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The Prevalence of Vitamin D Deficiency in Obese and Non-Obese Children Referred To Ali Asghar Zahedan Clinic In 1402

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Abstract

Introduction: Vitamin D deficiency is one of the most important medical problems, especially in children. It seems that one of the factors related to vitamin D deficiency in children is weight and obesity. The purpose of this study is to investigate the frequency of vitamin D deficiency in obese and non-obese children referred to Ali Asghar Zahedan Clinic in 1402.

Materials and methods: In this study, 94 children referred to Ali Asghar Clinic in Zahedan, including 47 obese children with high body mass index and 47 non-obese children with normal body mass index in terms of vitamin D levels. They were investigated in 1402. The samples were selected as available. The data was collected using observation and examination and experiments. Data analysis was done in SPSS version 22 software using independent T and Chi-square statistical tests. A significance level of less than 5% was considered.

Results: This study showed that the average vitamin D in two groups of obese and normal weight children was 21.7 ± 8.06 and 27.4 ± 12.4 ng/ml, respectively, and the level of vitamin D in obese children was It is significantly less than children with normal weight (P=0.011). Chi-square test also showed that the distribution of low vitamin level is significantly higher in the group of obese children than children with normal weight (14.9% vs. 6.4%) (P=0.05).

Discussion and conclusion: This study showed that obese children and adolescents are more at risk of vitamin D deficiency, which can be caused by poor nutritional status in these children. It is suggested to do more research to find the causes of vitamin D deficiency and to prevent and treat it with vitamin supplements.

Keywords: obesity, vitamin D deficiency, children

Introduction

Vitamin D is a steroid hormone that is essential for bone growth and development in children (1). In humans, the main source of vitamin D is the fraction made by the ultraviolet rays of sunlight (280-315 nm) from 7-dehydrocholesterol in the skin. Small amounts are also provided from food sources such as fish oil, eggs and fortified foods (2). The level of 25 hydroxyvitamin D in the serum is considered as an indicator of a person's vitamin D status and represents the vitamin D produced in the skin and the vitamin D obtained from the diet (2). The status of vitamin D is very different in European, Middle Eastern and Asian countries (3) In recent decades, there are reports of high prevalence of hypovitaminosis D and its side effects. (4) It is estimated that approximately 1 billion people worldwide suffer from vitamin D deficiency or insufficiency. In addition, the prevalence of insufficient vitamin D levels is significantly higher in Middle Eastern countries. This could be the result of various factors such as cultural dress codes, less time spent outdoors, and less vitamin D intake (5).

Vitamin D deficiency, a widespread health problem, is one of the main causes of rickets in infants and toddlers and osteopenia in adolescents. Although the Mediterranean region generally has a sunny climate, higher rates of hypovitaminosis D are observed in European and Mediterranean countries. (6) Vitamin D deficiency has become common, especially in the Middle East, due to the prevalence of wearing skin-covering clothing and avoiding sunlight (7)

During childhood, vitamin D plays an important role in calcium and phosphorus homeostasis and bone growth/mineralization. (8) In recent years, a wide range of health problems such as cardiovascular disease, high blood pressure, infections, autoimmune diseases and common cancers have been linked to low vitamin D levels. (9) it has been found that obesity is associated with hypovitaminosis D and thus has a greater chance of changes in glycemic control and metabolic syndrome in the general population (10).

According to the reports of the World Health Organization, obesity [body mass index (BMI) $\geq$ 95th percentile] has recently become an epidemiological problem due to its increasing prevalence. Since the late 1970s, obesity rates have quadrupled among 6- to 11-year-olds and tripled among 12- to 19-year-olds. (11) Childhood obesity is a global problem. It is known that overweight in childhood and adolescence is an important risk factor for obesity in adulthood as well as for the development of comorbidities. (12). Short-term supplementation studies have provided conflicting results regarding the effect of vitamin D on glucose tolerance and insulin sensitivity, and it is unclear whether vitamin D deficiency in children is associated with insulin resistance and whether vitamin D replacement has a role in the treatment of glucose intolerance. Does it exist in this age group or not (15). Intervention trials suggest that correcting obesity-related poor vitamin D status may reduce some of the comorbidities of obesity (13).

Research shows that both the active form, 1,25(OH)2D, and the parent molecule, vitamin D3, affect several key adipogenic genes and transcription factors, as well as fat accumulation. (14,15).

Therefore, according to the above and considering that no study has proven the prevalence of vitamin D deficiency in obese Iranian children, and further investigation to find the causes of vitamin D deficiency and its prevention and treatment with Vitamin Supplements The purpose of this study is to investigate the frequency of vitamin D deficiency in obese and non-obese children referred to Ali Asghar Zahedan Clinic in 1402

Material and method:

Study was cross-sectional (descriptive-analytical) and

Study community were Obese and non-obese children suffering from vitamin D deficiency referred to Ali Asghar Clinic in Zahedan city in 1402 were selected.

Entry criteria :

Obese and non-obese children suffering from vitamin D deficiency referred to Ali Asghar clinic in Zahedan city in 1402

Consent (at least one parent) to participate in the study

Exit criteria

1- Unwillingness to participate in the study

2- Suffering from any systemic disease

3- Using any medicine or supplement that affects the skeletal system

The data collection tool was based on laboratory data and information checklist. All participants underwent biochemical and physical examination. According to the body mass index, the prevalence rate of deficiency [serum 25-OH-D level <20 ng/ml] was calculated among normal weight, overweight/obese children, respectively. CDC reference values were used to evaluate overweight and obesity. (21) To define obesity in children, a comparison with the 85th and 95th percentiles of BMI for age-sex of a reference population was used. After an overnight fast, morning blood samples were taken from the participants to measure serum 25-hydroxyvitamin D (25-OHD), intact parathyroid hormone (iPTH) and alkaline phosphatase (ALP). Vitamin D deficiency was defined and considered as 25-OH-D levels between 10 and 20 ng/ml and normal vitamin D level as more than 20 ng/ml. (22) Subjects based on serum concentration of 25 -OH-D were divided into 3 categories (vitamin D deficiency, group A; normal or with vitamin D, group B). In this research, the competitive protein binding method was used to measure the levels of 25-OH-D Vita D EIA kit, Immundiagnostic. The normal range for 25-OH-D was 11 to 70 ng/ml and intra- and inter-assay coefficients of variation (CVs) were 10.7% and 13.2%, respectively. Serum iPTH was measured using chemiluminescence with an Immulite One analyzer. The reference range suggested by this method was 12-65 pg/ml and the total coefficients of variation were 2.8% and 3.4%, respectively. ALP serum levels were measured using original methods by Aeroset autoanalyzer equipment.

In this cross-sectional study, which was conducted after the proposal was approved by the Research Council of the Faculty of Medicine and permission was obtained from the Ethics Committee of Zahedan University of Medical Sciences, in 1402 in Zahedan University of Medical Sciences, 94 children referred to Ali Asghar Clinic with an easy and Available was included in the study. All participants underwent biochemical and physical examination.

The prevalence rate of deficiency [serum 25-OH-D level <20 ng/ml] among normal weight, overweight/obese children was calculated. CDC reference values were used to evaluate overweight and obesity. (21) To define obesity in children, a comparison with the 85th and 95th percentiles of BMI for age-sex of a reference population was used. When collecting data, the respondents will be assured that their information will remain confidential and will only be used in the analysis. Finally, the data was coded and entered into SPSS.22 software. In all analyses, $P < 0.05$ was considered as the significance level.

3-9-Ethical considerations:

This research code 1401.434 IR.ZAUMS.REC. It was approved by the Ethics Committee of Zahedan University of Medical Sciences. In this study, all ethical principles in accordance with the general guidelines of ethics in medical science research with human subjects in the Islamic Republic of Iran, including the following codes, were considered.

Fundings :

In this study, 94 children referred to Ali Asghar Clinic in Zahedan, including 47 obese children with a high body mass index and 47 non-obese children with a normal body mass index, were examined for vitamin D levels.

This study showed that the overall prevalence of vitamin D deficiency in these children is 38.3% (36 out of 94). Meanwhile, 10 (10.6) and 27 (27.7) children had low vitamin D and insufficient vitamin D, respectively and the prevalence of vitamin D deficiency in normal weight and obese children is 46.8% (22 out of 47) and 29.8% (14 out of 47) respectively.

In this study, the average age of the investigated children was 9.9 ± 2.4 years with a range of 4 to 16 years. The average age in two groups of obese and non-obese children was 10.46 ± 1.6 and 9.5 ± 2.9 years, respectively. The independent T-test showed that the two groups do not differ significantly in terms of age (P=0.58).

Also, in terms of the average level of vitamin D, the level of vitamin D in two groups was 24.6 ± 8.01 ng/ml and the average body mass index of all the examined children was 25.02 ± 6.5 kg/m2.

In terms of gender distribution, 46.8% of the obese group and 44.7% of the normal weight group were boys. The chi-square test showed that the two obese and non-obese groups were the same in terms of gender distribution and had no significant difference (P=0.8). (Table 1-4).

Table 1-4: Gender distribution in obese and non-obese children (body mass index within normal range) referring to Ali Asghar Clinic in Zahedan city in 1402

P	all N(%)	Female N(%)	Male N(%)	sex weight
0.8	47(100)	25(53.2)	22(46.8)	Obese
	47(100)	26(55.3)	21(41.7)	Normale
	94(100)	51(54.3)	43(45.7)	all

It shows the frequency distribution of vitamin D level according to gender in children referred to Ali Asghar Zahedan Hospital. Chi-square test showed that the distribution of vitamin level according to gender does not differ significantly (P=0.89). (Table 2-4)

Table 2-4: Frequency distribution of vitamin D level in children referred to Ali Asghar Zahedan Hospital according to gender

P	all N(%)	Sufficient N(%)	Insufficiency N(%)	Deficient N(%)	vitD sex
0/89	43(100)	27(62.8)	11(25.6)	5(11.6)	Male
	51(100)	31(60.8)	15(29.4)	5(9.8)	Female
	94(100)	56(61.8	26(27.7)	10(10.6)	all

Table 3-4 shows the frequency distribution of vitamin D levels in normal weight and obese children referred to Ali Asghar Zahedan Hospital by gender. Chi-square test showed that the frequency distribution of vitamin D level in children with normal weight and obese in both boys (P=0.5) and girls (P=0.26) is not significantly different (Table 3-4).

Table 4-3 Frequency distribution of vitamin D level in normal weight and obese children referred to Ali Asghar Zahedan Hospital by gender

P	all N(%)	Sufficient N(%)	Insufficient N(%)	Deficient N(%)	vitD	sex	
0.5	22(100)	12(54.5)	7(31.8)	3(13.6)	Normal	weight	Male
	21(100)	15(71.4)	4(19)	2(9.5)	Obese		
0.26	25(100)	13(52)	8(32)	4(16)	Normal	weight	Female
	26(100)	18(69.2)	7(26.9)	1(3.8)	Obese		

It shows the frequency distribution of vitamin D levels in normal weight and obese children referred to Ali Asghar Zahedan Hospital by age. The chi-square test showed that the frequency distribution of vitamin D levels in children with normal weight and obese both in children less than or equal to ten years old (P=0.23) and in children older than ten years old (P=0.72) is not significantly different.

It shows the frequency distribution of vitamin D level according to age in children referred to Ali Asghar Zahedan Hospital. Chi-square test showed that the distribution of vitamin levels according to age has no significant difference (P=0.061).

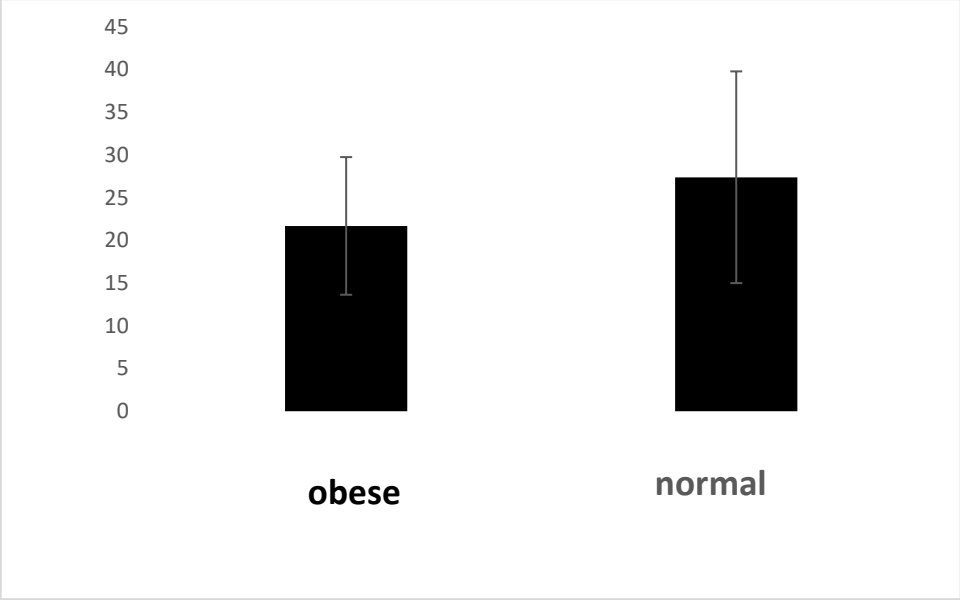
Table 4-4 Frequency distribution of vitamin D level in normal weight and obese children referred to Ali Asghar Zahedan Hospital by age

P	all N(%)	Sufficient N(%)	Insufficient N(%)	Deficient N(%)	vitD	Age	
0.23	20(100)	11(55)	8(40)	1(5)	Normal	weight	<=10 ye
	31(100)	26(77.4)	6(19.4)	1(3.5)	obese		
0.72	27(100)	14(51.9)	7(25.9)	6(22.2)	normal	weight	>10yr

	16(100)	9(56.2)	5(31.2)	2(12.5)	obese		

This study showed that the average vitamin D in two groups of obese and normal weight children was 21.7 ± 8.06 and 27.4 ± 12.4 respectively. Independent T test showed that vitamin D level in obese children is significantly lower than children with normal weight (P=0.011). (Chart 1-4).

Chart 1-4: The average level of vitamin D in children referred to Ali Asghar Zahedan Hospital by weight



It shows the frequency distribution of vitamin D levels in two groups of obese and non-obese children. Chi-square test showed that the distribution of low vitamin level is significantly higher in the group of obese children than children with normal weight (14.9% vs. 6.4%) (P=0.05).

Discussion

In this study, the number of 94 children referred to Ali Asghar Clinic in Zahedan, including 47 obese children with high body mass index and 47 non-obese children with normal body mass index, were examined in terms of vitamin D levels. they took. Therefore, age and gender were not confounding factors in this study and these variables were controlled in the causal relationship of obesity and vitamin D deficiency.

This study showed that the average vitamin D in two groups of obese and normal weight children was 21.7 ± 8.06 and 27.4 ± 12.4 respectively. Independent T test showed that vitamin D level in obese children is significantly lower than children with normal weight. The study of Mutlaqzadeh et al. in 2016 in Tehran (16), the study of Verônica et al. in 2021 in Brazil (18) and the study of Micah et al. in 2012 in the United States (17) are consistent.

On the other hand, the relatively widespread distribution of vitamin D receptor and 25-hydroxyvitamin D 1a-hydroxylase throughout the body, including evidence for the role of

vitamin D in adipogenesis and fat metabolism, may partially explain these widespread effects (18). On the other hand, most of the findings so far show that obese children need more vitamin D than non-obese people (19).

Some studies have shown that weight loss interventions using energy restriction and physical activity may also improve the poor vitamin D status associated with obesity, but more research is needed to clarify the mechanism and to determine the effectiveness of vitamin D supplements in reducing Conditions associated with childhood obesity and further elucidation of the mechanisms by which vitamin D exerts its effects on health require further investigation (20).

Chi-square test showed that the distribution of low vitamin level is significantly higher in the group of obese children than children with normal weight (14.9% vs. 6.4%). This result shows the acceptable division of vitamin D levels in children and is consistent with the results of Shariat et al.'s study in 2019 in Tehran (21) and Zakharova et al.'s study in 2019 in Russia (22).

A 2012 study by Micah et al. in the United States showed that 92% of obese subjects had 25(OH)D levels below 75 nmol/L and 50% below 50 nmol/L, while among non-overweight subjects, this The frequencies were 68 and 22%, respectively. This study showed that vitamin D deficiency is related to soft drink consumption, fruit juice consumption, and skipping breakfast, and low 25(OH)D level is also related to type 2 diabetes risk factors in obese children (20). The study of Mutlaqzadeh et al. in 2016 in Tehran showed that the frequency of hypovitaminosis D before therapeutic intervention in obese and non-obese foals was 95% and 66%, respectively. In this study, after the treatment, the above percentages decreased to 55% and 4%, respectively, and it indicates a low treatment response in obese children (16). Therefore, it seems that intervention with vitamin D in obese children improves the level of this vitamin, but for some reasons, its absorption is less than that of non-obese children, which requires more research in this field.

Some studies have shown the relationship between obesity and low levels of vitamin D and parathyroid hormone levels (23). On the other hand, some studies have shown that the level of this hormone is relatively high in obese children (24,25). As a result of stimulation of lipogenesis gene expression and inhibition of lipogenesis gene expression, intracellular calcium increases. Intracellular calcium also plays an important role in lipid metabolism (26,27). Therefore, these findings can justify the deficiency or change in vitamin D levels in overweight or obese children.

Conclusion

This study showed that obese children and adolescents are more at risk of vitamin D deficiency, which can be caused by poor nutritional status in these children. It is suggested that further research be done to find the causes of vitamin D deficiency and its prevention and treatment with vitamin supplements.

Suggestions

Conducting prospective studies on the effect of obesity on vitamin D levels in children

Determining the prevalence of vitamin D deficiency in children in a larger study with a large sample size using a random sample in Zahedan city.

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