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BMI AND WHR AS PREDICTORS FOR INSULIN RESISTANCE IN NORTH-EASTERN TYPE 2 DIABETICS: A STUDY

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ABSTRACT: BACKGROUND: The burden of diabetes has an enormous impact on population health, healthcare system and the economy. Due to the high incidence of diabetes with obesity documented all over India and throughout the world a study was conducted on 40 North-Eastern individuals with diabetes to see for any correlation between insulin resistance and obesity with BMI and WHR as obesity indicators. **AIM:** Aim of the study is to examine the predictive ability of insulin resistance in obese diabetic patients using anthropometric indices in the North-Eastern region of India. **MATERIALS AND METHODS:** The present study was carried out among 40 obese patients with type 2 diabetes mellitus. **SUMMARY:** Obesity is one of the major risk factors for diabetes mellitus. The study evaluates the relation between obesity and insulin resistance in the study population. **CONCLUSION:** The study showed a positive relation between obese diabetic individuals and insulin resistance. WHR (Waist Hip Ratio) was found to have more predictive value than BMI (Body Mass Index) for the level of insulin resistance.
KEYWORDS: Diabetes mellitus, Obesity, BMI, Serum Insulin.

INTRODUCTION: Diabetes mellitus has become a large economic burden all over the world. The number of diabetic patients in the world has been estimated at 110 million by 1994, 143 million by 2000 and prevalence of diabetes mellitus in adults is around 4%. It is projected that the disease prevalence will be 5.4% by the year 2025, with global diabetic population reaching 300 million. In the year 2000 an estimate showed the total number of patients with the disease to be 171 million and by 2030 the total number of cases with diabetes mellitus to be 366 million worldwide.[1] As the incidence of Diabetes mellitus is increasing worldwide it is also increasing at an alarming rate in India. It is said that India will the capital of Diabetes Mellitus in the world by the year 2025. The incidence of the disease as published by Indian Council Of Medical Research (ICMR) in 1972 reported the prevalence of the disease to be 2.3% at that time, which has increased to 12.35% in the year 2000 in the urban population.[2] Moreover type 2 diabetes occurs in the Indian population at an earlier age.[3] In Southern India it was reported that if one parent was diabetic 36% of the children will inherit the disease but if both parent are involved the figure goes to 50%.[4] The role of diet and physical activity in the development and progression of diabetes was emphasized elaborately in the Charak and Sushruta Samhitas.[5] Genetic predisposition, inherited ethnicity, increased waist to hip ratio, lifestyle changes contribute to rise of diabetes in Indians. Most type 2 diabetic patients are obese which can be defined as fat accumulation in the body above normal.[6] Body mass index is a very simple index to evaluate obesity and overweight in adults.[7, 8] Insulin resistance is frequently found in obese patients mainly those having central obesity.[9] The waist hip (WHR) ratio (WHR) provides an index of both subcutaneous and intra-abdominal adipose tissue.[10]

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The present study was carried to find any correlation between type 2 diabetes mellitus, insulin resistance, obesity and waist hip ratio of the participants. The participants did not have any long term complications of diabetes like neuropathy, nephropathy or coronary artery disease. Care was also taken not to include participants having other disease like thyroid disorders. The duration of the study was 1 year and the participants were of the age group of 38-62 years on the date of start of the study. All of them belonged to middle class families and were suffering from diabetes for at least the preceding 2 years. A total of 40 patients were included for the study with equal number of males and females i.e. 20 males and 20 females.

Diabetes mellitus was diagnosed by;
1. Symptoms of diabetes with casual plasma glucose level of $\geq$ 200mg/dl. Casual is defined as blood sample taken at any time of the day without regards to time since last meal. The classic symptoms of diabetes include polydipsia, polyuria and unexplained weight loss.
<div align="center">or</div>
2. FPG $\geq$ 126mg/dl. Fasting is defined as no food intake for 8 hours.
<div align="center">or</div>
3. 2-h post glucose $\geq$200mg/dl during an OGTT. The test was performed as described by WHO using a glucose load containing the equivalent of 75gms of anhydrous glucose dissolved in water.

No patient was on insulin therapy during the study duration. They were on oral hypoglycaemic drugs only.

B. All the cases were examined thoroughly with detailed history taking and clinical examination.
Obesity was diagnosed with the help of Body Mass Index (BMI).
BMI = Weight (Kg)/[Height (Meter)]^2.
Those having BMI more than 30 were included in the present study.

Waist Hip Ratio: The waist circumference was measured at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest. Hip circumference was measured around the widest portion of the buttocks, with the tape parallel to the floor.[11,12] All the measurements were taken in inches and was calculated as follows -
Waist-Hip ratio (WHR) = Waist (inch)/Hip(inch). Men and women having the ratio of more than 0.90 and 0.85 were taken to be abnormal.

Serum Insulin Level: Serum insulin estimation was done with the help of Radio immune assay (RIA). All samples for serum insulin were taken in the fasting state (No calorie for last 8 hours).

OBSERVATION: In the present study participants were divided into two groups i.e. male and female with 20 participants each. All the participants fulfilled the WHO criteria for diabetes mellitus. All the male and female participants had BMI more than 30 and were therefore obese. All the male and female participants had waist – hip ratio more than 0.90 and 0.85 respectively.

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In both the groups BMI and WHR was correlated with fasting serum insulin level to look for any correlation.

RESULTS: The average BMI of the male and female patients in the study was 31.080 and 34.875 respectively. The average WHR for the male and female patients was 1.0835 and 1.0135 respectively. The average fasting serum insulin level for male and female patients was 31.40 and 32.60 respectively. P value was found to be statistically significant when comparing correlation between WHR and fasting serum insulin level in both male and female groups but BMI with fasting serum insulin level only in the female group. In the male group correlation between BMI and fasting serum insulin level showed the P value not to be statistically significant.

	Male	Female
Average BMI ± SE	31.080 ± 0.310	34.875 ± 0.355
Average Serum Insulin ± SE	31.40 ± 0.564	32.60 ± 0.884
Value of P	P > 0.05	P < 0.05
Average WHR ± SE	1.0835 ± 0.050	1.0135 ± 0.070
Average Serum Insulin ± SE	31.40 ± 0.564	32.60 ± 0.884
Value of P	P < 0.05	P < 0.05
Average BMI ± SE of both groups combined	32.971 ± 0.232	
Average Serum Insulin ± SE of both groups combined	31.073 ± 0.518	
Value of P	P < 0.05	
Average WHR ± SE of both groups combined	1.023 ± 0.043	
Average Serum Insulin ± SE of both groups combined	31.073 ± 0.518	
Value of P	P < 0.05	
Table 1		

DISCUSSION: The study showed a positive correlation of BMI to fasting serum insulin level in both male and female group even though the two tailed P value for BMI and fasting serum insulin level in the male group was not statistically significant. WHR (waist – hip ratio) and fasting serum insulin level correlation in both male and female groups showed statically significant two tailed P value results. When both the two groups were combined correlation between BMI and fasting Serum Insulin Level and WHR and Fasting Serum Insulin level showed statistically significant two tailed P value respectively.

CONCLUSION: The present study showed that there is positive correlation between increasing BMI (Body Mass Index) and insulin resistance in male and female type 2 diabetics in North – Eastern population. We also found positive correlation between increasing WHR (Waist Hip Ratio) and insulin resistance in male and female type 2 diabetics in North – Eastern population. Minute evaluation of the data in the present study showed WHR to be abit more sensitive as indicator than BMI in predicting the level of insulin resistance even though both are very reliable indicators for the same.

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