PREVALENCE OF MICROALBUMINURIA AMONG TYPE 2 DIABETIC PATIENTS IN ILORIN, NIGERIA

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ABSTRACT

Background: Microalbuminuria is predictive of renal failure in diabetes and is also an independent predictor of cardiovascular and all cause mortality both in diabetes and in general population. The three leading causes of chronic kidney disease (CKD) in Nigeria are chronic glomerulonephritis, hypertension and diabetes mellitus, while diabetes mellitus is the leading cause of CKD in developed countries.

Objective: The aim of this study was to determine the prevalence of microalbuminuria among type 2 diabetic patients attending diabetic clinic of University of Ilorin Teaching Hospital, Ilorin Kwara state, Nigeria.

Methods: One hundred and thirty two known type 2 diabetic patients and sixty six controls were recruited for this study. Urinary albumin concentration was determined using ELISA method, data was collated and analysed using SPSS version 20.

Results: The overall prevalence of microalbuminuria in this study was 37.9%. The prevalence of microalbuminuria increased with poor glycaemic control and duration of diabetes. Multivariate regression analysis revealed that, the age, glycated haemoglobin, fasting plasma glucose and duration of diabetes mellitus are associated with microalbuminuria.

Conclusion: The prevalence of microalbuminuria in type 2 diabetic patients in this cross-sectional study was 37.9% and this was significantly related to age and poor metabolic control.

Keywords: Prevalence, microalbuminuria, type 2 diabetics, Ilorin

INTRODUCTION

Chronic kidney disease (CKD) in Nigeria mainly affects young adults in their most productive years there by constituting a drain on the nations economy^{1,2}. The three leading causes of CKD in Nigeria are chronic glomerulonephritis, hypertension and diabetes mellitus^{3,4} while diabetes mellitus is the leading cause of CKD in developed countries⁵.

Microalbuminuria is predictive of renal failure in diabetes and is also an independent predictor of cardiovascular and all cause mortality both in diabetics and in general population^{6,7}. The presence of microalbuminuria, glomerular hyperfiltration and hypertension are markers of renal disease in diabetes and therefore

their presence predict the development of clinical diabetic nephropathy^{6,7}.

It is established that early detection and proper management of diabetic nephropathy are imperative in achieving regression of CKD and retardation of its progression to end stage renal disease. This study therefore aimed at determining the prevalence of microalbuminuria among type 2 diabetic patients as seen in University of Ilorin Teaching Hospital, Ilorin, North Central geopolitical zone of Nigeria.

MATERIALS AND METHOD

This was a cross sectional descriptive study among type 2 diabetes patients in the North central geopolitical zone of Nigeria. Type 2 diabetes mellitus

was diagnosed using the World Health Organization (WHO) criteria⁸. Patients with history of hypertension and/or renal disease were excluded. One hundred and thirty two type 2 DM patients who met above criteria and consented to the study were recruited. They were age and sex matched with 66 healthy subjects who served as control in a ratio of 2:1. The anthropometric measurement was obtained and 5mls of venous blood in fasting state was obtained after observing aseptic procedure. The blood was collected into a lithium heparin bottle for analysis. Spot urine sample was collected into a clean plain specimen bottle for determination of microalbuminuria by immunoturbidometric assay.

The data was analysed using

SPSS version 16 and were presented as mean, standard deviation (SD) and percentages. Student's t-test was used to compare means and chi squared test to compare proportions. P values <0.05 were considered significant.

Biochemical analyses were done on Ciba Corning Express Plus Auto Analyser (Corning, Medfield, MA, USA) using kits supplied by Boehringer Mannheim, (Mannheim, Germany). Fasting and postprandial plasma glucose was estimated by glucose oxidase method. Glycated haemoglobin (HbA1c) was estimated by high pressure liquid chromatography using the Variant machine (Bio Rad, Hercules, CA, USA).

Spot urine samples were collected and urine creatinine was measured using Kinetic method. Urine microalbumin concentration was measured using commercially available immuno-turbidometric assay kits from Randox (Randox, UK) on Opera Technicon Auto Analyser (Bayer Diagnostics, USA). The urine sample was added to a buffer containing antibody specific for human serum albumin. The absorbance of the resulting turbid solution is proportional to concentration of albumin in the sample solution. By constructing a standard curve from the absorbances of the standards, the albumin concentration in the sample can be determined. The mean interassay and intraassay coefficient of variation were 3.4% and 2.4% respectively.

RESULTS

The overall prevalence of microalbuminuria in this study was 37.9%. The mean age $\pm$ SD of the patients was 59.53 years $\pm$ 0.86 years, mean BMI $\pm$ SD was 31.81 $\pm$ 0.54 kg/m² and the mean age $\pm$ SD was 58.9 $\pm$ 1.63 years.

Ninety three (70.5%) patients were females with mean age of 59.9 $\pm$ 1.01 years and thirty nine (29.5%) were males.

Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), fasting Plasma Glucose (FPG), glycated haemoglobin (HbA1c), albumin creatinine ratio (ACR) and estimated glomerular filtration rate (eGFR) were 126.70 $\pm$ 1.08, 87.56 $\pm$.97, 8.52 $\pm$ 0.49, 9.19 $\pm$ 0.47, 11.79 $\pm$ 1.07 and 62.83 $\pm$ 6.77 respectively. Univariate analysis demonstrated significant association between microalbuminuria and poor glycaemic control, duration of diabetic and female gender.

DISCUSSION

The incidence of DM especially type 2 is rapidly growing worldwide with some of its attendant chronic complications such as diabetic nephropathy (DN). Albuminuria is a renal risk factor and a sign of endothelial dysfunction which may lead to overt renal impairment. In this present study microalbuminuria occurred in 37.9% of type 2 diabetic patients which is comparable to the prevalence rate of 38% reported by Orluwene et al⁽⁹⁾ in Port Harcourt and 37.6% in Lagos by Iwalokun et al⁽¹⁰⁾. Our findings concur with the overall global prevalence of microalbuminuria of 39% in the study carried out by the Development of Education on microalbuminuria for Awareness of Renal and Cardiovascular Risk Diabetes Study. The prevalence in our study is however, higher than the prevalence of 25% reported by Adebisi et al⁽¹¹⁾ in Ilorin, 21% reported by Khahava et al⁽¹²⁾, 20% by Torffvitt et al⁽¹³⁾ and 22% as reported by Parvin et al⁽¹⁴⁾ all among type 2 diabetic patients. However, our finding contrast with the prevalence of 52% reported by Erasmus et al⁽¹⁵⁾, in a study conducted in Ilorin, 50%

reported in Benin by Unuigbo et al⁽¹⁶⁾ and 42% prevalence was reported by Okesina et al⁽¹⁷⁾ in South Africa. The variation in most of the studies quoted above could be due to patient sample size, various assay methodology of albuminuria, and probably early commencement of drugs to reduce the risk factors. Some of the reasons for the higher prevalence rates have been linked to hyperglycaemia (poor glycaemic control) and obesity, these are independent strong risk factors for developing proteinuria. We observed an increase in the mean of body mass index, fasting plasma glucose and glycated haemoglobin for the diabetic patients. However, the variation in the prevalence rate is probably attributable to difference in diagnostic criteria, the stage of the disease and the method of assessment.

Furthermore, no significant correlation was observed between the degree of glycaemic control and albuminuria. These findings are similar to observations made amongst diabetics in Nigeria by Erasmus et al⁽¹⁸⁾ and in Mexico by Hafnner et al⁽¹⁹⁾ respectively. An interesting observation in this study was the high prevalence of microalbuminuria in patients with relatively short duration of DM less than 5 years. This is similar to findings of Erasmus et al⁽²⁰⁾.

Micro-albuminuria occurred at all known duration of diabetes and the data in this study supports that abnormal albumin excretion may be detectable shortly after diagnosis. Similar findings have been reported from Nigeria by Erasmus et al⁽¹⁸⁾, from Nauru by Collins et al and from Saudi Arabia by Alzaid et al⁽²¹⁾ but are in contrast to other studies in which duration of diabetes was found to be a strong predictor of microalbuminuria as reported by

Table 1 Characteristics of type 2 diabetic patients (mean $\pm$ SD)

Parameters	Patient	Control	t test	P – value
Number	132	66		
Age	59.5 $\pm$ 0.86	62.4 $\pm$ 1.32	17.35	<0.0001
BMI	31.8 $\pm$ 0.54	26.81 $\pm$ 0.84	4.867	<0.0001
FPG	8.03 $\pm$ 0.29	4.12 $\pm$ 0.21	7.829	<0.0001
HBA1C	8.84 $\pm$ 0.27	3.40 $\pm$ 0.15	12.04	<0.0001
SBP	127.91 $\pm$ 0.72	118.80 $\pm$ 0.74	6.936	<0.0001
DBP	87.61 $\pm$ 0.58	80.70 $\pm$ 0.90	6.707	<0.0001

Table 2: Clinical and biochemical characteristic of the study subjects

	Male	Female	t-test	P-value
Number	39 (29.5%)	93 (70.5%)		
Age (years)	58.9 $\pm$ 1.63	59.9 $\pm$ 1.01	3.556	0.0008
Duration (year)	3.77 $\pm$ 0.697	4.66 $\pm$ 0.433	7.398	<0.0001
BMI	29.49 $\pm$ 0.991	32.67 $\pm$ 0.616	22.363	<0.0001
FPG (mmol/L)	8.53 $\pm$ 0.644	7.71 $\pm$ 0.310	9.881	<0.0001
HBA _{1c}	9.69 $\pm$ 0.52	8.50 $\pm$ 0.315	16.146	<0.0001
SBP (mmHg)	127.85 $\pm$ 1.65	127.72 $\pm$ 0.79	0.613	0.5412
DBP (mmHg)	85.56 $\pm$ 0.99	87.85 $\pm$ 0.67	15.443	<0.0001

TABLE 3 : Prevalence of microalbuminuria and macroalbuminuria in relation to duration of diabetes

Duration of DM(yrs)	N(%)	microalbuminuria	macroalbuminuria
0-5	103(78.3%)	40 (38.8%)	8 (7.8%)
6-10	2(15.9%)	7(33.3%)	1 (4.8%)
> 11	8(6.06%)	3(3%)	0 (0%)

West et al ⁽²²⁾, Mc Larty et al ⁽²³⁾, Albeert et al and Iwalokun et al at Lagos.

These conflicting observations may have occurred due to difficulty in dating the

onset of type 2 diabetes which may be connected with low education levels in some patients. In many developing countries like Nigeria, DM is undetected for a long period of time and is not uncommon for newly diagnosed

diabetics to present with established complications.

As reported in some studies such as Parvin et al ⁽²⁴⁾, Erasmus et al ⁽¹⁸⁾, and McLarty et al (1992) ^(2,3), African diabetics with hypertension and elevated serum creatinine were at greater risk of developing micro-albuminuria. This study, however, showed similar blood pressure levels in normo, micro and macro-albuminuric diabetics. These findings are in contrast to studies which have emphasized the importance of the relationship between UAE and elevated blood pressure Erasmus et al ⁽¹⁸⁾, Alzaid et al ⁽²⁵⁾. This may probably be due to antihypertensive administration by some patient.

CONCLUSION

The overall prevalence of microalbuminuria in this study was 37.9%. DN was more prevalent amongst the newly diagnosed patients with type 2 diabetes. There is an association between microalbuminuria and poor glycaemic control, duration of diabetes and female gender.

We recommend that preventive measures such as stepping up glycaemic control and early antihypertensive treatment with ACE inhibitors need to be intensified. Furthermore, regular screening for microalbuminuria should be implemented as part of the routine care of diabetic patients in Nigeria.

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