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Original Research Article

Study of Lipid Profile and Blood Pressure in Obese and Non-Obese: A Comparative Study

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Abstract

Background: Obesity affects life span of an individual by increasing morbidity and mortality. Obese individuals usually affected by lipid abnormalities which serve as risk factors for complications like cardiovascular disease, hypertension, diabetes mellitus etc. The study aimed to evaluate lipid profile and blood pressure in obese and non-obese. ***Materials and Methods:*** Study was carried out at Department of Medicine, GG Hospital, Jamnagar over a period of one year. Total 105 subjects were enrolled in this cross sectional study after informed consent. Body Mass Index (BMI) and blood pressure were recorded by standard protocol. Based on BMI, subjects were divided into three groups: Group I - Normal weight (18.5 to 24.9 kg/m^2) , Group II - Overweight (25 to 29.9 kg/m^2) Group III - Obese (more than 30 kg/m^2). Overnight fasting blood samples were collected and were analyzed for parameters like serum cholesterol, serum triglycerides, serum HDL, serum LDL & serum VLDL. ***Results:*** Blood pressure was elevated in Gr-III as compared to Gr-I+II ($p<0.001$). Serum Cholesterol, triglycerides, LDL, VLDL were elevated in Gr-III as compared to Gr-I+II ($p<0.001$). HDL was decreased in Gr-III compared Gr-I+II ($P<0.001$). ***Conclusion:*** Obese subjects showed lipid abnormalities like elevated Cholesterol, triglycerides, LDL, VLDL levels and decreased HDL level. Elevated blood pressure is also associated with Obesity.
Keywords: Obesity, Body mass index, Lipid profile.

INTRODUCTION

Obesity is a complex disorder which can be seen as can be seen as mixture of non-communicable disease. The WHO has described obesity as one of the most neglected public health problem, affecting every region of the globe [1]. In obese individual, there is an excess accumulation of fat which imposes an extra burden on cardiovascular system. With changing food habits and sedentary lifestyles, the prevalence of obesity has increased markedly in Western countries faster than the developing ones [2]. In India the current scenario showed "nutrition transition" which is associated with a change in the structure of the diet, reduced physical activity and rapid increase in the prevalence of obesity [3]. Elevated blood pressure suggestive of hypertension in youth is associated with obesity [4]. It is speculated that obesity may be the strongest modifiable risk factor for hypertension [5]. As per WHO, body mass index is the most useful epidemiological measure of obesity. It is nevertheless a crude index that does not take into account the distribution of body fat [6]. Obesity is one of the key risk factors for other chronic diseases together with smoking, high blood pressure and high blood cholesterol and type-2 Diabetes mellitus. Raised BMI increased the risk of cancer of the breast, colon, prostate, endometrium, kidney and gallbladder. Obese patients are affected by abnormal lipid profile parameters namely elevated Cholesterol, triglycerides and LDL. In adults, high LDL is strongly associated with a higher risk of coronary heart disease (CHD) while high HDL is usually protective. Lowering lipids through dietary or pharmacological therapy has been shown to decrease the incidence of atherosclerotic events [7]. The metabolic defects that ensue in obesity include increased levels of free fatty acids resulting from insulin resistance, increased LDL, VLDL and triglycerides and decrease in HDL. 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 to IDL, IDL to LDL [8]. Therefore in this study attempt has been made to to determine the effect of obesity on the serum lipid profile & try to compare the levels of lipid profile between obese subjects and non-obese subjects.

MATERIAL & METHODS

The study was a hospital based cross sectional study conducted at Department of Medicine, GG Hospital, Jamnagar over period of one year. Total 150 subjects were recruited according to simple random sampling method and selection criteria.

Inclusion Criteria

Both male and female subjects who are willing to participate in study, having Body Mass Index (BMI) > 18.5 kg/m^2, Age more than 20 years.

Exclusion Criteria

Subjects who are known case of obesity secondary to hypothyroidism, Cushing's syndrome, Hypothalamic disease and Pregnancy. Patients having diseases like congestive cardiac failure, renal failure, cirrhosis with ascitis. Obese patients taking lipid lowering drugs or any drugs affecting lipid metabolism were also excluded.

Subjects were explained the purpose and protocol of the study. After informed consent, BMI & blood pressure parameters (systolic blood pressure-SBP, diastolic blood pressure-DBP, pulse pressure-PP, mean arterial blood pressure-MAP) measured. BMI was measured by formula =body weight in (kg)/height in meter^2. Blood pressure was measured in sitting position by using sphygmomanometer. Subjects were divided into 3 groups according to BMI, Group I - Normal weight (18.5 to 24.9 kg/m^2) ,Group II - Overweight (25 to 29.9 kg/m^2) Group III - Obese (more than 30 kg/m^2). Overnight fasting blood samples were collected with aseptic precautions to measure following parameters: Serum Cholesterol, Serum Triglyceride, Serum HDL, Serum LDL, Serum VLDL. Analysis were done using following methods: Serum cholesterol was estimated by enzymatic cholesterol oxidase – peroxidase (end point colorimetry), Serum Triglyceride was estimated by enzymatic GPO-PAP (end point colorimetry), Serum HDL - cholesterol was estimated by Polyethylene Glycol (endpoint colorimetry), Serum LDL - cholesterol was estimated by Friedwald's formula, Serum VLDL - cholesterol was calculated by Formula = Serum triglyceride / 5. Statistical analysis was done by using GraphPad Prism software. Values were shown in Mean±SD. Unpaired student's t-test was applied to test difference between means. Pearson Correlation co-efficient (r) was calculated to test correlation between parameters. Statistical significance was accepted at p value of <0.05.

RESUTS

The study was carried out on 105 subjects, out of which 50 were males and 55 were females. The subjects were divided into three groups according to their body mass index and each group contains 35 subjects. Table-1 shows mean value of age and BMI. Table-2 shows mean lipid profile parameters in obese and non-obese subjects.

Table-3 shows mean value of blood pressure parameters which suggested that all the blood pressure parameters were elevated in Gr-III as compared to Gr-I & II.

Table-4 shows comparison of lipid profile parameters and blood pressure parameters between non-obese (Gr-I+II) and obese subjects (Gr-III).

Table-4 showed elevated cholesterol, triglycerides, LDL, VLDL and in Gr-III as compared to Gr-I+II. It also shows elevated blood pressure parameters in Gr-III compared to Gr-I+II.

Table-5 shows correlation coefficient between lipid profile and BMI. As per table-5, all lipid profile parameters were positively correlated with BMI except HDL which was negatively correlated.

Table-6 shows correlation coefficient between blood pressure and BMI. As per table-6, blood pressure was positively correlated with BMI.

Table-1: Mean Value of Age and BMI

Group	No. of Subjects	Age (years)		BMI (kg/m^2)	
		Mean	± SD	Mean	± SD
I	35	38.39	10.66	23.40	2.11
II	35	41.64	10.54	26.60	1.33
III	35	48.10	9.58	32.60	1.82

Table-2: Mean value of lipid profile parameters

Parameters	Group I		Group II		Group III	
	Mean	± SD	Mean	± SD	Mean	± SD
Cholesterol	170.90	18.30	194.80	21.37	218.68	23.31
Triglycerides	121.28	27.08	144.46	36.19	170.91	22.35
HDL	48.88	9.18	44.86	7.05	39.54	6.80
LDL	100.34	14.91	125.23	20.07	145.41	23.14
VLDL	24.61	4.06	25.71	4.68	32.70	5.29

Table-3: Mean Value of Blood Pressure Parameters

Parameters	Group I		Group II		Group III	
	Mean	± SD	Mean	± SD	Mean	± SD
SBP	119.37	6.65	126.40	8.94	134.68	13.95
DBP	78.34	3.74	81.88	4.57	85.94	7.18
PP	41.03	3.58	44.51	5.75	48.74	7.93
MAP	92.02	4.60	96.72	5.77	102.19	9.24

Table-4: Comparison between non-obese subjects and obese subjects

Parameters	Non obese (Group I+II)	Obese (Group III)	t-test	p value
Cholesterol	185.85	218.68	6.267	< 0.0001
Triglycerides	133.87	170.91	5.385	< 0.0001
HDL	45.87	39.54	-3.717	0.0003
LDL	113.81	145.41	6.636	< 0.0001
VLDL	26.16	32.70	5.296	< 0.0001
SBP	122.88	134.68	5.349	< 0.0001
DBP	80.11	85.94	5.087	< 0.0001
PP	42.77	48.74	4.687	< 0.0001
MAP	94.37	102.19	5.348	< 0.0001

Table-5: Correlation coefficient between lipid profile and BMI

Blood pressure parameters	Correlation Coefficient (r)	p	95% Confidence Interval for r
Cholesterol	0.6723	< 0.0001	0.55 – 0.76
Triglycerides	0.5834	< 0.0001	0.44 – 0.70
HDL	-0.4164	< 0.0001	-0.56 – 0.24
LDL	0.7068	< 0.0001	0.59 – 0.79
VLDL	0.5297	< 0.0001	0.37 – 0.65

Table-6: Correlation coefficient between blood pressure and BMI

Blood pressure parameters	Correlation Coefficient (r)	p	95% Confidence Interval for r
SBP	0.6002	< 0.0001	0.46 – 0.71
DBP	0.5656	< 0.0001	0.42 – 0.68
PP	0.5494	< 0.0001	0.40 – 0.67
MAP	0.5945	< 0.0001	0.45 – 0.70

DISCUSSION

Obesity has become a major worldwide health problem. In every single country in the world, the incidence of obesity is rising continuously and therefore, the associated morbidity, mortality and both medical and economical costs are expected to increase as well. The majority of these complications are related to co-morbid conditions that include coronary artery disease, hypertension, type 2 diabetes mellitus, respiratory disorders and dyslipidemia [1]. In this study value of all lipid profile parameters (cholesterol, triglycerides, LDL, VLDL) except HDL are significantly higher in overweight and obese subjects as compared to normal weight subjects. The similar findings were also observed in studies conducted by Mukhopadhyay SK *et al*., [9], Thakur JS *et al*., [10] and Abdul Rahman [11]. However, study conducted by Mishra N *et al.*, [12] was in contrast with the findings observed in present study. The typical lipid abnormalities observed in obesity is multifactorial and includes hepatic overproduction of VLDL, decreased circulating TG lipolysis and impaired peripheral free fatty acid (FFA) trapping, increased FFA fluxes from adipocytes to the liver and other tissues and the formation of small dense LDL [13]. In the present study, the mean value of systolic and diastolic blood pressure is significantly higher in overweight and obese subjects than in normal weight subjects. Similar study conducted by Renu Lohitashwa *et al*., [14]. on first year medical and dental students of 17 – 20 years age group enrolled in the academic years 2008– 09 and 2009 – 10 to J. N. Medical College, Belgaum found significantly higher mean value of systolic and diastolic blood pressure in overweight and obese students as compared to normal weight students and that was comparable with present study. The factors generally considered responsible for obesity-related alterations in the pressure-natriuresis curve include enhanced sympathetic tone, activation of the renin-angiotensin system (RAS), hyperinsulinemia, structural changes in the kidney, and elaboration of adipokines (hormones produced in fat itself) such as leptin [15, 16].

CONCLUSION

Obese persons are prone to develop elevated serum cholesterol, triglyceride, LDL and VLDL

cholesterol as compare to non obese. There is a positive correlation of serum cholesterol, triglyceride, LDL and VLDL level with body mass index in this study, and there is negative correlation of serum HDL level with body mass index. The mean values of blood pressure parameters are more in obese subjects as compared to non-obese subjects. There is a significant positive correlation between various blood pressure parameters and body mass index in this study. From the present study, it is concluded that obese subjects are at higher risk of development of dyslipidemias & hypertension.

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