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The Effect of Vitamin D on Biochemical Parameters among Childhood Obesity

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ABSTRACT

Background: A lack of vitamin D has been found to be a possible risk factor for a number of negative health effects.

Materials and Methods: This study examined the association among creatine kinase (CK) activity and vitamin D levels in children aged 6 to 12 who were obese and those who weren't. Between January and July 2025, sixty participants—30 obese and 30 healthy people who were matched for age and sex—were enlisted from pediatric outpatient clinics in Baghdad, Iraq. The World Health Organization's growth standards were used to measure anthropometric data, such as body mass index and waist circumference. Serum was kept at -20°C until analysis after venous blood samples were drawn and handled in a sterile manner. Enzymatic colorimetry was used to evaluate CK enzyme activity, Vitamin D concentrations were measured by ELISA. Statistical analyses were performed in SPSS using independent-samples t-tests to compare obese and control groups and Pearson's correlation to evaluate associations, with significance set at $p < 0.05$.

Results: Compared with controls, obese children had significantly lower vitamin D levels and significantly higher creatine kinase (CK) activity; waist circumference and body mass index were also significantly greater in the obese group, consistent with metabolic alterations associated with obesity.

INTRODUCTION

Over the past few decades, pediatric obesity has risen markedly is currently a significant worldwide public health issue in both developed and developing nations. (1). This complex, multidimensional disorder is influenced by genetic, environmental, and lifestyle agents and is associated with a range of metabolic, cardiovascular, and musculoskeletal complications (2). Recently, two biochemical markers linked to obesity—vitamin D and creatine kinase (CK)—have attracted interest because of their potential roles in inflammation, muscle function, and metabolic regulation (3). We thus determined serum vitamin D levels and CK activity in obese versus non-obese children, including the associations with anthropometric and metabolic parameters.

Vitamin D is a fat-soluble vitamin produced in the skin after exposure to ultraviolet B (UVB) light, and obtained from food. It is critical for calcium balance, immune regulation, and skeletal integrity (4). Beyond it's traditional role in bone, vitamin D has been reported to modulate inflammation, muscle metabolism and insulin sensitivity.(5)

Vitamin D deficiency is more common in obese subjects, especially in children, and may be due to adipose tissue sequestration of vitamin D, lack of sun exposure, and inadequate dietary intake (6). DThe reversible interconversion of creatine and adenosine triphosphate (ATP) by cash transfer system is coupled with creatine kinase and energy supply.

Obese people have been found to have elevated CK levels, which may be brought on by increased muscle mass, low-grade inflammation, or subclinical muscle injury associated with insulin resistance(9). Since vitamin D deficiency has been linked to muscular weakness, myopathy, and altered muscle energy metabolism, there is growing evidence that vitamin D status may affect CK activity(10).

Vitamin D supplementation has been demonstrated in studies to enhance muscular function and perhaps lower CK levels after muscle strain or damage, nevertheless, there is still a dearth of information about the connection between vitamin D and CK levels in obese children, especially in countries where both obesity and vitamin D insufficiency are highly prevalent(11). This study aimed to evaluate the association among obesity, vitamin D deficiency, and cardiovascular risk, in Iraqi children.

MATERIAS AND METHODS

This research studied the association between vitamin D status and creatine kinase (CK) activity in obese and non-obese children. The study enrolled 60 children aged between 6 and 12 years, attending pediatric outpatient clinics in Baghdad, Iraq, from January to July of 2025. There were 30 children with obesity and 30 healthy age- and sex-matched kids that constituted the control group. All participants were subjected to a clinical examination by pediatric physicians in order to exclude any endocrine disorders, chronic diseases and drug consumption which might influence the muscle enzymes level or vitamin D metabolism. Height and body weight were recorded while the subject was barefoot and in light clothing using a digital scale and stadiometer calibrated to 1 mm. BMI was calculated as weight (kg) divided by height (m^2). Obesity was classified according to the World Health Organization (WHO) growth reference criteria: more than +2 standard deviations for body mass index (BMI)-for-age (12). 5 mL of venous blood was collected from each participant, using aseptic conditions with sterile disposable syringes. The centrifugation was started soon obtaining the serum separator tubes with gel; the samples were then allowed to coagulate for approximately 20 min at room temperature. The tubes were centrifuged 5 min at 3000 rpm to get a clear serum. To prevent analyte degradation, the separated serum was aliquoted Ortho-McNeil Janssen and stored below-20 °C until analysis. Serum vitamin D levels were measured using a commercially available enzyme-linked immunosorbent assay (ELISA) kit (My BioSource, USA; Catolog number MBS735897), and Creatine kinase (CK) activity was analyzed by an enzymatic colorimetric assay kit (Elabscience, China; Catalog number E-BC-K558-S). Statistical analysis The data were processed in using the SPSS (statistical package for the social sciences), group differences were compared by independent sample t-test, correlation between vitamin D levels and CK activity was made utilizing Pearson's correlation coefficient.

RESULTS

The current study's findings showed that the obese and control groups various significantly in terms of BMI, waist circumference, serum vitamin D concentration, and creatine kinase (CK) activity.

The mean BMI from the obese group was significantly higher than that of the control group, as shown in Figure (1), suggesting a major difference in body composition between the two groups Figure 2 demonstrates that the mean waist circumference of obese children was considerably higher than that of the control group, indicating more central adiposity in the obese individuals. When compared to the control group, obese children's serum vitamin D levels were significantly lower, as seen in Figure (3).

The findings for CK activity, on the other hand, showed the reverse pattern. Serum CK levels were considerably greater in obese children than in the control group, as shown in Figure (4).

As shown in Figure (5), the Pearson correlation study between CK levels and BMI showed a positive significant correlation ($R^2 = 0.004$). This suggests that there was a considerable correlation between the study subjects' changes in BMI and variations in CK activity.

DISCUSSION

The significant rise in obesity rates, especially among children, is one of the biggest global public health issues. In addition to being linked to metabolic disorders, obesity is a major risk factor for cardiovascular disease (CVD) (13). Vitamin D insufficiency may influence lipid metabolism, vascular function, and inflammatory responses, which may lead to the development of cardiovascular problems, according to several studies (14). Vitamin D deficiency affects 10–25% of males and 10–30% of women in Europe, suggesting a significant impact on all demographic groups (15). Giovannucci et al. (16) showed that males with low vitamin D levels had a markedly increased risk from myocardial infarction in a seminal prospective trial with a 10-year follow-up. Similarly, Wang et al. (17) discovered that among people with hypertension, vitamin D insufficiency quadrupled the risk of cardiovascular disease. These results imply that vitamin D is important for cardiovascular health, perhaps because of its anti-inflammatory and endothelial-protective properties. Independent of seasonal change, cross-sectional data from a population-based study conducted in Porto, Portugal, showed that people with higher body fat percentages had lower serum vitamin D concentrations(18). Fatima et al. (19) revealed similar findings in Asian populations, confirming a negative correlation between serum vitamin D levels and body fat, the results of the current study, which showed that children who were obese had significantly lower serum vitamin D levels than healthy controls, are corroborated by these studies, because of its sequestration inside adipose tissue, decreased cutaneous production from less outdoor activity, or altered metabolic processing in obesity, vitamin D concentrations were shown to be lower in obese subjects. Our results are in line with those of Caleyachetty et al. (20), who found that obesity was linked to a 49% increased risk of coronary heart disease over a 5.4-year follow-up period in a large retrospective cohort study involving 3.5 million adults in the United Kingdom. This highlights the long-term cardiovascular consequences of obesity and highlights the significance of early childhood prevention and control.

A substantial correlation between CK activity and obesity was found in the study by Haan et al. (21), indicating that elevated CK levels could be a result of increased metabolic demand or muscle strain brought on by excess body mass. These findings are supported by our results, which demonstrate higher CK activity in obese youngsters when compared to controls. Higher muscle enzyme turnover, low-grade inflammation, or early metabolic changes in obese people may be associated with this rise.

CONCLUSION

In conclusion, it appears that a lack of vitamin D encourages the development of a more proatherogenic cardiometabolic risk profile in obese individuals. As a result, CK could be used as a marker to spot those who are at risk for obesity. Furthermore, because CK is independently related with BMI, future research on the role of CK in obesity may result in new treatment approaches to treat obesity.

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FIGURES

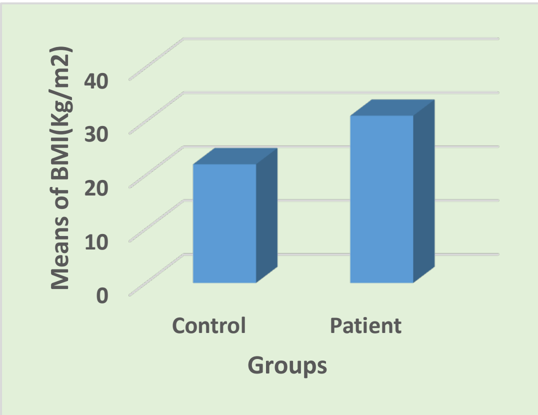

Figure (1): Means of BMI (Kg/m2) of obesity and control groups.

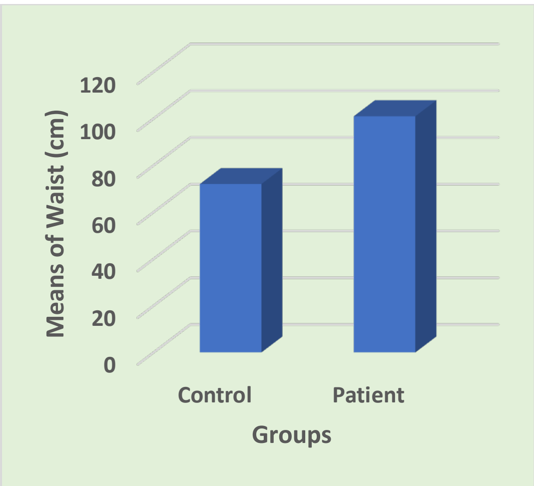

Figure (2): Means of Waist circumference (cm) of obesity and control groups.

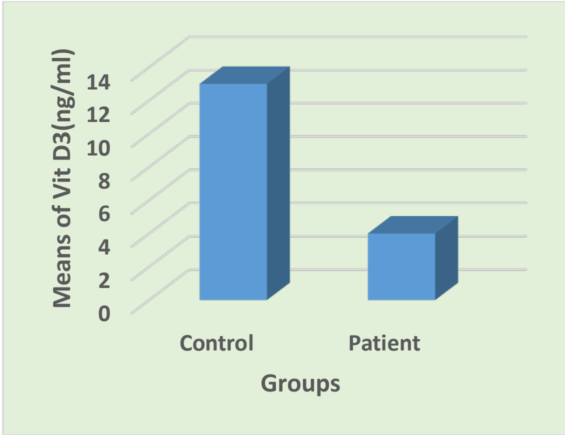

Figure (3): Levels of serum Vitamin D (ng/ml) of obesity and control groups.

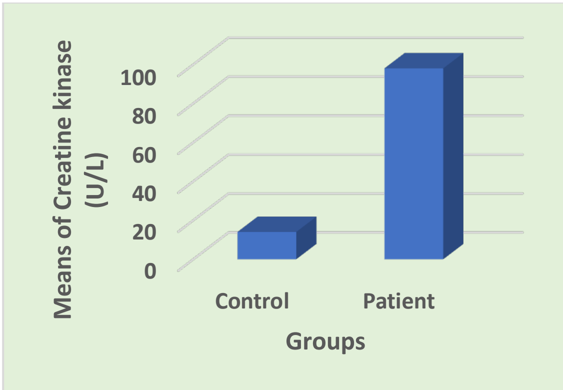

Figure (4): Levels of CK (U/L) of obesity and control groups.

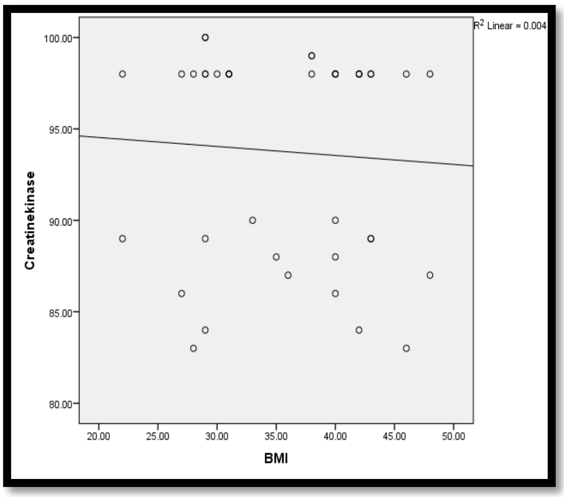

Figure (5): Correlation between the levels of CK and BMI.