



The Impact of Inflation on Medication Adherence Among People Living with Diabetes Mellitus Accessing Healthcare in a Tertiary Facility in Kwara State, Nigeria

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Abstract

Background: Diabetes Mellitus (DM) is one of the most common non-communicable diseases globally, with significant impacts in the Sub-Saharan Africa. In Nigeria, DM is one of the leading causes of reduced life expectancy and quality of life, placing huge burdens on individuals, families, and healthcare systems. The global economy including that of Nigeria has faced a sharp rise in inflation particularly after the COVID-19 pandemic. The inflation has driven up healthcare costs, negatively affected the social determinants of health, leading to higher out-of-pocket expenses, reduced access to needed care, and poorer health outcomes. **Objective:** This study assessed the impact of inflation on the care of patients living with DM, with a focus on medication adherence. **Methods:** This was a descriptive cross-sectional study conducted among patients with DM accessing healthcare in Ilorin, Kwara State, between March to May 2024. Data were collected from 211 patients, selected by systematic random sampling, using an interviewer-administered questionnaire. Data analysis was done using SPSS version 22.0, and a p-value of <0.05 was considered as statistically significant. **Results:** Most of the respondents 199 (94.3%) reported they were experiencing rising diabetes medication costs, with 87 (41.2%) reducing their adherence and 34 (16.1%) discontinuing their medications. A significant association was found between rising drug costs and medication adherence ($p < 0.001$), indicating that higher drug costs is linked to reduced adherence. Family donations 124 (58.8%), was the most common coping strategy, and those who had family support, demonstrated higher medication adherence levels ($p\text{-value} = 0.01$). **Conclusion:** The study revealed that inflation and the consequent rise in medication costs have a significant negative impact on diabetic patients' care. Policy formulation to enhance healthcare accessibility like promoting health insurance will alleviate the burden of inflation, while also advocating for government subsidy on medications and social support programmes, not only for diabetic patients, but all patients with chronic medical conditions; ultimately improving overall access to care.

Keywords: Diabetes, Inflation, Medication, Cost, Impact, Nigeria.

1. Introduction

Diabetes Mellitus (DM) is a chronic medical condition, characterised by persistent elevated blood glucose (sugar) levels, resulting from a defect in insulin secretion and/or action, leading to abnormal regulation of blood glucose levels, with consequent complications to the heart, blood vessels, kidneys, eyes, nerves, and damage to almost all cell types in the body [1-4]. These complications can greatly impair the quality of life and are associated with significant reduction in life expectancy if not effectively managed. The burden of DM is rising, and it has become global concern. Over the past few decades, both the incidence and prevalence of DM have been on a consistent rise [5]. Approximately 422 million people globally are affected by diabetes, with the majority in low- and middle-income nations, causing about 1.5 million deaths yearly [5]. In comparison to other continents, Africa is projected to experience the highest percentage increase in the prevalence of DM globally, rising by 134% from 24 million cases in 2019 to 55 million by 2045, which constitutes serious public health and economic implications, as many African countries lack the necessary resources to ensure adequate healthcare provision [6,7]. Nigeria has the largest number of people living with diabetes in Sub-Saharan Africa [8], with the prevalence of diabetes estimated at 5.8% [9]. In Nigeria, DM is a significant contributor to reduced life expectancy and quality of life, placing a huge burden on individuals, families, and healthcare systems [10, 11].

Over the past year, Nigeria has experienced a sharp rise in inflation, which has driven up the costs of healthcare services, medications, essential goods, and has negatively affected social determinants of health. The GDP in Nigeria contracted by 3.2% in 2020 amidst the COVID-19 pandemic-related lockdown. Inflation rose to 14.9% in November 2020, a 33-month high, reflecting core, medication and food prices increase emanating from supply shortages due to the total lockdown [12-14]. Even Post-COVID-19 the effects of inflation still linger affecting all facet of life including healthcare [15, 16].

These have cascaded into higher out-of-pocket expenses, impacting individual and family economic stability, and the ability to afford necessities such as food and housing. It has also reduced access to quality care, making many people unable to seek timely treatment, have regular check-ups and buy prescribed medications, with all these culminating into worsened health outcomes.

The rising prevalence of DM and the attendant effects demand for urgent attention to explore its effects on individuals, families, healthcare systems and the nation. It further highlights the need to strengthen healthcare systems, establish effective prevention programs, and improve access to affordable interventions and treatment in order to mitigate the impact on public health and economies, not only in Nigeria, but globally.

This study evaluated the impact of inflation on the care of patients with DM, focusing particularly on medication adherence. As inflation drives up the cost of essential goods and services, including healthcare, it creates significant financial pressure not

only on individuals managing chronic conditions like DM, but also their families and the healthcare system. The findings aim to provide insights into the critical need for policy interventions and support systems that can mitigate the adverse effects of inflation on healthcare access and treatment adherence, thereby improving the well-being of individuals living with DM.

2. Methodology

2.1 Study design, Area and Population

This was a descriptive cross-sectional study conducted among patients with DM receiving care at the Medical Outpatient Department clinics of the University of Ilorin Teaching Hospital, Ilorin, Kwara State, North Central Nigeria. The hospital provides health services to the population of Ilorin, other neighbouring rural and urban areas, and nearby states.

2.2 Sample Size Determination

The minimum sample size was calculated using the applicable formula [17].

Formula:

$$N = \frac{z^2 pq}{d^2}$$

Where:

N = Minimum sample size

z = Standard normal deviation usually set at 1.96

p = 0.86 (86%) satisfaction level in a similar survey among DM patients [18].

q = 1-p

d = Degree of accuracy usually set at 0.05

$$\frac{1.96^2 \times 0.86 \times 0.14}{0.05^2} = 185$$

To compensate for non-response, assuming a non-response rate of 15%:

$$185 / 0.85 = 218$$

This was rounded up to 220.

2.3 Sampling Technique and selection

Patients were selected by systematic random sampling. The study used an interviewer-administered questionnaire over a three-month period, from March 2024 to May 2024. A total of 220 questionnaires were administered, with 211 fully completed.

2.4 Eligibility Criteria

Inclusion criteria: Patients with DM, ≥ 18 years, who have accessed care in the hospital not less than three different occasions and gave informed verbal and written consent.

Exclusion criteria: Acutely ill looking patients, those requiring emergency medical attention and adolescent patients were excluded from the study.

2.5 Research Instrument and Data collection

The data collection process was conducted by trained research assistants using an interviewer-administered, anonymous, structured questionnaire written in English language. This instrument, designed by the researchers, drawing on insights from previous related studies [19-21], evaluated patients' experiences from their own viewpoints. The questionnaire encompassed an assessment of patients' socio-demographic and clinical characteristics, as well as the impact of inflation on perceived diabetes management, medication and adherence. Research assistants translated the questions to Pidgin English and Yoruba, and provided clarifications as needed by the patients.

2.6 Ethical Approval

The study received ethical approval from the Ethics and Research Committee of the University of Ilorin Teaching Hospital, Ilorin, Kwara State. Participation was entirely voluntary, and the study maintained strict protocols to ensure both confidentiality and anonymity for all participants.

2.7 Data Analysis

Data analysis was done using Statistical Package for Social Sciences (SPSS version 22), and frequency tables and cross tabulations were generated. Chi-square test was used to determine statistical significance of observed differences in the categorical variables. A confidence limit of 95% was used in this study and a p-value of less than 0.05 was considered significant.

3. Results

A total of 135 (64%) of participants were female, while 76 (36%) were male. The largest age group was 46-60 years, representing 99 (46.9%) of the participants, with nearly one-third, 66 (31.3%) being over 60 years old. In terms of formal education, a considerable portion, 89 (42.2%) had tertiary education, while close to one-quarter had primary 51 (24.2%) and secondary 49 (23.2%) education respectively. Most participants were employed/self-employed 152 (72.0%) and married 147 (69.7%). (Table 1)

Table 1: Socio-demographic characteristics of the study participants (N=211)

Socio-demographics	Frequency	Percentage (%)
Age		
31-45	46	21.8
46-60	99	46.9
≥ 61	66	31.3
Gender		
Male	76	36
Female	135	64
Marital status		
Single	19	9
Married	147	69.7
Divorced	14	6.6
Widowed	31	14.7
Education		
None	22	10.4
Primary	51	24.2
Secondary	49	23.2
Tertiary	89	42.2
Employment Status		
Unemployed	16	7.6
Employed	87	41.2
Self-employed	65	30.8
Retired	43	20.4

Majority of the respondents had Type 2 DM (185, 87.7%), while smaller groups had Type 1 (17, 8.1%) and gestational diabetes (9, 4.3%). The duration of diabetes varied, with 88 (41.7%) having been diagnosed for over 10 years, while 62 (29.4%) had been diagnosed for less than a year. Regarding medication use, about three-fifths of the participants 129 (61.1%) were on two medications, while 61 (28.9%) and 21 (10%) were on one and three medications respectively. A small proportion 27 (12.8%) used insulin only, 46 (21.8%) were on insulin and oral hypoglycaemics, while a considerable majority 138 (65.4%) were on oral hypoglycaemics only. (Table 2)

Table 3 shows that majority of the respondents 199 (94.3%) reported experiencing rising diabetes medication costs, leading to 87 (41.2%) reducing adherence, and 34 (16.1%) discontinuing their medications. To cope with the rising costs, respondents adopted various strategies, including relying on family donations 124 (58.8%), health insurance (15.2%) and support from social circles 27 (12.8%).

Table 2: Clinical characteristics and Medications used by study participants (N=211)

Variable	Frequency	Percentage %
Types of DM		
Gestational	9	4.3
Type 1	17	8.1
Type 2	185	87.7
Duration of DM diagnosis		
<1	62	29.4
1-5	42	19.9
6-10	19	9
>10	88	41.7
Number of DM medications used		
One	61	28.9
Two	129	61.1
Three	21	10.0
Type/s of medications used		
Insulin Only	27	12.8
Insulin + Oral Hypoglycaemics	46	21.8
Oral Hypoglycaemics only	138	65.4

Table 3: Influence of inflation on DM medication adherence among the study participants

Variable	Frequency	Percentage %
N =211		
Experienced Rising DM Drug costs		
Yes	199	94.3
No	12	5.7
Primary Coping Strategy for Rising DM Drug Costs		
Family donations		
Health insurance	124	58.8
Donations from social circles	32	15.2
Self-funding of drugs	27	12.8
Taking loans	22	10.4
	6	2.8
Effect of Rising Drug Costs on DM Medication Adherence		
No change	90	42.7
Reduced adherence	87	41.2
Discontinued medication	34	16.1

The association between socio-demographic characteristics of the respondents and medication adherence is shown in Table 4. Age, marital status, education, and employment status all had significant associations with medication adherence (p-values = <0.001, 0.002, 0.001, 0.045), while gender has no significant association with medication adherence (p-value =0.122).

Those in the age (31-45 years) group had the lowest adherence disruption despite increased medication cost, whereas the older groups had a higher proportion of individuals who discontinued their medications (p-value = <0.001).

Being married is associated with better adherence, with more married participants sustaining medication adherence, while others reduced adherence. (p-value = 0.002)

Higher education levels are linked to better medication adherence, with individuals having tertiary education demonstrating the highest proportions of sustained medication adherence, while those with no formal education have a higher tendency to discontinue medication (p-value = 0.001).

Employment status is also related to better adherence, with employed individuals showing better adherence than unemployed individuals (p-values = 0.045).

The association between rising DM drug costs, coping strategies and medication adherence in Table 5, showed statistically significant associations, implying that rising DM drug costs is linked with reduced medication adherence (p-value <0.001). Additionally, the type of coping strategy played a role, as those who benefited from family donations, demonstrated higher medication adherence levels (p-value = 0.01).

Table 4: Associations Between Sociodemographic characteristics and Medication Adherence (N=211)

Variable	No Change	Reduced Adherence	Discontinued Medication	Total	X ²	P-value
Age						
31 – 45	15	31	0	46	21.630	<0.001*
46 -60	48	32	19	99		
≥61	27	24	17	66		
Total	34	90	87	211		
Gender						
Male	26	38	12	76	4.208	0.122
Female	64	49	22	135		
Total	90	87	34	211		
Marital status						
Single	3	16	0	19	20.892	0.002*
Married	69	54	24	147		
Divorced	3	8	3	14		
Widowed	15	9	7	31		
Total	34	90	87	211		
Education						
None	8	12	2	22	22.562	0.001*
Primary	21	14	16	51		
Secondary	14	25	10	49		
Tertiary	47	36	6	89		
Total	90	87	34	211		
Employment Status						
Unemployed					12.894	0.045*
Employed	3	13	0	16		
Self-employed	41	31	15	87		
Retired	28	27	10	65		
Total	18	16	9	43		
Total	90	87	34	211		

*Statistically significant p-value

The association between rising DM drug costs, coping strategies and medication adherence in Table 5, showed statistically significant associations, implying that rising DM drug costs is linked with reduced medication adherence (p-value <0.001). Additionally, the type of coping strategy played a role, as those who benefited from family donations, demonstrated higher medication adherence levels (p-value = 0.01).

Table 5: Associations Between rising DM Medication costs, Coping Strategies and Medication Adherence (N=211)

Variable	Categories	No Change	Reduced Adherence	Discontinued Medication	Total	X ²	P-value
Experience of Rising DM drug costs	Yes	78	87	34	199	17.106	<0.001*
	No	12	0	0	12		
	Total	90	87	34	211		
Coping Strategy for Managing Rising DM drug Costs	Family Donations	60	43	21	124	26.830	0.01*
	Health Insurance	9	13	10	32		
	Donations from Social Circles	11	15	1	27		
	Self-funding	6	16	0	22		
	Loans	4	0	2	6		
	Total	90	87	34	211		

*Statistically significant p-value

4. Discussion

This study revealed that majority of participants were above 40 years of age. This finding was in keeping with other studies: Nwafor et al in Port Harcourt [22], Kayode et al in Lagos [23], Danjin et al in Gombe [24] and Ukah et al in Abuja, Nigeria [25]. Close to one-third (29.4%) of respondents were diagnosed with diabetes less than a year ago, while more than two-fifths (41.7%) have been living with the condition for over 10 years. This trend may suggest that health-seeking behaviour tends to be high shortly after diagnosis, reduces over time, and then increases again in later years. Majority (87.7%) of the respondents had Type 2 DM. Many studies have reported that Type 2 DM is the commonest, and the prevalence is increasing worldwide, especially among older populations [9-11, 26-29].

The findings of this study showed that the incidence of diabetes in older adults is high, and it highlights the need for interventions to prevent and manage the disease. The health problems of the older persons are usually chronic diseases and comorbidities e.g. cardiovascular diseases, endocrine / metabolic diseases and other systemic medical conditions [30-32], creating the need for increased utilisation of health services and taking a huge toll on their already dwindled finances [33,34]. Additionally, it also indicates that there is a need for more health education programmes targeted towards fostering awareness, encouraging healthy lifestyles and promoting positive health seeking behaviours not only among older adults, but also the younger age groups in order to have a healthier future generation.

The study revealed that majority (94.3%) of the participants experienced rising diabetes medication costs. This is not surprising, since inflation is a universal economic phenomenon affecting the general population. The few who reported they had not experienced rising diabetes medication costs were the elderly, who are likely to have their medication purchased and provided for them by their children. There was a significant relationship between rising drug cost and medication adherence. As inflation drives up the cost of goods and services including healthcare services and medications, it creates a huge financial burden on medical care, especially on individuals managing chronic conditions, affecting their ability to access and sustain care with consequent negative impact on treatment adherence. A significant portion of the respondents (over half, 57.3%) in this study reported that their adherence to medications was negatively affected by the rising cost of drugs, with 41.2% reducing adherence and 16.1% discontinuing their medication entirely. The issue of inflation is so worrisome, such that drug prices can sometimes increase from one week to the next, with such rapid increases forcing patients to skip doses, reduce dosage strength, or even abandon taking their drugs. The negative impact of inflation on access to medicines, particularly in Nigeria has been reported recently by several studies in Nigeria [35-39]. This trend is mostly common in nations and regions where access to affordable healthcare is limited, and this is a pointer to the need for the formulation and implementation of policies, such as health insurance, medication discounts, social support and other relevant programmes which mitigate the adverse effects of inflation on sustained access to healthcare and treatment. This study found some associations between age, marital status, education, and employment with medication adherence. Previous studies by Gelaw et al in Ethiopia [40], Shah et al in India [41] have also showed comparable results. However, Borzouei et al [42], and Ezenduka et al [43] reported that there was no association between the studied socio-demographic determinants and medication adherence in patients with Type 2 DM. The reason for the differences may be due the diverse study methodologies and research settings. The association between age and medication adherence suggests that adherence was better in the 31-45 years age group and tended to decline with age. This may be attributed to greater financial stability, as individuals in this age group are more likely to be gainfully employed and may also have fewer family burdens, whereas the elderly ones are retired and less economically active.

Marital status being significantly associated with medication adherence, might signify that marriage has a buffering effect on adherence disruption caused by increased medication costs, possibly due to greater support within married couples and families. Higher education levels were linked to better adherence, and may connote the interconnectivity between education, employment, health literacy and access to resources. Finally, employment status had a positive influence on medication adherence, likely due to the stable income and financial security that come with being employed. In Nigeria, the family, though facing its fair share of challenges, still holds great significance, with strong bonds reinforced by traditional norms, sociocultural practices and religious beliefs. The highest ranked coping mechanism reported by the participants in this study was family donations (58.8%). This finding of a considerable family support is in line with the findings of Ojewale et al [44] who found that only 60% of the participants in their study among DM patients had a positive perception of family support. However, it is lower compared to the findings of Ayonote et al [45] in Lagos found that 72.9% of the diabetic patients reported that their families were responsible for providing funds to procure their medications, and Iloh et al [46] in Southeast Nigeria, reported that 77.5% had family support especially in the form of necessary resources for diabetic care. The difference in these results could be due to the employment status of the participants in this study, as a larger proportion (72%) of the participants were employed or self-employed, and may be perceived as being able to care for themselves, unlike the retired participants who in most cases requires greater support and assistance from their family members. There was a significant relationship between family donations and medication adherence, implying that those with family support are more likely to have good medication adherence, and this finding is in tandem with other studies [45-48]. This highlighted the beneficial effects which strong family support has on achieving good medication adherence among patients being managed for DM. Health insurance is an important way towards improving access to healthcare services to the population and providing financial risk protection to individuals and families [49,50]. Health insurance enhances affordability and accessibility of healthcare services, making it easier for people to access and sustain necessary care, have better adherence to treatment regimens, thereby reducing the risk of complications and ultimately improving overall health outcomes. However, in this study health insurance did not show any significant influence on the mitigation of drug cost and enhancement of medication adherence. The reason may not be far-fetched, as many studies have reported the unavailability of prescribed drugs as one of the recurrent complaints and main reasons for patient dissatisfaction among enrollees under the National Health Insurance Programmes [51-57]. Thus, addressing this challenge will not be achieved only through expanding health insurance population coverage, but improving the quality of care, especially with regards to the availability of prescribed medications. A shift towards health insurance as the main healthcare financing mechanism will only be achievable if the quality of care provided under such health schemes is excellent and assured. This would require policy formulation and implementation to enhance access to quality healthcare services, raising awareness and educating the public on the benefits of health coverage, supporting those who may not be able to afford it, and making health insurance more attractive through the provision of excellent services including availability of essential drugs towards ensuring greater patient satisfaction [58-60].

5. Conclusion

The study revealed that inflation and the resultant rising medication costs impact medication adherence negatively in diabetic patients and emphasizes the need for policy interventions to mitigate the effect of inflation, not only for diabetes patients, but people managing chronic medical conditions. It highlights the necessity for policy initiatives to enhance healthcare services and promote health insurance as a viable healthcare financing mechanism.

nism, while also advocating for medication discounts and social support programmes towards improving overall access to care.

Limitations of the Study

The scope of the study was limited to a single healthcare facility and focused only on outpatients, which may influence the generalizability of its findings to other facilities and regions, as well as to inpatients who may have different perceptions of care. Despite these limitations, the study provides valuable insights and data for consultation, comparative analysis, and encourages the need for further research to improve healthcare services in Nigeria.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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