

Study of Lipid Profile in Young College Students of Amritsar City, Punjab, India

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Abstract: This study assessed plasma lipids in college students of Amritsar city. In this study 1000 college students aged 16-25 years were enrolled. A detailed questionnaire was used to collect anthropometric, dietary, lifestyle, smoking, alcohol and health data. Fasting serum samples were collected to assess the lipid profile. The lipid levels more than those recommended in NCEP guidelines were found with cholesterol raised in 10.3%, triglycerides raised in 4.3%, low HDL in 46.3% and raised LDL in 30.6% subjects. HDL was significantly lower in 69% of males as compared to 23.6% of females and triglycerides significantly higher in 4.4% of males as compared to 0.6% of females. LDL was found to be abnormal in 4.2% of females as compared to 1.2% of males while no significant differences were found in both sexes for total cholesterol. Overweight subjects with BMI ≥ 25 were found in 28.4% males and 10.8% females. Variables like BMI, WHR, sedentary lifestyle, smoking & alcohol showed a significant linear relationship with total cholesterol, triglycerides, LDL and VLDL and an inverse relation with HDL.

INTRODUCTION

Dyslipidemia is a group of disorders associated with deranged plasma lipids and lipoprotein levels. It is the most important risk factor responsible for the genesis of atherosclerosis leading to coronary heart disease, cerebral vascular disease and peripheral vascular disease¹. Researchers have suggested that approximately 25% of the adult population aged 20 and older have blood cholesterol levels that are considered high². Traditionally, lipid researches focus on people over the age of 45 when heart disease becomes the leading cause of death. However, new compelling evidence suggests that heart disease may actually begin as early as two years of age with interventions needed at a younger age group^{3,4}. Therefore the present study is being done to assess the lipid profile in college students of Amritsar city. This will enable the health care providers & educators to implement prevention strategies targeted at young people.

MATERIAL & METHODS

Participants

The proposed study was carried out in various colleges of Amritsar city. A total of 1000 students in the age group of 16-25 years were studied. Those excluded from the study were students with heart disease, hypertension, diabetes, hepatorenal disease, thyroid disease, arrhythmias, on antithyroid, lipid lowering, hypoglycemic, antihypertensive or androgenic medications. Details of history and physical findings were recorded on a performa including questions on general health, diet, smoking, drinking habits & lifestyle. Weight (kg) was recorded to nearest of 0.5 kg, height (m) through a vertical backboard of anthropometer with head positioned in the Frankfurt plane. BMI was calculated as weight in kg divided by square of height (in meters). BMI ≥ 25 kg/m² was taken as measure of generalized obesity as per WHO Asia pacific guidelines⁵. Waist circumference (cm), hip circumference (cm) & then their ratio were recorded. The ratio more than 1 in males and 0.85 in females is considered abnormal⁶.

Lipid analysis

12 hours fasting serum samples were collected using and indwelling cannula inserted in the anti-cubital vein to assess the lipid profile. Serum total cholesterol was measured by enzymatic cholesterol oxidase / peroxidase, end point method⁷. Serum TGs were estimated by dynamic

extended stability with lipid clearing agent, GPO – Trinder method, end point⁸. Serum HDL cholesterol was measured by phosphotungstic acid method, end point⁹. Serum value of LDL cholesterol was estimated by subtraction of VLDL and HDL from total cholesterol¹⁰. Serum VLDL was estimated by Friedman's formula¹¹, VLDL = S.TG/5.

Statistical Analysis

Data generated from the study will be analysed according to standard statistical methods. Results were tabulated in the form of mean \pm S.D. and analysed using students' 't' test and the level of significance was determined as its p value with p<0.05 taken as statistically significant and p<0.001 taken as highly significant. P>0.05 was taken as statistically not significant.

RESULTS

Table 1 shows the trend of lipid profile in young students with their gender differences. Significant differences were found in HDL and LDL in males and females while no significant differences were found in total cholesterol, triglycerides and VLDL.

Table 1: Blood Lipid Levels For Participants And Gender Comparisons

Lipid Profile	Males (Mean \pm SD)	Females (Mean \pm SD)	p-value
T.Cholesterol (mg/dl)	152.32 \pm 32.98	155.60 \pm 29.62	0.098
Triglycerides (mg/dl)	88.78 \pm 37.01	87.33 \pm 35.85	0.530
HDL(mg/dl)	46.37 \pm 9.83	59.18 \pm 11.35	<0.001***
LDL(mg/dl)	88.19 \pm 35.70	78.96 \pm 33.51	<0.001***
VLDL(mg/dl)	17.76 \pm 7.40	17.47 \pm 7.17	0.530

P < 0.05: Significant

*** P < 0.001: Highly Significant

Table 2 reveals the percentage of participants at risk due to elevated lipid levels based on the latest NCEP report.

Table 2: Blood Lipid Means And Percentage Of Students Above National Cholesterol Education Program (NCEP)¹² Guidelines

Parameter	NCEP Risk Guidelines	% above NCEP Guidelines
LDL	>160mg/dl	2.7
HDL-C	<50mg/dl	46.3
Total Cholesterol	>200mg/dl	10.3
Triglycerides	\geq 150mg/dl	2.5

P < 0.05: Significant P < 0.001: Highly Significant

Table 3 reveals the gender comparisons of various cardiovascular risk factors showing significantly high proportion of males with abnormal BMI, sedentary lifestyle, smoking & alcohol ingestion while abnormal WHR is more in females as compared to males.

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Table 3: Gender Comparisons Of Selected Cardio Vascular Risk Factors

VARIABLE	MALES		FEMALES		P value
	N	%	N	%	
BMI >25	142	28.4	54	10.8	<0.001***
Abnormal WHR	7	1.4	78	15.6	<0.001***
Sedentary Lifestyle	101	20.2	55	11	<0.001***
Smoking	38	7.6	0	0	<0.001***
Alcohol ingestion	38	7.6	0	0	<0.001***

P < 0.05: Significant *** P < 0.001: Highly Significant

Table 4 reveals significant correlation of all the lipid variables with BMI, WHR, physical activity, smoking & alcohol ingestion.

Table 4: Relationship Between Cardiovascular Risk Factors And Lipid Profile Variables

Variable	T.CM	TGs	HDL			LDL	VLDL
			Mean ± S.D.				
BMI(kg/m²)							
< 18	9	123.00±11.30	49.78±11.92	72.56±7.60	40.49±9.48	9.95±2.38	
18-25	795	144.49±24.60	79.10±29.41	55.50±11.37	73.16±27.53	15.82±5.88	
≥25	196	193.82±23.79	126.12±37.62	40.78±8.10	127.81±25.71	25.22±7.52	
P value		< 0.001			< 0.001		< 0.001
WHR							
Normal	915	149.10±27.96	83.19±32.50	53.51±12.46	78.94±32.50	16.63±6.50	
Abnormal	85	206.28±13.05	140.35±35.40	44.82±8.22	133.38±16.15	28.07±7.08	
P value		< 0.001	< 0.001	< 0.001	< 0.001		< 0.001
Physical activity							
Nonsedentary	689	134.70±37.45	69.72±40.29	62.89±15.03	57.86±43.11	13.94±8.05	
Sedentary	311	157.52±28.76	91.44±34.63	50.90±10.87	88.32±30.95	18.28±6.92	
P value		< 0.001	< 0.001	< 0.001	< 0.001		< 0.001
Smoking							
Nonsmoker	962	152.80±30.63	85.80±34.83	53.24±12.18	82.39±33.92	17.16±6.96	
Smoker	38	183.28±35.87	144.97±28.77	40.78±11.73	113.50±45.50	28.99±5.75	
P value		< 0.001	< 0.001	< 0.001	< 0.001		< 0.001
Alcohol ingestion							
No	962	152.80±30.63	85.80±34.83	53.24±12.18	82.39±33.92	17.16±6.96	
Yes	38	183.28±35.87	144.97±28.77	40.78±11.73	113.50±45.50	28.99±5.75	
P value		< 0.001	< 0.001	< 0.001	< 0.001		< 0.001

P < 0.05: Significant *** P < 0.001: Highly Significant

DISCUSSION

The NCEP recommends lipid screening beginning at the age of twenty years and continuing every five years with normal levels and more frequently with abnormal levels throughout adulthood². Therefore the primary purpose of this study was to ascertain the blood lipid levels of young students of Amritsar city. Male and female participation was equal being 500 students in each group. Males and females averaged 19.11(2.49) and 19.46(2.69) years of age respectively.

The male participants averaged 152.32 mg/dl (SD=32.98) for total cholesterol, 88.78 mg/dl (SD=37.01) for triglycerides, 46.37 mg/dl (SD=9.83) for HDL, 88.19 mg/dl (SD=35.70) for LDL, 17.76 mg/dl (SD=7.40) for VLDL. The female participants averaged 155.60 mg/dl (SD=29.62) for total cholesterol, 87.33 mg/dl (SD=35.85) for triglycerides, 59.18 mg/dl (SD=11.35) for HDL, 78.96 mg/dl (SD=33.51) for LDL, 17.47 mg/dl (SD=7.17) for VLDL. These averages are close to the values reported by Coelho VG¹³ in his study on lipid profile in Medicine students in Brazil in which male students averaged 155 mg/dl, 84 mg/dl, 46 mg/dl, 92 mg/dl, 17 mg/dl & female students averaged 164 mg/dl, 82 mg/dl, 60 mg/dl, 83 mg/dl, 16 mg/dl for total cholesterol, triglycerides, HDL, LDL and VLDL respectively. In another study on lipid levels in a cohort of sedentary students done by Bowden RG¹⁴, male students averaged 171.81 mg/dl for total cholesterol, 79.59 mg/dl for triglycerides, 46.47 mg/dl for HDL and 109.44 mg/dl for LDL & female students averaged 173.70 mg/dl for total cholesterol, 81.35 mg/dl for triglycerides, 61.62 mg/dl for HDL and 96.38 mg/dl for LDL. The plasma lipid profile in male Costa Rican adolescents given by Irwig MS¹⁵ were 149 mg/dl, 78 mg/dl, 38 mg/dl and 92 mg/dl & in female adolescents were 158 mg/dl, 78 mg/dl, 44 mg/dl and 95 mg/dl for total cholesterol, triglycerides, HDL & LDL respectively. The minor differences in the average values of lipid variables can be accounted for by the differences in ethnicity, lifestyles, diet patterns and social environment of the population under study.

The percentage of students having levels above NCEP guidelines in this

study are 10.3% for total cholesterol, 2.5% for triglycerides, 46.3% for HDL and 2.7% for LDL. These percentages are close to those calculated in the study by Bowden RG¹⁴ in his study which were 19.8% for total cholesterol, 4.8% for triglycerides, 38.8% for HDL and 41.3% for LDL. The difference existing in percentage of students above NCEP guidelines for LDL was due to the difference in the NCEP cutoff for LDL taken as 160 mg/dl in this study but 100 mg/dl taken in the study by Bowden RG¹⁴.

In the present study, significant and positive association was seen in BMI and total cholesterol, triglycerides, LDL and VLDL while HDL is shown to vary inversely with an increase in BMI (the prevalence of obesity or overweight was 28.4% in males and 10.8% in females revealing significant gender based differences in BMI; p value <0.001). Similar results with positive association between Obesity/overweight and total cholesterol, triglycerides, LDL, VLDL, and inverse association with HDL, were seen in studies done by Bertias G¹⁶ (obesity percentage in males being 39.5% and females being 23.3%), and by Coelho VG¹³ (obesity percentage in males being 1.4% and females being 3.8%) and by Cugnetto ML¹⁷. On the other hand, Aziz J¹⁸ in his study showed that an increase in BMI was related to an increase in triglycerides (p value 0.001) and decrease in HDL-C (p value 0.04) but no significant relation was observed between BMI and total cholesterol or LDL-C. Fisberg RM¹⁹ in his study showed different results with no significant association between lipids and BMI. In a study by Farajian P²⁰, BMI was found to have significant inverse correlation with HDL-C but was not shown to correlate with other lipid parameters. This difference can be accounted for by the differences in ethnicity and lifestyle, diet patterns rich in fats of the population under study. The different anthropometric indices used in these studies also account for the difference in results.

In the present study, significant and positive association was seen in WHR and total cholesterol, triglycerides, LDL and VLDL while HDL varied inversely with an increase in WHR (the prevalence of central obesity being significantly higher with p value <0.001, in females with a WHR above 0.85 was 15.6% as compared to males with a WHR above 1 in 1.4% only). These results were in tune with those shown by Bertias G¹⁶ (Central Obesity percentage in males being 30% and females being 30.5%). In a study by Farajian P²⁰, WHR was found to have significant inverse correlation with HDL-C and significant positive correlation with triglycerides (p value<0.01) but was not shown to correlate with other lipid parameters. This difference is due to the differences in ethnicity and lifestyle, diet patterns rich in fats of the population under study and different anthropometric indices used in these studies.

The present study reveals that total cholesterol, triglycerides, LDL and VLDL were significantly higher and HDL significantly lower in students who have a sedentary lifestyle as compared to those who have non-sedentary lifestyle (sedentary lifestyle was found to be more in males (20.2%) than in females (11%) with a p value of <0.001). Similar observations have been found in study done by Coelho VG¹³ where all the lipid parameters were found to correlate significantly with sedentary lifestyle. Lippi G²¹ in his study reported that total cholesterol, triglycerides, LDL-C and VLDL-C were lower whereas HDL-C was significantly higher in professional athletes. Fisberg RM¹⁹ in his study, found no significant association between sedentary life style and lipid parameters. This difference is due to the difference in diet patterns and lifestyles of both groups.

In the present study, significant and positive association was revealed between smoking and total cholesterol, triglycerides, LDL and VLDL and inverse association with HDL (7.6% smokers among males and none among females making the gender differences significant; p value <0.001). These observations were in tune with the studies done by Neki NS²² and by Rustogi R²³. Contrary to this, in studies by Fisberg RM¹⁹ and Coelho VG¹³, smoking was not found to correlate to any of the lipid parameters. These differences can be explained by the difference in

number of cigarettes smoked per day.

In the present study, it was revealed that total cholesterol, triglycerides, LDL and VLDL are significantly higher in alcoholics as compared to non-alcoholics, whereas HDL varies inversely with alcohol intake; (7.6% males took alcohol and none among females, making the gender differences significant with a p value <0.001). In the study by Coelho VG¹³ (prevalence of alcohol consumption was 8.1% in males and 2.5% of females), it was shown that alcohol consumption was related to an increase in levels of total cholesterol, LDL-C and HDL-C but a decrease in levels of triglycerides and VLDL-C. Wannamethee G²⁴ in his study revealed little association between alcohol intake and total cholesterol, a strong positive relation with HDL cholesterol, and a significant increase in triglycerides in heavy drinkers. These differences can be explained by the difference in amount and quality of alcohol consumed and difference in lifestyle and socioeconomic status.

CONCLUSION

HDL-C was significantly lower and LDL-C significantly higher in males as compared to females with no significant differences in total cholesterol and triglycerides. 28.4% male students were obese and 10.8% female students were obese (BMI>25). Sedentary lifestyle was prevalent in 20.2% male students and 11% female students. Variables like BMI, WHR, sedentary lifestyle, smoking & alcohol showed a significant linear relationship with total cholesterol, triglycerides, LDL and VLDL and an inverse relation with HDL thus necessitating the need for weight reduction in obese college students, regular exercise, lifestyle modification, abstinence from smoking as well as alcohol intake.

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