SECURITY OF VITAMIN D IN SCHOOLCHILDREN OF TASHKENT CITY

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Abstract: The aim of the study was to assess the vitamin D status in schoolchildren of Tashkent city. Materials and methods. From February to March 2018, 132 schoolchildren aged 13-16 years (mean age 14.64±0.19), selected through randomization, were examined at schools No. 246 and No. 98 in the Yunusabad district of Tashkent. The concentration of vitamin D - 25 (OH) D was determined using "DIAsource" (Belgium) commercial kits on a "Stat Fax 2100" (Israel) analyzer using the ELISA method for quantitative enzyme-linked immunosorbent assay. The results of the study revealed that only 13.6% of children had optimal vitamin D levels, 37 (28.0%) had insufficient levels, 43 children (32.6%) were diagnosed with vitamin D deficiency, and 34 (25.8%) had severe deficiency. The average vitamin D content in 132 children was 17.7±0.89 ng/ml, indicating a deficient level of vitamin D.

Keywords: vitamin D, schoolchildren

It has been just over 100 years since E. Mc. Collum and M.J. Davis (1913) discovered a compound in milk fat and cod liver oil, leading to the suggestion of the existence of a fourth vitamin necessary for maintaining health. Consequently, this compound was named after the fourth letter of the Latin alphabet, "vitamin D." By the mid-20th century, it was already known about the important antirachitic effect of vitamin D. But by now, it has become clear that vitamin D is not actually a vitamin. Unlike other vitamins, it, like all steroid hormones, can be synthesized independently in the body from acetate and cholesterol. Due to its interaction with specific receptors located in various cells far from the site of its formation, vitamin D exhibits diverse biological effects. Calcitriol is the most active metabolite of vitamin D, exhibiting all the qualities of the hormone, and, of course, it can be called "D-hormone" [1, 2, 3].

To date, it has been conclusively proven that vitamin D, functioning as a hormone with its "hormone-like axis: calcidiol-calcitriol - VDR (vitamin D receptor)," is closely interconnected not only with parathyroid hormone and calcitonin but also with the biological effects of insulin, estrogens, neurotrophic factors, and cytokines. Consequently, it is possible to model the effects of inadequate vitamin D levels in the human body through a range of issues, from stunted growth in

children to a wide spectrum of chronic diseases that claim the lives of hundreds of millions of adults [4, 5, 6].

According to the modern concept of preventive medicine, vitamin D deficiency is an independent risk factor for diseases such as arterial hypertension, coronary heart disease, peripheral blood vessel diseases, various forms of cancer, type 1 and 2 diabetes mellitus, autoimmune, infectious, and inflammatory diseases [7, 8, 9, 10].

Data from world literature indicate that the problem of vitamin D deficiency and insufficiency is currently gaining epidemic scale and coincides with the increase in the prevalence of non-communicable diseases (NCDs). In this case, vitamin D becomes one of the most cost-effective supplements, which allows improving the health of the population and reducing the costs of prevention of STIs, both in childhood and adulthood.

Evidence of positive effects of vitamin D stimulated the development of national recommendations for the prevention of vitamin D deficiency in Poland (2008), Hungary (2012), Germany, Austria, and Switzerland (2012) [11-13]. The Institute of Medicine of the US National Academy of Sciences, in collaboration with the Endocrinology Society, has also developed its own principles for vitamin D [14]. In 2012, the European Food Safety Authority issued revised levels (upper limits) of vitamin D for all relevant population groups [15].

The level of calcidiol - 25 (OH) D in serum is accepted as a standard biomarker of the body's vitamin D supply. This metabolite is quite stable (half-life 2-3 weeks), reflects the intensity of vitamin D synthesis in the skin and its intake with food [1, 3].

Numerous clinical studies examining the level of 25 (OH) D in relation to its relationship with human health status and disease risk have shown adequate levels of 25 (OH) D in the range of 30 to 50 ng/ml (75-125 nmol/l) and the required minimum concentration (>20 ng/ml or >50 nmol/l) for the normal existence of the organism [1, 3, 11-15].

Population studies indicate a high prevalence of D-hypovitaminosis among the child population. According to the results of a study conducted in the United Arab Emirates, despite the presence of sufficient insolation, a higher frequency of vitamin D deficiency was established in children aged 8 to 14 compared to children aged 2-7. In this regard, national recommendations have been developed [16]. In the USA, 61% of children have insufficient levels of vitamin D (15-29 ng/ml) and 9% have a deficiency level (<15 ng/ml) [17].

The purpose of our work was to study the level of vitamin D provision for schoolchildren in the city of Tashkent.

Materials and methods of research.

In the period from February to March 2018, 132 13-16 year old schoolchildren (average age 14.64±0.19) selected through randomization were examined at schools No. 246 and No. 98 in the Yunusabad district of Tashkent. In the observed groups, there were 86 (65.2%) boys and 46 (34.8%) girls, respectively. The distribution by sex and average age was uniform. Comprehensive studies were conducted using standard methods (questionnaires, collection of ante- and postnatal history, study of

heredity, clinical and paraclinical examination (measuring blood pressure (BP); anthropometry according to WHO criteria (2007); determining the stage of puberty according to the Tanner scheme (1962) and others)). The concentration of vitamin D-25 (OH) D was determined using "DIAsource" (Belgium) commercial kits on a "Stat Fax 2100" (Israel) analyzer using the ELISA method for quantitative enzymatic solid-phase analysis.

Results and their discussion.

Statistical analysis of the serum level of the metabolite of vitamin D showed that only 18 (13.6±2.9%) children had an optimal level of vitamin D (the average level of 25 (OH) D was 31.1±0.39 ng/ml), 37 (28.0±3.9%, $p<0.05$) - insufficient content (23.2±0.6 ng/ml, $p<0.001$), 43 (32.6±4.1%, $p<0.05$) children were diagnosed with vitamin D deficiency (14.9±0.5 ng/ml, $p<0.001$) and 34 (25.8±3.8%, $p<0.05$) - severe deficiency (8.1±0.2 ng/ml, $p<0.001$). The average content of vitamin D in 132 children was 17.7±0.89 ng/ml, indicating a deficiency level of vitamin D.

The obtained results coincide with the literature data. A.A. Kozlovsky's (2017) study of 25 (OH) D levels in 7-18-year-old school-age children in Gomel city showed a decrease in the average content of vitamin D metabolite, which was at 22.17±1.39 ng/ml [18]. The multicenter study "Rodnichok-1" conducted in Russia established vitamin D deficiency in 42% of children from birth to 3 years of age [1]. I.N. Zakharova's own research conducted in February 2011 revealed D hypovitaminosis in almost half of 100 adolescent girls aged 11-17 at the Moscow Cadet Corps [1]. The results of the following studies showed a year-round vitamin D deficiency and the deepest deficiency (at the level of avitaminosis) was established in May in adolescents in Moscow. Even during the summer months, vitamin D status did not normalize in adolescents.

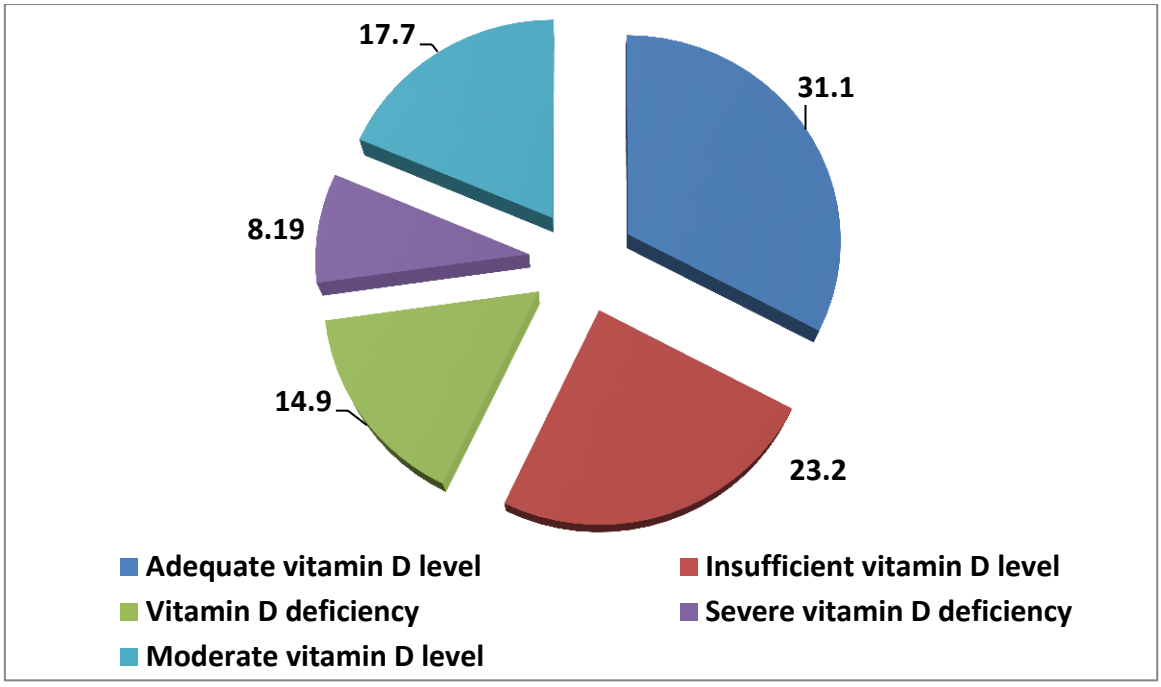

Figure 1. Average indicators of the level of vitamin D provision of schoolchildren in the city of Tashkent (ng/ml)

Prospective research by D.I. Akhmedova et al. (2019) studied the levels of 25-hydroxivitamin D in 239 children aged 2-3 years living in various regions of the Republic of Uzbekistan during the period of maximum insolation, and also revealed vitamin D deficiency in 18.4% and insufficiency in 63.6% of children [19].

Conclusion.

It is known that up to 80% of vitamins D can be synthesized in the skin when the exposed skin surface is sufficiently insolated with 280-315 nm ultraviolet radiation. But the synthesis of vitamin D depends on the angle of incidence of sunlight, i.e., geographical latitude, time of year, and time of day. Also, prolonged stay indoors, dark skin, intense sun exposure, insufficient physical activity, smog, and high cloud cover reduce D vitamin production**.** The geographical location of our country above 35° north latitude is one of the reasons for the low vitamin D status. The obtained results indicate that vitamin D from dietary sources and skin synthesis does not provide adequate levels in the body to maintain health. Therefore, the development of national programs for the prevention and treatment of insufficient and deficient levels of vitamin D in children and adolescents is of particular relevance.

References:

1. Symposium "D-Hormone - Discovery of the 21st Century" Review of presentations by I.N. Zakharova, L.Ya. Klimov, V.A. Kuryaninova, I.L. Nikitina, and others. Pediatrics (Supplement to Consilium Medicum journal). 2018: 1: 23-30. DOI: 10.26442/2413-8460_2018.1.23-30.

2. Wasker M., Holick M.F. Sunlight and Vitamin D. A global perspective for health. Dermatoendocrin. 2013; Jan1; 5(1): 51-108. Doi: 10.4161/de

3. Kodentsova V.M., Mendel O.I., Khotimchenko S.A., Baturin A.K., Nikityuk D.B., Tutelyan V.A. Physiological requirement and effective doses of vitamin D for correcting its deficiency. Current state of the problem. Voprosy pitaniia [Problems of Nutrition]. 2017; 86 (2): 47-62.

4. Sattar N., Welsh P. Editorial: Vitamin D and chronic disease prevention: Multiple meta-analysis but still no magic bullet.BMJ.2014; 348:g2280.

5. Sokolovic S. Vitamin D and cardiovascular disorders. Vitamin D papers from European Vitamin D Association Conference – Oct. 2015: 840-842.

6. Verdoia, M., et al.Vitamin D deficiency is independently associated with the extent of coronary artery disease. Eur. J. Clin. Invest. – 2014. –Vol. 44, № 7. – P. 634 – 642.

7. Sabetta J.R., DePetrillo P., Cipriani R.J. et al. Serum 25-hydroxyvitamin D and the incidence of acute viral respiratory tract infections in healthy adults. PLoS One 2010; 5: e11088.

8. Vaidya A., Williams J.S. The relationship between vitamin D and the renin-angiotensin system in the pathophysiology of hypertension kidney disease and diabetes. Metabolism:clin. and experim. 2012; 6(4):450-458.

9. Van Belle T.L., Gysemans C., Mathieu C. Vitamin D in autoimmune infections and allergic diseases: a vital player? Best Pract.Res.Clin. Endocrinol. Metab.2011; 25: 617-632. Doi: 10/1016/j.been.2011.04.009.

10. Wang L., Song Y., Manson J.E., Pilz S. Circulating 25-hydroxyvitamin D and risk of cardiovascular disease: A meta-analysis of prospective studies. Circ. Cardiovas. Qual. Outcomes.2012; 1;5:819-829.

11. Charzewska J.,Chlebna-Sokol D., Chybicka A. et al. Prophylaxis of vitamin D deficiency-Polish recommendation 2009. Endocrinol. Pol. 2010; 61: 228-232.

12. Takacs I., Benko I., Toldy E. et al. Hungarian consensus regarding the role of vitamin D in the prevention and treatment of diseases. Orv. Hetil. 2012;153 (Suppl.): 5-26.

13. German Nutrition Society. New reference values for vitamin D. Ann. Nutr. Metab. 2012; 6: 214-246.

14. IOM (Institute of Medicine): Dietary reference intakes for cflcium and vitamin D. Washington (DC): National Academies Press (US); 2011.

15. Holick M.F., Binkley N.C., Bischoff-Ferrari H.A.,Gordon C.M. et al. Endocrine Society Evalution treatment, and prevention of vitamin D deficiency: An Endocrine Society clinicfl practice guideline. J. Clin. Endocrinol. Metab.2011; 96:1911-1930.

16. Rajah J., Haq A., Pettifor J.M. Vitamin D and calcium status in urban children attending an ambulatory clinic service in the United Arab Emirates. Dermato-Endocrinology. 2012; 41: 1-5.

17. Kumar J., Muntner P., Kaskei F.J., Hailpern S.M. MLM Prevalence and associations of 25- hydroxyvitamin D deficiency in US children. NHANES 2001-2004. Pediatrics. 2009; 124: 362-370.

18. Kozlovsky A.A. Vitamin D status of the population in Gomel city. Collection of scientific articles from the Republican scientific-practical conference "Current Issues in Medicine" Gomel, November 2-3, 2017. pp. 393-395.

19. Akhmedova D.I., Kamilova A.T., Shamsiev F.M., Salikhova K.Sh. et al. Vitamin D levels in young children in some regions of the Republic of Uzbekistan. Pediatrics (Tashkent). 2019; 1: 177-183.