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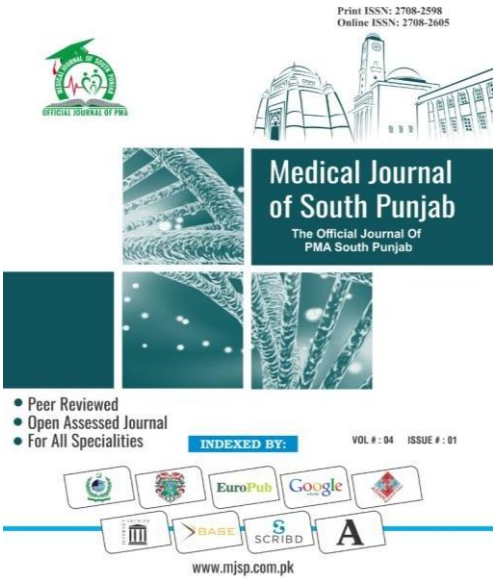

Assessing the Link between Zinc Levels and Obesity in Young Adults

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Original Article

Assessing the Link between Zinc Levels and Obesity in Young Adults

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ABSTRACT

Objective: *The objective of this study is to determine whether zinc intake and obesity are related in young individuals.*

Methods: *A cross-sectional study was carried out in Quaid-e-Azam Medical University, Bahawalpur, involving 123 young adults aged between 18 and 25 years. Main variables of study were body weights based on BMI (Body Mass Index) and its association with serum zinc levels. Trained research assistants utilized a digital scale, a stadiometer, and a measuring tape to gather anthropometric data, which encompassed measurements such as body weight, height, and waist circumference. The study lasted six months from September 2022 to March 2023.*

Results: *Serum zinc in normal body weight patients was 130.1 ±26.3 and in overweight patients it was 86.3 ± 19.1. Serum zinc levels were lower in obese individuals than in overweight individuals, as well as lower in overweight individuals than in normal-weight individuals.*

Conclusion:*These results suggested an association between obesity in younger adults and serum zinc levels. More research is needed in order to confirm these findings, verify the negative correlation between these two parameters and to examine the processes underlying the link between zinc and obesity.*

Keywords:BMI, serum zinc levels, young adults, obesity, cross-sectional study

1. INTRODUCTION

Obesity is a major public health issue in the world today[1]. In the United States, more than 40% of adults are dealing with obesity, and the occurrence of this condition is even more prominent among young adults. Obesity is associated with a number of chronic conditions including diabetes type 2, coronary artery disease, and several cancers[2]. The primary therapeutic approach for addressing obesity commences with non-pharmacological methods, involving lifestyle changes such as dietary adjustments, increased physical activity, and behavioral modifications[3]. Recent data, however, show that despite these initiatives, the rise in overweight people has only been moderately successful, with stubbornly high rates among both adults and children[4].

A supplementary strategy involves treating obesity pharmacologically when non-pharmacological therapies are unsuccessful[5]. This option is taken into account for people who have not improved after a year of dietary and lifestyle changes, as well as for people who have multiple organ complications like impaired glucose tolerance, insulin resistance, steatohepatitis, ovarian hyperandrogenism, or who have a strong family history of cardio-metabolic problems[6].

Zinc stands as a crucial trace element vital for numerous bodily functions. Its significance spans across upholding homeostasis, averting conditions like cardiovascular diseases, cancer, obesity, and diabetes, as well as maintaining the proper functioning of the immune system. Reduced zinc levels have been linked to an increased likelihood of resistance to insulin, inflammation, high blood pressure, and raised triglyceride levels in the bloodstreams of overweight and obese people[7]. Furthermore, some previous researches have demonstrated that the addition of zinc through supplementation effectively enhances insulin sensitivity, diminishes inflammation, and decreases blood pressure among individuals who are obese[8]. Additionally, it is well known that zinc contributes to the metabolism of other trace metals like copper, phosphorus, and calcium[9,10]. Therefore, a drop in zinc levels may have an impact on how biological processes are controlled at the cellular level[11]. Zinc deficiency is a prevalent issue, particularly in underdeveloped nations. Due to dietary and lifestyle changes, it is also becoming more prevalent in developed nations[12].

There is some evidence to suggest that zinc deficiency may be associated with obesity[13]. Multiple studies have

indicated a link between insufficient zinc levels and a higher likelihood of being overweight or obese[14]. The current research was designed toassess the relationship between zinc levels and obesity in young adults. The outcomes of this investigation would contribute to a deeper comprehension of zinc's involvement in obesity development. Furthermore, these findings could potentially hold significance for the advancement of novel obesity treatments.

2. METHODOLOGY

The Biochemistry Department at Quaid e Azam Medical University, Bahawalpur, carried out a cross-sectional study. After receiving approval from the Ethical Review Committee, the study started in September 2022 and ran through March 2023. Taking the previous obesity prevalence of 8.8% according to a study conducted in Bangladesh[15]at a confidence level of 95% and margin of error 5% the sample size was calculated to be 123 using the formula $n=z^2p(1-p)/d^2$. The study population was made up of MBBS second-year students who were selected using random sampling applying a lottery approach. All students including males and females were 18 -25 years of age. Those with comorbidities were excluded as that might introduce bias in the study. Each participant provided their informed consent after being fully informed of the research's objectives and any potential benefits and risks. A self-administered Questionnaire was used to collect sociodemographic data. Trained research assistants utilized a digital scale, a stadiometer, and a measuring tape to gather anthropometric data, which encompassed measurements such as body weight, height, and waist circumference. The participants were classified as normal weight, over weight and obese on the base of their BMI (Body Mass index).BMI of 18.5 to24.9 labelled as normal weight range, BMI 25.0 to 29.9, labelled as overweight range and BMI 30.0 or higher labelled as obesity according to CDC classification[16].In the sample population, the estimated reference range for blood zinc levels was 60-120 g/dL, with the range being 59-125 g/dL for men and 50-103 g/dL for women[17].

Serum samples were collected from 123 young and healthy participants. Following a 12-hour fast, each participant underwent venipuncture to draw a 5 mL peripheral blood sample, which was then placed in a sterile vacutainer tube. The serum extraction process involved the following steps: (a) the blood sample is let to stand for 20 minutes to aid in clotting, (b) the coagulate is separated and centrifuged

for 10 minutes at 3000 rpm, (c) the serum is kept in Eppendorf tubes and kept at -20°C until analysis. Using inductively coupled plasma mass spectrometry, the amounts of serum zinc were measured.

The SPSS version 27.0 program was used to enter and analyze the data. Body weights and serum zinc levels were calculated using descriptive statistics to determine parameters of central tendency and dispersion. To compare means by sex and for independent samples, the student's t test was utilized. The mean differences in weight categories were determined using analysis of variance (ANOVA) of one factor. A 5% significance level was used for all tests, with a 95% confidence interval.

3. RESULTS

The sample's gender distribution was equal, with 52.6% of women and 47.4% of males (n = 76). The findings on serum zinc levels, Body weights according to BMI, and sex are displayed in Table 1. Normal weight women had higher mean zinc levels than overweight or obese women, same is true for men.

Although there was no statistically significant difference in BMI between the sexes ($p > 0.05$), women had higher BMI values than males. Table:1 Regardless of gender, those who were overweight or obese had decreased serum zinc levels. Serum zinc in normal body weight patients was 130.1 ±26.3 and in overweight patients it was 86.3 ± 19.1. Serum zinc levels were lower in obese individuals than in overweight individuals, as well as lower in overweight individuals than in normal-weight individuals. These results held true for both sexes. Table :2

Table-1: Zinc levels, BMI, and gender

Nutritional status	Gender	Mean± SD	Mean difference	p-value
Weight categories		**Zn levels (µg/dL)**		
Normal weight	Women	133.4 ± 25.4	5.2	0.396
	Men	123.5 ± 28.6		
Over-weight	Women	86.5 ± 18.5	-0.64	0.444
	Men	90.6 ± 19.8		
Obesity	Women	66.7 ± 14.1	6.4	0.474
	Men	61.9 ± 7.9		

Table-2:Association of serum Zinc levels and Body weights

Weight Categories	Mean ± SD Zinc levels (µg/dL)	Confidence interval (95%)
Normal weight	130.1 ± 26.3	118.9-143.2
Over weight	86.3 ± 19.1	80.9-94.8
Obese	66.1 ± 13.1	58.3-74.4

4. DISCUSSION

The findings indicated that serum zinc levels were notably higher in normal-weight women compared to their overweight or obese counterparts. Additionally, overweight and obese women exhibited significantly higher average BMIs in comparison to normal-weight women. No statistically significant variations in zinc levels were observed between genders. Consequently, individuals classified as overweight or obese displayed lower serum zinc levels, irrespective of their gender. In essence, rise in BMI was linked to a decline in serum zinc levels.

These results align with some prior researches, which have consistently shown an inverse relationship between serum zinc levels and obesity. Gu, Kundang et al. performed a meta-analysis and discovered that obese children and adults had considerably lower serum zinc levels than their normal-weight counterparts[18].Similarly, a study by Di Martino, G et al[19] discovered that compared to people of normal weight, overweight and obese people had considerably decreased serum zinc levels.Previous studies have also validated the negativerelation between serum zinc levels and BMI found in the current study. A study conducted in Iran[20] found that plasma zinc levels were significantly lower in obese individuals, and that low zinc concentration was correlated with high levels of inflammatory markers which is also supported by other studies done in south Korea and Russia[21]. Another study conducted in Turkey by Konukoglu, Dildar, et al[22] reported a negative association between serum zinc levels and BMI in overweight and obese individuals.

In the Saudi Arab population, a scoping review found a 30% prevalence of obesity and overweight in people under 25 years old, with a 40% prevalence in men and a 25% prevalence in women[23]. However, our research showed that females were more likely to be obese. There was no statistically significant difference in serum zinc levels between the sexes, according to a cross-sectional study done in Riyadh[24]. Our study's consistent findings supported the notion that there are no gender-related differences in serum zinc levels.

Zinc is essential for maintaining healthy lipid and glucose metabolism because it controls and affects insulin expression. Research has shown that supplementing with zinc can lead to improvements in blood pressure, glucose levels, and serum LDL cholesterol[25]. A more profound understanding of zinc's

properties could potentially contribute to the treatment of Obesity.

5. CONCLUSION

The results of this study provide evidence that there is a link between decline in serum zinc levels and young adult obesity. These results imply that the introduction of zinc supplementation could emerge as a prospective approach for averting and managing obesity. However, more research is required to confirm these conclusions and determine the best zinc supplementation dose and time frame.

Limitations of the study

The study possesses certain limitations that merit consideration. First off, the results' relevance to a larger population may be constrained by the sample size, which was quite small. Second, the cross-sectional design of the study prevents the establishment of causal relationships between serum zinc levels and obesity. Thirdly, the research did not evaluate participants' dietary zinc intake, a factor that could have potentially influenced the outcomes.

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