An audit of chronic kidney disease risk factors in type 2 diabetic patients in a tertiary hospital in Southern Nigeria

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Abstract

Background: Prevalence of diabetes mellitus (DM) is on the increase in Nigeria with diabetic nephropathy (DN) as one of the commonest causes of end stage renal disease among Nigerians. We determined the risk factors of chronic kidney disease (CKD) prevalent in type 2 diabetics.
Methods: Type 2 diabetics attending the outpatient clinic of a tertiary health institution were recruited over a six week period and had their records reviewed.
Results: A total of 144 type 2 diabetics were recruited. Fifty-three (36.8%) were males while 91 (63.2%) were females. Mean age of all diabetics was 57.5± 11.5 years. The prevalence of obesity, metabolic syndrome, hypertension, dyslipidaemia, and poor glycaemic control were 38.8%, 70.8%, 67.4%, 64.6%, and 46.5% respectively. Central obesity, dyslipidaemia and metabolic syndrome were significantly more prevalent in female diabetics while hypertension and metabolic syndrome were more prevalent in elderly participants. Forty-four (30.6%) of the diabetics had CKD. Hypertension, dyslipidaemia and metabolic syndrome were more prevalent in diabetics with CKD, although only hypertension was significant.
Conclusion: CKD risk factors were highly prevalent in type 2 diabetics in this study. Measures aimed at reducing these risks should be instituted to delay the onset and progression of CKD.

Keywords: diabetes mellitus, chronic kidney disease, risk factors

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Introduction

The prevalence of diabetes mellitus (DM) is on the increase in Nigeria due to adoption of westernized lifestyle.[1] Most patients with type 2 DM usually have evidence of chronic complications at the time of diagnosis and diabetic nephropathy (DN) is one of such. Diabetic nephropathy is the leading cause of end-stage renal disease (ESRD) in developed nations, and ranks third as the cause of ESRD in Nigeria after chronic glomerulonephritis and hypertension.[2]

Diabetic nephropathy is a preventable complication of DM. The risk factors for DN include black race, male sex, poor glycaemic control, obesity, smoking, family history of renal disease, hypertension, and dyslipidaemia.[3] Most of these risk factors are modifiable by intervention measures, hence DN can be delayed or prevented if the appropriate measures are instituted early.

The global burden of ESRD is quite enormous even in developed countries where better health care services and insurance are available for the care of patients with ESRD.[4] The mortality from ESRD is very high in developing countries including Nigeria and this trend is attributable to many reasons. Chronic kidney disease patients present late, pay out-of-pocket for treatment, trained personnel (nephrologists, renal nurses, technicians) are few and centres that provide dialysis facilities are also few. Cost of renal care is beyond the reach of most patients with ESRD in Nigeria and they can only afford few sessions of dialysis before they eventually succumb due to high cost of renal care.[5]

Early identification of risk factors for chronic kidney disease (CKD) in high risk groups such as diabetics and modification of these factors are therefore, key to preventing DN. This study aimed to determine the prevalence of some risk factors for CKD in type 2 diabetic patients attending the out patient clinic of a tertiary health centre in southern Nigeria.

Materials and Methods

This was a descriptive study in which type 2 diabetic patients attending medical outpatient clinic within a six-week period from 16th October 2012 to 30th November 2012 were reviewed for presence of CKD risk factors. Inclusion criteria for the study were: admission into the diabetic follow up clinic for at least 3 months, presence of complete results of investigation in patient's case file and informed consent for participation in the study. All type 1 diabetics, type 2 diabetics admitted into the follow up clinic less than 3 months ago, diabetics with incomplete results of investigation and those who did not consent to participation in the study were excluded.

Information obtained from participants case files

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included age, sex, duration of diabetes and previous history of hypertension. Parameters determined in participants were: weight, height, body mass index (BMI) and waist circumference. The average of the three most recent fasting blood glucose results, most recent lipid profile results, serum creatinine and urinalysis results assessed by use of meditest combi-2 dipstick test in the clinic visits during a period of at least three months were obtained from patients' case files. Weight was measured in kilograms using a bathroom weighing scale with the patients in light clothing. Height was measured in meters using a standard stadiometer. The body mass index (kg/m^2) was calculated using the formula: Weight(kg) / Height(m^2).The waist circumference (cm) was measured at the midpoint between the lowest rib and iliac crest during expiration.

Central obesity was defined as waist circumference (WC)> 102 cm in males and >88cm in females. Obesity was defined as body mass index (BMI) value of >29.9 kg/m^2.[6] Poor glycaemic control was defined as average fasting blood sugar (FBG) of > 120mg/d[7], Dyslipidaemia as total cholesterol (TC) > 200mg/dl or triglycerides (TG) > 150mg/dl or low density cholesterol (LDL-C) > 100mg/dl or high density cholesterol (HDL-C) < 50mg/dl in females and <40mg/dl in males.[8]Metabolic syndrome was defined using NCEP-ATPIII (National Cholesterol Education Program - Adult Treatment Panel) 2001 criteria[9]where the presence of any three of the following was taken as metabolic syndrome: Blood pressure > 130/85 mmHg or known hypertensive on treatment, FBS >100mg/dl or known diabetic patient on treatment, WC > 102cm in males and > 88cm in females, TG > 150mg/dl and HDL cholesterol < 50mg/dl in females and < 40mg/dl in males. Estimated glomerular filtration rate (eGFR) was determined using modification of diet in renal disease (MDRD) formula. [10]Chronic kidney disease was defined as persistent proteinuria on dipstick for a period of ≥ 3 months or and estimated GFR of <60mls/min/1.73m^2 body surface area.[11]

Statistical analysis

Quantitative variables are expressed as means and standard deviations while qualitative variables are expressed as frequencies and percentages. Pearson Chi square test was used to determine any significant association between categorical variables. P values less than 0.05 were taken as significant.

Results

A total of 144 type 2 DM patients made up of 53 males (36.8%) and 91 females (63.2%) were recruited for the study. The age of the patients ranged from 29 to 87 years with a mean age of 57.49 ± 11.49 years. Ninety- four (65.3%) of the study participants had been diabetic for 5 years or less.

Table 1: Prevalence of CKD risk factors according to gender

	Male (N= 53) n (%)	Female (N= 91) n (%)	P value
Hypertension	33 (62.3)	64 (70.3)	0.210
Central obesity	17 (32.1)	77 (84.6)	< 0.001
Obesity	17 (32.1)	36 (39.6)	0.474
Poor glycaemic control	21 (39.6)	46 (50.5)	0.140
Dyslipidaemia	29 (54.7)	64 (70.3)	0.040
Metabolic syndrome	27 (50.9)	75 (82.4)	< 0.001

The CKD risk factors were metabolic syndrome, hypertension, abdominal obesity, dyslipidaemia, and obesity which were present in 70.8% 67.4%, 65.3% ,64.6% and 36.8% respectively (Figure 1). Hypertension, poor glycaemic control and obesity were more prevalent in the females compared to males, although the difference was not statistically significant. However, central obesity was significantly more prevalent in females ($p<0.001$) and the trend was same for dyslipidaemia ($p\geq0.04$) and metabolic syndrome X ($p< 0.001$) as shown in Table 1. Metabolic syndrome and hypertension were significantly more prevalent among participants above 60 years of age (Table2).

Table 2: Prevalence of CKD risk factors according to age

Parameter	< 60 years (N= 79) n (%)	≥ 60 years (N= 65) n (%)	P value
Hypertension	43 (54.4)	54 (83.1)	<0.001
Abdominal obesity	52 (65.8)	42 (64.4)	1.000
Generalised Obesity	31 (58.5)	22 (41.5)	0.603
Poor glycaemic control	39 (49.4)	28 (43.1)	0.504
Dyslipidaemia	55 (69.6)	38 (58.5)	0.220
Metabolic syndrome	50 (63.3)	52 (80.0)	< 0.001

Chronic kidney disease was present in 44 (30.6%) of the type 2 diabetic patients that were reviewed. The risk factors present in diabetics with CKD vs diabetics without CKD were hypertension (81.8% vs 61%), poor glycaemic control (38.6% vs 50%), dyslipidaemia (75% vs 60%), abdominal obesity (61.4% vs 67%), obesity (34.1% vs 38%) and metabolic syndrome (75% vs 60%). Hypertension, dyslipidaemia and metabolic syndrome were more prevalent in diabetics with CKD, but only hypertension was statistically significant ($p\geq0.01$) (Table 3).

Table 3: CKD risk factors in diabetics with CKD and without CKD

Risk factors	Diabetics without CKD n=100 Frequency (%)	Diabetics with CKD n=44 Frequency (%)	Pvalue
Hypertension	61 (61%)	36 (81.8%)	0.01
Poor glycaemic control	50 (50%)	17 (38.6%)	0.21
Dyslipidaemia	60 (60%)	33 (75%)	0.08
Abdominal obesity	67 (67%)	27 (61.4%)	0.51
Obesity	38 (38%)	15 (34.1%)	0.65
Metabolic Syndrome	60 (60%)	33 (75%)	0.26

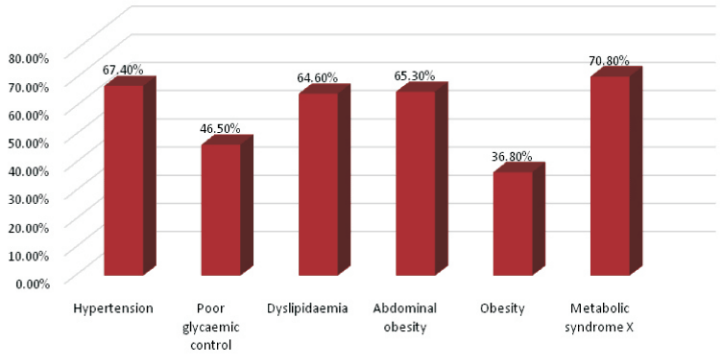

Figure 1: Pevalence of CKD risk factors among study participants

Discussion

The cost of caring for diabetics who develop nephropathy and eventually ESRD is enormous and unaffordable for most patients; hence preventive nephrology which should include screening for risk factors for the development of CKD will go a long way in the care of diabetic patients. Proper management of risk factors identified would slow down or prevent development of DN. We found that the risk factors for CKD were highly prevalent in the diabetics studied.

Glycated haemoglobin could not be assessed in this study because of financial constraints and instead blood glucose was used to assess glycaemic control. Despite this limitation, a large proportion (46.5%) of participants in this study had poor glycaemic control. This finding is similar to that of Ajayiet al[12] in South western Nigeria and Uloko et al[13] in the South East, who reported poor glycaemic control in 67.5% and 52.7% respectively of diabetics studied. The prevalence of poor glycaemic control was lower in diabetics with CKD. This might be explained by prolonged half life of insulin from its reduced renal clearance in the presence of CKD. Persistent poor glycaemic control in a diabetic patient, often leads to early onset of complications of DM. The United Kingdom Prospective Diabetes Study (UKPDS) has shown that intensive glycaemic control reduces the risk of microvascular complications such as DN in type 2 diabetics.[14,]All concerned in the care of diabetics need to be more aggressive in glycaemic control to reduce the rising prevalence of DN.

Hypertension was present in 67.4% of this study population. A similar trend of high prevalence of hypertension in diabetics has been reported by Ajayi et al[12] where 24.5% had blood pressure below 130/80 mmHg. The prevalence of hypertension was significantly higher in older diabetics and those with CKD in this study. The UKPDS has shown that the incidence of both microvascular and macrovascular events increase proportionately in diabetic persons with increasing systolic blood pressure.[15] Thus, diabetic patients should be monitored closely for early detection and aggressive control of hypertension especially the older diabetics. Metabolic syndrome was found in 70.8% of this study population and this is similar to a prevalence of 63.6% reported by Peupet et al[16] in a study done in North Central Nigeria. The proportion of diabetics who were obese in this study was 36.8% and this was similar to 32.9% reported by Edo et al.[17]Metabolic syndrome was commoner in older diabetics and those with CKD.

Central obesity was present in 65.3% of the diabetics studied and was significantly prevalent in female diabetics. Visceral adipocytes are potent sources of angiotensin II, leptin and tumour necrosis factor-alpha which are deleterious factors that impact on the renal haemodynamics causing glomerular endothelial dysfunction, glomerulosclerosis and tubulointerstitial fibrosis.[18] Obesity is also associated with sleep apnea syndrome which leads to hypoxic episodes, vasodilatation, and increased renal blood flow and hyperfiltration with attendant deleterious effect on the kidney. All these factors play part in development of nephropathy in metabolic syndrome. Weight reduction in severely obese individuals without overt renal disease can reverse renal dysfunction by ameliorating the effect of hyperfiltration,[19]hence weight reduction should be encouraged in obese diabetic patients.

Dyslipidaemia was found in 64.6% of our diabetics and this is in agreement with previous report of high prevalence rate of lipid abnormalities among diabetics.[20]It was more prevalent in female diabetics and those with CKD. Dyslipidaemia may damage glomerular capillary endothelialcells, mesangial cells and podocytes by enhancing the recruitment of macrophages which infiltrate the glomerulus, becoming foam cells that also release cytokines. Thus, treatment of dyslipidaemia is worthwhile in diabetics.

The limitations of this study are the relatively small sample size, inability to use glycated haemoglobin and albumin creatinine ratio to assess glycaemic control and

albuminuria respectively due to availability in the hospital.

In conclusion, the risk factors for CKD in this group of type 2 diabetic patients are highly prevalent. Efforts should be geared towards modifying these risk factors in order to prevent or slow down the development of CKD in them.

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