ORGINAL ARTICLE

Access to Anti-Diabetic Medicines among Patients Attending Tertiary Health Facilities in Oyo State, Nigeria

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Abstract

Objective: The management of Diabetes Mellitus (DM) is long-term and can be expensive. This study aimed to describe access to anti-diabetic medicines among patients in tertiary health care facilities in Oyo State, Nigeria.

Materials and Methods: This was a hospital-based cross-sectional study. The study sites were the University College Hospital (UCH), Ibadan, and Ladoke Akintola University Teaching Hospital, Ogbomosho. It was conducted among 366 diabetic patients who had been attending the endocrinology clinic of these two tertiary health institutions for at least one year. Data analysis was done with the Statistical Program for Social Sciences.

Results: Female participants were 186 (50.8%) and 298 (85.6%) depended on close relatives to purchase their drugs. Those who had difficulties affording their anti-diabetic medications were 142 (38.8%) and 80 (56.3%) preferred buying a cheaper brand of anti-diabetic medication. Also, 136 (37.2%) respondents had missed their required drugs at some point due to insufficient funds. Males who were able to afford their anti-diabetic medication were 96 (53.3%) compared to 128 (68.8%) females (*P*-value= 0.002). Those with no formal education had the highest proportion of respondents who could not easily afford anti-diabetic drugs (60.9%), those with tertiary education had the highest proportion of respondents who could afford their medication (77.5%), (*P*-value=< 0.001). Among those in the 61-70 years age group, 78 (66.1%) achieved glycaemic control compared to 34 (42.5%) of those above 70 years (*P*-value=< 0.001).

Conclusion: To improve affordability, subsidizing the cost of anti-diabetic medications and encouraging patients to enrol in the Health Insurance Scheme will be beneficial.

Keywords: Diabetes mellitus, Glycemic control, Anti-diabetic medicines, Nigeria

Introduction

Diabetes mellitus (DM) is an increasing global public health problem (1). DM is a chronic disease that requires long-term medical treatment to slow down the progressiveness of the disease and prevent the development of serious complications such as

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diabetic neuropathy, retinopathy, foot ulcer, etc. DM was estimated to affect at least 425 million people (aged 20-79 years) worldwide in 2015, and is expected to rise to 629 million by the year 2045 (2). The International Diabetes Federation estimated that the number of people living with DM in Africa is expected to increase to 23.9 million by 2030 (2,3). In sub-Saharan Africa, the burden of diabetes and other non-communicable diseases has been predicted to rise beyond that of infectious diseases by the year 2030 (3,4).

DM is associated with increased morbidity arising from its complications, and mortality. DM mainly affects those in the working-class age group. Poorly managed DM patients have poor quality of life, prolonged and frequent hospital admissions at substantial costs. Apart from being a health burden, the management of DM has substantial financial implications on individuals, health systems, and the national government. Globally, the management of diabetes is expected to rise to 490 billion US dollars in 2030 (3).

A major obstacle to achieving substantial progress in the management of DM is access to essential medicines. It is estimated that one-third of the global population of DM patients lacks reliable access to required medicines (5,6). The poorest countries of Africa and Asia suffer more with nearly 50% of the population lacking access to these medicines (7,8).

Access to anti-diabetic medication in this study refers to the availability and affordability of medicines required to manage diabetes. Research on access to anti-diabetic medications among DM patients in Nigeria is needed to understand the factors that influence drug affordability among these patients. This would help to chart strategies for improving the accessibility of these essential medications to DM patients. This study, therefore, aimed to assess the availability and affordability of essential medicines to manage diabetes to achieve good glycemic control among patients.

Materials and Methods

Study design

The study was a descriptive, hospital-based, cross-sectional survey.

Study population

The study focused on DM patients attending specialist clinics particularly endocrinology clinics and metabolic research units in the University College Hospital (UCH) Ibadan, and Ladoke Akintola University College Hospital (LTH), Ogbomosho.

Study sites

The study was conducted at LTH, Ogbomosho, and UCH, Ibadan. These hospitals were chosen because they were the Teaching Hospitals in Oyo State, serving the largest city in western Africa. DM cases are usually referred to these hospitals from within and outside Oyo State.

Study area

Oyo State is in south-western Nigeria, with its capital city in Ibadan. Oyo State covers approximately an area of 28,454 square kilometers and is ranked 14th by size. It was formed in 1976 from the former Western State, and originally included Osun State, which was split off in 1991. Oyo State is homogenous, mainly inhabited by the Yoruba ethnic group, primarily agrarian but has predilection for living in high-density urban centers (9).

There are two major tertiary health institutions in Oyo State which are LTH, Ogbomosho, and UCH, Ibadan. Both facilities have trained specialists that provide care for many, including DM patients.

Sample size determination

This was done using the formula for sample size calculation for cross-sectional studies.

$$n = \frac{(Z\alpha)^2 \times \mathrm{pq}}{d^2}$$

Where the prevalence of diabetes in Nigeria is 11% (10) = 150.4. Using a design effect of 2

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due to clustering of the study locations, the sample size was calculated as:
n= 2×150.4 = 300.8. Adjusting for non-response, a minimum sample size of 333 was obtained. Proportional allocation for the sampling unit of each study site was done. UCH provides care to twice the population of DM patients visiting LTH. As a result, 222 patients were recruited from UCH, while 111 patients were recruited from LTH.

Sampling technique

Each hospital was regarded as a cluster. Systematic random sampling was used to select DM patients receiving treatment in the health centers that fit the inclusion criteria.

Inclusion criteria

Patients who were registered with and attended the endocrinology clinic on fixed clinic days.

Exclusion criteria

DM patients who are on dietary management only, not taking any hypoglycemic medication.

Data collection

A semi-structured, interviewer-administered questionnaire was administered to DM patients who sought treatment in the selected health facilities using Census and Survey Processing System version 6.0.1 (CSPro) on minicomputer tablets (11). The questionnaire was installed on four android tablets and was pre-tested among DM patients visiting Adeoyo State Hospital, Ring road, Ibadan (a secondary level health facility) to ensure validity and reliability. Results obtained from the pretest informed on the need to refine ambiguous questions. The questionnaires were subsequently deployed during patient's consultation waiting time. The case files of patients who participated in answering the questionnaires were then requested from the medical records department of the respective health institutions (using the case file number) to determine the level of glycemic control based on physicians' remarks and parameters such as glycosylated hemoglobin (HbA1c), fasting blood sugar (FBS), and 2-hour post prandial (2hpp). FBS between 70 mg/dl and 130 mg/dl, 2hpp of <180 mg/dl, and an HbA1c of <7% were classified as reasonable glycemic control.

Data analysis and management

Descriptive statistics such as frequencies and mean were used for analyzing continuous data, namely age, sex, marital status, occupation, and partner's occupation. Inferential statistics such as chi-square was used to establish relationships between variables. The association between the number of months respondents had been diagnosed with DM and their affordability of their antidiabetic medication was tested using independent sample T-tests. The data analysis was done with SPSS, version 18.0 (12).

Confidentiality of data

All subjects in this study were assigned code numbers and no name was recorded. Information collected could not be linked to participants in any way and their names or identifiers were not used in any publication or reported from this study.

Translation of protocol to local language

The instrument for data collection was translated into the local language of the participants and back-translated to English language.

Voluntariness

Participation in the study was voluntary, and participants were free to withdraw from the research at any time without adverse consequences.

Ethical considerations

Ethical approval was obtained from the UI/UCH Ethical Review Committee, College of Medicine, University of Ibadan, Ibadan, Nigeria (Reference Number: UI/EC/15/0233) before commencing the study.

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Results

Socio-demographic characteristics

More than two-thirds 254 (69.4%) of the respondents were from UCH with the remaining 112 (30.6%) of the respondents from the LTH. Proportion of females (186, 50.8%) was slightly higher than the males (180, 49.2%). Married respondents were 308 (84.2%) while 16 (4.4%) of the respondents were single. Respondents of Yoruba Ethnicity were 342 (94.3%) (Table 1).

The average income of the respondents was 54, 569 (S.D: 32,317) naira with the highest-earning 300,000 naira monthly. (As at the time of this study, one U.S dollar (USD) was equivalent to 198 naira). The median age of the respondents was 59.6 years (Range: 19-83 years). The mean history of diabetes among participants was over 9 years, precisely 109.6 ± 86.9 months.

Expenditure on drugs

Almost all respondents 348 (95.1%) were aware of the amount of money they spent monthly on purchasing drugs for diabetes management. Among the 348 (95.1%), only 22 (6.3%) respondents, depended on the National Health Insurance Scheme (NHIS) for the purchase of their drugs, 28 (8.0%) were responsible for the purchase of the drugs themselves while 298 (85.6%) depended on close relatives such as parents, children, or spouses for money to purchase their drugs.

A mean amount of 6946.26 (35 USD) ± 4241.77 (21.4 USD) Naira was spent monthly on drug purchases by respondents. The median

Table 1. Socio-demographic characteristics of respondents (N=366)

Characteristics	Frequency	%
Hospital		
UCH	254	69.4
LTH	112	30.6
Gender		
Male	180	49.2
Female	186	50.8
Age group		
≤50 years	100	27.3
51-60 years	68	18.6
61-70 years	118	32.2
>70 years	80	21.9
Marital status		
Single	16	4.4
Married	308	84.2
Widow (er)	42	11.5
Formal schooling		
Never attended	46	12.6
Basic	178	48.6
Post-Basic	142	38.8
Religion		
Christianity	258	70.5
Islam	108	29.5
Ethnic background		
Yoruba	342	93.4
Others	24	6.6
Occupation		
Professional	10	2.7
Skilled	138	37.7
Unskilled	164	44.8
Unemployed	48	13.1
Others	6	1.6
Occupation of partner(N=302)		
Professional	6	2.0
Skilled	122	40.4
Unskilled	96	31.8
Unemployed	74	24.5
Others	4	1.3

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amount of 5,200 Naira (26.26 USD) was spent monthly on the purchase of drugs by respondents. The amounts spent ranged from 250 Naira (1.26USD) to 30,000 (151.51USD) Naira per month. In contrast, the median income of respondents was 30,000 (151.51USD).

Affordability of drugs

When asked about the affordability of the drugs they were currently using, 142 (38.8%) respondents opined that they had difficulties affording the drugs. Of these 142 respondents, 80 (56.3%) had prescriptions for cheaper drugs by their physicians. Of the 80 respondents who had cheaper drug prescriptions, only 48 (60.0%) purchased the cheaper drugs. In total, 136 (37.2%) respondents had missed their required drugs at some point due to insufficient funds (Table 2).

Regarding the affordability of drugs, 96 (53.3%) males were able to afford their drugs compared to 128 (68.8%) females (*P*-value= 0.002). Those with no formal education had the highest proportion of respondents who could not easily afford anti-diabetic drugs (60.9%), those with tertiary education had the highest proportion of respondents who could afford their medication (77.5%), (*P*-value= <0.001) (Table 3).

Table 2. Frequency distribution of affordability variables

Frequency distribution of affordability variables	Frequency	%
Ease of financing drug purchase (N=366)		
Easy	224	61.2
Difficult	142	38.8
Prescription of a cheaper brand (N=142)		
No	62	43.7
Yes	80	56.3
Purchase cheaper drug (N=80)		
No	32	40.0
Yes	48	60.0
Ever missed drugs due to lack of funds		
No	230	62.8
Yes	136	37.2

Table 3. Association between affordability and socio-demographic characteristics

Characteristics	Easy		Difficult		*P-value
	Frequency	%	Frequency	%	
Gender					
Male	96	53.3	84	46.7	0.002
Female	128	68.8	58	31.8	
Age Group					
<50	56	56.0	44	44.0	0.270
51-60	40	58.8	28	41.2	
61-70	72	61.0	46	39.0	
>70	56	70.0	24	30.0	
Marital Status					
Single	6	37.5	10	62.5	0.050
Married	196	63.6	112	36.4	
Widowed	22	52.4	20	47.6	
Level of Education					
None	18	39.1	28	60.9	<0.001
Basic	96	53.9	82	46.1	
Tertiary	110	77.5	32	22.5	
Religion					
Christianity	154	59.7	104	40.3	0.360
Islam	70	64.8	38	35.2	
Ethnic Background					
Yoruba	216	63.2	126	36.8	0.004
Others	8	33.3	16	66.7	

*Chi-square test was conducted

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Affordability of anti-diabetic drugs

The average age of respondents that were able to easily afford the drugs was 60.95 ± 13.07 years, while the average age of those who found it difficult to afford their drugs was 57.32 ± 13.92. The mean number of months respondents had been diagnosed with diabetes for those who had no problems affording the drugs (112.84 ± 94.81 months) was slightly higher than the average duration of those who had problems affording the drugs (104.39 ± 72.95 months).

Availability of anti-diabetic drugs

Among the respondents, 346 (94.5%) reported experiencing no trouble or stress before procuring their drugs. Also, 314 (85.8%) respondents had to cover 2 kilometers or less before accessing their drugs. Similarly, 73.2% of the respondents had no difficulty in accessing their drugs from the closest pharmacy to them while 98 (26.8%) did. Of those who had no difficulty in accessing their drugs in the closest pharmacy to them, 62 (63.3%) had the pharmacists suggest an alternative drug to them, while only 12 (21.9%) of these 62 did not purchase the alternative. More than 9 out of 10 (92.3%) of the respondents reported that they had ever missed their medication due to accessibility problems while 28 (7.7%) of the respondents had never missed their medication due to problems of accessibility.

Almost equal proportions of males (95.6%) and females (93.5%) reported that they did not have to undergo stress before obtaining their drugs. The youngest age group had only 4.0% of its members experiencing stress while the oldest age group tripled this proportion. The association between age group and stress experienced before accessing drugs was statistically significant (*P*-value= 0.010). The only exception to the trend was that the second-youngest age group (51-60 years) had a lower proportion (2.9%) of its members having stress than the youngest age group. A statistically significant association (*P*-value= 0.030) was also found between glycemic control and stress before accessing drugs with 6 (3.0%) respondents with uncontrolled sugar levels having stress as compared to 14 (8.3%) of those with controlled sugar levels. While (97.8%) females reported never missing their medication due to accessibility issues, 24 (13.3%) of males did. The association between gender and having missed medication due to accessibility issues was statistically significant (*P*-value= < 0.001).

Association between Glycemic control and sociodemographic characteristics

Almost the same proportion of males (45.6%) and females (46.8%) were found to have achieved glycemic control. Also, singles had the lowest proportion of respondents with controlled glycemic levels (12.5%) while the married had the highest proportion (48.4%), (*P*-value= 0.020). Among those in 61-70 years age group 78 (66.1%) achieved glycaemic control compared to 34 (42.5%) of those above 70 years (*P*-value=< 0.001) (Table 4).

A greater proportion of respondents who covered more than two kilometers to get drugs (51.9%) had better glycemic control than those who covered less than this (45.2%). Also, a greater proportion of respondents offered an alternative (58.1%) had controlled glycemic levels compared with the only 16.7% of respondents who were not. Of 62 respondents who were offered available substitutes, the results showed that while 63.6% of those who purchased the alternative had controlled glycemic levels, only 44.4% of those who did not purchase the alternative did (*P*-value= < 0.001) (Table 5).

Discussion

Regarding the affordability of drugs, only a third of respondents were able to afford their drugs. This proportion is similar to the findings of Kalyango and colleagues in their study on the risk factors for non-adherence to medication among DM patients in Uganda (13). The similar proportion noticed indicates the poor economic indices of African

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countries; a major reason for poor adherence to medication among DM patients.

From this study, one of the major limitations to accessing medications was the issue of the high cost of medications. According to the study by Enwere and colleagues, most diabetic patients in the South western part of Nigeria missed their medication because of the high cost of these medications (14). The persistent high costs sometimes led to catastrophic expenditure whereby more than half of the respondents had to spend more than 10% of their income on anti-diabetic medicines. Affordability also affects how available the drugs are for patients because of the cost of transportation to the nearest pharmacy. This

Table 4. Association between socio-demographic characteristics and achievement of glycaemic control

Characteristics	Glycaemic control Achieved		Glycaemic control Not achieved		*P-value
	Frequency	%	Frequency	%	
Gender					
Male	82	45.6	98	54.4	0.820
Female	87	46.8	99	53.2	
Marital status					
Single	2	12.5	14	87.5	
Married	149	48.4	159	51.6	0.020
Widowed	18	42.9	24	57.1	
Level of education					
None	19	41.3	27	58.7	
Basic	86	48.3	92	51.7	0.660
Tertiary	64	45.1	78	54.9	
Religion					
Christianity	119	46.1	139	53.9	0.940
Islam	50	46.3	58	53.7	
Ethnic background					
Yoruba	163	47.7	179	52.3	0.030
Others	6	25.0	18	75.0	
Age group					
<50	34	34.0	66	66.0	
51-60	23	33.8	45	66.2	<0.001
61-70	78	66.1	40	33.9	
Above 70	34	42.5	46	57.5	

*: Chi-Square test was conducted

Table 5. Association between accessibility and Glycaemic control

Characteristics	Glycemic control Achieved		Glycemic control Not achieved		*P-value
	Frequency	%	Frequency	%	
Stress in sourcing drugs (N=366)					
No	155	44.8	191	55.2	0.03
Yes	14	70.0	6	30.0	
Distance covered to obtain drugs (N=366)					
2km or less	142	45.2	172	54.8	0.37
More than 2km	27	51.9	25	48.1	
Difficulty in finding drug in pharmacy					
No difficulty experienced	127	47.4	141	52.6	0.44
Difficulty experienced	42	42.9	56	57.1	
Substitute offered in case of unavailability (N=98)					
No	6	16.7	30	83.7	<0.001
Yes	36	58.1	26	41.9	
Substitute purchased (N=62)					
No	8	44.4	10	55.5	<0.001
Yes	28	63.6	16	36.4	
Ever missed drugs due to unavailability					
Never missed	155	45.9	183	54.1	0.67
Previously missed	14	50.0	14	50.0	

*: Chi-Square test was done

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may be so because of high mark-up on drugs which limits the purchasing power of patients who pay out of pocket. Some respondents however refused to purchase generic medication because of the fear that the generic drugs might not be effective which was similar to the study by Yusuff and his team (15). This could however be due to inadequate controls on the import of substandard generic medications, and improper storage by different drug hawkers.

Anti-diabetic medicines are less affordable in Nigeria because of low wages, poverty, and high costs. A statistically significant number of the respondents who had problems with affording their medications had poor glycemic controls when compared with their counterparts. The majority of the respondents that had poor access to medication, either because it was not available or because it was costly for them to buy, had poor glycemic control. This was also reported in a study that showed that there was poor adherence to medication because of the cost of procuring medication leading to poor glycemic control in such patients (15).

Many of the patients who experienced affordability as a problem also had poor glycemic control which is associated with a lot of complications such as retinopathy, neuropathy, and nephropathy. Further, most of these patients have other co-morbidities that still require management. In most of these hospitals, branded medications were mostly prescribed, which if not on NHIS, would be expensive and difficult for most patients to afford. A very minute number of the respondents depended on NHIS for drug purchase, with consequent good glycemic control. This is however too small to meet the demands of the numerous diabetic patients that are found in our society.

Interestingly, the results of this study showed that the second oldest age group (61-70 years) had the highest proportion of respondents with uncontrolled glycemic levels, even higher than the oldest age group. Similar results were reported among African Americans and Latin Americans in a similar study conducted in America (16).

However, in a study assessing the knowledge of diabetic patients towards dietary intake, Abioye-Kuteyi and colleagues reported a lower proportion of diabetic patients with poor glycemic control among those aged 61-70 years (17). The reason for this difference could be because the reference literature was conducted among physicians only. Physicians are more knowledgeable about the effects of glycemic control and knowledge is a predictor of good glycemic control (18,19).

In addition, Bott and his team identified that diabetic patients who were skilled or professional workers were less likely to have uncontrolled glycemic levels than their semi-skilled or unskilled counterparts (20). Thus, non-health professionals should be equipped with adequate knowledge of glycemic control.

The proportion of DM patients unable to afford their drugs in this study was higher than that reported by Kennedy and colleagues in a study in the United States of America (21). This is to be expected as the socioeconomic status in both countries differs greatly.

Several other studies have linked the affordability of drugs to socioeconomic status and documented their resultant effects on health outcomes (22). The affordability of anti-diabetic drugs was found to be significantly associated with glycemic control in this study. This trend is also reflected in results from other African and Middle-Eastern countries. Researchers conducted in Uganda, Egypt, and Kuwait have all reported worsened glycemic control among diabetic patients who are not able to afford their drugs (13,23,24). This further reiterates the importance of affordability of drugs as a key determinant in the health outcomes of patients of known chronic diseases. Whiting et al. (2003) identified the inability of diabetic patients to afford drugs as one of the greatest challenges to reducing the mortality caused by DM in Africa (25).

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Strengths
This study was conducted in two tertiary health facilities.

Limitations
Due to the self-reporting of respondents regarding the use of medications, questions were limited to a few weeks to reduce recall bias.

Conclusions
From the study, it was gathered that there is poor access to anti-diabetic medication which ultimately leads to poor glycemic control in most of these patients. To reduce the challenge of poor access to these medications, we recommend the following. subsidization of antidiabetics should be done by the national government in collaboration with the Federal Ministry of Health to improve affordability for individuals on an average income. For this cause, improved awareness should be made on the health insurance to improve uptake among members of the population, and thus reduce the direct brunt of medication cost for DM patients. Secondly, anti-diabetic medications should be decentralized to primary health centers or local clinics. This will address the difficulties encountered in making trips to the tertiary health facilities located some distance away from the residence of many DM patients. In like manner, the availability of anti-diabetic medications will improve medication adherence and follow-up for many diabetic patients due to the proximity of such health facilities.

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Conflict of Interest
The authors declare no conflict of interest.

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