

## Markers of Diabetic Nephropathy in Diabetic Patients in Gusau, Zamfara State, Nigeria

<sup>\*1</sup>A. Usman, <sup>2</sup>R.A. Umar, <sup>2</sup>N.I. Shehu, <sup>3</sup>U. Wali and <sup>4</sup>A. Nasir

<sup>1</sup> Department of Chemistry, Umaru Musa Yaradua University, Katsina

<sup>2</sup> Department of Biochemistry, Usmanu Danfodiyo University, Sokoto

<sup>3</sup> Department of Chemical Pathology, School of Medical Laboratory Science, Usmanu Danfodiyo University, Sokoto

<sup>4</sup> School of Education, Yusuf Bala Usman College of Legal and General Studies, Daura.

[\*Corresponding author; aminurimi@yahoo.com, ☎:+234(0)8067062441]

**ABSTRACT:** Diabetic nephropathy is the kidney disease that occurs as a result of diabetes. Cardiovascular and renal complications share common risk factors such as blood pressure, blood lipids, and glycemic control. The markers of diabetics nephropathy in diabetic patients, serum glucose, creatinine clearance, urinary albumin and blood pressure in 40 diabetic (9 type I and 31 type II diabetics) patients attending Federal Medical Centre, Gusau, were determined. Sixteen (16) age- matched volunteers served as control. In type I diabetes mellitus; serum glucose level, creatinine clearance, and microalbuminuria were significantly different ( $P < 0.05$ ) between the subjects and control. In type II diabetes mellitus, serum glucose level, systolic pressure and age were significantly different ( $P < 0.05$ ) between the subjects and control. Therefore, serum glucose level, creatinine Clearance and microalbuminuria could be the markers of nephropathy in type I diabetics while serum glucose level, systolic pressure and higher age could be for type II diabetics. Other markers of risk for diabetic nephropathy are needed for optimal clinical management. The implication of this result for improving the quality of life of diabetics is discussed.

**Key words:** Creatinine, Diabetic patients, Glucose, Microalbuminuria.

### INTRODUCTION

Diabetic nephropathy, a leading course of kidney failure and one of the key complications of diabetics, is defined by either microalbuminuria that is a urinary albumin excretion greater than 300mg in a 24 hour collection or by abnormal renal function as present by an abnormality in serum creatinine, calculated creatinine clearances or glomerular filtration rate (GFR) in diabetic patients (Amos *et al.*, 1997).

Diabetics kidney disease is one of the most common cause of end stage kidney disease (ESKD) and account for a large proportion of patients beginning dialysis therapy (USSRDS 2001). Up until two decades ago diabetes mellitus was reported to be an uncommon cause of chronic kidney disease in Nigeria (Oyediran and Akinkugbe 1970). But in the last few years, reports from several Renal units in the country now place diabetic nephropathy as a third most common causes of chronic renal failure (Sanusi *et al.*, 1979). Microalbuminuria, glomerular hyperfiltration, and hypertension are markers for renal events in diabetes and their presence predict development of clinical diabetics nephropathy (Ravid and Brosh 1998). Diabetics nephropathy or diabetics kidney disease, affects 20 to 30 percent of patients with diabetes, it is also common cause of kidney failure (Navarro *et al.*, 2003)

Diabetic nephropathy presents in its earliest stage with low level of albumin (microalbuminuria) in the urine, this often is referred to as incipient nephropathy. As the disease progress, urine albumin levels increase until the patient develops overt nephropathy (define as more than 300mg per 24 hours or more than 200mcg per minute). Overt nephropathy occurs in conjugation with hyperfiltrative period in which creatinine clearance and glomerular filtration rate are high (USRDS 2002). The elevated clearance is deceptive, however, because it is followed by a gradual decrease in glomerular filtration rate that ultimately leads to kidney failure (Gal *et al.*, 1997)

### MATERIALS AND METHODS

#### Patients Recruitment and Collection of Samples

The study area is Gusau, Zamfara State, Nigeria. Blood and urine samples were collected and weight, height and blood pressure were measured in diabetic patients attending Federal Medical Centre, Gusau, Zamfara state. Samples from healthy volunteers were used as control.

All subjects were instructed to fast for 12 hours after which 4ml venous blood samples were obtained by venipuncture and urine samples were collected in fresh sterile containers. Weight, height, and blood pressure

were immediately taken. Serum from the blood obtained and urine were used for analysis.

### Chemicals, Reagents, and Equipment

Glucose and Creatinine Reagent kits were purchased from Randox laboratories Ltd, Diamond road, crumlin co, Atrim,, United Kingdom. All chemicals and reagents used were of analytical grade. General laboratory routine equipment were used.

### Serum Glucose Determination

Enzymatic determination of glucose concentration was done using glucose oxidase method according to Trinder (1969).

### Determination of Creatinin

Jaffe's creatinine reaction method by Jaffe's (1886) was used in the determination of creatinine and then

cockroft Goult formular (cockroft 1976) was used to calculate creatinine clearance.

### Determination of Albumin

Urine albumin determination was by Strip Method (Boehringer Mannheim), which is based on the "Protein error" principles of indicators

### Statistical Analysis

The result is presented as mean+ standard deviation. Significant differences between means were compared using SPSS application package.

### RESULTS AND DISCUSSION

The results of demographic and some physicochemical characteristic in diabetes and control subjects are presented in Table 1.

**Table 1:** Demographic and some Physicochemical Characteristic in Diabetes and Control Subjects

Parameters	Type I diabetics	Type II diabetics	Control
No of subjects	9	31	16
Age (years)	32.667 ± 3.391 (35-39)	55.709 ± 9.082 (45-74)	40.375±14.532 (24-65)
weight (kg)	57.667±7.55	69.58 ±17.117	63.562± 3.076
Systolic Pressure (mmHg)	140±26.458	137.807±21.162	122.652±17.988
Diastolic pressure (mmHg)	86.66± 18.708	85± 13.354	78.125 ± 11.087
FBS (mmol)	10.489±4.901	8.719± 4.368	4.856±1.022*
CCL(mls/min)	63.914± 20.667	71.747± 30.02	82.703±17.864
Microalbumuria (mg)	16.667 ± 15.811	2.903 ±9.01	Nil

Values in parentheses are subjects age range.

values are means (X) ± standards deviation (S.D)

FBS= fasting blood sugar; CCL= Creatinine clearance;

\* Significantly different from control using t- test (P<0.05)

The measurement of urinary albumin loss and creatinine clearance or serum creatinine are the best screening tests for diabetic nephropathy and the overall risk of developing diabetic nephropathy varies between about 10% of type II diabetics to about 30% of types I diabetics (Akinsola *et al.*, 1989). In type I diabetic, hyperglycaemia starts in the first decade of life and is the only recognized cause of nephropathy. On the contrary, in type II diabetics hyperglycemia starts after the forties, usually when the kidneys have already suffered the long term consequences of aging, and of other recognized promoters of chronic renal injury such as arterial hypertension, obesity, dyslipidaemia, and smoking (Ruggenet and Rumuzzi 1998). Both type I and type II diabetes have significantly higher fasting blood sugar levels than in control; i.e. there is significant (P < 0.05) difference between the type I and type II diabetics and control (Table 1). This finding is typical of diabetics and may be due to destruction of the

β-cells of the pancreas by the viruses or as a result of autoimmune destruction, accompanied by antibodies directed against insulin or islet cells. These lead to hyperglycaemia, and as a result, there is no insulin secretion i.e. in type I diabetic but in type II diabetes is as a results of post receptors lesion or masking of the insulin receptors by fat which lead to reduction in the glucose uptakes by the cells.

Microalbuminuria occurs in both type I and type II diabetics (Table 1). When microalbuminuric subjects were compared with type I diabetic and control, a significant (P<0.05) difference was observed. On the other hand, no significant (P<0.05) difference was observed between type II diabetic and control. This indicates the type I are more susceptible to mircoalbuminuria or diabetic nephropathy than in type II diabetics. The earliest detectable change in the course of diabetic nephropathy is thickening in the glomerulus

as a result of hyperglycaemia (Mogensen and Christensen 1984). Creatinine is a waste product in the blood created by the normal break down of muscles cells during activity. Healthy kidney filters creatinine out of the blood and into the urine. When kidneys are not working well, creatinine levels builds up in the blood. Creatinine clearance is the rate at which creatinine is been cleared in the blood i.e is been excreted into the urine and in the case of normal kidneys have higher filtration rate than the affected ones in terms of kidney disease (Bazari 2007). Thus, Table 1 shows that there is significant ( $P<0.05$ ) difference between type I diabetics subjects and control in term of creatinine clearances. Creatinine clearance in type I diabetic subjects is low when compared to control and may lead to kidney failure (Mogensen and Christensen 1984).

Most of the type II diabetics are hypertensive which is due to the deposition of fats in the heart arteries (arteriosclerosis) thereby causing increase in blood pressure. As seen in Table 1, there is significantly ( $P<0.05$ ) higher in systolic pressure in the type II diabetic subjects than in control.

Table 1 shows that there is no significant ( $P>0.05$ ) difference between type I diabetics and control on the following parameters; age, weight, systolic and diastolic pressure. More intensive measures to restore normoglycaemia, normatension and decreasing the incidence of nephropathy in diabetic have to be considered.

An important measure in the prevention and management of diabetic mellitus and diabetic nephropathy is tight glycaemic control. Insulin therapy in types I is used to reduce the risk of type I diabetes while in type II some hypoglycaemic drugs are used in the management of type II diabetes, examples of those drugs are suphonylurea drugs, such as tolbutamide or glibenclamide, can stimulate insulin secretion. While in the case of microalbuminuria or diabetic nephropathy , calcium channel blockers, angiotensin II blocking agents are used in the prevention and management of diabetic nephropathy (Martins and Daria 2006).

**Table 2:** Contingency Table Analysis of Association of Microalbuminuria with Type I a and Type II Diabetics

Subjects	Type I Diabetics			Type II Diabetics		
	Albuminuria positive	Albuminuria negative	Total	Albuminuria positive	Albuminuria negative	Total
No. of patients	5	4	9	3	28	31
No Disease	0	8	8	0	8	8
Total	5	12	17	3	36	39

## CONCLUSION

The study revealed high level of glucose and reduced rate of creatinine clearance in type I diabetic mellitus than in normal subjects. Microalbuminuria which is the earliest laboratory evidence of diabetics nephropathy, is common in type I diabetes. Serum glucose levels, creatinine clearance and microalbuminuria are markers of diabetic nephropathy in the study population.

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