

**A STUDY ON BMI AND LIPID PROFILE IN OBESE AND NON-OBESE INDIVIDUALS:
A RETROSPECTIVE STUDY IN A TERTIARY CARE CENTRE**Prasad DKV^{1*}, and Preethi B.^{2*}^{1,2}Department of Biochemistry, NRI Institute of Medical Sciences, Sangivalasa-531162, Andhra Pradesh, India.***Corresponding Author: Dr. Preethi B.**

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ABSTRACT

Background: Obesity increases the risk of developing many co-morbidities like dyslipidemia, atherosclerosis, CHD, hypertension, insulin resistance which may lead to metabolic syndrome. There is alarming rise of obesity in present era. Obesity being a modifiable risk factor for metabolic syndrome can be kept in check by restricted diet and physical activity, which can prevent the diseases, such as CHD, hypertension etc. This study was done with an aim to estimate the serum lipid profile levels in obese subjects with BMI ≥ 30 kg/m² and to compare them with that in non-obese subjects with BMI 18.5 - 24.9 kg/m². **Methods:** In this cross-sectional study, the records of 100 patients who have visited cardiac OPD for evaluation were included for the study and the following parameters were examined: age, sex, body mass index, and lipid profile. **Results:** A total of 100 (50 obese and 50 non-obese) subjects were analyzed in this study. Elevated levels of TC, TGL and LDL were found in obese individuals when compared to non-obese individuals. However, no significance was noted with VLDL. In male and female subjects, elevated levels of TC, TGL and LDL were noted as compared to their respective non-obese subjects. Significantly elevated levels of TC and HDL were found in obese women compared to obese men, however no significant change was observed related to LDL though elevated levels were noted. **Conclusion:** Serum lipid profile parameters (except HDL) are raised in obese compared to non obese counterparts. The raised lipid profile parameters enhance the risk of developing atherosclerosis and CHD.

KEYWORDS: BMI, Total cholesterol, HDL, LDL, Non-obese, Obese.**INTRODUCTION**

Human beings store energy in form of triglycerides in adipose tissue for any future emergency when food might become scarce. When excess of triglycerides are stored in adipose tissue due to increased calorie intake and decreased physical activity obesity results. Obesity is rising in alarming rate in present generation as food is available in plenty. Percentage prevalence of overweight and obesity by year 2030 will be around 23% and 32% respectively.^[1] The prevalence of obesity in India varies between 11.8% -31.3% and 138 million people are affected by obesity.^[2] Prevalence depends on age, sex, socio-economic status and geographical distribution. India is facing health issues due to both obesity and nutritional deficiency.

Obesity is measured by an index that is called body mass index (BMI). It is calculated by the formula $\text{Weight}/\text{Height}^2$, where weight is Kg and height is in meters. People are considered obese when their body mass index (BMI), exceeds 30 kg/m². According to WHO, BMI can be classified into following groups i.e., BMI <18.5 Kg/m²- Underweight; BMI ≥ 18.5 -24.9 Kg/m²- Normal weight; BMI ≥ 25 -29.9 Kg/m²- Overweight; BMI 30-34.9 Kg/m²- Obesity I; 35-39.9

Kg/m²- Obesity II and >40 Kg/m²- Extreme obesity.^[3]

According to WHO, obesity is considered as one of today's most neglected public health problems, affecting every area of the world.^[4] Obese persons have increased risk of developing coronary artery disease, diabetes mellitus, hypertension, metabolic syndrome. Blood lipid levels are modifiable risk factors for atherosclerosis and coronary heart disease (CHD). Total cholesterol (TC), cholesterol esters, triglycerides (TGL) and phospholipids are transported to the other tissues in the form of lipoproteins as they are lipophilic. Major classes of lipoproteins are chylomicrons (CM), low density lipoproteins (LDL) and high density lipoproteins (HDL), named by the site of their assembly and type of lipid and apo protein they have.^[5] Many lipid/lipoprotein abnormalities are prevalent in obesity and heart problems. According to NCEP ATP III guideline, hypercholesterolemia defined as TC > 200 mg/dl, high LDL-C when value >100 mg/dl, hypertriglyceridemia > 150 mg/dl and low HDL-C when value < 40 mg/dl. Dyslipidemia defined by presence of one or more than one abnormal serum lipid concentration. The present study was undertaken to compare the lipid profile in obese and non obese patients.

MATERIALS AND METHODS

In this retrospective study, data of 100 patients who have visited cardiology OPD of Anil Neerukonda Hospital for cardiac evaluation between 23-50 years of age, from March 2020 to June 2021 were included, whose BMI and lipid profile were analyzed.

Out of 100 subjects, 50 patients were cases (BMI ≥ 30 kg/m²) and 50 were taken as control, who had normal BMI (18.5 – 24.9 kg/m²).

Inclusion criteria

Patients with age group between 23-50 yrs with BMI ≥ 30 and BMI between 18.5 – 24.9 kg/m² without any cardiac disorder history and serious medical disorders were included.

Exclusion criteria

Pregnant women, children, underweight persons (<18.5 kg/m²), cancer patients, patients on lipid lowering drugs, persons having any infections were excluded from the study.

Estimation of serum total cholesterol by cholesterol oxidase / phenol amino antipyrine method (CHOD-PAP), serum HDL cholesterol by immuno-inhibition method, serum LDL cholesterol by immuno-inhibition method and serum triglyceride by glycerol phosphate oxidase (GPO) method was done.

Results were expressed as mean \pm SD and student's t test was done to compare the variables between groups and p-value <0.05 is considered to be significant.

RESULTS

Table 1: Comparison of lipid profile in obese and non obese patients.

	Non-obese (n=50) Mean \pm SD	Obese (n=50) Mean \pm SD	P -value
TC(mg/dl)	170.98 \pm 39.71	198.85 \pm 66.99	0.01*
TGL(mg/dl)	144.38 \pm 56.3	165.02 \pm 71	0.0007*
HDL(mg/dl)	43.23 \pm 8.09	37.38 \pm 7.09	0.093
VLDL(mg/dl)	74.66 \pm 38.7	112.34 \pm 60.28	0.166
LDL(mg/dl)	99.58 \pm 40.19	152.77 \pm 66.48	0.0*

Note: p<0.05 is significant

Table 1 shows comparison of lipid profile in obese and non obese patients. The mean \pm SD of TC in obese and non obese was 198.85 \pm 66.99 and 170.98 \pm 39.71 respectively. The mean \pm SD of TGL in non obese is 144.38 \pm 56.3 and in obese males is 165.02 \pm 71. The mean

\pm SD of HDL in non obese is 43.23 \pm 8.09 and in obese is 37.38 \pm 7.09. Elevated levels of TC, TGL and LDL were seen in obese as compared to non obese with a statistical significance (p<0.05).

Table 2: Comparison of lipid profile in female obese to male obese patients

	Female(n=25) Mean \pm SD	Male(n=25) Mean \pm SD	P value
TC(mg/dl)	226.88 \pm 52.9	203.8 \pm 65.1	0.17
TGL(mg/dl)	170.28 \pm 76	192 \pm 42.1	0.20
HDL(mg/dl)	48.9 \pm 9.9	39.2 \pm 7.63	0.0003*
LDL(mg/dl)	138.72 \pm 55.5	126 \pm 67.1	0.4
VLDL(mg/dl)	32.88 \pm 14.4	38.1 \pm 8.1	0.12

Note: p-value <0.05 is significant

Table 2 shows comparison of lipid profile in female obese to male obese patients. No significant difference was noted in the levels of TC, TGL and LDL between

male and female individuals. However, significant low levels of HDL were seen in male obese as compared to female obese (p<0.05)

Table 3: Comparison of lipid profile in male obese and non obese patients.

	Non-obese (n=25) Mean \pm SD	Obese (n=25) Mean \pm SD	P value
TC(mg/dl)	161.8 \pm 35.5	203.8 \pm 65.1	0.006*
TGL(mg/dl)	138.8 \pm 51	192 \pm 42.1	0.0002*
HDL(mg/dl)	39.8 \pm 7.5	39.2 \pm 7.63	0.7
VLDL(mg/dl)	34.8 \pm 19.5	38.1 \pm 8.1	0.4
LDL(mg/dl)	94.6 \pm 32.1	126 \pm 67.1	0.03*

Note: p-value <0.05 is significant

Table -3 shows comparison of lipid profile in male obese

and non obese patients. Significantly higher levels of TC,

TGL and LDL were found in obese males as compared to non-obese males ($p < 0.05$). No difference was found

between these two groups as regard to HDL levels.

Table 4: Comparison of lipid profile in female obese and non obese patients

	Non obese(n=25) Mean±SD	Obese(n=25) Mean±SD	P value
TC(mg/dl)	176.2±40.69	226.88±52.9	0.0004*
TGL(mg/dl)	130.4±47.2	170.28±76	0.03*
HDL(mg/dl)	45.72±12	48.9±9.9	0.3
LDL(mg/dl)	103.92±39.9	138.72±55.5	0.01*
VLDL(mg/dl)	33.28±19.8	32.88±14.4	0.9

Note: p value <0.05 is significant

Comparison of lipid profile in female obese and non obese patients was depicted in table 4. Significantly elevated levels of TC, TGL and LDL were noted in obese females as compared to non obese female patients. No significant difference was found between these groups in relation to HDL.

DISCUSSION

Dyslipidemia, specifically hypertriglyceridemia and low levels of HDL-C have been shown to have a strong predisposing factor for many diseases including obesity, diabetes and cardiovascular diseases. There is 2 to 3% increase in risk for CHD for every 1 mg/dL decrease in HDL-C.^[6] Despite some controversy, elevated levels of fasting as well as non-fasting triglycerides also appear to be an independent risk factor for CHD.^[7,8] Insulin and leptin resistance is seen in obesity, so that metabolic dysregulation, elevated fatty acids (FFA), TG and increased secretion of pro-inflammatory “adipokines” occur. Lipotoxicity, chronic inflammation, hypertension, atherosclerosis, and CHD are consequences if obesity is not treated.

Obesity also causes development of fatty liver which reduces protein secretion, leading to clotting disorders, dyslipidemia and edema.

In the present study, significantly higher level of TC, LDL and TGL and low levels of HDL were found in obese individuals as compared to non obese subjects. Similar results were also observed by Bhatti et al. where higher levels of TC, TGL and LDL were found.^[9] Similarly several others claimed similar resemblance with statistical significance.^[10,11] A positive correlation was noted between TG and high BMI and negative correlation with HDL.^[12] A positive correlation was observed between LDL and BMI up to 20.3 Kg/m² in females and in males up to 27.1 Kg/m².^[13]

The gender disparity in lipid profile might be due to influence of estrogen and progesterone hormones in females. Due to the influence of estrogen, LDL decreases, and TGL and HDL increase whereas the opposite is true with progesterone.^[14] In the present study, it is observed that the levels of TC and LDL were higher where as TGL levels were lower in female obese compared to male obese. However, elevated HDL levels

were noticed in obese females compared to obese males. Our results were in accordance with Njelekela et al. where elevated levels of TC, LDL were seen in females.^[15] On the contrary study carried out by Shabana et al. found high TC, LDL and TGL in males compared to females.^[16] In a study done by Hussain et al., TC levels of male patients were lower, whereas TG and HDL-C were higher compared to women with no statistical significance.^[17]

CONCLUSION

We conclude that serum lipid profile parameters (except HDL) are raised in obese compared to non obese individuals. The raised lipid profile parameters enhance the risk of developing atherosclerosis and CHD.

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