

Effect of Dyslipidemia on Insulin Resistance, in Centrally Obese Adult Groups in Karachi Population

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ABSTRACT

Aim: To observe the effect of dyslipidemia on insulin resistance in centrally obese adult groups.

Methods: This study was carried out by arranging free camp for obesity in Clifton area and Punjab colony for adults (20-40 years) from November 2010 to April 2011. For assessment hundred overweight patients were involved. After taking history & physical examination, samples were collected for fasting blood sugar, insulin and lipid profile. The BMI, and waist hip ratio was measured by following the criteria of the national heart lung and blood institute.

Results: One hundred patients select for the purposes of study. In centrally obese, body mass index was high in female (34.1 ± 0.67) as compared with males (31.68 ± 0.53), but waist hip ratio was elevated in male cases (2.16 ± 0.14) as compared to females (1.64 ± 0.17). Statistical analysis was carried out. The lipid profile including, 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) and LDL (168.86 ± 5.88), whereas HDL (25.27 ± 1.35) was increase in female cases as compared with male case (19.75 ± 1.035), It was also observed that increased level of triglycerides was observed in both cases of male (177.85 ± 4.06) and female (177.85 ± 4.06). The fasting blood sugar level was high in the male cases (167.9 ± 3.48) than female (152.77 ± 6.94), when compared with control cases. It was noted that insulin level ($M=5.8 \pm 0.38$, $F=5.68 \pm 0.46$), was high in both male and female.

Conclusion: It was concluded that, the significance effects of triglycerides, Low density lipoprotein was observed in both sexes of centrally obese groups which causes central obesity and insulin resistance.

Keywords: Fasting blood sugar (FBS), Insulin resistance (IR), Low density lipoprotein (LDL)

INTRODUCTION

Central obesity is the chief cause of the resistance to insulin-mediated glucose removal and compensatory hyperinsulinemia, it is associated with lipoprotein abnormalities. There are three major components of the dyslipidemia that occur in centrally obese people: increased fasting and postprandial triglyceride-rich lipoproteins (TRLs), decreased HDL, and increased small, dense LDL particles. The metabolism of all lipoproteins is highly interconnected; it is likely that a common primary metabolic defect of insulin resistant states the association of measures of insulin resistance with plasma total or VLDL triglyceride, and negative associations with HDL cholesterol concentration.¹ This links Dyslipidemia with obesity, especially central deposition of fat. The hepatic overproduction of VLDL appears to be the primary and vital defect of the insulin resistant state accompanying obesity and compensatory hyperinsulinemia. Inability to restrain hepatic glucose production, impaired muscle glucose uptake and oxidation, and inability to suppress release of non

esterified fatty acids (NEFA) from adipose tissue are the most important consequences of insulin resistance in liver, muscle and adipose tissue, respectively.² These events give rise to increased NEFA and glucose flux to the liver, which is an important regulator of hepatic VLDL production.³ Another key site in the regulation of VLDL secretion is the rate of apo B-100 degradation. Newly synthesized apo-B-100 remains associated with the rough endoplasmic reticulum (RER) and is degraded by the ubiquitin/proteasome system, or is translocated into the lumen and incorporated into lipid-poor VLDL precursors. Lipids and microsomal triglyceride protein (MTP), a heterodimeric lipid transfer protein that is required for the assembly of apo B-containing lipoproteins, play a major role in the translocation of apo-B 100.⁴ Lipids are mobilized from adipose tissue through lipolysis, a hormonally strictly regulated process where triglycerides are hydrolysed to the end products, free fatty acids and glycerol. Insulin resistance also increases hepatic lipase activity, is responsible for hydrolysis of phospholipids in LDL and HDL particles and leads to smaller and denser LDL particles and a decrease in HDL. Insulin is a regulator of adipocyte, and promotes adipocyte triglyceride stores by a number of mechanisms, including the differentiation of preadipocytes to adiposities and, in mature adiposities, Central (intra-

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abdominal) depots of fat are much more strongly linked to insulin resistance, type 2 diabetes, and cardiovascular disease than are peripheral (gluteal/subcutaneous) fat depots and they are more lipolytically active, due to thyukioir4f 79 pnikeir complement of adrenergic receptors.⁵

The aims of the study was to classify obesity into different classes on the basis of Body Mass Index and waist hip ratio and to correlates all parameters of lipid profile (Cholesterol, LDL, HDL, and TG) with insulin hormones and insulin resistance value which causes diabetes and atherosclerotic cardiovascular diseases events. For the purpose of socioeconomic status and dietary behavior subjects were categories into Upper class, middle class and lower class. For the upper class we selected area of Clifton, middle class selected area of Punjab colony and the lower class selected area of north Karachi. Dietary behavior was taken by history of their dietary schedule.

PATIENTS AND METHODS

The present study was carried out by arranging free camps for obesity in Clifton area, Punjab colony and north Karachi. For assessment overweight hundred obese adult male and female (20-40 years) were included. Their history, physical examination was carried. The measurement of BMI, and waist hip ratio and some biochemical parameters of lipid profile and FBS, insulin and insulin resistances were included in this study. BMI and waist hip ratio was measured by following the criteria of the national heart lung and blood institute. Cut off body mass index was taken as, normal subject <25 kg/ m² and obese subject >25 kg/m². Centrally obesity was defined on the basis of waist circumference in cm. Waist circumference measured at minimum circumference between the lower border of the ribs and iliac crest on mid axillaries' line. Centrally obesity was defined on the basis of waist circumference is >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. Patients having history of xanthoma, hypertension and cardiovascular diseases were included. Those patients having renal dysfunction and diabetes mellitus were excluded. Lipid profile was measured by enzymatic method by Randox, FBs 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 centrally obese male (31.68±0.53) and female (34.1±0.67) showed increased body mass index, as well as increased in waist hip ratio in male i.e. 2.16±0.14) as compares with female 1.64±0.17 (Table 1). The statically analysis was carried out in all parameters of lipid profile and each parameter was compared in both sexes of adult centrally obese. The 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, i.e. 19.75±1.035. It was also observed that same level of triglycerides that is increased in both cases of adult male (177.85±4.06) and female 177.31±3.04 (Table 2). The analysis was carried out on the fasting blood sugar level. The fasting blood sugar level was high in the male cases (167.9±3.48) than female (152.77±6.94). The analysis was also applied on insulin level and insulin resistance. It was noted insulin level, was high in both cases of adults (M=5.8± 0.38, F=5.68±0.46) and insulin resistance was low in male (1.732±0.089) as compares female, (2.43±0.18) [Table 3].

Table 1: Comparative study of body mass index, waist hip ratio In centrally obese groups (n=44)

Parameter	Female centrally	Male centrally	P value
BMI	34.1±0.67	31.68±0.53	P<0.001
W/H	1.64±0.17	2.16±0.14	P<0.001

P<0.001 (Highly significant)

Table 2: Comparative study of cholesterol, triglycerides, high density lipoprotein, low density lipoprotein level in centrally obese

Parameter	Female centrally	Male centrally	P value
Cholesterol	280.4±3.44	271.54±5.72	P>0.05
TG	177.85±4.06	177.31±3.04	P<0.001
HDL	19.75±1.035	25.27± 1.35	P<0.001
LDL	175.15±3.08	168.86±5.88	P<0.001

P<0.001 (Highly significant) P>0.05 (Not significant)

Table 3: Comparative study of fasting blood sugar, insulin resistance and insulin level In centrally obese

Parameter	Female centrally	Male centrally	P value
FBS	134.1±0.67	167.9±3.48	P<0.001
Insulin	1.64±0.17	5.8±0.38	P<0.001
IR	2.43±0.18	1.732±0.089	P<0.001

P<0.001 (Highly significant)

DISCUSSION

Insulin is a regulator of adipocytes, and adipocytes promotes triglyceride stores by a number of mechanisms, including the differentiation of pre adipocytes to adiposities and, in mature adiposities, Central (intra-abdominal) depots of fat (central obesity) are much more strongly linked to insulin resistance, type 2 diabetes, and cardiovascular disease than are peripheral (gluteal/subcutaneous) fat depots and they are more lipolytically active, due to thyuhkioir4f 79 pnikeir complement of adrenergic receptors. Insulin is a stimulator of lipoprotein lipase (LPL) activity, by increasing LPL mRNA, and therefore enhancing its rate of synthesis.⁶ LPL activity in skeletal muscle of insulin resistant 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 VLDL⁷. VLDL particles are mainly cleared from circulation by the LDL receptor (LDLR), also referred to as apo B/E receptor. The transcription of the LDLR gene is regulated by intracellular cholesterol concentration, hormones, and growth factors. Sterol regulatory element binding protein-1 (SREBP-1) is selectively involved in the signal transduction pathway of insulin and insulin-like growth factor-I (IGF-I) leading to LDLR gene activation.⁸ The insulin resistance associated with central obesity may also impair LDLR activity, thus contributing to the delayed VLDL particle clearance accompanying this condition.

Insulin acutely suppresses the total production rate of VLDL particles by decreasing mainly the production of large, VLDL1 (Sf 60-400), without affecting that of small TRLS, VLDL2 (Sf20-60).⁹ This effect seems to be independent of the availability of NEFA¹⁰. In type 2 diabetes insulin appears unable to inhibit acutely the release of VLDL1 from the liver, despite efficient suppression of serum NEFA.¹¹ However, the decrease in circulating VLDL particles following acute insulin action in insulin sensitive individuals appears to be the result not only of a decreased hepatic production¹² but also an increased clearance. In insulin resistance and type 2 diabetes, increased free fatty acids from adipose tissue and impaired insulin-uptake of free fatty to the liver free fatty acid levels are elevated in individuals with impaired glucose tolerance suggests that insulin resistance associated with elevated free fatty acid levels occurs in hyperglycemia¹³. In the presence of insulin resistance, free fatty acids in the form of triglycerides are deposited in muscle, liver, heart, and pancreas.¹⁴ Insulin resistance also increases hepatic lipase activity, is responsible for hydrolysis of phospholipids in LDL and HDL particles and leads to

smaller and denser LDL particles and a decrease in HDL¹⁵.

CONCLUSION

It was concluded that Central (intra-abdominal) depots of fat (central obesity) are much more strongly linked to insulin resistance, type 2 diabetes, and cardiovascular disease than are peripheral (gluteal/subcutaneous) fat depots and they are more lipolytically active, due to thyuhkioir4f 79 pnikeir complement of adrenergic receptors, that is why increased catabolism of fats and centrally obese groups shows increased significant effect (>0.001) of triglycerides, low density lipoprotein and HDL. These elevated levels of free fatty acid causes insulin resistance.

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