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Out Patient

An Observational Study to Evaluate Correlation between Body Mass Index (BMI) and Random Blood Glucose at a Diabetes Care Hospital in Bihar

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Abstract	**Original Research Article**

Background and Aim: Body mass index (BMI) ≥ 25 kg/m^2 is consider as obesity which is considered as one of the modifiable risk factors of Type 2 Diabetes (T2DM). The main aim of the study is to evaluate correlation between body mass index (BMI) and Random Blood Glucose and how the metabolic component influence the severity of uncontrolled type 2 diabetes at a diabetes care hospital in Patna city. **Method:** 120 subjects whose age in between 30 to 60 years has selected for the trial. Weight and height was recorded and random blood glucose was measured by automatic home based blood glucose monitor (Accu -Check Instant S Meter). **Result:** Mean age of subjects was $41.0 + 6.8$ years ($40.0 + 6.6$ among females and $42.2 + 6.4$ among males p= 0.1007). Between BMI and RBS, a positive correlation was noticed among 120 subjects (Pearson's correlation coefficient r = + 0.29). With an increase in age in there was a statistically significant increase in RBS and BMI ($p \geq 0.001$). **Conclusion:** A statistically significant direct co relation among RBS and BMI was confirmed in the present study. Major conclusion from this study suggest that BMI is crucial factor to maintain normal glycemic level in subjects with T2DM.
Keywords: BMI, T2DM, Accu -Check Instant S Meter, RBS, Age.

INTRODUCTION

Over weight incidence and obesity rates were increased by many folds over the past few years [1]. In the pathogenesis of type 2 diabetes one of the most important modifiable risk factors is diabetes [2]. It is predicted that T2DM will continue to increase in the next twenty years, and more than 70% of the patients will appear in developing countries, with the majority of them being 45-64 years old [3]. The risk of developing diabetes and associated cardio vascular risk rapidly in subjects with obesity [4]. There is a poor understanding that how obesity induces insulin resistance. It has been postulated that inflammated adipocyte modulate insulin secretion from pancreatic beta cells, insulin action on peripheral tissue and body weight and which may contribute to insulin resistance [5]. There is an increasing trend of BMI with increased adiposity which puts a hefty effect in diabetes and overall health [6]. The nonesterified fatty acids (NEFAs) that are secreted from adipose tissue in obese people may lead to the hypothesis that insulin resistance and β-cell dysfunction are most likely linked [7].

The main aim of the study is to evaluate correlation between body mass index (BMI) and Random Blood Glucose and how the metabolic component influence the severity of uncontrolled type 2 diabetes at a diabetes care hospital in Patna city.

METHODS

The present study was carried out in 120 patients of T2DM who were attended diabetes OPD (Out Patients Department) in Prakash Diabetes Hospital, Patna with approval ethics committee. In this prospective and observational study all patients we enrolled applying inclusion and exclusion criteria. Main inclusion criteria were 1. Diagnosed with T2DM, 2. Signed the patient information consent, 3. Regular for follow up. Major exclusion criteria was T2DM subjects with severe micro and macro vascular complications like sever CV event or cerebrovascular events.

The demographic data, medical history and clinical data included: age, gender, height, weight, waist circumference (WC), Waist hip ratio, duration of diabetes. All patients consent were taken. A complete physical examination was performed. Height was measured in standing position with a standard tape meter. Body mass index was calculated applying WHO formula of wt (kg)/ht(m2). The Classification of obesity was done as per Asian Indian classification published in 2003.

BMI and RBS of all participating subjects were screened on initial clinic visit. Scatterplots of blood glucose levels were charted against BMI and correlation coefficients calculated. Diagnosis of uncontrolled T2DM was based on a random blood sugar (RBS) ≥140 mg/dl.

Descriptive data are presented as the means ± standard deviation, the median with interquartile range if the parameters were non-parametrically distributed, or the numbers of subjects with percentages within parentheses. Statistical data analyses were performed using SPSS version 12.0software (SPSS, Chicago, IL, USA). All of the reported P-values were two-tailed, and those less than 0.05 were considered statistically significant.

RESULTS

Out of 120 T2DM subjects 67 were male and 53 were female. Mean age of subjects was 51.0 + 12.8 years (50.0 + 13.6 among females and 52.2 + 16.4 among males p= 0.1007).

Table 1 depicts associated comorbid condition with BMI level. It has been observed that higher BMI is associated with increased risk of hypertension, PVD and dyslipidemia.

Table-1: Associated comorbid condition with BMI level

Parameter	BMI<25 (Kg/m^2)	BMI>25 (Kg/m^2)	P Value
Hypertension	25	39	<0.005
Ketoacidosis	12	14	0.986
Neuropathy	5	4	0.961
Hypothyroidism	3	7	0.493
PVD	9	15	<0.005
Dyslipidemia	11	26	<0.005

The mean FBS of the study population was 158.70 ± 10.74 mg/dl and the mean BMI was 27.1 ± 3.38. The Pearson's correlation coefficient between RBS and BMI of the study population was positive (r = + 0.29). There was a stepwise increase in the magnitude of BMI and RBS, with an increase in age.

Table-2: Mean BMI and mean FBS of different age groups

Age Groups	Mean BMI (Kg/m^2)	Mean RBS (mg/dl)
30 - 40	23.29	115 mg/dl
40 - 50	27.00	148 mg/dl
50 - 60	29.78	172 mg/dl

Paired T test was done. Results show that 22/60 subjects with BMI<25kg/m2 have RBS of <140mg/dl (Figure-1A). 35/60 Subjects with BMI of >25kg/m2 have RBS of >140mg/dl. (Figure-1B) Significant p value is seen. The study shows that Body Mass Index is directly related to Random Blood Sugar. (Table 3)

Table-3: Comparison of BMI with random blood sugar

BMI (Kg/m^2)	RBS<140 (mg/dl)	RBS>140(mg/dl)	Total	P Value
BMI<25	22	38	60	<0.005
BMI>25	25	35	60	<0.005
Total	47	73	120	<0.005

DISCUSSION

Incidence of obesity, diabetes, cardiovascular risk factors were interlinked and together they are affecting health of Indian population along with their quality of life. Incidence of obesity, diabetes, cardiovascular risk factors were also caused for the increased morbidity and mortality of world population.

Because of the changes in lifestyles, increasing high-calorie diet and physical inactivity in developing country like India, diabetes has become one of the upfront risk factor for associated cardiovascular events [8]. There were several studies which has already established the strong correlation between BMI and blood glues levels [9, 10]. Like our observation, Vittal BG *et al.* also showed earlier that the mean BMI of different age groups showed an increasing trend over the decades and an increase in mean BMI [11]. It is expected, therefore that BMI should correlate with blood glucose levels. This is, however, not always the case. A Scottish study has previously shown no significant correlation between random blood sugar levels and BMI [12]. Racial and other biological factors may be responsible for this difference as was suggested in a study involving Caucasian and African-American women [13].
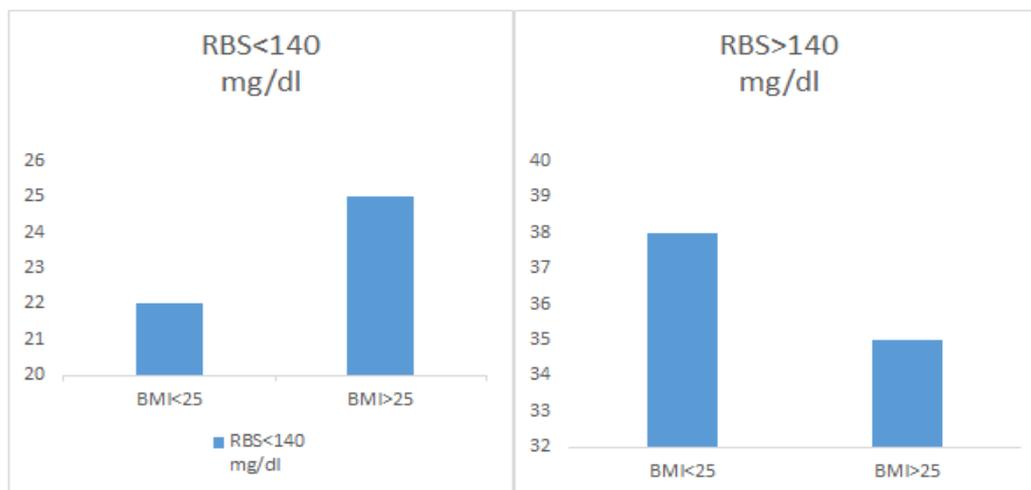
Fig-1A & 1B: BMI versus RBS

Level of adiposity was measured by BMI; however the correlation between BMI and actual body fat differs among different ethnicity, this leads to the cut off points for the overweight status and obesity based on BMI, will have to be ethnicity specific [14].

Our study did not take into account the other indices of obesity like waist hip ratio and abdominal circumference.

CONCLUSION

A statistically significant direct co relation among RBS and BMI was confirmed in the present study. Major conclusion from this study suggest that BMI is crucial factor to maintain normal glycemic level in subjects with T2DM. This trial leads to a conclusion that subjects who are suffering from diabetes needs to educate more regarding lifestyle modification and strict exercise regimen what is acceptable for the subjects.

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