

Cardiovascular Risk Factors among Diabetic Patients Attending a Nigerian Teaching Hospital.

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Abstract

Background / objectives – Diabetes mellitus, Systemic hypertension, Dyslipidaemia and obesity are established cardiovascular risk factors. This study screened type 2 diabetic Nigerian patients for cardiovascular risk factors. Methods: Fifty (50) consecutive diabetic patients, aged 30 – 80 years, and 50 age and sex – matched non diabetic controls were investigated for their lipid profile, serum urea and creatinine, blood pressure, body weight, height and body mass index (BMI). Results: Total cholesterol, High Density Lipoprotein cholesterol (HDL), Low Density Lipoprotein cholesterol (LDL), triglyceride, serum urea and creatinine levels were significantly higher among Diabetic patients, compared with controls. Conclusion: These findings confirm diabetes mellitus as a disorder with dyslipidaemia. There is a need to anticipate, suspect, investigate and treat biochemical derangements and dyslipidaemia in patients with diabetes. It will also be helpful to incorporate routine biochemical and lipid assays in the management of these patients. The services of dieticians should be employed for dietary counseling to avoid food items that can aggravate or elevate endogenous/blood lipid levels.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycaemia due to disturbances of carbohydrate, fat, and protein metabolism that are associated with absolute or relative deficiencies in insulin secretion, insulin action or both (Charles FA, 1998. Albertis KG, 1998). Over 170 million people worldwide and about 1 – 7% of the Nigerian population are affected (Wokoma FS, 2002. Fabiyi et al, 2002).

A Nigerian national non-communicable disease survey estimated the prevalence to be 2.2% with over 90% being type 2 diabetes. (Akinkugbe OO, 1997). A prevalence of 3.1% has been reported in urban Jos (Puepet FH, 1996). The morbidity and mortality associated with DM results from either its acute or chronic complications. Chronic complications include macrovascular disorders such as atherosclerosis, a recognized major cause of mortality in the diabetic population (Bennet, 1999). Other long term effects and complications of diabetes include progressive development of retinopathy, nephropathy, and neuropathy. Extensive studies world wide have demonstrated that persons with DM are predisposed to dyslipidaemia with risks for vascular disorders (Ana, 2002). Among the recognized chronic complications of DM is diabetic

nephropathy which is the leading cause of end stage renal disease in the western world.(Raine,1993; Reitz,1999). In diabetic nephropathy, a number of serum electrolytes are known to be deranged, with significant morbidity and mortality (Alvin, 2001; Ataru, 2003; Ana 2002; Puepet 2003). Information on serum biochemical profiles of diabetic populations in northern Nigeria is scarce. The aim of this study was to determine the serum biochemical profile of diabetic patients resident in Jos, north central Nigeria.

MATERIALS AND METHODS

A total of 50 diabetic subjects (both males and females) aged between 30 – 80 years attending the diabetic clinic of the Jos University Teaching Hospital were selected for the study. Diabetes in this study was defined based on laboratory findings of a fasting plasma glucose levels greater than 7.0mmo/L on two or more occasions (WHO, 1999). Their medical history and personal data were obtained via a comprehensive questionnaire after due approval from the ethnical committee of the hospital.

Fifty age and sex – matched non diabetic persons attending the family medicine out patient clinic of the hospital were used as controls in this study. Informed consent was obtained from all the participants.

Eight milliliters (8mls) of venous blood was collected from each subject and dispensed into plain biochemical bottles for serum lipids, urea, creatinine and electrolytes. These parameters were assayed / determined in the chemical pathology laboratory using standard methods of Afonja (2001). The latest fasting blood glucose as at time of the study (using a glucometer (Acu check) was recorded for each patient. Other clinical parameters such as age, sex, weight in kg, height in metres, and duration of diabetes were also noted and recorded. Body mass index (BMI) was calculated. Data obtained were subjected to statistical analysis using statistical package for social sciences 10.0 (SPSS) software. Probability (p) values of less than 0.05 were taken as significant.

RESULTS

Fifty patients were studied. Their ages ranged from 30 to 80 years. The age and sex distribution are shown in table 1. Females constituted 62% while males constituted 38%. There were 31 females and 19 males in each of the groups. Table 2 shows the clinical parameters of participants. There was no significant mean age difference between diabetic patients (51 – 8 ± 10.2 years) compared to non diabetic controls (49.7 ± 8.7), $p > 0.05$. There was however significantly higher mean systolic blood pressure in the diabetic patient (146.4 ± 19.4 mmHg) than the controls (83.8 ± 4.7mmHg); $P < 0.05$. Also, diabetic patient had significantly higher mean BMI (27.3 ± 4.4kg/m²) than non diabetic controls (25.3 ± 3.9), $P < 0.05$.

Tables 3, 4 and 5 show the results of the biochemical parameters among both groups. Table 3 shows the distribution of participants according to their serum triglyceride levels. Twenty one (42%) of diabetic patients had triglyceride levels within the normal range, While 29 (58%) had triglyceride levels above 1.75mmol/L. Forty nine (98%) of the control group had normal triglyceride levels, while 1(2%) of the controls had elevated triglyceride level.

Table 4 shows the distribution of all participants according to the LDL level. Forty five (90%) of diabetic patients had normal LDL levels while 5(10%) had LDL levels above normal. All the controls had LDL level within the normal limits. Table 5 shows the mean levels of urea, creatinine, total cholesterol, high density lipoprotein (HDL), triglycerides, low density lipoprotein (LDL) and fasting plasma glucose of all subjects. Urea level in diabetic patients (4.6 ± 1.2mmo/L) was not significantly higher than the controls (4.2 ± 0.5 mmo/L), $P > 0.05$. Creatinine level in the

diabetic (89.3 ± 34.2) was significantly higher than the controls (57.9 ± 8.5mmo/L) $P < 0.05$ even though within the normal limits.

Mean total cholesterol level in the diabetic subjects (4.61 ± 1.55 mmol/L) was significantly higher than the controls (3.10 ± 0.52mmol/L), $P < 0.05$. The mean high density lipoprotein (HDL) was significantly higher in the diabetic patients (2.25 ± 0.99mmo/L) than the controls (1.95 ± 0.46), $P < 0.05$.

The mean triglyceride level was significantly higher in the diabetic group (1.9 ± 0.9) than the control group (1.0 ± 0.5); $P < 0.05$. With regards to LDL levels, the mean LDL level was significantly higher in the diabetic patients (1.48 ± 0.84) than the control group (0.69 ± 0.35); $P < 0.05$.

Expectedly, the mean Fasting Plasma Glucose (FPG) of diabetic subjects (10.1 ± 4.6) was significantly higher than that of the control group (5.0 ± 0.6); $P < 0.05$.

Figure 1

Table 1: Age and Sex distribution of study population

Age (yrs)	Persons with DM No. (%)		Controls No. (%)		Total
	M	F	M	F	
30 – 39	-	6(6)	1(1)	3(3)	10(10)
40 – 49	5(5)	8(8)	10(10)	14(14)	37(37)
50 – 59	4(4)	14(14)	6(6)	10(10)	34(34)
60 – 69	9(9)	2(2)	-	4(4)	15(15)
70 – 79	1(1)	1(1)	2(2)	-	4(4)
Total	19(19)	31(31)	19(19)	31(31)	100(100)

Figure 2

Table 2: The clinical parameters of study population

Parameter	Persons with DM Mean	Controls Mean	P value	Remark
Age (years)	51.8 ± 10.2	49.9 ± 8.7	0.20	NS
DBP (mmHg)	93.2 ± 12.0	83.8 ± 14.7	0.02	S
SBP (mmHg)	146.4 ± 19.4	128.8 ± 22.0	0.02	S
BMI (kg/m ²)	27.3 ± 3.9	25.3 ± 3.9	0.01	S
Duration of DM (Years)	9.96 ± 5.34	NA	-	-

Key: DBP – Diastolic Blood Pressure

SBP – Systolic Blood Pressure

BMI – Body Mass Index

S – Significant

NS – Not significant

NA-Not applicable

Figure 3

Table 3: Distribution of study population according to triglyceride levels

Triglyceride Level(mmol/l)	Persons with DM No (%)	Controls No (%)
< 1.75	21(42)	49(98)
>1.75	29(58)	1(2)
Total	50(100)	50(100)

Figure 4

Table 4: Distribution of study population according to low lipoprotein (LDL) level

LDL mmol/L	Persons with DM No (%)	Control No (%)
≤ 3.0mmol/L	45(9)	50(100)
>3mmol/L	5(10)	-
Total	50(100)	50(100)

Figure 5

Table 5: Summary of biochemical parameters of study population

biochemical parameter (mmol/l)	Persons with DM Mean± SD	Controls Mean±SD	P value	Remark
Urea	4.6±1.2	4.2±0.5	0.05	NS
Creatinine	89.3±34.2	57.9±8.5	0.01	S
Total cholesterol	4.6 ±1.55	3.10±0.52	0.01	S
HDL cholesterol	2.25±0.99	1.95±0.46	0.01	S
TG	1.9±0.9	1.0±0.5	0.01	S
LDL cholesterol	1.49 ±0.70	0.69 ±0.35	0.01	S
FPG	10.1±4.6	5.0±0.6	0.01	S

Key: I

HDL – High Density Lipoprotein

FPG – Fasting Plasma Glucose

TG-Triglyceride

S – Significant

NS – Not significant

DISCUSSION

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycaemia due to disturbances of carbohydrate, fat and protein metabolism that are associated with absolute or relative deficiencies in insulin secretion, insulin action, or both (charles,1998). Numerous studies have shown that serum biochemical and electrolyte abnormalities can occur in the course of diabetes mellitus (Raine, 1993). Our study showed that the serum urea levels are higher in the diabetic subjects compared to the control subjects although the difference was not statistically significant ($P = 0.05$). This finding contrasted that reported by Puepet et al (2003) who

documented significantly higher urea levels among diabetics. This difference may perhaps be due to the larger sample size of their study or the duration of DM may be longer in their own subjects compared to this present study. The mean serum creatinine levels in both groups were within normal limits, but significantly higher in the diabetic subjects compared with the non-diabetic controls. ($P < 0.05$). This finding agrees with the work of Puepet,(2003) who also reported significantly higher creatinine levels in persons with diabetes . Diabetic nephropathy, with raised serum creatinine, is one of the chronic complications of DM (Alvin, 2001).

The total cholesterol and HDL levels were higher in the diabetic subjects than the controls. These differences were statistically significant ($P < 0.05$). Serum triglyceride levels were also significantly higher in the diabetic subjects compared to the non diabetic control ($P < 0.05$). Serum low density lipoprotein (LDL) was elevated in 5 (10%) of the diabetic subjects in this study while none of the control subjects had raised serum LDL. The difference was statistically significant. These findings confirm DM as a disorder with dyslipidaemia. Dyslipidaemia found in this study agrees with the findings of Puepet (2003) who also reported dyslipidaemia among the metabolic changes that occur in persons with DM. It also agrees with the report of Siminialayi and Emem (2004) who expressed in a review article that the components of the insulin resistance syndrome include dyslipidaemia, obesity, and hypertension among others. The hypertriglyceridaemia found in this study agrees with the opinion of Ataru's group (2003), that triglyceride, BMI, glycated haemoglobin and platelet count are independent predictors of insulin resistance. It also agrees with Ana et al (2002) who found DM, obesity, high fat intake and hypertension are risk factors for atherosclerosis. This study showed that persons with DM are predisposed to dyslipidaemia, with risk for vascular disorders. Raised low density lipoprotein cholesterol (LDL) is a major risk factor for coronary artery thrombosis (Ana et al, 2002). The significantly higher HDL levels in the diabetic subjects found in this study is at variance with the findings of Puepet(2003) who reported a higher but not significant HDL level in diabetic subjects. This difference may be due to the smaller sample size of this study.

In conclusion, this study showed significantly elevated levels of total cholesterol, HDL, LDL, triglyceride, serum urea and creatinine levels among diabetic subjects compared with non diabetic controls, confirming diabetes as a disorder

with hyperlipidaemia. These findings confirm diabetes mellitus as a disorder with dyslipidaemia. There is a need to anticipate, suspect, investigate and treat biochemical derangements and dyslipidaemia in patients with diabetes. It will also be helpful to incorporate routine biochemical and lipid assays in the management of these patients. The services of dieticians should be employed for dietary counseling to avoid food items that can aggravate or elevate endogenous/blood lipid levels.

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