

## Is high BMI, a risk for Insulin Resistance even in the individuals with no Family History of Metabolic Syndrome

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### Abstract-

**Introduction-** Obesity is among the main health concerns of the world today. Obesity increases the risk of diseases like type 2 diabetes, hypertension, heart diseases, stroke etc. BMI has been suggested as an ideal measure of adiposity and obesity. The number of diabetic cases is increasing globally from 108 million in 1980 to 422 million in 2014. Insulin resistance increases risk of developing diabetes.

**Materials and Methods-** An observational cross-sectional study from the people of the city, Vijayawada, India was done on 80 healthy individuals with no history of smoking, alcoholism, medications and no personal or family history HTN, DM, Endocrine disorders. BMI was calculated using formula-  $BMI = wt \text{ in Kg} / ht \text{ in m}^2$ . Fasting insulin levels assessed using enzymatic immunoassay method on chemiluminiscene. Insulin resistance is calculated by using HOMA IR index.

**Results-** The mean of fasting insulin of individuals with normal BMI was  $5.61 \pm 1.41$  and in individuals with high BMI was  $11.8 \pm 1.81$  and the difference was statistically significant with  $p < 0.01$ . The mean of insulin resistance of individuals with normal BMI was  $1.16 \pm 0.34$  and in individuals with high BMI was  $2.33 \pm 0.46$  and the difference was statistically significant with  $p < 0.01$ .

**Conclusion-** Healthy individuals with high BMI showed a significant increase in fasting insulin levels and insulin resistance when compared with individuals with normal BMI suggesting high BMI can be a risk for developing insulin resistance even in healthy individuals.

**Keywords-** Obesity; Fasting insulin levels; insulin resistance.

Date of Submission: 20-05-2020

Date of Acceptance: 06-06-2020

### I. Introduction

Obesity is a complex, multifactorial, and largely preventable disease [1] affecting, along with overweight, over a third of the world's population today [2,3]. The World Health Organization (WHO) defines obesity as abnormal or excessive fat accumulation that may impair health [4]. According to WHO global estimates in 2019, about 38.2 million children under the age of 5 years were overweight or obese. Body mass index [BMI] is a measure of assessing obesity or overweight. Even though BMI is an indirect measure and fail to distinguish between fat, muscle or bone mass, BMI has been suggested as an ideal measure of adiposity since it is easy to measure and is closely associated with obesity related health risks [5]. Overweight and obesity are established risk factors for the development of metabolic diseases such as diabetes, hypertension, dyslipidemia, cardiovascular disease, and certain cancers [6]. Overweight raises risk of developing type 2 diabetes by a factor of three, and obesity by a factor of seven, compared to normal weight [7]. Insulin resistance, the decreased effect of insulin on glucose uptake, metabolism, or storage is a fundamental aspect of the etiology of type 2 diabetes [8]. Insulin resistance occurs both due to genetic and lifestyle factors. Obesity causes insulin resistance, by large fat accumulation leading to increased levels of free fatty acids and triglycerides in the skeletal muscle thereby increasing insulin resistance, an even greater rate of lipolysis causing vicious cycle [9,10].

The present study was done on 80 healthy individuals, 62 women and 18 men between age 40 to 60 years, with no family history of Metabolic Syndrome, no past history of metabolic diseases, non smokers, non alcoholics and not under any sort of medication. Among them 40 individuals were having high BMI and 40 individuals were having normal BMI (controls). Serum glucose, serum insulin and insulin resistance were calculated in the study group and evaluated the relation between BMI and insulin resistance.

### II. Materials & Methods

**Study Design:** It was an observational cross-sectional study from the people of the city, Vijayawada, India, done on Feb, 2020.

**Inclusion Criteria-** Healthy individuals

**Exclusion Criteria-**

- Family history of DM , HTN, Obesity
- Past history of chronic illnesses like DM, HTN, Endocrine disorders, Chronic infections, Medications
- Smoking, Alcoholism

Informed consent was taken from all the individuals of study group in their own language. Blood sample was collected after an overnight fasting of 12 hours under aseptic conditions.

Serum Glucose levels were measured by GOD/POD method<sup>[11]</sup> on autoanalyser within 1 hour of collection of blood. Normal range- 70 to 110 mg/dl or 4.2 to 5.3 mmol/L

Serum Insulin levels were estimated using enzymatic immunoassay method on chemiluminiscene. Normalfasting Insulin- 3 to 8 microIU/ml.

Insulin Resistance is calculated by using HOMA IR (homeostatic model assessment) index using formula- fasting insulin concentration (microunits per millilitre) X fasting glucose concentration (millimolar)/22.5<sup>[12]</sup> .

Body Mass Index was calculated using height and weight with the formula- BMI=Kg/m<sup>2</sup> . Normal range- 18.5 to 24.9 Kg/m<sup>2</sup>.

Statistical Analysis: Data was analysed using Open Epi Software Version 3.0<sup>[13]</sup>, t- test, chi-square test were used to compare data. P<0.05 was considered as statistically significant.

**III. Results**

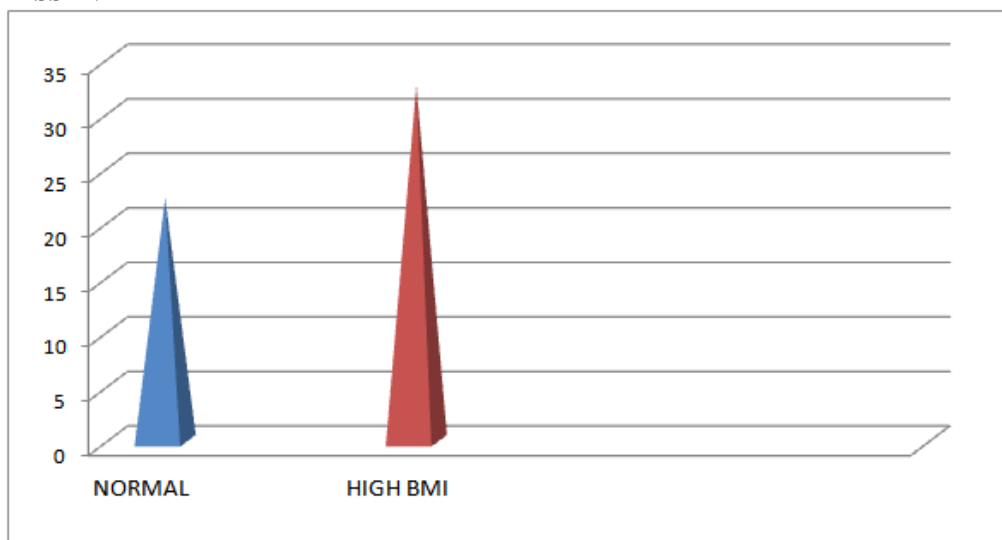
The present study consists of 80 healthy individuals. Among them 40 were having high BMI and 40 normal BMI (controls). The mean age of individuals with high BMI (52.20) is slightly higher than individuals with normal BMI (53.95) and was not statistically significant. The proportion of females in study group (62) was more when compared to males (18) but both females and males were equally distributed (31 females, 9 males) in each group of normal and high BMI. The fasting blood glucose levels of all individuals were within normal range (70 to 110 mg/dl) .

The mean of fasting insulin of individuals with normal BMI was 5.61 ± 1.41 and in individuals with high BMI was 11.8 ± 1.81 and the difference was statistically significant (p< 0.01).

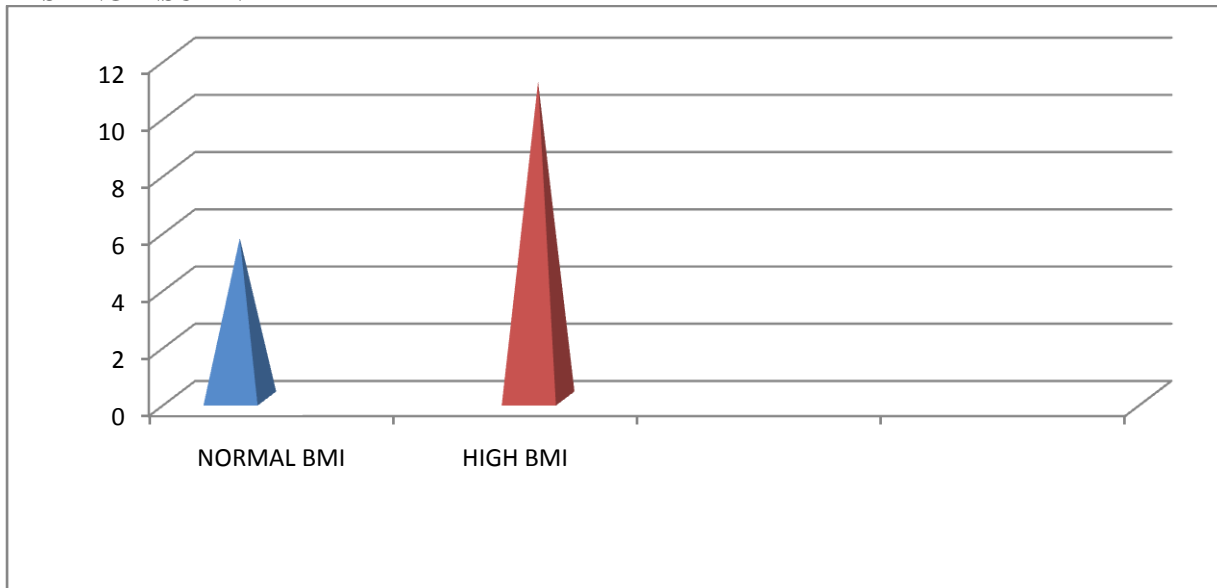
The mean of insulin resistance of individuals with normal BMI was 1.16 ± 0.34 and in individuals with high BMI was 2.33 ± 0.46 and the difference was statistically significant (p< 0.01).

PARAMETER		NORMAL BMI	HIGH BMI
BMI	22.28±1.31		32.61±4.27
FASTING INSULIN	5.61±1.41		11.08±1.81
INSULIN RESISTANCE	1.16±0.34		2.33±0.46

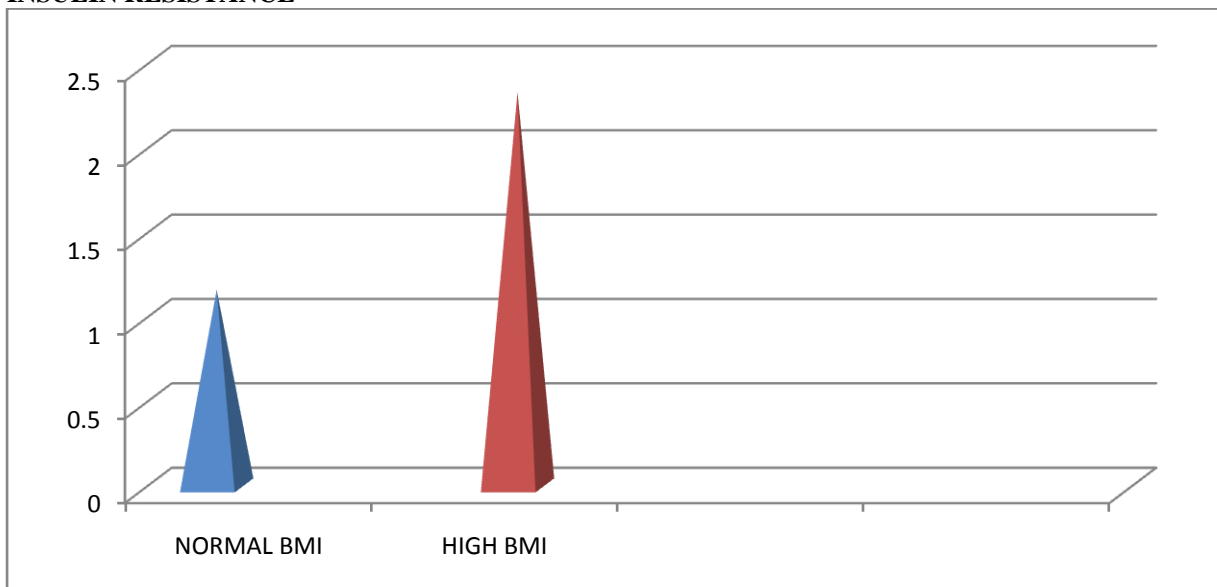
**BODY MASS INDEX**



**FASTING INSULIN**



**INSULIN RESISTANCE**



**IV. Discussion**

Obesity is one of the major problems of the world today and reached epidemic proportions gradually with atleast 2.8 million people each year becoming overweight and obese. Studies in the recent times showed that obesity, Metabolic syndrome, and insulin resistance are interrelated and coexist.

In this study containing two groups of healthy individuals with normal and high BMI showed a significant difference in both fasting insulin levels and insulin resistance with P value < 0.05. The study shows obesity as the underlying factor for the development of insulin resistance in individuals with no other known risk factors like smoking, alcoholism, metabolic diseases and family history. The results of this study are similar with the study of Yashpal Singh et al<sup>[15]</sup>.

**V. Conclusion**

The study shows high BMI can be a risk factor for high insulin resistance even in healthy individuals with no family history of metabolic diseases and no habitual risk factors like smoking and alcoholism.

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Dr. Yallamelli Mounika, et. al. “Is high BMI, a risk for Insulin Resistance even in the individuals with no Family History of Metabolic Syndrome.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(6), 2020, pp. 06-09.