CHARACTERISTICS OF EPIDEMIOLOGY OF DENTAL CARIES IN CHILDREN FROM REGIONS WITH HIGH AND OPTIMUM FLUORINE CONTENT IN DRINKING WATER

EPIDEMIOLOGIA PRÓCHNICY ZĘBÓW U DZIECI Z REGIONÓW Z WYSOKĄ I OPTYMALNĄ ZAWARTOŚCIĄ FLUORU W WODZIE PITNEJ

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ABSTRACT

Introduction: Prevention of dental diseases in children is the priority item on the modern dentistry agenda. Among the undeniable factors known as contributing into caries incidence, there is fluoride content in the external environment, especially in drinking water, which is the main source of fluoride intake.

The aim: This study is aimed at evaluating dental caries indices in children and adolescents inhabiting in areas with optimal and high-level fluoride concentration in drinking water and assessing their level of oral hygiene.

Materials and methods: To explore the caries epidemiology in the regions with optimal and high fluoride content, we examined 315 children aged 6, 12 and 15 who live in the city of Poltava (fluoride content in drinking water is 0.9-1.2 mg / l) and 91 children of the same age residing in the village of a town type Mashivka (fluoride content in drinking water ranges from 1.7 to 2.9 mg / l).

Results: More than half of the 6-year-old children of both groups have decayed teeth.

The comparative analysis of the prevalence and intensity of caries in the children aged 12 and 15 years demonstrated a significant increase in the number of individuals diagnosed to have caries with increasing age in both groups.

Conclusions: Our research suggests that, along with the number of other cariogenic factors, fluorosis contributes to a more intense course of caries progression.

This situation demands wider health policy measures to support primary and secondary caries prevention and management among the children.

KEY WORDS: dental caries, fluorosis, children

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INTRODUCTION

Prevention of dental diseases in children is the priority on the modern dentistry agenda. Oral health has been recognized as an integral component of the right to health. Oral health of an individual starts developing in the early childhood and depends on the general health condition as well as on the influence of environmental factors.

Dental caries continues to be a major public health issue worldwide, even in developed countries. Despite the dynamic development of dental technologies, the caries prevention still remains challenging for health care and medical science.

Caries is the most prevalent chronic childhood diseases that occurs as much as 5 times more often than asthma, 4 times more often than obesity, and is 20-fold more common than diabetes. There exists a viewpoint presuming that caries is a disease difficult to be cured or can not be cured at all, i.e. an irreversible disease, due to the complex interaction of cultural, social, behavioural, nutritional and biological risk factors associated with its initiation and development [1].

Environmental impacts rank one of the leading positions in triggering caries. The composition and properties of community drinking water, in general, affect the general health of the population and the development of dento-facial system in particular. Among the undeniable factors known as contributing into caries incidence, there is fluoride content in the external environment, especially in drinking water, which is the main source of fluoride intake [2]. However, the role of fluoride in the development of caries is far from being unambiguous.

At low concentrations of this element in drinking water, the prevalence of the disease reaches high rates, up to 98 - 100% [3]; optimal fluoride content contributes to the reduction of caries incidence. Fluoride concentration exceeding over the optimal values does not cause anti-caries action [4]; fluorine in the concentration of 20 mg / l against cariogenic diet contributes to the development of experimental caries [5]. That is, epidemiological characteristics of caries in children can differ in terms of regions they live in.

THE AIM

This study is aimed at evaluating dental caries indices in children and adolescents inhabiting in areas with optimal

Table I. Distribution of the children by age

Age (years)	Poltava (a city) I group	Mashivka (a village of a town type) II group
6	105	40
12	105	29
15	105	22
Total	315	91

Table II. The prevalence rate of dental caries in primary and permanent teeth in the children

Age (years)	df		DMF	
	I	II	I	II
6	60%	57,5%	3%	58,0%*
12	45%	20,7%	63%	72,4%
15	–	–	81%	95,5%*

*- the difference is probable, p <0,02

Table III. Intensity of caries in primary and permanent teeth in the children

Age (years)	df		DMF		Oral hygiene index by Fedorov-Volodkina	
	I	II	I	II	I	II
6	2,0±0,22	2,48±0,43	0,05±0,03	1,83±0,24*	1,9±0,12	3,23±0,12
12	1,0±0,13	0,52±0,48	1,5±0,14	4,1±0,51*	2,6±0,1	2,78±0,18
15	–	–	2,8±0,25	6,18±0,75*	1,6±0,07	2,32±0,19

*- the difference is probable, p <0,02

and high-level fluoride concentration in drinking water and assessing their level of oral hygiene.

MATERIALS AND METHODS

To study the caries epidemiology in the regions with optimal and high fluoride content, we carried out thorough dental examination of 315 children aged 6, 12 and 15 who live in the city of Poltava (fluoride content in drinking water is 0.9-1.2 mg / l) and 91 children of the same age residing in the village of a town type Mashivka (fluoride content in drinking water ranges from 1.7 to 2.9 mg / l). The findings obtained were recorded in the WHO designed standard oral health assessment form for children.

The following indices were employed to assess caries epidemiology in the children depending on fluoride content in drinking water: caries prevalence in primary and permanent teeth, caries intensity indices (df, DMF), oral hygiene index by Fedorov-*Volodkina* (1971). 'Caries Marker' (VOCO) was used to verify the diagnosis of caries.

RESULTS AND DISCUSSION

315 children from Poltava who were examined according to WHO scheme made up the I group 1; 91 children from Mashivka constituted the II group (Table I).

The analysis of the data obtained by carrying out the epidemiological survey of children of the first and second groups allowed us to reveal some peculiarities of caries prevalence (Table II). The prevalence of caries in temporary teeth in 6-year-old children of the first group made up 60% (Table II). The average intensity according to the values of df index was 2.0 ± 0.22 tooth per an individual examined (Table III). At the same time, in 6-year-old children of the second group this figure equaled 57.5%, (Table II) against caries intensity of 2.48 ± 0.45 tooth per an individual (Table III), i.e. more than half of the children in this age of both groups had decayed primary teeth.

According to the DMF index, the prevalence of dental caries in 6-year-old children of the first group corresponded to 3% (3 children), and the caries intensity rate was 0.05 ± 0.03 tooth. The prevalence rate of caries in permanent teeth among 6-year-old children in the second group reached 58.0%, i.e. more than half of the examined children of this age have decayed permanent teeth. The prevalence of caries of temporary teeth in these children,coincides with the prevalence of permanent teeth caries (57.5% and 58.0% respectively) with intensity rate of 1.83 ± 0.24. Thus, 6-year-old children from the city of Poltava, where fluoride content in drinking water is within the optimal limits, have significantly lower prevalence rate and intensity of caries in permanent teeth than the children from the village of the town type Mashivka, where fluoride content significantly exceeds the permissible concentration.

The prevalence of temporary teeth caries in 12-year-old children of the first group by df index was 45%, its intensity reached 1,0 ± 0,13 teeth per an individual. The children of

the second group aged 12 years demonstrated the prevalence rate of caries of temporary teeth reduced to 20.7%. The similar situation is observed in terms of indices of the caries intensity of temporary teeth. The caries intensity of caries of temporary teeth in 12-year-old children is 0.52. In our opinion, this dynamics is associated with an accelerated physiological replacement of decayed temporary molars with permanent molars in the region with high fluoride level in in drinking water.

The prevalence of caries in permanent teeth in 12-year-old children of the first group is 63%, and its intensity is 1,5 ± 0,14 per an individual. The prevalence of caries for this age group by DMF index according to the WHO reports corresponds to the average level, and its intensity according to the WHO is identified as low. At the same time, the prevalence of caries in permanent teeth among 12-year-old children of the second group makes up 72.4%. According to WHO, this prevalence rate can be regarded as an average. The intensity of caries in permanent teeth up to 12 year age doubles and is 4,1 ± 0,51 teeth per an individual examined ($p < 0,05$). This level of caries intensity is described as high in accordance with the WHO scale.

When comparing the prevalence and intensity of caries by DMF indices in 12-year-old children, the significant rise in the number of children with decayed teeth has been observed with increasing age in both groups. However, the children from Mashivka (high fluoride content in drinking water) demonstrate more that 2.7-fold higher intensity of caries in permanent teeth compared with the children residing in Poltava (optimal fluoride content in drinking water).

The prevalence of caries in permanent teeth in 15-year-old adolescents of the first group makes up 81% and its intensity is 2.8 ± 0.25 teeth per an individual. According to WHO data, the prevalence of caries in this age group is considered as of high level, and intensity is of the average level. In 15-year-old adolescents of the second group, the survey revealed a significant increase in prevalence, risen by nearly 1/3 that reached up 95.5%, an increase in caries intensity was observed to go up to the age of 15 years, and its index is 6.18 ± 0.75 teeth per an individual.

Indices of prevalence rate and intensity of caries in permanent teeth are considerably higher in the children of all the subgroups from Mashivka.

The children of both groups have found out to have carious lesions of molars detected in their typical sites: the central fossa and distal fissure on the upper molars; distal buccal fissure and the blind fossa (fossa caecum) on the buccal surface of the lower molars. Moreover, the children of the second group are found out to have carious lesions in sites with enamel destruction, e.g.: tubercles, smooth surfaces of molar crowns. The areas with signs of caries-affected dentin were stained with "Caries Marker" in contrast to the intact areas of teeth (enamel, dentin). Carious lesions in incisors were more often detected on contact surfaces, less often on the vestibular surface in areas of enamel destruction. In the children of the primary school age, carious cavities in the permanent teeth affected with fluorosis had a relatively small "inlet", with undermined edges of the enamel. The carious cavities were localized within the mantle dentin, and quite often within the parapulpal dentine. Dentin in the site of the carious cavity was softened, of light colour, and was easily removed by an excavator. The results described above point up the active course of the carious process.

Having assessed the oral hygiene status indices we can conclude the oral hygiene status of the 6-year-old and 15-year-old children residing in Poltava can be rated as satisfactory (correspondingly 1.9 and 1.6), while the 12 year-old children have unsatisfactory oral hygiene status (2.7) (Table 3). The analysis of the oral hygiene status indices of the children residing in Mashivka shows high values of oral hygiene status (Table 3). 6-year-old children from Mashivka have significantly higher hygiene indices than the children from Poltava that range within the poor level (3.23 ± 0.12). Then, with increasing age, oral hygiene status indices somewhat improve and in the group of 12-year-old children reach the values of 2.78 ± 0.18 that allows us to assess the their oral hygiene status as "unsatisfactory" ($p < 0,05$). There is no probable difference between the levels of oral hygiene in the children of the two groups. At the age of 15, the oral hygiene status index by Fedorov-Volodkina index becomes significantly better than the average and equals 2.32 ± 0.19, but is identified as "poor" by its quality, and remains significantly worse in comparison with the level of hygiene in the children of the first group.

According to the results of our study, the prevalence rate of caries among the children of Poltava aged 6 and 12 corresponds to the average level according to WHO standards, while 15-year-old adolescents are identified to have high prevalence rate of caries. The intensity of caries in 6-year-old and 12-year-old children can be described as low according to WHO reports, and the intensity of caries on 15-year-old adolescents corresponds to the mean level.

The analysis of the results obtained by surveying 91 children aged 6, 12 and 15 years from Mashivka, whose permanent teeth formed in the conditions when drinking water contains fluoride concentration ranging from 1.7 to 2.9 mg / l, has shown the average prevalence rate of dental caries and high intensity of the caries process. Especially marked cariogenic situation has been found out in the 6-year-old children. Our research suggests that, along with the number of other cariogenic factors, fluorosis contributes to a more intense course of caries progression.

Thus, summing up the results obtained by surveying the children from the city of Poltava and from the village of a town type Mashivka has demonstrated the low level of their oral health, as evidenced by the values of indices of caries prevalence and intensity in temporary and permanent teeth. This situation demands wider health policy measures to support primary and secondary caries prevention and management among the children and in this way to reduce the burden of caries. The data obtained testify to the inadequacy of individual and population-based approaches in fighting against caries. Paediatric dentists should specify and develop a range of goals and tasks to advocate preventive approach rather than restorative.

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