Original Research Article

Level of Glycaemic Control among Diabetic Patients Accessing Care at Bowen University Teaching Hospital, Ogbomoso

Abstract

Background: Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycaemia resulting from impairment in insulin secretion, insulin action or both. The aim of management of diabetes mellitus is to achieve and maintain blood glucose levels within normal ranges and prevent its complications. This study aims to determine the level of glycaemic control and factors associated with good glycaemic control among among adult outpatients with diabetes mellitus in Bowen University Teaching Hospital (BUTH), Ogbomoso with a view to intensify effort towards achieving good glycaemic control.

Method: A descriptive cross-sectional study in which 299 consenting diabetic patient were recruited using systematic sampling technique. Sociodemographic characteristics of each participant and their medical history were documented. The level of glycaemic control was recorded for each participant and it was classified as either poor or good.

Results: Most of the study participants (41.8%) were over 60 years old while the age group less than 30 had the lowest proportion of participants (1.3%). About two third (60.5%) of the study participants were females. Majority (91.6%) of the study participants were married. Poor glycaemic control was found in about 83.6% of the participants. The factors found to have a statistically significant association with glycaemic control include; age group, sex, educational level and duration on treatment.

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Conclusion: The long-term glycaemic control of the participants was unacceptably poor. There is need to intensify efforts targeting good glycaemic control in the patients with diabetes mellitus in order to prevent complications from the disease.

Key Words: diabetes, glycaemic control, disease, insulin

Introduction: Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycaemia resulting from impairment in insulin secretion, insulin action or both.[1] Diabetes mellitus is fast assuming pandemic with alarming increase in its prevalence rate.[2]

The number of people with DM has risen from 108 million in 1980 to 415 million in 2015 thus, putting the global prevalence at 8.8%. Furthermore, it has been projected that by 2040, 642 million people or 1 out of 10 adults will be living with diabetes mellitus.[3] The current prevalence of DM in Nigeria has been estimated to be in the range of 8% - 10%.[4] Noteworthy, of the global population of people living with DM, 80% are from the developing countries.[2]

There are four broad classes of DM designated as; Type 1 diabetes (due to autoimmune β-cell destruction, usually leading to absolute insulin deficiency), Type 2 diabetes (due to a progressive loss of β-cell insulin secretion frequently on the background of insulin resistance), Gestational diabetes mellitus (GDM) (diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation) and Specific types of diabetes due to other causes.[5]

The clinical picture of diabetes mellitus is characterised by the presence of elevated plasma glucose with or without symptoms or its complications.[6] The symptoms of DM include polyuria, polydipsia, unexplained weight loss, polyphagia, recurrent infections, etc.[6] Based on World Health Organization (WHO) guideline, diagnosis of DM is made with fasting plasma glucose ≥ 7.0mmol/l (126mg/dl) or 2-hours post-prandial plasma glucose ≥ 11.1mmol/l

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(200mg/dl).[7] The ADA and WHO has recommended that a cut-point of $HbA_1C \geq 6.5\%$ can be used to diagnose diabetes mellitus.[8]

Diabetes mellitus, one of the diseases called diseases of affluence was previously known to plague the Western world and not Africa[9] but presently, because of the impact of urbanization and epidemiological transition hitting this region, the story is changing. The aim of management of diabetes mellitus is to achieve and maintain blood glucose levels within normal ranges and prevent its complications.[10] This could be done in several ways including; dietary and lifestyle modification, use of oral antidiabetic drugs or the use of insulin. If the glycaemic control is poor, then complications ensue.

Assessment of blood glucose control could be measure of either short term or long-term glycaemic control. Short term glycaemic control is essentially carried out by assessing fasting plasma glucose and postprandial glucose levels while long term glycaemic control involves evaluation for glycosylated haemoglobin (HbA_1C) levels.[6] The best indicator of true glycaemic control over a period of time is HbA_1C level.[11] Glycaemic targets for non-pregnant adults based on ADA include $HbA_1C < 7.0\%$, fasting blood glucose of 70–130mg/dl (3.9–7.2mmol/l) or 1-2 hour postprandial capillary plasma glucose < 180 mg/dl (<10.0mmol/l).[5] Good glycaemic control implies glycosylated haemoglobin lesser than 7% while a value of $\geq$ 7% was considered poor glycaemic control.[5]

The aim of this study was to determine the level of glycaemic control and factors associated with good glycaemic control among adult outpatients with diabetes mellitus in Bowen University Teaching Hospital (BUTH), Ogbomoso with a view to intensify effort towards achieving good glycaemic control among diabetic patients accessing care at BUTH Ogbomoso.

The study area was Ogbomoso, a city in Oyo state, South-West of Nigeria. The indigenous people are from the Yoruba ethnic group. Farming is their main vocation and a few are

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traders, artisans or civil servants. Christianity, Islam and Traditional worship are their religious practices. The study centre was Bowen University Teaching Hospital (BUTH), Ogbomoso.

Materials and Methods: A total of 299 patients attending adult diabetic clinic in both General Outpatient Department and Endocrinology clinic were recruited for the study using systematic sampling technique. The data collection lasted 4 months between March and June 2018. The inclusion criteria include consenting patients aged 18 years and above with diabetes mellitus who have been on treatment for at least 6 months. The exclusion criteria include pregnant patients because the glycaemic target for pregnant patient differs from the other adult population and cognitively impaired patients because they may not be able to follow instructions. A structure questionnaire was used to collect data on socio-demographic characteristics and medical history of the participants. The Socio-demographic characteristics included: respondent's age, gender, marital status, religion, ethnic group, level of education, occupation, and place of residence (urban or rural). Urban residence is identified as one with a population of at least 5,000 inhabitants while rural residence is one with population of less than 5,000 inhabitants.[12] The medical history included: duration of illness and current medications.

The estimation of HbA_1C was done using A1CNow®+ system. This provides the percentage of glycosylated haemoglobin ($\%A_1C$) in capillary or venous whole blood. Participants were not required to fast before the sample collection.

The study protocol was reviewed by the ethical committee of Bowen University Teaching Hospital, Ogbomoso and ethical approval was obtained before the study commenced.

Completed questionnaires were serially coded and data were inputted into the computer using Statistical Package for Social Sciences (SPSS) for Windows, version 20 by IBM Corporation, Armonk, New York. Same was used for data analysis. Data presentation was done using

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frequency tables and prose. The association between two categorical variables was tested using chi square and Fischer exact test with p-value set at less than 0.05. Descriptive statistics was used to determine the level of glycaemic control among adult outpatients with diabetes mellitus accessing care in BUTH.

The Standard Occupational Classification System designed by Office of Population Census and Surveys, London (OPCS 1991) and modified for Nigeria was used to classify participants into socioeconomic classes 1-3 as follows:

Class 1 = skilled worker e.g., professionals and managerial officers and retirees of this cadre

Class 2 = unskilled workers e.g., Artisans and traders

Class 3 = dependents e.g., retirees of class 2, those not on pension, house wives of class 2 cadre, students. [13]

Participants were grouped as having good glycaemic control if HbA_1C is < 7% while a value of ≥ 7% was considered poor glycaemic control.[5]

Results

Three hundred questionnaires were administered to the study group but only 299 were completed giving a response rate of 99.7%. All the participants had glycosylated haemoglobin test done.

Table 1: **Socio-demographic Characteristics of the Participants** (N = 299).

	Frequency	Percentage (%)
Age (years): ≤ 30	4	1.3
31-40	15	5.0
41-50	63	21.1
51-60	92	30.8
Above 60	125	41.8

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Mean age = 59.3	Standard Deviation= 11.2	
Gender: Female	182	60.9
Male	117	39.1
Marital status: Single	3	1.0
Married	274	91.6
Separated	3	1.0
Widow	19	6.4
Religion: Christianity	228	76.3
Islam	71	23.7
Education: No formal	89	29.8
Primary	90	30.1
Secondary	55	18.4
Tertiary	65	21.7
Social Class: Class 1	74	24.7
Class 2	203	67.9
Class 3	22	7.4
Ethnicity: Yoruba	285	95.3
Hausa	3	1.0
Igbo	11	3.7
Residence: Rural	91	30.4
Urban	208	69.6

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Table 1 above showed the socio-demographic characteristics of the participants. The age group with the highest proportion of participants was age above 60 years with 41.8% of the participants while the group below 30 years was the lowest with a frequency of 1.3%. It can be seen that only 39.1% of the participants were males and 60.9% were females, giving a male to female ratio of 0.6:1. Majority of the participants (91.6%) were married. Christianity was the more practised religion with a frequency of 76.3%. The largest proportion of the participants (95.3%) belonged to Yoruba ethnic group. About 67.9% of the respondents were in class 2 and majority of the participants (69.6%) were urban dwellers.

Table 2: **Medical Characteristics of the Participants**

	Frequency	Percentage (%)
Current Medications		
Oral	186	62.2
Insulin	11	3.7
Both	102	34.1
Duration of Diabetes		
≤ 5 years	201	67.2
6 – 10 years	48	16.1
Above 10 years	50	16.7
Glycaemic control		
Good	49	16.4
Poor	250	83.6
Mean HbA1C =9.2 ± 2.5%		

From the above Table, 62.2% of the participants were on oral anti-diabetic drugs and of this proportion, about 102 (34.1%) were on both oral and insulin. About 67.2% of the participants

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had a duration of diabetes less than 5 years. Most of the participants had a poor glycaemic control with a frequency of 83.6%. The mean HbA1C level was 9.2 ± 2.5%.

Table 3: Glycaemic Control Status

Variables	**Glycaemic Control (GC)**		X^2	**p-Value**
	Good GC	**Poor GC**		
Age Group (Years)				
<30	0(0.0%)	4(100%)		
31-40	0(0.0%)	15(100%)		
41-50	17(27.0%)	46(73.o%)	F=11.236	0.018
51-60	9(9.8%)	83(90.2%)		
>60	23(18.4%)	102(81.6%)		
Total	49(16.4%)	250(83.6%)		
Sex				
Female	20(11.0%)	162(89.0%)		
Male	29(24.8%)	88(75.2%)	X^2=9.894	0.002
Education Level				
No formal education	13(14.6%)	76(85.4%)		
Primary	8(8.9%)	82(91.1%)		
Secondary	11(20.0%)	44(80.0%)		
Tertiary	17(26.2%)	48(73.8%)		
Total	49(16.4%)	250(83.6%)		

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Medication				
Oral	29(15.6%)	157(84.4%)		
Insulin	0(0.0%)	11(100%)		
Both	20(19.6%)	82(80.4%)	F=2.623	0.255
Total	49(16.4%)	250(83.6%)		
Duration of Treatment (Years)				
<5	25(12.6%)	174(87.4)		
6-10	8(16.0%)	42(84.0%)		
>10	16(32.0%)	34(68.0%)	X^2=11.024	0.004
Total	49(16.4%)	250(83.6%)		

Table 3 above showed that age group above 60 years, female sex, participants with primary level of education, use of oral antidiabetic agent and duration of diagnosis less than 5 years had highest proportion with poor glycaemic control. A significant association with glycaemic control was found with the participants age group, sex, level of education and duration on treatment.

Discussion

This study involved 299 participants. The age group above 60 years had the highest proportion of respondents which was 41.8% while the age group below or equal to 30 years was the lowest which was 1.3%. The age distribution of the respondents in this study illustrated the attributes of the elderly with respect to health seeking behaviour. Even though type-2 DM can be seen in adults below the age of 30 years, the minimum age found in this study was 30 years. This may be due to the fact that when under 30 years is not healthy, the parents will deny possibility of DM and will fail to present them to the hospital.

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A statistically significant association was found between the age group of the participants and glycaemic control in this study. This does not agree with Yakubu et al[14] in North West Nigeria who found that age was associated with poor glycaemic control but not to the level of significance. In line with this, a hospital based observational study conducted in Luska[15] to assess glycaemic control and associated self-management behaviours in diabetic outpatients found that, poor glycaemic control was not strongly associated with age of participant. This also agrees with Chetoui et al[16] in which age had no significant association with glycaemic control.

Majority of the respondents were females with a prevalence of 60.9%. The larger proportion of female in the study reflected the positive attitude of females to seeking health care. Consistent with this finding is the report of previous study which reported 62.1% of females in Enugu,[17] a study in Senegal reported a male to female ratio of 0.67:1.[18] The above showed that larger proportion of females were involved in the studies as seen in others.[19,20,21] However, the report by Ogbera et al[22] revealed that males were more than females (1:0.97).

Even though, females have good health seeking behaviour has seen in this study, about 89.0% of them had a poor glycaemic control which was in contrast to the finding by Chetoui et al[16] where males were found to have poor glycaemic control. This study demonstrated a statistically significant association between sex and glycaemic control. This was similar to the finding by Yakubu et al[14] who found that gender and ability to practice dietary control as recommended by clinicians were significantly associated with glycaemic control. However, Musenge et al[15] observed that poor glycaemic control was not strongly associated with sex of the participants.

Majority of the respondents (91.6%) in this study were married. This finding was supported by previous literature that described DM to be an adult-onset disease.[23] The population under study was well distributed in the adult group and the minimum age was 30 years, it will be

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expected that majority would be married. Previous other studies were in consistent with this finding.[19,23] In this study, 76.3% of the respondents were Christians. Ogbomoso is generally known to be a Christian dominated community, that might have accounted for the above finding. However, previous similar studies did not emphasize this.

In addition, majority of the respondents had no formal education (29.8%) or only primary education (30.1%) this may be because they were elderly and education was not paramount then. This could have accounted for the 67.9% distribution of the respondents into social class 2. The finding in this study agrees with Chetoui et al.[16] who observed that participants who could not read had a poor glycaemic control but negates the finding by Musenge et al[15] that, poor glycaemic control was found in patients with at least secondary level of education. A significant association was seen between level of education and glycaemic control in this study. In contrast to this finding, Musenge et al[15] found that the participants with at least secondary level of education had poor glycaemic control but no statistically significant association was found.

In this study, 67.2% of the respondents had duration of DM treatment less than 5 years while a smaller percentage (16.7%) had duration of treatment over 10 years. The shorter duration of treatment seen in the respondents may be due to late presentation to the hospital for diagnosis and treatment. The late presentation may also be attributed to the cultural perception of patients and the low level of education reported earlier. However, Ogbera et al[22] in a study aimed to determine the prevalence of the foot-at-risk for ulceration in diabetic patients in an urban out-patient clinic in Lagos, Nigeria reported that 40.6% of the respondents had medium term DM duration (5-9 years). This may be due to higher level of education seen in urban dwellers. Duration of treatment was significantly associated with glycaemic control in this study. This agrees with Chetoui et al.[16] on bivariate analysis who found that duration of diabetes was significantly associated with HbA1c level. In contrast to this, Yakubu et al[14]

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found that poor glycaemic control was associated with duration of diabetes greater than or equal to 5 years.

The present study showed that about two third of the study participants were on oral antidiabetic drugs for the control of their blood glucose and about 84.4% of them had poor glycaemic control while only a few participants (3.7%) were on insulin therapy and all of those on insulin therapy had poor glycaemic control. This was contrary to the thinking that control would be better for those on oral medication when compared with those on insulin therapy. However, the fear of having to inject one's self may contribute to poor compliance seen in the group on insulin therapy. This finding was confirmed by Chetoui et al[16] where he found that participants on diet and oral antidiabetic drugs alone were better controlled than those on insulin.

In this study, HbA_1C was used to assess participants' level of glycaemic control. The level of glycaemic control in participants were unacceptably poor as only 16.4% of the participants had good glycaemic control. The mean level of glycosylated haemoglobin in this study was 9.2 ± 2.5%. The values of HbA_1C of participants in this study ranged between 4.6% and 21%. In another study done to determine the level of glycaemic control among diabetic patients in Umuahia, Nigeria by Ngwogu et al,[24] 38% of the study populations had good glycaemic control with mean glycated haemoglobin of 8.4 ± 1.7%. Similar to this finding, Musenge et al[15] in Lusaka, Zambia, found the prevalence of patients with good glycaemic control to be 38.7% while 61.3% had poor glycaemic control. Both studies have glycaemic control which doubles the finding in this study.

However, some other studies conducted in Niger-Delta region of Nigeria by Ufuoma et al[25] reported that 55% of the population had poor glycaemic control. In addition, the mean fasting blood glucose and HbA_1C of the respondents were 7.89 ± 3.6 mmol/L and 8.2% respectively. This agrees with Tshitenge et al[21] in a study conducted in Botswana where an uncontrolled

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glycaemia with a percentage of 59% and a mean HbA_1C of 8.1%were found in patients. A significantly higher result was found in Morocco by Chetoui et al[16] in 2017 in a cross-sectional study conducted to determine the prevalence of poor glycaemic control and associated factors in type 2 diabetes patients. It was reported that 66.3% of the total participants had poor glycaemic control. The above findings showed a remarkable deficiency in glycaemic control among the patients with DM. Therefore, emphasis should be place on strict control of glycaemia by both the physician and the patients.

Conclusion: The glycaemic control was found to be poor in this study but age group, sex, level of education and duration on treatment were found to be associated with good glycaemic control among the study participants.

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