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PROBLEMS OF NITRATE WATER POLLUTION IN POLTAVA REGION

PROBLEMY ZWIĄZANE Z ZANIECZYSZCZENIEM WODY AZOTANAMI W REGIONIE POŁTAWY

Kateryna V. Pikul, Lyudmyla E. Bobyрева, Tatiana M. Kotelevska, Natalia O. Pryimenko, Konstantin V. Tarasenko

HIGHER STATE EDUCATIONAL INSTITUTION OF UKRAINE, UKRAINIAN MEDICAL STOMATOLOGICAL ACADEMY, POLTAVA, UKRAINE

ABSTRACT

Introduction: The topicality is determined by priority and importance of researches that have preventive referral directed on provision of harmonious growth and early childhood development, children's resistance to the infection's effects and other unfavorable external factors. There are problems about the role of permanent nitrate load in the formation of children health issues, especially children who live in the area with high nitrate levels in drinking well water.

The aim is to evaluate the physical development of children who live in nitrate-contaminated areas.

Materials and methods: Object of study - children living in nitrate-polluted locality. Subject of study - violation of physical development and morbidity of children in interrelation of factors that determined. Methods - clinical, biochemical, instrumental, sanitary-hygienic, statistical.

Results: When studying the content of methemoglobin among adult population in village areas, where well water with a high concentration of nitrates is consumed and in the city where centralized water supply is used, it was observed that rural people have a higher level of methemoglobin. Parents who lived in nitrates-polluted territories have a chronic pathology formed in childhood that affects the morbidity of their children, which affects the health of the nation.

Conclusions: centralized water supply was conducted many locations over the years, but parents who lived in nitrates-polluted territories have a chronic pathology formed in childhood that affects the morbidity of their children.

KEY WORDS: children, nitrates in food and water, prophylaxis, management

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INTRODUCTION

The topicality is determined by priority and importance of researches that have preventive referral directed on provision of harmonious growth and early childhood development, children's resistance to the infection's effects and other unfavorable external factors. Rapid development of molecular and cell biology has significantly expanded our understanding of biochemical, physiological, molecular, and other processes in the healthy human body and allowed us to draw conclusions regarding subtle pathogenic mechanisms of particular clinical symptoms and diseases [1].

There are problems about the role of permanent nitrate [2] load in the formation of children health issues, especially children who live in the area with high nitrate levels in drinking well water. These problems exist on the background of widespread environmental pollution by chemical and radioactive substances and their unfavorable impact on the health of Ukrainian population. According to the "Unified hygienic control of the content of nitrates in food and water," which was introduced in Ukraine, the limit of allowable concentration of nitrate in drinking water is 45mg/L in the acidic residue and 10 mg / l of nitrogen, while there should not be any nitrites. The maximum safe nitrate dose in the human body is 5mg/kg. There is 0.5-0.75% methemoglobin in the body under normal circumstances. Even at the nitrate concentration of 100mg/L in drinking water an acute

poisoning in infants can occur [3]. When studying the content of methemoglobin in an adult population in rural areas, where well water with a high concentration of nitrates is consumed, there is a higher level observed than in a city where centralized water supply is used. There is evidence that the concentration of methemoglobin in the blood of pregnant women who live in the village is also higher. Nitrates from the body of a nursing woman are withdrawn in concentration up to 6mg/L. A lot of attention in the scientific literature is devoted to the issue of drinking water connection and methemoglobinemia [4]. It is proven that the movement of nitrates occurs when the vertical migration of water is up to 10m and with horizontal - at a depth of 5m. With a content of nitrates in water 51-100mg/L, the level of methemoglobin increases up to 3.5%.

The study is done by the author within the GDR, is a fragment of the theme "Current issues of prevention, diagnosis, treatment and rehabilitation of alimentary-dependent diseases in children and the impact of adverse environmental factors on these diseases», (state registration number 000 134 0198U).

THE AIM

The aim of study is to evaluate the physical development of children who live in nitrate-contaminated areas.

MATERIALS AND METHODS

Object of study - children living in nitrate-polluted locality. Subject of study- violation of physical development and morbidity of children in interrelation of factors that determine it. Methods - clinical, biochemical, instrumental, sanitary-hygienic, statistical. The study followed official statistics on the digestive organs morbidity among children of nitrate-polluted Khorolsky region ($n = 7133$) and environmentally friendly Myrhorod city ($n = 7719$) for the period 1999-2002. We have studied the results of general clinical examination of 148 pupils aged 7 to 16 years old. 80 of them lived in nitrate-polluted area in the village, used well water with elevated levels of nitrates (main group) and 66 children who lived in the city and used water from centralized water supply (comparison group). A survey of children was conducted at the upper secondary schools, child consultations, sanitary and epidemiological stations of districts (Khorolsky, Semenovskyy, Lokhvitsky, Hrebinkivsky; the colleagues from the department of Pediatrics №1 examined children of Chutovsky, Karlovsky, Mashevsky districts) of Poltava region, City Children's Hospital, Regional Clinical hospital of the city of Poltava, Institute of Ecological Hygiene and Toxicology in Kyiv, CSRL Ukrainian Medical Stomatological Academy. The content of nitrates in water of individual mine wells ranged from 50 to 2200 mg/dm³ in nitrate-polluted areas and up to 45 mg/dm³ in the areas with centralized water supply. While collecting data the following documentation was used: "Exchange card of pregnant," "History of birth (to study the anamnesis vitae of infants)," Individual card of child development ", books of registration of medical examination [4].

RESULTS AND DISCUSSION

During the long-term chemical nitrate pollution of the environment there are preconditions for the formation of chronic nitrate load; in these conditions (on the basis of chronic hypoxia) not only chronic pathology, but also violations of physical development of children may develop. The undoubtedly increased morbidity of the children of the main group led to an increase of disharmonious physical development of schoolchildren because of children who had a height above the average and circumvention of the chest below the average age standard 2 times more compared with the comparison group ($p < 0.05$). During the examination of schoolchildren who lived for a long time in nitrate-polluted area, it was discovered that children from 7 to 12 had more harmonious physical development than children aged 13 to 16. It means that increasing nitrate load on the child's body in the time aspect also increases the percentage of children with disharmonious physical development ($p < 0.01$). Analyzing the distribution of the harmonious development of schoolchildren by gender, it was noted that this relative index in boys was slightly lower in the main group and was 35% versus 79.3% with the accuracy of the difference ($p < 0.01$). Harmonious physical development in girls was 43.2% in the main group and 59% in the comparison group ($p > 0.05$).

Among the examined children [4], the pathology of the urinary organs was confirmed. The percentage of the urinary system disorders in the main group was 3 times higher than in the comparison group. At the age of 7 to 12 years abnormality met only among the surveyed students from nitrate-polluted area - 27.1%. The percentage of school children from 13 to 16 years with various disorders of urinary system was 32.6% versus 16.3% ($p < 0.05$). Deficiency anemia was found to be 4 times more common in children from the main group than in the comparison group ($p < 0.01$). Frequency of deficiency anemia was higher in girls than in boys of nitrate-polluted areas and was 21.6% compared to 5.1% of high school girls who lived in ecologically clean area ($p < 0.05$). In the main group the studied digestive organs morbidity among male schoolchildren was 2.3 times higher than in the comparison group ($p < 0.05$). Among girls of the main group, the percentage of digestive disorders was 2.9 times higher versus the comparison group ($p < 0.01$).

Must admitted that about our methodical, we put methemoglobin, the normal which about WHO should not increase above 2.5 g/l. Result of the main group where we did exactly ($p < 0.01$) content of methemoglobin in 2.05 time or in 105% responsible control were very good conditions (tab.I). According to the data of professional literature, scientists who investigated the problem of nitrates pollution of drinking water on the child's body, also found possible correlation bonds of average strength between blood nitrogen oxide and free radicals NO⁻ and indicators that characterize the state of enzymatic liver exchange, namely those that reflect the level of intoxication of the organism, hepatocyte cytolysis and the development of cholestasis [5]. In parallel with the formation of NO⁻ with chronic nitrate loading in the blood of children and the formation of methemoglobinemia. For a comprehensive assessment of the influence of nitrate contamination of drinking water on the health of children, in particular on the studied blood parameters, between them and methemoglobin and nitrates, correlation bonds were investigated. Between the level of total bilirubin and NO⁻ blood, an average dependence was observed in children who consumed water with an excess of nitrates $r = 0.46$ ($p < 0.05$). The strong correlation between the level of nitrates and the alanin-transferase reflected [6] the dependence of the functioning of the liver and the bile-excreting system on the excessive intake of nitrates to the body in the schoolchildren of the main group $r = 0.72$ ($p < 0.01$). In determining the presence of a connection between renal blood samples, the probability was established only in children who used water from wells with high nitrogen content. Connections between urea and blood nitrates were observed for medium force - $r = 0.46$; residual nitrogen - $r = 0.49$; creatinine $r = 0.49$ ($p < 0.05$). Correlations between the level of total protein and blood nitrates were unlikely.

When we compared the long-term consequences of chronic nitrate intoxication as a result of the overall morbidity of children whose parents had been exposed to permanent effects of nitrates on their bodies since their childhood, they noted that the issue is relevant today.

Table I. Level of methemoglobin in blood of examined children who lived in the territory of high level of nitrates and clean ecologic territory

Title	Statics	Groups of children		P
		main group n=22	differential group n=22	
Methemoglobin g/L	M±m Trust interval	4,61±0,35 3,95-5,3	2,08±0,07 1,99-2,16	p<0,001

Table II. Morbidity among children aged 0-16years in 1000 children (2016) [7]

Nº	Rayon	The total incidence	For 1000 us.	In the first life	For 1000 us.
1	V. Bahachansky	5 104	1581.2	3 506	1086.1
2	Gadyatsky	9 363	1348.0	6860	987.6
3	Globinsky	10 600	1653.2	8 564	1335.6
4	Hrebinkivsky	6 097	1847.0	4 775	1446.5
5	Dykansky	4 002	1483.3	2 851	1056.7
6	Zinkivsky	6 513	1493.1	4984	1142.6
7	Karlivsky	9 405	1922.5	6 287	1285.2
8	Kobelyatsky	9 201	1570.9	6 854	1170.2
9	Kozelshchynsky	3 741	1530.1	2 559	1046.6
10	Kotelevsky	3,734	1308.8	2 686	941.5
11	Kremenchutsky	8 097	1315.3	6 148	998.7
12	Lokhvitytsky	10 877	1989.9	8 804	1610.7
13.	Lubensky	18 723	1717.1	10 919	1001.4
14	Mashivsky	4 570	1852.5	2 945	1193.8
15	Myrhorodsky	13 753	1503.9	9732	1064.2
16	N.Sanzharsky	6 705	1509.8	4 536	1021.4
17	Orzhytsky	4 262	1358.2	3 440	1096.2
18	Pyryatynsky	7 965	1827.7	5,939	1362.8
19	Poltavsky	13 997	1566.7	11 333	1268.5
20	Reshetylivsky	6,660	1784.1	3 922	1050.6
22	Semenivsky	5 195	1922.6	3 856	1427.1
23	Khorolsky	8 409	1935.8	5 864	1349.9
24	Chornukhynsky	1 788	1337.3	1 207	902.8
25	Chutivsky	8 564	2654.7	6 758	2094.9
26	Shyshatsky	4 577	1657.1	3 267	1182.8

Almost 15 years later, we decided to compare the overall incidence in our study areas (Hrebinkivsky, Karlivsky, Lokhvitskiy, Mashivsky, Pyryatynsky districts) inhabited by people with permanently high levels of nitrates in the water with a relatively safe Myrhorodsky district (comparison group). We noted increased rates in these areas as indicated in the table II.

CONCLUSIONS

Centralized water supply was conducted many locations over the years, but parents who lived in nitrates-polluted territories have a chronic pathology formed in childhood that affects the morbidity of their children.

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Conflict of interest:

The Authors declare no conflict of interest

ADDRESS FOR CORRESPONDENCE

Lyudmyla E. Bobyreva

Higher State Educational Institution of Ukraine,
Ukrainian Medical Stomatological Academy,
23 Shevchenko str, 36000 Poltava, Ukraine
tel: +380955614138
e-mail: ekateryna.pikul@gmail.com

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