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## RESEARCH ARTICLE

# PREVALENCE AND OUTCOME OF TYPE 2 DIABETES MELLITUS AND ITS COMPLICATIONS AMONG ADMITTED PATIENTS IN A STATE TERTIARY HEALTH FACILITY, SOUTHWEST, NIGERIA

<sup>1</sup>Akinwale, Oladayo Damilola, <sup>1</sup>Akinbowale, Busayo Temilola, <sup>2</sup>Oladotun, Nike Oloruntosin and <sup>2</sup>Akinbade Musiliat Olufunke

<sup>1</sup>Lautech Teaching Hospital, Osogbo; <sup>2</sup>Lautech Open and Distance Learning Centre, Ogbomosho

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### ABSTRACT

Type 2 Diabetes Mellitus (T2DM) is a complex and chronic metabolic disorder associated with multiple complications and disabilities which contribute to increased mortality and poor quality of life among affected individuals. This study was a 5 years retrospective descriptive study of adult patients with diagnosis of type 2 diabetes mellitus admitted into male and female medical wards, LAUTECH Teaching Hospital, Osun state Nigeria, between January 2015 and December 2019. Data that were extracted from admission and discharge register include age, gender, date of admission, diagnosis, and date of discharge or death, outcome of management and complications. Data were analyzed using descriptive and inferential statistics. The result revealed 9.5% prevalent rate of type 2 diabetes mellitus which was found to be high among females than males. Majority of the patients were admitted with complications and the most prevalent complication was diabetic foot ulcer. Moreover, majority of the patients improved and were discharged home. In conclusion, prevalence of diabetes among admitted patient was very low and patients presented at the hospital when they develop complications. It is therefore recommended that early detection and prompt management should be ensured, appropriate preventive measure such as regular blood glucose monitoring, dietary modification, regular exercise, and regular check-up should be encouraged to reduce complications, need for hospital admission and improve outcome of type 2 diabetes mellitus.

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## INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a complex metabolic disease characterized by increased blood glucose with high prevalence in developing countries. Diabetes Mellitus (DM) is a major chronic health problem that has reached epidemic proportion worldwide (Whiting *et al.*, 2010). The prevalence of diabetes mellitus is increasing worldwide with global prevalence of 382 million people in 2013 which is expected to increase to 592 million by 2035 (International Diabetes Federation, 2015). The incidence of diabetes mellitus is higher in developing countries like India and China compare to developed countries (Ramachandra and Snehalatha 2010; Li *et al.*, 2017). As a result of this increasing prevalence, type 2 DM presents a tremendous clinical and economic burden globally and has become a key public health issue (Li, *et al.*, 2017). In Nigeria, there has been an increase in the prevalence of diabetes affecting all regions, with highest prevalence in the south-south region (Uloko *et al.*, 2018). Al-Globlan *et al.* (2014) identified traditional risk factors such as age, unhealthy habit, obesity, high fat diet, cigarette smoking and excessive alcohol intake as major causes of type 2 diabetes.

Sharma and Joshi (2016) also stated that obesity and sedentary lifestyle contribute to development of diabetes mellitus among high risk individuals. In furtherance to this, Olokoba *et al.* (2012) reported a number of lifestyle factors and genetics factors contributing to development of type 2 diabetes mellitus of which physical inactivity, sedentary lifestyle, cigarette smoking and generous consumption of alcohol are major risk factors. According to Olokoba *et al.* (2012), the burden of diabetes is associated with both acute and chronic complications. Acute complications such as hyperglycemic emergencies remain a major concern in Nigerians and this account for 40% of all diabetes admissions with documented determinants of fatal outcomes being diabetes foot ulcers, hypokalaemia and sepsis (Ogbera *et al.*, 2009). However, of all DM admissions, hyperglycemic emergencies such as Diabetic Keto Acidosis (DKA) and Hyperosmolar Hyperglycemic Syndrome (HHS) are listed as part of major complications of DM, associated with high case fatality rates (Chijioke *et al.*, 2010). Chronic hyperglycemia is associated with long term damage to multiple systems and the harmful effect of this condition includes microvascular and macrovascular complications causing damage to both the

small and large blood vessels (Knowles & Reaven, 2016). Microvascular complications of this condition are retinopathy causing blindness, nephropathy leading to renal failure, and neuropathy leading to impotence and foot ulcer (IDF, 2015). The macrovascular complications include various cardiovascular diseases (Fowlers, 2018). Evidence suggest that patient with type 2 DM have an increase risk of microvascular complications including foot ulcer, retinopathy and chronic kidney disease as well as macrovascular complications such myocardial infarction and stroke (Fowlers, 2008; Hermanns *et al.*, 2015). Foot ulceration is one of the complications of DM that is widely reported on with a prevalence rate of about 9.5% and it is reported to occur in 25% of all new cases of DM (Ogbera *et al.*, 2006). According to Umerri and Obason (2013), diabetic nephropathy is associated with increased cardiovascular conditions such as Stroke, and peripheral vascular disease and heart failure (Onwuchekwa & Asekomeh, 2009; Umuerrri & Obasohan, 2013). Therefore, the aim of this study is to determine the prevalence, complication and outcome of type 2 diabetes mellitus among admitted patients in male and female medical wards of LAUTECH Teaching Hospital, Osun State, South-West, Nigeria.

**Statement of Problem:** Type 2 diabetes mellitus is chronic lifelong condition with long term complications that requires a continuous lifestyle control and modification (Colik *et al.*, 2015). However, managing type 2 diabetes present numerous challenges to the attainment of optimal health care, many of which are inherent in the fear and perceptions of patient with this condition (Uloko *et al.*, 2017). Evidence have shown that prevalence of diabetes is increasing and that the complication associated with the condition can be prevented, but there are still patients who lack adequate knowledge and skills to manage and control their conditions which eventually leads to irreversible complications that reduce their quality of life and outcome of this condition (Kucuk, 2015).

### Objectives

1. To determine the prevalence of type 2 diabetes mellitus among admitted medical patients in LAUTECH Teaching Hospital (LTH) Osogbo, Osun State.
2. To determine the most prevalent complications of type 2 diabetes mellitus among admitted medical patients in LAUTECH Teaching Hospital (LTH) Osogbo, Osun State.
3. To determine the outcome of type 2 diabetes mellitus among admitted male and female patients admitted to medical wards in LAUTECH Teaching Hospital (LTH) Osogbo, Osun State.

### Research Questions

1. What is the prevalence of type 2 diabetes mellitus among admitted patient in medical wards?
2. What is the most prevalent complications of type 2 diabetes mellitus among admitted patient in medical wards?
3. What is the outcome of type 2 diabetes mellitus among admitted patients in medical wards?

### Hypotheses

**Ho:** There is no significant relationship between selected socio-demographic variables (Age, Gender and Occupation) and complications of T2DM

**Ho:** There is no significant relationship between selected socio-demographic variables (Age, Gender and Occupation) and outcome of T2DM.

### METHODOLOGY

This study was a 5years retrospective, descriptive study of adult patient with diagnosis of type 2 diabetes mellitus admitted into male and female medical wards LAUTECH Teaching Hospital, a tertiary health facility in Osun state Nigeria, between January 2014 and December 2019. Data that were extracted from admission and discharge register include age, sex, date of admission, diagnosis, and date of discharge or death, outcome of management and complications, where the diagnosis could not be ascertained, the case files were collected from the medical record department to ascertain the diagnosis. Identification of case was based on documented diagnosis of type 2 DM by the managing physicians either at the time of patients' discharge from the hospital or death. Ethical clearance will be obtained from the health research and ethical committee of the hospital.

### Inclusion Criteria

All admitted patients with diagnosis of type 2 diabetes mellitus in male and female wards between January 2015 and December 2019.

### Exclusion Criteria

All out patients in clinic and emergency were excluded.

### Data Analysis

Data were coded and analyzed using SPSS version 21 and presented in tables, using descriptive statistics of frequency, percentage, mean and standard deviation where applicable and inferential statistics of chi-square for stated testing hypothesis at 0.05 level of significant. Cross tabulation was used to compare the two groups (male and female). Continuous variables were expressed as means with standard deviation, categorical variables were expressed as frequency with the percentage, and comparison of continuous variable between the groups (male and female) was expressed with cross tabulation.

### RESULTS

A total number of 1816 patients were admitted between the year 2014 and 2019, out of which 1,050(57.8%) were males while 766(42.2%) were females. Diabetes mellitus was observed in 174 patients. This represents 9.5% total admission. DM was found to be high among females than males as more than half of 91(52.3%) of the patients were female and less than half 83(47.7%) were males. The age ranged between 26 and 100 years with mean age of 58.2±7.6 years. About 102(58.2%) were between age 26-55 years with female being relatively younger than male (57.8±7.6 and 58.5±7.6 respectively) while 67(38.5%) and 5(2.9%) were between age 56-85 and 86-100 years respectively. The result further shows that there was no statistical significant relationship between age of admitted patient with diabetes mellitus ( $X^2 = 1.817$ ;  $df=4$ ;  $p\text{-value}= 0.773$ ) in the study area. Diabetes mellitus was

significantly common in patients aged 56-70 years 78(44.8%) with higher prevalent in female 45(49.5%). Table 2 shows the prevalence of diabetes-related complications. Complications discovered in the study area were diabetes nephropathy 10(5.7%), retinopathy 3(1.7%), encephalopathy 5(2.9%), ketoacidosis 4(2.3%), Hyperosmolar Hyperglycemic Syndrome 19(10.9%), diabetic foot ulcer 65(37.4).

Table 3 shows that majority 111(63.8%) of admitted patient with diabetes mellitus were discharged home alive, while 38(21.9%) death were recorded. The result further shows that there is statistical significant relationship between gender of patients with diabetes mellitus and outcome of diabetes mellitus ( $X^2 = 9.471$ ;  $df = 3$ ;  $p$ -value = 0.021). Table 3 shows that majority 111(63.8%) of admitted patient with diabetes

**Table 1. Socio-Demographic factors of Patients with diabetes mellitus by Gender**

Variable	Male	Female	Total	$X^2$	df	p-value
Age (Year)	F (%)	F (%)	F (%)			
26-40	12(14.5)	11(12.1)	23(13.2)			
41-55	23(27.7)	21(23.1)	44(25.3)			
56-70	33(39.8)	45(49.5)	78(44.8)			
71-85	12(14.5)	12(13.2)	24(13.8)			
86-100	3(3.6)	2(2.2)	5(2.9)			
Total	83 (100.0)	91(100)	174(100)	1.817	4	0.773
Mean age	58.5±7.6	57.8±7.6				
Marital status						
Single	0 (0)	1(1.1)	1(0.6)			
Married	83 (100)	80(87.9)	163(93.7)			
Divorce	0(0)	9(9.9)	9(5.1)			
Widow	0(0)	1(1.1)	1(0.6)			
Total	83(100.0)	91(100)	174(100)	10.710	3	0.005
Occupation						
Trading/Business	20 (12.4)	52(57.2)	72(33.2)			
Skilled Artisan	8 (9.3)	3(4.6)	11(7.2)			
Transporter	5 (3.6)	0(0)	5(1.9)			
Farming	3(7.1)	0(0.5)	3(4.1)			
Cleric/Clergy	2 (2.7)	1(1.1)	3(1.9)			
Student	3 (2.7)	3(1.5)	6(2.1)			
Civil Servant	18 (18.2)	12(10.8)	30(14.8)			
Self-Employed	1 (6.7)	0(0.5)	1(3.8)			
Retiree	17 (37.3)	12(21.7)	29(30.0)			
House wife	0	1(2.0)	1(0.9)			
Dependent	6	7	13			
Total	83 (100.0)	91(100)	174 (100)	28.660	10	0.000

**Table 2. Type 2 Diabetes Mellitus related complications**

Variable	Male	Female	Total	$X^2$	Df	P-value
	F (%)	F (%)	F (%)			
Chronic hyperglycemia with complications						
Nephropathy	5(6.0)	5(5.5)	10(5.7)			
Retinopathy	1(1.2)	2(0)	3(1.7)			
Encephalopathy	1(4.8)	4(0)	5(2.9)			
Diabetes KetoAcidosis	4 (10.8)	0(0.0)	4(2.3)			
Hyperosmolar Hyperglycemic Syndrome	9(10.8)	10(10.9)	19(10.9)			
Diabetes Foot	42(50.6)	23(25.3)	65(37.4)			
Multiple Complications	6(7.2)	20(22.0)	26(14.9)			
Hyperglycemia emergency without complication	15(18.1)	27(29.7)	42(24.1)			
Total	83(100.0)	91(100)	194(100)	22.39	7	0.002

**Table 3. Outcome of diabetes mellitus among admitted patients**

Variable	Male	female	Total	$X^2$	df	p-value
Outcome of Type 2 Diabetes Mellitus	F (%)	F(%)	F(%)			
Discharge	46(55.4)	65(71.4)	111(63.8)			
Discharge against medical advise	12(14.5)	5(5.5)	17(9.7)			
Referred	2(2.4)	6(6.6)	8(4.6)			
Death	23 (27.7)	15(16.5)	38(21.9)			
Total	83(100.0)	91(100)	174(100)	9.471	3	0.021

Also, 26(14.9%) developed multiple complications while 42(24.1%) were admitted for hyperglycemic emergency without complications. A significant male prevalence for diabetic foot was also observed. Moreover, there was statistical significant relationship between gender and prevalence of diabetic related complication among the admitted patients in the study area ( $X^2=22.39$ ,  $df = 7$ ,  $P = 0.002$ ).

mellitus were discharged home alive, while 38(21.9%) death were recorded. The result further shows that there is statistical significant relationship between gender of patients with diabetes mellitus and outcome of diabetes mellitus ( $X^2 = 9.471$ ;  $df = 3$ ;  $p$ -value = 0.021).

## Test of Hypothesis

**Table 5. Relationship between selected demographic characteristic and complications of diabetes mellitus**

ANOVA<sup>a</sup>

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	25.488	3	8.496	5.985	.001 <sup>b</sup>
Residual	241.322	170	1.420		
Total	266.810	173			

a. Dependent Variable: Complication of type 2 Diabetes Mellitus

b. Predictors: (Constant) Age, Gender and Occupation,

Table 5 indicates that regression model predicts the dependent variable ( $P = 0.001$ ) which is less than 0.05 indicating statistical significant relationship between the predictors (Age, Gender and occupation) and complications of diabetes mellitus

**Table 6. Relationship between selected demographic characteristics (Age, Gender and Occupation) and outcome of diabetes mellitus**

ANOVA<sup>a</sup>

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	56.687	3	18.896	2.607	.053 <sup>b</sup>
Residual	1232.055	170	7.247		
Total	1288.741	173			

a. Dependent Variable: Outcome of Diabetes

b. Predictors: (Constant) Age, Gender, Occupation,

Table 5 indicates that regression model predict the dependent variable with p value of 0.05 indicating statistical significant relationship between the predictors (Age, Gender and occupation) and outcome of diabetes mellitus.

## DISCUSSION OF FINDINGS

The findings from this study revealed the mean age ( $58.2 \pm 7.6$  years) of patients with type 2 diabetes and there were slightly more female 45 (49.5%) than male 33 (39.8%). Almost all 163 (93.7%) were married while only 12(6.3%) were single, divorced and widow. Approximately one third of the patients were traders while one sixth were retiree. This is supported by National Diabetes Statistics Report that adults aged 45-64 were the most diagnosed age group for diabetes (CDCs, 2015). Another study conducted by Asiimore and Kiconco (2015) showed that the age group most affected by diabetes was 61-65yrs. This study is also in tandem with study conducted in Southern Nigeria showing an increasing burden of type 2 diabetes mellitus among adult Nigerians aged 70-79 years with higher prevalence in females than male, however, prevalence increases with ageing in both sexes (Danjin, Usman, & Adamu, 2016). Moreso, this study is inconsistent with a retrospective study conducted in Northern Nigeria which showed high prevalence of diabetes in males than in females (Ekpenyoung et al., 2011). Findings from the study revealed 9.5% prevalence rate of type 2 DM among admitted patient in the study area with slightly high prevalence among females than male 52.3% and 47.7% respectively. This prevalence is in line with study conducted in Egypt with prevalence of 8.9% (Khedr, Fawi & Alla, 2016). This is in contrast with the study conducted in Korea from 2012 to 2016 that showed 0.5% (Dong-il, Sangyang & Sing 2019). However, prevalence of 13% was reported in North America and 5.5% in Asia with

global prevalence of 8.8% (Zhang et al., 2017). Another study conducted in Kanungu showed high prevalence (18.7%) of type 2 DM likewise study conducted in Eastern Sudan showed higher prevalence (20.8%) of type 2 DM (WHO, 2016). Finding from this study is also supported by the study conducted in South-South Nigeria with prevalence 9.8% (Uloko, Musa & Sada, 2018). Moreso, prevalence of 4.3% was also reported in Northwest Nigeria (Sabir et al., 2017). Furthermore, the study revealed that approximately three-fourth of the patient were affected with complications of type 2 diabetes out of which one-third were diabetes foot ulcer which was more prevalent among males than females, about one-fourth of the patient were admitted for hyperglycemic emergence only without complication. Moreso, multiple complications like Nephropathy, retinopathy, neuropathy and encephalopathy were accounted for almost fifteen percent while approximately ten percent had Hyperosmolar Hyperglycemic Syndrome. This study is in tandem with study conducted in Eastern Nepal which showed that majority of the cases accounting for diabetic admission were related to hyperglycemic emergences including ketoacidosis and hyperosmolar hyperglycemic syndrome (Subedi, et al., 2018). Also, Lopez (2020) reported that among patient with diabetes, 15% develop a foot ulcer and 12-24% of individual with a foot ulcer require amputation. Uginu et al. (2019) also reported that foot ulceration is common in patient with diabetes with current global prevalence of about 6.3%. The result of this study is relatively high compare with study conducted by in West Ethiopia with 13.6 % prevalent diabetes foot ulcer (Tsefamicheal et al., 2017).

However this study is in tandem with study conducted in Ghana which revealed high prevalence of diabetes foot ulcer and lower extremely amputation among diabetic patients (Larbie, 2019). Tadesse, Belayneh and Emmanuel (2020) in their study stated that diabetic patients develop complications like retinopathy, neuropathy and microalbuminuria over time. Therefore according to WHO (2019), the spectrum of chronic complication as associated with diabetes mellitus is extended to include microvascular complications like Nephropathy, Neuropathy retinopathy and chronic macrovascular complication like coronary artery disease, stroke, diabetic encephalopathy and diabetic foot. The finding further revealed that more than two-third of the patients improved and discharged home, however, approximately one fifth of the patient died on admission as a result of diabetes related complications with higher mortality recorded among male while higher percentage of female were discharged home. Therefore, out of 174 patient admitted with type 2 diabetes mellitus, 111(63.8%) improved and discharged home, and 38(21.9%) died while 17(9.7%) were discharged against medical advice. This finding is supported by Subedi et al. (2018) who reported that 76% diabetes patients improved at the time of discharge, 9% left against medical advice, however, low mortality rate (2%) was reported in the study which is in contrast with the mortality result of this study. In this study, hypoglycemic brain damage and hyperosmolar hyperglycemic syndrome were the major cause of death among the patients, this is in contrast with study conducted by Subedi et al. (2018) that end stage renal disease and cardiovascular disease were the most common cause of mortality among diabetic patients. Our study further showed a significant relationship between age, gender and occupation and complication of diabetes mellitus ( $p=0.001$ ) as well as

outcome of diabetes mellitus ( $p=0.05$ ) among admitted patients in the study area. This study is consisted with previous report from North Sudan which showed that older age was a risk factor for diabetes mellitus (Woor et al., 2015). Likewise a significant association between type 2 DM and older age was reported by Saheed et al. (2019). Danjin, Usman and Adamu, (2016) also reported an increasing burden of type 2 DM among adult Nigerian aged 20-79years with higher prevalence in female than male, however prevalence increase with age in both sexes. Ruhembe, Mosha and Nyonuchucha (2014) reported that DM patients with average age of 46-60years has a higher prevalence indicating that age is significantly associated with type 2 diabetes mellitus. This is in contrast with study conducted by Song et al., (2016) that men had a higher risk for developing type 2 diabetes mellitus. However Saeed et al. (2017) reported no significant association between gender and diabetes mellitus. Ekpenyong et al., (2012) also showed a significant association between gender and diabetes mellitus, that males are 2 times likely to develop diabetes mellitus than female.

**Limitations of the study:** A lot of constraints were observed in the process of carrying out this study. Firstly, there were cases of incomplete data as a result of inadequate documentation. Secondly, due to industrial and strike action that led to partial of activity in the hospital and there was no patient admission for certain period included in the study.

### Conclusion and Recommendation

Type 2 diabetes mellitus was observed to be low in the study area, with high prevalence among female patients between ages 56 and 70 years. Complications of diabetes mellitus were observed to be high among admitted patients and the most prevalent complication identified in the study area was diabetic foot ulcer. It is therefore recommended that early detection, prompt management of the condition should be the goal of individual patients, health care personnel and Government. Moreso, appropriate preventive measure such as regular blood glucose monitoring, dietary modification, regular exercise, regular check-up and adherence to treatment regimen should be put in place to reduce complications as well as the need for hospital admission so as to improve the outcome of type 2 diabetes mellitus.

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