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Full Length Research Paper

Lipid profile of a population of diabetic patients attending Nigerian National Petroleum Corporation Clinic, Abuja

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This study was conducted to compare the lipid profile of diabetic patients and healthy controls. The lipid profiles and lipoprotein levels of 50 known diabetic patients and 50 healthy subjects were studied. Total cholesterol (TC), Triacylglycerols (TG), Low density lipoprotein-cholesterol (LDL-C), and high density lipoprotein cholesterol (HDL-C) levels were assayed for each group using standard biochemical methods. The mean TC, TG, and low density lipoprotein cholesterol levels were lower in the diabetics than in the control subjects though these were not significant ($P > 0.05$). The frequency of high TC level was higher in the diabetic group while the frequency of low HDL-C level was higher in the healthy controls. The prevalence of high TG and LDL-C were approximately equal in the two groups. The mean (±SD) HDL- C was significantly lower ($P < 0.05$) in males compared to the females for both diabetic and control groups. The better lipid profiles in the diabetic patients compared to the controls were apparently due to the regime of management of their condition.

Key words: Diabetes, lipid profile, Nigerians.

INTRODUCTION

Diabetes mellitus (DM) is a common endocrine metabolic disorder and a leading cause of death world wide (Faghilimani et al., 2006). There are more than 154 million diabetics worldwide and its prevalence is on the increase in the developing countries (Bennett, 2000; Sajjadi et al., 2005). Certain racial and ethnic groups have a greater risk of developing diabetes (Manu et al., 2007). Majority of those that suffer from this disease are from Africa and Asia (Manu et al., 2007). This may be due to genetic disposition and life style of people in these areas. Nigeria being the most populous country in Africa may harbor a substantial number of people with this condition.

The disease is accompanied in many cases by secondary alterations of protein and fat metabolism resulting in an array of physical disorders (Welsh et al., 2004). Lipids and lipoproteins abnormalities are well known risk factors for heart disease. Elevated levels of triacylglycerols (TG), cholesterol, and low density lipoprotein-cholesterol (LDL-C), are documented as risk factors for atherogenesis (LRCP, 1984). The blood level of high density lipoprotein-cholesterol (HDL-C) in contrast bears an inverse relationship to the risk of atherosclerosis and coronary heart disease. The higher the level, the smaller the risk (Khoo et al., 1997; Tao et al., 1992). Lipid abnormalities play an important role in the causation of diabetic atherosclerosis (Easterman and Keen, 1997; Lewis and Steiner, 1996), but the pathophysiology is complex and clearly multifactorial (Gupta and Kapse, 2001), with dysfunction of the fibrinolytic system (Sobel, 1996) pro- oxidative state (Baynes and Thrope, 1996), hyperglycaemia (Malemberg et al., 1995; Lehto et al., 1997) and possibly hyperinsulineamia (Fontbonne et al., 1989) also explaining part of the increased susceptibility of people with diabetes to atherosclerotic complications.

Epidemiological studies have shown that diabetics have 2 - 4 times higher risk of developing cardiovascular diseases (Aboot et al., 1988; Gaillard et al., 1997). Abnormal lipid profiles and lipoprotein oxidation (especially LDL-C)

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Table 1. Biochemical parameters of diabetics and controls.

Parameters	Diabetics(n= 0)	Control(n = 50)	p - value
Total cholesterol (mg/dl)	211.02±59.91	229.77± 33.63	0.057
Triacylglycerols (mg/dl)	142.10± 52.28	148.84 ±105.91	0.687
HDL-C (mg/dl)	44.04± 12.28	44.28± 15.80	0.932
LDL-C (mg/dl)	141.04± 55.15	156.10± 37.63	0.130
Glucose (mg/dl)	197.58± 85.75	85.76± 11.14	0.001

HDL-C = high density lipoprotein – cholesterol, LDL-C = low density lipoprotein cholesterol

are more common in diabetics and are aggravated with poor glycaemic control. As diabetic patients constitute a unique group with different lifestyles and genetic dispositions, the measurement of their lipid profile is needed to investigate how their lipid metabolism is affected by diabetes. Considering the probable disorders of lipid profile and acceleration of atherosclerotic process in high risk groups, this work assessed the lipid profile of a randomly selected group of adult Nigerian diabetics and compared them with controls.

SUBJECTS AND METHODS

The subjects used in the study were diabetic patients who attend the Nigerian National Petroleum Corporation (NNPC) Group Medical Services Centre, Abuja, Nigeria. A total of 50 diabetic patients (30 males, 20 females) and 50 healthy controls (32 males, 18 females) were randomly selected. Patients with other ailments and metabolic disorders were excluded from the study. Diabetes was ruled out in the control group by asking questions about the clinical signs of diabetes such as polyuria, polydipsia and recent weight loss. Laboratory tests were also used to confirm the absence of diabetes in the control group. Ethical clearance was sought and obtained for the study from the hospital. The aim of the study was explained to the subjects by the physicians and those who gave informed consent were included in the study by the researchers.

In both subjects, venous blood samples were obtained after overnight fast into tubes containing lithium heparin (for lipid profile) and EDTA (for blood glucose) as anticoagulants. The samples were centrifuged at 1500 rpm for 5 min to obtain the plasma. Plasma cholesterol, triacylglycerols, high density lipoprotein – cholesterol (HDL-C), and glucose were assayed using test strips manufactured by Roche Diagnostic Limited (Bell Lane Lewes, East Sussex BN 71LG, UK). All assays were performed on a reflotron machine. (Roche, diagnostic GmbH, D-68298 Mannhein, Germany). The machine automatically displays the concentrations of the parameters assayed in mg/dl. The used test strip was then removed from the reflotron machine and disposed off.

LDL-C was calculated indirectly by the method of Friedwald et al. (1972) as shown below.

LDL-C = total cholesterol – HDL-C + TG/ 5

The lipid profile of the subjects was classified based on the ATP III model (NCEP, 2001).

Statistics

The data obtained in this study were presented using descriptive statistics. In order to test whether or not significant differences exist between groups, we analysed the mean values with student t- test. The acceptable level of significance was P ⊓0.05.

RESULTS

The mean age of the subjects were 53.14 ± 12 and 49.20 ± 11.10 years for the diabetic and control groups respectively. The sex distribution showed that there were more diabetic males 30(60%), compared to diabetic females 20(40%). There were also more males 32(64%) compared to the females 18(36%) in the control group.

Table 1 shows that the mean total cholesterol, triacylglycerols and LDL-C were lower in the diabetics compared to the controls though these were not significant ($P > 0.05$). The fasting blood sugar level of the diabetics was significantly higher ($P < 0.05$) than those of the controls. Table 2 compared the mean biochemical variables with respect to gender in diabetics and the control respectively. The results shows that the mean HDL-C concentration was significantly lower ($P < 0.05$) in the male diabetics compared to the female diabetics. In the control group (Table 2) the mean HDL-C concentration was also lower ($P < 0.05$) in the males compared to the females.

Table 3 shows the frequency of TC, TG, LDL-C and HDL-C concentrations in both patient and control groups. The results show that the frequency of high TC was higher in the diabetic group (34% Vs 28%). The frequency of high TG and high LDL-C were approximately equal in the two groups. The control group had a higher frequency of low HDL-C than the diabetic group. There was no significant difference in the mean lipid profile of male/female diabetics compared to male/female controls ($P > 0.05$).

DISCUSSION

Patients with diabetes can have many complications including elevated levels of VLDL-C, LDL-C and Triacylglycerols; and low levels of HDL-C (Haffner, 1998). These patients have a preponderance of abnormalities in the composition of smaller, denser particles, which increase atherogenicity even if the absolute concentration

Table 2. Comparison of the biochemical parameters in the males and females in both groups.

Parameters	Diabetics			Controls		
	Male N = 30	Females N = 20	p-Values	Male N = 30	Females N = 20	p-Values
Total cholesterol (mg/dl)	215.03 ± 66.94	205.00 ± 48.49	0.567	230.19 ± 35.96	228.89 ± 29.99	0.897
Triacylglycerols (mg/dl)	143.40 ± 59.74	140.15 ± 39.93	0.832	135.09 ± 70.90	173.28 ±14.93	0.225
HDL-C (mg/dl)	40.53 ± 11.68	49.30 ± 11.14	0.011*	40.31 ± 11.79	51.33 ± 19.58	0.016*
LDL-C (mg/dl)	149.90 ± 60.89	129.05 ± 46.12	0.199	163.47 ± 40.57	143.00 ± 28.21	0.064
Glucose (mg/dl)	206.57 ± 96.96	184.10 ± 65.53	0.369	84.59 ± 11.19	87.83 ± 11.04	0.329

HDL-C: high density lipoprotein–cholesterol; LDL-C: low density lipoprotein-cholesterol.
*significance, $P < 0.05$.

Table 3. Frequency of the biochemical variables in the diabetic and control groups according to the ATP III classification.

	Diabetics (%)	Control (%)
Total cholesterol (mg/dl)		
Desirable(< 200)	21(42)	2(4)
Borderline (200- 239)	12(24)	34(68)
High (240)	17(34)	14(28)
Triacylglycerols (mg/dl)		
Normal (<150)	32(64)	35(70)
Borderline high (150 – 199)	11(22)	7(14)
High(200 – 499)	7(14)	8 (16)
LDL-C (mg/dl)		
Optimal (<100)	12(24)	3(6)
Near optimal (100 – 129)	7(14)	6(12)
Borderline high (130 – 159)	12(24)	23(46)
High (160 - 189)	10(20)	10(20)
Very high (190)	9(18)	8(16)
HDL –C (mg/dl)		
Low(< 40)	19(38)	23(46)
High (60)	7(14)	9(18)
Borderline(40-59)	24(48)	18(36)

of LDL-C is not significantly increased (Haffner, 1998).

In our study, the lipid and lipoprotein profiles of the diabetics were lower than that of the controls. These findings are contrary to previous studies which suggest that lipoprotein abnormalities are higher in diabetics than in non-diabetics (Idogun et al., 2007; Albrki et al., 2007). The study also shows that when the mean (±SD) of the variables are separated for the male and female subjects, HDL-C was significantly lower in both diabetic and non-diabetic males. The higher the level of HDL-C, the lower the risk of developing artherosclerosis (Khoo et al., 1997). The results show no gender difference in the lipid metabolism between the diabetic and non-diabetic males and females.

Vinter-Repalust et al. (2007) reported no significant differences in the prevalence of type 2 diabetes mellitus (DM) between males and females. It is known that abnormalities arising from DM are related to gender, duration and drug compliance (Gustafsson et al., 2004).

The patients used in the study were out patients that visit the clinic regularly. The NNPC clinic Abuja is a high profile hospital that caters for mainly workers in the highly paying oil industry in Nigeria. The patients have been on drug for about one year. They were on the average educated and were also properly informed on the management and risks associated with diabetes as against the control group that was drawn from the general population. This could have led to the higher mean lipid abnormalities observed in the control group.

The prevalence rates for high TC, combined high and very high LDL-C and low HDL-C in the diabetic subjects were 34 and 38% respectively. These values are in agreement with the studies of Idogun et al. (2007) and Emile et al. (1993). Lipid abnormality levels in the North American population are approximately 50 and 25% for cholesterol and triacylglycerols respectively (LRCPEC, 1970). The prevalence rates of high TC and triacylglycerol from this study were 34 and 14% respectively.

The study showed combined hyperlipidaemia in the two groups. The diabetic patients had higher prevalence of high serum cholesterol than the controls while the control group had a higher frequency of low level of HDL-C than the patients. The two groups showed approximately equal frequency of high triacylglycerol and LDL-C. This suggests that the two groups could be equally predisposed to cardiovascular diseases. The higher mean levels of some serum lipids in the control group could be due to better nutritional control and drug therapy in the diabetic group. Efforts should therefore be made to continuously educate the populace on diabetes, its management, feeding and life styles.

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