

EVALUATION OF DIABETES CONTROL IN DIABETIC PATIENTS ATTENDING
CONSULTANT ENDOCRINOLOGIST OUTPATIENT CLINIC AT A NIGERIAN FEDERAL
TEACHING HOSPITAL*Nwafuru K. Solomon¹, Odili U. Valentine²¹ Department of Pharmacy, Federal Teaching Hospital, Owerri, Nigeria. ² Department of Clinical Pharmacy and Pharmacy Practice, University of Benin, Nigeria*Corresponding Author's Email: drsknwafuru@gmail.comDOI: [njcpt.com.ng/101.1.2.46](https://doi.org/10.1.2.46)**Abstract**

Introduction: Diabetes Mellitus is a group of metabolic diseases characterized by chronic hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. It is a public health disorder that results in complications if proper control is not applied.

Objectives: This study was conducted to evaluate the knowledge and level of diabetes control in diabetes patients attending the Consultant Endocrinologist outpatient clinic of Federal Teaching Hospital Owerri, Nigeria.

Methods: The number of patients recruited for this study was 102. The study was a cross-sectional, observational and prospective research that used a well-structured and pretested questionnaire, Electronic patients' record of the hospital and a Diabetes Knowledge Test (DKT) kit (a valid, reliable and authenticated instrument for assessing and measuring the diabetic Knowledge of patients). This kit was developed by the University of Michigan Diabetes Research and Training Centre.

Results: Males were the most respondents 56(54.9%). The married patients 78(76.5%) while 39(38.2%) of the population had higher education certificates. The patients were more public servants than others while most of them earned ₦80,000 monthly salary. The major risk factor was a family history of diabetes 55(53.92%) and a marginal number of patients were never trained in diabetes knowledge 51(50%). A large number of the patients neither drink alcohol 80(78.43%) nor smoke tobacco 93(92.16%). The fasting blood sugar of the patient above normal was 53(51.96%) for males and 45(44.12) for female respondents. Males were more overweight (BMI=18.5-24.9kg/m²) 31(30.39%) than the females 22(21.57%) and poor control led to some complications like neuropathy, retinopathy, hypertension, and nephropathy, to mention a few.

Conclusion: While the knowledge of respondents on diabetes mellitus was remarkable, various risk factors were not considered for effective control and these were noted as reasons for poor control.

Key Words: Evaluation, Diabetes mellitus control, Consultant endocrinologist, Outpatient clinic, Federal Teaching Hospital.

Introduction

Diabetes is a metabolic disorder of carbohydrate, lipid and protein metabolism.^[1] The disorder is featured with chronic hyperglycaemia resulting from defects in insulin production, insulin action or both. Diabetes mellitus may present with characteristic symptoms such as polyuria (excessive urination), polyphagia (excessive hunger), polydipsia (excessive thirst), and diminution of vision associated with weight loss of weight.^[2] In severe form, Keto acidosis or a non-ketotic hyperosmolar syndrome may emerge and pave the way to stupor, coma; and in the absence of effective therapy, death. The negative outcomes of DM include long-term destruction, dysfunction and failure of organs.^[3] The long-term effect includes the progressive development of specific complications of retinopathy with the potential loss of sight, nephropathy that may lead to renal failure, and or neuropathy with risk of foot ulcers, amputation, Charcot joints and features of autonomic dysfunction, including sexual loss.^[4] Population with diabetes are at increased risk of cardiovascular, peripheral, vascular and cerebrovascular diseases/or disorders. Several disease states contribute to the establishment of diabetes. These include processes which destroy the beta cells of the pancreas with resultant insulin deficiency and additionally, others that result in resistance to insulin action.^[5] Diabetes prevalence for all age groups globally has been presumed to be 2.8% in 2000 and is projected to be 4.4% by 2030.^[1]

The population with diabetes has been projected to rise from 171 million to 366 million by 2030.^[6] In Nigeria, the number of persons with diabetes was 1.7 million in 2000 and is estimated to rise to 4.8 million in 2030. Meanwhile, a global record of 2013 estimated 382 million people as diabetic worldwide with type 2 diabetes making up about 90% of all cases.^[7] This is equal to 3.3% of the population with equal rates in both women and men.^[8]

In 2011, diabetes resulted in 1.4 million deaths globally, while in the African region, premature death stood at 58% and in Nigeria, 4.3%^[41] making it the 8th leading cause of death.^[1] The number of people with diabetes is expected to rise to 592 million by 2035.^[9] The increased cardiovascular risk associated with diabetes mellitus made it the 6th leading cause of death in the United States, with 284,000 deaths, 15 million work days absent and an additional 107 million work days lost due to unemployment disability according to 2007 reports.^[42] The financial impact of diabetes mellitus in 2007 was approximately 174 million USD or one of every five dollars spent on health in the United States.^[10] There is now an alarming increase in the rates of type 2 diabetes globally. Notably are China, and India where it was not general initially.^[11]

The objective of this study was to assess the level of diabetes control in diabetic patients attending the consultant endocrinologist clinic of Federal Teaching Hospital, Owerri, Nigeria.

Methods

Study setting

The study was conducted at the outpatient clinic of Federal Teaching Hospital Owerri, Nigeria which is a Public Tertiary Teaching Hospital located in the metropolitan city of Owerri, Owerri Municipal Council of Imo State, Nigeria. The Hospital provides comprehensive health care services to the residents of Owerri indigenes and residents and referrals from neighbouring states. The hospital is a centre for pharmacovigilance in Southeast Nigeria and a centre for training resident physicians, resident pharmacists, interns and other professionals. It is a 622-bed hospital with 13 wards and many clinical departments. A total of 102 patients were recruited at the facility within the study period of August to December 2023.

Study design

The study involved a descriptive, cross-sectional, observational prospective study of 102 adult diabetic patients who attended a consultant endocrinologist outpatient clinic from August to December 2023.

Inclusion and exclusion criteria

The research included adult type 2 diabetic patients and excluded children, type 1 diabetes and gestational diabetics.

Sample size calculation

The study recruited an average of 4 – 5 patients per week. The sample size calculation was determined as described by Yamane (1967) to be 81, but increased to 102 by attrition.

Ethical approval

Ethical clearance was sought from the Federal Teaching Hospital, Owerri Human Research and Ethics Committee with approval number FMC/OW/ETHICAL/VOL.2. An informed consent form was given to the patients to sign before enrolment. The consent form explained the aim of the study, clarifying questions, and concerns and respondents were allowed to decline participation if they wished. Retrieved data were kept in a designed passworded computer.

Data collection procedure

Following ethical approval, Electronic Medical Records of patients, pretested structured questionnaires and diabetes knowledge test scores of the University of Michigan were used to collect data from one hundred and two outpatients of both sexes whose consents were sorted. Relevant patients'

anthropometrics necessary for diabetes poor control were also evaluated. The study was between August to December 2023.

Data analysis

Data collected were entered into Microsoft Excel Spread Sheet and double-checked. The Statistical Package for Social Science (IBM SPSS) version 21 was used and results were presented in percentage, and p-value using the student t-test.

Results

A total of 102 diagnosed type 2 diabetes mellitus patients attending the consultant endocrinologist outpatient clinic were recruited for this study and these numbers completed the structured and pretested questionnaire. The mean age of the respondents was 53.9 ± 12.80 . The majority of the patients were males 56(54.9%) while the married respondents were 78(76.5%). Most of the patients had higher education certificates; 39 (38.2%) and more were public servants 49(48.1%) while patients above a monthly income of N80,000, 42(41.2%) (Table 1).

Table 1: Patients' Characteristics (N= 102)

Characteristics of Patients	n (%)
Gender	
Male	56(54.9)
Female	46(45.1)
Marital Status	
Single	15(14.7)
Married	78(76.5)
Widowed	9(8.8)
Education	
Nil	11(10.8)
Primary	12(11.8)
Secondary	21(20.6)
Higher Education	39(38.2)
Post Graduate	19(18.6)
Occupation	
Self-employed	26(25.5)
Public Servant	49(48.1)
Department	13(12.8)
Retirees	14(13.7)
Monthly Income	26(25.5)
Less than ₦18,000	20(19.60)
₦19,000 – ₦49,000	14(13.7)
₦50,000 – ₦79,000	42(41.2)
Greater than N80,000	

Patients' status and monthly income expressed descriptively in percentage

The respondents' disease status was traced more to their family background 55(53.92%), while greater numbers of the patients were never trained on diabetes mellitus knowledge 51(50%) than the trained 47 (46.1%). The majority of the respondents denied taking alcoholic drinks 80 (78.43%) as more doesn't smoke 93(92.16%) compared to those that smoke many sticks daily 3(2.94%) in Table 2.

Table 2: History and Lifestyle Status (N = 102)

History and Lifestyle Status	n (%)
History of Diabetes Mellitus	
Family History	55(53.92)
Nil Family History	42(41.18)
No Idea	5(4.9)
Diabetes Knowledge Training	
Trained	47(46.1)
Never Trained	51(50)
No Idea	6(5.9)
Daily Alcoholic Intake	
One bottle	19(18.63)
Two bottles	2(1.96)
Many bottles	1(0.98)
None	80(78.43)
Daily Tobacco Intake	
One stick	4(3.92)
Two sticks	1(0.98)
Many sticks	3(2.92)
None	93(92.16)

Patient's history and lifestyle were expressed in percentage

The overall mean DKT score of the respondents was 6.54 ± 2.51 and the mean male score (6.55 ± 2.5) and mean female DKT score (6.54 ± 2.56) were statistically significant ($p > 0.05$). Respondents score on knowledge of DKT score was knowledge of DM food 52(51%); knowledge of food highest in carbohydrates 90(88.2%); knowledge of free food 43(42.2%); effect of exercise 56(54.9%); symptoms of nerve disease 32(31.4%) and effect of unsweetened fruit juice 38(37.3%) (Table 3).

Table 3: DKT Score (N = 102)

Diabetes Knowledge Test Score	n (%)
1. Diabetic food	52 (51%)
2. Food highest in carbohydrate	90 (88.2%)
3. Food highest in fat	52 (51%)
4. Free food	43 (42.2%)
5. Glycosylated haemoglobin	25 (24.5%)
6. The best method for testing sugar	56 (54.9%)
7. Effect of unsweetened fruit juice	38 (37.3%)
8. Which shouldn't be used to treat low-sugar	32 (31.4%)
9. Effect of exercise	56 (54.9%)
10. Effect of infection	44 (43.1%)
11. The best way to take care of feet	56 (54.9%)
12. Effect of low-fat milk on heart	63 (61.80)
13. Symptoms of nerve disease	32 (31.4%)
14. Not associated with diabetes	70 (68.6%)

DKT (diabetes knowledge test) score of the University of Michigan was expressed as percentages males 45(44.12%) & females 38(37.25%)

The Hb_{A1C} of most of the respondents were above 7% compared to the range of the Nigerian Diabetic Association of 4 – 6%. The gender variables were statistically ($p > 0.05$) above the normal fasting plasma glucose of 7mmol/l (126mg/l) as more of the respondents were hypertriglyceridemic and dyslipidemic ($p < 0.05$). The results on waist circumference and body mass index are presented in Table 4.

Table 4: Diagnostic laboratory results (N = 102)

Markers	Males n (%)	Females n (%)	p-value (t-test)
Hb _{A1C} (%)			
4 – 6	1 (0.98)	2 (1.96)	0.494
7	10 (9.8)	5 (4.9)	
Greater than 7	45 (44.12)	38 (37.25)	
FPG (mml/l)			
3.33 – 7	2 (2.9)	3 (2.9)	0.846
Greater than 7	53 (51.96)	45 (44.12)	
Lipid Panel (mg/dl)			
HDL			
Greater than 40	45 (44.12)	38 (37.25)	
Less than 40	11 (10.78)	8 (7.8)	
TG			
Less than 150	11 (10.78)	6 (5.88)	0.001
Greater than 150	45 (44.12)	40 (39.22)	
LDL			
Less than 130	25 (24.51)	30 (29.41)	0.348
Greater 130	31 (30.34)	15 (14.71)	
GFR (ml/min/1.73 m ²)			
Greater than 90	32 (31.37)	22 (21.57)	
Less than 90	24 (23.53)	24 (23.53)	
Waist Circumference (cm)			
Less than 88.9	22 (21.57)	30 (29.41)	0.001
Greater than 88.9	8 (7.84)	16 (15.69)	
Less than 101.6	2 (1.96)	0 (0)	
Greater than 101.6	24 (23.53)	0 (0)	
BM I(kg/m ²)			
<24	8 (7.84)	2 (1.96)	0.053
25 – 29.9	31 (30.39)	22 (21.57)	
Greater than 30	16 (15.69)	23 (22.55)	

GFR =glomerular filtration rate; BMI = body mass index, TG= triglyceride, LDL=low density lipoprotein, HDL=high density lipoprotein

Complications encountered by the patients were revealed as thus: retinopathy 38(37.26%); neuropathy 64(62.74%); nephropathy 47(46.05); hypertension 58(56.86%); duration of diabetes 42(41.8%) and other complications (Table 5).

Table 5: Distribution of DM complications and duration of DM (N = 102)

Complications & duration of DM	n (%)
Retinopathy	38 (37.26)
Neuropathy	64 (62.74)
Nephropathy	47 (46.05)
Hypertension	58 (56.86)
Arrhythmia	22 (21.57)
Stroke	12 (11.76)

Hyperglycemia	48 (47.06)
NKHS	13 (12.76)
Duration of DM	
1 – 5years	42 (41.18)
6 -10years	44 (43.14)
Greater than 10years	13 (12.74)

NKHS = Non ketotic hyperosmolar state; DM = diabetes mellitus

The mean BMI of female respondents was $29.16 \pm 3.13 \text{ kg/m}^2$ while the mean glycosylated haemoglobin of males was 8.361 ± 1.5770 ($p > 0.05$) as shown in Table 6.

Table 6: Distribution of Mean DKT, mean Hb_{A1C} and mean BMI (N = 102)

Variables	Male (Mean Total)	Female (Mean Total)	p-value
DKT score	6.55 ± 2.50	6.54 ± 2.56	0.757
Hb _{A1C}	8.36 ± 1.5770	8.109 ± 1.31	0.189
BMI	28.54 ± 3.06	29.93 ± 3.09	0.025

Hb_{A1C}=glycoslated haemoglobin; DKT= diabetic knowledge test score; BMI body mass index; SD = standard deviation

Discussion

Most of the diabetic patients seen in this study were treated as outpatients. They were mostly males. During the study period, the majority of the patients were married and mostly public servants. In line with the study, patients were outpatients and such proved more economical than admission for patients to visit the clinics from home for treatments.^[20]

Ethnicity and genetic disposition are risk factors for diabetes mellitus.^[21] This study established that the majority of the patient's diabetic cases were traced to their family background 55(53.92%). It is in alliance with studies performed in various countries.^[22] Training of both diabetic and non-diabetic patients on the disease is vital for the burden reduction or reduction from the occurrence of the disease. From the study, more of the patients 51(50%) were never trained in the knowledge and management of diabetes and this contributed to the poor control of the disease.^[23]

Tobacco smoking or intake is one of the risks in the development of complications in diabetes patients and the research had few respondents as smokers. According to the 2014 Surgeon General Report, smoking increases the risk of Type 2 diabetes by 30 – 40% for active smokers compared to non-smokers suggesting cessation should be encouraged.^[24]

Alcohol intake in moderation has been proven to be beneficial to health as light to moderate consumption lowers the risk of diabetes compared to the abstainers^[25] but heavy consumption is equal to or greater than the risk to abstainers.^[26] In the research, many of the diabetic patients 80 (78.43%) never took any alcoholic drink or beverages and this could not be the reason for poor control as relevant other risk factors were assessed.

The diabetic knowledge test score was used to assess the level of knowledge of the patients on different types of food and markers that can lead to the elevation of diabetes in the sufferers. The score was relatively above 50% while most of the scores on some were poor as these, symptoms of nerve disease 32(31.48%); Glycosylated haemoglobin 25(24.5%); effects of unsweetened fruit juice 38(37.3%); effect of which should be used to treat low sugar were not satisfactory. As these were established, nutrition is pivotal in the management of diabetes mellitus^[27], likewise healthy prescribed exercise.^[28] Glycosylated haemoglobin (Hb_{A1C}) is a standard tool for the assessment of diabetes mellitus according to the International Committee of American Diabetic Association.^[29] The research proved that the majority of the Hb_{A1C} of the respondents was beyond the normal range of 6% (male = 45; 44.12%; female = 38; 37.25%). It was seen in this study that most of the patients were diabetic with poor glycaemic control.^[30] Further confirmation was the assessment of fasting glucose sugar as the majority of the patients' fasting plasma glucose was above 7mmol/l and thus corroborated the poor glycaemic control.^[31] Fasting blood glucose is a log linearity and vital risk of vascular disease of diabetes mellitus.^[32] The lipid panel was another marker assessed as diabetes is a metabolic disorder of lipid, carbohydrate and protein

metabolism. The respondents' low-density lipoprotein and triglycerides cholesterol were above the healthy limit and this indicated dyslipidemia and hypertriglyceridemia. The presence of poorly controlled lipids provoked the increase in obesity, hypertension and vascular disease that predisposed unresolved complications.^[33] Poorly controlled diabetes mellitus is the leading cause of rising renal diseases globally. Some of the patient's Glomerular filtration rates were below 90mls/min/1.72m² and as such the reason for identified renal problems. Diabetic nephropathy is the leading cause of end-stage renal disease in both the western and tropical world. The impact of this is alarming as the study identified diabetic nephropathy as part of unresolved risks.^[34] Measuring waist circumference is a simple means of assessing the levels of visceral fat. The study reported some of the patients with higher waist circumferences than the normal circumferences limit (females less than 88.9cm and males less than 101.6cm). Increased waist circumference is also closely associated with increased risks of diabetes mellitus.^[35] Overweight and obesity have been discovered as risks associated with diabetes mellitus. A reasonable number of the patients were overweight and obese. This is responsible for increases in abdominal body mass development of diabetes, cardiovascular disease and possible cancer,^[36] the more the BMI the more Hb_{A1C}.^[37]

Diabetes mellitus is an established risk factor for microvascular and macrovascular disease diseases.^[38] The patients' demography indicated that the patient suffered from complications ranging from retinopathy, nephropathy, neuropathy, hypertension, hyperglycemic hyperosmolar state and the rest of others as already presented in the result. The poor glycemic control was responsible for the occurrence of the recorded complications.^[39] The study revealed that most of the patients on duration of years intervals of 1 – 5 years and 6 – 10 years had most of the complications and risks posed by the disease. Independent effects on duration of diabetes mellitus displayed greater risk at earlier onset than at late state, predisposing consequences with witnessed at the course of the study.^[40]

Conclusion

The study revealed that there was poor glycemic control of the diabetes mellitus patients attending the consultant outpatient clinic of the Federal Teaching Hospital Owerri, Nigeria. The consequences of the poor control of DM were responsible for the occurrence of both the microvascular and macrovascular-related complications observed at the time of the study. This implied that more patient education is needed by different classes of health professionals to control the spike as outcomes were not satisfactory.

Recommendations

There is a need to consistently educate the diabetic patients attending the Teaching Hospital for expert care on knowledge of the disease, complications and consequent evidence-based protocol for controlling the disease.

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Conflict of Interest

The authors hereby declare that there is no conflict of interest in this study.

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