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SERUM LIPID AND GLUCOSE CONCENTRATION IN RELATION TO SOME PHYSIOLOGICAL VARIBLES IN COLLEGE STUDENTS FROM NNEWI, NIGERIA

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Abstract

Background: Serum lipid and glucose levels are largely determined by and or related to certain physical, physiological and biochemical parameters/variables. This study therefore, is aimed at determining the levels of serum lipid and glucose and the relationship between the serum lipid and glucose concentrations and the physical and physiological parameters/variables of apparently healthy individuals.

Method: The blood samples of twenty-five medical students in the age range of 20 and 25 years were analyzed, for the serum glucose, total cholesterol (TC), triglyceride (TG), and high-density lipoprotein cholesterol (HDLc) levels after overnight fast, and LDL_C calculated.

Result: The mean serum glucose, HDLc, TC and LDLc were not significantly different in females and males students. The serum TG was however significantly lower in females than in the males (90.22 ± 25.17 vs. 116.93 ± 21.54 mg/dl; P< 0.05). Furthermore, females are significantly lower in weight than the males (61.2 ± 6.91 vs. 69.96 ± 9.30 kg; P< 0.05). Significant correlations were also recorded.

Conclusion: The results presented showed that the slight difference seen in males and females was a factor of growth and diet and activity.

Mots clés : Lipide, glucose, physiologique et variables

Résumé

Introduction : Sérum lipide et niveau du glucose sont en grande partie déterminés par ou liés aux certains physique physiologique et variables/paramètres biochimiques. Donc, l'objet de cette étude est de déterminer les niveaux de sérum lipide et du glucose et le rapport entre le sérum lipide et concentration du glucose et des variables/paramètres physiques et physiologiques des individus apparemment en très bonne santé.

Méthodes : La prise de sang de vingt cinq étudiants en médecine dans la tranche d'âge de 20 – 25 ans ont été étudiés pour le sérum glucose, cholestérol total (CT) triglycéride (TG), et les niveaux de la densité élevée du cholestérol lipoprotéines (HDLc) après un jeüne d'une nuit, et LDLc calculé.

Résultats : Le sérum glucose, HDLc, TC et LDLc moyen n'étaient pas sensiblement différents chez des étudiants du sexe féminin et masculin. Le sérum TG toutefois était sensiblement inférieur chez le sexe féminin et le sexe masculin (90,22+- 25,17 contre 116, 93+-21,54mg/dl ; P<0,05). Par ailleurs sexe féminin sont sensiblement inférieurs en poids plus que chez le sexe masculin. (61,2+-6,91 contre 69,96+-9,30kg : P<0,05). Des corrélations importantes ont été également notées.

Conclusion : À travers des résultats, nous notons que la différence légère vue chez le sexe masculin et le sexe féminin était un facteur d'activité, d'alimentation et de la croissance.

Introduction

Blood cholesterol levels have long been known to be related to atherosclerosis and other cardiovascular disease. [1] Low density lipoproteins (LDL) and very low density lipoproteins (VLDL) are also believed to favour coronary heart disease, while high density lipoproteins (HDL) are cardioprotective. [1, 2] The HDL cholesterol level is more closely related to atherosclerosis than is total cholesterol[3] and the inverse HDL relationship has been shown to be a predictor of coronary attack. [4] High plasma lipid levels are associated with diabetes mellitus, hypertension and atherosclerosis amongst others. [4]

Plasma lipid levels are increased, by cholesterol rich diet like egg yolk, alcoholism, and iron-rich diet. [5] Carbohydrate diets tend to decrease HDL level, whereas physical exercise increases them. Diets such as tomatoes decreases plasma lipids,[6] while it was also discovered in recent times that high dose of black tea polyphenol and hormone replacement therapy decreases the dangers of lipid related cardiovascular problems, and low birth weight increases HDLc.[7] Moderate alcohol, fruits, vegetables and high estrogen increase HDL level and hence are cardioprotective.[8] Plasma lipid levels are influenced by physiological age, body weight, percentage body fat, body mass index (BMI), blood pressure and diet.[9,10]

This study is aimed at determining the plasma lipid and glucose levels among medical students, the relationship between plasma lipid levels and some biochemical and physiological variables and influence of stress on plasma lipid levels.

Materials and Methods

Twenty-five clinical medical students (12 males and 13 females) participated in this study, after obtaining their informed consent. The students' diets were monitored for 2 weeks. Age, height, weight, blood pressure, pulse rate, mean arterial pressure, body mass index and hip to waist ratio were taken before collection of blood sample. 5mls of fasting blood samples were collected from ante-cubital vein into a plain container and centrifuged after clotting. Serum was separated and stored at –4^{o}C until analyzed.

Serum glucose was determined by glucose oxidase method (Randox laboratory Ltd., UK). Cholesterol was determined by enzymatic method using Wako cholesterol test kit (Code No 274-46401; Wako Pure Chemical Ind., Ltd Osaka, Japan). Triglyceride was determined by in vitro enzymatic colorimetric method for quantitative determination of Triglycerides in serum and plasma (Code No 276-69801; Wako Pure Chemical Ind., Ltd Osaka, Japan). HDLc was determined by enzymatic colorimetric method with Wako assay kits (Code No 274-67401; Wako Pure Chemical Ind., Ltd Osaka, Japan). LDL cholesterol was calculated using the frie formula; LDL = TC – (HDL + TG/5), where TG/5 = VLDL. Data were analyzed by student t-test and Pearson correlation.

Results

The age range of the subjects is 20-25 years. Male subjects are on the average older than the female subjects (Table 1). Though the male subjects have significantly larger body weight and height than the female subjects, their BMI is not significantly different (P>0.05) (Table 1). The blood pressure is similar in the subjects.

There is no significant difference in the Hip circumference of the male and female subject, though male subjects have larger waist circumference than the females, while the females have larger hip/waist ratio than male subjects (Table 1).

The serum glucose, total cholesterol, HDL cholesterol and LDL cholesterol concentrations are similar in male and female subjects. Interestingly, serum triglyceride concentration is significantly higher in males than in females (Table 2).

In male and female subjects, BMI correlated positively with waist, hip, and weight, whereas waist correlated with weight (Table 3). Triglyceride correlated positively with waist and height with weight. LDL cholesterol correlated positively with total cholesterol in male and female subjects and in both subjects combined. On the other hand, HDL cholesterol correlated negatively with Triglyceride and LDL cholesterol in both subjects combined and in male subjects (Figure 1).

Table 1: Some physiological variables among male and female medical students (Mean ± SD)

Variable	Total	Male	Female	P-value
Age (yrs)	23.3 ± 1.5	24.0 ± 1.5	22.7 ± 1.3	0.0293
Weight (kg)	65.4 ± 9.1	70.0 ± 9.3	61.2 ± 6.9	0.015
Height (m)	1.70 ± 0.08	1.74 ± 0.07	1.65 ± 0.06	0.0039
BMI (kg/m2)	22.7 ± 2.4	23.0 ± 2.0	22.4 ± 2.8	0.5330
MAP (mmHg)	89.1 ± 6.1	90.2 ± 6.6	88.1 ± 5.8	0.3969
Pulse (bt/min)	69.9 ± 6.6	69.6 ± 7.0	70.2 ± 6.6	0.8137
Waist (inches)	29.4 ± 2.4	30.9 ± 1.9	27.9 ± 1.8	0.0005
Hip (inches)	37.7 ± 2.3	37.5 ± 2.3	37.8 ± 2.4	0.7760
Waist/Hip	1.29 ± 0.09	0.82 ± 0.04	0.74 ± 0.04	2.62E-05

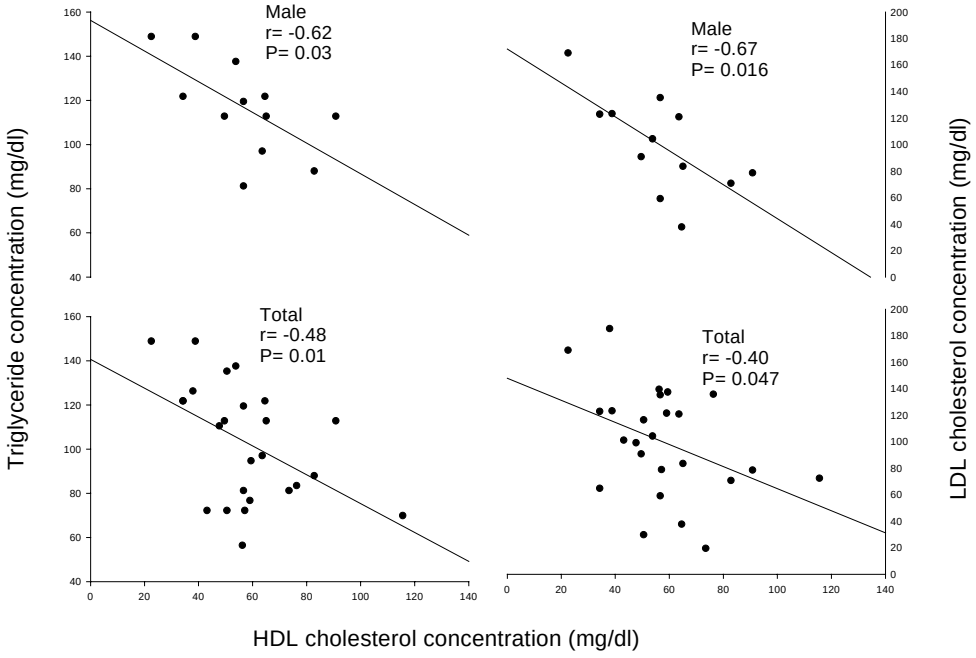
Table 2: Some biochemical parameters among male and female medical students (Mean ± SD).

Parameter	All Subjects	Male	Female	P-value
Glucose (mmol/L)	4.71 ± 0.75	4.53 ± 0.79	4.67 ± 0.70	0.5867
Total Cholesterol (mg/dl)	178.14 ± 38.89	179.62 ± 29.33	176.78 ± 47.26	0.8574
Triglyceride (mg/dl)	103.04 ± 26.72	116.93 ± 21.54	90.22 ± 25.17	0.0089
HDL Cholesterol (mg/dl)	57.59 ± 19.80	56.58 ± 19.25	58.54 ± 21.03	0.8096
LDL Cholesterol (mg/dl)	99.94 ± 41.26	99.66 ± 36.61	100.19 ± 16.64	0.9746

Table 3: Significant correlation of some of the physiological and biochemical factors.

Variable	Total r (P-value)	Male r (P-value)	Female r (P-value)
Weight/BMI	0.73 (0.0000)	0.82 (0.001)	0.81 (0.001)
Height/Weight	0.64 (0.001)	0.79 (0.002)	-
TG/Waist	0.62 (0.001	0.83 (0.001)	-
HDLc/Weight	0.63 (0.001)	-	0.75 (0.003)
LDL/TC	0.90 (0.000)	0.89 (0.000)	0.92 (0.000)
BMI/Waist	0.62 (0.001)	0.75 (0.005)	0.72 (0.006)
BMI/Hip	0.80 (0.000)	0.79 (0.002)	0.86 (0.000)
Waist/Weight	0.79 (0.000)	0.81 (0.001)	0.57 (0.041)

Figure 1: Serum HDL cholesterol relative to serum triglyceride and LDL cholesterol concentrations in all the subjects and male subjects.



Discussion

The subjects recruited for this study were drawn form medical students and though the male subjects were little older, with larger body weight, height, waist as well as waist to hip ratio than the female subjects, their BMI were similar. Invariably, in these subjects their body weights were proportional to their heights and are therefore essentially comparable. Furthermore, the mean arterial pressure and

and pulse pressure are similar in the males and females.

Apart from the triglyceride concentration, which is higher in males than in females, total cholesterol, HDL cholesterol, LDL cholesterol and even glucose concentrations were similar in the two groups. The difference in triglyceride concentration may be attributed to the fact that males are more active and are able to mobilize stored triglycerides more than the female subjects. In fact, percentage of body fat has been shown to be negatively associated with physical activity, with exercise having pronounced effects on energy expenditure and substrate oxidation. [9]

Estrogen in pre-menopausal women potentiates the synthesis of HDL-C, and may thus confer cardio-protection against artherosclerosis. [8] This may account for the higher but not significant level of HDLc seen in the females than males in this study. Furthermore, the importance of blood pressure, serum cholesterol and protienuria as predictors for cardiovascular disease mortality, fatal and non-fatal myocardial infarction, and stroke is confirmed for patients with Type I and Type II diabetes mellitus. Whereas, the presence of coronary artery disease (CAD) in post-menopausal women is independently associated with altered cholesterol metabolism as reflected by low synthesis and inefficient elimination of cholesterol.

The indices of growth, especially weight, height, waist and BMI correlated positively with each other in all the subjects. These results show that the subjects consist of a growing population, whereas, BMI indicates a higher level of stored fatty acid.

It is interesting that HDLc correlated negatively with TG and LDLc. While TC, TG and LDL are related to atherosclerosis and other cardiovascular disease, [1] HDLc is cadioprotective.[1, 2] HDL is a scavenger of cholesterol (from breakdown of stored TG) from tissues, and transports it to the liver. In fact, the inverse HDL relationship has been shown to be a predictor of coronary attack. [9]

Due to downturn in the economy of Nigeria, carbohydrate laden diet constitutes the staple food of an average home. [11] The subjects were mainly on carbohydrate diets, which tend to decrease HDL level. Physical activities and stress reminiscent of any college environment in Nigeria probably compensated for the low level of HDLc arising from carbohydrate based meal. Plasma lipid levels are also influenced by physiological parameters including age, body weight, percentage body fat, body mass index (BMI), blood pressure, diet and other life styles[9, 12, 13] and this probably explains the finding of this study.

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