ORIGINAL ARTICLE

Correlation between Serum Glucose and BMI in undergraduate students

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ABSTRACT

Aim: To determine the correlation between serum glucose and BMI in undergraduate students.
Methods: This cross sectional study was conducted at Department of Medicine LMDC/ Ghurki Trust Teaching Hospital Lahore. Total 166 students either male or female having age from 17 years to 23 years were selected. Serum blood glucose was measured and BMI was calculated.
Results: Minimum age of students was 17 years and maximum age was 23 years. Mean age of the students was 18.57 ± 0.99 years, mean BMI was 24.65 ± 6.196 and mean serum glucose level was 126.23 ± 25.56mg/dl. The Pearson correlation test showed that the level of level of serum glucose increased with increasing BMI. This positive correlation was statistically significant (r= 0.625, P= 0.000).
Conclusion: The observed positive correlation between BMI and serum glucose reiterates the effect of adipose tissue in impairing blood glucose regulation and emphasizes the importance of the maintenance of normal BMI.
Keywords:BMI, correlation, serum glucose, obesity

INTRODUCTION

Body mass index (BMI) is a good measure of general adiposity. It is defined as the weight in kilograms, divided by the square of the height in meters (kg/m2)[1]. A person can be categorized as underweight if his/her BMI is ≤18.5, as normal weight if his/her BMI is in the range of 18.5–24.9, as overweight if his/her BMI is between 25 to 29.9 and as obese if his/her BMI is ≥30[2]. A raised BMI value is an established risk factor for ischemic heart disease, stroke and carcinomas[3].

Obesity is one of the most important modifiable risk factors in the pathogenesis of type 2 diabetes. The mechanism by which obesity induces insulin resistance is poorly understood. Adipocytes secrete a number of biological products (leptin, TNF-alfa, free fatty acids, resistin, and adiponectin) that modulate insulin secretion, insulin action and body weight and may contribute to insulin resistance[4]. A positive correlation is assumed to exist between BMI and fasting blood sugar (FBS) levels.

Global epidemic obesity - "globesity" - is rapidly becoming a major public health problem in the world and is on the rise. In many populations, the average BMI has been rising by a few percent per decade, thus fuelling the concern about the effects of increased adiposity on health[5].

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This study was undertaken to determine the correlation between serum glucose and BMI in an under graduate students.

MATERIAL AND METHODS

This cross sectional study was conducted at Department of Medicine LMDC/ Ghurki Trust Teaching Hospital Lahore.Total 166 students either male or female having age from 17 years to 23 years were selected. Students with any systemic disease were excluded from the study.

History was taken from all the students regarding family history of diabetes mellitus.Weight and height of all the patients was measured by weighing machine and measuring tape to calculate BMI. Random blood sample was drawn and sent to laboratory for serum glucose levels. Findings of the laboratory test and BMI was entered on pre-designed proforma along with demographic profile of all the students.

All the collected data was entered in SPSS version 17. Mean and SD was calculated for age, BMI, serum glucose level. Frequencies were calculated for gender and family history of DM. Pearson correlation test was applied to check the correlation between BMI and serum glucose levels. Stratification was done for age, gender and family history of DM. post stratification student t test was applied to detect the difference of serum glucose levels for these variables. P value ≤ 0.05 was considered statistically significant.

RESULTS

Total 166 students were selected were for this study. Minimum age of students was 17 years and maximum age was 23 years. Mean age of the students was 18.57±0.99 years, mean BMI was 24.65±6.196 and mean serum glucose level was 126.23 ± 25.56mg/dl.

The Pearson correlation test showed that the level of level of serum glucose increased with increasing BMI. This positive correlation was statistically significant (r= 0.625, P= 0.000). (Table 1)

Students were divided into two age groups i.e., age group 17-20 years and 21-23 years. Total 160 students belonged to age group 17-20 years and only 6 students belonged to age group 21-23 years.

In age group 17-20 years, mean serum glucose was 126.96±25.68 mg/dl. In age group 21-23 years, mean serum glucose level was 106.33±9.24 mg/dl. Statistically significant (P=0.025) difference of mean serum glucose between both age groups was noted. (Table 2)

Male patients were 77 and female patients were 89. Mean serum glucose level of maple students was 128.64±26.24 and mean serum glucose level of female students was 124.15±24.92. The difference of mean serum glucose levels between male and female patients was statistically insignificant with p value 0.714 (Table 3).

Total 91 students found with family history of DM and 75 students found without family history of DM. Mean serum glucose level was 124.23±25.50mg/dl in students with family history of DM and 128.65±25.59 mg/dl without family history of DM. The difference between mean serum glucose level between both groups was statistically insignificant with p value 0.813 (Table 4).

Table 1: Correlation of BMI with serum glucose

	Serum glucose (mg/dl)	
	Pearson correlation (r)	P value
BMI	0.254	0.009

Table 2: Comparison of mean serum glucose level between the both age groups

Age Group	n	Mean	Std. Deviation
17-20 years	160	126.96	25.68
21-23 years	6	106.33	9.24

P value 0.025

Table 3: Comparison of mean serum glucose level for gender

Gender	n	Mean	Std. Deviation
Male	77	128.64	26.24
Female	89	124.15	24.92

P value 0.714

Table 4: Comparison of mean serum glucose level for gender

Family H/O DM	n	Mean	Std. Deviation
Yes	91	124.23	25.50
No	75	128.65	25.59

P value 0.813

DISCUSSION

In the present study, BMI showed a positive correlation with serum glucose (Pearson's correlation coefficient r=+0.254). A positive correlation between BMI and blood sugar was also reported by other studies[6,7]. Ethnicity affects the association between obesity and diabetes and that probably explains the different levels of association between obesity and blood glucose levels which are observed in various studies[8].

In age group 17-20 years, mean serum glucose was 126.96±25.68 mg/dl. In age group 21-23 years, mean serum glucose level was 106.33±9.24 mg/dl. Statistically significant (P=0.025) difference of mean serum glucose between both age groups was noted.

The prevalence of obesity, as measured by BMI, is high in many countries all over the world and is rising. It is mainly attributed to the changing lifestyles and dietary habits[5,9].

The mechanism by which obesity induces insulin resistance is poorly understood, but a number of mechanisms have been suspected to be involved. Obesity causes peripheral resistance to insulin-mediated glucose uptake and may also decrease the sensitivity of the beta-cells to glucose[10]. These changes are largely reversed by weight loss, leading to a fall in blood glucose concentrations towards normal levels. Weight gain precedes the onset of diabetes; conversely, weight loss is associated with a decreased risk of type 2 diabetes[11,12].

The administration of resistin, an adipocyte derived hormone, decreases while the neutralization of resistin increases insulin-mediated glucose uptake by the adipocytes. Thus, resistin may be a hormone that links obesity to diabetes[4]. Leptin is produced by adipocytes and is secreted in proportion to the adipocyte mass. It signals the hypothalamus about the quantity of stored fat. Studies in humans and animals have shown that leptin is associated with obesity and insulin resistance[13]. The deficiency of adiponectin, an adipocyte-derived hormone, plays a role in the development of insulin resistance and subsequently, type 2 diabetes[14].

Retinol-binding protein 4, free fatty acids, tumour necrosis factor-alpha, plasminogen activator inhibitor 1, interleukin-1 beta, uncoupling protein 2 and obestatin are also implicated in the adipose tissue induced pathogenesis of type 2 diabetes[15].

BMI is a good measure of adiposity; however, the relationship between actual body fat and BMI differs between ethnic groups, and as a consequence, the cut off points for the overweight status and obesity based on BMI, will have to be ethnicity specific[16].

CONCLUSION

The observed positive correlation between BMI and serum glucose reiterates the effect of adipose tissue in impairing blood glucose regulation and emphasizes the importance of the maintenance of normal BMI.

The effects of increasing obesity, as indicated by an increase in BMI over the decades in a population can be disastrous, as it can lead to enormous health costs. Hence, awareness needs to be created in children right from the school age, as well as amongst the parents of these children, in order to have an appreciable impact in preventing or delaying the onset of type-2 diabetes in later life.

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