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A STUDY OF ASSOCIATION BETWEEN OBESITY AND LIPID PROFILE

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ABSTRACT

Introduction

Obesity is the accumulation of excess body-fat, due to greater energy intake when compared to the energy expenditure leading to increased BMI. The metabolic defects in obesity includes altered lipid profile along with increased risk of cardiovascular diseases, diabetes, hypertension, dyslipidemia, and elevated serum uric acid. In this study we have tried to find out association of lipid profile with obesity.

Material and Method

This study was conducted in the Department of Biochemistry, GMC kota. 50 case samples and 50 control samples were taken. Serum was separated and serum lipid profile levels were estimated by fully Automated Analyzer ERBA EM 360. Data was analyzed on Excel sheet and results obtained using Student's unpaired t- test and Pearson's correlation.

Result

Cases have significantly higher values for serum lipid profile levels except HDL-Cholesterol as compared to controls and have significant positive correlation with BMI.

Conclusion

Obesity is associated with increased serum lipid profile levels except HDL-Cholesterol. Therefore, patients presenting with this biochemical abnormality are recommended to be investigated for obesity and vice versa.

KEYWORDS: Obesity, BMI, Cholesterol, Triglyceride, HDL, VLDL, LDL

INTRODUCTION

Obesity refers to excess of body-fat which is due to greater energy intake compared to the energy expenditure. Obesity has been associated with an increased risk for metabolic syndrome in adults (Lerario et al., 2002).

The metabolic defects that ensue in obesity include increased levels of free fatty acids resulting from insulin resistance, increased LDL-cholesterol, VLDL and triglycerides and decrease in HDL-cholesterol. It is most likely that presentation of increased free fatty acids to liver as a function of obesity is primarily responsible for over production of VLDL and this is probably the key to increased LDL via the sequence: VLDL→ intermediate density lipoprotein (IDL)→ LDL [1] . VLDL production has also been shown to be directly related to insulin levels [2] and per cent body fat [3] .

Obesity increases the risk of cardiovascular diseases and diabetes [4] especially when the extra fat is accumulated to central and intra-abdominal depots [5], [6]. The increased cardiometabolic risk in obesity is at least partly mediated through atherogenic dyslipidemia characterized by an increase in plasma triglycerides, large very low density lipoprotein

(VLDL) particles, small dense low density lipoprotein (LDL) particles as well as low concentrations of high density lipoprotein (HDL) cholesterol [7]. It is also recognized that changes in the function of individual lipids due to peroxidation, imbalanced fatty acid composition or their altered flux from peripheral tissues may contribute to development of atherosclerosis and diabetes [8].

The origin of obesity and related dyslipidemias is multifactorial [9]. Not all obese individuals develop dyslipidemia and not all dyslipidemic patients are obese. This study aims to find whether lipid profile is increased in healthy obese when compared to healthy non – obese and the association of hyperlipidemia with obesity based on BMI.

MATERIAL AND METHODS

This study was performed in the Department of Biochemistry, Government Medical College, Central Laboratory NMCH Kota from period of September 2014 to October 2015. A total of 100 patients were studied, of which 50 patients were cases and 50 were controls who were patients without obesity or any other condition known to cause altered serum lipid profile levels.

BMI was calculated as follows.

$$\mathrm{BMI} = \frac{m}{h^2},$$

where m and h are the subject's weight and height respectively.

BMI is usually expressed in kilograms per square meter, resulting when weight is measured in kilograms and height in meters.

Inclusion Criteria

- 50 Obese with BMI ≥ 30 and 50 Non – Obese persons with BMI between 18.5 to 24.9 according to WHO's criteria.
- Apparently healthy adults of age group : 18 – 50 years.
- Persons not having any clinical conditions known to affect carbohydrate, protein or lipid metabolism or body composition.

Exclusion Criteria

- Pregnancy.
- Age <18
- Age > 50
- Diabetes Mellitus.
- Renal disorder
- Thyroid disease.

- Patients with malignancy
- History and presence of jaundice
- Chronic liver diseases
- Smoking
- Alcoholics
- Familial hyperlipidemia
- Patients on lipid lowering drugs

After explaining the type of study, written consent was taken from all the subjects. 12-hour fasting period, venous blood samples were collected from all the cases and controls. Serum was separated and serum lipid profile levels were estimated by fully Automated Analyzer ERBA EM 360.

Statistical Analysis

Statistical analysis was done using suitable statistical tool. Data was estimated on excel sheet and analysed statistically. Quantitative data was summarized in the form of MEAN ± SD and differences in mean of both the groups were analyzed using Student's unpaired t-test . The P value <.05 was taken as significant. Association was found by Pearson's Correlation.

RESULTS

Table 1: Lipid Profile Parameters of Obese and Non - Obese

Study Parameters	Non - Obese	Obese	P Value	Significance
TC(mg/dl)	153.74 ± 27.84	181.88 ± 33.55	<0.0001	Significant
TG (mg/dl)	90.26 ± 37.42	133.62 ± 69.25	0.0002	Significant
HDL-C (mg/dl)	47.88 ± 8.46	44.18 ± 7.76	0.0248	Significant
VLDL-C (mg/dl)	17.66 ± 7.49	26.34 ± 13.8	0.0002	Significant
LDL-C (mg/dl)	88.2 ± 22.48	111.36 ± 31.12	<0.0001	Significant

Table 2: Pearson's Correlation of BMI with Lipids

Pair	Non - Obese	Obese
	r Value	r Value
BMI vs CHO	.20	.43
BMI vs TG	.11	.29
BMI vs HDL	-0.04	-0.25
BMI vs VLDL	.12	.29
BMI vs LDL	.23	.39

DISCUSSIONS

This study was done to estimate the Serum lipid profile levels in healthy obese subjects with BMI ≥ 30 kg/m^2 and to compare them with that in healthy non–obese subjects with BMI 18.5 – 24.9 kg/m^2 on basis of WHO's criteria for Obesity [10], and to find out if there is any association between BMI and these parameters in obesity. The obese subjects

were called Cases, and the non–obese as Controls.

The study was done on a fixed study format taking personal information, doing physical examination and then the overnight fasting venous samples were taken and were analyzed.

Table 1. shows the mean ± SD values of serum Cholesterol (mg/dl) to be 181.88 ± 33.55 in cases as compared to 153.73 ± 27.84 in controls, of serum triglyceride (mg/dl) to be 133.62 ± 69.25 in cases as compared to 90.26 ± 37.42 in controls, of serum VLDL (mg/dl) to be 26.34 ± 13.8 in cases as compared to 17.66 ± 7.49 in controls, of serum HDL (mg/dl) are 44.18 ± 7.76 in cases as compared to 47.88 ± 8.43 in controls and of serum LDL (mg/dl) to be 111.36 ± 32.72 in cases as compared to 88.2 ± 22.48 in controls.

Table 1. also shows p-value < 0.0001 for cholesterol, 0.0002 for triglyceride, 0.0002 for VLDL, 0.0248 for HDL and <0.0001 for LDL stating that the differences are statistically significant.

Table 2. shows Pearson's correlation between S.TC and BMI (r=0.43) as positive, between S.TG and BMI (r=0.29) as positive, (r=0.29) as positive between S.VLDL and BMI, (r=-0.25) as negative between S.HDL and BMI and (r=0.39) positive between S.LDL and BMI for obese.

For non-obese (r=0.20) showing low correlation in controls between S.TC and BMI, (r=0.11) showing no correlation in controls between S.TG and BMI, (r=0.12) showing no correlation in controls between S.VLDL and BMI, (r=-0.04) for showing no correlation in controls between S.HDL and BMI and (r=0.23) showing low if any correlation in controls between S.LDL and BMI.

Similar results were found in a study carried out by Bhatti MS, Akbri MZ, Shakoor M on BMI and Lipid Profile among obese and non obese taking BMI > 25 kg/m^2 as cut off for obese. They found out that all lipid profile parameters S.TC, S.TG, S.VLDL and S.LDL showed significant increase in obese except S.HDL whose level showed significant decrease with BMI.[11]

Szczygielska A, Widomska S, et al carried out a study in Poland in which they found increased S.TC and S.TG concentration but lower levels of S.HDL in obese when compared to non obese. They found no significant difference in mean LDL cholesterol in obese and non obese.[12]

CONCLUSIONS

By this study we conclude that Serum Lipid Profile Parameters (Except HDL) are raised in and are positively correlated with obesity. The raised Lipid Profile parameters enhance the risk of developing atherosclerosis and CHD. Dyslipidemia increase as Obesity increases.

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