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Study of Serum Cholesterol in obese and non-obese subject

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Abstract

The global epidemic of overweight and obesity is rapidly becoming a major public health problem in many parts of the world. Rapidly changing diets and lifestyles are fueling the global obesity epidemic**.** It is associated with an increased risk of developing various non-communicable diseases, including hypertension, coronary heart disease, diabetes, stroke and some forms of cancer**.** Obesity has been found to be associated with changes in levels of serum cholesterol and it may differ with age, sex, weight, height, BMI (Body Mass Index) and life style groups. This study aims at measuring and correlating values of serum cholesterol level in obese and non-obese individuals. It has been found that obese individuals having increased BMI and sedentary life style had high cholesterol level as compared to non-obese individuals. They are at high risk for CHD, so early detection of alteration in serum triglyceride level will prevent CHD and non-communicable diseases.

Keywords: Body mass index, Diabetes, Fat, Hypertension, Obesity

Introduction

According to the World health organization[1], obesity is a condition in which body mass index (BMI) of a person goes beyond 30.

Obesity is a multifactor disorder and its development is due to multiple interactions between genes and environment. The primary cause for being overweight and obese is unhealthy dietary habits, reduced physical activities as well as the genetic predisposition.[2]

Obesity is perhaps the most prevalent form of malnutrition. As a chronic disease, prevalent in both developed and developing countries, and affecting children as well as adults, it is now so common that it is replacing the more traditional public health concerns including under nutrition. It is most significant contributors of ill health.[3]

In 2014, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 600 million were obese. Overall, about 13% of the world's adult population (11% of men and 15% of women) was obese in 2014. In 2014, 39% of adults aged 18 years and over (38% of men and 40% of women) were overweight. The worldwide prevalence of obesity more than doubled between 1980 and 2014.[4]

Total cholesterol comprises all the cholesterol found in various lipoproteins such as high-density lipoproteins (HDL), low-density lipoproteins (LDL), and very low-density lipoproteins (VLDL).

According to the **NCEP ATP III (National cholesterol education program Adult treatment panel-III)**[5] Total cholesterol level less than 200 mg/dl is considered as normal while more than 240 mg/dl is considered as risk factor for CHD. LDL Cholesterol less than 100 mg/dl & HDL cholesterol more than 60 mg/dl is considered normal.

The present study aims to correlate and test the hypothesis that there are metabolic derangements in obese individuals like altered Serum cholesterol level.

Material and Methods

The study was carried out in Physiology department of Smt. N.H.L. Municipal Medical College & V.S. general hospital, Ahmedabad during a time period from June 2008 to November 2010. Total sixty five obese subjects of the age group between 20-70 yrs, coming for health check-up at this institute, were selected for the study. Subject with BMI 30 or more than 30 are taken as obese.

Thirty five non-obese volunteers who were non-smokers and non-tobacco chewers with BMI less than 30, age group of 20-70 years were selected for control or comparison of the study.

Subjects taking lipid lowering agents, with hypothyroidism, taking oral contraceptive pills and with any metabolic disorder affecting lipid profile were excluded.

The ethical committee of the hospital gave ethical approval for the study. Informed consent prior to study was taken from all the subjects.

Information about Name, Age (years), Sex, Education, Occupation, Weight (kilogram), Height (meter), Address, any history of metabolic diseases (diabetes, hypertension etc.) is obtained from each subjects.

The weight was taken using battery operated body weight scales & height was measured by using a 'drop down' tape measure fixed at about 2metres on a wall, subjects were asked to remove any heavy objects with

them like keys, wallet, ornaments, and shoes etc. before taking the readings for weight & height.

BMI calculated for all the subjects using readings of weight in kilograms & height in meter.

BMI = Weight (kg)/Height $(m)^2$

All the subjects were divided according to their life style in active, moderately active & sedentary groups[6].

Blood sampling was done after ten hours of overnight fasting. The venepuncture was done in the cubital fossa and serum was separated by centrifugation at 5000 rpm for 10 minutes, the supernatant clean serum was then pipetted out and the samples were analysed in Erba Mannheim Model XL 600 automated analyser.

Fasting lipid profile is done to measure total cholesterol[7] by cholesterol oxidase method, LDL[8,9,10] and HDL cholesterol[11] by direct kit method using liquid stable reagent – poly venyl sulfonic acid & poly ethyl glycol, methyl ether coupled classic precipitation method).

Results

Following observation were made from the study of lipid profile in 65 obese and 35 non obese subjects.

Table 1: Serum cholesterol parameters

Variables in (mg/dl)	Mean±SD of obese	Mean ± SD of non-obese	p- value
Total Cholesterol	222.91±48.65	163.96±30.65	0.0001
LDL	135.54±56.90	97.54±33.84	0.001
HDL	46.2±13.23	46.26±11.11	0.982
VLDL	47.44±25.96	37.19±36.82	0.109
LDL/HDL Ratio	3.13±1.47	2.15±0.8	0.001

There is a significant difference in S. Cholesterol, S.LDL and LDL/HDL ratio in obese and non-obese subject. There is not a significant difference in S. HDL and S. VLDL in obese and non-obese subjects.

Table 2: Comparing S. cholesterol in obese with different life style

Variables in (mg/dl)	Mean±SD of Active life style	Mean±SD of Moderately Active life style	Mean±SD of Sedentary life style	p-value
Serum Cholesterol	176.67±29.91	198.84±51.15	229.62±54.64	0.009
Serum HDL	43.26±8.2	47.98±15.98	44.52±9.6	0.5172
Serum LDL	113.85±35.45	126.45±65.04	155.01±44.19	0.0943
Serum VLDL	54.34±24.10	44.47±27.33	49.63±24.89	0.5816
LDL/HDL Ratio	2.64±0.72	2.82±1.42	3.72±1.56	0.0431

Level of serum cholesterol and LDL/HDL ratio is showing significance (p value<.05) with life style of individuals.

Table 3: Comparing S. Cholesterol in obese and non – obese with different age groups

Sr No	Age groups (yrs)		Serum LDL		Serum HDL		Serum cholesterol	
			Mean±S.D.	P value	Mean±S.D.	P value	Mean±S.D.	P value
1	20-40	Obese (N=16)	111.04±36.94	0.2023	43.16±9.44	0.2074	195.96±29.67	0.6082
		Non-obese (N=20)	95.14±36.12		47.94±13.01		164.85±36.30	
2	41-60	Obese (N=45)	143.86±61.12	0.0141	45.85±9.74	0.5878	232.83±50.42	0.0001
		Non – obese (N=11)	95.15±33.40		44.18±5.49		158.91±22.61	
3	60-70	Obese (N=4)	127.15±48.10	0.6913	44.52±16.03	0.8566	19.1±58.59	0.1424
		Non – obese (N=4)	116.12±21.99		43.55±13.47		167.35±18.08	

Above table is showing that in age group of 41 to 60 yrs the serum LDL and Serum Cholesterol level is significantly higher (p value <.05) in obese individuals as compared to non-obese individuals while in age group 20 to 40 and 61 to 70 yrs it is not showing any significance (p value >.05) this could be due to small sample size in these age groups.

Discussion

According to a Comparative Study of blood lipid profile of obese and non-obese sedentary college men[12], When various parameters of blood lipid profile were compared it was observed that there was significant difference between obese and non-obese subjects in relation to total cholesterol triglycerides and high density lipoprotein. On the average, the more fat, the more likely an individual will be dyslipidemic and to express elements of the metabolic syndrome.

Mechanism contributing to complications of altered lipid profile in obesity is due to excessive fat in visceral adipocytes which release an excess amount of Free Fatty Acids. This further increases synthesis of triglycerides and secretion of VLDL rich in triglycerides into circulation increasing fasting TG blood levels. Through cholesteryl ester transfer protein (CETP), TGs from VLDL are exchanged for cholesterol in HDL. TG-rich LDL and VLDL subsequently undergo hydrolysis by hepatic lipase or lipoprotein lipase leading to formation small, dense LDL particles which are more toxic and atherogenic[13]. This atherogenicity is the root cause for all obesity related complications.

According to a study of Obesity in Spanish Schoolchildren: Relationship with Lipid Profile and Insulin Resistance[14] .When comparing the lipid profile between obese and non-obese children, they observed that, in both sexes, obese children had significantly higher serum cholesterol & serum LDL levels than non-obese children. The findings of our study are also almost similar in which obese subjects are having higher triglycerides level.

According to a study of blood triglyceride in obese and overweight patient at Cardiology department, University of Lubin, 2003.[15] It was observed that the total triglycerides concentrations is higher in obese.

Present study showed statistically significant higher values of Serum cholesterol & serum LDL in obese individuals. These results are in accordance with a cross sectional study done during 2009-10 by Michael Khoury, Cedric Manlhiot et al which showed statistically significant association between lipid profile and measures of adiposity[16]. Another case control study of adolescents done by Gilles Plourde on caucassian adolescents also revealed that overall abnormal glucose and lipid profile were significantly associated with obesity[17].

Conclusion

In present study the values of harmful lipid like total cholesterol and LDL levels in obese group was significantly higher, early and immediate interventional measures like increase in physical activity, healthy dietary habits and regular surveillance are required in them to prevent development of irreversible dangerous complications.

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