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Original Article

Prevalence of main dental diseases in children who live in conditions of biogeochemical fluorine and iodine deficiency

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ABSTRACT

Background: Dental status is one of the main indicators of overall health. We examined it in children aged 6–15 years who live in conditions of biogeochemical fluorine and iodine deficiency (Transcarpathian region, Ukraine), to improve the quality of dental care.

Materials and Methods: In this cross sectional study To assess the state of teeth, we used indicators recommended by the WHO Expert Committee. The prevalence and intensity of dental caries, periodontal status, oral hygiene status and dentoalveolar anomalies were determined using a questionnaire and descriptive analyses was done ($P < 0.05$).

Results: The total prevalence of caries in deciduous teeth in children was $57.86\% \pm 1.56\%$, with intensity of 2.61 ± 0.6 . The total prevalence of caries in permanent teeth was $71.45\% \pm 1.31\%$, with intensity of 2.36 ± 0.52 . Analysis of the results showed a high prevalence of periodontal disease, which increases with age. The level of oral hygiene was evaluated as unsatisfactory. Studying the prevalence of dentoalveolar anomalies showed the lowest prevalence ($40.05\% \pm 2.56\%$) at the age of 6 years and the maximum value at 12 years ($77.20\% \pm 2.75\%$). In addition, we found poor hygienic knowledge of the parents, lack of medical activity of parents to preserve dental health of the child, lack of dentists' work on hygiene education, and public health education for prevention of dental diseases. On the other hand, a high level of confidence was revealed in the information received from dentists.

Conclusion: The high prevalence of leading dental diseases requires modernization of the existing prevention programs for children.

Key Words: Anomalies, caries, hygiene, prevalence

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INTRODUCTION

Transcarpathian region (Ukraine) belongs to unique areas to explore natural fluoride, iodine deficiency as environmental factors, where inhabits human. The region is small, located at the center of Europe on the southern slopes of the northeastern Carpathians. This is a unique territory of Ukraine, where a quarter of the population are children.

There is a marked increase in the prevalence of leading dental diseases due to the absence of elements that are essential for full-fledged growth in children. Iodine deficiency remains one of the most widespread in the world, despite the active use of iodized salt in developed countries. Suffice it to say

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that this mineral deficit affects >1 billion people. The deficiency of fluoride in the body is associated with its reduced level in drinking water (<0.7 mg/l). In the Transcarpathian region, this indicator is 0.3–0.4 mg/l. The main manifestations of lack of fluoride: Bone damage (osteoporosis), caries of teeth, development of cardio-vascular diseases

In case of mismatch of the essential elements in order to ensure the health condition of the oral cavity and the body of the child as a whole, a correction of their number, depending on age, gender, and living conditions, is required.

Currently, the prevalence of dental disease among children is high, and we should expect further deterioration, if not change the conditions that affect the development of oral cavity diseases. Dental status is one of the main indicators of overall health.^[1]

Dental health aspect is characterized by two key indicators – prevalence and intensity that reflect the quantitative trait diseases of the teeth, gums, oral hygiene level, and so on.^[2]

Thus, the main direction in the development of prevention in the future is to determine the risk factors for the formation and progression of major dental diseases and the development of ways to manage them.

In order to effectively manage the risk factors for the emergence and progression of caries in children, the geographical and ecological characteristics of the region of permanent residence, the general health of the child, and a number of local factors should be taken into account.

One of the urgent health issues is the assessment of the quality of dental care for children who live in the conditions of biogeochemical fluorine and iodine deficiency. This applies particularly to provide therapeutic dental care to children, particularly in the treatment of common diseases such as dental caries and periodontal diseases.

MATERIALS AND METHODS

In this cross sectional study The objects of the survey were children of Transcarpathian region (Ukraine). Dental examination was conducted at the ages of 6, 12, and 15 years. In every age group, 50 healthy boys and 50 healthy girls were examined. The survey was conducted in the dental office using a set of dental tools. A total of 300 people were examined. To assess

the state of teeth, indicators recommended by the WHO Expert Committee were used.^[3]

The prevalence of dental caries was determined by the following formula:

$$\text{Prevalence of dental caries} = \frac{\text{Number of individuals with caries}}{\text{Total surveyed}} \times 100\%$$

The intensity of dental caries during temporary occlusion was determined by the *df* index, where *d* is decay (caries) and *f* is filling in temporary teeth during alternating bite by an index: *df* + DFM, where *D* is decay (caries), *F* is filling, *M* is missing (removed) in permanent teeth during permanent occlusion (DFM). To assess the prevalence and intensity of dental caries in children aged 12 years, the criteria recommended by the WHO Regional Office for Europe was used (Martthaller, O'Mullane, and Metal, 1996).

Periodontal status was assessed by the Community Periodontal Index (Leus, 1988). Oral hygiene status in children was assessed using Simplified Oral Hygiene Index (Green and Vermillion, 1964). Orthodontic anomalies were considered by the classification of teeth anomalies (Persin).

A questionnaire was used, which included questions about the awareness of children about oral hygiene, risk factors of dental diseases, and diet.^[4,5]

All calculations were performed on a PC using a licensed software for operating system Windows and standard software package Statsoft. Inc STATISTICA 6.0 2300 East 14th Street Tulsa, OK 74104 USA. Statistical data processing was carried out using Student's probability *t*-test.

RESULTS

At 6-years old children the prevalence of caries of deciduous teeth was 92.19% ± 2.94%. At age 12, it was 16.4% ± 3.18%, and at 15 years, it was 4.02% ± 1.92%. Analysis of the survey showed that the tendency of caries formation in permanent teeth increases with the age from 18.64% ± 3.75% in 6-year-old children to 88.21% ± 3.3% in 15-year-old children [Chart 1].

The average intensity of caries of permanent teeth in 12-year-old children was 2.83 ± 1.58. The structure of the DFM index was as follows: at the 12-year-olds dominant component was "D," which amounted to 1.84 ± 0.14, while the component "F" was only 0.98 ± 0.09, also appeared component

“M,”. The 15-year-olds dominated the component “F” and it was $- 2.25 \pm 0.15$ and component “D” was $- 1.67 \pm 0.13$ [Table 1].

Among the identified violations, dental periodontal disease is in second place. Analysis of the results showed a high prevalence of periodontal disease, which increases with age. In 53.44% 6-year-olds were symptoms of periodontal tissue diseases. In the 12-year-olds, the prevalence of periodontal disease was 80.28%. The intensity of periodontal lesions in the 12-year-olds was 1.56. Among 15-year-olds, the prevalence increased to 85.5% and the risk of disease was 14.5%. The intensity of periodontal disease increased to 1.74. Mild periodontal lesions among 12-year-olds were at 65.26%. Nearly 15.02% of children had an average degree of periodontal lesions and they need professional oral hygiene.

The average value of Greene–Vermillion index in children with alternating bite was 1.48 and with permanent occlusion, it was 1.56. In all patients, an increased presence of dental plaque was observed.

An examination of the children studied the prevalence of dentoalveolar anomalies. The lowest prevalence was found at the age of 6 years ($40.05\% \pm 2.56\%$). The maximum value of prevalence of dentoalveolar anomalies was detected at the age of 12 years ($77.20\% \pm 2.75\%$). At 15 years, there was a slight decrease to $75.50\% \pm 3.01\%$. The prevalence of dentoalveolar anomalies was compared between boys and girls. The total prevalence for girls was $71.63\% \pm 1.23\%$, while for boys, it was $68.21\% \pm 1.42\%$ ($P > 0.05$); there were no significant differences [Chart 2]. In the structure of nosological forms, anomalies dominated in the sagittal plane: distal bite -58.9% and medial bite -13.3% . The vertical anomalies in the form of deep bite were also quite common in 61.1% of patients. Patients with open bite constituted a small group of 7.4%.

We questioned 314 parents of schoolchildren who live in Transcarpathian region to determine the level

of hygiene knowledge and dental disease prevention. When asked at what age should a child brush his/her teeth, only 18.79% of parents said that the teeth should be cleaned after teething. Nearly 39.24% believe that the teeth should be cleaned from 2 years of age, 25.44% reported as from 3 years of age, and 20.53% of the parents said that the teeth should be cleaned from 4 years and older.

Of the proposed answers to the questionnaire for the means of child care, 99.52% of parents indicated that for oral care they used toothbrush and toothpaste and 45.93% in addition to basic hygiene products used advanced methods (chewing gum, rinses, toothpicks, and floss). Around 0.32% of children do not brush their teeth.

Nearly 23.62% of the parents visit the dentist once in every 6 months or more. Most of the parents (55.66%) turn to the dentist when the child has a toothache. Nearly 66.19% of people believe that their child is in need of preventing dental diseases measures, 17.7% of parents answered no, and 16.19% do not know.

Nearly 33.38% of parents always follow the dentist’s recommendations. When asked what methods of health education trust you more, 88.76% of parents answered individual conversation with the doctor as the method.

Table 1: The intensity of caries in permanent teeth among key age groups of children

| Age (years) | DFM | The structure of DFM index | | |
|-------------|-----------|----------------------------|-----------|-----------|
| | | D | F | M |
| 6 | 0.27±1.2 | 0.17±0.02 | 0.1±0.02 | - |
| 12 | 2.83±1.58 | 1.84±0.14 | 0.98±0.09 | 0.01±0.01 |
| 15 | 4.04±2.08 | 1.67±0.13 | 2.25±0.15 | 0.12±0.01 |

D: Decay; F: Filling; M: Missing

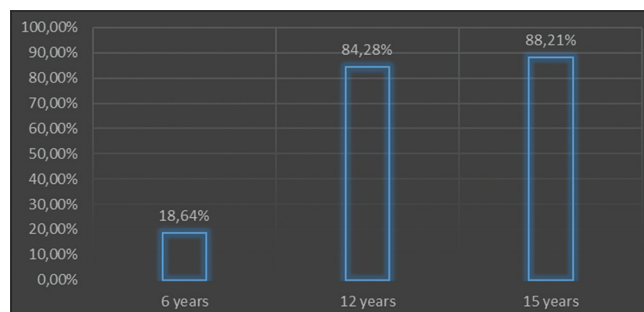


Chart 1: Prevalence of caries in permanent teeth among key age groups of children.

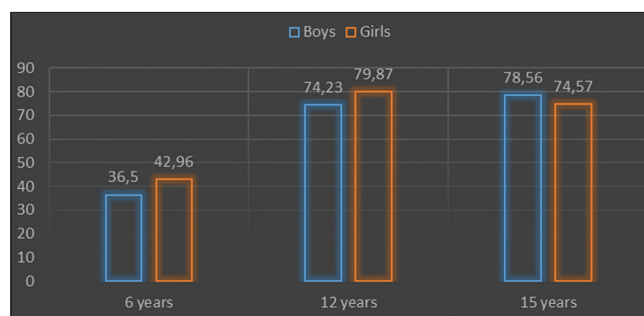


Chart 2: Prevalence of dentognathic anomalies depending of the sex of the children, %.

DISCUSSION

Children under the age of 12–15 years are among one of the groups of great interest for the WHO epidemiological measurement of caries prevalence and intensity, and thus, one of the most studied age groups for the evaluation of oral health. In the literature, there are not many articles presenting the results of studies on the achievements in unique regions with natural fluorine and iodine deficiency. Transcarpathian region is a well-known agricultural region. The present study demonstrates high values of the prevalence and intensity in the surveyed children. The total prevalence of caries of deciduous teeth in children was $57.86\% \pm 1.56\%$. The intensity of deciduous teeth caries was 2.61 ± 0.6 . The total prevalence of caries in permanent teeth was $71.45\% \pm 1.31\%$ and the intensity of caries of permanent teeth was 2.36 ± 0.52 .

In order to compare the intensity of caries expressed in the DMF index in the Transcarpathian region with other countries, we referred to similar epidemiological studies of Georgia and Poland.^[6,7] In all these studies, group of 12-year-olds was monitored.

The data about the prevalence and intensity of dental caries demonstrate their combination with a high frequency of unsatisfactory hygiene needs, as evidenced by achievements of studies in recent years, including that of Kamińska *et al.* in this direction.^[8]

According to the results of Shishniashvili *et al.* the dynamics of dental caries is mostly expressed in young children. The studies revealed that the average rate of dental caries for the studied group living in regions with ecologically favorable conditions is relatively lower than that in ones living in regions with unfavorable conditions which equals to 39.6% and 63.6%, respectively.^[6]

Dental caries is still a social problem in many countries, including Poland. Through epidemiological studies conducted in index groups among children and adults, it is possible to monitor its progress and take appropriate action. Another study provided by Rodakowska *et al.* obtained similar results of high values of caries intensity among 12-year-olds from the Podlaskie region, which corresponds to the results of the present study. It was noticed that there were more filled teeth in children living in the urban areas, while in our research, the component “F” was only 0.98 ± 0.09 .^[7]

The study of 6-year-old schoolchildren in Qatar indicated that about 71% of children were suffering

from dental caries lesions, and only 28.6% of children were caries free. In Ukraine, this indicator in the same age group was nearly 81%.^[9] Data about poor oral hygiene in children of 6–15 years were closely intertwined with the results of the work of Mustufa *et al.*^[10]

Social and economic factors, such as the level of education and family income, are well-documented determinants of the development and progression of dental caries. Parents in Kuwait seemed to have weak knowledge and practices with regard to their children’s oral health that coincide with the results of our study. Coordinated efforts by health professionals, including pediatricians and pediatric dentists, are required to increase parental awareness regarding oral hygiene habits, diet, and feeding practices and to promote early preventive visits to the dentists.^[11]

Feconja’s data show that hypodontia and microdontia were found more prevalent in females than males, whereas hyperdontia and macrodontia were more common in males,^[12] although according to our research, there was no significant difference between sexes regarding the structure of nosological forms.

Results of studies conducted by Bagnenko *et al.*,^[13] in which they analyze the epidemiology of various forms of dentoalveolar anomalies in school-age children of Kirishi district of Leningrad region, were consistent with the results of our research.

The study by Quashie-Williams *et al.* reported increasing open bite to be the most commonly occurring occlusal anomaly associated with oral habits.^[14] In our study, patients with open bite constituted only 7.4% and there was no tendency to increase.

Analysis of the results showed a high prevalence of periodontal disease, which increases with age, which is consistent with the research study among school-going children of urban and rural areas of Bhopal district, India.^[15]

Our research data reaffirm that steps toward the individualization of WHO goals and objectives, depending on the country and region, are correct. Naturally defined differences, such as the lack of fluorine and iodine, are reflected in the health of their inhabitants.

CONCLUSION

Hence, we found poor hygienic knowledge of the

parents, lack of medical activity of parents to preserve dental health of the child, lack of work performed by dentists on hygiene education, and public health education on the prevention of dental diseases. On the other hand, a high level of confidence was revealed in the information received from dentists. Dentists should be aware of the means and methods of oral hygiene, to be able to advise on the correct choice, and should motivate patients for oral health as an integral part of healing the body.

Thus, the high prevalence of leading dental diseases in children who live in the conditions of biogeochemical fluorine and iodine deficiency (Transcarpathian region) requires modernization of the existing prevention programs for organized groups.

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Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial, in this article.

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