug cost is more with Rs 2,964/month and consultation charges is Rs 117/month; laboratory cost is Rs 227/month. Transportation charges are Rs 90/month and dietary cost includes Rs 120/month which is given in table 1.

Patients who got admitted for DM management spent Rs 10,701± 4,519/month with drug cost Rs 4,025/month, consultation charges Rs 140/month, laboratory cost Rs 233/month, transportation cost is Rs 160/month, and dietary cost is Rs 122/month which is given in table 1.

And patients who got admitted for DM complication management spent Rs 31,809 ± 7,574/month. Their drug cost is Rs 9,870/ month and consultation cost is Rs 177/month, laboratory cost is Rs 324/month, transportation cost is Rs 187/month, dietary cost is Rs 245/month. The detailed distribution of total direct cost is listed in table 1.

TABLE No. 1: DISTRIBUTION OF TOTAL DIRECT COST

COST COMPONENTS IN DM PATIENTS	AVERAGE COST /MONTH (Rs)			P VALUE
	OUTPATIENT N=158	INPATIENT N=82	INPATIENT WITH COMPLICATION N=81	
Consultation	117 ± 77	140 ± 80	177 ± 90	0.196
Laboratory	227 ± 120	233 ± 115	324 ± 160	0.289
Drug	2,964 ± 1,024	4,025 ± 1,294	9,870 ± 2,294	0.015
Transportation	90 ± 78	160 ± 80	187 ± 80	0.149
Dietary	120 ± 80	122 ± 90	245 ± 90	0.198
In Hospital Charges	-	6,021 ± 2,860	21,129 ± 4,860	0.038
TOTAL	3,544 ± 1,379	10,701 ± 4,519	31,809 ± 7,574	0.020

Considering the DM patients who visit outpatient department for their management, type of DM, age and gender do not have any impact on the total average direct cost spent which is

described in table 2. The total average cost spent by patients with complications is Rs 3,378 which is more than patients without complications of Rs 2,634 with p-value = 0.048 (table 2).

TABLE No. 2: EXPENSES OF DM PATIENTS

VARIABLES	NUMBER (N)	COST/MONTH (Rs)	P VALUE
GENDER			
Male	194	3,049 ± 1,258	0.528
Female	127	3,631 ± 1,165	
TYPE OF DM			
Type 1	59	1,874 ± 989	0.478
Type 2	262	2,569 ± 1,154	
AGE			
20 - 29	10	2,614 ± 1,089	0.525
30 - 39	21	2,184 ± 1,020	
40 - 49	65	3,219 ± 1,210	
50 - 59	102	3,810 ± 1,454	
60 - 69	85	2,624 ± 1,320	
70 - 79	33	4,561 ± 1,890	
>80	5	2,241 ± 1,110	
COMPLICATION			
with DM complication	247	3,378 ± 1,201	0.048
without DM complication	74	2,634 ± 1,084	

Among the total population, patients with foot ulcer spent 8.5 fold more than patients without DM complications. Patients with cardiovascular complications spent 4.5 fold; neuropathy and nephropathy spent 4 fold more than patients without DM complications. The total cost spent for the complication is listed below in table 3.

TABLE No. 3: COMPLICATION MANAGEMENT COST

COMPLICATION	NUMBER (N)	COST (Rs)	P VALUE
FOOT ULCER	31	29,499 ± 8,965	0.005
CARDIOVASCULAR	42	16,323 ± 8,023	
NEUROPATHY	15	14,868 ± 5,618	
NEPHROPATHY	12	14,334 ± 3,794	

During the study, the number of anti-diabetic drugs per prescription varied from one to four. The overall drug use is, 15% of patients use insulin and 61% of patients use Oral Hypoglycemic Agents (OHA) and 23% use both insulin and OHA. In type 1 DM patients,

56% of patients are prescribed insulin and 34% with insulin and OHAs. In type 2 DM patients, 6.3% of patients received insulin and 73.3% with OHAs and 20.2% with combination of both insulin and OHA.

In the management of DM and its complications, drug cost contributes more in the total direct cost. Thus the drug usage and its cost are listed below in table 4.

TABLE No. 4: DISTRIBUTION OF COST AMONG OHA AND INSULIN

DRUG	NUMBER OF USERS	TOTAL COST/MONTH (Rs)
OHA		
Biguanides	211	3,571
Sulphonyl Ureas	128	6,131
DPP-4 Inhibitors	16	1,785
Alpha Glucosidase Inhibitors	12	815
Thiazolidinediones	4	76
SGLT2 Inhibitors	1	91
INSULIN		
Insulin Mixtard	73	7,667
Fast acting Insulin	4	2,229
Regular Insulin	34	957
Long acting Insulin	4	397
Rapid acting Insulin	2	330

Overall it is found that the DM patients who visits out-patient department spent Rs 3,544/month for their DM management. Further, this cost increases when they got admitted due to DM management and for complication management. The type of DM, gender, age does not have any impact on the total average expenditure of management of DM. Drug costs contributes more for the patients who visits out-patient department whereas in-hospital charges contributes more for patients who got admitted for DM and its complication management.

DISCUSSION

The study was conducted to determine the average direct cost spent for the management of DM and its complications per month. Regardless of type of DM, the average direct cost spent

by patients who visits out-patient department for the management of DM is Rs 3,544 ± 1,379/month. Among the total direct cost 91% of cost is contributed by drugs. Thus the direct costs were significantly increased with the increased drug cost. Similarly in a comprehensive literature review conducted by Yesudian et al in 2014, estimated direct and indirect cost of DM and found that drug cost contributed more than half of the total direct cost ^[4]. Various studies estimated for cost components, in that drug costs accounted for more than half of the total direct costs ^[9] ^[6].

Thus the drug cost is on rise, in India, the two main barriers to access medicines are poor procurement procedures and weak supply chain systems which contribute to low quality, high price and variable availability of drugs ^[10].

Patient who got admitted for DM and its complication management spent more than patients without complication in which, in-hospital charge contributes 66% of the total direct cost followed by drug cost with 32%. Akari et al in 2013 conducted a study in South India ^[10] and Ballista et al conducted a study with type 2 DM patients and found that hospital admission accounts for the largest part of DM cost ^[11]. Similarly in a study by Ramachandran A et al with 556 subjects from various regions of seven Indian states ^[5] and Al Maskari et al in 2004 conducted a study in Abu Dhabi with 150 patients where the in-hospital charges accounts the major part of the DM management ^[12]. However, the length of the hospital stay has a relatively high unit compared with other resources and overall medication cost.

In this study, there is no significant difference seen in laboratory, transport, consultation and food cost among the patients who got admitted for DM management and for DM complication management.

In the current study, patients with Foot complications spent Rs 29,499 ± 8,965 which is 8.5 times more than patients with no complication. Whereas a study conducted by Shobana R et al in Southern India, 2014, with 270 DM patients concluded that foot complication contributed highest cost among the different type of complications ^[13]. Among the various complications, foot complications incur high expenditure due to hospitalization and surgical management.

In this study, the total average direct cost spent by out-patients for DM management is Rs 3,544/month. The total average direct cost spent by the patients who got admitted for DM complication management is Rs 31,809/month. Cost is 10 fold increasing when patients got

admitted with DM complication. Similarly, in a study conducted by Bjork, patients with DM complications spent 3 times more than patients without complications ^[14]. It shows that the cost of DM care is escalating, thus increasing the economic burden to family.

CONCLUSION

In the management of DM, the cost of medication contributes more than 50% of total direct cost. Thus type of DM, age and gender does not have any impact on DM management cost. For DM out-patients the drug cost contributes more to the average total direct cost whereas patient who got admitted for management of DM and its complications, in-hospital charges accounts more followed by drug cost.

The prevalence and the number of DM patients in India is increasing every year, as per per-capita income, patient spent for DM management is above 50% of income, which becomes a great burden to individual. Considering the economic burden of DM in India, it is necessary to realize the cost effective measures of diabetic care like early screening, lifestyle modifications like diet restriction, aerobic exercise and assessment of organ damage.

LIMITATIONS

Large number of samples would have given accurate results.

Indirect and intangible cost was neglected.

Study was carried out in single centre.

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CONFLICT OF INTEREST

There is no conflict of interest.

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