ORIGINAL ARTICLE

Obesity is a Major Risk Factor of Cardio Vascular Disease (CVD) in Adults

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ABSTRACT

Objective: To classify obesity into different classes on the basis of body bass index and waist hip ratio and to correlates all parameters of lipid profile with insulin hormones and insulin resistance value which causes diabetes and atherosclerotic cardiovascular diseases events.

Patients and methods: This descriptive study was carried out from free camp for obesity in Clifton area and Punjab Colony, Karachi from November 2010 to April 2011. Overweight adults (20-40 years) were selected along with the history of Xanthoma, yellow coloration of eyes, and high blood pressure and cardiac arrest. One hundred samples were taken for fasting blood sugar (FBS), lipid profile, insulin, insulin resistance (IR). The measurement of body mass index (BMI), and waist hip ratio and some biochemical parameters was measured by following the criteria of the National Heart Lung and Blood Institute.

Results: Hundred patients were selected for the purposes of study. body mass index was increases in both adult male and female (M=31.27±1.2, F=31.3±0.27), and waist hip ratio was slightly increases in adult male (1.2±0.04) as compared to female (1.1±0.025).The statically analysis was carried out in all parameters of lipid profile in both male and female adult obese. In female obese cholesterol, (280.29±2.38), triglycerides [TG] (180.14±1.93) and low-density lipoprotein [LDL] (178.95±1.58) was slightly increased, as compared with male obese i.e., cholesterol (277.51±2.06), triglycerides (175.62±2.32), and low density lipoprotein (177.08±1.79), whereas high density lipoprotein (HDL) was slightly decreases in female obese (21.83±0.68) as compared with male obese cases (23.56±0.66). The analysis was carried out on the fasting blood sugar level. The fasting blood sugar level was high in the female obese (160.04±2.55) than male obese (151.96±2.32). The analysis was also applied on insulin level and insulin resistance. It was noted that there was slightly increase level of insulin in male (M= 5.82±0.24) as compared with (F=5.77±0.25), whereas insulin resistance was also slightly increased in males (M=1.88±0.061) when compared with female.

Conclusion: Triglycerides, low-density lipoprotein, high-density lipoprotein, fasting blood sugar, insulin and insulin resistance are a major risk factor of cardiovascular diseases in adults.

Keywords: Low density lipoprotein, high density lipoprotein, fasting blood sugar, Insulin resistance

INTRODUCTION

The mechanism of the relationship among obesity, inflammation, and cardiovascular disease is that when individuals become obese and their adipocytes enlarge, the adipose tissue undergoes molecular and cellular alterations that subsequently affect systemic metabolism. First, macrophages accumulate within adipose tissue, leading to local inflammation[1]. Several proinflammatory factors are produced in adipose tissue as obesity increases. When compared to lean individuals, adipose tissue in obese individuals shows higher expression of pro-inflammatory proteins, including TNF-*α* and IL-6. Macrophage numbers in adipose tissue also increase with obesity[2] apparently acting as scavengers of apoptotic adipocytes[3]. Macrophage accumulation and the subsequent local inflammation are believed to

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result in numerous metabolic dysfunctions that accompany obesity, including systemic inflammation and atherosclerosis[4]. The dyslipedemia of obesity and presumably the actual cardiovascular risk, favours described in other forms of insulin resistance, namely hypertension, fasting and postprandial hyperglycemia, and a dyslipedemia characterized by elevations in triglycerides, production of small, dense LDL particles and reduced HDL cholesterol.[5] In man, lipids are mobilized from adipose tissue through lipolysis, a hormonally strictly regulated process where triglycerides are hydrolyzed to the end products, free fatty acids and glycerol[6,7]. Catecholamine are the main lipolytic hormones in man and stimulate lipolysis in adipocytes by binding to beta 1, 2 and 3-adrenoceptors, activating the lipolytic cascade, the last step being activation of the enzyme hormone-sensitive lipase[8,9]. Hyperinsulinemia is known to enhance hepatic very-low-density lipoprotein synthesis and thus may directly contribute to the increased plasma triglyceride and LDL cholesterol levels. Resistance to the action of insulin on lipoprotein lipase in peripheral tissues may also contribute to elevated triglyceride and LDL cholesterol

levels[10]. It has been suggested that insulin resistance may be responsible for the reduced levels of HDL cholesterol observed in type-2 diabetes patients and that despite enhanced HDL cholesterol synthesis, the plasma HDL cholesterol concentration was significantly reduced in patients with type-2 diabetes versus control subjects; this decrease in plasma HDL cholesterol was accounted for entirely by an increase in the ratio of apolipoprotein A1/HDL cholesterol degradation, which exceeded the enhanced rate of its synthesis[11].

PATIENTS AND METHODS

The present study was carried out by arranging free camp for obesity in Clifton area, Punjab colony and north Karachi for the collection for obese adult male and female (20-40 years) groups. In this free camp physical examination was carried by taking patient history, The BMI, and waist hip ratio was measured by following the criteria of the national heart lung and blood institute, for assessment overweight was involved. Cut off body mass index was taken as normal subjects $<25kg/m^2$ and obese subject $>25kg/m^2$. Patients having history of Xanthoma, hypertension and cardiovascular disease were included. Those patients having renal dysfunction and diabetes mellitus were excluded. Centrally obesity was defined on the basis of waist circumference in >90 cm in men and >80 cm in women. Subjects were divided into adult obese, centrally obese groups. Height and weight were recorded with help of height and weight scale. Standing height and weight measured with subject in length clothing and without shoes. Height recorded to the nearest cm and weight to the nearest 0.1 kg. Body mass index was calculated by using formula as: BMI = weight in kg / height in m^2. Cut off body mass index was taken as normal subject $<25kg/m^2$ and obese subject $>25kg/m^2$. Centrally obesity was defined on the basis of waist circumference in cms. Waist circumference measured at minimum circumference between the lower border of the ribs and iliac crest on mid axillaries' line. Cut off value for waist circumference was taken >90 cm in men and >80 cm in women. The measurement of BMI and waist hip ratio and biochemical parameters of lipid profile and FBS, insulin and insulin resistances were included in this study. Lipid profile was measured by enzymatic method by Randox, Fasting blood sugar was measured by glucose oxidase method, insulin level was measured by ELISA and insulin resistance was calculated by HOMA. All values expressed as mean±SEM of that mean and all parameters were statically analyzed by SPSS version 10. To evaluate the significance of the difference between the compared means, two-tailed paired student test was done. P <0.001 was considered significant.

RESULTS

During studies it was observed that adult obese male, showed slightly increased level of body mass index (31.27±1.2) as compared with female obese (31.3±0.27) [Table 1]. The statistical analysis was carried out in all parameters of lipid profile in both male and female adult obese and centrally obese. In female obese cholesterol (280.29±2.38), triglycedes (180.14±1.93) and low-density lipoprotein (178.95±1.58) was slightly increased, as compared with male obese i.e., cholesterol (277.51±2.06), triglycerides (175.62±2.32) and low density lipoprotein (177.08±1.79), whereas high density lipoprotein was slightly decreases in female obese (21.83±0.68) as compared with male obese cases (23.56±0.66). Whereas in case of centrally obese the measurement of cholesterol (280.4±3.44) and LDL (175.15±3.085) was high in male cases as compared with female cases (cholesterol 271.54±5.72), LDL (168.86±5.88), whereas HDL (25.27±1.35) was increase in female cases as compared with male cases [19.75±1.035] (Table 2). The analysis was carried out on the fasting blood sugar level. The fasting blood sugar level was high in the female obese (160.04±2.55) than male obese (151.96±2.32). The analysis was also applied on insulin level and insulin resistance. It was noted that same level of insulin that is increases in both sexes of adults obese (M=5.82±0.24, F=5.77±0.25). The insulin resistances level was also calculated in both groups of obese, resistance level of insulin was likely same but increase when compared with control cases [F=1.82±0.054, M=1.88±0.061] (Table 3).

Table 1: Comparison of BMI & waist hip ratio in adult obese

Parameter	Male obese	Female obese
BMI	31.27±1.2	31.3±0.27
W/H ratio	1.22 ±0.04	1.14±0.02

Table 2: Comparative study of cholesterol, triglycerides, high density lipoprotein, low density lipoprotein, level in adult obese (n=120)

Parameter	Male obese	Female obese
Cholesterol (mg/dl)	277.51±2.06	280.29±2.38**
TG (mg/dl)	175.62±2.32	180.14±1.93*
HDL (mg/dl)	23.56±0.66	21.83±0.68*
LDL (mg/dl)	177.08±1.79	178.95 ±1.58

*P<0.05 (Significant)   **P >0.05 (Non-significant)

Table 3: Comparative study of fasting blood sugar, insulin resistance, and insulin level, in adult male and female obese and centrally obese (n=120)

Parameter	Male obese	Female obese
FBS (mg/dl)	151.96±2.32	160.04±2.55*
Insulin (UIU/ml)	5.82±0.24	5.77±0.25*
IR	1.88±0.061	1.82±0.054*

*P<0.05 (Significant)

DISCUSSION

The largest survey of the relationship of obesity on blood lipids is the National Health and Nutrition Examination Survey (NHANES)[12] demonstrated that total and LDL cholesterol levels were higher in the obese than the non-obese[13]. It is important to point out the degree of obesity (overweight vs. obese) or distribution (central vs. peripheral) exerts a dose-response effect on blood lipids, specifically as increased VLDL triglycerides and cholesterol, reduced HDL cholesterol and a relative increase in small, dense LDL particles[14,15]. On the average, the more fat, the more likely an individual will be dyslipidemic and to express elements of the metabolic syndrome. Age and gender also are important modifiers of the impact of obesity on blood lipids[11]. Overweight women may have somewhat different patterns than obese men. For young women, excess body weight seems to be associated with higher total, non-HDL and LDL cholesterol levels, higher triglyceride levels, and lower HDL cholesterol levels[16]. Adipose tissue from obese children and adults contains activated macrophages within visceral adipose tissue are known to express and release cytokines and the subsequent local inflammation are believed to result in numerous metabolic dysfunctions that accompany systemic inflammation and atherosclerosis[16,17]. In addition to increased synthesis, the insulin resistance of obesity is characterized by decreased clearance of TRLs. Insulin is a stimulator of lipoprotein lipase (LPL) activity, by increasing LPL mRNA, and therefore enhancing its rate of synthesis. LPL activity in skeletal muscle of insulin resistant subjects has been shown to be lower, suggesting a defective insulin regulation of LPL. Therefore, the decreased LPL activity and mass in insulin resistance slow down the normal lipoprotein metabolic cascade, resulting in decreased clearance of VLDL[18,19]. Very low-density lipoprotein particles are mainly cleared from circulation by the LDL receptor (LDLR)[20,21].

CONCLUSION

Triglycerides, and Low density lipoprotein, insulin and insulin resistance is a major risk factor of cardio-vascular disease.

REFERENCES

1. Samad F, Yamamoto K, Pandey M. Elevated expression of transforming growth factor-beta in adipose tissue from obese mice. Mol Med 1997;3(1): 37 -48.
2. Weisberg SP, McCann D, Desai M, Rosenbaum M, Leibel RL, Ferrante AW Jr. Obesity is associated with macrophage accumulation in adipose tissue. J Clin Invest 2003; 112(12): 1796-808.
3. van der Zee PM, Biró E, Trouw LA, Ko Y et al. C-reactive protein in MI binds to circulating microparticles but is not associated with complement activation. Clin Immunol 2010;135(3): 490-5.
4. Rössner SM, Neovius M, Montgomery SM, Marcus C, Norgren S. Alternative methods of insulin sensitivity assessment in obese children and adolescents. Diabetes Care 2008; 4: 802-4.
5. Maffeis C, Moghetti P, Grezzani A, Clementi M, Gaudino R, Tatò L. Insulin resistance and the persistence of obesity from childhood into adulthood. J Clin Endocrinol Metab 2002; 87(1): 71-6.
6. Miyashita Y, Shirai K, Itoh Y, Sasaki H et al. Low lipoprotein lipase mass in preheparin serum of type 2 diabetes mellitus patients and its recovery with insulin therapy. Diabetes Res Clin Pract 2002; 56(3): 181 -7.
7. Ohira M, Miyashita Y, Ebisuno M, Saiki A et al. Effect of metformin on serum lipoprotein lipase mass levels and LDL particle size in type 2 diabetes mellitus patients. Diabetes Res Clin Pract 2007;78(1): 34-41.
8. Rodríguez A, Catalán V, Gómez-Ambrosi J, Frühbeck G. Visceral and subcutaneous adiposity: are both potential therapeutic targets for tackling the metabolic syndrome? Curr Pharm Des 2007; 13(21): 2169-75.
9. Phillips LK, Prins JB. The link between abdominal obesity and the metabolic syndrome. Curr Hypertens Rep 2008; 10(2): 156-64.
10. Sheen YJ, Sheu WH. Metabolic syndrome and renal injury. Cardiol Res Pract 2011; 11: 567-75.
11. Tesauro M, Canale MP, Rodia G, Di Daniele N, Lauro D, Scuteri A, Cardillo C. Metabolic syndrome, chronic kidney, and cardiovascular diseases: role of adipokines. Cardiol Res Pract 2011; 12: 653-62.
12. Sundquist J, Winkleby MA, Pudaric S. Cardiovascular disease risk factors among older black, Mexican-American, and white women and men: an analysis of NHANES III,1988-1994.3[rd] National Health & Nutrition Exam. Survey. J Am Geriatr Soc 2001;49(2): 109 -16.
13. Hickman TB, Briefel RR, Carroll MD, Rifkind BM. Distributions and trends of serum lipid levels among United States children and adolescents ages 4-19 years: data from the Third National Health and Nutrition Exam. Survey. Prev Med 1998; 27(6):879-90.
14. Hak AE, Stehouwer CD, Bots ML, Polderman KH, Schalkwijk CG, Westendorp IC, Hofman A, Witteman JC. Associations of C-reactive protein with measures of obesity, insulin resistance, and subclinical atherosclerosis in healthy, middle-aged women. Arterioscler Thromb Vasc Biol 1999; 19(8): 1986-91.
15. Jovelić A, Raden S, Hajduković Z, Canji T. The relationship between C-reactive protein and subclinical carotid arteriosclerosis in military pilots. Vojnosanit Pregl 2009; 66(6): 465-71.
16. Maffeis C, Moghetti P, Grezzani A, Clementi M, Gaudino R, Tatò L. Insulin resistance and the persistence of obesity from childhood into adulthood. J Clin Endocrinol Metab 2002; 87(1): 71-6.
17. Stevens VJ, Obarzanek E, Cook NR, Lee IM et al. Long-term weight loss and changes in blood pressure:

results of the Trials of Hypertension Prevention, phase II. Ann Intern Med 2001; 134(1): 1-11.

18. Xu M, Bi Y, Chen Y, Xu Y, Li M, Wang T, Wang W, Ning G. Increased C-reactive protein associates with elevated carotid intima-media thickness in chinese adults with normal low density lipoprotein cholesterol levels. Atheroscler Thromb 2013; [Epub ahead of print]

19. Weker H. Simple obesity in children. A study on the role of nutritional factors. Med Wieku Rozwoj 2006; 10(1): 3-191.

20. Sinha DP, Ahmed S, Baneerjee AK, Das M, Hassan H. Significance of an index of insulin resistance in non-diabetic patients with impaired fasting glucose with acute myocardial infarction and its correlation to short term outcome. Indian Heart J 2009; 61(1): 40-3.

21. Ridker PM, Rifai N, Pfeffer MA, Sacks FM, Moye LA, Goldman S, et al. Inflammation, pravastatin, and the risk of coronary events after myocardial infarction in patients with average cholesterol levels. Cholesterol and Recurrent Events (CARE) Investigators. Circulation 1998; 98(9): 839-44.