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Original Research Article

Correlation between serum lipid profile and body mass index in young healthy medical students

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ABSTRACT

Background: Obesity is defined as increased accumulation of fat in various tissues in the body causes impairment in the body. The cause for obesity is imbalance between calories intake and calories expenditure There is increased intake of calorie rich foods and reduced physical activity due to urbanization all over the world.

Body mass index is simple index to divide obesity among adults. It is defined as person's weight in kilograms divided by height in meter squares (m^2).

Obesity and elevated BMI are the major causes for development of chronic diseases like stroke, hypertension, malabsorption syndrome, Type 2 diabetes and other cardiovascular disorders.

BMI and obesity are the modifiable risk factors of type 2 diabetes, cardiovascular disorders and hypertension. This study was carried out to correlate the relationship between BMI and lipid profile among young healthy medical students.

Methods: This study comprises 45 males and 55 females (100 in total) young adults aged between 18 to 25 years. The design for this study was cross-sectional survey. Ethical approval was taken from ethical committee of BMCH, Chitradurga. BMI, lipid profile levels are measured from the subjects.

Results: A total of 100 participants were tested. Among them 45 males were males and 55 were females. The mean age of the subjects was 22 years. Among them, 30 were overweight and 17 were obese while, 4 were underweight. The mean BMI was 26.72±3.45 Kg/m^2.

Mean serum cholesterol in 100 students was 147.63 ± 15 mg/dl, mean LDL-C was 85.23±14.8 mg/dl, mean HDL-C was 23.22±5.56 mg/dl and mean triglycerides were 76.6 ±18.5 mg/dl. The mean BMI of students was 22.5 kg/m^2 ±5.5.

Conclusion: It was found in our study that prevalence of overweight is the major driving forces in the development of diabetes mellitus, hypertension, metabolic syndrome. Prevalence of obesity is significantly higher among young adults. This prevalence may be due to lack of awareness and unhealthy lifestyles, so health education and more preventive measures should decrease the prevalence of obesity and cardiac risks in our medical college by modifying their lifestyle.

1. Introduction

Obesity is defined as an excess accumulation of fat in the body resulting in adverse effects on health of the individual.[1] Obesity is becoming a major health burdon in developing countries like in India.[1] Almost about 50-70% of adult Indians are either overweight or obese or have abdominal obesity. The increasing prevalence of obesity in India has a direct correlation with the increasing prevalence of obesity-related co-morbidities; hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetes mellitus (T2DM), stroke and cardiovascular disease (CVD).[1]

Obesity is now estimated to be the second leading cause of mortality and morbidity, causing an estimated 2.6 million deaths worldwide and 2.3% of the global burden of

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disease.[2] There is an overall consensus that obesity poses a significant risk for the development of cardiovascular disease, alterations in glucose metabolism and reduces life expectancy.[3]

Lipids and lipoproteins are well known risk factors for the development of ischemic heart disease. Increased levels of triglyceride, cholesterol and LDL-C are documented as risk factors for atherosclerosis[4] LDL-C in its oxidized or acetylated form has been identified as a major atherogenic particle, as it not only load macrophages with cholesterol for the formation of foam cells but also because it is chemotactic for circulating monocytes, is cytotoxic and can adversely alter coagulation pathways.[5–7] The blood level of HDL-C in contrast bears an inverse relationship of the risk of atherosclerosis and coronary heart disease that is higher the level, smaller the risk.[8,9]

Association of lipid profiles with obesity and BMI has been reported.[10] Waist circumference is increasingly being accepted as the best anthropometric indicator of abdominal adiposity and metabolic risk. There is limited published data about the association of body mass index BMI) with lipid profile among healthy medical students.

2. Materials and Methods

This study comprises 45 males and 55 females (100 in total) young adults aged between 18 to 30 years. The design for this study was cross-sectional survey. Informed consent was taken from all the participants. Ethical approval was taken from ethical committee of BMCH, Chitradurga. Participants who are having history of diabetes, hypertension or Dyslipidemia with and without treatment are excluded from the study.

2.1. Data collection procedure

The following parameters are measured for all the study subjects anthropometric, and lipid profile.

1. The weight of the subject was measured by using weighing machine in kilograms(kg). The height of the subject was measured in centimeter without the shoes. BMI was calculated by dividing weight in kilogram by square of height in meter (kg/m^2).

Table 1:

WHO classification of BMI	
BMI <18.5	Underweight
BMI 18.5-24.9	Normal
BMI25-29.9	Overweight
BMI >30	Obese

2.2. Laboratory investigations

Blood samples were collected from the antecubital vein, in the early morning, after a minimum of 12 hours of fasting period, in a supine position. Biochemical analysis Serum cholesterol, (TC) triglycerides (TG), Serum high density lipoprotein (HDL) were measured by International Federation of clinical chemistry (IFCC) approved enzymatic methods processed Autoanalyzer Erba- 200.

2.3. Statistical analysis

Statistical analysis was performed with the SPSS version 20. The differences between different groups of BMI were compared using one-way analysis of variance (ANOVA). The statistical significance was set at the P value of less than 0.05.

3. Results

The total participants of100 healthy young students males and females were enrolled for the study. Based on the value of BMI, subjects were classified as underweight (BMI < 19 kg/m^2), normal weight (BMI 19-26 kg/m^2), Overweight (BMI>26 kg/m^2).

Mean serum cholesterol in 100 students was 147.36 ± 24 mg/dl, mean LDL-C was 84.52 ±32.8 mg/dl, mean HDL-C was 19.76±7.87 mg/dl and mean triglycerides were95.23 ±26.8 mg/dl.

The mean BMI of students was 22.9 kg/m^2 ±5.4. Among 100 students, 35 were underweight that is their BMI was less than 19 kg/m^2, 65 were normal that is their BMI was between 19 kg/m^2 and 26 kg/m^2 and 25 were overweight that is their BMI was more than 26Kg/m^2. Mean values of serum cholesterol, LDL-C, HDL-C, triglycerides; VLDL and Triglycerides with their standard deviations according to three BMI groups are given in Table 2. There was significant correlation found between any of the lipid profile variables with different BMI groups.

4. Discussion

In this study, various BMI groups (underweight, normal and overweight) are compared with regards to serum total cholesterol, LDL-C, HDL-C, triglycerides, and VLDL.

In our study we found out that cholesterol level, LDL, triglycerides levels are significantly higher in overweight BMI group as compared to normal weight adults. HDL is found to be slightly lower in overweight BMI group. VLDL is found to be slightly higher in overweight individuals.

Obesity and overweight poses high risk for the development of various non communicable diseases like hypertension, type 2 diabetes mellitus, stroke, myocardial infarction and other cardiovascular diseases.

Being overweight or obese has adverse metabolic effects on cholesterol and triglycerides. Free fatty acids (FFA) are

Table 2: Cholesterol, LDL-C, HDL-C, triglycerides, according to three BMI groups (Mean ±SD)

Variables	Under weight (BMI<19kg/m^2)	Normal (BMI19-26kg/m^2)	Overweight (BMI>26kg/m^2)	p- value*
Cholesterol (mg/dl)	141.26 ±24.8	152.26 ±24.3	159.27 ±15.9	0.28
LDL (mg/dl)	82.25 ±18.8	90.27 ±26.7	96.12 ±20.3	0.43
VLDL (mg/dl)	14.22±2.45	15.21±3.57	17.18±4.6	0.05
Triglycerides (mg/dl)	75.3 ±16.3	81.18 ±24.7	89.1 ±26.21	0.04
HDL-C (mg/dl)	49.32 ±4.8	49.5 ±5.1	45.43 ±4.5	0.54

*p-value calculated by ANOVA comparing the means of the variables for the three BMI groups P<0,05 considered significant

released in excess from adipose tissue in the body leading to production of triglycerides in the liver and secretion of VLDL. Hypertriglyceridaemia and VLDL reduce HDL cholesterol. Circulating FFA, may contribute to the induction of hypertension, type 2 diabetes mellitus.Certain previous studies showed that hyperinsulinemia and insulin resistance are strongly correlated with obesity and elevated BMI.

It has been estimated that risk of myocardial infarction is 55% to 75% less in adults with normal weight as compared to obese adults. However, the influence of obesity on cardiovascular risk begins from adolescence and is associated with an increased risk of coronary heart disease in male and female subjects.

Previous studies found that an accumulation of LDL in the arterial wall is an essential step in the initiation of atherosclerosis. Increased permeability of the endothelium and increased retention of LDL particles within the intima are important underlying mechanisms. Small LDL particles are more likely to be retained in the intima than large buoyant LDL particles. LDL particles may undergo chemical modification within the intima and become oxidized. OxLDL may enter white blood cells (leukocytes) called macrophages, which subsequently transform into foam cells. Foam cells are commonly found in atherosclerotic plaques. Products of oxLDL may provoke vascular wall cells to produce cytokines, which promote recruitment of inflammatory cells into the vascular wall. Immune reactions and low-grade inflammation play a crucial role in the formation and progression of atherosclerotic plaques.

Rupture of the plaque surface, often with superimposed blood clotting (thrombosis), frequently occurs during the evolution of coronary atherosclerotic lesions. Plaque rupture is an important mechanism underlying most cases of acute heart attack and sudden cardiac death. Plaques that are prone to rupture are termed vulnerable plaques.

As 20% students of our total study population are overweight, so number of at-risk individuals is much higher. Therefore, strategies designed to limit cardiovascular risk should address weight reduction during childhood and adolescence.

5. Conclusion

It was found that higher prevalence of overweight and obesity is the major driving forces in the development of hypertension, cardiovascular diseases, diabetes mellitus and metabolic syndrome.

Obesity is more common in significant among young adult population. This higher prevalence may be due to lack of awareness and unhealthy lifestyles, so health education and more preventive measures will help to decrease the prevalence of obesity and cardiac risks in our medical college by modifying their lifestyle.

Initially, Identifying students who are gaining weight, overweight or obese, is a first step in preventing and treating overweight by various interventions.

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