Impact of vitamin D deficiency on the risk of developing type 1 diabetes

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Abstract: According to modern concepts, vitamin D traditionally belongs to the group of fat-soluble vitamins, it is not actually a vitamin in the classical sense of the term, since it is not biologically active. Due to two-stage metabolism in the body, it turns into an active hormonal form - 1,25-dihydroxyvitamin D and has diverse biological effects due to interaction with specific receptors localized in the nuclei of cells of many tissues and organs. [9,10,11,12] In this respect, the active metabolite of vitamin D behaves like a true hormone, hence the name D-hormone. At the same time, following the historical tradition, in the scientific literature it is called vitamin D [4,1].

Keywords: vitamin D, type 1 diabetes, metabolism

Currently, an increasing number of studies indicate the role of vitamin D deficiency in the development of chronic diseases of the cardiovascular system, diabetes, and oncopathology. [5,6,7,8] In most cases, epidemiological studies in adults form the basis of the evidence base. Much less studied is the effect of vitamin D deficiency on the development of chronic pathology in children and adolescents [2]. It is known that more time in the sun during childhood and early adolescence is associated with a reduced risk of developing multiple sclerosis [3]. vitamin D increases the risk of developing autoimmune diseases, including type 1 diabetes. In the pathogenesis of the development of the disease, the leading link is the destruction of beta-cells by autoantibodies of T-helper type 1. [15,16]In vitro, calcitriol (vitamin D) inhibits T cell proliferation and reduces the production of cytokines, T helper type 1, IL-2, and IFN-γ, and therefore reduces the autoimmune inflammation response [13,14].

Purpose of the study: to study the content of the transport form of vitamin D - hydroxyvitamin D (25(OH)D) in the blood serum of children with newly diagnosed

type 1 diabetes mellitus and to assess the risk of developing the disease depending on the provision of the body with it in children.

Materials and methods of research

The study included 44 children diagnosed with newly diagnosed type 1 diabetes mellitus - 17 children under the age of 7 years and 27 children from 7 to 16 years of age. Among children with type 1 diabetes, there were 18 boys and 26 girls. The control group of 40 people (25 boys and 15 girls) consisted of 15 people under the age of 7 years and 25 people from 7 to 16 years old. Patients with newly diagnosed type 1 diabetes mellitus included in the study compared with the control group did not have significant differences in gender. The level of vitamin D was assessed by the content of the transport form of the vitamin, 25-hydroxyvitamin D (25(OH)D), in the blood serum. The interpretation of the results of determining the level of (25(OH)D) was carried out in accordance with the recommendations of the International Society of Endocrinologists (2011) and the recommendation of the European Consensus: severe deficiency - the level of (25(OH)D) is less than 10 ng / ml, deficiency - from 10-20 ng/ml, deficiency - 21-29 ng/ml, values > 30 ng/ml were considered normal [5].

Based on the results of the study, a database was formed in the MS Excel 2010 spreadsheet package, on the basis of which statistical data processing was carried out using the Microsoft OfficeExcel 2010, Statistica 6.0 (StatSoft, USA), IBM SPSS Statistics 20 statistical software package. The research results were processed by methods of descriptive and variational statistics (O. Yu. Rebrova, 2002). A descriptive analysis was performed for all children included in the study. If the distribution of the trait was taken close to normal, then the arithmetic mean (M) and the standard error of the mean (m) were calculated. For a comparative analysis of qualitative indicators in two groups of patients on one basis, the $\chi 2$ test and Fisher's exact test were used (with small sample sizes). For comparative analysis of quantitative data, the nonparametric Mann-Whitney test (U) and the Kruskal-Wallis rank test (H-test) were used.

The risk of developing the disease was assessed by determining a quantitative value (OR) with a 95% confidence interval (CI) for it and calculating the reliability of paired comparisons between groups (Fisher's test). At OR = 1, they spoke about the absence of a relationship between the compared factors (features), at OR < 1, they spoke about a negative relationship, at OR > 1, about a positive relationship of features.

Results and its discussion. The results of determining the level of 25-hydroxy-vitamin D in the blood in children with newly diagnosed type 1 diabetes mellitus and in healthy children are shown in Fig. 1. the level of vitamin D in the blood serum showed its low level in the vast majority of children both with newly diagnosed type 1 diabetes mellitus and in the comparison group (95% and 72.5%, respectively), which indicates an insufficient supply of vitamin D in the population in in general, which may be due to the peculiarity of the location of the city of Krasnoyarsk in the zone of low

insolation and a small number of sunny days during the year. At the same time, in children with newly diagnosed type 1 diabetes mellitus, vitamin D deficiency is significantly more common in 59% and 36% relative to the comparison group (12.5% and 60%, respectively), which indicates a more pronounced hypovitaminosis of vitamin D in children. children with newly diagnosed type 1 diabetes. The lowest levels of vitamin D in blood serum were determined in preschool children with newly diagnosed type 1 diabetes mellitus - 19.75 ± 3.28 compared with healthy children of the same age, whose vitamin D level was 53.2 ± 9.94 . In schoolchildren, the difference in vitamin D levels was less significant: 21.82 ± 2.08 in children with diabetes mellitus and 31.28 ± 3.33 in healthy children (Fig. 1).

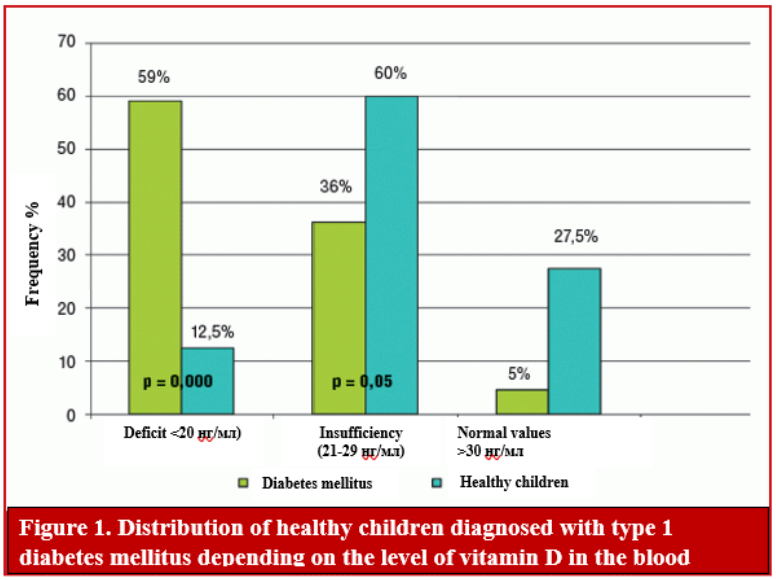

Figure 1. Distribution of healthy children diagnosed with type 1 diabetes mellitus depending on the level of vitamin D in the blood

Thus, it can be assumed that serum 25(OH)D deficiency may be one of the risk factors for the development of type 1 diabetes mellitus. To test the impact of vitamin D insufficiency and deficiency in the blood on the risk of developing type 1 diabetes, an OR score was used - the odds ratio (OR), for which a 95% confidence interval (95% CI) was used to assess the significance. Vitamin D insufficiency and deficiency were taken as a risk factor, and the development of type 1 diabetes mellitus was taken as an outcome. In children with vitamin D deficiency, the risk of developing type 1 diabetes mellitus was 3.6 (OR), in children with vitamin D deficiency this indicator is 5.9 (OR), therefore, the lower the concentration of vitamin D in the blood, the higher the risk of getting sick type 1 diabetes mellitus.

A.A.Ginde, J.M.Mansbach, C.A.Camargo (2009) in their study showed that while the peak incidence of viral infections, especially in the pediatric population, usually occurs during the winter months, when skin synthesis of vitamin D is insufficient, individuals with 25(OH)D levels below 10 ng/ml are at increased risk of developing an upper respiratory infection paths regardless of the season.

An analysis of the frequency of the debut of type 1 diabetes mellitus depending on the time of year found that most often children with newly diagnosed cases were

admitted to the hospital in the spring, when, presumably, the level of 25(OH)D in the blood serum was minimal (Fig. 2).

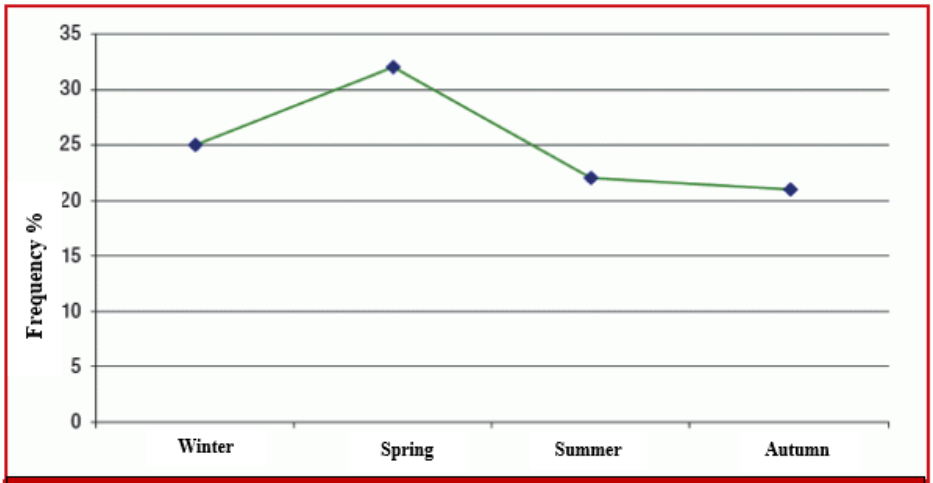

Figure 2. Frequency of onset of type 1 diabetes mellitus depending on the time of vearserum

Determination of the content of 25(OH)D in blood serum in children with newly diagnosed type 1 diabetes mellitus, depending on the time of year and the onset of the disease, showed that most children with this diagnosis mainly had deficiency and insufficiency of its content in the blood without significant differences in depending on the season (Fig. 3).

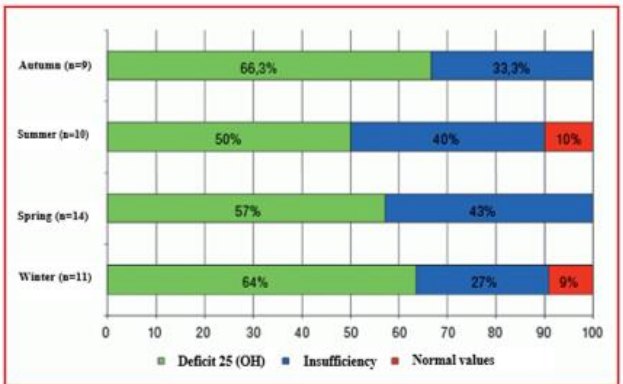

Figure 3. Serum levels of 25 (OH)D in children with newly diagnosed type 1 diabetes mellitus depending on the season of the onset of the disease

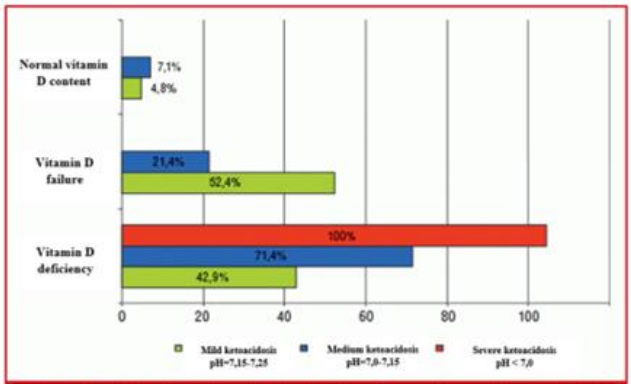

Figure 3. The level of vitamin D in the blood depending on the severity of diabetic ketoacidosis

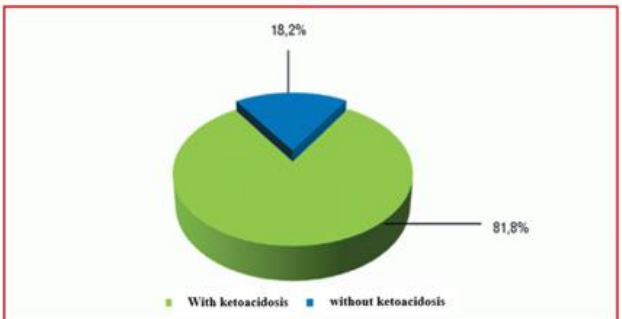

Figure 4. The frequency of diabetic ketoacidosis in children entering the hospital for the first time

Most children admitted to the hospital with the first symptoms of type 1 diabetes mellitus have metabolic decompensation and are admitted in a state of diabetic ketoacidosis of varying severity. The children included in our study are no exception. On fig. 4 clearly shows that 81.8% of children were admitted with symptoms of

ketoacidosis. The study of the severity and severity of clinical manifestations of ketoacidosis, depending on the provision of the body with vitamin D, showed that the lower the concentration of vitamin D, the more severe the degree of ketoacidosis. Children with severe ketoacidosis (pH < 7) were 100% vitamin D deficient. In moderate acidosis (pH 7.0-7.15), serum vitamin D deficiency was 3 times more common than deficiency (71, 1% and 21.4% respectively). With mild ketoacidosis, there was a predominance of children with vitamin D deficiency in the blood serum, in the absence of significant differences in the groups.

Conclusion

Thus, the study of the level of 25(OH)D in the blood serum showed the presence of vitamin D insufficiency and deficiency in 84.5% of the examined children, while the incidence of hypovitaminosis D in children with newly diagnosed diabetes mellitus significantly prevailed over the group of healthy children. The data obtained indicate the undesirable consequences of the lack of specific prevention of hypovitaminosis D in older age groups in increasing the risk of developing type 1 diabetes in individuals predisposed to it. When assessing the odds ratio, a relationship was revealed: the lower the concentration of 25(OH)D, the higher the risk of developing type 1 diabetes mellitus. The presence of vitamin D deficiency and insufficiency not only contributes to the development of the disease, but also aggravates its course, which is consistent with the literature data. Our study showed an association between the severity of clinical symptoms and the severity of ketoacidosis and low serum levels of vitamin D25(OH)D, highlighting the need for adequate vitamin D supply and prevention of vitamin D deficiency in growing children.

Recommendations

Screen the population to evaluate vitamin D levels in the body. Start prophylactic vitamin D treatment to lower glycemia, improve endogenous insulin efficacy, and minimize early and complications.

References

1. Khamidova, M. N., I. F. Ismatova, Zh. Sh. Berdierov, G. Sh. Negmatova, and A. T. Daminov. "DIABETES AND COVID-19." Eurasian Journal of Medical and Natural Sciences 2, no. 13 (2022): 190-204.

2. Takhirovich, D. A., Corners, S. J. A., Shukhratovna, N. G., Shukhratovna, S. G., & Zaynuddinovna, M. G. (2022). COURSE OF COVID-19 IN PATIENTS WITH DIABETES MELLITUS. Web of Scientist: International Scientific Research Journal, 3(02), 73-76.

3. Takhirovich, D. A., Corners, S. J. A., Shukhratovna, N. G., Shukhratovna, S. G., & Zaynuddinovna, M. G. (2022). COURSE OF COVID-19 IN PATIENTS WITH

DIABETES MELLITUS. Web of Scientist: International Scientific Research Journal, 3(02), 73-76.

4. Nazira, K., Siddikovna, T. G., Davranovna, D. A., Takhirovich, D. A., & Tulkinovich, O. S. (2021). Cardiovascular complications in patients who have had covid on the background of diabetes mellitus 2. Central Asian Journal of Medical and Natural Science, 2(3), 37-41.

5. GROWTH HORMONE FOR THE TREATMENT OF HEREDITARY DISEASES IN CHILDREN Ortikov Shahzod Tulkinovich. Karimova Nazira Alimovna, Kurbanova Nozima Sobirjanovna, Daminov Abdurasul Takhirovich / International Journal of Innovation Engineering and Management Studies. 2021 281-284.

6. Oripov F. S., Togaeva G. S. "Prevalence of diabetic foot in patients with type 2 diabetes mellitus in the Samarkand region" / / Biomeditsina va amaliet zhurnal. Zhild 7. son 5. pp. 143-147. Toshkent 2022.

7. Narbaev A.N. Juraeva Z.A. Kurbanova N.S. Kuvondikov G.B. Sodikov S.S. (2017). Features of the study of multifactorial management of type 2 diabetes mellitus. Biology va tibbiyot muammolari. Halkaro ilmiy magazine No. 4 (97) Samarkand 2017. No. 4 (97).2017 77-78str

8. Features of the Course of Type 2 Diabetes Mellitus in Combination with Arterial Hypertension and Ways to Correct Them Negmatova Gulzoda Shukhratovna, Salimova Dildora Erkinovna Eurasian Medical Research Periodical 17, 39-41, 2023

9. FEATURES OF THE COURSE OF TYPE 2 DIABETES MELLITUS IN COMBINATION WITH ARTERIAL HYPERTENSION AND WAYS OF THEIR CORRECTION G.Sh. Negmatova, D.E.Salimova LLC "Research and publications", Ta'lim fidoyilari, 2023.

10. Features of coexistence of type 2 diabetes mellitus with arterial hypertension and methods of their treatment Gulzoda Shukhratovna Negmatova, Dildora Erkinovna Salimova OOO "Open science", Science and Education, 2023

11. G. S. Togaeva, Clinical And Biochemical Parameters Of Patients With Type 2 Diabetes Who Were Trained At The School Of Self-Control. // JOURNAL OF BIOMEDICINE AND PRACTICE SPECIAL ISSUE-2. P-131-136, 2020

12. Togaeva G.S. Oripov F.S. Structural features of cells of islets of Langerhans in offspring with alloxonic diabetes // A new day in medicine. 2/1 (29/1). April June. 2020. p. 218-220.

13. Abrarova D. N., Negmatova G. Sh., Togaeva G. S. "Clinical and functional status in patients with type 2 diabetes mellitus with autonomic neuropathy". // The American Journal of Academic research. // Volume 2. (5) pp. 409-415. 2022

14. Narbaev A.N. Togaeva G.S. "The Use of daily continuous glucose monitoring in clinical practice". //The American Journal of medical sciences and pharmaceutical research. // Volume 2. Issue 9. 2020.Pages 82-85

15. Narbaev A.N., Togaeva G.S. (2020) Features study of multifactorial management of type 2 diabetes mellitus. Uzbekistonda ilmiy-amaliy tadқiқotlar mavzusidagi conference materiallari. No. 17. 30 June. 2020. Page 118-119.

16. Abrarova D. N., Negmatova G. Sh., Togaeva G. S. "Clinical and functional condition of patients with vegetative neuropathy with type 2 diabetes". // American journal of academic research. // Volume 2. (5) Str 409-415. 2022

17. Halimova, Z. Yu. and G. Sh. Negmatova. "Autoimmune Polyglandular Syndromes. A Review of the Literature." Central Asian Journal of Medical and Natural Sciences 2.4 (2021): 166-175.