Original Research Paper

Volume-9 | Issue-5 | May-2019 | PRINT ISSN No 2249 - 555X

General Medicine

# TREND OF DYSLIPIDEMIA IN OBESE AND NON OBESE HEALTHY INDIVIDUALS AND PREDICTIVE 10 YEAR CARDIAC RISK

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**ABSTRACT**

**Introduction-** Obesity is one of the emerging epidemics in the world and is associated with many co-morbid conditions like hypertension, diabetes mellitus, coronary artery disease, anemia, dyslipidemia and cancer. Prevention of obesity will result in overall reduction of the co-morbidities and it's subsequent cardiovascular risks with overall decrease in mortality and morbidity.

**Aim-** This Study aims to find the trend of dyslipidemia in Obese and Non Obese healthy individuals and it's predictive value for cardiac risk after 10 years.

**Materials and Methods-** This is a prospective type of descriptive analytical study with 240 patients who visited the OPD at SRMS-IMS and are above 18 years of age. The patients are divided into obese and non obese based on BMI. BMI>25 is taken as obese. Fasting Lipid profile which **included –** Total Cholesterol, HDL, LDL, VLDL and triglycerides are estimated in them. Patients who are already on Anti-lipid agents are excluded from the study. 10 Year Cardiac risk is established by Framingham Risk Score and the data is analysed statistically by SPSS Software.

**Conclusion-** In our study we concluded that, in obese individuals, Total Cholesterol and LDL levels are significantly increased in comparison to **Non-** obese Individuals. Other parameters like VLDL, Triglycerides and HDL Levels are also deranged but the data was found to be non significant. 10 year calculated risk for CAD was found to be high in obese in comparison to non obese Individuals.

**KEYWORDS :**

## INTRODUCTION-

Obesity is a condition in which there is excess body fat accumulation to the extent that it has adverse effects on health, leading to increased morbidity and mortality due to development of chronic metabolic disorders. According to World health Organisation, it is one of the most neglected epidemics of the world.[1] Obesity in India has reached an epidemic with more than 5% population being affected by morbid obesity. The most common cause of obesity is physical inactivity and unhealthy lifestyle.[2] It is associated with many co-morbid conditions like hypertension, diabetes mellitus, coronary artery disease, anemia, dyslipidemia and cancer.

## MATERIALS AND METHODS-

This is a prospective and retrospective type of descriptive analytical study of 240 patients who visited the OPD above the age of 18 years. The patients are divided into obese and non obese based on BMI.

BMI>25 is taken as obese and BMI <25 is taken as non obese[2]. The patients were subjected to complete general examination, weight and height recording and subsequent calculation of BMI. Fasting Lipid profile estimation included Total Cholesterol, HDL, LDL, VLDL and triglycerides which was done after 8 hours of fasting.. Patients who were already on Anti-lipid agents were excluded from the study.

We calculated the 10 year predictive score for CAD by Framingham 10 year cardiac risk score which included, Gender, Age, Smoking, Total Cholesterol, HDL, Systolic BP and whether the treatment for hypertension was taken.The data is analysed statistically by SPSS Software.

## OBSERVATION-

**Table 1- Male-Female Distribution (n=240)**

| | OBESE n=166(69%) | NON OBESE n=74(31%) |
|---|---|---|
| MALE (138) | 94(56.6%) | 44(59.4%) |
| FEMALE (102) | 72(43.4%) | 30(40.6%) |

In our study total 240 healthy patients were enrolled, of which 138 were males and 102 were females. Overall obese population was 166 (69%) and non obese were 74 (31%) and of all obese 56.6% were males and 43.4% were females.

**Table 2- Comparison of Lipid Profile in Obese and Non Obese Individuals**

| | OBESE (n=166) | NON OBESE (n=74) | P VALUE |
|---|---|---|---|
| AGE (Years) | 51.77 ± 12.4 | 51.16 ± 11.1 | N/A |
| BMI ( $kg/m^{2)}$ | 28.2 ± 2.6 | 23.4 ± 1.5 | <0.001 |
| T CHOL (mg/dl) | 200.43 ± 56.1 | 174.8 ± 52.9 | 0.019 |
| TRIGL (mg/dl) | 185.3 ± 103.5 | 160.91 ± 65.8 | 0.123 |
| HDL(mg/dl) | 39.45 ± 12.9 | 37.05 ± 7.7 | 0.209 |
| VLDL(mg/dl) | 38.93 ± 17.9 | 33.02 ± 16.8 | 0.085 |
| LDL(mg/dl) | 114.01 ± 49.2 | 96.6 ± 40.6 | 0.046 |

The mean age of obese and non obese population was almost equal 51.77 +/-12.4 years and 51.16+/-11.1years respectively. Mean BMI in obese was 28.2+/-2.6 $kg/m^2$ and in non obese was 23.4+/-1.5 $kg/m^2$ with p value of <0.001 which is highly significant. Total Cholesterol levels found in obese was 200.4 +/- 56.1 mg/dl and 174.8+/-52.9 mg/dl in non obese with a p value of 0.019 which is again highly significant. LDL levels in obese is 114.01 +/- 49.2 mg/dl and 96.6+/-40.6 mg/dl in non obese with a significant p value of 0.046.

Triglyceride levels were much higher in obese (185.3 +/- 103.5 mg/dl) in comparison to non obese (160.91 +/-65.8 mg/dl) but the data was found to be non significant with a p value of 0.123. HDL levels in obese were 39.45 +/- 12.9 mg/dl and 37.05 +/-7.7 mg/dl in non obese whereas VLDL also showed higher values in obese but with non significant p values.

**Table 3- Framingham 10 year cardiac risk score**

| | OBESE | NON OBESE |
|---|---|---|
| RISK SCORE | 14 | 8.5 |
| 10 YEAR PREDICTIVE RISK FOR CAD | 22% | 4.7% |

We calculated the 10 year predictive score for CAD by Framingham 10 year cardiac risk score which included, Gender, Age, Smoking, Total Cholesterol, HDL, Systolic BP and whether treatment for Hypertension taken. In our study we found that average risk score in obese was 14 and 8.5 in non obese. Predictive 10 year risk for CAD was 22% in Obese individuals and 4.7% in non obese individuals which is significant.

## DISCUSSION-

Dyslipidemia is a group of biochemical disorders, which is frequently

seen in obese individuals. It is associated with obesity and has a major role in atherosclerosis and cardiovascular diseases in the obese individuals.[3] All the components of the dyslipidemia i.e. decreased HDL, high Triglycerides and LDL have shown to be atherogenic of which LDL is supposed to be the most atherogenic.

Obesity, especially central obesity, is probably the main cause of the metabolic syndrome (MetS), which includes insulin resistance, type 2 diabetes mellitus, hypertension obstructive sleep apnea syndrome, non-alcoholic fatty liver disease (NAFLD) and dyslipidemia, all risk factors for cardiovascular disease .[3] Visceral obesity leads to insulin resistance in part mediated by adipokines and free fatty acids (FFA). Adipokines such as resistin and retinol-binding protein 4 decrease insulin sensitivity, whereas leptin and adiponectin have the opposite effect. In addition, cytokines like TNF-α and IL-6, which originate from macrophages in adipose tissue, are involved .[2]

The typical dyslipidemia of obesity consists of increased triglycerides (TG) and FFA, decreased HDL-C with HDL dysfunction and normal or slightly increased LDL-C. The concentrations of plasma apolipoprotein (apo) B are also often increased, partly due to the hepatic overproduction of apo B containing lipoproteins .[3] Lipolysis of TG-rich lipoproteins is impaired in obesity by reduced mRNA expression levels of Lipoprotein lipase (LPL) in adipose tissue , reductions in LPL activity in skeletal muscle and competition for lipolysis between VLDL and chylomicrons. Increased postprandial lipemia leads to elevated levels of FFA, resulting in detachment of LPL from its endothelial surface. The exchange of TG from these remnants for cholesterol-esters from HDL by CETP with the concerted action of hepatic lipase, ultimately leads to the formation of small dense LDL. In the presence of hypertriglyceridemia, the cholesterol-ester content of LDL decreases, whereas the TG content of LDL increases by the activity of CETP. However, the increased TG content within the LDL is hydrolyzed by hepatic lipase, which leads to the formation of small, dense LDL particles. Small dense LDL are relatively slowly metabolized with a five day residence time, which enhances its atherogenicity.[3]

**Classification of Overweight and Obesity by BMI, Waist Circumference, and Associated Disease Risk. [4]**

| | BMI (kg/m2) | Obesity Class | Disease Risk* (Relative to Normal Weight and Waist Circumference) | |
|---|---|---|---|---|
| | | | Men ≤40 inches (≤ 102 cm) Women ≤ 35 inches (≤ 88 cm) | > 40 in (> 102 cm)<br>> 35 in (> 88 cm) |
| Underweight | < 18.5 | | - | - |
| Normal† | 18.5–24.9 | | - | - |
| Overweight | 25.0–29.9 | | Increased | High |
| Obesity | 30.0–34.9<br>35.0–39.9 | I<br>II | High<br>Very High | Very High<br>Very High |
| Extreme Obesity | ≥ 40 | III | Extremely High | Extremely High |

*Disease risk for type 2 diabetes, hypertension, and cardiovascular disease.

Normal BMI patients with increased waist circumference have been at increased risk for dyslipidemia and it's atherogenic effects.[4] However, BMI should be routinely assessed in every clinic for both children and adults to facilitate early identification, evaluation and management of obesity and its associated disorders.[4]

A study conducted in Turkey population to estimate the prevalence of dyslipidemia [5] consisting of 4809 subjects found that dyslipidemia was significant in high BMI in men than in women with a significant high cardiac risk. The prevalence of dylipidemia increased with age, with the highest prevalence in the 60-69-years. The trend of high TC, LDL-C and TG, a high TC/HDL-C ratio and low HDL-C increased steadily in line with BP, BMI, waist circumference, Waist Hip Ratio, and FBG ($P < 0.0001$).

A study by Pandya et al.[6] in the Gujarati population consisting of 400 subjects also found that total cholesterol, LDL and LDL and TGs are relatively high among high BMI when compared with normal BMI persons[6]

Our study also showed that Total cholesterol is significantly high ($p=0.019$) with high BMI compared with normal BMI. These findings are consistent with the findings of Philip et al.[7]

Our study also concluded that LDL Cholesterol is high in obese individuals. These findings are consistent with the studies of Grundy and Barnett who have proposed in their chapter that increased LDL, decreased HDL are important risk factors for developing cardiovascualr disease and mortality.[8]

In the study by Lemieux et al.[9] comprising of 907 men who participated in Quebec Health Survey, to quantify the prevalence of the 'hypertriglyceridemic waist', were subjected to A triad of metabolic markers (high insulin and apolipoprotein B levels, and small, dense, low density lipoprotein particles. They found that 19% had an elevated waist circumference (90 cm or greater) plus elevated triglyceride levels (2.0 mmol/L or higher). They also displayed a metabolic risk profile that was deteriorated to the same extent as that of men with diabetes who had participated in the survey moreover suggested a increased cardiovascular risk by calculating the Framingham risk score.

Management of dyslipidemia ranges from lifestyle modification, Diet modification and drugs.

According to National Cholesterol Education Program guidelines (NCEP)[10], the target LDL cholesterol value in patients with coronary heart disease or other atherosclerotic disease is 100 mg per dL (2.60 mmol per L) or lower. If the LDL level does not exceed 100 mg per dL in a patient with coronary heart disease, the patient should begin the step I diet, regularly participate in physical activity and stop smoking. Annual lipoprotein analysis is indicated for this group. Premenopausal women and men 35 years of age or younger with dyslipidemia but without other risk factors for coronary heart disease or a genetic predisposition are generally considered at low risk.

The NCEP guidelines recommend that patients at higher risk of coronary heart disease receive more intensive interventions for dyslipidemia than patients at lower risk. For all practical purposes, treatment of patients with multiple risk factors for coronary heart disease but without a history of coronary disease should be as aggressive as that for patients with coronary heart disease.[10] Use of aspirin has been indicated in patients with Framingham risk score more than 10. In a study by Steven C et al[11], they included 1087 patients and concluded 10 year risk of myocardial infarction or coronary death of more than 10% or diabetes with one other cardiac risk factor. Aspirin has been proven beneficial in the primary prevention of CHD. By implementing the Framingham risk score , appropriate utilization of aspirin can be improved and cardiac events can be reduced.[11]

In a study by Chitra U et al[12], Included 316 patients and concluded that patients who exercise for more than 30 minutes per day, had lower LDL and Total Cholesterol levels with higher LDL levels and recommends daily exercise to all patients.[12]

There are limited studies on dyslipidemia in Indians. The prevalence of dyslipidemia in India ranges from 10% to 73% in various studies[13] depending on socio-economic strata (high vs. middle or low), the area of residence (rural vs. urban) and age.

In our study, most of the population belongs to rural areas, and the prevalence of dyslipidemia was high in obese individuals in comparison to non obese individuals. Total Cholesterol and Serum LDL levels were significantly high in obese individuals and is associated with high cardiac risk after 10 years. HDL was low in obese individuals but the data was statistically non significant.

## CONCLUSION-

In our study, we concluded that, in healthy Individuals, it is the Total Cholesterol and Serum LDL Levels which are significantly high in obese individuals in comparison to non obese individuals and is the cause of complications occurring in these individuals.

Other studies suggest that Hypertriglyceridemia, Increased Total cholesterol and decreased HDL are seen in obese individuals and is associated with higher cardiac risk by Framminghamscore.

Health education on lifestyle modifications through various media is being provided regularly but the prevalence of obesity and its associated complications is on a surge worldwide, and is one of the major public health problems, which is also proven by the present study.

Dyslipidemia when detected should be promptly treated by Lifestyle Modificiation and Diet Control. Patients can be started on anti lipidemic drugs who are at high risk for developing morbidities and Aspirin is indicated in patients with Framingham score more than 10.

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