Perceived family support and medication adherence among diabetic patients with good and poor glycaemic control attending a teaching hospital in south-western Nigeria.

Abstract

Background:

Aim: To compare perceived family support (PFS) and medication adherence among adult T2DM patients with good and poor glycaemic control.

Methods: This was a hospital-based cross-sectional comparative study among patients with T2DM. The participants were systematically recruited and divided into two groups after glycated haemoglobin testing. Additional data was collected using a structured interviewer – administered questionnaire adapted from Perceived Social Support – Family Scale and 8-item Modified Morisky Adherence Scale.

Results: The mean PFS scores among participants with good and poor glycaemic control were 16.37 and 13.97 points respectively. The difference between their mean scores was significant (*P* 0.000). The mean score of medication adherence among participants with good glycaemic control was 7.13 points while participants with poor glycaemic control had a mean score of 6.42 points. The difference between their mean scores was significant (*P* 0.012). A statistically significant association was found between medication adherence and glycaemic control (*P* 0.025).

Conclusions: This study found that T2DM participants with stronger PFS and better medication adherence had better glycaemic control than participants with weaker PFS and poor medication adherence. It is therefore important to emphasise family support and measures that improve medication adherence in the holistic management of T2DM.

Key-words: Perceived family support, medication adherence, glycaemic control, type two diabetes mellitus, and overall clinical outcomes.

Introduction

Type 2 Diabetes mellitus (T2DM) is increasingly becoming a global burden with compelling data of rising prevalence especially in low- and middle- income countries in Africa due to fast population growth, ageing, urbanisation and altered lifestyle. [1] According to American Diabetes Association (ADA), it is a complex chronic disease characterised by a progressive loss of beta-cell insulin secretion frequently on the background of insulin resistance. [2] It constitutes about 90 - 95% of diabetes mellitus (DM) globally. [2, 3] Evidence has shown that T2DM, due to the effect of chronic hyperglycaemia constitutes the commonest risk factor for both micro- and macro-vascular morbidities. [2, 3] These vascular damages are responsible for increasing risk of mortality and impaired quality of life among patients with T2DM. [2 - 4]

DM is a global public health burden and its global cases were reported to have risen from 108 million in 1980 to 422 million cases in 2014. [1] This global burden has been projected to increase to 550 million cases by the year 2030. [5] The centre for disease control and prevention (CDC) reported that about 25.8 million Americans were affected by DM. [6] In Africa, it was reported in 2019 that over 19 million people were living with DM and it was projected to rise to about 47 million cases in 2045. [4] In Nigeria, the findings by Ogbera *et al* from the review of DM in Nigeria revealed the prevalence rates that ranged from 8% to 10%. [7]

In view of the high global burden of T2DM, it has been recommended that achieving optimal glycaemic control is pivotal for the reduction of T2DM-related morbidity and mortality. [2, 3] According to ADA, good glycaemic control is regarded as glycated haemoglobin (HbA1c) of <7% or when pre-prandial capillary plasma glucose is within 4.4–7.2 mmol/L (80–130 mg/dL) or when Peak post-prandial capillary plasma glucose (1 – 2 hours) is < 10.0 mmol/L (<180 mg/dL). [2] It is otherwise referred to as poor glycaemic control when the values are greater than the above targets. In order to achieve good glycaemic control, both pharmacologic and non-

pharmacologic measures have been recommended. [2] A study among T2DM patients in South Africa found that the glycaemic control was generally poor with a mean HbA1c of 11.4%.[8] In Nigeria, the diabcare study among patients with DM revealed that only 32.4% of the participants had good glycaemic control. [9] In respect of the higher prevalence of poor glycaemic control among T2DM patients despite appropriate choice of pharmacologic agents, attention is gradually being shifted to the synergistic effect of the non-pharmacologic measures on glycaemic control. [2, 3, 10] These non-pharmacologic measures are being considered probably as the driver of change needed in achieving optimal glycaemic outcome. Among these are family support and medication adherence which were investigated in this study.

Perceived family support is defined as the felt provision of different forms of emotional and instrumental services and assistance from family members along with negative or positive supportive forms of family interaction within past years. [11] Some studies have reported the interplay between family support and glycaemic control among diabetic patients. [12 – 14] Baig *et al* in the United States conducted a systematic review study among diabetic patients and reported heterogeneous findings but of note were few studies that found improved glycaemic control following sessions of family-based intervention.[12] Keogh *et al* in Ireland found in their interventional study that participants who received family-based therapy had better glycaemic control than the participants in the control group. [13] However, Vaccaro *et al* in a comparative study among T2DM participants in USA reported that family support was not significantly associated with glycaemic control. [14]

As pharmacologic approaches remain the cornerstone in the management of T2DM, proper choice of drugs may not be enough to achieve good glycaemic control if patients fail to use their drugs as prescribed by their clinicians. Hence, medication adherence is another non-

pharmacologic factor that may be of importance in the chronic care model for the management of T2DM. According to Vrigens *et al*, medication adherence is the extent to which patients are able to use their medications as prescribed. [15] Several studies round the world including the United States, Malaysia and Libya have demonstrated that poor adherence leads to poor glycaemic control.[16–18] In Nigeria, only few studies have been done to show the role of medication adherence in achieving good glycaemic control.[19, 20]

In view of varying studies on the roles of non-pharmacologic measures in the glycaemic control of T2DM patients, this study was designed to elucidate further on how family support and medication adherence could influence the glycaemic control in a typical Nigerian sociocultural setting. Hence, the objectives of this study were to compare the perceived family support among adult T2DM participants with good and poor glycaemic control as well as to compare medication adherence among adult T2DM participants with good and poor glycaemic control.

MATERIALS AND METHODS

This study was conducted at the General Outpatient (GOP) Clinic of the Family Medicine Department (FMD) of Lagos University Teaching Hospital (LUTH) in Lagos State. LUTH is a 761 – bed hospital, established in 1962 and it provides care in the major specialties of medicine and surgery for a large selection of patients across all socioeconomic classes in Lagos and its environs. The GOP clinic of FMD provides primary and comprehensive care for all categories of patients including diabetic patients from Monday to Friday between 8am and 4pm.

Study Population

The participants of this study were patients with T2DM attending the GOP Clinic of FMD.

Study Design

This was a hospital-based comparative cross-sectional study.

Determination of Sample Size

The minimum sample size for this study was determined by using the formula for comparison of two proportions. [21]

$$n = \frac{2P(1-P)(Z_{\alpha/2} + Z_{\beta})^2}{(P_1 - P_2)^2}$$

Where

n = minimum sample size per group

$$P = \frac{P_1 + P_2}{2}$$

P_1 = Proportion of target population with good glycaemic control.

P_2 = Proportion of target population with poor glycaemic control.

$Z_{\alpha/2}$ = Significance level of 95% = 1.96

Z_{β} = Level of Power at 80% = 0.84

A study conducted on the glycaemic outcomes among patients with T2DM in LUTH found that 38% (0.38) had good glycaemic control and 62% (0.62) had poor glycaemic control. [22] These proportions were used to determine the sample size for this study.

$$P = \frac{P_1 + P_2}{2} = \frac{0.38 + 0.62}{2} = 0.5$$

$$n = \frac{2 \times 0.5 (1-0.5) (1.96 + 0.84)^2}{(0.38-0.62)^2}$$

$$= 68.06 = 69$$

Allowing 10% mark-up for non-responders = 69 + 6.9 = 75.9 Approximately 76.

The total number of participants that were recruited for the two groups was 152.

The final sample size was 76 participants per group.

Sampling Technique

A systematic random sampling technique was carried out with a sampling interval of three (based on the study population and sample size). The first participant was determined randomly by balloting between the first three eligible patients to arrive the clinic using the patient register and the sampling interval was maintained throughout the study. The last eligible patient for each day was noted and carried over to the next clinic day using the same sampling interval. The case files of all recruited patients were marked to avoid duplication. Following complete recruitment of participants in the poor control group, the researchers continued to recruit for the remaining participants in the good glycaemic control using the same sampling interval until the estimated sample size was completed.

Inclusion Criteria

Consenting and ambulatory adult T2DM patients aged 18 years and above who were attending the GOP clinic of FMD in LUTH and had been followed up for at least 6 months prior to the commencement of the study.

Exclusion Criteria

Acutely-ill patients as they may be unable to concentrate. Patients with haemoglobinopathy, severe anaemia, polycythaemia, haemolysis, recent blood loss or transfusion, and use of erythropoeitin therapy because of the possibility of spurious HbA1c result. [2, 23]

Data Collection

Data was collected for this study over five months using a pretested interviewer administered questionnaire. The questionnaire was divided into four sections namely: laboratory testing, socio-demographic variables, perceived family support and medication adherence.

On-the-spot assessment of HbA1c was performed for each patient using the HbA1c kit (CLOVER A1cR self-test cartridge manufactured by Infopia Co Ltd, Korea) which is a fully automated boronate affinity assay with a test range of 4 - 14%. [24, 25] About 2ml of whole venous blood sample was collected into a lithium heparin bottle and subsequently analysed in the side laboratory with result delivered in 5 minutes. Random blood samples were sent to the laboratory intermittently to ensure the kit was still appropriately calibrated. The participants were subsequently assigned into groups based on the outcome of HbA1c testing namely good (HbA1c < 7%) and poor glycaemic control (HbA1c ≥ 7%), and questionnaire was administered. **S**ocio-demographic variables were assessed using questions adapted from the WHO STEPS 26 questionnaire. [26] Perceived family support was assessed using perceived social support-family scale (PSS-Fa) which is a 20-item validated scale and has good reliability with alpha coefficient of 0.90. [27] The total score ranges from zero to 20 with scores ≥ 11, 7 but < 11 and < 7 regarded as Strong, weak and no family supports respectively. Medication adherence was assessed using an 8-item Modified Morisky Adherence Scale (MMAS-8) and has a Cronbach's alpha value of

0.83. [28] The total score ranges from zero to eight with scores 8, 6 but <8 and <6 categorized as high, medium and low adherence respectively.

Data Analysis

Data was analysed using SPSS version 20.0. Sociodemographic variables were presented using frequency table and Pearson chi square was used to test for association that existed between the two groups of good and poor glycaemic control. Perceived family support and medication adherence were presented using mean and standard deviation, and independent t-test was used to compare their means across the two groups. Perceived family support and medication adherence were transformed to categorical variables and Pearson chi square was used to test for association that existed between the two groups. The level of statistical significance was set at *P-value* ≤ 0.05.

RESULTS

A total of 76 adult T2DM participants per group were recruited into the study. Hence, a total of 152 respondents participated in the study and the data collected from all the participants was analysed.

Table 1: Association between age, sex, marital status and glycaemic control among T2DM participants

Variable	**Good glycaemic group**	**Poor glycaemic group**	χ^2	***P*-value**
	N_1 =76 (%)	N_1 =76 (%)		
Age (Years)			3.659	0.599
25 – 34	0 (0.0)	2 (2.6)		

35 – 44	6 (7.8)	3 (3.9)		
45 – 54	11 (14.5)	12 (15.8)		
55 – 64	28 (36.9)	24 (31.6)		
65 – 74	24 (31.6)	28 (36.9)		
75 and above	7 (9.2)	7 (9.2)		
Sex			0.117	0.732
Male	25 (32.9)	27 (35.5)		
Female	51 (67.1)	49 (64.5)		
Marital status			3.742	0.291
Single	0 (0.0)	2 (2.6)		
Married	63 (82.9)	55 (72.4)		
Separated	1 (1.3)	1 (1.3)		
Widowed/Widower	12 (15.8)	18 (23.7)		

Socio-demographic Characteristics

Table 1 shows that over one third of the participants which accounted for 28 (36.9%) in each group were within 55 – 64 years in the good glycaemic control group and 65 – 74 years in the poor glycaemic control group. Female participants predominated in both groups with 51 (67.1%) and 49 (64.5%) participants in the good and poor glycaemic control groups respectively.

Table 2: Association between level of education, employment status, social class, monthly income and glycaemic control among T2DM participants

Variable	**Good glycaemic control**	**Poor glycaemic control**	χ^2	***P-value***

	N_1 =76 (%)	N_1 =76 (%)		
Level of education			7.518	0.185
No formal education	3 (3.9)	3 (3.9)		
Primary education	22 (28.9)	12 (15.8)		
Secondary education (up to JSS3)	5 (6.6)	3 (3.9)		
Secondary education completed	21 (27.6)	31(40.8)		
Tertiary education	21 (27.6)	18 (23.7)		
Postgraduate degree	4 (5.3)	9 (11.8)		
Employment status			4.701	0.095
Unemployed	24 (31.6)	14 (18.4)		
Employed	24 (31.6)	35 (46.1)		
Retired	28 (36.8)	27 (35.5)		
Social class	N_1 = 24 (%)	N_2 = 35 (%)	15.913	0.007*
Professional	5 (20.8)	4 (11.4)		
Managerial	0 (0.0)	5 (14.3)		
Skilled non-manual	0 (0.0)	9 (25.7)		
Skilled manual	2 (8.3)	6 (17.1)		
Partly Skilled	5 (20.8)	3 (8.6)		
Unskilled	12 (50.1)	8 (22.9)		
Monthly income (in Naira)			0.535	0.911
< 50,000	58 (76.3)	56 (73.6)		
50,000 - < 100,000	11(14.5)	11 (14.5)		
100,000 - < 200,000	4 (5.3)	4 (5.3)		
200,000 - < 500,000	3 (3.9)	5 (6.6)		

*Statistically significant at *p-value* ≤ 0.05, **360 naira is equivalent to one United States dollar

In Table 2, almost all of the participants, 73 (96.1%) in each group had formal education. The social class of participants was found to be significantly associated with glycaemic control (*P* 0.007).

Table 3: Comparison of perceived family support between participants with good and poor glycaemic control

Variable	Glycaemic control	N	Mean	SD	T-test	df	*P-value*
Family Support	Good	76	16.37	3.58	3.75	145.49	0.000*
	Poor	76	13.97	4.27			

*Statistically significant at *p-value* ≤ 0.05

Perceived family support in good and poor glycaemic control groups

In Table 3, the mean score (± SD) of perceived family support in good glycaemic control group was 16.37 (± 3.58) while participants in poor glycaemic control group had lower mean score of 13.97 (± 4.27). The difference between the mean scores across the two groups was significant (*P* 0.000).

Table 4: Association between perceived family support and glycaemic control among T2DM participants

Perceived family support	Good	Poor	χ^2	*P-value*

	N_1 =76 (%)	N_1 =76 (%)		
Strong	69 (90.8)	64 (84.2)	2.932	0.231
Weak	6 (7.9)	7 (9.2)		
No	1 (1.3)	5 (6.6)		

Table 4 shows the transformation of perceived family support into three categories namely strong, weak and no family support. Majority of the sampled patients had strong family support in the good and poor glycaemic control groups accounting for 69 (90.8%) and 64 (84.2%) respectively. However, the association that existed between the family support and glycaemic control was not statistically significant (*P* 0.231).

Table 5: Comparison of medication adherence between participants with good and poor glycaemic control

Variable	Glycaemic control	N	Mean	SD	T-test	df	*P-value*
Medication Adherence	Good	76	7.13	1.57	2.54	145.59	0.012*
	Poor	76	6.42	1.87			

*Statistically significant at *p-value* ≤ 0.05

Medication adherence in good and poor glycaemic control groups

In Table 5, the participants' mean score (± SD) of medication adherence in good glycaemic control group was 7.13 (± 1.57) while participants in poor glycaemic control group scored 6.42

(± 1.87). The difference in the mean scores of medication adherence across the two groups was significant (*P* 0.012).

Table 6: Association between medication adherence and glycaemic control of T2DM participants

Variable	Good N_1 =76 (%)	Poor N_1 =76 (%)	χ^2	*P-value*
Medication adherence			7.348	0.025*
High adherence	50 (65.8)	35 (46.0)		
Medium adherence	14 (18.4)	16 (21.1)		
Low adherence	12 (15.8)	25 (32.9)		

*Statistically significant at *p-value* ≤ 0.05

In Table 6, almost two-third of the participants, 50 (65.8%), in good glycaemic control group were highly adherent with their medications while high medication adherence was recorded in just a little above one-third of participants, 35 (46.0%), in poor glycaemic control group. A significant association existed in the proportions of medication adherence across the glycaemic control groups (*P* 0.025).

DISCUSSION

In this study, the mean scores of perceived family support among participants with good and poor glycaemic control were 16.39 and 13.97 points respectively. This result showed that even

though the mean scores of both groups were within the category of strong family support, the participants in the good glycaemic control group had stronger family support than their contemporaries in the poor glycaemic control group. This finding is in consonance with a study by Tol *et al* in Iran which found a mean score of 12.89 points indicative of strong family support among T2DM participants.[29] The mean scores of perceived family support in this study are however at variance with the finding by Adetunji *et al* in a cross-sectional study in south-western Nigeria which reported a lower mean score of 9.5 points indicative of weak family support. [30] This sharp contrast may be due to the fact that this study was conducted at the Family Medicine clinic where emphasis is placed on psychosocial component of health unlike the study by Adetunji *et al* that was conducted at a diabetes clinic.

The comparison of perceived family support between the two glycaemic groups in this study showed that participants in the good glycaemic control group had stronger family support than their contemporaries in the poor glycaemic control group and the difference in their means was statistically significant (*P* 0.000). This finding is consistent with other studies that found statistically significant difference in means of perceived family support and glycaemic control. [14, 29, 31] In contrast to the finding of this study, Gao *et al* reported from their study in China that a significant relationship did not exist between the mean score of social support and glycaemic control. [32] This variation could be due to the use of health education impact questionnaire to measure the perceived support of the participants while this index study used PSS-Fa scale. It could also be due to the cultural variation in the social network of the Chinese and Nigerian participants.

This present study found that majority of the participants accounting for 90.8% and 84.2% in good and poor glycaemic control groups respectively had strong family support. These

proportions are in conformity with the finding of a study by Iloh *et al* in Abia state, South-eastern Nigeria which found that 90.8% of T2DM participants had functional family with strong family support. [20] This similarity could be attributable to the fact that the two studies were conducted in the GOP clinics of Family Medicine where T2DM patients being followed up are expected to be provided with family–focused intervention. In contrast, some studies have reported much lower level of family support than the findings of this study despite using similar tool for assessing family support. [30, 33, 34] This contrast may be due to the fact that the participants in this study were metropolitan city dwellers who were more educated and could better harness their family resources unlike the other studies that were conducted in rural/semi-urban areas of Nigeria.

This study demonstrated some differences in the proportions of PFS across the two groups but the association was not statistically significant (*P* 0.231). This finding is in consonance with the finding of another comparative study among T2DM in USA by Vaccaro *et al* which showed that family support was not significantly associated with glycaemic control. [14] In contrast with the finding of this study, some cross-sectional studies have reported a statistically significant association between family support and glycaemic control. [12, 13, 19, 20, 30, 33, 34] This variation could be because some of the studies used FPG to assess level of glycaemic control unlike this study that did HbA1c testing for all the participants. [20, 30, 33] Also, some of the studies with a conflicting finding did not use PSS-Fa that was used in this study to assess family support. [12, 13, 20] It is of note that the effect of PFS in this study was statistically significant when viewed as a continuous variable but this effect loses statistical significance when the variable was transformed into categories.

In this study, the mean score of medication adherence among participants with good and poor glycaemic control were 7.13 and 6.42 points respectively, both indicative of medium adherence, and the difference between their mean scores was statistically significant (*P* 0.012). These findings are not consistent with the findings of studies by Chew *et al* in Malaysia (that reported lower mean score of 5.61 points) and Alkhoshaiban *et al* in Saudi Arabia that reported lower mean scores of 5.68 and 5.66 points among participants with good and poor glycaemic control respectively. [35, 36] Alkhoshaiban *et al* found that there was no significant difference between the mean scores of medication adherence between participants with good and poor glycaemic control. [36] The variation could be because Alkhoshaiban *et al* conducted their study among elderly population who may have poor drug adherence on account of pill burden arising from treatment of multi-morbidities unlike the participants of this current study that were adults aged 18 years and above.

Based on the categories of medication adherence namely high, medium and low, this study found that high adherence accounted for 65.8% and 40.0% among participants with good and poor glycaemic control respectively. Medium adherence constituted 18.4% and 21.1% across participants with good and poor glycaemic control respectively while low adherence accounted for 15.8% participants with good glycaemic control and 32.9% participants with poor glycaemic control. Medication adherence was found to be statistically significant with glycaemic control in this study (*P* 0.025). In Ogbomoso, south-western Nigeria, Fadare et al reported levels of medication adherence of 40.3%, 33.3% and 26.4% representing high, medium and low adherence respectively which are fairly consistent with the findings of this study. [37] Iloh *et al* in south-eastern Nigeria reported that medication adherence was significantly associated with glycaemic control (*P* 0.038) which is consistent with the finding of this study. [20] Ashur *et al* in a

study among diabetic patients in Libya reported that 36.1% and 63.9% of the participants sampled had low and high/medium adherence respectively and the association between medication adherence and glycaemic control was significant (*P* 0.008). [18] These findings by Ashur *et al* are in consonance with the findings of this study probably because of the consistency in the sociodemographic characteristics as participants of both studies were predominantly female and married, and MMAS-8 and HbA1c were used to assess the adherence and glycaemic control respectively. In Kenya, a study by Waari *et al* found that high, medium and low adherence accounted for 45.5%, 26.2% and 28.3% of study participants respectively which are consistent with the findings in the poor glycaemic control group. [38] Waari et al also found that a significant association existed between medication adherence and glycaemic control as well as that poor adherence was associated with poor family support in self-management of DM. The similarity between the findings by Waari *et al* and of this study could probably be due to fact that both studies were conducted among African population aged 18 years and above, and MMAS-8 and HbA1c were used to assess medication adherence and glycaemic control respectively. Wong *et al* in a study among diabetic patients in China reported findings that are in consonance with the findings of this study, as 32.2% participants had low drug adherence and low medication adherence was found to correlate with poor glycaemic control (*P* 0.007). [39] Similarly, Mayberry *et al* in the United States reported from their study that patients with poor medication adherence are more likely to have poor family support and consequently, poor glycaemic control. [16]

Conclusion

This study concludes that T2DM patients with good glycaemic control has stronger family support than their contemporaries with poor glycaemic control. It also shows that T2DM patients with good glycaemic control are more drug-adherent than those with poor glycaemic control. In

order to improve the overall health outcome of patients with T2DM, It is therefore necessary to emphasise on medication adherence and family-based intervention in the holistic care of T2DM.

Ethical Approval and Consent:

Written approval for the study was obtained from the Health Research and Ethics Committee of LUTH. We explained the aim and objectives of the study to all eligible participants, assured them of strict confidentiality and without coercion, a written informed consent was obtained from each of them. HbA1c was conducted on all consenting participants and their results were shared with them after data collection.

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