Nigerian Journal of Pharmaceutical Sciences
Vol. 23, No2, 2024, ISSN: 0189-823X

EVALUATION OF CARDIOVASCULAR DISEASES RISKS AND DRUG UTILIZATION PATTERN IN PATIENTS WITH TYPE 2 DIABETES MELLITUS ATTENDING A TERTIARY HEALTH CENTRE IN LAGOS, NIGERIA

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ABSTRACT

Diabetes mellitus is a chronic medical disorder that is associated with elevated levels of blood sugar. It is estimated that about 422 million people worldwide have diabetes mellitus. The risk for cardiovascular disease is 2–3 times higher in people with type 2 diabetes mellitus compared with those without the disorder. The study design was a descriptive cross-sectional survey. A structured questionnaire was used to obtain relevant information to the study from the participants by both interview and directly from their hospital record. The questionnaires were used to enquire and record information on; participants demographics, anthropometric measurements, fasting blood sugar levels, pattern of use of antidiabetic and antihypertensive agents prescribed, and lipid profile of participants. A total of two-hundred and two patients participated in the study, 71% were females and the mean age was 61 years. The commonest cardiovascular risk factor identified among participants was central obesity with prevalence of 92% when assessed with waist-hip ratio. In conclusion the commonest risk factor for cardiovascular disease among the study participants was central obesity, present in 92% of the patients reviewed, the prevalence of hypertension was 67.3% and dyslipidaemia 64.4%. The commonest antidiabetic drug prescribed was metformin and calcium channel blockers were the most commonly prescribed antihypertensive agent.

Keywords: Anti-diabetics, Anti-hypertensives, Cardiovascular-disease, Cardiovascular-risks, Medications, T2DM

INTRODUCTION

Diabetes mellitus is a chronic medical disorder that is associated with elevated levels of blood sugar. The disorder is usually complicated with cardiovascular diseases (CVD) which can lead to significant damage to the kidneys, blood vessels, heart, eyes and central nervous system (WHO, 2023).

It is estimated that about 422 million people worldwide have diabetes mellitus. Majority of people with this disorder live in low-and middle-income countries (WHO, 2023). It is estimated that 1.5 million deaths are directly attributed to diabetes annually (WHO, 2023). More than 95% of people with diabetes have type 2 diabetes Mellitus (WHO, 2023).[1] The prevalence of diabetes in Nigeria is 3.7% among adults (IDF, 2021). Type 2 diabetes Mellitus is often preventable (WHO, 2023). Factors that contribute to developing type 2 diabetes include obesity, sedentary life style and hereditary (Low-Wang *et. al*, 2016).

Cardiovascular disease is a major cause of morbidity and mortality among people with diabetes mellitus, with a significantly increased prevalence compared with people

without diabetes (Roman *et. al*, 2021). Cardiovascular diseases account for approximately one-third, 17.9 million of all deaths globally (WHO, 2017). Life expectancy among patients with type 2 diabetes mellitus (T2DM) can be reduced by up to 10 years due to CVD (IDF, 2016). The risk for CVD in patients with diabetes increases with increasing level of poor blood sugar control, the duration of diabetes and the number of risk factors (Roman *et. al*, 2021). The risk for cardiovascular disease is 2–3 times higher in people with T2DM compared with those without the disorder (Roman *et. al*, 2021; Gu *et. al*, 1999; IDF, 2019). More than of 30% of individuals with T2DM have cardiovascular disease, and over 50% die from it (Roman *et. al*, 2021).

In addition to diabetes other risk factors for CVD include; high blood pressure, abdominal obesity, atherogenic dyslipidaemia (hypertriglyceridemia, low High-density lipoprotein cholesterol, high low density lipoprotein cholesterol particles, smoking and second-hand smoke exposure, unhealthy diet, proinflammatory and oxidative stress state, microalbuminuria, non-alcoholic fatty liver disease and physical inactivity (CDC; Fryar *et. al*, 2012; Alberti *et. al*, 2009).

The aim of this study is to evaluate cardiovascular risk factors and the drug utilization patterns in patients with type T2DM attending the outpatient clinic of a tertiary health facility. The study objectives are to evaluate the demographics and baseline clinical profile of the participants, anthropometric profiles, fasting blood glucose, lipid profile, and the drug utilization patterns.

METHODS

The study was conducted at the diabetes and metabolic clinic of the Lagos State University Teaching Hospital (LASUTH), Ikeja. Consecutives adult patients aged 18 years and above diagnosed with diabetes, who were on treatment for T2DM and attending follow-up clinic were recruited into the study. Patients who refused to consent to participate in the study were excluded. The study design was a descriptive cross-sectional survey. A structured questionnaire was used to obtain relevant information to the study from the participants by both interview and directly from patients' record.

The questionnaires were used to enquire and record information on; participants demographics, anthropometric measurements, fasting blood sugar levels, pattern of use of antidiabetic and antihypertensive agents prescribed, and lipid profile of participants. Hypertension was diagnosed according to WHO diagnostic criteria, systolic blood pressure of ≥140 mmHg and/or the diastolic blood pressure of ≥90 mmHg taken as the cut-off points for making diagnosis of hypertension (Campbell *et. al*, 2022). Waist circumference was measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a stretch-resistant tape that provides a constant 100 g tension. Hip circumference was measured around the widest portion of the buttocks, with the tape parallel to the floor. For both measurements, the subjects were made to stand with both feet closed together, arms at the side and body weight evenly distributed (WHO, 2011). Dyslipidaemia was defined according to national cholesterol education program adult panel III (NCEPATP III) guidelines, using the following cut-of points for the fasting lipid profile: TC≥200 mg/dl, HDL-c ≤40 mg/dl, LDL-c ≥130 mg/dl, and TG≥150 mg/dl (NCEP, 2002).

Sample Size Calculation

The calculated minimum sample size for participants was 95. The calculation was based of the prevalence of 3.7% for diabetes in Nigeria (IDF, 2021). Precision of 5% and

confidence interval of 99% were used in the calculation, using the formular for calculating sample size for a cross-sectional study (Charan and Biswas, 2013). All consenting patients seen during the study period were recruited to participate in the study.

Ethical Consideration

Study protocol was reviewed and approved by the LASUTH ethical review committee. Only participants who consent to participate were recruited to the study. The identity of the participants was concealed as the participants were not identified by name or any other personal identifier.

RESULTS

A total of two-hundred and two patients participated in the study, the mean age of the participants was 61 years with age range of 19 to 85 years. More than two-third of patients with diabetes attending the clinic were females and 67% had history of hypertension. Details of the baseline clinical profiles of the study participants are in Table I.

Assessment of increase in weight as a risk factor for cardiovascular disease, using the body mass index showed that a third of the participants are obese, and when participants who were overweight were included this increased to 70% of the total participants. Assessment of the waist circumference as a measure of central obesity showed that, 169 (83.6%) of the total 202 participants had central obesity. Details as shown in Tables I and II.

Dyslipidaemia was assessed by evaluating the fasting plasma lipid levels, the outcome revealed that 31% of the participants had deranged level of total cholesterol. Details in Table III.

A review of the drug utilization pattern of the participants showed that about two-third were on antihypertensive medications, the commonest antihypertensive medication prescribed were calcium channel blockers, 45.6% of the participants were on this class of antihypertensive drugs. Details of the drug utilization pattern is Table IV.

DISCUSSION

The finding from this study showed that about two-third of diabetic patients attending our clinic were also hypertensives. Hypertension is known to increase the risk of cardiovascular diseases (CVD) by 2-4 folds when present as an independent risk factor (Ferrannini *et.al*, 2012). The prevalence of hypertension among the diabetic population is almost twice that of non-diabetic patients (Nouh *et. al*, 2019; Kabakov *et. al*, 2006; Sowers, 2003). The reported 67% prevalence of hypertension among patients with type 2 diabetes in this study is similar to the 60% pooled prevalence of hypertension among urban residents in Ethiopia with type 2 DM (Haile, 2023).

More than half of the participants in the study have poor glycaemic control. Type 2 diabetes mellitus as an independent risk factor increases risk of CVD by two to four times compared to non-diabetics, this risk is further worsened by poor glycaemic control (Gu *et. al*, 1999; IDF, 2019; Kannel, 1979).

Table I. Baseline Social and Clinical Profiles of Participants

Variables	Number (frequency)
Sex	
Males	58 (28.7)
Females	144 (71.3)
Family history of diabetes	
Positive	42 (20.8)
History of hypertension	
Positive	136 (67.3)
Fasting blood sugar	
Not controlled (≥110mg/dl)	116 (57.4)
Diastolic blood pressure	
Controlled (<90mmhg)	148 (73.3)
Not controlled (≥90mmhg)	54 (26.7)
Systolic blood pressure	
Controlled (<140mmhg)	101 (50.0)
Not controlled (≥140mmhg)	101 (50.0)
Anthropometric measurements	
Waist circumference	
Female (>80cm)	136/144 (94.0)
Male (>94cm)	33/58 (56.8)
Overall	169/202 (83.6)
Waist-hip ratio	
Female (≥0.85)	137/144 (95.1)
Male (≥0.90)	50/58 (86.2)
Overall	187/202 (92.0)

Table II. BMI classification of participants

Body mass index (kg/m^2)	Classification	Percentage
<18.5	Underweight	2.5
18.5-24.9	Normal	22.3
25-29.9	Overweight	36.1
≥30	**Obesity**	**34.7**
30-34.6	Class I	23.8
35-39.9	Class II	6.9
≥40	Class III	4.0

Table III. Pattern of Dyslipidaemia Among the Study Participants

Variables (mg/dl)	Frequency (%)
Total cholesterol >200	31.7
Triglyceride ≥150	13.4
LDL ≥130	5.0
HDL <40	35.6
Overall prevalence	64.4

Table IV. Pattern of Antihypertensives and Oral Hypoglycaemic Medications Prescribed

Variables	Outputs (%)
Anti-lipids medications (Statins)	**50.5**
Antihypertensives medications	**63.4**
Calcium channel blockers	45.6
ACEIs	16.8
ARBs	14.4
Diuretics	14.4
Beta Blockers	4.5
Diabetes medications	
Metformin	81.7
Sulfonylurea	22.3
DPP-4 inhibitor	20.8
Thiazolidinediones	1.5
Insulin	2.0

Abdominal obesity defined as waist–hip ratio above 0.90 for males and above 0.85 for females, or a BMI above 30kg/m^2 is associated with increased risk of cardiovascular disease (NHBL, 2000). This study showed that 34.7% of participants were obese, this percentage was increased to 70.8% when patients who were overweight were added to the number. However, when the waist circumference and waist to hip ratio were used to assess for central obesity, this percentage went up significantly to more than 90% prevalence of obesity among women, 57% and 86% obesity prevalence among men using waist circumference and waist-hip ratio respectively. It is unclear which anthropometric measure; body mass index (BMI), waist circumference, waist-hip ratio or even hip circumference is the most important predictor of risk of CVD in adults (WHO, 2011). BMI essentially measures body size and composition, and is useful to diagnose underweight and overweight. Central abdominal fat is better reflected by measuring the waist circumference, waist–hip ratio and waist–height ratio (WHO,

2011). In women, BMI is associated with increased risk of cardiovascular disease; however, waist-hip ratio appeared to be a stronger independent risk factor than BMI (WHO, 2011).

Studies have shown that dyslipidaemia was highly prevalent in all the geopolitical zones of Nigeria (Oguejiofor *et.al.,* 2012). Reports from previous studies showed that the prevalence of dyslipidaemia ranged from 60% among apparently healthy Nigerians to 89% among diabetic Nigerians (Oguejiofor *et.al.,* 2012). The lipid profile from this study showed that two-third of the participants have dyslipidaemia. The two most common types of dyslipidaemias found among the study cohort were high levels of total cholesterol and low levels of HDL. This finding may not however be a true reflection of the prevalence and pattern of dyslipidaemia because half of the participants in the study were already on statins, a lipid lowering medication. Data from meta-analysis have shown that statins are effective in the prevention of cardiovascular diseases in type 2 diabetics (Mills *et. al.,* 2011). Individual studies that supported effectiveness of statins include the Collaborative Atorvastatin Diabetes Study and the Heart Protection Study (Colhoun *et. al*., 2004; Collins *et.al*., 2003).

The commonest prescribed antihypertensive drug among the study participants were calcium channel blockers. The renin-angiotensin-aldosterone system (RAAS) blockers, ACEI and ARB were the next most commonly prescribed antihypertensive drug. There is no consensus on the class of antihypertensive drug most appropriate for the treatment of hypertension in diabetic patients (Grossman and Grossman, 2017). Different guidelines emphasize use of different drug classes for the treatment of hypertension among diabetics (Grossman and Grossman, 2017). Calcium channels blockers (CCBs) are considered as potential first-line for the treatment of hypertension among diabetics, especially in the elderly with isolated systolic hypertension (Tuomilehto, 1999). The use of angiotensin receptor blockers (ARBs), and angiotensin converting enzyme inhibitors (ACEI) are considered as compelling in the treatment of hypertensive in diabetic patients (Scheen, 2004). ARBs and ACEIs are equally effective in preventing progression of kidney disease in diabetic patients with early nephropathy with ARBS having comparable BP lowering capacity with fewer side effects compared with ACEIs (Barnett *et. al*., 2004). In a study conducted in a country in South eastern part of African, diuretic is the most commonly prescribed antihypertensive drug (Yazie *et. al*., 2022). This practice was based on the country national guideline that recommends diuretic among the first line antihypertensive drugs. A similar pattern was observed in a study from Benin in the South-southern part if Nigeria, the study was however among hypertensive patients and not in diabetic-hypertensives in which caution on the use of diuretic is advised (Adejumo *et. al*., 2017).

The oral antidiabetic drug that was most commonly prescribed for the participants in the study was metformin, 82% of the patients were on this agent. This pattern of prescription is similar to finding in other local studies across different parts of Nigeria (Ogbonna *et. al*., 2023; Taoreed, 2023; Uwakwe *et. al*., 2017). Metformin is the preferred first line oral antidiabetic drug in type 2 diabetic patients who are overweight or obese. The drug helps with weight reduction, over two-third of patients in this study are either overweight or obese (Garber *et.al.,* 1997). Metformin is commonly used in combination with other antidiabetic agents (Tsang, 2012). There are currently seven classes of oral antidiabetic drugs. They are classified into insulin secretagogue

(sulfonylureas, meglitinides), insulin sensitizer (metformin, thiazolidinediones), decrease glucose flux (alpha-glucosidase inhibitors), incretin mimetic agent (DPP-4 inhibitor), and glycosuric agent (SGLT2-inhibitor) (Tsang, 2012; Saudek, 2005). These drugs act by different mechanisms to control glucose levels.

In conclusion the commonest risk factor for cardiovascular disease among the study participants was central obesity, present in 92% of the patients reviewed, the prevalence of hypertension was 67.3% and dyslipidaemia 64.4%. The commonest antidiabetic drug prescribed was metformin and calcium channel blockers were the most commonly prescribed antihypertensive agent.

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