SERUM LIPID PROFILE IN DIABETIC AND HYPERTENSIVE NIGERIAN SUBJECTS FROM KANO METROPOLIS-NIGERIA

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ABSTRACT

Aim: This study was undertaken to compare the serum lipid profile of diabetic and hypertensive subjects resident in Kano metropolis and to evaluate their pattern and probable disposition to atherosclerosis and coronary heart disease.

Methods: Forty hypertensive subjects (HPT, 20 males and 20 females) and fifty non-insulin dependent diabetic subjects (DBT, 29 males and 21 females) had their lipid levels, blood pressures (BP) and body mass index (BMI) compared.

Results: Hypertensive subjects had higher mean serum TC, HDL-CH, BMI and BP values that diabetic subjects. Male/HPT subjects had higher mean serum TC, HDL-CH, LDL-CH and BP values than their female counterparts. Female diabetics had higher mean serum TC, LDL-CH and BMI values than their male counterparts. In both HPT and DBT subjects, there were correlations between TC and LDL and between TG and VLDL. Treatment with antihypertensive and antidiabetic drugs produced significant differences in mean serum HDL-CH ($P < 0.005$) and LDL-CH ($P < 0.025$) between HPT and DBT subjects.

Conclusion: From the study, Diabetes seems to increase the TC: HDL-CH ratio in the study subjects suggesting a greater risk of developing coronary heart disease. High BMI values were also observed which is consistent with earlier reports that link obesity with increased risk of non-insulin dependent diabetes mellitus.

INTRODUCTION

Diabetes mellitus is a chronic disorder of carbohydrate metabolism characterized by elevation of blood sugar due to relative or

absolute lack of insulin that leads to abnormalities in the metabolism of fats and protein. A study of serum TC and HDL-CH in Nigerian diabetics[1] revealed that serum TC and HDL-CH levels were higher in Nigerian diabetes compared to non-diabetic subjects.

Hypertension is a worldwide disorder. It is probably directly or indirectly responsible for 10% to 20% of all deaths. The result of an epidemiological study has clearly demonstrated that hypertensive patients have significantly higher plasma lipids at every age group than their normotensive counterparts[2]. A study on urban dwelling Nigerians undergoing treatment for hypertension reported significant increase in serum LDL-CH and TG level[3].

The prevalence of hypertension is 1.2 to 1.5 times greater in patients with diabetes mellitus compared with matched non-diabetic individuals[4]. The co-existence of diabetes mellitus and hypertension is important, as they are multiplicative risk factors of macrovascular and microvascular disease, coronary heart disease (CHD), congestive heart failure and of peripheral vascular disease[5]. This study was undertaken to examine the serum lipid profile of diabetic and hypertensive subjects resident in Kano metropolis and to evaluate their pattern and probable disposition to atherosclerosis and CHD.

MATERIALS AND METHODS

SUBJECTS

A total of ninety subjects (n=90) participated in this study, comprising of forty hypertensive subjects (HPT, 20 males and 20 females) and fifty diabetic subjects (DBT, 29 males and 21 females). These subjects were regular out patient attenders of Diabetic and Hypertensive clinics of Aminu Kano Teaching Hospital, Kano and Murtala Mohammed Specialist Hospital, Kano. Informed consent was obtained from each subject and the study had earlier been approved by the Ethical Committee, Aminu Kano Teaching Hospital, Kano. Information on each subject's dietary habit, lifestyle, and medical history was obtained through a questionnaire. Body weight and height measurements were conducted according to standard procedure[6].

Systolic and diastolic blood pressures (mmHg) were measured using a sphygmomanometer.

BLOOD SAMPLES

Fasting venous blood sample (5ml) was collected aseptically from the ante-cubital vein of each subject using a plastic disposable syringe. Serum was separated from each sample and kept at 4^{o}C prior to analysis. Serum TC concentration was estimated by cholesterol esterase/oxidase method using biosystem kit, catalogue No. COD 11505[7].

Serum HDL-CH concentration was determined according to the procedure outlined by Lopes-Virella, et al[8]. Serum TG concentration was estimated by coupled enzymatic method, using glycerol kinase (RANDOX, catalogue No. TR 210)[9]. Friedwald's formula was used to calculate LDL-CH concentration[10].

Correlation Coefficients were determined and student's 't' test was used to calculate the level of significance between mean values of the biochemical parameters assessed in the study subjects.

RESULTS

HPT subjects had higher mean serum TC and HDL-CH concentrations than DBT subjects. Mean BMI and BP (both systolic and diastolic) values were lower in DBT subjects, while TC/HDL-CH ratio was higher in DBT than in HPT subjects (Table I).

When the subjects were divided on the basis of sex (Table II), male HPT subjects had higher mean serum TC, HDL-CH, LDL-CH levels and BP values than their female counterparts. Female DBT subjects had higher mean serum TC, LDL-CH levels and BMI values than their male counterparts. Male HPT subjects had higher mean serum TC, HDL-CH levels, BMI, BP values and TC/HDL-CH ratio than female HPT subjects.

The effect of drugs on serum lipid profile in the study subjects is shown in Table III. Use of antidiabetic drugs (DBT subjects) produced significantly lower HDL-CH ($P < 0.005$), lower systolic BP ($P < 0.005$) and higher LDL-CH ($P < 0.025$) when compared to the use of antihypertensive drugs (HPT subjects). In both HPT and DBT subjects, there were correlations between TC and LDL; and between TG and VLDL (Table IV).

TABLE I: ***SERUM LIPID PROFILE, BODY MASS INDEX AND BLOOD PRESSURE IN HYPERTENSIVE AND DIABETIC SUBJECTS***

SUBJECTS	TC (mmol/L)	HDL-CH (mmol/L)	LDL-CH (mmol/L)	TG (mmol/L)	BMI (Kg/m^2)	BP (mmHg)	TC: HDL-CH
Hypertensive (HPT) n = 40	7.55 ± 3.24	3.20 ± 1.24	4.15 ± 3.63	1.17 ± 1.04	27.5 ± 5.06	163.25 ± 32.45 101.13 ± 15.25	2.35
Diabetics (DBT) N = 50	7.20 ± 3.46	1.11 ± 0.84	5.75 ± 3.63	1.66 ± 1.17	25.8 ± 5.47	145.00 ± 30.20 90.80 ± 13.22	6.47

Results are presented as mean ± standard deviation; n = number of subjects. For BP readings, upper figures represent systolic pressure, while lower figures represent diastolic pressure.

TABLE 2: ***SERUM LIPID PROFILE, BODY MASS INDEX AND BLOOD PRESSURE IN DIABETIC AND HYPERTENSIVE SUBJECTS ACCORDING TO SEX***

SUBJECTS		TC (mmol/L)	HDL-CH (mmol/L)	LDL-CH (mmol/L)	TG (mmol/L)	BMI (Kg/m^2)	BP (mmHg)	TC: HDL-CH
HYPERTENSIVE-DIABETICS	M n = 20	8.0 ± 4.25	3.39 ± 1.29	4.52 ± 1.56	0.81 ± 0.25	26.2 ± 3.93	168.5 ± 36.31 103.5 ± 18.99	2.35
	F n = 20	7.08 ± 1.74	3.01 ± 1.20	3.78 ± 2.12	1.54 ± 0.36	28.7 ± 5.79	157.0 ± 27.55 98.8 ± 10.24	2.35
	M n = 29	6.67 ± 1.62	1.17 ± 0.86	4.99 ± 2.10	1.68 ± 0.20	25.6 ± 3.12	147.2 ± 31.16 92.06 ± 14.73	5.70
	F n = 21	7.91 ± 4.97	1.03 ± 0.82	6.58 ± 3.08	1.63 ± 0.15	26.1 ± 7.53	141.9 ± 29.26 89.64 ± 10.91	7.67

Results are presented as mean ± standard deviation; n = number of subjects. For BP readings – upper figures represent systolic pressure, while lower figures represent diastolic pressure.

TABLE 3: ***EFFECT OF DRUGS ON SERUM LIPID PROFILE IN STUDY SUBJECTS***

DRUGS	TC (mmol/L)	HDL-CH (mmol/L)	LDL-CH (mmol/L)	TG (mmol/L)	TC: HDL-CH
Antiphypertensives n = 35	7.31 ± 3.53	2.99[a,b] ± 1.15	4.12[c] ± 3.69	1.13[d] ± 0.94	2.44
Antidiabetics n = 44	7.28 ± 3.42	1.11[a] ± 0.81	5.84[c] ± 3.62	1.66[d] ± 1.22	6.55
Combination of antihypertensives and antidiabetics	6.89 ± 3.73	1.15[b] ± 0.98	5.43 ± 3.84	1.58 ± 1.02	5.99

Results are presented as mean ± standard deviation.
Figures in the same row or column bearing similar superscript are significant.
a,b,:- P < 0.005; c,d:- P < 0.025.

TABLE 4: ***CORRELATION COEFFICIENTS OF SERUM LIPIDS IN STUDY SUBJECTS***

SUBJECTS		TG	VLDL	LDL
Hypertensive-Diabetic	TC	+ 0.09	+ 0.32	+ 0.87
	TG	-	+ 0.92	+ 0.10
	VLDL	+ 0.92	-	+ 0.29
Normotensive-Diabetic	TC	- 0.09	+ 0.32	+ 0.87
	TG	-	+ 0.92	+ 0.10
	VLDL	+ 0.92	-	+ 0.29

DISCUSSION

Mean serum TC levels in the groups of study subjects (Table I) are above values reported for apparently healthy subjects living in the same environment[11]. Higher serum TC in HPT subjects have been reported by other workers[2]. Higher mean serum HDL-CH levels in HPT subjects (Table I) offers a higher degree of protection from developing coronary heart disease[13]. Mean serum HDL-CH levels in the two groups of study subjects (Table I) are above values reported for apparently healthy subjects living in the same locality[11].

Sex difference in the level of serum TC observed amongst DBT subjects (Table II) agrees with the findings of Feinleib[14]. Higher mean serum HDL-CH in males than in females in the two groups of study subjects (Table II) is in contrast with the findings of Jarikre, et al[15]. Also, the sex difference recorded in serum TG levels (Table II) differs from the observation of Jarikre, et al[16]. Increased serum TG levels in female subjects could be due to dietary habit, lifestyle and body physique as revealed by high BMI values. Higher serum LDL-CH levels in males than in females in HPT subjects (Table II) agrees with the report of Farmer, et al[17].

Mean BMI values in the two groups of study subjects were higher than the corresponding values reported for apparently healthy male and female subjects from the same locality[18]. This observation is consistent with earlier reports which link obesity with increased risk of non-insulin dependent diabetes mellitus[19].

High TC:HDL-CH ratio has been reported to be an indicator of cardiac endpoint[20]. The observed high TC:HDL-CH ratio in DBT subjects (Table I and II) than in HPT subjects indicates a greater risk of developing coronary heart disease in DBT subjects.

Antihypertensive drugs such as thiazide diuretics and beta adrenergic blocking agents have been incriminated as hyperlipidaemic agents[21]. The result of this work appears to support the findings of David and Wilhelm[21] because subjects on antihypertensive drugs (i.e HPT subjects) had the highest mean serum TC level than the other group of subjects. The correlation observed between the various lipid

classes in the two groups of subjects (Table IV) agrees with earlier reports[22]. In conclusion, it is suggested that further work be conducted to ascertain the effect of mode/duration of treatment and lifestyle on the serum lipid and lipoprotein profile in HPT and DBT subjects in Kano State, Nigeria.

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