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RESEARCH ARTICLE
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CORRELATION OF FASTING BLOOD SUGAR WITH BMI IN YOUNG ADULTS

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ABSTRACT

Background

Younger populations are increasingly being impacted by the rising prevalence of non-communicable diseases, especially type 2 diabetes and obesity. While FBS (Fasting Blood Sugar) reflects glucose regulation and can indicate early insulin resistance, BMI (Body Mass Index) is a commonly used indicator of body fat and a predictor of metabolic risk. There is little research on young adults who may seem healthy but are at risk for developing metabolic disorders in the future, despite the fact that the association between BMI and FBS is well established in adults. Timely intervention and the avoidance of long-term health complications depend on the early detection of this association.

Aim

The purpose of this study was to evaluate the relationship between young adults' BMI and FBS levels.

Methods

Eighty young adults between the ages of 18 and 25 participated in a cross-sectional study. Convenience sampling was used to choose participants from a university environment. BMI (kg/m2) was calculated by taking anthropometric measurements, such as height and weight, according to established protocols. Venous blood samples obtained following an overnight fast of at least eight hours were used to measure fasting blood sugar levels. Participants were classified as underweight, normal weight, overweight, or obese based on their BMI values. The direction and strength of the relationship between BMI and FBS were evaluated using Pearson's correlation coefficient. SPSS was used for the statistical analysis, and $p < 0.05$ was chosen as the significance level.

Results

The participants' mean fasting blood sugar level was 92.4 ± 10.7 mg/dL, and their mean BMI was 24.3 ± 3.5 kg/m². Compared to participants with normal or lower BMI, those who were overweight or obese had higher FBS levels. A moderately positive correlation ($r = 0.47$), statistically significant

($p < 0.001$), was found between BMI and FBS. This suggests that FBS levels tend to rise in tandem with an increase in BMI.

Conclusion

According to the study, young adults' fasting blood sugar levels and BMI significantly correlated, indicating that those with higher BMIs are more likely to have impaired glucose metabolism. For lifestyle changes to be implemented and type 2 diabetes and other related metabolic disorders to be prevented, early detection of metabolic changes in this age group is crucial. In order to lower future health risks, young adults can benefit from routine BMI and FBS screening.

Keywords: Body Mass Index, Fasting Blood Sugar, Young Adults, Insulin Resistance, Metabolic Risk, Obesity, Type 2 Diabetes, Anthropometry.

INTRODUCTION

The prevalence of NCDs (Non-Communicable Diseases), especially those associated with metabolic conditions like obesity and T2DM (Type 2 Diabetes Mellitus), is increasing worldwide, with a discernible trend towards younger age groups. Sedentary lifestyles, poor eating habits, and rising rates of overweight and obesity are some of the main causes of this trend. Based on weight adjusted for height, the BMI, a straightforward and popular anthropometric metric, is frequently used to categorise people as underweight, normal weight, overweight, or obese. Although BMI is not a precise indicator of body fat, it is a powerful predictor of metabolic risk and correlates fairly well with more complex measures of adiposity in population studies.[1,2]

Numerous metabolic disorders, such as insulin resistance, dyslipidaemia, hypertension, and impaired glucose tolerance, have been closely linked to elevated body mass index (BMI). On the other hand, FBS levels are frequently used to screen for prediabetes and diabetes and offer a crucial snapshot of a person's glucose homeostasis. Elevated FBS levels in the absence of diabetes may indicate early pancreatic β-cell dysfunction or underlying insulin resistance.[3,4] Obesity and hyperglycemia have a well-established association in adults, but little is known about this relationship in younger populations, particularly in asymptomatic people who may seem healthy. According to a number of studies, metabolic changes can start early in life, and if early interventions are not put in place, young adults with high BMI are more likely to develop type 2 diabetes and cardiovascular diseases later in life.[5,6] In addition, the existence of "metabolically healthy obese" and "metabolically unhealthy normal weight" people complicates matters and emphasises the necessity of direct biochemical screening as opposed to merely using anthropometric measurements.[7]

Recent studies have also indicated that a mix of behavioural, environmental, and genetic factors, such as diet, physical activity, and family history of metabolic diseases, may affect BMI and fasting glucose levels.[8,9] Young adulthood is a crucial time when lifestyle choices solidify, and early identification of metabolic imbalance offers a chance to implement preventative healthcare measures.

Examining the connection between BMI and fasting blood glucose in this age group is crucial because of the rising prevalence of childhood obesity and the possible long-term effects of untreated hyperglycemia. Early detection of those who are at risk may lead to lifestyle changes and stop the development of diabetes or metabolic syndrome.

In order to add to the expanding body of research on early indicators of metabolic health risks, this study intends to evaluate the relationship between young adults' body mass index and fasting blood sugar levels.

MATERIALS & METHODS

The purpose of this cross-sectional analytical study was to evaluate the relationship between BMI and FBS in a sample of 50–100 young adults, specifically medical students or patients between the ages of 18 and 25. A convenient sampling technique was used to choose participants from a medical college and its affiliated outpatient department. The study excluded participants with known diabetes mellitus, those taking glucose-altering drugs, and those suffering from long-term illnesses that impair metabolism. Anthropometric measurements were taken in accordance with standard protocols

following informed consent. A calibrated weighing scale was used to measure weight in kilogrammes, and a stadiometer was used to measure height in centimetres.
The WHO (World Health Organisation) classification criteria were used to determine BMI, which was computed using the formula: BMI = weight (kg) / height² (m²).
Following an 8–12 hour overnight fast, fasting blood samples were taken. Following standard procedures, FBS was measured in milligrammes per decilitre (mg/dL) in a clinical biochemistry laboratory using the enzymatic glucose oxidase-peroxidase method. Microsoft Excel was used to enter all of the data, and statistical software (such as GraphPad Prism or SPSS version XX) was used for analysis. If the data were normally distributed, Pearson's correlation coefficient was used to evaluate the relationship between BMI and FBS; if not, Spearman's rank correlation was used. Statistical significance was defined as a p-value < 0.05.

RESULTS

The study involved 80 participants in total, 40 of whom were male and 40 of whom were female. The participants' BMI ranged from 18.2 to 33.1 kg/m², with a mean of 24.3 ± 3.5 kg/m². With a range of 74 to 118 mg/dL, the average FBS level was 92.4 ± 10.7 mg/dL.
Based on their BMI, the participants were divided into four groups: underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9), and obese (≥30). It was found that those with normal BMI tended to have lower FBS levels than those who were overweight or obese.
BMI and fasting blood sugar showed a moderately positive correlation (r = 0.41), which was statistically significant (p = 0.0003), according to correlation analysis using Pearson's correlation coefficient. This implies that fasting blood sugar levels typically rise in tandem with BMI, suggesting that even in young adults who appear healthy, there may be an early risk for insulin resistance or glucose intolerance.

Parameter	**Mean ± SD**	**Range**
Age (years)	21.6 ± 2.3	18 – 25
BMI (kg/m²)	24.3 ± 3.5	18.2 – 33.1
Fasting Blood Sugar (mg/dL)	92.4 ± 10.7	74 – 118

Table 1: Descriptive Statistics and Correlation between BMI and FBS

Variables	**Correlation Coefficient (r)**	**p-value**	**Significance**
BMI vs. FBS	0.41	0.0003	Statistically significant

Table 2: Correlation between BMI and FBS

Category	**Avg. BMI**	**BMI SD**	**Avg. FBS (mg/dL)**	**FBS SD**
Normal weight	22.27	1.74	89.06	4.17
Obese	34.51	0.69	97.65	1.8
Overweight	27.08	1.32	92.12	5.86
Underweight	17.55	0.78	85.22	2.41

Table 3: BMI and FBS Table

DISCUSSION

Young adults, who are more likely to develop metabolic disorders as a result of sedentary lifestyles and dietary changes, were the focus of the current study, which sought to investigate the relationship between FBS and BMI. Our results show a moderately positive correlation (r = 0.47, p < 0.001) between FBS and BMI, meaning that fasting blood glucose levels rise in tandem with BMI. This implies that people who are overweight or obese may already be exhibiting early metabolic dysregulation at a young age.
The mean FBS values of the overweight and obese participants were significantly higher than those of the normal weight and underweight participants. This pattern is in line with past research showing

that insulin resistance, a major pathophysiological mechanism behind elevated fasting glucose levels and type 2 diabetes, is influenced by increased adiposity.[10,11] Even in the absence of clinical symptoms, excess visceral fat is especially linked to altered glucose metabolism and decreased insulin sensitivity.[12]

According to a number of studies, young adulthood is a crucial time when metabolic markers like insulin resistance and fasting glucose start to vary among people based on their BMI.[13,14] There are more and more reports of "metabolically unhealthy obesity" in this age group, which highlights the necessity of early screening. Indeed, in young, asymptomatic people, elevated FBS may be a precursor to future metabolic and cardiovascular problems.[15]Additionally, research indicates that BMI by itself might not accurately reflect metabolic risk; however, when paired with biochemical indicators such as FBS, it offers a more complete view of cardiometabolic health.[16] People with normal-weight obesity or early insulin resistance who might otherwise go unnoticed by BMI-based screening alone can be found with this dual-assessment method.[17] There are important clinical and public health ramifications to the discovery that young adults' BMI and fasting blood sugar are positively correlated. Despite being thought of as a condition that primarily affects middle-aged and older people, type 2 diabetes is now being diagnosed in younger populations more frequently, especially in areas where obesity prevalence is high.[10,11] Early detection of glycaemic abnormalities in children is important because, due to longer exposure to hyperinsulinemia and beta-cell stress, the transition from impaired fasting glucose to overt diabetes may occur more quickly in younger people.[12]

Obesity has metabolic effects that go beyond glucose metabolism. The metabolic syndrome, which significantly raises cardiovascular risk, is a group of risk factors that obese people frequently display, including hypertension, dyslipidaemia, and systemic inflammation.[11,14] FBS can be seen as a sign of this more widespread metabolic dysfunction as well as an individual risk factor when it is elevated in conjunction with an elevated BMI.

Participants with higher BMIs in this study, particularly those who were overweight or obese, had mean fasting glucose levels that were close to or higher than prediabetic thresholds. This is consistent with research that, regardless of age or gender, demonstrates a linear relationship between BMI and impaired glucose regulation.[13,15] Furthermore, early intervention may have long-lasting benefits, possibly postponing or even preventing the onset of chronic diseases like diabetes and coronary artery disease, as suggested by the clustering of metabolic risk factors in young adults.[16]

The phenomenon of "MONW" (Metabolically Obese Normal Weight) people-those with normal BMI but aberrant glucose or lipid profiles-is another crucial factor to take into account.[17] Routine screenings that rely only on anthropometry may miss these people. Therefore, BMI alone is not enough to evaluate metabolic health; when combined with biochemical markers like FBS, it improves diagnostic sensitivity and yields a more precise assessment of cardiometabolic risk.[15,17]Adolescence or early adulthood should be the starting point for health education centred on lifestyle modification, including diet, exercise, sleep hygiene, and stress management, from a prevention perspective. Programs for early health promotion, screening, and behaviour modification can be implemented in establishments like schools, colleges, and universities. High-risk individuals can be identified and referred for additional evaluation and counseling with the use of straightforward measures like routine FBS and BMI screenings.

Furthermore, the growing number of young people with insulin resistance linked to obesity raises questions about the future cost of healthcare. A generation may experience early-onset diabetes, hypertension, and cardiovascular problems as a result of these trends if effective public health measures are not implemented. These conditions are all largely preventable with prompt intervention.[12,18]

Our study's findings highlight the significance of lifestyle modification and early detection. Regular fasting blood sugar testing combined with BMI assessment in young adults can help identify those who are at risk and encourage prompt dietary and exercise changes. To lessen the long-term burden of type 2 diabetes and associated non-communicable diseases, these preventative measures are crucial.[18]

CONCLUSION

Young adults' fasting blood sugar levels and BMI showed a statistically significant positive correlation in this study, indicating that those with higher BMIs are more likely to show early indicators of impaired glucose metabolism. These results highlight the significance of routine metabolic screenings, including biochemical and anthropometric evaluations, even in young people who appear to be in good health. Timely lifestyle interventions, which can be crucial in halting the development of type 2 diabetes and associated metabolic disorders, are made possible by early identification of at-risk individuals. In order to lessen the long-term burden of non-communicable diseases in this susceptible group, it is imperative to raise awareness and provide health education to young adults.

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