Economic Burden of Diabetes Management in the University Teaching Hospital in South India

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Abstract

Introduction: India is the 'Diabetes Capital' of the world. The number of cases of diabetes is sharply increasing and so are the complications from diabetes. Owing to the chronic nature of the disease, cost of care is a cause of concern.

Methods: It is a prospective study designed at a 1,350-bed university teaching hospital in South India. A total of 300 patients from outpatients and in-patients were included in the study. Direct and indirect cost of diabetes management was derived from each individual bill. Cost of illness for a patient was calculated to understand the economic burden.

Results: Average direct cost of a single visit of a podiatry patient in OP was ₹1,594 and for a diabetes patient was ₹1,400. Cost of hospitalization of a podiatry patient was ₹52,574 and for a diabetes patient was ₹31,999.

Conclusion: High cost of care of diabetes and diabetes-related complications by both direct and indirect costs drive the urgency to have governmental/insurance support for chronic disease management for better living.

Keywords

Diabetes, economic burden, podiatry

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Introduction

The prevalence of diabetes is increasing worldwide, especially in emerging economies like India. In India, the prevalence of diabetes has risen from 2.1 per cent in 1970 to about 12.1 per cent in 2000. This increase in diabetes is likely to impose a large burden on India's economy (Ramachandran et al., 2001). This is largely because of the cost of diabetes-related complications, which account for more than 70 per cent of the cost of diabetes therapy. The financial burden due to diabetes stems from not only the medicine cost but also from charges due to consultation, investigation, hospital stay and surgeries done for the complication of diabetes. Apart from this, indirect cost which arises from the time lost, loss of productivity, travel cost, loss of income of bystander and the patient is also important.

Given the wide variability in the stage, severity and complications of the disease, calculating the economic burden of diabetes at the individual level is a highly complex task. There have been several studies from India on the cost of diabetes therapy (Ramachandran, Snehalata, Latha & Vishwanathan, 1997). These excellent studies have either been done in specialized diabetes centres or in government institutions. It is well known that diabetes affects virtually every organ in the body, and that diabetes care requires specific inpatient and outpatient treatments by various specialists. Therefore, it is useful to ascertain diabetes-related spending in a multi-specialty private hospital setting. We attempted to relate the economic burden on patients with diabetes attending a specialized tertiary care hospital in South India.

Methodology

The prospective study was conducted in endocrinology department. Both outpatients and inpatients were included. We included all diabetic patients who have attended the hospital outpatient and inpatient areas for the period from 1 December 2012 to 13 February 2013. A total of 300 patients from outpatient and 300 from inpatient areas were included in the study. In the 'primary' data collection methods, we included interviews with patients and relatives with a predetermined questionnaire. 'Secondary' data collection methods include extraction of data from the billing database of the hospital information system (HIS). Direct cost of the outpatients includes registration fees, consultation fees, pharmacy charges, laboratory charges and radiology charges. Indirect cost of the outpatients was travel expense, disability, loss of income of the patient, food charges and room rent. Direct cost of the inpatients was consultation fees, pharmacy charges, lab charges, radiology charge, procedure cost and room charges, while indirect cost includes travel expense, disability, loss of income of the patient and food charges. From these primary and secondary data, we attempted to calculate the cost of illness and the current census shows that the Cochin population is around 3,279,860. Of this, the urban population is 2,232,601. The rural population is 1,047,259. By using a formula to calculate the cost of illness, we calculated the average total cost per person. The cost of illness (COI; Ahuja, 1979) is defined as the value of the resources that are expended or foregone as a result of a health problem. The COI includes health sector costs, the value of lost productivity by the patient (indirect cost) and the cost of pain and suffering (intangible costs). The cost of illness is calculated as: COI = number of episodes × (direct cost per episode + indirect cost per episode).

Statistical Analysis

The statistical analysis was done using the statistical software SPSS version 20. Due to the skewed data, we have used the nonparametric tests for analysis. Spearman's rank correlation method was used for

finding the correlation between age, duration of hospitalization and outpatients and hospitalized patients. Kruskal–Wallis test was used for comparing the difference of various costs both outpatient and inpatient between different zones and different types of treatments. All the tests are two-sided at the 5 per cent level of significance.

Results

Characteristics of the patients enrolled in the study are described in Table 1. Majority of the patients studied were podiatry outpatients and hospitalized patients. The average direct cost of a single visit of podiatry patients in outpatient setup was ₹1,594 and in the case of diabetes patients was ₹1,401. The average cost of a single hospitalization of podiatry patients was ₹52,574.20 and diabetes patients ₹31,999.60 (Table 1). We also analyzed the correlation between age and the cost of hospitalization. Our results show that the direct cost of therapy increased with increasing age, as well as with an increasing duration of hospitalization (Table 2). The result also shows that there is a significant increment in various costs of podiatry patients compared to diabetes patients, both outpatients and hospitalized patients, except in direct cost of outpatients.

We sought to analyze the various factors contributing to direct and indirect costs of therapy, and the results are summarized in Figure 1. Medication (pharmacy)-related costs accounted for the highest proportion of direct cost among outpatients, while intensive care unit (ICU) charges accounted for the highest proportion among the parameters contributing to direct cost among hospitalized patients (Pradeepa & Mohan, 2002). Travel-related costs accounted for the highest proportion of indirect cost among outpatients, while the cost incurred by the person accompanying the patient, that is, travel, accommodation and salary loss (due to absenteeism) accounted for the highest proportion among the parameters contributing to indirect cost among hospitalized patients.

Table 1. Overall Cost of a Single Visit to Hospital in an Outpatient and Inpatient Setup of Podiatry and Diabetes Patients

	Outpatient (n = 300)		Hospitalized Patients (n = 300)	
Variables	Podiatry (171) Medication (129)	p-value	Podiatry (190) Medication (110)	p-value
Sex				
Male	92 (54%) 84 (65%)		150 (79%) 84 (76%)	
Female	79 (46%) 45 (35%)		40 (21%) 26 (24%)	
Age	56.14 ± 12.56 56.06 ± 12.06	0.851	58.41 ± 14.662 55.42 ± 21.087	0.757
Costs				
Direct cost	1,594.88 ± 2,524.87 1,401.98 ± 1,771.287	0.626	52,574.20 ± 41,527.57 31,999.60 ± 23246.21	<0.001
Indirect cost	2,179.81±1,761.99 1,377.10 ± 749.18	<0.001	6,295.99 ± 2,260.64 5,363.13 ± 2,161.64	<0.001
Total cost	3,774.68 ± 3,023.83 27,779.08 ± 1,836.25	<0.001	5,8870.19 ± 41,371.43 47,071.83 ± 23,356.83	<0.001

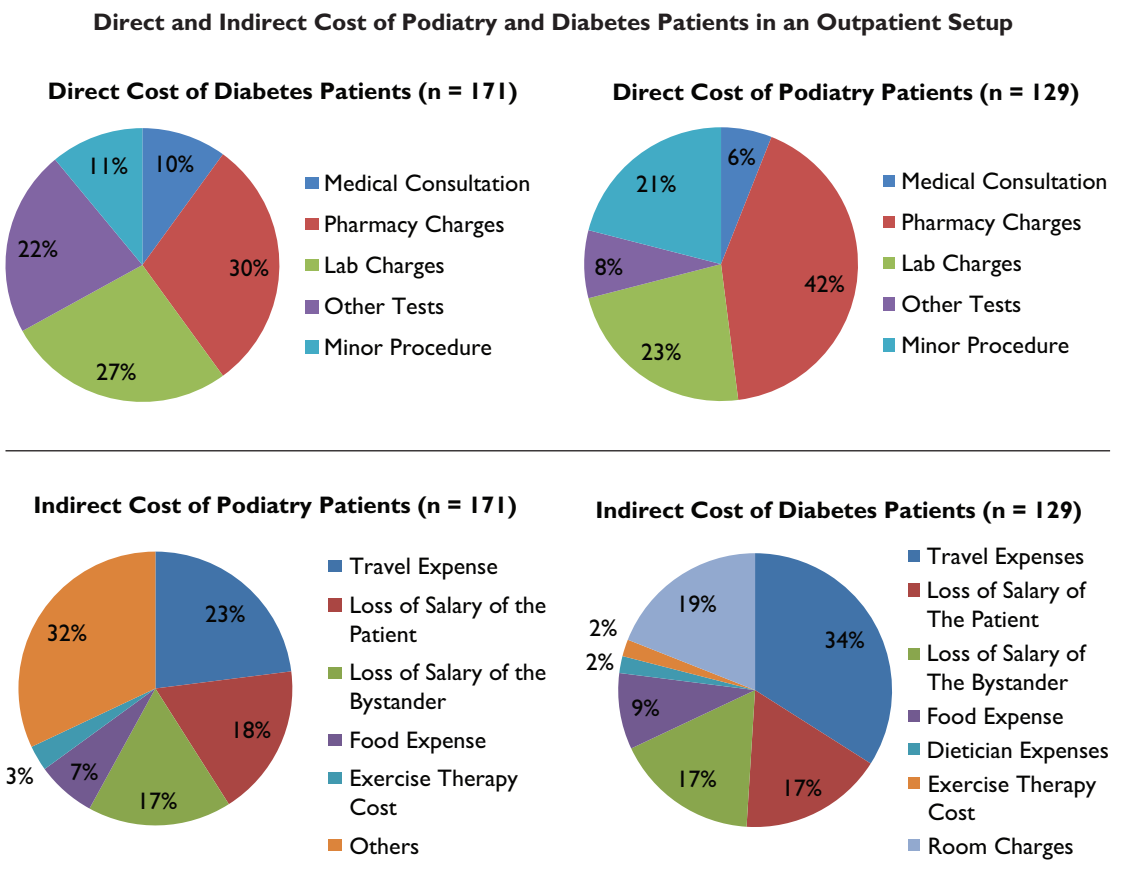
Source: Individual Case Record Forms and Patients Bills.

Note: There is a significant difference in the costs of diabetes and podiatry patients, both outpatients and hospitalized patients, except in the direct cost of outpatients.

Table 2. Analysis of Correlation between Age, Duration of Hospitalization and Various Costs

	Hospitalized Patients				Outpatients	
	Age		Duration of Hospitalization		Age	
Costs	*r*	*p*-value	*R*	*p*-value	*r*	*p*-value
Direct cost	0.248	<0.001	0.393	<0.001	–0.054	0.355
Indirect cost	–0.068	0.239	0.029	0.625	–0.096	0.096
Total cost	0.245	<0.001	0.396	<0.001	–0.093	0.108

Source: Individual Case Record Forms and Patients Bills.
Note: There is a significantly low correlation between age, duration of hospitalization and various costs except indirect cost of inpatients, where there is no correlation between age and various costs in OP patients.



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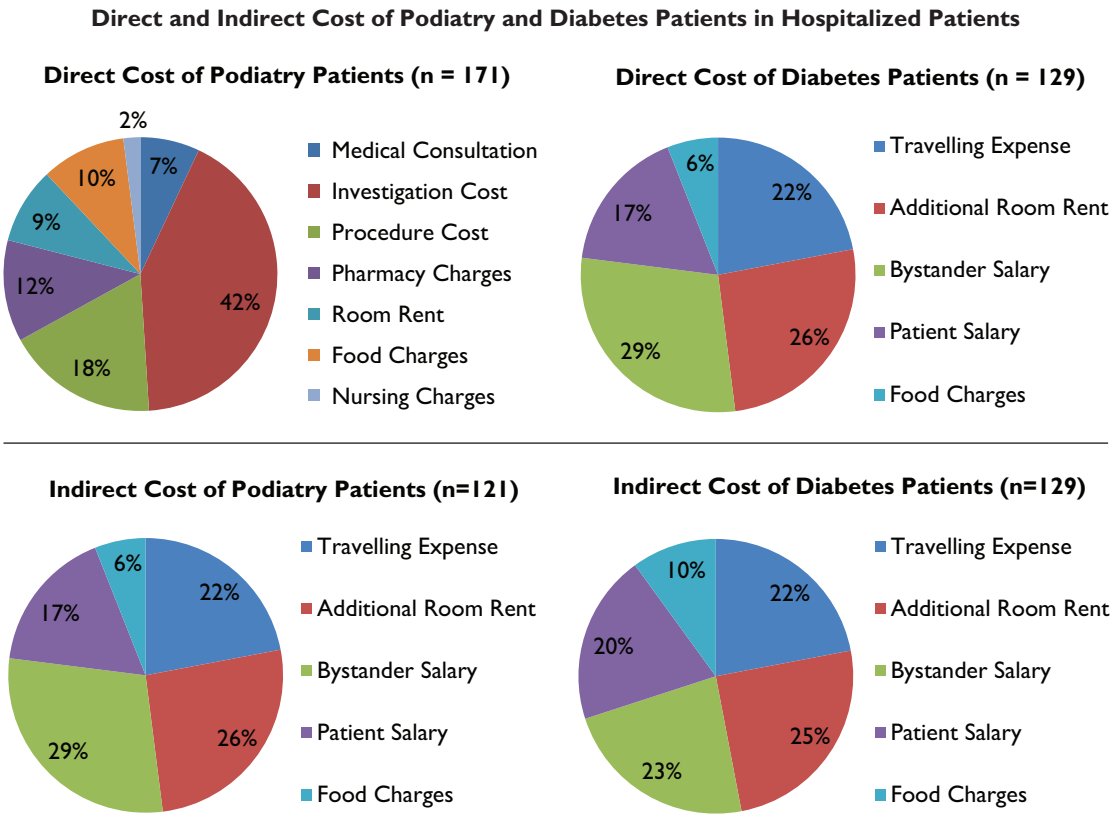

Figure 1. Cost Distribution of Podiatry Patients and Diabetes in an Inpatient and Outpatient Setup

Source: CRFs and data collection sheets.

The results suggested a statistically significant correlation between the distance travelled and indirect cost of care for both hospitalized patients as well as outpatients. The direct costs, that is, pertaining to patient care, did not show a statistically significant difference with the distance travelled (Table 3). This analysis did not include Zone 5 (patients from outside Kerala), as this subgroup had a very small sample size ($n = 6$ for outpatients and $n = 0$ for hospitalized patients) (Table 4).

Discussion

The results of our study show a strikingly high cost of diabetes treatment in a tertiary care hospital in South India (Kwauja, Rafique, White & Azam, 2004). The high average cost of a single hospitalization or a hospital visit could be due to the fact that this study was done in a tertiary care centre, where patients visited when they had major complications due to diabetes, such as, foot-related events, coronary disease or chronic kidney disease.

Table 3. Comparison of Various Costs between Different Zones in Outpatients and Hospitalized Patients

Costs	Zones	Hospitalized Patients				Outpatients			
		n	Mean	SD	*P*-value	*n*	Mean	SD	*p*-value
Direct cost	Zone 1 (<50 km)	84	40,910.74	31,961.14	0.96	137	1,247.88	1,134.45	0.094
	Zone 2 (50–100 km)	102	37,871.76	26,606.13		80	1,247.82	1,128.18	
	Zone 3 (100–200 km)	100	50,763.80	51,513.97		67	1,506.42	1,137.79	
	Zone 4 (200–300 km)	14	45,258.83	42,651.38		9	7,15.67	793.52	
	Zone 5 (>300 km)					6	1,181.67	702.75	
Indirect cost	Zone 1 (<50 km)	84	4,715.85	1,741.93	<0.001	138	1,807.30	1,938.03	<0.001
	Zone 2 (50–100 km)	102	6,359.76	2,2830.02		80	1,729.19	923.88	
	Zone 3 (100–200 km)	100	6,411.04	2,097.82		67	1,980.99	893.96	
	Zone 4 (200–300 km)	14	7,203.43	3,187.77		9	1,732.78	724.67	
	Zone 5 (>300 km)					6	2,388.33	860.82	
Total cost	Zone1 (<50 km)	84	45,626.58	32,276.45	0.59	137	3,061.61	2,568.79	0.005
	Zone 2 (50–100 km)	102	44,231.51	26,406.54		80	2,977.00	1,532.17	
	Zone 3 (100–200 km)	100	57,174.84	51,105.19		67	3,487.40	1,556.43	
	Zone 4 (200–300 km)	14	52,462.26	41,717.26		9	2,448.44	1,134.57	
	Zone 5 (>300 km)					6	3,570.00	1,550.56	

Source: Individual Case Record Forms and Patients Bills.

Notes: Zone 1 = Kochi (<50 km)
Zone 2 = Thrissur, Alappuzha and Kottayam (50–100 km)
Zone 3 = Palakkad, Pathanamthitta, Idukki, Kollam and Kozhikode (100–200 km)
Zone 4 = Kannur, Thiruvanathapuram (200–300 km)
Zone 5 = Hyderabad, Coimbatore (>300 km).

Our study has several limitations: first, it was done in a privately funded tertiary multi-specialty care centre and therefore does not reflect the cost incurred by patients either in the government hospitals or in specialized diabetes care institutes. However, data from government hospitals and private care centres are already available (Ramachandran et al., 1997, 2001). This article only seeks to supplement the information with data from a privately funded tertiary multi-specialty care center. A second limitation is that the study was done in a department with a full-fledged diabetes foot care unit, and therefore the high cost of treatment incurred could have been due to diabetic foot-related hospitalizations, revascularizations and amputations. A final limitation is that clinical data on duration of diabetes as well as prevalence of complications was not available.

Nevertheless, we believe that these results offer an interesting glimpse into the economics of tertiary-level diabetes care in India (Caro, Ward & O'Brien, 2002). The high tertiary care cost incurred by patients makes it imperative for the society and government to take steps to improve primary- and secondary-level diabetes care to prevent the onset of diabetes-related complications that may require hospitalizations and tertiary-level care. The need for patients to travel long distances, as well as the direct correlation between cost and distance travelled are important pointers for public health policy-makers. This is because these results suggest the need for accessibility to quality diabetes care even in remote and underserved areas. Finally, a very important result in our study was the cost incurred by the

Table 4. Projection of Diabetes for Kochi, Kerala and Indian Population

	Kochi		Kerala		India	
	IP	OP	IP	OP	IP	OP
Population	3,279,860	3,279,860	33,387,677	33,387,677	1.21 billion	1.21 billion
Urban	2,232,601	2,232,601	8,667,441	8,667,441	742,490,639	742,490,639
Rural	1,047,259	1,047,259	24,720,236	24,720,236	286,119,689	286,119,689
Pre-urban	0.11802	0.11802	0.11802	0.11802	0.11802	0.11802
Pre-rural	0.03867	0.03867	0.03867	0.03867	0.03867	0.03867
Pre. rate urban population	11.802	11.802	11.802	11.802	11.802	11.802
No. diabetic urban population	263,491.57	263,491.57	1,022,931.387	1,022,931.387	87,628,745.21	87,628,745.21
No. diabetic rural population	40,497.50553	40,497.5055	95,5931.5261	95,5931.5261	11,064,248.37	11,064,248.37
Pre. rate rural population	3.867	3.867	3.867	3.867	3.867	3.867
Direct cost	13,009,424.64	385,245	13,009,424.64	385,245	13,009,424.64	385,245
Indirect cost	1,786,778	550,393	1,786,778	550,393	1,786,778	550,393
Total cost	14,796,202.64	93,5638	14,796,202.64	93,5638	14,796,202.64	935,638
Total cost per person	49,320.67547	3,118.79333	49,320.67547	3,118.793333	49,320.67547	3,118.793333
COI	98,641.35093	37,425.52	98,641.35093	37,425.52	98,641.35093	37,425.52
COI urban population	25,991,164,426	9,861,309,024	100,903,333,908.03	38,283,739,076.06	8,643,817,808,578.77	3,279,551,356,610.65
COI rural population	3,994,728,655	1,515,640,203	94,294,377,136	35,776,234,449	1,091,392,406,636.80	414,085,248,792.26

Source: Individual Case Record Forms and Patients Bills.
Note: IP = inpatient, OP = outpatient.

accompanying person. In terms of travel, accommodation and economic loss due to absenteeism, our study shows that the presence of an accompanying person (often called bystander in local usage of English) comes at a high cost. Though the prevalence of geriatric age group population is increasing in Kerala, this high bystander-related cost was not due to advanced age of the study subjects (the mean age was less than 60 years). This suggests that the presence of a bystander (e.g., son, daughter, spouse, sibling or servant) is imperative in diabetic patients who are in their 50s, regardless of whether they receive inpatient or outpatient care. This is a problem that has no solutions, and answers probably lie in the economics of health insurance, taxation, publicly funded care of the sick, or as is often the case in India, the need for nongovernmental agencies to step into the picture to offer solutions (Huizinga & Rothman, 2006). To summarize, the results of our study are strikingly high when tertiary-level treatment is required by patients with diabetes. While medication-related costs were important in the outpatient setting, ICU-related costs were important in the inpatient setting. The high cost incurred for travel and personal care of the patient makes it important that health policymakers explore new ways to tackle the emerging spectre of diabetes and its complications.

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