

детей трех возрастных групп (от 2 до 5 лет, от 6 до 9 лет, от 10 до 13 лет). По результатам ранжирования территорий показана взаимосвязь между местом проживания и уровнем ксенобиотиков и эссенциальных микроэлементов. Описан патоморфоз экстенсивных неврологических и соматоневрологических отклонений, динамика факультативной симптоматики. Результаты исследования

позволяют заключить, что особую значимость, по всей вероятности, приобретает не только содержание (дисбаланс) ксенобиотиков и эссенциальных микроэлементов в организме ребенка, но и их возможное первичное или вторичное участие как факторов риска развития неврологических нарушений в регионах различного уровня антропогенного неблагополучия среды проживания.

რეზიუმე

საქართველოს ეკოლოგიურად პრობლემურ რეგიონებში მცხოვრები სხვადასხვა ასაკის ბავშვთა ნევროლოგიური დარღვევები

ა.ჩინია, ნ.გელაძე, ქ.გოგბერაშვილი, ნ.ხაჭაპურიძე, ს.ბახტაძე, ნ.კაპანაძე

თბილისის სახელმწიფო სამედიცინო უნივერსიტეტი, ბავშვთა ნევროლოგიური დეპარტამენტი; ლაბორატორია „მრჩეველი“; ფსიქიური ჯანმრთელობისა და ნარკომანიის პრევენციის ცენტრი, საქართველო

სტატიაში მოყვანილია სხვადასხვა დონის ანტროპოგენური დაბინძურების რეგიონში მცხოვრები პიპერაქტიურობისა და ყურადღების დეფიციტის სინდრომის მქონე ბავშვთა და მოზარდთა კლინიკური გამოკვლევების მონაცემები. გამოვლინდა ურთიერთკავშირი ნევროლოგიური დარღვევების ხასიათს, სიმძიმეს, ასევე სამი სხვადასხვა ასაკობრივი ჯგუფის (2-დან 5 წწ., 6-დან 9 წწ., 10-დან 13 წწ.) ბავშვთა ორგანიზმში Hg, Pb, Zn და Cu შემცველობას შორის. ტერიტორიების რანჟირების შედეგების მიხედვით გამოვლინდა კავშირი საცხოვრებელ ადგილსა და ქსენობიოტიკების და ესენციური მიკროელემენტების დონეებს შორის,

ასევე აღწერილია ექსტენსიური ნევროლოგიური და სომატონევროლოგიური გადახრის მეტამორფოზი, ფაკულტატური სიმპტომატიკის დინამიკა. გამოკვლევების შედეგებზე დაყრდნობით ავტორებს გამოტანილი აქვთ დასკვნა, რომ განსაკუთრებულ მნიშვნელობას იძენს არა მხოლოდ ქსენობიოტიკებისა და ესენციური მიკროელემენტების შემცველობა (დისბალანსი) ბავშვის ორგანიზმში, არამედ ასევე მათი როგორც რისკის ფაქტორის შესაძლო პირველადი ან მეორადი მონაწილეობა ნევროლოგიური მოშლილობების განვითარებაში ანტროპოგენურად პრობლემურ სხვადასხვა დონის საცხოვრებელი გარემოს რეგიონებში.

VITAMIN D STATUS AMONG GEORGIAN CHILDREN WITH HIGH ACUTE RESPIRATORY MORBIDITY

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Vitamin D deficiency has been identified as a common metabolic/endocrine abnormality [7,8,9,26]. Vitamin D deficiency (<20 ng/mL) and insufficiency (20-30 ng/mL) affect almost 1 billion people worldwide. Considered as hormone rather than as vitamin, vitamin D has receptors on virtually every cell in the human body. In addition to bone metabolism, vitamin D has many roles in the body, including cell growth modulation, neuromuscular and immune function, and inflammation reduction [1,2,23,24,25].

There are several publications, where it is confirmed Vitamin D influence on immune system. It activates the innate and dampens the adaptive immune systems [6,22,25,32]. Deficiency has been linked to increased risk or severity of viral infections, its recurrence, including HIV [1,3,5,10]. Low levels of vitamin D appear to be a risk factor for tuberculosis, and historically it was used fish oil (rich with vitamin D) [12]. According several research data vit D supplementation decreases the risk of acute respiratory tract infections (11, 15 and the exacerbation of asthma

[4,16,18]. Evidence is lacking on whether it does so in children under five years of age [17,31].

In 2016 at Cochrane Database Syst Rev. [31] was published data from high-, middle-, and low-income countries. Objectives of the study was to evaluate the role of vitamin D supplementation in preventing pneumonia, tuberculosis (TB), diarrhea, and malaria in children under five years of age. The study covered data from randomized controlled trials (RCTs) that evaluated preventive supplementation of vitamin D (versus placebo or no intervention) in children under five years of age. Authors concluded, that one large trial did not demonstrate benefit of vitamin D supplementation on the incidence of pneumonia or diarrhoea in children under five years. Trials that evaluated supplementation for preventing other infections, including TB and malaria, have not been performed. Pneumonia is still the most common cause of death in small children. The last publications show the increased evidence of association between vitamin D deficiency and severity of lower respiratory tract infections and pneumonia [13,28,30].

The group of authors [19] published the data of systematic review and meta-analysis of individual participant data (IPD) from randomized controlled trials to assess the overall effect of vitamin D supplementation on risk of acute respiratory tract infection, and to identify factors modifying this effect. Authors concluded that Vitamin D supplementation protects against acute respiratory tract infection overall. Patients who were very vitamin D deficient experienced the most benefit.

So, despite intense focus around the role of vitamin D status in health and disease, there has been a worldwide failure to eradicate the most severe manifestations of vitamin D and calcium deficiency in most vulnerable population – childhood. There is no published data about vitamin D plasma level in Georgian population.

The present study was conducted to reveal vit D content among Georgian children with high acute respiratory morbidity.

Material and methods. The prospective observational study was performed by comparing serum vitamin D levels in children with recurrent respiratory infections (Upper respiratory Tract URT infections, bronchiolitis, bronchitis, pneumonia) and healthy children in two cities of Georgia- Tbilisi and Rustavi. The 2 cohorts of 277 children at age from 3 months to 15 years were formed. The first cohort formed - 147 children with recurrent respiratory infections. 130 healthy children were included in control group (II cohort). Children were included in study under parental signed agreements. 3 age groups were performed – 131 children were at age- 3 months to 5 years (I cohort – 68 children and II cohort – 63 children), 100 children -from age 5 years and 1 month to 10 years (I cohort – 50, II cohort – 50), and 46 adolescents - from 10 years and 1 month to 15 years (I cohort – 29, II cohort –17). In the I age group from I cohort (68 cases) were included 32 cases of bronchiolitis, 18 cases of upper respiratory tract acute infections and 18 cases of pneumonia. In the second age group (50 children) were included 16 cases of URT infections, 15 bronchitis, 19- pneumonia. The third age group (29 children) was formed by 9 cases of pneumonia, 10 cases of bronchitis and 10 cases of URT infections (Diagram 1).

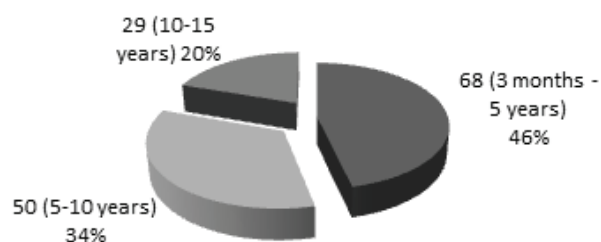


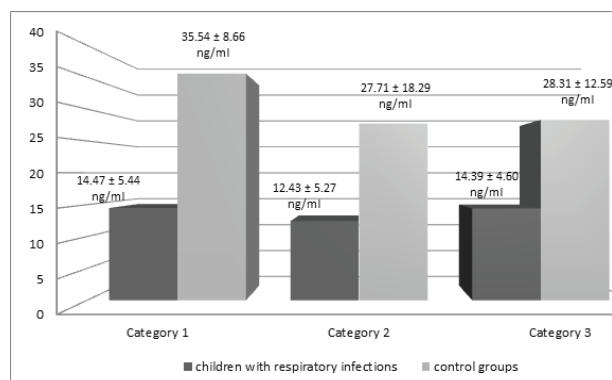
Diagram 1. 147 children with recurrent respiratory infections (3 age groups) – I Cohort

One moment blood concentration of 25-hydroxyvitamin D was determined in every study participant. According to recent consensus, a 25(OH)D concentration <30 nmol/L, or <12 ng/mL was an indication of vitamin D deficiency, a 25(OH)D concentration of 30–50 nmol/L, or 12–20 ng/mL was considered to indicate insufficiency; concentrations >50 nmol/L to 250 nmol/L, or 20 ng/mL-100ng/mL was considered to be sufficient (8, 20). The children with recurrent respiratory infections were selected at the moments of ambulatory visits in Rustavi or Tbilisi offices, or during hospital stay at Tbilisi State Medical University Zhvania Pediatric Academic Clinic. A structured questionnaire was completed to collect data on demography, diet, duration of breastfeeding, vitamin D supplementation, family history for al-

lergic diseases, respiratory morbidity. The history of the child's illness and the results from the physical examination and laboratory/instrumental data were recorded in a standardized form. Collected data were analyzed for statistical significance.

Results and discussion. The most of the affected children (80,9%) were investigated over the period 2018-19 November – April. The hospitalization for upper and lower respiratory diseases occurred in 92,9% for group I, 76,2% of group II and 31,8% of the III group.

Mean serum 25(OH) vitamin D level in the I age group with respiratory infections was 14.47±5.44 ng/ml and control group data were 35.54±8.66. Among children from II age group with respiratory morbidity vit D level was 12.43±5.27 ng/ml and control group data were 27.71±18.29 ng/ml. In III age group mean serum 25(OH) vitamin D level was – 14.39±4.60ng/ml. Control group data – 28.31±12.59ng/ml. Comparison of serum 25(OH) vitamin D levels between the study groups (I cohort vs II cohort) revealed a statistically significant difference (p<0.05), Diagram 2.



Category 1 – I age group (3 months to 5 years); Category 2 – II age group (5-10 years); Category 3 – III age group (10-15 years)

Diagram 2. vitamin D levels in children with recurrent respiratory infections and healthy children

According to received results, only the healthy children from the first age group had the sufficient vit D plasma concentration 35.54±8.66 ng/ml. In both other age groups (from age 5 year to 10 and 10-15 years) the vit D plasma levels were insufficient (27.71 ng/ml) as it is defined in Endocrine Society Clinical Practice Guideline, published in The Journal of Clinical Endocrinology & Metabolism, 2011[4]. In 14% of healthy adolescents from group III the vit D plasma level was <20ng/ml (16±11.5ng/ml).

We performed this study to evaluate whether lower serum levels of vitamin D may be associated with a higher risk for respiratory tract infections. It was selected children at age 3 months to 15 years with high respiratory morbidity. Most of the cases were with the recurrence of disease episodes. Difficulty was that there is no universal consensus on the definition of recurrent childhood RTIs [14]. Recurrent pneumonia is defined as 2 or more episodes in a single year or 3 or more episodes ever, with radiographic clearing between occurrences [21]. According to World Health Organization (WHO) data, a child could present, annually, during its five years of life, 4 to 8 episodes of respiratory infections, affecting mainly lower respiratory system. So, it has been proposed that to diagnose RRI at least one of the following criteria has to be present: ≥6 respiratory infections per annum, ≥ 1 respiratory infection per month involving the upper airways from Sep-

tember to April ≥ 3 respiratory infections per annum involving the lower airways [14]. So, in our study in the research groups with recurrent infections were included children with more than 3 episodes of pneumonia, more than 3 episodes of bronchiolitis and bronchitis, 6-8 episodes of ARI per annum.

According to our results, the children with recurrent respiratory infections revealed statistically significant lower level of vit D than healthy children. It is consistent with systematic review and meta-analysis of observational study results, published in the January 2017 issue of *Tropical Doctor*, *JAMA* (2019), *Allergology and Immunopathology* 2019 [1,5,13], where it was found the mixed results. Some trials confirmed effect of vit D deficiency on high morbidity with ARI. The reason why vit D appears to work in some situations but not others, is not understood yet. But what was confirmed that vitamin D levels were significantly lower among children with recurrent respiratory tract infection vs healthy control.

According our study results, in the group of children at age 10 to 15, vit D plasma concentrations even among healthy adolescents (control) were insufficient/deficient according to Endocrine Society Clinical Practice Guidelines, published at 2011 and 2016 [8,9,20]. 14% of Georgian adolescents were vit D deficient (vit D plasma level was $<20\text{nm/ml}$). This data is consistent to data of other researches published from European, Asian and other countries. The Society for Adolescent Health and Medicine reported, that Vitamin D deficiency is common in adolescents worldwide, and the list of reported detrimental health effects associated with this deficiency continues to grow [29]. As adolescence is a critical developmental period for bone health, the effect of vitamin D status on parathormone (PTH) concentrations and BMD in adolescents could be of major importance.

Conclusion. So, 25(OH)D deficiency in children was associated with high morbidity with respiratory infections. After 5 years of age the healthy children in Georgian urban regions reveal Vit D insufficiency, especially in adolescent period.

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SUMMARY

VITAMIN D STATUS AMONG GEORGIAN CHILDREN WITH HIGH ACUTE RESPIRATORY MORBIDITY

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Vitamin D deficiency has been identified as a common metabolic/endocrine abnormality. There aren't any published data about vitamin D plasma level in Georgian population. Present study was conducted to reveal vit D status among Georgian children with high acute respiratory morbidity. The prospective

observational study was performed by comparing serum vitamin D levels in children with recurrent respiratory infections (Upper respiratory infections, bronchiolitis, bronchitis, pneumonia) and healthy children in two cities of Georgia - Tbilisi and Rustavi. The 2 cohorts of 277 children at age from 3 months to 15 years were investigated. First cohort formed - 147 children with recurrent respiratory infections. 130 healthy children were included in control group (II cohort). One moment blood concentrations of 25-hydroxyvitamin D was determined in every study participant. The mean serum 25(OH) vitamin D level in the I age group with respiratory infections was 14.47±5.44 ng/ml and control group data were – 35.54ng/ml±8.66. In II age group with respiratory morbidity vit D level was 12.43±5.27 ng/ml and control group data were 27.71±18.29 ng/ml. In III age group mean serum 25(OH) vitamin D level was – 14.39±4.60ng/ml. Control group data – 28.31±12.59ng/ml. Comparison of serum 25(OH) vitamin D levels between the study groups (I cohort vs II cohort) revealed a statistically significant difference (p<0.05). In 14% of healthy adolescents from group III the vit D plasma level was <20 ng/ml (16±11.5 ng/ml). 25(OH)D deficiency in children was associated with high morbidity with respiratory infections. After 5 years of age most of the healthy children with the low respiratory morbidity in Georgian rural regions reveal Vit D insufficiency, especially in adolescent period.

Keywords: vit D status, children, adolescents, recurrent respiratory diseases.

РЕЗЮМЕ

СОДЕРЖАНИЕ ВИТАМИНА D В КРОВИ ДЕТЕЙ С ВЫСОКОЙ ОСТРОЙ РЕСПИРАТОРНОЙ ЗАБОЛЕВАЕМОСТЬЮ, ПРОЖИВАЮЩИХ В ГРУЗИИ

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На сегодняшний день дефицит витамина D идентифицирован как распространенная метаболическая/эндокринная патология.

Цель исследования - определение статуса витамина D среди грузинских детей с высокой острой респираторной заболеваемостью.

Проспективное обсервационное исследование проведено путем сравнения уровней витамина D в сыворотке крови детей с рецидивирующими респираторными инфекциями (инфекции верхних дыхательных путей, бронхиолит, бронхит, пневмония) и здоровых детей в двух городах Грузии - Тбилиси и Рустави. 277 детей в возрасте от 3 месяцев до 15 лет были разделены на 2 группы: основная группа (n=147) дети с рецидивирующими респираторными инфекциями; контрольная группа (n=130) - здоровые дети. Основная группа с учетом возраста разделена на 3 подгруппы: I подгруппа (n=131) в возрасте от 3 месяцев до 5 лет; II подгруппа (n=100) в возрасте от 5 лет и 1 месяца до 10 лет и III подгруппа (n=46) - от 10 лет и 1 месяца до 15 лет. У детей определяли концентрацию 25-гидроксивитамина D в крови. Средний уровень витамина D 25(OH) в сыворотке крови у детей I возрастной группы с респираторными инфекциями составил 14,47±5,44 нг/мл, в контрольной

группе - $35,54 \pm 8,66$ нг/мл. Во II подгруппе с респираторной заболеваемостью уровень витамина D составил $12,43 \pm 5,27$ нг/мл, в контрольной группе - $27,71 \pm 18,29$ нг/мл; в III подгруппе - $14,39 \pm 4,60$ нг/мл, в контрольной группе - $28,31 \pm 12,59$ нг/мл. Сравнение уровней витамина D 25 (ОН) в сыворотке между

исследуемыми группами выявило статистически значимые различия ($p < 0,05$).

Таким образом, низкий уровень 25 (ОН) D витамина у детей связан с острой заболеваемостью респираторными инфекциями.

რეზიუმე

სისხლში D ვიტამინის შემცველობა მაღალი რესპირატორული ავადობის შემთხვევებში საქართველოში მცხოვრებ ბავშვებში

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თბილისის სახელმწიფო სამედიცინო უნივერსიტეტი,
გ. ჟვანიას სახ. პედიატრიის აკადემიური კლინიკა, საქართველო

D ვიტამინის დეფიციტი საკმაოდ გავრცელებული მეტაბოლურ/ენდოკრინული პათოლოგიაა მსოფლიოში.

კვლევის მიზანს წარმოადგენდა D ვიტამინის დონისა და მაღალ რესპირატორულ ავადობას შორის კავშირის დადგენა საქართველოში მცხოვრებ ბავშვებში.

ჩატარებულია პროსპექტული კვლევა თბილისისა და რუსთავში მცხოვრებ 3 თვიდან 15 წლამდე ასაკის 277 ბავშვზე, ანამნეზში რეკურენტული რესპირატორული პათოლოგიით. სისხლში ერთჯერადად განისაზღვრა D ვიტამინის შემცველობა. მიღებული იყო ინფორმაცია ბავშვების დიეტის, ტუბუთი კვების ხანგრძლივობის, ალერგიის ოჯახური ანამნეზის, რესპირატორული

ავადობის შესახებ. მიღებული შედეგების მიხედვით, პირველ ასაკობრივ ჯგუფში რესპირატორული ავადობით D ვიტამინის კონცენტრაციამ სისხლში შეადგინა $14,47 \pm 5,44$ ნგ/მლ, მეორე ასაკობრივ ჯგუფში - $12,43 \pm 5,27$ ნგ/მლ, მესამე ასაკობრივ ჯგუფში კი - $14,39 \pm 4,60$ ნგ/მლ. საკონტროლო ჯგუფის მონაცემებმა შეადგინა $35,54 \pm 8,66$ ნგ/მლ, $27,71 \pm 18,29$ ნგ/მლ და $28,31 \pm 12,59$ ნგ/მლ, შესაბამისად.

ამგვარად, ბავშვებში მაღალი რესპირატორული ავადობის შემთხვევაში სარწმუნოდ დაბალი იყო D ვიტამინის კონცენტრაცია სისხლში საკონტროლო ჯგუფთან შედარებით.

CARDIAC IMPLANTABLE ELECTRONIC DEVICE INFECTIONS - PREVENTION, DIAGNOSIS, TREATMENT AND IMPACT ON QUALITY OF LIFE

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In recent decades, with the development of medicine, the implantation of cardiac electronic devices with various functions, such as pacemakers, cardioverter defibrillators (ICD), and cardiac resynchronization therapy devices (CRT) has been widely introduced. These cardiac implantable electronic devices (CIED) saved the lives of many patients and improved their quality of life. Despite confirming the benefits of these devices in many recent studies, complications, such as cardiac implantable electronic device-related infections occurred. When it comes to infection, the most effective strategy against it is to make prevention and properly assess the risk factors that may contribute to the development of the infection. Risk factors for CIED infection may be divided into three groups: patient-related, procedure-related, and device-related. Numerous studies have shown that the importance of various risk factors is different, which is often related to the patient's age and other comorbidities.

The patient-related risk factors include such conditions as end-stage renal disease, diabetes mellitus, heart failure, COPD, past CIED infection, malignant tumors, fever before implanta-

tion, use of corticosteroids or anticoagulants. One of the most important procedure-related risk factor is a hematoma, which is identified as a significant precondition for the development of CIED infection [13,19]. It should be noted, that early reoperation due to pocket hematoma or lead dislodgement significantly increases the risk of CIED infection [34]. Many scientists also pay attention to the duration of the procedure. Prolongation of the procedure increases the risk of infection [30]. As well the route of entry is a very important factor. The cephalic cutdown technique is the access of choice in terms of avoiding infectious complications. Due to various emergencies, temporary pacing is indicated prior to the procedure, although there is some evidence that temporary cardiac pacing has been shown to contribute to CIED infection [33]. Therefore, temporary pacing should be avoided as much as possible. Also, device pulse generator replacement/upgrade roughly increases the risk of CIED infection.

Regarding device-related factors, type of devices (CRT or ICD) and/or the numbers of leads (≥ 2) may be associated with increased risk of CIED infection [30]. Considering the above-