



Original Research

Association between Diabetes-Related Distress and Medication Adherence among Patients with Type 2 Diabetes Mellitus, Southwest Nigerian

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Abstract

Background: Diabetes-related distress is a common complication that usually impacts the well-being, health outcomes and adherence to medications, especially in individuals with type 2 diabetes mellitus (T2DM). Hence, this study aimed to estimate diabetes-related-distress and its association with medication adherence.

Methodology: This is a hospital-based cross-sectional study conducted among 135 patients with T2DM recruited consecutively from a diabetes clinic of a tertiary health institution, Southwest, Nigeria, from March to September 2022. Data were obtained using the Diabetes Distress Scale (DSS-17) questionnaire and Morisky's Medication Adherence Scale (MMAS-8). The association between the dependent variable (DRD) and the independent variable (medication adherence) was assessed with chi-square, and predictors of DSS with logistic regression analysis. The ethical approval was obtained from the committee of the hospital.

Results: The mean age of study participants, and duration of diabetes were 62.20 ± 12.80 years and 7.96 ± 7.01 years, respectively. The proportion of diabetes distress among the study population was 30.5% (8.3 % had high distress and 22.2 % moderate distress). Poor adherence to medications was 66.5%. The study showed that diabetes-related distress was associated with poor medication adherence ($\chi^2=9.251$, $p=0.010$). Patients who were highly distressed had 56% lower odds of adhering to their medications compared to those who were not (OR: 0.32, 95% CI: 0.15-0.62).

Conclusion: Our findings suggest that diabetes distress is a common issue and significantly determines medication adherence. Thus, incorporating routine screening for distress into the standard diabetes care will be an important intervention to improve adherence and health outcomes of people living with T2DM.

Keywords: Diabetes, psychological distress, medication adherence, Africa

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Introduction

Diabetes Mellitus (DM) is one of the most important public health conditions with significant economic burdens. The incidence and prevalence of DM have increased dramatically in most countries in the world, especially in sub-Saharan African countries [1]. The global prevalence of diabetes, which was 654 million in 2021, has been projected to increase to 800 million by the year 2045.¹ As Nigeria continues its progress as a nation both demographically, socially, technologically and economically, disease patterns and burdens are changing due to changes in lifestyle and dietary patterns of its population. A recent meta-analysis of diabetes prevalence in Nigeria by Olamoyegun et al [2] estimated the prevalence of DM among adults older than 18 years at 7.0% in 2024, and this prevalence varies from one region to another. This increase in the number of people with diabetes mellitus (DM) will put an additional burden on the individuals, communities, and the nation.

Although there are basically two major types of diabetes, type 1 DM and type 2 DM, type 2 diabetes mellitus (T2DM) constitute approximately 90-95% of all diabetes in Nigeria [3]. Type 2 DM is a lifelong health condition which is usually managed with lifestyle changes, oral hypoglycaemic agents (OHA), insulin or a combination of agents. Since diabetes management is lifelong and with a complex regimen, the majority of day-to-day care is handled by patients and/or families [4]. Individuals with diabetes need to perform specific multifaceted activities in their daily lives, such as consuming appropriate diets, regular exercising, monitoring of blood glucose levels, adherence to medication, foot care and possessing problem-solving skills [5]. These can be described as meal, move, meter, medication, motion and more, respectively. These activities, which determine the degree of glycaemic control and, to a large extent, the quality of life, are associated with some levels of emotional distress, struggles and worries, collectively referred to as diabetes-related distress (DRD). Diabetes-related distress (DRD) is defined as a patient's concerns about diabetes mellitus, its management, the need for support, and access to health care [6,7]. The distress is from the daily hassles and demands of the disease management, [8] worries about poor glycaemic control, [9] fears about diabetes-related complications, lack or inadequate support from families, friends or colleagues [11,12], stigmatization, [13] and financial inadequacies [14]. When diabetes distress becomes protracted and is not identified early and managed, patients experience burnout, leading to feelings of helplessness, hopelessness, and frustration with diabetes care [15-17]. Although similar to depressive disorder, DRD is not considered a psych-disorder, as it differs from major depressive disorder in being content rather than symptom specific, and the symptoms are not severe enough to meet the diagnostic criteria for major depressive disorder [18].

Diabetes related distress is the most common psychological co-morbid condition among patients with type 2 diabetes mellitus [19]. Recent meta-analysis studies showed that 22 % to 49.2% of people with T2DM experience DRD [20-23]. A single study conducted in Southwest Nigeria by Adesina *et al* [24] found that 37.6 % of patients with type 2 diabetes had DRD. Although the burden of illness is a major determinant of DRD, the presence of diabetes-related complications, co-morbidities, and a more complex treatment regimen has been associated with increased DRD [25,26]. With the projected increase in the global prevalence of diabetes, DRD is also expected to increase among people living with diabetes (PLWD), and this may impact medication adherence among many routine responsibilities of diabetes management. Diabetes distress has been shown to be associated with suboptimal clinical consequences ranging from poor adherence to medication regimen, to suboptimal glycaemic control and subsequently impaired quality of life (QoL) [26,27]. Although medication adherence among PLWD in Nigeria showed moderate adherence [28], its association with diabetes-related distress has not been explored. It is therefore imperative to assess DRD and its association with medication adherence among people living with type 2 diabetes mellitus.

Methods

This is a cross-sectional, hospital-based study where patients with type 2 DM were recruited in a tertiary health institution located within Southwest, LAUTECH teaching hospital, [29] Ogbomoso, Nigeria. The data was collected from the Diabetes clinic of the hospital. Patients who were attending the clinic and were clinically diagnosed with type 2 diabetes were approached to participate in the study.

Inclusion criteria

Eligible patients of the study were adults at least 30 years of age with a confirmed diagnosis of DM for at least six months and were attending follow up clinic for diabetes care regularly.

Exclusion criteria

Participants with type 1 diabetes, secondary causes of diabetes, gestational diabetes, maturity-onset diabetes of the young (MODY), or latent autoimmune diabetes in adults (LADA) were excluded from the study. Participants were also excluded if they had been diagnosed with any known psychiatric disorder according to their medical records. Also excluded from the study were those who were not able to complete the questionnaire because they had a severe illness or those who were having difficulty understanding the questions in the survey.

Sample size determination.

The minimum sample size was determined using the formula by Cochran (1963) and the estimated prevalence of diabetes in Southwest, Nigeria, at 10.6% [30]. This yielded an estimated minimum sample size of 135 participants. Hence, all patients with type 2 diabetes who met the eligibility criteria attending the Diabetes outpatient clinic during the study period (April to November 2022) were consecutively recruited into the study.

$$1. \quad n_0 = z^2 pq / e^2$$

where n_0 is the minimum sample size, $Z_{\alpha/2}$ is 1.96 at a confidence interval at 95%, e is the level of precision, p is the estimated proportion of patients with T2DM, and $Deff$ is the design effect set at 1.03 and assuming a 10% nonresponse rate.

Instrumentation

The study questionnaire was composed of three (3) sub-sections assessing various domains:

1. Sociodemographic data: This included age, sex, marital status, and average monthly income of the family.
2. The second section was about diabetes-related history and presence or absence of comorbidities; duration and type of DM, type and frequency of medication, family history of DM, and history of DM complications.
3. Diabetes Distress Scale Questionnaire (DDS-17)

There are two commonly used and accepted scales as statistically good assessments of diabetes related distress: the Problem Areas In Diabetes (PAID) scale [12] and the DRD Scale (DDS) [17]. Although the PAID scale has strengths to assess DRD, it has some drawbacks, including the absence of subscales to distinguish the various components of DRD and the non-availability of questions addressing patients' experience with their health care providers. This prompted the development of a 17-item questionnaire (DDS-17) to measure DRD. The DDS-17 differentiates four (4) main subscales from the principal term, which include: emotional burden (EB, 5 items), physician-related distress (PRD, 4 items), regimen-related distress (RRD, 5 items), and interpersonal distress (ID, 3 items), which represent different areas of potential diabetes-specific distress. DDS-17 uses a Likert scale with each item scored from 1 to 6, reflecting the distress experienced over the last month: 1 (not a problem), 2 (a slight problem), 3 (a moderate problem), 4 (a somewhat serious problem), 5 (a serious problem), and 6 (a very serious problem). Total possible scores for DDS-17 will be 17–102 (average 1–6). Thus, the actual average scores for the DDS-17 and their subscales yield 3 patient subgroups: little or no distress, <2.0; moderate distress, 2.0–2.9; high distress, ≥3.0. A brief version: the DDS-2, which is a 2-item instrument, was also developed for the initial screening of DRD [18]. The same grading is used for scoring the DDS-2.

4. Morisky Medication Adherence Scale (MMAS)

The Morisky Medication Adherence Scale (MMAS-8) is an eight-item validated self-reported adherence tool developed by Morisky et al. [30]. MMAS-8 has high reliability and validity instrument and has been used for studies on medication adherence among patients with diabetes in Nigeria [28,30]. MMAS-8 collects information on how frequently patients forget to take their medications and the reasons for this using a binary (Yes/No) for questions 1 to 7, and a 5-option Likert scale for item 8, (never/rarely/sometimes/often/always). The scoring is such that each “no” response is rated as “1” and the “yes” response as “0” except for question 5 (Did you take your diabetic medicine yesterday?), which is the reverse, i.e., “yes” is rated as 1 and “no” as 0. For item 8 (How many times do you have difficulty remembering to take all your medications?), if the patient responds “0 (Never/Rarely)”, the score is “1” and if response “4 (All the time)” is chosen, the score is “0”. Responses to the item 1 is rated as 0.25, item 2 as 0.75 and finally item 3 as 0.75 respectively based on the scoring method from the original developer. The total score for the MMAS-8 ranges from 0 to 8. The scores are then categorized as low (less than 6), medium (6 to less than 8) and high (8) medication adherence.

5. Laboratory results (glycated haemoglobin [HbA1c] and fasting plasma glucose [FPG]) of each patient were used. The most recent HbA1c (maximally within the last 3 months before the survey) of each patient and the average of the three most recent FPG were used. Overall, 62 of the patients did not have a recent HbA1c.

Ethical approval: Ethical approval was obtained from the LAUTECH Teaching Hospital Research Ethics Committee, reference number LTH/OGB/EC/2022/580.

Statistical analysis

Data were analyzed using IBM SPSS STATISTICS 25.0. Descriptive statistics were used for the participants' characteristics and measured variables. For continuous variables, means with standard deviations were reported for normally distributed data, while median and interquartile ranges were reported as descriptive statistics for variables that are skewed. Normality assumption of continuous variables was tested with the skewness and kurtosis tests. Chi-squared and Fisher's exact tests of independence were used to test for association between categorical independent variables and the outcome variables (diabetes distress and medication adherence). Binary logistic regression models were used to determine the effects of the independent variables on the outcome variables. The statistical test of significance was set at 5%.

Results

Participants

Overall, 135 participants were enrolled in the study, 92 (68.10%) were females, and the mean age was 62.20 (SD = 12.80) years (age range, 38 to 83 years). The majority of the participants, 89 (65.9%), were aged at least 60 years, 74 (54.8%) had been diagnosed with DM < 5 years ago, and 70 (51.9%) were on oral hypoglycemic agents alone. The median duration of diabetes was 48.00 (IQR 11) years (Table 1).

Table 1: Socio-demographic characteristics of the respondents (n=135)

	Frequency	Percent
Age group		
< 30 years	2	1.5
30-39 years	3	2.2
40-49 years	15	11.1
50-59 years	26	19.3
≥ 60 years	89	65.9
Mean ± SD = 62.2±12.8 years		
Gender		
Male	43	31.9
Female	92	68.1
Level of Education		
None	17	12.6
Primary	43	31.9
Secondary	40	29.6
Tertiary	35	25.9
Occupation		
Unemployed	14	10.4
Trading	60	44.4
Artisan	10	7.4
Civil servant	16	11.9
Professional	6	4.4
Retiree	29	21.5

Marital status		
Single	4	3
Married	94	69.6
Divorced/Separated	5	3.7
Widowed	32	23.7
Ethnicity		
Yoruba	118	87.4
Hausa	3	2.2
Igbo	9	6.7
Others	5	3.7
Religion		
Christianity	75	55.6
Islam	58	43
Traditionalist	2	1.5
Income		
<10,000	46	34.1
10,000-20,000	25	18.5
21,000-50,000	30	22.2
51,000-100,000	19	14.1
>100,000	15	11.1
Duration of diabetes mellitus		
< 5 years	74	54.8
≥ 5 years	61	45.2
Median (months) = 48.00, IQR = 11		
Range = 323		
Smoking history		
Yes	4	3
No	131	97
Alcohol history		
Yes	10	7.4

No	125	92.6
DM Medication		
OHA	70	51.9
OHA+Insulin	33	24.4
Insulin	12	8.9

DM; diabetes mellitus; HTN: hypertension; OHA: Oral hypoglycaemic agents

Distribution of co-morbidities/ complications among participants

Table 2 shows the distribution of co-morbidities as identified among the participants. The majority of the participants, 103 (76.3%), had hypertension, out of which 57 (42.2%) had it for < 5 years. Other co-morbidities are sexual dysfunction, 23 (17.0%), stroke, 12 (8.9%), and heart failure, 4 (3%).

Table 2: Distribution of co-morbidities/ complications among participants (n=135)

Variables	Yes n(%)	No n(%)
Co-morbidities		
HTN	103(76.3)	32(23.7)
Stroke	12(8.9)	123(91.1)
Heart failure	4(3)	131(97)
PAD	12(5.9)	123(91.1)
Complications		
Retinopathy	27(20.0)	108(80.0)
Nephropathy	12(8.9)	123(91.1)
Neuropathy	46(34.1)	84(62.2)
Sexual dysfunction	23(17.0)	112(83.0)
Foot Ulcer	12(8.9)	123(91.1)

HTN: hypertension; PAD: peripheral arterial disease

Burden of diabetes-related distress

Analysis of DDS-17 results indicated that 30.5% of the participants had DRD based on the total score of the questionnaire. This comprised 22.2% and 8.3% as moderate and severe DRD, respectively. In addition, 30.9% of our study participants had moderate to high emotional burden/distress. Also, the males and females differ significantly in their scores for DDS-17 ($P=.040$) and emotional burden ($p=.043$) at $p<.050$. (Table 3)

Table 3: Diabetes Related Scale (DSS) Score

Variables	Total (n=135)	Male (n= 43)	Female (n= 92)	P-Value
Diabetes Related Scale (DSS) Score				
DDS-17	1.63±0.74	1.44±0.54	1.72±0.81	0.040*
EB	1.90±1.05	1.63±0.82	2.02±1.12	0.043*
PRD	1.32±0.64	1.23±0.51	1.36±0.69	0.247
RRD	1.61±0.84	1.42±0.57	1.70±0.93	0.074
ID	1.44±0.99	1.29±0.68	1.51±1.11	0.222
Diabetes Distress (DD) Severity				
	Low	Moderate	High	
DDS-17	75(69.4)	24(22.2)	9(8.3)	
EB	67(69.1)	24(21.6)	9(9.3)	
PRD	16(39.0)	16(39.0)	9(22.0)	
RRD	47(61.0)	21(27.3)	9(11.7)	
ID	16(45.6)	11(31.4)	8(22.9)	

Source: (Field Survey, 2023) *Mean±SD, P -Probability value, *-significant at P<.050*

EB: Emotional burden; PRP: Physician related distress, RDR: Regimen related distress, ID: Interpersonal related distress

Sociodemographic determinants of diabetes-related distress

Table 4 showed that marital status, religion, and duration of diabetes were the sociodemographic parameters that were significantly associated with diabetes-related distress (DRD) ($x^2=10.696$, $p=.013$), ($x^2=10.600$, $p=.014$), ($x^2=8.281$, $p=.016$), and ($x^2=8.137$, $p=.004$), respectively. Additionally, we found a significant association between DRD and duration of hypertension, and presence of heart failure ($x^2=6.044$, $p=.014$) and ($x^2=5.704$, $p=.017$) respectively at $p<.050$.

Table 4: Sociodemographic determinants of diabetes-related distress

Categories	Diabetes Distress		Total	χ^2	df	P-Value
	No Distress	Diabetes Related Distress				
Age Group						
< 30 years	1	1	2	1.026	1	0.906
30-39 years	2	1	3			
40-49 years	12	3	15			
50-59 years	20	6	26			
≥ 60 years	67	22	89			
Gender						
Male	34	9	43	0.422	1	0.516
Female	68	24	92			
Level of Education						
None	8	9	17	10.696	3	0.013*
Primary	31	12	43			
Secondary	34	6	40			
Tertiary	29	6	35			
Occupation						
Unemployed	7	7	14	8.492	5	0.131
Trading	44	16	60			
Artisan	8	2	10			
Civil servant	14	2	16			
Professional	4	2	6			
Retiree	25	4	29			
Marital Status						
Single	1	3	4	10.6	3	0.014*
Married	77	17	94			
Divorced/Separated	4	1	5			

Widowed	20	12	32			
Ethnicity						
Yoruba	92	26	118	3.104	3	0.376
Hausa	2	1	3			
Igbo	5	4	9			
Others	3	2	5			
Religion						
Christianity	61	14	75	8.281	2	0.016*
Islam	41	17	58			
Traditionalist	0	2	1			
Income						
<10,000	33	13	46	3.164	4	0.531
10,000-20,000	20	5	25			
21,000-50,000	21	9	30			
51,000-100,000	17	2	19			
>100,000	11	4	15			
Duration of DM						
< 5 years	63	11	74	8.137	1	0.004*
≥ 5 years	39	22	61			
Smoking History						
Yes	2	2	4	1.458	1	0.227
No	100	31	131			
Alcohol history						
Yes	8	2	10	0.116	1	0.734
No	94	31	125			
HTN						
Yes	77	26	103	0.15	1	0.699
No	25	7	32			
Stroke						

Yes	9	3	12	0.002	1	0.963
No	93	30	123			
Heart failure	2	2	4	1.458	1	0.227
Yes						
No	100	31	131			
PAD						
Yes	11	1	12	1.851	1	0.174
No	91	32	123			
Retinopathy						
Yes	20	7	27	0.04	1	0.841
No	82	26	108			
Nephropathy						
Yes	9	3	12	0.002	1	0.963
No	93	30	123			
Neuropathy						
Yes	38	8	46	1.633	1	0.201
No	61	23	84			
Sexual dysfunction						
Yes	20	3	23	1.951	1	0.162
No	82	30	112			
Foot Ulcer						
Yes	7	5	12	2.115	1	0.146
No	95	28	123			
Overall Medication Adherence						
Poor Adherence	41	18	59	9.251	1	0.010*

Good Adherence	61	13	74
Fasting plasm glucose	0	2	2

χ^2 -Pearson chi square value, df-degree of freedom, P -Probability value, *-significant at $P < .050$

Association between diabetes-related distress and medication adherence

The prevalence of medication adherence among the participants was 59 (43.7%). The association between the overall medication adherence of the respondents and DRD, as shown in Table 5, revealed that the medication adherence of the respondents was significantly associated with diabetes distress ($\chi^2=9.251, p=.010$) at $p < .050$. Hence, individuals with diabetes distress are at least 9 times more likely to have poor medication adherence.

Table 5: Relationship between Diabetes-Related Distress and Medication Adherence

Categories	Diabetes Distress		Total	χ^2	Df	P-value
	No Diabetes-Related Distress	Diabetes-Related Distress				
Overall Medication Adherence						
Low Adherence	41	18	59	9.251	2	0.010
Moderate Adherence	61	13	74			
High Adherence	0	2	2			

χ^2 -Pearson chi square value, df-degree of freedom, P -Probability value, *-significant at $P < .050$

Table 6 below shows the relationship between the socio-demographic characteristics of the respondents and their medication adherence revealed that the age group and ethnicity were significant factors associated with medication adherence, with ($\chi^2=10.018, p=.038$) and ($\chi^2=12.276, p=.006$) respectively at $p < .050$.

Discussion

Diabetes-related distress occurs in approximately 1 in 3 patients with type 2 diabetes among our study population, indicating that DRD is a very common psychological problem among patients with type 2 diabetes. We also found that patients who experienced diabetes-related distress tended to poorly adhere to their medications compared with individuals who were not distressed about their diabetes status. Hence,

diabetes distress is an essential determinant of clinical outcomes in T2DM care and may lead to poor self-management, adherence to medications and treatment, and poor blood glucose status in such patients. These findings are consistent with previous studies suggesting that medication adherence is significantly determined by the presence of diabetes-specific distress [9, 33]. For this reason, the American Diabetes Association's psychosocial care guidelines recommended that people with diabetes should be assessed regularly for the presence of DRD, especially in individuals whose blood glucose target is not achieved [32].

The burden of DRD in this study is relatively high in comparison with previous studies conducted in India (13.3%) [31], the Netherlands (22.3%) [20], and Saudi Arabia (25%) [31, 15] and 31.3% reported by Geleta *et al* [32] in Ethiopia. However, several other studies had found a higher prevalence of DRD than the present study. For example, studies in Bangladesh [31] and Malaysia [31] using the DDS-17 scale showed that almost half of patients with T2DM had DRD. Also, studies in Ghana [22] and Adesina *et al* in Nigeria [33] reported prevalences 44.7% and 51.9% of patients had DRD, respectively. The reason for the variations in the prevalence compared to the studies cited above could be due to differences in the quality of diabetes care services, practice of diabetes education, and the measurement tool used to measure DRD (as some of the studies used PAID instead of DSS-17). This difference may also be related to patterns of family and social support implemented in different societies, the presence, types and extent of comorbidities among study participants. A number of studies have shown that the better the level of healthy coping skills a patient with diabetes possesses, the lower the diabetes-related distress [31]. Thus, coping skills which can be acquired through structured diabetes education should be incorporated into diabetes management protocols to reduce DRD.

In line with previous studies [15, 31], this study showed that the majority of the participants had poor glycemic control, as only about 1 in 5 participants achieved an optimal glycated haemoglobin (HbA1c) of < 7%. The presence of DRD could have a negative impact on blood glucose levels, which was partly a reflection of poor medication adherence. Hence, incorporating routine screening for DRD into diabetes care and adopting comprehensive approaches to diabetes management to improve adherence to self-care behaviors and health outcomes of type 2 diabetes patients may help to improve glycaemic control.

Limitation

There are several potential limitations of this study that should be considered in the interpretation of the present findings. First, the cross-sectional design of the study limits the ability to draw conclusions about causality or directions of the relationships between DRD and the independent variables. Also, the study was based on participants' reports; its reliability may not be guaranteed because of the possibility of recall bias. There is also the possibility of social desirability bias, in which respondents did not answer truthfully based on their beliefs or experiences but rather answered based on a manner they believe will be viewed favourably by others.

Conclusions

This study concluded that diabetes related distress was highly prevalent in type 2 diabetes patients, and this was significantly associated with poor medication adherence. This suggests that DRD requires frequent screening, and appropriate attention should be placed on its early detection. Hence, factors associated with the occurrence of DRD should be targeted during diabetes care so patients can take the required interventions and prevent further problems.

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