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Health-care cost of diabetes in South India: A cost of illness study

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ABSTRACT

Objective: The objective of this study is to analyze the health-care cost by calculating the direct and indirect costs of diabetes with co-morbidities in south India.

Methods: A prospective observational study was conducted at Rohini super specialty hospital (India). Patient data as well as cost details were collected from the patients for a period of 6 months. The study was approved by the hospital committee prior to the study. The diabetic patients of age >18 years, either gender were included in the study. The collected data was analyzed for the average cost incurred in treating the diabetic patients and was calculated based on the total amount spent by the patients to that of total number of patients.

Findings: A total of 150 patients were enrolled during the study period. The average costs per diabetic patient with and without co-morbidities were found to be United States dollar (USD) 314.15 and USD 29.91, respectively. The average cost for those with diabetic complications was USD 125.01 for macrovascular complications, USD 90.43 for microvascular complications and USD 142.01 for other infections. Out of USD 314.15, the average total direct medical cost was USD 290.04, the average direct non-medical cost was USD 3.75 and the average total indirect cost was USD 20.34.

Conclusion: Our study results revealed that more economic burden was found in male patients (USD 332.06), age group of 51-60 years (USD 353.55) and the patients bearing macrovascular complications (USD 142.01). This information can be a model for future studies of economic evaluations and outcomes research.

Keywords: Cost analysis; diabetes; economics; health-care

INTRODUCTION

Pharmacoeconomic evaluations have grown to be an essential tool in therapeutic decision making especially in chronic diseases like diabetes, where there are limited resources. Pharmacoeconomic research is the process of identifying, measuring and comparing the cost, risks and benefit of programs, services or therapies and determining, which alternatives produce the best health outcomes for resource invested.[1,2] The economic burden of diabetes mellitus (DM) on patients, institutions and society in the form of direct and indirect costs is enormous world-wide. The prevalence of DM is rising in alarming scale in India, which poses a major threat to clinical management, economic growth and social well-being of the patients.[3,4] In 2011, 366 million adults with diabetes were recognized and by 2030 this will definitely rise to 552 million adults. This number will be continuing to increase globally due to the high growth of population size, age, urbanization and high prevalence of obesity and sedentary life-style.[5] In 2011, a total of 4.6 million deaths were reported with diabetes. The total health care expenditures were Unites States (US) 465 billion dollars in the same year of which 11% were adults within the age group of 20-79 years.[6] Although the South-East Asia region comprises only seven countries, it is one of the most heavily populated regions in the world. The adult population of India alone accounts for 86% of the region's total population of 856 million in 2011. Current estimates indicate that 8.3% of the South-East Asian adult population or 71.4 million people had diabetes in 2011 of which 61.3 million are from

India. The number of people with diabetes in India, Bangladesh and Sri Lanka make up to 99% of the total region. The estimated regional diabetes prevalence increases to 10.2% in 2030 as a consequence of increasing life expectancy in India (the proportion of the population over 50 years is expected to increase from 16% to 23% from 2011 to 2030).[7] The main objective of this study is to analyze the healthcare cost by calculating the direct and indirect costs of diabetes with co-morbidities in south India.

METHODS

A prospective observational study was conducted at super-specialty hospital, Andhra Pradesh, India. Patient's data as well as cost details were collected from the records for a period of 6 months (February-July 2012). The study was approved by the hospital committee prior to the study initiation. The diabetic patients of age greater than 18 years, either gender who stayed in hospital for a minimum of 2 days were included in the study. Out-patients, pregnant women and those who avail reimbursement were excluded.

A total of 150 patients were identified during ward rounds and through regular case record reviews during study period. The enrolled patients were followed from the day of admission until the day of discharge and the relevant study data including age, sex, height, weight, education, occupation, body mass index (BMI), smoking habit and medical and social history were collected. Total direct costs include direct medical and non-medical costs. The direct medical cost includes the medication costs, cost of laboratory investigations, cost of consultation and cost of hospitalization and the direct non-medical costs include the transportation cost to hospital and cost of food during the hospitalization. The indirect costs (i.e., productivity loss) were determined based on modified labor force, employment and earnings data based on job category for patients who were employed during the evaluation period.[8] The costs of drugs, syringes, administration, extra nursing and medical care and any other invasive or non-invasive procedures along with laboratory tests were collected. All the relevant and necessary data was collected from patient's case notes, treatment charts, laboratory reports, interviewing patients or patient care takers, interviewing health-care professionals, or other relevant sources. Data pertaining to the cost of extra medications and administration devices was collected from the patient (interviewing), patient case sheets, nurses and pharmacy records.

The data observed was analyzed for the average cost incurred in treating the diabetic patients and was calculated based on the total amount spent by the patients to that of total number of patients. Patient perspective was taken for the analysis of cost component and the details were collected by direct patient interview. Details of direct medical cost, direct non-medical cost and indirect cost were analyzed. Other costs such as intangible cost and opportunity cost were excluded. From the data obtained, overall cost per diabetic patient as well as total cost per period of 6 months was calculated. All the costs data of Indian Rupee (INR) was converted into United States dollar (USD) at the rate of 1 USD = 54.26 INR value in the year 2012.

RESULTS

A total of 150 patients were enrolled during the study period. Out of 150 patients, 100 (66.67%) were males and 50 (33.33%) were females. The other demographic details such as age, educational status, occupational status, family history and duration of diabetes, BMI, co-morbidities, length of hospital stay and number of drugs per prescription were summarized in Table 1.

The average total cost per diabetic patient without complications was USD 29.91. Out of USD 29.91, the average total direct medical cost per patient was USD 27.33 (91.37%); direct non-medical cost was USD 0.36 (1.23%) and indirect cost was USD 2.21 (7.4%). The average total cost for the treatment of diabetes with co-morbidities per patient was found to be USD 314.15. Out of USD 314.15, the average total direct medical cost per patient was USD 290.04 (92.41%); direct non-medical cost was USD 3.75 (6.47%) and indirect cost was USD 20.34 (1.12%). The individual total direct medical cost components of diabetic patients (*n* = 150) were summarized in the Table 2. Out of 150 patients, the patients who have macrovascular complications were found to spend more health care cost compared with others. The male patients were found to have more healthcare cost compared to female patients. Furthermore, the age group of 61-70 years was found to have spent more health care cost than others. Individual costs were summarized in Table 3.

DISCUSSION

Our study results reveal that the cost of hospitalization, consultation and cost for other drugs were high and the cost of investigation and cost of medication for diabetes were less when compared to the study conducted by Kapur *et al.*[9] The overall average health care costs during the hospital stay were found to be higher in males than females and it was also found to be higher in the age group of 51-60 years followed by 61-70 years, which might be due to increased

Table 1: Demographic details of the studied patients (*N*=150)

Demographic details	No. patients (%)
Educational status	
Illiterate	36 (24)
Primary (1-7th class)	29 (19.34)
Higher secondary (7-12th class)	54 (36)
U.G and P.G	31 (20.66)
Occupational status	
House wife	41 (27.33)
Employee	36 (22.66
Pensioner	20 (13.33)
Self employed	15 (10)
Agriculture	26 (17.33)
Laborer	10 (6.66)
Student	2 (1.33)
Body mass index (kg/m²)	
Under weight (<18.50)	1 (0.67)
Normal weight (18.51-24.99)	30 (20)
Over weight (25.00-29.99)	78 (52)
Obese (≥30.00)	41 (27.33)
Family history of diabetes	
Paternal	28 (18.67)
Maternal	10 (6.67)
Both paternal and maternal	49 (32.66)
No family history	63 (42)
Age groups (Years)	
18-30	1 (0.68)
31-50	85 (56.66)
51-70	32 (21.33)
>70	32 (21.33)
Duration of diabetes	
Less than 1 year	9 (6)
1-5 years	86 (59.34)
5-10 years	40 (26.66)
More than 10 years	11 (7.33)
Co-morbid condition	
Hypertension	70 (46.67)
Ischemic stroke	30 (20)
Cellulites	23 (15.34)
Ischemic heart disease	4 (2.66)
Chronic renal failure	6 (4)
Retinopathy	3 (2)
Urinary tract infection	11 (7.33)
No. drugs per prescription	
2-5	5 (3.34)
6-9	97 (64.66)
10-13	47 (31.33)
More than 13	1 (0.67)
Length of hospital stay (Days)	
2-5	64 (42.67)
6-9	53 (35.33)
10-13	29 (19.33)
More than 13	4 (2.67)

U.G=Undergraduate program, P.G=Postgraduate program

number of co-morbidities; similar results were found in the Henriksson *et al.*, Al-Maskari *et al.*, and Hogan

Table 2: Direct medical cost components (per patient) in the studied diabetic patients (total cost: INR. 15738, USD. 255.32)

Components of cost (average)	Costs		
	INR	USD	% of total cost
Investigations/lab tests	1598	29.45	10.15
Medications for diabetes	380	7.00	2.42
Medications for co-morbidity conditions	3769	69.46	23.94
Hospitalization	7800	143.75	49.56
Doctors consultation	2191	40.37	13.93

INR=Indian Rupee; USD=United States Dollar

Table 3: Heath care cost (per patient) for gender and age wise distribution, diabetes and its complications among the studied patients

Characteristics	Direct medical cost		Direct non-medical cost		Indirect cost	
	INR	USD	INR	USD	INR	USD
Gender						
Male	16476	303.64	212	3.90	1420	26.17
Female	14258	262.77	186	3.42	470	8.66
Age						
18-30	13238	243.97	90	1.65	-	-
31-40	10599	195.33	145	2.67	2934	54.07
41-50	14780	272.39	183	3.37	2571	47.38
51-60	16802	309.65	269	4.95	2113	38.94
61-70	17426	321.15	197	3.63	-	-
71-80	15789	290.98	150	2.76	-	-
81-90	9452	174.19	259	4.77	-	-
Condition						
Diabetes	1483	27.33	20	0.36	120	2.21
Macrovascular	7000	129	106	1.95	600	11.05
Microvascular	4593	84.64	54	0.99	260	4.79
Infections	2662	49.06	24	0.44	124	2.28

INR=Indian Rupee; USD=United States Dollar. 1 USD=54.26 INR (year 2012)

et al. studies.[10-12] The overall average health care costs were found to be higher in the patients who have history of DM for more than 5 years when compared to those with a history of less than 5 years DM. Furthermore, the overall healthcare costs were found to be higher in the patients with more than three co-morbidities, which may be due to the more number of medications, laboratory investigations, consultations and hospitalization. In the present study, there was a positive relationship between increased costs of health care services with increased number of complications. In addition, the average healthcare costs were significantly increased with the increased length of the stay of the patients in the hospital. The hospital admission accounts for the largest part of diabetes cost; besides, the extra-need for inpatient hospital care for patients who have developed late

complications will greatly affect cost, since hospital bed-day has a relatively high unit cost compared with other resources and overall medication costs.[13] Furthermore, most of the diabetics consuming oral hypoglycemic agents will receive insulin soon after hospital admission for complications and this further increase the costs. It has been documented that urban people spend more money on diabetes compared with rural counterpart, not only due to better awareness but also due to greater affordability. The present study focuses on the direct and indirect cost spent due to type 2 diabetes by patients in semi-urban setup. Patients needed consultation not only from physicians, but also from cardiologists and surgeons, which may cause the increased health care cost. The main limitations of this study include its duration (6 months) and performing in a single center. In future, multi-central studies should be conducted to compare cost of diabetes.

To the best of our knowledge, it is the first study in assessing the health care costs of diabetes in south Indian population, Andhra Pradesh. This information can be a model for future studies of economic evaluations and outcomes research.

AUTHORS' CONTRIBUTION

All authors contributed in the idea of research, design of study, data analysis and manuscript preparation.

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Announcement