

A COMPARATIVE STUDY OF VARIOUS METABOLIC PARAMETERS AND INSULIN SECRETION IN OVERWEIGHT AND OBESE INDIVIDUALS

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ABSTRACT

BACKGROUND

Overweight and obesity are major health issues. As per WHO definition, BMI equal to or greater than 25 is overweight and BMI equal to or greater than 30 is obesity. It is associated with various metabolic physiological abnormalities like changes in insulin secretion and metabolic parameters.

MATERIAL AND METHOD

Forty individuals were selected for study as per inclusion and exclusion criteria and divided in two groups. All the parameters of both the groups were calculated.

RESULT

Fasting and postprandial insulin level was normal in overweight individuals, but it was towards higher side in obese that is 25 mIU/L and 176.48 mIU/L. Plasma glucose concentration was normal, but lipid profile was higher in both groups.

CONCLUSION Overweight and obesity is now a global issue. It is associated with various physiological abnormalities leading to diabetes mellitus and cardiovascular diseases. Present study is designed to study the effect of overweight and obesity on various parameters in coastal Andhra Pradesh, and it was found that all the parameters in both the groups were towards higher side except few.

KEYWORDS

Overweight, Obesity, Insulin Secretion.

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INTRODUCTION: Noncommunicable diseases (NCDs) are killing 38 million people each year. All age groups and all the regions are affected by NCD. It is often associated with older age group, but evidence shows that 16 million of all deaths attributed to NCDs occur before the age of 70 yrs. Of these premature deaths, 82% occurred in low and middle income country. Globalisation of unhealthy diets may show up in individuals as raised blood pressure, increased blood glucose, elevated lipids and obesity. These are called intermediate risk factors which can lead to cardiovascular disease, a NCD.⁽¹⁾ In terms of attributable deaths, overweight and obesity are considered leading metabolic risk factors next to increased blood pressure.^(2,3) Overweight and obesity are designed as abnormal or excessive fat accumulations that impair health. As per WHO definition, BMI equal to or greater than 25 is overweight and BMI equal to or greater than 30 is obesity.⁽⁴⁾ Present study is designed to compare various metabolic parameters and insulin secretion in overweight and obese individuals in coastal

Andhra Pradesh. Raised BMI is a major risk factor for NCD. The risk for these NCDs increases with increase in BMI.

MATERIAL AND METHOD: Present study is designed to compare various metabolic parameters and insulin secretion in overweight and obese individuals in coastal district of Andhra Pradesh. Before start of the study, a written consent was obtained from Institutional Ethics Committee. A written informed consent was obtained from each individual on a predesigned consent form. Forty individuals were enrolled for this study as per inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Age 18 to 60 yrs. Both sex	Hypertension Hypothyroidism Diabetes mellitus Kidney and liver disease Any medication

In the beginning of the study, all the individuals were divided in to two groups. Group A consists of individuals whose body mass index was more than 25 but less than 30 that is in overweight range. Group B consists of individuals with body mass index more than 30 that are in obese range. Various physiological parameters like fasting plasma

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glucose, postprandial plasma glucose, HDL, LDL, TG, total cholesterol, fasting and postprandial insulin concentration was measured in both the groups. Data was analysed by using unpaired t-test.

For estimation of plasma glucose, hexokinase method was used. Triglyceride concentration was estimated by method of Neri and Fringe. Total serum cholesterol was estimated by method based on Liebermann-Burchard reaction calorimetric method. HDL concentration was estimated by precipitation method. LDL cholesterol was calculated by using WHO approved formulae. LDL-cholesterol = Total cholesterol – TG/5 – HDL (mg/dL). Serum insulin was determined by using an enzyme linked immunosorbent assay.

RESULTS: Forty individuals were selected as per exclusion and inclusion criteria. Group A consists of twenty individuals. Mean age of individuals in group A was 38.2 yrs. There were twelve males and 8 females in group A. Mean body mass index of the individuals in group A was 26.8 and they belong to overweight group.

Characters	Overweight (Mean)	Obese (Mean)	t-value	p-value
Age (In year)	38.2	42.2	-	-
Sex (M/F)	12/8	13/7	-	-
BMI	26.8	32.4	-	-
FPG	88.6	97	2.3731	0.01
PPG	108.4	136.4	8.49	0.00001
TG	143.6	159.6	2.98	0.00398
HDL	44	38.4	3.03	0.003638
Total chol.	193.4	222.45	4.0316	0.00035
LDL	119.6	144.36	3.469	0.0012
Fasting insulin concentration	11.8 mIU/L	24.64	16.396	0.00001
Post prandial insulin concentration	114.64 mIU/L	176.48	21.4	0.00001

Table 1: Various Parameters in Both Groups

Mean fasting plasma glucose and postprandial glucose was 88.6 mg/dL and 108.4 mg/dL respectively. Triglyceride concentration in overweight group was 143.6 mg/dL. Total cholesterol and HDL mean value in overweight group was 193.4 and 44 respectively. LDL concentration mean was calculated and it was 119.6. In group A, mean of fasting insulin was 11.8 mIU/L and postprandial insulin concentration it was 114.64 mIU/L.

In Group B that is obese individuals, mean age was 42.2 and mean body mass index was 32.4 kg/m² mean of fasting

plasma glucose and postprandial plasma glucose was 97 mg/dL and 136.4 mg/dL. Serum triglyceride mean value was 159.6 mg/dL and HDL was 38.4 mg/dL. Total cholesterol was 222.45 mg/dL and LDL mean value was calculated and it was found 144.36 mg/dL. Fasting and postprandial insulin level was 24.64 mIU/L and 176.48 mIU/L respectively.

DISCUSSION: Various studies have suggested that genetic predisposition is a key factor in obesity.^(5,6) It is characterised by an excess of adipose tissue. A complex mechanism maintains homeostasis of an energy store. In this complex mechanism, central nervous system mainly hypothalamus along with various neuropeptides, neurotransmitters, insulin and leptin coordinates the behaviour, metabolic and physiological responses and maintain the balance between expenditure and intake. Any abnormality in this system is associated with overweight and obesity, effect of this overweight and obesity is associated with change in various metabolic parameters and insulin resistance.^(7,8)

In our study, we have found that in overweight group and obese group all the parameters were towards higher side.

Effect on Insulin Secretion: Fasting insulin secretion in overweight group was having mean value 11.8 mIU/L and in obese group was 24.64 mIU/L it is towards higher side but just less than to be qualified as insulin resistance that is more than 25 mIU/L. Postprandial insulin secretion was also towards higher side that is 114.64 mIU/L and 176.48 mIU/L in both the group with t value 21.4 and P value <0.00001 which is highly significant. These findings are similar to the work of E. Ferrannini et al,⁽⁹⁾ Lilliojas et al⁽¹⁰⁾ and Parulsingla et al.⁽¹¹⁾ The association between obesity and insulin resistance is likely a cause and effect relationship mechanism of insulin resistance in increased adipose tissue is associated with deregulations in interconnected endocrine, inflammatory, neuronal and cell autonomous pathway.⁽¹²⁾

Effect on Fasting and Postprandial Plasma Glucose: Fasting plasma glucose mean value in overweight and obese group was 88.6 mg/dL and 97 mg/dL respectively, high t value 2.3731 and P value 0.0132 which is less than 0.05. Postprandial plasma glucose mean value was 108.4 mg/dL and 136.4 mg/dL respectively with t value 8.49 and P value 0.0001. In overweight group, the FPG is normal; but in obese group it is toward higher side. This is similar to the study of various authors.^(11,13) Molecules like FFA, Leptin, TNF α and others are released from adipose tissue and are known to effect glucose metabolism.

Effect on Lipid Metabolism: All the parameters in both the groups were towards higher side, it was more in obese group than the overweight. Serum TG concentration in overweight and obese group having mean value, 143.6 mg/dL and 159.6 mg/dL respectively with P value 0.00001, which is towards higher side. This is similar to the work of

Rokjan et al.⁽¹⁴⁾ Tissue resistance to insulin mediated glucose uptake which accelerate VLDL and TG production rate and decreased lipoprotein lipase mediated lipolysis in adipose tissue increases TG level.

Serum HDL concentration was decreased in both the groups, the mean value was 44 mg/dL and 38.4 mg/dL respectively which is similar to the work of various authors.^(14,15)

Serum total cholesterol and LDL concentration was also towards higher side in both groups which was 193.4 mg/dL and 222.43 mg/dL and 119.6 and 144.36 mg/dL respectively, with P value 0.0001 and 0.0001 respectively which is similar to the study of Golay et al.^(16,17)

CONCLUSION: Overweight and obesity are global issues now, associated with various physiological abnormalities leading to diabetes mellitus and cardiovascular diseases. Present study is designed to study the effect of overweight and obesity on various parameters in coastal Andhra Pradesh and it was found that all the parameters in both the groups were towards higher side except few. So we recommend healthy diet, regular physical activity and maintenance of ideal body weight for an individual. Also an extensive study is required to detect insulin resistance by including other physiological parameters. Finance was a major limitation to our study, otherwise extensive study can be conducted.

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