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THE ROLE OF VITAMIN D DURING PRIMARY EXOGENOUS CONSTITUTIONAL OBESITY IN WOMEN

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Abstract:

According to the literature, in recent years, the relationship of overweight and obesity with vitamin D deficiency has been published very often. This study was conducted at the TMA in the general hospital in the department of 2 therapy and endocrinology. 85 women with exogenous constitutional obesity and 30 women of the control group with normal body weight were examined. The results showed that the higher the BMI, the more pronounced the vitamin D deficiency. In addition, these women had a high level of insulin and an indicator of insulin resistance. Also, a negative correlation was found between the content of vitamin D and some parameters of the study - insulin in the blood and the state of insulin resistance.

Keywords: Vitamin D, exogenous constitutional obesity, fertile age, insulin resistance

INTRODUCTION

Obesity is a chronic heterogeneous disease that progresses in the natural course, characterized by excessive accumulation of adipose tissue in the body: in men – more than 10–15%, in women – more than 20–25% of body weight [5,13].

The level of human health is determined by a large number of internal and external factors, among which a serious role is played by the prevalence in the population of a number of disorders and pathologies that are epidemic or endemic. The latter fully include overweight and obesity, as well as a decrease in the supply of vitamin D. Recent studies have shown both the progressive growth of this group of pathology and its significant and not yet fully understood effect on the growth of metabolic, cardiovascular, immune, oncological and many other diseases, as well as on negative genome editing, which means the manifestation of the above-mentioned disorders in subsequent generations [7,8,16,17].

In recent years, the attention of researchers has been attracted by the fact of a frequent combination of vitamin D deficiency and metabolic disorders in both adults and children [1,2,16,14,17], but geographical location does not always have a significant effect on the level of 25(OH)D in the blood [17]. Thus, the results of a number of studies have shown that low serum levels of vitamin D are most often observed in obese patients, type 2 diabetes mellitus (DM) [10,11,16], dyslipidemia [4,6,10].

Vitamin D is not only the main regulator of calcium-phosphorus metabolism, but also takes part in the control of various processes and functions in the body. It is known that about 80–90% of vitamin D in the form of cholecalciferol (vitamin D3) is formed in the skin under the influence of ultraviolet radiation, and only 10–20% in the form of ergocalciferol (vitamin D2) or vitamin D3 comes from food (salmon, tuna, cod, beef liver, butter, milk, cheeses, egg yolks, some mushrooms, cereals and other foods) [8]. The presence of skin pigmentation, the use of closed clothing, sunscreens, as well as the geographical region of residence, old age, diet, medication, malabsorption syndrome and other factors can have a negative impact on the intake and formation of vitamin D in the human body [9].

The pathogenetic relationship between obesity and vitamin D deficiency appears to be due to several mechanisms. First, in obesity, vitamin D, which is fat-soluble, is distributed in large volumes in adipose tissue, which leads to a decrease in its concentration in the blood plasma. Secondly, it can be assumed that obesity reduces the natural production of vitamin D in the skin under the influence of sunlight, since obese people wear more closed clothes and spend less time in the sun [7,17].

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It turned out that among patients of both sexes, regardless of age, the same trend can be traced: as BMI increases, there is a decrease in the level of 25(OH)D [29, 30]. An inverse correlation with BMI was noted not only for 25(OH)D, but also for serum 1,25(OH)2D. Seasonal differences in serum 25(OH)D concentrations were most pronounced in the group of men younger than 50 years of age with normal body weight. A decrease in vitamin D content to a level where it can be said to be deficient was most often observed among patients with BMI≥40 (32% of women and 46% of men). The results of this study confirm that serum 25(OH)D3 levels and seasonal variations depend on BMI. According to these data, one in 3 women and one in 2 men with a BMI≥40 are deficient in vitamin D [3,9].

However, it is believed that low levels of vitamin D contribute to the development of obesity and/or at least prevent weight loss. Thus, in vitro studies have shown that 1,25-dihydroxyvitamin D blocks the differentiation of adipocytes, inhibits the synthesis of a protein that provides fatty acid transfer, which is necessary in lipolysis processes, suppresses the activity of PPAR-y receptors, and also inhibits the expression of the free fatty acid synthetase gene, which is an important enzyme of lipogenesis [7,11]. Thus, in conditions of vitamin D deficiency, activation of lipogenesis and inhibition of lipolysis are observed, leading to an increase in the amount of fat mass [17].

With this in mind, the aim of this work is: To study the relationship between some metabolic parameters in women of childbearing age with exogenous-constitutional obesity and vitamin D deficiency.

MATERIALSAND RESEARCH METHODS

The study involved 85 women with primary exogenous-constitutional obesity (main group), permanently residing in Tashkent and the Tashkent region, meeting the inclusion criteria: age 25-45 years, overweight or obesity, according to WHO criteria and (body mass index (BMI) ≥ 25), no signs of acute illness or exacerbation of chronic at the time of enrollment in the study, no fact of taking vitamin D supplements for at least one month prior to enrollment in the study. Exclusion criteria from the main group: morbid obesity with a BMI of >40 kg/m2, obesity due to other endocrine diseases (hypothyroidism, hypercorticism, hypopituitarism and other types), obesity due to injuries of the hypothalamic-pituitary region, the presence of chronic diseases of the digestive tract, liver and kidneys.

The control group (n-30) consisted of women without overweight and obesity (BMI 18-24.9). The main group and the control group were comparable in age (mean age 34.5 ±8.9 and 3 5.7±3.2 years, respectively).

The anthropometric survey included measurements of height, body weight, waist circumference (OT) and hips (OB) using standard methods. Based on the indicators of height and body weight, the body mass index (BMI) was calculated according to the formula A. Quetelet: body weight / height 2 (kg / m2). A BMI equal to and more than 30 kg/m2 was taken for the presence of obesity. Based on an RT score of 80 cm or more, women were diagnosed with abdominal obesity according to the criteria of the International Diabetes Federation (IDF, 2005).

The assessment of the degree of vitamin D supply was carried out according to the level of 25(OH)D in blood serum (immunochemiluminescence method, Abbott Architect 8000 analyzer, USA) in 115 women (85 women of the main and 30 control groups) using the criteria of the International Society of Endocrinologists (2011) [1, 4] and the recommendations of the Russian Association of Endocrinologists, the Russian Association of Osteoporosis [1, 4;]. A serum value of 25(OH)D above 75 nmol/L (30 ng/ml) was taken for normal vitamin D supply, 50 to 75 nmol/L (20-30 ng/ml) for deficiency, and a level below 50 nmol/L (20 ng/ml) for deficiency [11,12,14]. A hormonal study was also conducted: blood insulin with the calculation of the insulin resistance index (HOMA-IR).

The obtained data are presented as a percentage or in the form of an average errorand (M±m). Statistical data processing was carried out using the STATISTICA software system for Windows (version 9.0). To clarify the relationship between the studied indicators, a correlation analysis was carried out with the calculation of the Pearson correlation coefficient. The criterion for the statistical reliability of the results obtained was the value of $p<0.05$.

RESEARCH RESULTS

The results of the study showed that 7-4 women had abdominal obesity (OT≥80 cm), which was 87.0%, while normal OT indicators were determined in 11 (13.0%) women.

Andby applying BMI, it was revealed: 40 (47.0%) patients were overweight, 2 4 (2 8.2%) 1 degree, 21 (24.8%) 2 degree obesity.

Serum 25(OH)D levels ranged from 8.2 to 49.0 ng/mL (mean 26.75±7.61 ng/mL). It turned out that in many of the women examined, 25(OH)D levels were lower than the control values. At the same time , 4 0 (47.0%) women had a deficiency, 38 (43.5%) had a deficiency and only 7 (9.5%) of the women showed the optimal content of vitamin D. Thus, the majority of women surveyed had a lack or deficiency of vitamin D. At the same time, women with vitamin D deficiency had the highest body weight (Table 1).

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It was found that in women with normal body weight, the level of 25(OH)D in the blood was higher than in women with overweight and obesity (32.47±3.78 ng/ml versus 2 2.87±4.32 ng/ml; p<0.05)

Table 1
Metabolic parameters in women with varying degrees of BMI

Index	Control IMT - 18-24.9 kg/m² n-30	IMT – 25-29.9 kg/m² n-40	BMI - 30-34.9 kg/m² n-24	BMI - 35-39.9 kg/m² n-21	R
25 (OH)D, ng/ml	46,9±9,6	21,4±5,6*	15,9±3,5*,**	13,9±5,5*,**	p<0,001
Blood glucose, fasting, mmol/l	4,0±0,5	4,2±0,3	5,2±0,7	5,3±0,2	p>0,001
Insulin in the blood, IU / l	7,7±4,0	17,5±3,7*	23,5±7,3*,**	24,5±8,9*,**	p<0,05
HbA1c, %	4,9±0,4	5,2±0,7	5,6±0,5*	5,8±0,5*	p<0,05
HOMA-IR	1,4±0,6	3,1±0,4*	6,03±0,6*,**	6,12±0,4*,**	p<0,001
OH, mmol/l	4,2±0,2	5,1±0,3	5,5±0,6*	5,8±1,2*	p<0,05
TG, mmol/l	1,5±0,03	1,8±0,07	1,9±0,04	2,3±0,09*	p>0,001
LDL, mmol/L	1,9±0,07	2,0±0,1	2,3±0,09	2,43±0,05	p>0,001
HDL, mmol/l	1,4±0,06	1,3±0,03	1,0±0,05*	1,0±0,09*	p<0,05

Note: *p<0.05; p<0.001 – the presence is significant in relation to the control group; **-the presence of reliability in relation to the study group

In the analysis of metabolic comorbidity in obese women, the most significant disorders were represented by an increase in insulin in the blood, the development of insulin resistancein more than half of the examined, as well as hypercholesterolemia and hypertriglyceridemia. In the obese group, the average fasting blood insulin was higher compared to the overweight group, which reflects the state of insulin resistance, the main pathogenetic link in the development of metabolic syndrome. Insulin in the blood was in all major groups with elevated BMI. So, if insulin in the blood is increased by 60% in the overweight group, then in the groups with obesity I and II degree, this indicator was increased by 70% and 71.4%, (p<0.05), respectively.

So, there is a fact that with an increase in BMI, the content of 25 (OH) D in the blood decreases. If 25 (OH) D in the blood of overweight women is reduced by 55% (p<0.05) in relation to the control group, then in women with obesity I and II degrees, the content of 25 (OH) D in the blood was reduced by 68% and 72%, (p<0.05) , respectively. This once again proves the relationship between the volumeof adipose tissue and the concentration of 25 (OH) D in the blood.

To compare whether there is a relationship between the studied parameters, we conducted a correlation analysis. A correlation analysis study showed that there are certain relationships between 25 (OH) D in the blood with anthropometric data and metabolic parameters, for example, the level of vitamin D fromnegatively correlated with BMI (-60), OT (-0.59) (P<0.05), blood glucose (P >0.05), blood insulin (-0.7 6) (P<0.05), as well as the insulin resistance index - HOMA IR (-0.61) (P<0.05) in women with vitamin D deficiency . The same changes were found in women with a lack of this vitamin.

Table 2
Correlation analysis of vitamin D levels, anthrapometric and metabolic parameters in the examined women

Options	The value of the coefficient Spearman's rank correlation (R)	
	Deficiency 25(OH)D <20 ng/mL n-38	Deficiency 25 (OH) D 20-30 ng / ml n-40
BMI, kg/m2	-0,60*	-0,41*
OT, cm	-0,59*	-0,43*
Blood glucose, fasting, mmol/l	-0,34	-0,29
Insulin in the blood,	-0,76*	-0,49

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HbA1c, %	-0,11	-0,10
HOMA IR	-0,61*	-0,23
OH, mmol/l	-0,28	-0,21
TG, mmol/l	-0,13	-0,10
LDL, mmol/L	-0,15	-0,17
HDL, mmol/l	-0,20	-0,12

Note: * - level of statistical significance <0.05

There is evidence that vitamin D deficiency may be involved in the pathogenesis of insulin resistance and metabolic syndrome [15,16,17].

In conclusion, it should be noted that there is no unequivocal answer to the question of whether vitamin D deficiency is a cause or a consequence of obesity today. However, given the fact that there is a relationship between some metabolic parameters and the level of vitamin D supply, there is no doubt. It is necessary to single out obese people in a separate risk group for vitamin D deficiency, determine their level of 25 (OH) D in the blood serum and, if there is a deficiency and deficiency, fearlessly prescribe prophylactic or therapeutic doses of vitamin D. Simultaneously with taking a vitamin D preparation, it must be remembered that a decrease in body weight by more than 5% of the initial value is capable of independently positively affect the level of vitamin D supply in obese patients.

CONCLUSION

1. Low levels of vitamin D in women of childbearing age with exogenous-constitutional obesity have been established. Women with obesity have a lower supply of vitamin D compared to overweight women (13.9± 5.5 ng/ml versus 21.4±5.6*ng/ml).

2. In the group of overweight and obese women , metabolic disorders are represented by an increase in fasting insulin levels, an increase in the HOMA-IR index, cholesterol and triglyceride levels.

3. When conducting a correlation analysis of the relationship of vitamin D with anthropometric data and metabolic parameters, we obtained data that the level of vitamin D is negatively correlated with BMI (-0.60), OT (-0.59), as well as the insulin resistance index - HOMA IR (-0.61) (P<0.05). In the group with vitamin D deficiency, a negative relationship between BMI, OT, and blood insulin was also revealed.

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