

Original Research Article

Cost associated with hospitalization of non-adherent type 2 diabetes patients in a tertiary healthcare facility in Ibadan, Nigeria

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Sent for review: 22 November 2018

Revised accepted: 23 March 2019

Abstract

Purpose: To estimate the cost of hospitalization associated with medication non-adherence among type 2 diabetes mellitus (T2DM) patients in a tertiary healthcare facility in Nigeria.

Methods: Three hundred and fifty-four (354) medical records of T2DM patients admitted into the medical wards from 2013 to 2015 were used for the study. Medical records with history of medication non-adherence (MNA) prior to hospitalization as indicated by physicians were included in the study. Direct medical costs associated with the management of the patients during hospitalization were measured using out-of-pocket payer perspective. Pearson product moment correlation coefficient was used to determine the relationship between the variables, with $p < 0.05$ considered statistically significant.

Results: Among the 354 admitted patients, 226 (63.8 %) had a record of MNA. The mean age was 57.5 years \pm 14.6. The majority of the patients (61.5 %) were either petty traders or artisans/self-employed. Duration of hospitalization increased with increase in number of comorbid disease (Pearson product moment correlation $r = 0.13$ $p = 0.05$). Total cost incurred during hospitalization was US\$146,669.3 (average, \$ 650.1), of which more than one quarter was cost of medications. Cost of management and cost of laboratory investigations increased with increase in the number of co-morbid diseases ($r = 0.24$, $p = 0.00$; $r = 0.2$, $p = 0.02$, respectively). Cost of management also increased with increase in days of hospitalization ($r = 0.2$, $p = 0.00$).

Conclusion: Cost of hospitalization related to non-adherence to medication is high among the studied population. There is need to work out strategies to enhance adherence among diabetes patients.

Keywords: Non-adherence, Cost, Management, Hospitalization, Co-morbid diseases

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Tropical Journal of Pharmaceutical Research is indexed by Science Citation Index (SciSearch), Scopus, International Pharmaceutical Abstract, Chemical Abstracts, Embase, Index Copernicus, EBSCO, African Index Medicus, JournalSeek, Journal Citation Reports/Science Edition, Directory of Open Access Journals (DOAJ), African Journal Online, Bioline International, Open-J-Gate and Pharmacy Abstracts

INTRODUCTION

Diabetes mellitus (DM) is a group of chronic medical conditions in which there is derangement of metabolism in the body. It could occur when

there is absolute or low insulin production or resistance to the produced insulin, resulting in a sustained hyperglycaemic state [1]. The persistent hyperglycaemia and associated complications requires intensive care and visit to

healthcare facilities, which increases the cost of care of the disease.

Globally, about 285 million people were living with DM in 2010. This was projected to double by 2030 [2]. In Nigeria, there is no nation-wide survey or any research within Nigeria with current report on the prevalence of diabetes in the country. The last national survey of non-communicable diseases (NCDs), carried out in 1997, reported 2.2 % as prevalence of diabetes in Nigeria [3]. However, the prevalence of T2DM has been high and is still increasing in Nigeria, with the country reported as having the highest burden of diabetes in Africa [4]. Globally, the number of patients with diabetes has been projected to double by 2050 [2]. Therefore, the prevalence of diabetes is high. This is a concern for both public health and public policy. Oral diabetes medications and insulin are the core agents for management of diabetes. However, about one-third of diabetic patients do not attain optimal benefit from the therapy due to medication non-adherence (MNA) [5].

Adherence with medication therapy is generally low among patients with chronic conditions such as diabetes [6]. In the United States, poor adherence to medication has been shown to lead to an estimate of 125,000 deaths annually and 33 to 69 % of medication-related hospital admissions [7, 8]. Many studies have reported that MNA is associated with increase in inpatient admission, emergency department visit, and total diabetes-related cost [6,9]. Medication non-adherence (MNA) has been shown to cost \$100 to \$300 billion each year on avoidable hospitalization in the US when both direct and indirect costs are included, this represented 3 to 10 % of total US healthcare costs [8].

In 2010, 12 % of the health expenditures and US\$ 1330 (ID 1478) per individual was anticipated to be spent on diabetes mellitus globally [10]. However, this expenditure was found to vary by age group, sex, region, and country's level of income [10]. Many factors can lead to poor medication adherence among patients. Nevertheless, high costs of medications and co-payments that some patients have to pay for medications prescribed for them have been shown to negatively effect adherence to medication [11].

The World Health Organisation claims that over the past decade, there was greater increase in the prevalence of diabetes in low- and middle-income countries than what was reported in high-income countries [12]. Past studies in Nigeria have been mainly on the burden of diabetes in

the country [13,14]. Data on cost of hospitalization resulting from non-adherence to medication(s) among patients diagnosed with diabetes mellitus are scarce. Therefore, this study estimated the cost associated with hospitalization among non-adherent T2DM patients in one of the largest tertiary healthcare institutions in southwestern Nigeria.

METHODS

This study involved collection of data from case notes of patients diagnosed with T2DM and admitted to the University College Hospital (UCH) Ibadan, Nigeria. They had a record of subjective assessment of the physician for non-adherence to medication as documented in their case notes at the point of admission (in 2013, 2014 and 2015) into the hospital.

Study population

Available information from the Record Department of UCH indicated that 354 patients were on admission during the 3-year period. Out of this figure, 226 had records of subjective assessment of physician for non-adherence to medication as documented in their case notes at the point of admission and were available for use for the study.

Data collection

The case notes of the patients admitted in the years 2013, 2014 and 2015 were retrieved from the Statistics Section of the Record Department in the University College Hospital (UCH). Each case note was well screened and anyone with a record of non-adherence to medication(s) as indicated by physician in the case note clerking was included in the study.

Three hundred and fifty-four (354) case notes were retrieved and 226 were found to have records of non-adherence to medication(s). The remaining 128 were those who had no record of non-adherence to therapy due to the fact that they were newly diagnosed cases and some others were admitted to the hospital as a result of other comorbid diseases but had good blood glucose control.

Data were retrieved from the case notes assessed for cost of non-adherence arising from cost of hospitalization. They included costs of investigations, medications, consumables, bed fee, oxygen use, procedures, physiotherapy services, dressings and of transportation. These were calculated as direct cost associated with

their hospitalization resulting from non-adherence to medication(s).

The primary outcome variables were cost types (medications, diet, bed fee, laboratory investigations, procedures, use of other hospital facilities, and transportation fee) measured in the 2013, 2014 and 2015 USD exchange rate using the out-of-pocket perspective. Costs for each year were presented as cost for the population of patients admitted due to non-adherence to medication(s) before admission that year. Other variables included were age, sex, marital status, residence, and comorbidities.

The comorbidities included anaemia, stroke, heart failure, cardiovascular disease, hypertension, liver disease, diseases of the lung, renal failure (chronic and acute), peptic ulcer disease and bleeding; they were defined according to ICD-9 codes. The comorbidities were categorized as count of comorbidities, which was defined as 0, (that is none), 1, 2, and 3 or more. This count has been reported to be more efficient [5].

The cost items for this study included direct medical cost and non-medical cost. Direct medical cost included cost of medications (diabetes medication, hypertension, comorbid diseases), cost of all laboratory investigations related to disease state, bed fee, procedures (amputation), cost of blood transfusion, dressings, use of oxygen, physiotherapist service, nursing services.

The cost of medication was calculated using unit dose of medication used and summing up total cost of medication used for the period of hospitalization. The cost for all the direct medical cost was based on hospital tariff of each year studied. The non-medical cost was cost of transportation (to and fro from the hospital) based on National Union of Road Transport Workers' (NURTW's) tariff in the state.

Data analysis

Data were entered into SPSS version 23 and analysed. Pearson product moment correlation coefficient was used to determine the relationship between variables, with $p < 0.05$ considered statistically significant.

Currency exchange rate applied

1.0 US\$ was taken to be equivalent to a mean of Nigerian naira (₦)156.5 for 2013, ₦170.0 for 2014, and ₦ 189.0 for 2015 [16]. The mean

exchange rate over the 3-year period was ₦171.8 to US\$1.0.

Ethical approval

Ethical approval was received from the UI/UCH Research Review Board on 14th April, 2015, with certification no. UI/UCH EC and registration no. NHREC/05/01/2008a. The international guideline for human studies used was the NIH guideline for human subject research protection. This guideline was borne in mind when collecting data retrospectively [15].

RESULTS

The total number of the available case notes of admitted patients primarily diagnosed with T2DM within the study period was 354. Those with a record of non-adherence to medication(s) which resulted in their hospitalization were 226, which was 63.8 % of the admitted patients. The number of patients admitted in each year with a record of non-adherence included: 83 (36.7 %), for 2015; 68 (30.1 %), for 2014; and 75 (33.2 %), for 2013. There were 115 (50.9 %) males and 111 (49.1 %) females. The patients had a mean age of 57.5 years (SD, 14.56) and an average duration of diabetes of 6.0 years (SD, 5.77). The majority 148 (65.5 %) had been diagnosed for 1-5 years, 50 (22.1 %) for 6 - 10 years, and 28 (12.4 %) for > 10 years. About 85 (37.6 %) lived outside the Ibadan metropolis, while 141 (62.4 %) lived within the metropolis.

As for the number of days on admission: 114 patients (50.4 %) were admitted for 1 - 10 days; 90 (39.8 %) for 11-20 days; and 22 (9.7 %) patients for > 20 days. The mean duration of admission was 11.9 days (SD, 10.6) and mean HbA1c among the patients was 10.45 % (SD, 1.94 %).

Table 1: Occupation of patients

Occupation	Frequency	Percent
Petty trader	62	27.4
Self-employed	40	17.6
Retiree	39	17.3
Artisan	37	16.4
Civil servant	30	13.3
Unemployed	18	8.0
Total	226	100.0

With regard to reasons for non-adherence, the majority of the patients had a record of cost-related non-adherence 152 (69.0 %), and being tired of taken multiple drugs 46 (20.3 %), while 28 (12.4 %) had no record of reason for non-adherence to medication(s).

Among this population, 101 (44.7%) patients were being managed for T2DM and other comorbid conditions, while 125 (55.3 %) were both hypertensive and T2DM patients. Also, 32 (14.2 %) were National Health Insurance Scheme enrollees, while 194 (85.8 %) were not and pay for the medical bills out of their pockets.

Table 2: Co-morbidity conditions presented by the patients and cost of management during their hospitalization

Co-morbid condition	Frequency (%)	Cost of management (US\$)
Hypertension	125 (66.4)	1,413.1
Neuropathy	74 (32.7)	2,199.4
Diabetic foot ulcer	40 (17.7)	33,685.0
Dyslipidemia	32 (14.2)	846.2
Chronic Renal Failure	31 (13.7)	9,836.8
Lung disease	25 (11.1)	741.1
Cerebrovascular disease(stroke)	13 (5.7)	4,230.3
Cardiovascular disease (HHDx)	13 (5.7)	1,782.0
Liver diseases	8 (3.5)	923.6
Retinopathy	6 (2.7)	756.0
Congestive heart failure	6 (2.7)	73.1
Peptic ulcer disease and bleeding	6 (2.7)	1,148.0
Total		47,798.1

Exchange rate for the three years was ₦171.8 to US\$1.0

The cost of management of the complications was 32.5 % of the total cost of management. The cost related to foot care included dressing of ulcer/wound for the 40 patients and amputation for the 24 patients (US\$11,251.5), control of the blood glucose (\$15,933.9) and use of antibiotics (US\$6,441) was US\$33,626.4, which was an average of US\$842.1 per patient. The cost of management of DM foot was 22.1% of the total Cost-of-Illness (COI) for the 226 patients. The cost of management of chronic renal failure (CKD) among the 31 patients was estimated to be US\$6,327.2, giving an average of US\$204.1 per patient. The patients managed for CKD had some other costs of management added to their cost items. These included cost of anaemia, electrolyte imbalances, dialysis, and laboratory investigations related to the disease. The cost of management of retinopathy of 6 patients was US\$754.7 and average of US\$125.8 per patient.

The numbers of comorbid diseases was found to increase with increase in ages of patients (Pearson product moment correlation $r = 0.3$, $p = 0.00$). Duration of hospitalization increase with increase in number of comorbid disease (Pearson product moment correlation $r = 0.13$, $p = 0.05$).

Cost of management also increased with increase in days of admission ($r = 0.2$, $p = 0.00$), cost of laboratory investigation increased with increase in the number of comorbidities ($r = 0.2$, $p = 0.02$). Cost of management was found to increase with increase in comorbid diseases (Pearson product moment correlation $r = 0.24$, $p = 0.00$).

DISCUSSION

Diabetes has been shown to exert a heavy economic burden on patients, national health system and society at large, and the burden borne depends on the differences in the socioeconomic status, and social insurance policies of the countries the patient live in [10]. Nigeria currently has a health insurance scheme (National Health Insurance Scheme –NHIS), which mainly services civil servants in the country and few members of the private sector [17]. Although the scheme has put measures in place to extend its service to the informal sector of social health insurance programme, which includes rural dwellers, artisans and other people/community who are not public servants or uniformed officers, few people are enrolled in it.

In this study, the majority of the patients paid for healthcare out-of-pocket. Because they did not enroll with the NHIS, they privately funded their health care. This is supported by a previous study in Nigeria which reported that more than 90% of patients privately fund their healthcare bills [18]. Furthermore, the findings of this study support previous research which reported that patients diagnosed with and being managed for diabetes in low-income countries like Nigeria are responsible for payment of the bulk of their healthcare cost (out-of-pockets) because there are no financial risk protection mechanisms [19]. This implies that diabetes exerts a heavy economic burden on the patients and their relations, who have to help out in making funds available for the management of the condition. The need for more enlightenment of the public on the National Health Insurance Scheme, especially the informal sector, which will bring about a co-payment design and reduce patient's out-of-pocket payment, is highly essential.

Non-adherence to medication(s) has been shown to be responsible for 33 to 69% of medication-related hospital admissions in the US [8]. This is similar to the finding in this study, because more than one-third of the patients diagnosed with type 2 diabetes hospitalized during the period of study were due to non-adherence.

Table 3: Cost of hospitalization of patients for the 3-year period studied

Cost variable	Year of admission	Number of patients	Amount (\$)	Total (\$)	Mean cost/year (US\$)	Percent of total cost (%)
Other drugs (for Complications)	2015	75	15,962.5	40,204.9	193.5	27.4
	2014	68	11,997.4		178.3	
	2013	83	12,244.9		162.0	
Diabetes medications	2015	75	3,065.8	10,094.1	37.2	6.9
	2014	68	3,028.3		45.0	
	2013	83	4,000.0		52.9	
Anti hypertensives	2015	75	303.1	1,410.7	3.7	9.6
	2014	68	555.6		8.3	
	2013	82	552.0		6.1	
Total for all medications				51,709.7	227.6	35.1
Laboratory fee	2015	75	15,923.3	42,247.1	193.0	28.8
	2014	68	12,269.2		182.3	
	2013	83	14,054.7		185.9	
Bed fee	2015	75	5,913.9	15,553.0	71.7	10.6
	2014	68	4,039.6		60.0	
	2013	83	5,599.5		74.1	
Diabetes Diet	2015	75	5,390.6	14,118.2	65.3	9.1
	2014	68	3,609.4		53.6	
	2013	83	5,118.2		67.7	
Consumables	2015	75	2,354.5	7,514.6	28.5	5.1
	2014	68	2,337.0		34.7	
	2013	83	2,823.1		30.9	
Transportation fee	2015	75	741.0	1,463.9	9.0	1.0
	2014	68	307.3		4.6	
	2013	83	415.6		5.5	
Blood Transfusion (N=12)	2015	4	186.3	651.9	42.3	0.4
	2014	2	139.7		70.6	
	2013	6	326.0		59.6	
Wound care (N=40)	2015	17	855.6	1,880.1	45.8	1.2
	2014	8	346.3		43.8	
	2013	15	678.1		46.5	
Use of Oxygen (N=29)	2015	6	122.2	646.1	18.5	0.4
	2014	11	197.9		18.2	
	2013	12	326.0		29.8	
Amputation (N=24)	2015	9	4,190.9	9371.4	423.3	6.4
	2014	8	2,328.3		470.6	
	2013	7	2,852.2		446.9	
Other procedures (N=2)	2015	1	232.8	465.7	211.6	0.3
	2014	1	232.8		235.3	
Physiotherapy service (N=7)	2015	3	43.7	116.4	13.2	0.08
	2014	2	29.1		14.7	
	2013	3	43.7		16.0	
Total	2015	75	55,286.2	145,738.1	650.1	
	2014	68	41,417.9			
	2013	83	49,034.0			
		226	145,738.1			

Exchange rate for the three years was ₦171.8 to US\$1

The cost of hospitalization resulting from non-adherence to medication(s) among the studied population was high considering the fact that the expenditures of majority of these patients were out-of-pocket. In addition, most of these patients were from the low socioeconomic class comprising petty traders, retired workers, artisans and the unemployed, who have been shown in past studies in the same healthcare facility to have meagre income [14,18] and are, therefore, not financially strong to cope with the cost of their medications. Cost of medications has been reported to be a strong reason for non-

adherence to medication(s) among the studied population [18].

In a previous study on cost of hospitalization of diabetes patients, laboratory costs rated highest when compared to other costs, like cost of medications [20]. In this study, cost of medications, both for diabetes and other comorbid conditions, accounted for the highest cost. Cost of laboratory investigations on the course of admission was one third of the total expenditure. Cost of laboratory investigation was found to increase with increase in the number of

comorbid diseases. Some of these investigations would not have been recommended if the patient had adhered to the recommended medications and had not developed complication(s). Cost of other drugs used in the management of complications of DM was found to be more than one-quarter of the total cost of management on admission (Table 3). In addition, cost of other management attributed to the hospitalization resulting from the non-adherent behaviour of patient was high.

The average HbA1c (which was far higher than the normal value of < 7.0 %) at admission showed that the patients were not adherent to their medication(s). A previous study showed that haemoglobin A1c reduces with increase in adherence to diabetes medications use [21]. Besides, many of them would have developed complications before they were admitted, which also increases the cost of management. Cardiovascular complications tend to increase with increase in 1.0 % of HbA1c above normal or target level of 7.0 % [22]. The increase in comorbid disease with age has been reported [23] and this becomes worse in patients with poor clinical outcome (high HbA1c) who are in their advanced age and do not adhere to their medications.

Diabetic neuropathy was the most common complication among the participants but the cost of managing it was not as high as those with Diabetes Foot Ulcer (DFU). However, all the patients in this study with DFU also presented with diabetic neuropathy –a major risk factor for DM foot ulceration [24]. Cost was higher among patients managed for DFU as compared to other complications of DM. The average cost of managing DM foot in this study was found to be a little lower than ₦180,581.6 (\$1051.1), which was reported in a previous study in Nigeria [24]. More than two-thirds of the DFU patients in that study had amputation, which accounted for the increase in the cost of management [24] compared to this study, where more than half of the DFU patients underwent amputation while on admission.

Another complication which invariably increased cost of management among the patients was chronic renal failure. However, the prevalence among the studied population was lower than the 11 % reported in a previous study in a hospital setting in Nigeria [25].

Limitations of the study

This was a retrospective study. There was no direct contact with the patients to establish report

of medication non-adherence and reason(s) for their non-adherence to medication. The study relied on the accuracy and completeness of physician's subjective assessment of patients for non-adherence to medication(s) made available in the patients' case notes. There could have been some patients among those admitted that would have been missed out in the process of assessing their adherence to medication(s). Therefore, cost of hospitalization may be much higher than what was reported in the study. In addition, indirect costs (such as, mortality, caregivers, and productivity loss) on the parts of the patients and caregivers were not accounted for in this study, which would have increased the cost associated with hospitalization.

CONCLUSION

The cost of hospitalization associated with non-adherence to medication(s) for patients with T2DM is huge (average of \$650.0), an amount too large for an individual in a country where a substantial number of its citizens live on < \$57 monthly. It is suggested that healthcare providers and health policymakers should focus on factors associated with non-adherence among patients with the aim of resolving it through a proven intervention programme in order to reduce the cost associated with it.

DECLARATIONS

Acknowledgement

The authors acknowledge members of medical records unit of University College Hospital, Ibadan, Nigeria who assisted in making available the medical records of patients. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

The authors declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by them.

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