

ASSESSMENT OF KNOWLEDGE LEVEL AMONG GEORGIAN PARENTS ABOUT VITAMIN D INFLUENCE ON CHILD'S HEALTH. QUESTIONNAIRE SURVEY

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Vitamin D is a group of fat-soluble secosteroids. It has a secosteroid structure in which a bond (C9–C10) in ring B of the steroid structure is broken. Vitamin D₃ and vitamin D₂ are produced by the photochemical reaction of 7-dehydrocholesterol and ergosterol with ultraviolet light B (naturally with sunlight), and subsequent heat isomerization, respectively. These two chemical reactions (not enzymatic reactions) are essential for vitamin D synthesis. In human, these reactions of 7-dehydrocholesterol occur in the skin. They are responsible for increasing intestinal absorption of calcium, magnesium, and phosphate, and multiple other biological effects. In humans, the most important compounds in this group are vitamin D₃ (also known as cholecalciferol) and vitamin D₂ (ergocalciferol) [3,8,11].

Cholecalciferol and ergocalciferol can be ingested from the diet and from supplements. Only a few foods, such as the flesh of fatty fish, naturally contain significant amounts of vitamin D. In the U.S. and other countries, cow's milk and plant-derived milk substitutes are fortified with vitamin D, as are many breakfast cereals. Mushrooms exposed to ultraviolet light contribute useful amounts of vitamin D. Dietary recommendations typically assume that all of a person's vitamin D is taken by mouth, as sun exposure in the population is variable and recommendations about the amount of sun exposure that is safe are uncertain in view of the skin cancer risk [5,7,11].

Vitamin D from the diet, or from skin synthesis, is biologically inactive. A protein enzyme must hydroxylate it to convert it to the active form. This is done in the liver and in the kidneys. Cholecalciferol is converted in the liver to calcifediol (25-hydroxycholecalciferol); ergocalciferol is converted to 25-hydroxyergocalciferol. These two vitamin D metabolites (called 25-hydroxyvitamin D or 25(OH)D) are measured in serum to determine a person's vitamin D status. Calcifediol is further hydroxylated by the kidneys to form calcitriol (also known as 1,25-dihydroxycholecalciferol), the biologically active form of vitamin D. Calcitriol circulates as a hormone in the blood, having a major role regulating the concentration of calcium and phosphate, and promoting the healthy growth and remodeling of bone. Calcitriol also has other effects, including some on cell growth, neuromuscular and immune functions, and reduction of inflammation [16,17,25].

The active vitamin D metabolite calcitriol mediates its biological effects by binding to the vitamin D receptor (VDR), which is principally located in the nuclei of target cells. The binding of calcitriol to the VDR allows the VDR to act as a transcription factor that modulates the gene expression of transport proteins (such as TRPV6 and calbindin), which are involved in calcium absorption in the intestine. The vitamin D receptor belongs to the nuclear receptor superfamily of steroid/thyroid hormone receptors, and VDRs are expressed by cells in most organs, including the brain, heart, skin, gonads, prostate, and breast. VDR activation in the intestine, bone, kidney, and parathyroid gland cells leads to the maintenance of calcium and phosphorus levels in the blood (with the assistance of parathyroid hormone and calcitonin) and to the maintenance of bone content [2,11,15].

As one of the most important roles of vitamin D is to maintain calcium and phosphate levels for bone formation, and allowing proper functioning of parathyroid hormone to maintain serum cal-

cium levels, vitamin D deficiency can result in lower bone mineral density and an increased risk of reduced bone density (osteoporosis) or bone fracture. Vitamin D is also critical for bone remodeling through its role as a potent stimulator of bone resorption [16].

The VDR regulates cell proliferation and differentiation. Vitamin D also affects the immune system, and VDRs are expressed in several white blood cells, including monocytes and activated T and B cells. In vitro, vitamin D increases expression of the tyrosine hydroxylase gene in adrenal medullary cells, and affects the synthesis of neurotrophic factors, nitric oxide synthase, and glutathione [15,16].

Vitamin D receptor expression decreases with age and findings suggest that vitamin D is directly related to muscle strength, mass and function. Apart from VDR activation, various alternative mechanisms of action are under study, such as inhibition of signal transduction by hedgehog, a hormone involved in morphogenesis [26].

An estimated one billion people worldwide are either vitamin D insufficient or deficient. Vitamin D deficiency is widespread in the European population [1,5,9,17,20]. European research is assessing vitamin D intake levels in association with disease rates and policies of dietary recommendations, food fortification, vitamin D supplementation, and small amounts of sun exposure [1,3,5,9,11,17]. A diet with insufficient vitamin D in conjunction with inadequate sun exposure causes vitamin D deficiency. Severe vitamin D deficiency in children causes rickets, a softening and weakening of bones, which is a rare disease in the developed world, but common in developing countries. Being deficient in vitamin D can cause intestinal absorption of dietary calcium to fall to 15%. When not deficient, an individual usually absorbs between 60-80%.

Vitamin D functions to activate the innate and dampen the adaptive immune systems. Deficiency has been linked to increased risk or severity of viral infections, including HIV. Low levels of vitamin D appear to be a risk factor for tuberculosis, and historically it was used as a treatment. Supplementation slightly decreases the risk of acute respiratory tract infections and the exacerbation of asthma. Evidence is lacking on whether it does so in children under five years of age [4,6,10,12,16,18,21,25].

Various institutions have proposed different recommendations for the amount of daily intake of vitamin D. These vary according to precise definition, age, pregnancy or lactation, and the extent assumptions are made regarding skin synthesis of vitamin D. A 2014 review concluded that the most advantageous serum levels for 25(OH)D for all outcomes appeared to be close to 30 ng/mL (75 nmol/L). The optimal vitamin D levels are still controversial [7,8,11,13,16,19,23,27].

Supplementation with vitamin D is a reliable method for preventing or treating vit D deficiency. Identifying and treating vitamin D insufficiency or deficiency is important to maintain bone strength and may even improve the health of other body systems, such as the immune, muscular, and cardiovascular systems [11,21]. Success of treatment greatly depends on parental understanding of vit D importance for child health. The present study was aimed to determine the parents' knowledge level about vit D importance for children normal health state, functions of vit D, sources, recommended duration of supple-

mentation. We couldn't find any published data about parental knowledge for vit D.

Material and methods. The questionnaire was utilized as cross-sectional survey to determine the awareness of parents about vit D influence and importance for child health. The questionnaire was designed by the authors. Survey questions covered the topics of parents'/caregivers' information needs; understanding of importance of vit D supplementation, causes of vit D deficiency, duration of supplementation, importance of screening adolescent girls for vit D deficiency. The survey was administered to parents/ caregivers of children of age from 1 to 15 years old living in Tbilisi and different regions of Georgia. The data were analyzed using Excel.

Results and discussion. A total 850 individuals participated in the study. Most of them 88,3% (Diagram 1, Column 1) believed vit D to be important for health of a child, but could not explain why the vit D deficiency must be prevented. The participants were asked what they believed to be good dietary sources of vitamin D. 74% (Column 2) of respondents could identify oily fish or eggs. However, 3 (46%) believed dairy products to be a good dietary source of vitamin D. 21,6% (4) - cannot answer. More than 5 (59%) of participants supported their children by vit D drops up to age of 1 year, 6 (40%) by themselves decide to give it only 1-2-months. Only 7 (12%) of mothers continue to support her child by vit D till 24 months and more. On the question about the importance of prevention the vit D deficiency among adolescent girls, as for future mothers, 8 (85,3%) of participants answered they hadn't any information about this.

The questionnaire asked respondents whether general pediatricians have provided education or advice about the importance of maintaining adequate vitamin D levels in children, only 9% (Column 9) of parents said that they had received information from their child's pediatrician. 89% (Column 10) of respondents to the questionnaire wanted more information about vitamin D and vitamin D deficiency.

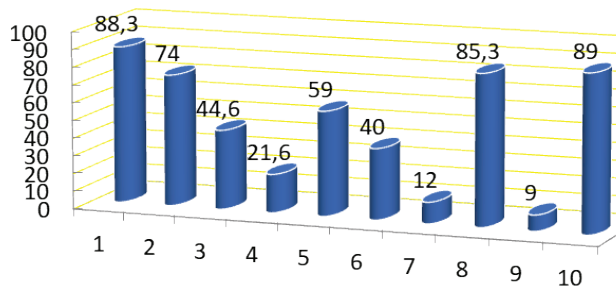


Diagram 1. Parents knowledge level for vit D

Vitamin D deficiency and insufficiency are highly prevalent among children worldwide. Assessment of vitamin D concentrations was included in the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study. The study results indicate that vitamin D deficiency is a highly prevalent condition in European adolescents and should be a matter of concern for public health authorities [5,9,17,20,24]. There are published data from Asian countries with high prevalence of hypovitaminosis D [12,28] mostly in adolescent girls.

According to received data about vitamin D importance for health state in any ages of life, the vitamin D deficiency should be corrected. It is clear, that effectiveness of hypovitaminosis D prevention and treatment highly depends on parental understanding of problem. We couldn't find any published data about parental knowledge for vit D in Georgian population. The

present study was performed to determine the level of parental knowledge about vit D importance for children normal health state, functions of vit D, sources, recommended duration of supplementation.

The questionnaire was utilized as cross-sectional survey. Survey questions covered the topics of parents'/caregivers' information needs; understanding of importance of vit D supplementation, causes of vit D deficiency, duration of supplementation, importance of screening adolescent girls for vit D deficiency. Study results revealed the parental/care givers poor awareness and level of knowledge about vit D importance for child normal growth and health state. The level of knowledge was quite not enough for maintaining sufficient level of vit D plasma concentration in children.

As a conclusion we can say, that there is a need for increased level of parental education to ensure children have a better chance of maintaining adequate vitamin D levels. For this it can be recommended to create informational network between parents and medical service providers, support Georgian population with informational booklets, organize TV and other meetings about importance of balanced diet, physical activity outdoor, developmental needs of children. Especially, it is important among adolescent girls. They must be discussed as future mothers and it is confirmed the influence of maternal vit D plasma level during pregnancy on fetus and neonate growth and development [2,4,13,14,19,22,28].

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SUMMARY

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Keywords: vit D supplementation, children, questionnaire, knowledge, survey.

РЕЗЮМЕ

ОЦЕНКА УРОВНЯ ЗНАНИЙ РОДИТЕЛЕЙ ДЕТЕЙ, ПРОЖИВАЮЩИХ В ГРУЗИИ, О ВЛИЯНИИ ВИТАМИНА D НА ЗДОРОВЬЕ ДЕТЕЙ. АНКЕТНЫЙ ОПРОС

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Целью исследования явилось определение уровня знаний родителей о значимости витамина D для состояния здоровья детей, его функциях, источниках, рекомендуемой продол-

жительности профилактики или лечения. Анкета, разработанная авторами, использовалась для определения осведомленности родителей о влиянии витамина D на здоровье детей. Вопросы опроса охватывали темы информационных потребностей родителей/опекунов; понимание значимости приема витамина D, причин его дефицита, продолжительности приема, необходимости обследования девочек-подростков на дефицит витамина D. Опрос проводился среди родителей/опекунов детей в возрасте от 1 до 15 лет, прожи-

вающих в Тбилиси и различных регионах Грузии. Данные проанализированы с использованием программы Excel. В исследовании приняли участие 850 человек. Согласно полученным результатам, осведомленность родителей и уровень знаний о значимости витамина D для нормального роста и здоровья ребенка являются низкими и существует необходимость в повышении уровня родительского воспитания с целью обеспечения у детей адекватного уровня витамина D и избежания гиповитаминоза.

რეზიუმე

საქართველოში მცხოვრები ბავშვების მშობლების ცნობადობის დადგენა D ვიტამინის გავლენის შესახებ ჯანმრთელობის მდგომარეობაზე. ანკეტური გამოკითხვა

მ.ჯაჭვამე, ქ.გოგბერაშვილი

თბილისის სახელმწიფო სამედიცინო უნივერსიტეტი, საქართველო

ჩატარებული კვლევების მიხედვით ათეულობით მილიონი ადამიანი ამჟამად მთელს მსოფლიოში განიცდის D ვიტამინის დეფიციტსა და უკმარისობას, განსაკუთრებით ბავშვთა ასაკში. პრობლემის მოგვარების ძირითადი გზას წარმოადგენს შესაბამისი დოზითა და ხანგრძლივობით ბავშვთა პოპულაციის D ვიტამინით უზრუნველყოფა. ბავშვებში D ჰიპოვიტამინოზის წარმატებული პრევენცია და მკურნალობა დამოკიდებულია მშობლების ინფორმირებულობის ხარისხზე.

შრომის მიზანს წარმოადგენდა საქართველოს მოსახლეობის ინფორმირებულობის დადგენა D ვიტამინის მნიშვნელობის შესახებ ადამიანის ჯანმრთელობისათვის. ავტორების მიერ შექმნილი კითხვარით გამოკითხულია საქართველოს სხვადასხვა რეგიონში მცხოვრები 1-დან 15 წლამდე ასაკის ბავშვის 850

მშობელი. კითხვარი მოიცავდა შეკითხვებს: აძლევთ/ აძლევდით თუ არა თქვენს შვილს D ვიტამინს და რა ხანგრძლივობით, რომელი საკვებია მდიდარი ამ ვიტამინით, D ჰიპოვიტამინოზის გართულებები, D ვიტამინის გავლენის შესახებ ორგანიზმის სხვადასხვა სისტემების ფუნქციონირებაზე. ჰქონდათ თუ არა ინფორმაცია მოზარდ გოგონებში D ჰიპოვიტამინოზის შორეული შედეგების შესახებ. მიღებული შედეგების საფუძველზე ავტორებს გამოტანილი აქვთ დასკვნა, რომ საქართველოს მოსახლეობის ცნობადობის ხარისხი D ჰიპოვიტამინოზის გავლენის შესახებ ბავშვის ჯანმრთელობის მდგომარეობაზე დაბალია. რეკომენდებულია გაიზარდოს მშობლების ინფორმირებულობის ხარისხი, რაც გააუმჯობესებს ბავშვების D ვიტამინით უზრუნველყოფას და შეამცირებს D ჰიპოვიტამინოზის გართულებებს.

EXPERIMENTAL STUDY OF STRESS EFFECT ON CONNECTIVE TISSUE METABOLISM IN WHITE RATS DURING SUBCUTANEOUS ADRENALINE ADMINISTRATION

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According to the literature, a long-term effect of stress on the body can significantly affect the indices of homeostasis, which are greatly influenced by the liver activity [1]. The researchers studied adrenaline administration effect on the oxidative metabolism of the liver in rats manifested by increased oxidative damage of the mitochondrial apparatus of cells [2]. Structural changes in the liver of rats under chronic stress were also studied. They stated an increase in the number of cells in a state of degeneration and an increase in the area of sinusoidal capillaries. There were reparative processes in the liver parenchyma of rats with high resistance to stress, which were manifested by an increase in the number of dual-core hepatocytes [3].

An assessment of the functional state of the liver in rats after a single administration of adrenaline revealed an increase in the content of medium molecules and lipid peroxidation products in liver homogenates, as well as an increase in the activity of lactate dehydrogenase, ALT, and AST in the blood. The results of histological studies detected blood flow disorders and hepatocyte dystrophy [4]. After intraperitoneal adrenaline administration, glycogen content in the liver of rats with low locomotor activity, was less than in stress resistant animals. Due to the fact that adrenaline can enhance glycolysis, we can state that preliminary training animals helps reduce the liver's response to adrenaline [5]. Adrenaline is also known to be able to influence vasoconstriction in the liver and cause hypertension [6].