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STUDY OF SERUM LIPID PROFILE IN INDIVIDUALS RESIDING IN AND AROUND NALGONDA

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ABSTRACT

Lipids are essential components of biological membranes, lipoproteins and metabolic regulators that control cellular function and homeostasis. The lipid profile indicates whether there is a problem in metabolizing lipids (metabolic syndrome), or consumption of a high-fat or high-cholesterol diet. Lipid profile and body fat have been shown to be the important predictors for metabolic disturbances including dyslipidaemia, hypertension, atherosclerosis, diabetes, cardiovascular diseases, hyperinsulinaemia etc. Any alteration in the levels of lipids in the body makes the individuals more prone to develop these diseases. An abnormal lipid profile is known to be strongly associated with atherosclerotic cardiovascular diseases and has a direct effect on endothelial dysfunction.

A total number of 100 subjects comprising of group A (n=59) with normal lipid profile and group B (n=41) with abnormal lipid profile were included in the study. Lipid profile, atherogenic index, BMI and waist hip ratio were studied in both the groups. However the levels total cholesterol, triglycerides, VLDL and LDL cholesterol very significantly increased in group B but there was no significant difference in HDL cholesterol levels, BMI, waist hip ratio and atherogenic index when compared to group A.

KEYWORDS: *lipid profile, Total cholesterol, HDL cholesterol, Triglycerides, VLDL, LDL cholesterol.*

INTRODUCTION

Lipids are essential components of biological membranes, lipoproteins and metabolic regulators that control cellular function and homeostasis[1]. Lipids play essential roles in virtually all aspects of biological life. Some of these roles include serving as hormones or hormone precursors, helping digestion, providing energy, storage and metabolic fuels, acting as functional and structural components in biomembranes and forming insulation to allow nerve conduction and preventing heat loss[2].

Lipid profile refers to the levels of fats found in our blood. These include total cholesterol, triglycerides, "good" cholesterol, namely high-density lipoprotein or HDL-cholesterol; "bad" cholesterol, namely low-density lipoprotein or LDL-cholesterol. These levels can be easily determined in a simple laboratory test. The lipid profile indicates whether there is a problem in metabolizing lipids (metabolic syndrome), or consumption of a high-fat or high-cholesterol diet[3].

Lipid profile assay has found useful application in the management of patients with cardiovascular diseases, monitoring patients with diabetes mellitus[4], in the assessment of obese individuals, alcoholics and individuals of high social status and also in the assessment of malnourished children[5-7]. Association of altered lipid profiles is reported with lifestyle, age, intraabdominal adiposity, obesity, BMI and waist to hip ratios[8].

Lipid profile and body fat have been shown to be the important predictors for metabolic disturbances including dyslipidaemia, hypertension, atherosclerosis, diabetes, cardiovascular diseases, hyperinsulinaemia etc. Any alteration in the levels of lipids in the body makes the individuals more prone to develop these diseases[9].

An abnormal lipid profile is known to be strongly associated with atherosclerotic cardiovascular diseases and has a direct effect on endothelial dysfunction[10].

In the present study, an attempt has been made to investigate the correlation of BMI with lipid profiles in Indian context especially in Nalgonda district, a rural area of Andhra Pradesh. Obesity is not observed to a large extent in this rural and economically backward area. However the number of patients admitted with adverse cardiac events

continues to be similar to the city based hospitals. Moreover, this region is known to be an area of endemic fluorosis. Hence, this study explored the correlation of the atherogenic index with BMI in attempt to devise cardiac risk factors in a rural population.

AIMS AND OBJECTIVES

AIM: To study the lipid profile in a study group residing in a predominantly rural setting with endemic fluorosis where obesity is uncommon.

OBJECTIVES:

1. To estimate serum Lipid profile in persons attending the OPDs in this hospital.
2. To calculate atherogenic index to assess cardio metabolic risk factor.
3. To calculate BMI from height and weight in patients whose lipid profile was measured.
4. To correlate BMI with lipid levels and atherogenic index.

MATERIALS AND METHODS:

a. Patients and controls

In the present study 100 individuals attending the outpatient department of Medicine, Kamineni Institute of Medical Sciences, Narketpally, Nalgonda, Andhra Pradesh, were included. These individuals were divided into individuals with normal lipid profile (Group-A) and individuals with abnormal lipid profile (Group-B).

b. Collection of blood sample for analysis:

5ml of fasting venous blood was drawn from patients, in to a sterile disposable syringe which was transferred into plain tubes. The samples were centrifuged at 3000 rotations per minute for 10 min and serum was collected. The serum was processed within one hour of collection.

c. Investigations performed:

1) Total Cholesterol and HDL cholesterol:

Method: CHOD-POD.

Principle: Cholesterol is determined after enzymatic hydrolysis and oxidation, Cholesterol esters are hydrolyzed by the enzyme cholesterol esterase to give free cholesterol and fatty acid molecules. The free cholesterol gets oxidized in the presence of cholesterol oxidase to liberate cholest-4-ene-3one and peroxide. The indicator quinoneimine is formed from hydrogen peroxide and 4-aminoantipyrine in the presence of phenol and peroxidase.

The intensity of this colored complex is measured at 505nm and is directly proportional to the cholesterol concentration present in the sample.

Total cholesterol = Absorbance of T_1/Absorbance of Standard x 200 mg/dl.

HDL cholesterol = Absorbance of T_2/ Absorbance of Standard x 50 mg/dl.

2) Triglycerides:

Method: Glycerol phosphate oxidase (GPO) and peroxidase (POD)

Principle: Triglycerides are determined after enzymatic hydrolyzed with lipases, Serum triglycerides are hydrolyzed to glycerol and free fatty acid by lipases. In the presence of ATP and glycerol kinase. Glycerol is converted to glycerol 3 phosphate which is then oxidized by GPO to yield hydrogen peroxide. Peroxide catalyses the conversion of hydrogen peroxide, 4-aminoantipyrine and ESPAS to a colored quinoneimine complex measured at 546nm.

3. LDL & VLDL were calculated as follows: Friedwald formula (NCEP 2001)

(1) VLDL = TGL ÷ 5

(2) LDL = Total Cholesterol – (VLDL + HDL).

Concentration represented in mg/dl.

4. Atherogenic index: AIP was computed for each patient according to the following equation[11]:

AIP = log (TGL/HDL)

With units for TGL and HDL in mmol/L.

5. Body Mass Index Analysis:

Height and weight were measured to the nearest 0.5 cm and 0.1 kg, respectively. BMI was calculated as weight/height^2 (kg/m2) and was used as an estimate of overall adiposity.

6. Waist to Hip ratio:

Waist circumference and hip circumference, a validated estimate of visceral adiposity was measured to the nearest 0.5cm using a steel tape.

STATISTICAL ANALYSIS:

The results were statistically analyzed by the student's t-test and by Pearson's correlation coefficient by using sigma stat software. P-value of < 0.05 was considered as statistically significant.

RESULTS:

Table I: Distribution of age among individuals in Group-A and Group-B

	Group – A (n= 59)	Group B (n=41)
Range (Years)	27 – 70	**30-70**
Mean ±SD	**47.86±12.07**	**50.10 ± 9.68**

Table I shows distribution of age among individuals in Group-A and Group-B. The mean and SD of group A was 47.86±12.07 years with the range between 27 to 70 years and that of Group B was 50.1±9.68 years with the range between 30 to 70 years.

Table II: Lipid profile in Group A and Group B:

	Group-A (n = 59)		Group-B (n = 41)	
Parameters	Range	Mean ± SD	Range	Mean ± SD
TC (mg/dl)	106 – 196	157.73 ± 24.07**	201 – 333	220.95 ± 29.33**
HDL (mg/dl)	24 – 62	40.49 ± 8.77	20 – 64	42.41 ± 9.52
LDL (mg/dl)	44 – 148	94.75 ± 25.38**	79.4 – 236.8	133.84 ± 37.63**
VLDL (mg/dl)	11.1 – 64	27.60 ± 12.59*	14.3 – 74.4	35.01 ± 14.72*
TG (mg/dl)	35 – 360	137.39 ± 62.87*	73 – 372	174.56 ± 72.14*

** p Value < 0.0001,*p Value < 0.05

Comparison of lipid profile between Group-A and Group-B is shown in the above table. The Total cholesterol of group B was highly significant when compared to group A ($p<0.0001$). The LDL-cholesterol of Group B was highly significant when compared to Group A ($p<0.0001$). There was no change in the levels of HDL-cholesterol between two groups. The VLDL of group B was significant when compared to group A ($p<0.05$). The TGL of group B was significant when compared to group A ($p<0.05$).

Table III: BMI and Waist/Hip Ratio in Group A and Group B:

	Group-A (n = 59)		Group-B (n = 41)	
	Range	Mean ± SD	Range	Mean ± SD
BMI	16.86 – 31.4	21.78±2.95	18.02 – 27.54	22.10±2.46
WAIST/HIP	O.881 – 1.02	0.93±0.08	0.894 – 1	0.94±0.03

Table III shows the comparison of BMI and WHR between Group A and Group B and the statistical analysis showed that there was no difference in BMI and in WHR levels between Group A and Group B ($p>0.05$).

Table IV: Atherogenic index in Group A and Group B:

	Group A (n = 59)		Group B (n = 41)	
	Range	Mean ± SD	Range	Mean ± SD
Atherogenic Index	-5.533 – 1.562	-0.33±1.46	-5.919 -0 .63	0.1±1.14

Comparison of Atherogenic Index between Group A and Group B was done as shown in the above table, with no statistical significance.

Table V: Correlation between lipid profile levels in individuals of Group-A (normal lipid profile)

	TC	TGL	HDL	LDL	VLDL
TC	1	r = 0.075 p=0.57	r = 0.379 p <0.05	r= 0.656 p<0.0001	r= 0.082 p= 0.529
TGL		1	r= -0.196 p= 0.136	r= -0.491 p<0.0001	r= 0.959 p<0.0001
HDL			1	r= 0.128 p= 0.334	r= -0.139 p= 0.295
LDL				1	r= -0.459 p<0.0001
VLDL					1

Table V shows the correlation between the lipid profile levels in individuals with normal lipid profile. There was positive correlation between total cholesterol-HDL; total cholesterol-LDL; TGL-LDL; TGL-VLDL and LDL-VLDL with p<0.05.

Table VI: Correlation between lipid profile levels in individuals of Group B (abnormal lipid profile)

	TC	HDL	LDL	VLDL	TGL
TC	1	r = 0.498 p<0.001	r = 0.6637 p <0.0001	r= 0.222 p= 0.163	r= 0.253 p= 0.111
HDL		1	r= 0.463 p<0.05	r= -0.124 p= 0.439	r= -o.087 p= 0.589
LDL			1	r= 0.04 p= 0.804	r= 0.027 p= 0.868
VLDL				1	r= 0.024 p=0.872
TGL					1

Table-VI shows the correlation between the lipid profile levels in individuals with abnormal lipid profile. There was positive correlation between Total cholesterol-HDL; Total cholesterol-LDL and HDL-LDL with p<0.05.

Table VII (a): Correlation between BMI and lipid profile in normal individuals.

	TCHOL	TGL	HDL	LDL	VLDL
BMI	r=0.021	r= -0.0786	r=-0.2519	r= 0.169	r= -0.416

Tables VII (b): Correlation between BMI and abnormal lipid profile individuals.

	TCHOL	TGL	HDL	LDL	VLDL
BMI	r= -0.0807	r= 0.0315	r= -0.099	r= -0.0567	r= 0.0103

Tables- VII (a) and VII (b) shows the correlation between BMI and lipid profile in normal individuals and abnormal lipid profile individuals.

Table VIII (a): Correlation between WHR and abnormal lipid profile individuals.

	TCHOL	TGL	HDL	LDL	VLDL
WHR	r= -0.2517	r= -0.1383	r= -0.0763	r= -0.27	r= -0.176

Table- VIII (b): Correlation between WHR and abnormal lipid profile individuals.

	TCHOL	TGL	HDL	LDL	VLDL
BMI	r=0.021	r= -0.0786	r=-0.2519	r= 0.169	r= -0.416

Tables -VIII (a) and VIII (b) shows the correlation between WHR and lipid profile in normal individuals and abnormal lipid profile individuals. No significant correlation was found between BMI or WHR and normal lipid profile or abnormal lipid profile individuals. Hence, abnormal lipid profile parameters can exist even in the absence of obesity.

DISCUSSION

The abnormalities of blood lipids are related mainly to different dietary habits of people, lifestyle, and heredity along with the other factors as we have mentioned in the section of introduction. When we compare our data with some recent studies done on Indian people of other region, we have found that our values did not differ much with the values of those studies. Though it seems lipid levels in Indians are on an average less, compared to population abroad, it is observed that the values of present study follow a similar pattern as in some of the foreign countries. Probably due to the health consciousness and public awareness regarding the role of dietary habit and lifestyle on the occurrence of heart disease, an uniform pattern of living quality and healthy food habit has put the population of different regions of India on a similar plateau.

In the presented study, increased total cholesterol(28%), LDL-cholesterol (29%), TGL levels (21%) was observed in individuals with abnormal lipid profile compared to normal.

Chadha, N. et al. Found differences in serum lipid levels in urban-rural population, particularly high risk total cholesterol and LDL cholesterol which was similarly observed in our study[12].

Krishnaswami S revealed that higher triglycerides with marginally raised LDL-cholesterol was observed in patients from South India, whereas increase in total cholesterol and LDL-cholesterol was common in those from North India[13], but in our study we observed more increase in LDL-cholesterol levels than TGL.

In Asia, increasing trends in lipids and in prevalence of dyslipidemias with increase in LDL cholesterol and decrease in HDL cholesterol has been reported in populations of Beijing, rural China and South Korea[14-16].

Sapna Smith etal. was observed that serum total cholesterol, LDL cholesterol and TGL were significantly raised where as the level of HDL cholesterol was significantly lower in diabetic subjects as compared to control, even similar results were shown by us[17].

Holst-Schumacher I study showed the prevalence of low levels of HDL-cholesterol, marginal levels of total homocysteine and a tendency to have high levels of triglycerides were the most outstanding cardiovascular risk factors found in this population, specially in rural subjects, which could be associated with the quality of the diet of these habitants. It is necessary to develop effective intervention strategies to promote healthy lifestyles in the population in order to reduce the cardiovascular mortality rates in Costa Rica[18].

In our study the atherogenic index has no significant increase in normal and abnormal lipid profile individuals which contradictory study of

Meng H observed atherogenic index have good predictive val**ue** for future cardiovascular events . Since both Group A and Group B individuals have high HDL levels, the atherogenic index was never significantly elevated.The High HDL levels may be attributed to the physical labour which is part of the rural life style of our study groups[19].

In our study, no significant correlation was observed between BMI and lipid profile, which is contradictory to the study of Manu Arora, Shyamal koley, in which negative correlation was found between BMI and HDL-cholesterol[20].

Mahapatra S et al study observed that BMI did not show any correlation with triglyceride or high density lipoprotein cholesterol which reflects our study[21].

Baral N showed positive correlation of BMI with all the four lipid parameters even though it was not statistically significant as we seen in our study[22].

Anuradha Kalra study observed there was no correlation seen between markers of obesity such as BMI and waist/hip ratio with various lipid parameters as we seen in our study[23].

Tonje Holte Stea high paternal educational level was associated with a lower BMI and a better lipid profile among young adult men. Furthermore, men with low BMI, both high and low fit, had a better lipid profile than those with high BMI/low fit. Men with high BMI/high fit had a better lipid profile that those with high BMI/low fit[24].

CONCLUSION

In present study we observed significant correlation between total cholesterol, LDL and HDL. These three parameters play significant role in the prevalence of coronary risk factors, hypertension, diabetes, obesity and sedentary lifestyle especially in rural area.

In our study the atherogenic index has no significant increase in normal and abnormal lipid profile individuals, it shows that body fat distribution, rather than general obesity, is more correlated with obesity-related atherosclerotic risk factors and sex-associated differences.

No significant correlation was found between BMI or WHR and normal lipid profile or abnormal lipid profile individuals. Hence, abnormal lipid profile parameters can exist even in the absence of obesity.

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