Research Article

Serum lipid profile of college/university students taking home made food or market fast food

Saghir Ahmad Jafri¹, Muhammad Qasim^{2*}, Khaleeq ur Rehman¹, Muhammad Shareef Masoud² and Mahmood-ur-Rahman²

^{1.} FMH College of Medicine & Dentistry, Shadman, Lahore Pakistan.

^{2.} Department of Bioinformatics and Biotechnology Government College University Faisalabad, Pakistan.

*Corresponding author's email: qasemawan@gmail.com

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Abstract

The study was undertaken to estimate the lipid profile of university students taking homemade or market fast food frequently. Total 150 male and female students from University College of Medicine and Dentistry, The University of Lahore were included in the study to determine their serum lipid levels e.g. TC, LDL-C, HDL-C and TG. ANOVA test was used for statistical analysis. The 45.03% males and 36.84% females in the study showed significantly raised level of LDL as compared to normal value. Males had significantly elevated ($P<0.05$) low density lipoprotein cholesterol (LDL-C), 25.19% males and 21% females had significantly higher total cholesterol (TC) ($P<0.05$) as compared to standard values. Females showed significantly higher Cholesterol level than males. 6.8% males and 5.26% females had elevated TG. 21.37% males and 1.05% females had lower HDL levels. Students who used to take food from market had higher cholesterol as compared to those who took home made food. It may be concluded that a high prevalence of abnormal lipid profile among university students existed without student awareness. The students taking home made food had significantly ($P<0.05$) lower lipid component levels than those taking fast food frequently.

Key words: Cholesterol, Lipoprotein, Plaque, Antioxidant, Triglycerides, BMI.

Introduction

Hyperlipidemia has been recognized as one of the adjustable risk factors in the etiology of cardiovascular disease (CVD). Elevated lipid profile is the main contributor to the development of myocardial infarction worldwide [1]. Various authorities like United States National Cholesterol Educational

Program, Adult Treatment Panel III (NCEP ATP III) and the Joint European Task Force (JETF) have developed standard clinical parameters for cardiovascular diseases (CVD) risk management, and scientific studies have shown that modification of life style, eating habits and risk factors can postpone the development of CVD or

inhibit repeated events in those with CVD at baseline [2-5].

Lipids are a heterogeneous group of water insoluble organic molecules and are major source of energy for the body. They serve additional functions in the body as carrier of fat soluble vitamins, have regulatory or coenzyme functions and synthesis of prostaglandins, bile salts and steroid hormones which play major role in the control of the body homeostasis. Imbalance of lipids leads to major clinical problems [6]. A lipid profile measures total cholesterol which is sum of high density lipoprotein cholesterol (HDL-C), Low density lipoprotein cholesterol (LDL-C), very low density lipoproteins (VLDL) and triglycerides (TG) [7].

Cholesterol is a lipid used to help emulsify fats through bile salts and strengthen cell membranes. But when blood cholesterol reaches high levels, it sticks on artery walls and increases the risk of atherosclerosis, blood clots, heart attack and stroke [8]. Elevated low-density lipoprotein (LDL) and cholesterol concentration has been established as a risk factor for cardiovascular disease. LDL consists of a heterogeneous group of particles of varying sizes and density. The smaller LDL particles are more atherogenic [9]. Decrease in total and LDL cholesterol is strongly related to reduction in the progression of atherosclerosis. The rate of progression of plaques is directly tied to the future risk of heart attacks and death [10].

Studies on both the genders have revealed risk for atherosclerotic disease which is inversely related to blood levels of HDL-C. HDL helps to extract excess cholesterol deposited in blood vessel walls and deliver it back to the liver for elimination through the gastrointestinal

tract. In general, the higher the HDL-C, the greater is the capacity to remove cholesterol and prevent blockages in blood vessels. HDL-C helps to keep blood vessels dilated, thereby promoting better blood flow. HDL-C also reduces blood vessel injury through its antioxidant and anti-inflammatory functions [11].

Triglycerides are the most common type of fat in the body and are major source of energy. When a person eats fat, body uses the calories to meet quick energy needs and extra calories are turned into triglycerides and stored in fat cells to be used later. The excess calories are stored as fat regardless of what kind of calorie source a person eats, (carbohydrate or protein). If a person regularly eats more calories than he can burn, he may have high triglycerides. In normal amounts, triglycerides are important for good health. But high triglycerides often cause conditions called metabolic syndrome. Metabolic syndrome is the combination of increased blood pressure, hyperglycemia, excess weight, low HDL (good cholesterol) and high triglycerides. This syndrome increases the risk for heart disease as well as for diabetes and stroke [12].

Researchers have suggested that approximately 25% of the adult population aged twenty and older have blood cholesterol levels that are considered high [13]. Traditionally research has been focused on people above forty-five years when heart disease may become the leading cause of death. However, new compelling evidence suggests that heart disease may begin as early as two years of age thus interventions needed at a younger age [14].

It has been reported that most children and adolescents who have risk factors

for heart disease are more likely to have heart disease in adulthood and the same risk factors and predictors of heart disease commonly associated with adulthood are now being discovered in youth [15].

The purpose of this study was to determine the prevalence of abnormal lipid profile among university students aged between 18-30 years. Abnormal lipid profile in young age is an important risk factor for CVD in later age [16].

Materials and Methods:

The study was approved from the institutional review board of The University of Lahore (UOL) and was conducted at the Institute of Molecular Biology and Biotechnology, The University of Lahore and FMH College of Medicine and Dentistry, Lahore. The study included 150 healthy looking male and female university students. Almost 50% students were included in both food groups. Only difference was that fast food group had 9 females and homemade food group had 10 females. Written informed consent was obtained from each participant and the study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki. The students with any disease condition or under any medication were not included in the study. A questionnaire with consent was filled by the participants to examine their eating habits, socioeconomic status and family history of lipid profile abnormalities. The group in both sexes eating 90% homemade food and those taking more than 50% restaurant fast food were grouped separately.

Sample collection:

Fasting blood samples (4-5ml) were collected by the help of an expert phlebotomist from university students. The sera of samples were separated by

centrifugation at 3000 rpm for 10 minutes. The serum was then stored in refrigerator at 2 - 4°C prior to processing.

Biochemical Analysis:

All lipid analyses were done at the laboratory of Institute of Molecular Biology and Biotechnology, The University of Lahore. The analysis for cholesterol and triglyceride was done by using enzymatic kits.

Cholesterol was determined after enzymatic esterification and oxidation in the presence of Cholesterol Esterase and Cholesterol Oxidase. The hydrogen peroxidase formed reacts, under catalysis of peroxidase, with phenol and 4-aminophenazone to form a red-violet quinonemine dye ad indicator [17].

Low density lipoproteins (LDL) were precipitated by heparin at their isoelectric point (pH 5.04). After centrifugation the high density lipoproteins (HDL) and the very low density lipoproteins (VLDL) remained in the supernatant, which were then determined by enzymatic methods [18]. LDL fractions were precipitated quantitatively by the addition of phosphotungstic acid in the presence of magnesium ions. After centrifugation, the cholesterol concentration of HDL fraction, which remained in the supernatant were determined by enzymatic method [19].

The Triglycerides were determined after enzymatic hydrolysis with lipases. The indicator is a quinonemine formed from hydrogen peroxide, 4 aminophenazone and 4-chlorophenol under the catalytic influence of peroxidase [20].

The obese students were not included in the study. The obesity was determined according to the criteria developed by NHLBI (National Heart Lung Blood Institute). According to this obesity is

determined by body mass index (BMI) which is weight in kilogram (kg) divided by square of height in meters, $BMI = kg / m^2$ [21].

Preferred Cut-off Values

For serum lipids NCEP - ATP III Guidelines were used [5]. According to these standard guidelines, hypercholesterolemia is defined as TC >200mg/dl, LDL-C as >100mg/dl, hypertriglyceridemia as TG >150mg/dl and HDL-C <40mg/dl. Dyslipidemia is defined by presence of one or more than one abnormal serum lipid concentration. For obesity NHLBI criteria were used according to this Obesity is defined as a BMI > 30. Over weight (BMI 25-30) were included who showed absolute healthy look.

Statistical analysis:

The statistical analysis was performed using SPSS (Version 12). Continuous variables were presented as mean values $\pm$ standard deviation and percentages. ANOVA was used for the analysis of all variables [22].

Results

A total of 150 samples of university students were tested for their Lipid profile e.g. cholesterol, HDL, LDL and Triglycerides. Out of total participants 131 were males and 19 were females. The mean cholesterol level was found to be 159.42mg/dl $\pm$ 51.48SD and mean triglycerides level was 153.63 mg/dl $\pm$ 49.85SD. The mean HDL was found to be 39.74 mg/dl $\pm$ 5.021SD and mean LDL was 94.73mg/dl $\pm$ 41.75SD. Males had mean cholesterol level of 159.88 mg/dl $\pm$ 51.58SD. Mean TG level was 156.78mg/dl $\pm$ 50.67SD. Mean HDL level was 39.69 $\pm$ 5.08. mean LDL was 94.09mg/dl $\pm$ 41.33SD. Females had mean cholesterol level of 156.26mg/dl $\pm$ 52.14SD. Mean TG level was 131.95mg/dl $\pm$ 38.23SD. Mean HDL

level was 40.11mg/dl $\pm$ 4.65SD. Mean LDL was 91.21mg/dl $\pm$ 44.94SD (Table 2). The prevalence of abnormal lipid profile in male and female students is shown in Table 1.

Males had high ratio of overweight as compared to females in this study. There were 31.29% males who were overweight and females were 10.52 % (Table 3).

Students who used to take food from market had significantly high levels of LDL and Total Cholesterol ($p = 0.003$ and 0.002) as compared to those who take home made food but there was no difference in the levels of TG, HDL and BMI ($p > 0.005$). The fast food usually includes Burger, Chips, pizza, soft drinks etc. In this study it was found that the students who took fast food had a little higher cholesterol level as compared to those who do not take such food but the effect was insignificant ($p > 0.05$). There was no effect of fast food on other lipid variables and BMI.

Discussion

The elevated lipid profile is an important risk factor for cardiovascular diseases in adults and there are only few studies showing this among young population. The NCEP recommends lipid screening beginning at age twenty and continuing every five years, with normal levels, and more frequently with abnormal levels throughout adulthood. This research provides information regarding the serum lipid levels among university students. A number of students were identified in high risk based on lipid levels.

This study found that a large number of participants 45.03% males and 36.84% females had elevated low density lipoprotein cholesterol (LDL-C). 25.19% males and 21% females had elevated Total Cholesterol (TC), 6.8% of the

Table 1. Percentage of students with abnormal lipid profile

Parameters	Male	Female
Cholesterol	25.19% (229.mg/dl $\pm$ 29.96SD)	21% (241.5 $\pm$ 30.78 SD)
Triglycerides	6.8% (286.87mg/dl $\pm$ 121.24SD)	5.26% (114 $\pm$ 20.5 SD)
HDL-C	21.37% (33.07mg/dl $\pm$ 1.65SD)	21.05% (34.25 $\pm$ 0.5SD)
LDL-C	45.03% (11.96mg/l $\pm$ 20.54SD)	36.84% (137.43 $\pm$ 31.17SD)

Table 2. Gender wise distribution of serum lipids and BMI in students

Parameter (Mean $\pm$ SD)	Males (n=131)	Females (n=19)
Total cholesterol (mg/dl)	159.88 $\pm$ 51.58	156.26 $\pm$ 52.146(P>0.05)
LDL-cholesterol (mg/dl)	94.09 $\pm$ 41.33	91.21 $\pm$ 44.94(P<0.05)
Triglycerides (mg/dl)	156.78 $\pm$ 50.67	131.95 $\pm$ 38.23(P<0.05)
HDL-cholesterol (mg/dl)	39.69 $\pm$ 5.08	40.11 $\pm$ 4.65(P>0.05)
BMI (kg/m ²)	23.77 $\pm$ 5.08	21.93 $\pm$ 3.83(P>0.05)

Table 3. Percentage of participants by normal & overweight

Parameters	Male	Female
Normal Weight (BMI 18- 25kg/m ²)	68.70 %	89.47%(P<0.05)
Over Weight (BMI>25kg/m ²)	31.29 %	10.52%(P<0.05)

males and 5.26% of females had elevated Triglycerides (TG) while 21.37% males and 21.05% females had lower high density lipoproteins (HDL) levels. Comparing this data to another study done on university students in Baylor University USA led to the observation that in both studies the prevalence of hyperlipidaemia is almost same. In Baylor university the greatest number of participants 41.3% had elevated LDL 19.8% , elevated TC, 4.8% , elevated Triglycerides and 38.8% had lower HDL levels [23].

Prevalence of overweight was considerably high in this study. 31.29% males and 10.52 % of females were found overweight. According to another study on Indo- Asian population the overall prevalence of overweight was 25.0%. The prevalence was highest, 42.8%, among women aged 35–54 years. Among those aged 15–24 years the prevalence was 12.4% for men and 13.8% for women [24] .

The students who tend to eat food from market had significantly elevated cholesterol and LDL levels and lower HDL levels as compared to homemade food eaters. However the differences were not statistically significant (p > 0.02 and p> 0.03 respectively). References have shown that South Asian diets are rich in saturated fats. Besides it also involves overcooking of food which results in destruction of nutrients like folate. Deep frying and refrying in the same oil lead to trans fatty acids formation probably contributes to disturb normal lipid absorption and metabolism causing dyslipidemia [25]. The influence of diet on dyslipidemia was reported in a Canadian study wherein 3 groups: a control group, a group that was administered statin and a third group with dietary modification was included. The lipid levels were checked at baseline and again after 4 weeks. A drastic reduction in lipid levels was observed in statin and dietary modified groups as compared to control group. However,

between the two treated groups the differences were non-significant [26].

Conclusion:

It may be concluded from the findings of this study that there is a high prevalence of abnormal lipid profile in university students which is not known to students and may lead to complications in later life. It was found that 45.03% males and 36.84% females had elevated low density lipoprotein cholesterol (LDL-C), 25.19% males and 21% females had elevated TC, 6.8% males and 5.26% females had elevated TG, 21.37% males & 21.05% females had lower HDL levels. 31.29 % males and 10.52 % females were overweight and 10.68 % males and 5.26 % females were Obese. Diet, family history and Smoking are important risk factors for abnormal lipid profile in young students about which awareness is needed.

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