ORIGINAL ARTICLE

CONTENTS

Analysis of the intensity of carious infection of teeth in children permanently living in conditions of a pollated ecosystem

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ABSTRACT

Aim: Assessment of dental caries and its impact on the level of dental health of children aged 15–18 years of Upper Tysa region, who constantly live in conditions of combined negative effects of factors of natural and technological genesis.

Materials and Methods: During the dental examination, the incidence of dental caries in 360 children aged 15-18 years from various biogeochemical zones of the cross-border region of the Upper Tysa region was studied and assessed using the International Caries Detection and Assessment System — ICDAS II (International Caries Detection and Assessment System).

Results: It was found that the use of physiologically suboptimal drinking water from decentralized water resources is among the environmental determinants of the state of dental health of children in the Upper Potyssia. In lowland children in Hungary and Slovakia, caries was observed more often on the chewing surfaces than on the proximal ones (46/42; 64/54), and in Ukraine and Romania, on the contrary, the prevalence of the carious process was observed on the proximal surfaces (71/98; 70/ 94). This may be related to longer exposure to factors. In conclusion, the analysis of the ICDAS II indicator among children of the cross-border region of the Upper Tysa region indicates certain features that underlie the state of dental health in different regions, including climate-geographic zones and special biogeochemical provinces.

Conclusions: The obtained data can be used both to forecast the dynamics of dental morbidity in children living in these regions, and to develop differentiated tactics of treatment and preventive measures.

KEY WORDS: ICDAS II, children, Upper Tysa region, the intensity of tooth decay, the polluted ecosystem

Wiad Lek. 2024;77(9):1979-1988. doi: 10.36740/WLek/195165 DOI

INTRODUCTION

In recent decades, there has been an increase in the number of eco-dependent diseases, including dental diseases [1-8]. Long-term research confirms that long-term pollution of the area with toxic compounds leads to the fact that they accumulate in individual components of the ecosystem, which negatively affects living organisms [9-17].

The issue of ecosystem pollution in the Transcarpathian region is relevant today, as it is this region of Ukraine that suffers the most from floods, devastating deforestation and other environmental damage. The Upper Potyssia region covers the territory of a unique natural complex that provides the catchment area of the Tisza River from the city of Rakhiv (Ukraine) to the city of Dombrat (Hungary). Transcarpathia is almost completely correlated with Upper Potyssia, which according to the modern administrative-territorial division includes the Transcarpathian region of Ukraine, Eastern Slovakia, the northern districts of Sabolch of the Satmar county of Hungary, Satu-Mar and Baia-Mar counties of Romania. The region is demarcated by the state borders of Ukraine, Hungary, Romania, and Slovakia (Fig. 1) [18-20].

It is well known that Upper Tysa region, like the entire Transcarpathian region, is an endemic area with a biogeochemical deficiency of fluorine and iodine, which has a significant impact on dental health [21-24]. A real threat to the population, nature, and recreational resources for the Upper Potyssia is the critical ecological situation (Fig. 2), which has developed in large areas of the region and is associated with the pollution of the Tisza River basin by products of emergency emissions from mining enterprises in Romania (2000), waste with extremely high concentrations salts of heavy metals in the Tisza tributary to the Samos River, Baia Mare and Baia Borsha bridges, which, together with catastrophic floods (1998, 2001), led to the

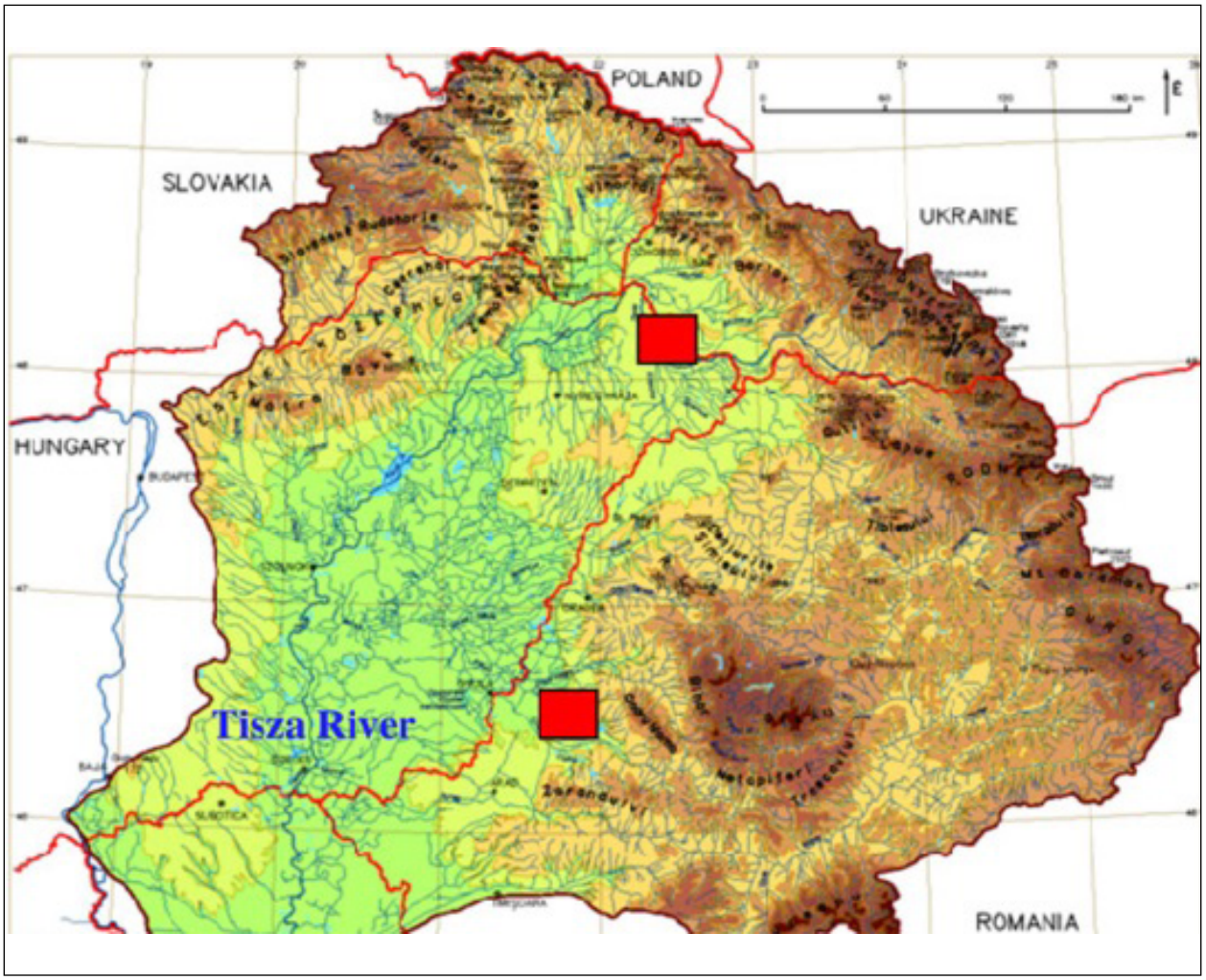

Fig. 1. Administrative-territorial map of the UpperTysa region.

accumulation of toxicants in the ecosystems of flooded areas [18-21]. Such pollution with heavy metal ions (HM), cyanides, radionuclides, pesticides, phenols, nitrogen oxides, nitrates determine the current state of many ecosystems, and the main danger for the biosphere in this case is caused by the ability of these toxicants to accumulate in living organisms.

The average level of providing the population of these territories of Transcarpathian with tap water is 32.2% [25], and there is practically no centralized water supply in rural settlements. Their water supply is mainly provided by physiologically suboptimal drinking water from domestic wells and boreholes. According to data from water resources departments of transboundary countries [26-29], a slightly better situation is observed with regard to centralized water supply - 57.72% of settlements in Hungary, 49.63% in Romania, and 51.56% in Slovakia, however, in neighboring countries, a significant share of use of physiologically suboptimal drinking water from decentralized water resources, which increases the risks of biological influence of environmental factors on the dental health of the population. Through drinking water and regional food products, toxicants, migrating through trophic chains, accumulate in the human body, which causes disruption of many metabolic processes, has a mutagenic, carcinogenic and embryotoxic effect, negatively affects the immune status of the human body, as well as the level of general somatic and dental health. Children are especially sensitive to the negative impact of the environment on the body, in which a tendency to deterioration of general somatic health by 23-42% is observed [17,22,24].

All this led to an urgent need for international and interregional and scientific cooperation in order to monitor the remediation and protection of the affected ecosystems of the Upper Potyssia in the program for the development of integration cooperation of scientists of the Carpathian region in the field of environmental protection «Mobilization, accumulation, distribution and bioremediation of heavy metals in polluted ecosystems of the upper basin of the Tisza River» (0103U007901, 2003-2004), «Development of a system of monitoring

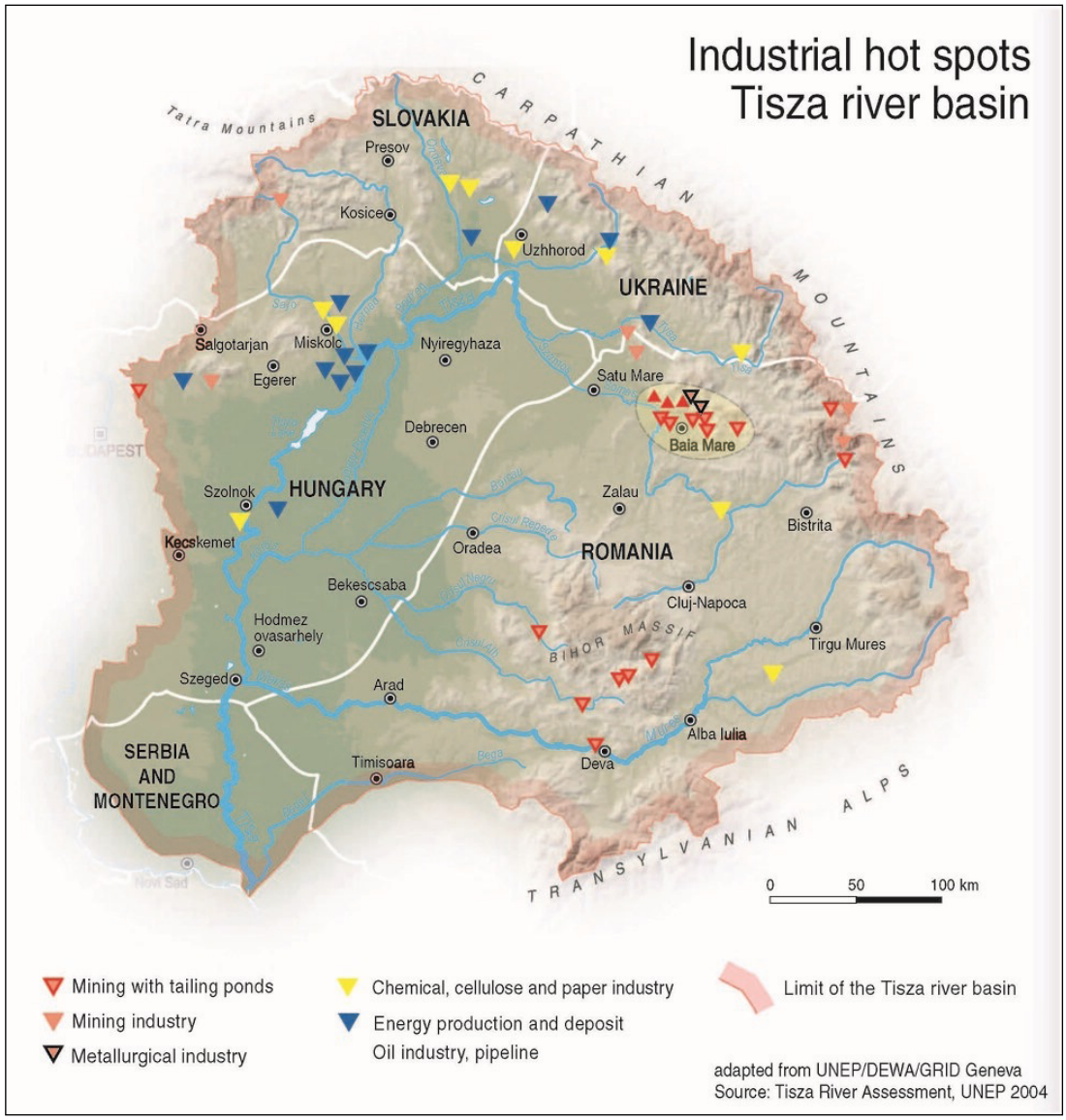

Fig. 2. The main pollutants of the Tysa River basin in Transcarpathian region.

studies of the state of environmental pollution in the border areas of the Coast region» (HU 2003/004-347-05-02-02, 2005-2006) [19], which was implemented with the support of the European Union. But most of the fundamental ecological and medical-biological issues of this plan remain open, which indicates the relevance of targeted scientific research and monitoring of the adaptation capabilities of the organism and the impact of polluted territories of the Upper Tysa region ecosystem on the formation of dental health of children who permanently live in this area.

An in-depth study of the mechanisms of the pathogenetic influence of adverse environmental factors on dental health will allow for the scientific justification and development of differentiated regionally targeted dental prevention programs, which will contribute to increasing the effectiveness of the primary prevention of dental caries and periodontal tissue diseases in children.

AIM

Assessment of dental caries and its impact on the level of dental health of children aged 15–18 years of Upper Tysa region, who constantly live in conditions of combined negative effects of factors of natural and technological genesis.

MATERIALS AND METHODS

To achieve the set goal during 2018-2022. a dental examination of children aged 15–18 years of the Upper Tysa region was carried out in each geographical and natural-climatic region (Table 1).

A total of 360 children were examined, of which 199 (55%) were boys and 163 (45%) were girls. As for their age, the average value was (14.17±1.06) years from the number of practically healthy children permanently living in this area. The coefficient of internal examination

Table 1. Geography of children's examination

Country	Climate-geographic zone		
	Lowland	Foothills	Mountain
Romania (Maramureş County)	Marmarosh - Sighetu	Baia Mare	Borşa
Ukraine, (Transcarpathian region)	Berehove and district	Khust city and district	Tyachiv city and district
Hungary	Zahon and settlements Sabolch - Satmar - Bereg region	Tokaj and settlements Borshod - Abay Zemplen region	Polgar and settlements Hajdu-Bihar region
Slovakia (Košice Region)	Mykhailivtsi	Sobrantsi	Strazhskoye

Table 2. The number of carious lesions on teeth in children in the lowland biogeochemical zone according to the ICDAS II system

	Ukraine		Hungary		Slovakia		Romania	
Code	1	2	1	2	1	2	1	2
0	183 (72)	183 (65,1)	210 (78)	210 (80,2)	203 (76)	203 (79,4)	192 (73,1)	192 (67,2)
1	6 (2,4)	7 (2,5)	3 (1,2)	2 (1,1)	7 (2,6)	6 (2,5)	6 (2,3)	7 (2,6)
2	11 (4,2)	12 (4,4)	9 (4,1)	9 (4,2)	12 (4,6)	9 (3,4)	11 (4,3)	13 (4,4)
3	24 (9,4)	27 (9,6)	15 (7,2)	11 (5,4)	12 (4,6)	12 (4,5)	22 (8,5)	25 (8,7)
4	16 (6,4)	19 (6,6)	11 (5,3)	8 (3,7)	13 (4,8)	9 (3,4)	17 (6,3)	19 (6,7)
5	8 (3,3)	21 (7,5)	6 (3,1)	9 (4,2)	12 (4,6)	11 (4,2)	8 (3,2)	18 (6,2)
6	6 (2,4)	12 (4,4)	2 (1,1)	3 (1,2)	8 (2,9)	7 (2,6)	6 (2,3)	12 (4,2)
Together with the affected surfaces	71 (28)	98 (35,0)	46 (22)	42 (19,8)	64 (24)	54 (20,6)	70 (26,9)	94 (32,8)

Notes: 1 — on chewing surfaces, abs. (%), 2 — on the proximal surfaces, abs. (%).

(Kappa index) was 0.83. Clinical examination data were recorded in a specially developed child's dental status assessment card based on WHO recommendations and a child's dental examination card for epidemiological studies. When making a diagnosis of caries, the generally accepted classification of ICD-10 was used. The study was carried out taking into account the main provisions of the GCP ICH and the Helsinki Declaration on Biomedical Research, the Council of Europe Convention on Human Rights and Biomedicine (2007) and the recommendations of the Committee on Bioethics under the Presidium of the National Academy of Sciences of Ukraine (2002) and the positive opinion of the Bioethics Commission of the Uzhhorod National University. Children and parents were informed about the purpose and methods of the study and, subject to obtaining written consent, the children were examined. Joint epidemiological surveys of the cross-border territories of Hungary, Romania and Slovakia were conducted in accordance with the agreement on cooperation and partnership with the Uzhgorod National University at the clinical bases of supporting higher educational institutions.

During the dental examination, the incidence of dental caries in children from different biogeochemical zones was studied and assessed using the International Caries Detection and Assessment System — ICDAS II (International Caries Detection and Assessment System), which is an evidence-based system for clinical visual caries detection and provides an opportunity to determine the stage and depth of the carious process — from the first carious changes in the enamel to the pronounced cavity in the dentin of the tooth. The data of clinical observations were recorded in the cards for the examination of the condition of the oral cavity in children for epidemiological studies, which allow the registration of the state of the hard tissues of the tooth with the help of six codes: three - for the assessment of carious changes in the enamel and three - for the assessment of carious changes in the dentin in the sequence of their growth severity [29].

The International Caries Classification and Management System (ICCMS — International Caries Classification and Management System) [29] is based on the international ICDAS II system, according to which three stages of carious lesions are distinguished: initial, moderate and extensive (extensive), and it is not about depth, but precisely about the stage of development of the pathological process, which allows for the application of certain algorithms for each stage, which cover diagnostic, preventive and therapeutic measures. In addition to direct classification (determining the stage

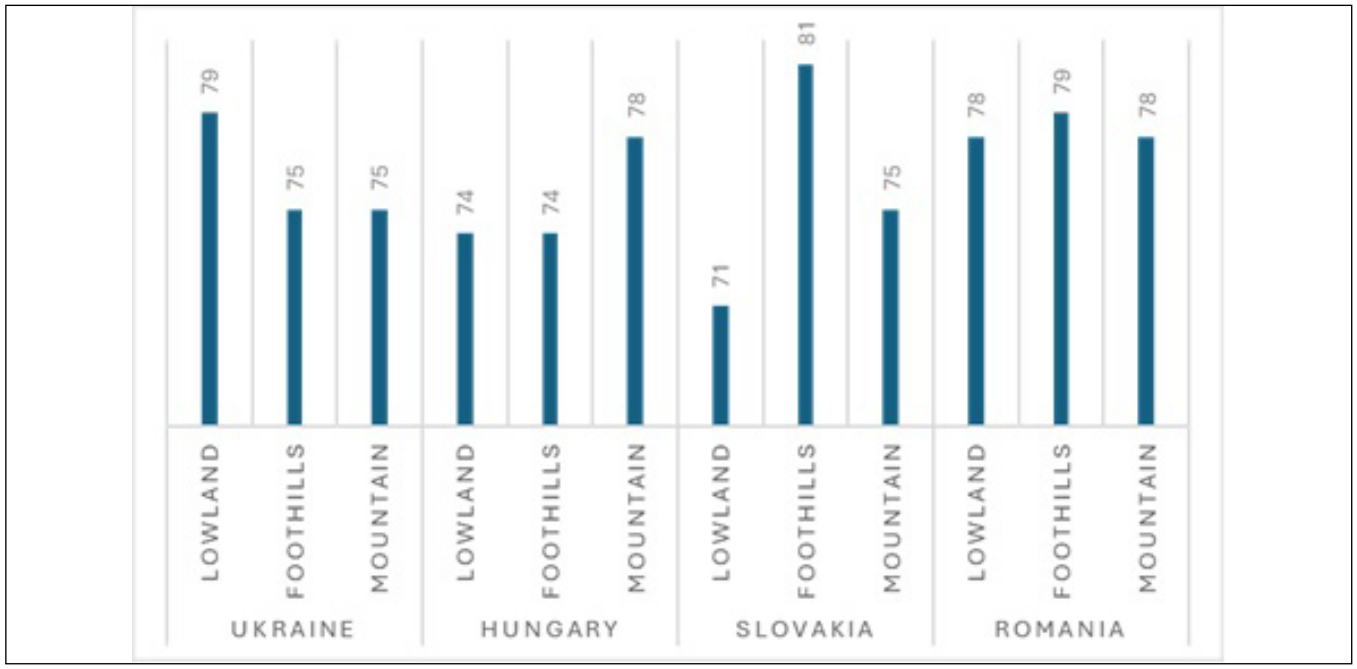

Fig. 3. Comparison of the depth of carious lesions in children of the Upper Tysa region according to the ICDAS II system.

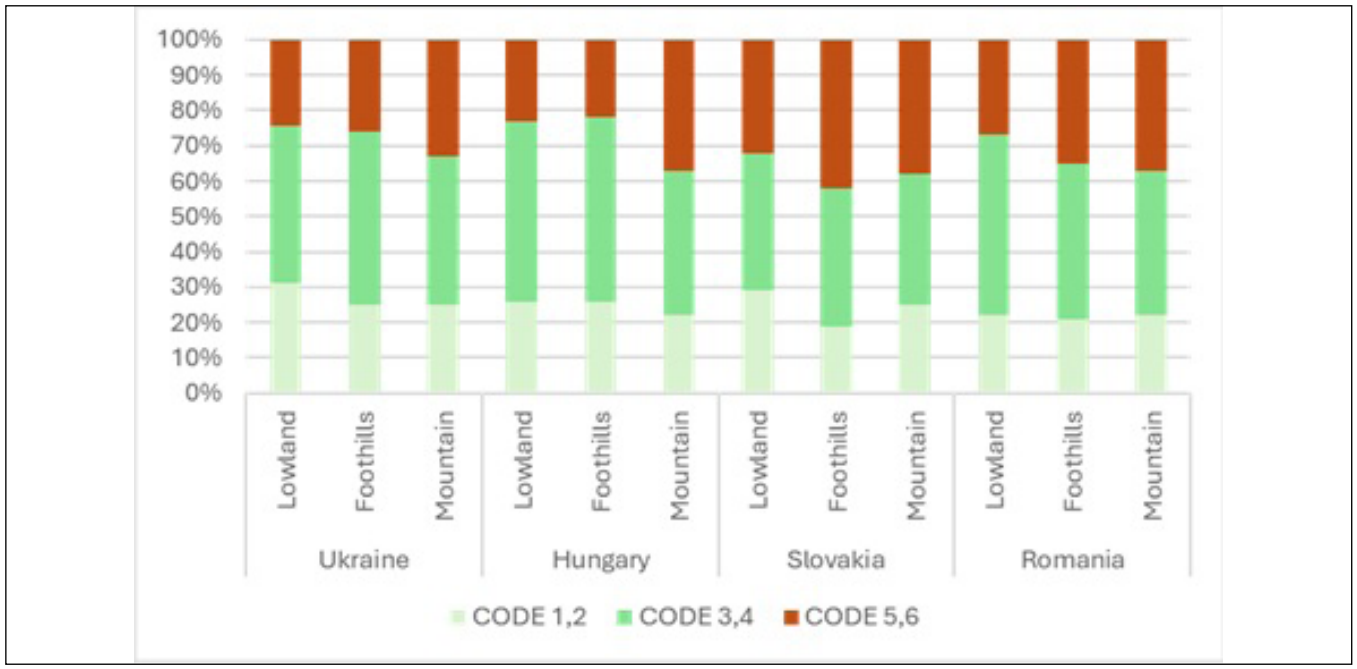

Fig. 4. The frequency of carious damage to the dentin of molars in children.

and activity of caries), the system includes determination of the individual risk level of the development and progression of the disease, decision-making and recommendations regarding tactics — preventive measures, disease control, tooth tissue preservation, and operative treatment.

The results of laboratory and clinical studies were processed by methods of variational statistics with determination of the mean value, its errors, Student's t-test for multiple comparisons, using Excel (MS Office 2018, Microsoft, USA) and STATISTICA 6.0 (StatSoft, USA). Differences in indicators at the level of significance $p < 0.05$ were considered statistically significant.

RESULTS

To assess dental caries, children were divided into three groups according to their biogeochemical habitat zones: lowland, foothills, and mountains. In lowland children in Hungary and Slovakia, caries was observed more often on the chewing surfaces than on the proximal ones (46/42; 64/54), and in Ukraine and Romania, on the contrary, the

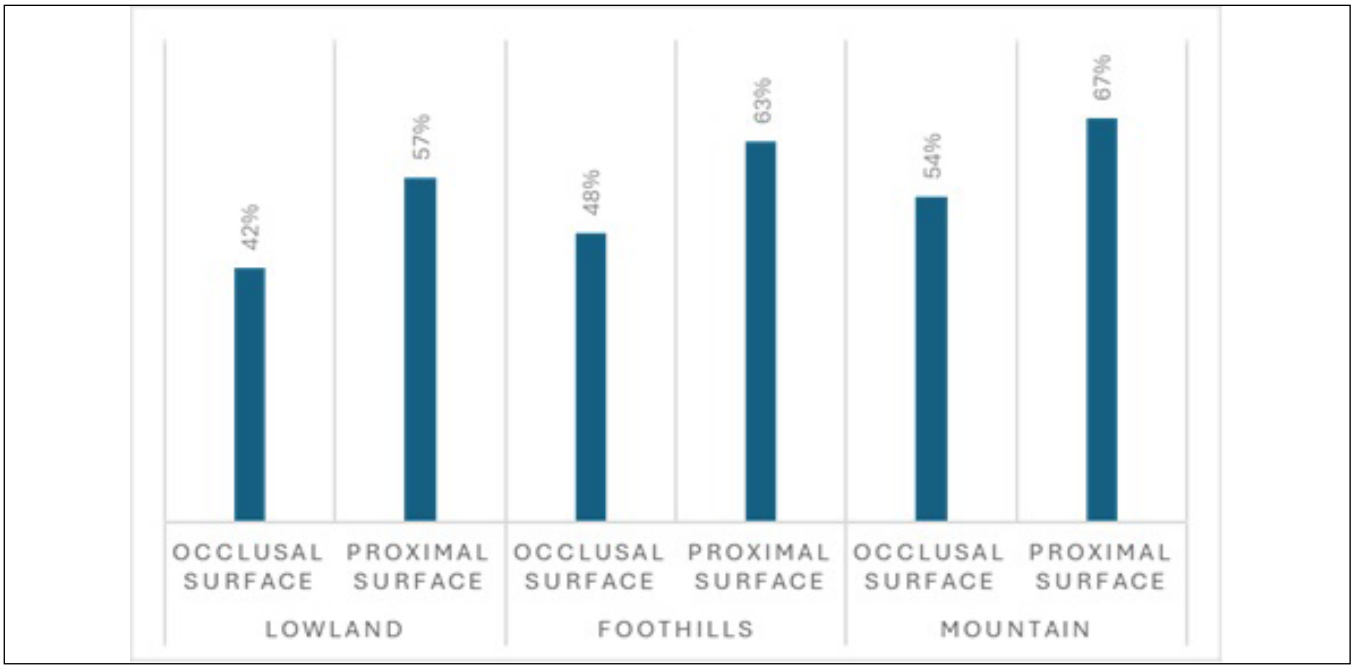

Fig. 5. The frequency of secondary carious lesions of molars in children of the Upper Tysa region according to the ICDAS II system.

prevalence of the carious process was observed on the proximal surfaces (71/98; 70/ 94) (Table 2). Regarding the distribution of carious lesions by depth, the average stage of carious lesions (codes 3, 4) among the examined children of the lowland zone of Ukraine and three neighboring countries (Hungary, Slovakia, Romania) was observed more often than the stages of deep and superficial carious lesions (codes 5, 6 and 1, 2).

Accordingly, 86 (51%) lesions (45 (51%), 46 (39%), 83 (51%)); 47 (28%) lesions (20 (23%), 38 (32%), 44 (27%)) and 36 (21%) lesions (23 (26%), 34 (29%), 37 (22%)) (Fig. 3, 4). The number of filled teeth in this group was 106 (9.5%). 78 fillings were located on the chewing surfaces of the teeth, 28 - on the proximal ones. Signs of secondary caries were observed on 33 (42%) fillings out of 78, located on the chewing surfaces of molars, and 16 (57%) fillings out of 28, on the proximal surfaces (Table 3, Table 4, Table 5, Fig. 5).

In the second group of the foothill zone (Table 3), the number of carious cavities on the proximal surfaces increased and slightly exceeded the number on the chewing surfaces (86/113, 71/114, 80/101), with the exception of Hungary (75/55). Regarding the distribution of carious lesions by depth, the average stage of carious lesions (codes 3, 4) among the examined children of the foothill biogeochemical zone of Ukraine and two neighboring countries (Hungary, Romania) was observed more often than the stages of deep and superficial carious lesions (codes 5, 6 and 1 , 2). Accordingly, 98 (49%) lesions (68 (52%), 79 (44%)); 52 (26%) lesions (29 (22%), 63 (35%)) and 49 (25%) lesions (33 (26%), 39 (21%)), except in Slovakia, where the stage of deep carious lesions prevails (77 (42%)/73 (39%)/35 (19%)) (Fig. 3, Fig.4). Also, 233 sealed teeth (19.2%) were found in this group of children. 94 teeth had fillings on the masticatory surfaces and 139 on the proximal surfaces. Signs of secondary caries were present in 45 fillings (48%) out of 94 on the chewing surfaces of molars and 88 fillings (63%) out of 139, which were localized on the proximal surfaces (Table 5, Fig. 5).

In the third group of the mountain zone (Table 4), the number of carious cavities on the proximal surfaces increased and significantly exceeded the number on the chewing surfaces (87/123, 77/99, 79/113, 83/122). Regarding the distribution of carious lesions by depth, the average stage of carious lesions (codes 3, 4) among the examined children of the mountainous biogeochemical zone of Ukraine and two neighboring countries (Hungary, Romania) was observed more often than the stages of deep and superficial carious lesions (codes 5, 6 and 1 , 2). Accordingly, 88 (42%) lesions (72 (41%), 84 (41%)); 70 (33%) lesions (65 (37%), 75 (37%)) and 52 (25%) lesions (39 (22%), 46 (22%)) except Slovakia, where the number of lesions corresponding to codes 5, 6 practically corresponds to the number of lesions corresponding to codes 3, 4, but prevail over the values of codes 1, 2 (73 (38%) ≈ 70 (37%)) > 49 (25%) (Fig. 3, 4). In this group, 273 filled teeth (29.3%) were observed. In 117 teeth, fillings were located on the chewing surfaces, in 156 - on the proximal ones. Out of 117 signs of secondary caries, 63 (54%) had fillings located on chewing surfaces and out of 156, 104 fillings (67%) were located on proximal surfaces (Table 5, Fig. 5).

DISCUSSION

The analysis of the structure of carious lesions in children aged 15-18 years, who live in the conditions of the combined negative effect of factors of natural and technological

Table 3. The number of carious lesions on teeth in children in the foothills climate-geographic zone according to the ICDAS II system

	Ukraine		Hungary		Slovakia		Romania	
Code	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
0	202 (70,2)	202 (64,2)	214 (74)	214 (79,3)	217 (75,2)	217 (65,4)	198 (71,1)	198 (66,1)
1	10 (3,5)	11 (3,6)	6 (2,2)	4 (1,5)	7 (2,6)	6 (1,9)	9 (3,3)	7 (2,4)
2	13 (4,4)	15 (4,7)	12 (4,1)	11 (4,2)	13 (4,5)	9 (2,6)	13 (4,7)	10 (3,4)
3	27 (9,5)	31 (9,8)	24 (8,2)	15 (5,4)	16 (5,6)	18 (5,5)	19 (6,8)	29 (9,6)
4	19 (6,7)	21 (6,7)	18 (6,3)	11 (4,2)	14 (4,8)	25 (7,6)	17 (6,1)	14 (4,6)
5	10 (3,5)	21 (6,7)	9 (3,1)	11 (4,2)	10 (3,6)	27 (8,2)	12 (4,3)	25 (8,5)
6	7 (2,3)	14 (4,4)	6 (2,2)	3 (1,3)	11 (3,7)	29 (8,8)	10 (3,7)	16 (5,4)
Together with the affected surfaces	86 (29,8)	113 (35,8)	75 (26,0)	55 (20,7)	71 (24,8)	114 (34,6)	80 (28,9)	101 (33,9)

Notes: 1 — on chewing surfaces, abs. (%), 2 — on the proximal surfaces, abs. (%).

Table 4. The number of carious lesions on teeth in children in the mountain climate-geographic zone by the ICDAS II system

3	**Ukraine**		**Hungary**		**Slovakia**		**Romania**	
Code	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
0	186 (68,1)	186 (60,2)	204 (72,3)	204 (67,2)	198 (71,7)	198 (63,4)	191 (69,7)	191 (61,1)
1	9 (3,2)	14 (4,4)	7 (2,6)	10 (3,4)	10 (3,6)	12 (3,9)	10 (3,7)	11 (3,6)
2	12 (4,4)	17 (5,5)	9 (3,5)	13 (4,4)	13 (4,7)	14 (4,6)	13 (4,7)	12 (3,9)
3	20 (7,4)	27 (8,6)	13 (4,7)	20 (6,6)	13 (4,7)	20 (6,5)	16 (5,8)	26 (8,3)
4	17 (6,3)	24 (7,7)	19 (6,6)	20 (6,6)	13 (4,7)	24 (7,6)	16 (5,8)	26 (8,3)
5	17 (6,3)	22 (7,3)	18 (6,5)	23 (7,5)	16 (5,7)	22 (7,2)	15 (5,6)	26 (8,3)
6	12 (4,4)	19 (6,3)	11 (3,8)	13 (4,4)	14 (4,9)	21 (6,8)	13 (4,7)	21 (6,6)
Together with the affected surfaces	87 (31,9)	123 (39,8)	77 (27,7)	99 (32,9)	79 (28,3)	113 (36,6)	83 (30,3)	122 (38,9)

Notes: 1 — on chewing surfaces, abs. (%), 2 — on the proximal surfaces, abs. (%).

genesis (Upper Tysa region), shows that in the lowland biogeochemical zone, the stage of medium carious lesions significantly prevails, in contrast to the stages of deep and superficial lesions .

Among children of the foothills and mountain climate-geographical zones, there is also a prevalence of medium carious lesions of molars, however, for these zones of Slovakia, the prevalence of the stage of deep carious lesions of molars is characteristic. In the course of the examination, it was established that the worst caries situation in children of the Upper Depression region of Ukraine and Romania, as evidenced by the high quantitative index of detected carious cavities, is primarily due to the peculiarity of the geomorphological surface of the region, its hydrological regime and the high degree of polyetiological pollution of the studied ecosystem. Also, the frequency of carious damage to the dentin of molars is the highest in the mountain biogeochemical zone, the maximum peak of the damage is observed precisely in the settlements of the Upper Tysa region of Ukraine and Romania, the minimum is in children of the lowland biogeochemical zone of Hungary.

Among children of the mountainous biogeochemical zone of the Upper Tysa region, a high prevalence of secondary carious lesion of molars is characteristic - 167 abs. values among all examined. Secondary caries is much more often observed when defects are localized on the proximal surfaces of molars in children. Regarding the distribution of carious cavities of molars by localization, in children of the Upper Tysa region, there is a tendency to damage the proximal surfaces of molars, the exception is the lowland biogeochemical zones of Hungary and Slovakia, where there is a prevalence of damage to the chewing surface of molars in children.

According to Hungarian colleagues Szőke J, Petersen PE [24], among children aged 15-18 years living in the territory of western and central Hungary for the period 2018-2022, there is a predominant surface lesion of the hard tissues of the teeth, which corresponds to codes 1,2 according to the system ISDAS II, CODE 1 is 31.2%, CODE 2 – 19.8% of 828 examined children. According to J. Szőke, in 2019, 42.6% of children aged 15 years have caries and intact teeth. Thus, for comparison, in the western regions

Table 5. Number of fillings and their analysis on children's teeth in different climatic and geographical zones

Indicators	Climate-geographic zone					
	Lowland		Foothills		Mountain	
	on occlusal surfaces Abs. (%)	on the proximal surfaces of Abs. (%)	on occlusal surfaces Abs. (%)	on the proximal surfaces of Abs. (%)	on occlusal surfaces Abs. (%)	on the proximal surfaces of Abs. (%)
secondary caries	33 (42)	16 (57)	45 (48)	88 (63)	63 (54)	104 (67)
the total number of fillings	78 (100)	28 (100)	94 (100)	139 (100)	117 (100)	156 (100)

Table 6. Comparative analysis of the indicator of the intensity of carious lesions of the hard tissues of the teeth among children of the cross-border of the Upper Tysa region depending on the determinant of iodine-fluorine devitsite

Indicators	Ukraine			Hungary			Slovakia			Romania		
	Climate - geographical zones											
	Lowland	Foothills	Mountain	Lowland	Foothills	Mountain	Lowland	Foothills	Mountain	Lowland	Foothills	Mountain
The ICDAS II index value, CODES	> 4	> 4	> 5	≤ 3	≤ 4	> 4	> 4	> 4	> 4	> 4	> 4	≥ 5

of Hungary in 1985, 15-year-old children had an average of 5 teeth affected by caries, and after 30 years, the caries rate decreased to 2.3 DMFT in 2017-2020. Answers to the questionnaire showed that 11.9% of 15-year-olds visited the dentist because of pain or discomfort in the mouth, and 40.5% were dissatisfied with the appearance of their teeth.

According to the data of Romanian researchers Stanciu, Ioana-Andreea; Tanase, Mihaela; Luca, Rodica, among the examined children aged 15-17 years in the central regions of Romania during 2020, there is a predominant superficial lesion of the hard tissues of the teeth, which corresponds to codes 1,2 according to the ISDAS II system, CODE 1 is 46.8%, CODE 2 is 28 .8% of the 1025 examined children, however, there is damage to the mantle dentin corresponding to codes 3,4: CODE 3 is 39.1%, CODE 4 is 14.4% of the total number of examined according to the ISDAS II system.

In conclusion, the analysis of the ICDAS II indicator among children of the cross-border region of the Upper Potyssia indicates certain features that underlie the state of dental health in different regions, including climate-geographic zones and special biogeochemical provinces (table 6) [23]. The obtained data can be used both to forecast the dynamics of dental morbidity in children living in these regions, and to develop differentiated tactics of treatment and preventive measures.

CONCLUSIONS

Analysis of the structure of carious lesions in children aged 15–18, who were born and constantly live in the conditions of the combined negative effect of factors of natural and technological genesis (Upper Tysa region), indicates that there is a continuing trend of the caries intensity indicator, a significant progression of the stage of medium carious lesions in the lowland biogeochemical zone, in contrast to the stages of deep and surface damage. During the survey, it was established that the worst caries situation is in children of the Upper Tysa region region of Ukraine and Romania, which is evidenced by the high quantitative index of detected carious cavities - 528 and 550, respectively, primarily due to the peculiarity of the geomorphological surface of the region, the peculiarities of the hydrological regime and the high degree of polyetiological pollution territory of the studied ecosystem.

It was found that the use of physiologically suboptimal drinking water from decentralized water resources is among the environmental determinants of the state of dental health of children in the Upper Tysa region.

The obtained indicators of dental health are closely correlated with the level of environmental and hygienic safety, and the degree of correlation is the highest for teenagers in the 16-17-year-old group. This may be related to longer exposure to factors.

Among children of the mountainous biogeochemical zone of the Upper Tysa region, a high prevalence of secondary carious lesion of molars is characteristic — 167 abs. Values among all examined. Secondary caries is much more often observed when defects are localized on the proximal surfaces of molars in children (208/141,

respectively). As for the distribution of carious cavities of molars by location, in children of the Upper Tysa region, there is a tendency to damage the proximal surfaces of molars, the exceptions are the lowland biogeochemical zones of Hungary and Slovakia, where the prevalence of damage to the chewing surface of molars in children is observed. The use of the ICDAS II index is a simple and informative method for assessing caries in children, which allows analyzing and differentiating the structure of carious lesions by depth, which is important in the development of using the ICDAS II index is a simple and informative method for assessing caries in children, which allows analyzing and to differentiate the structure of carious lesions by depth, which is important in the development of predictive algorithms of preventive protocols and makes them understandable and acceptable studies in the scientific environment, and to join international programs on this issue.

Further study of the pathogenetic relationships of the negative impact of factors of natural and technological genesis on the dental health of children who constantly live in conditions with the geochemical anomaly of fluorine-iodine deficiency will contribute to the development of differentiated, regionally adapted programs of stomatological endogenous prevention and increase its effectiveness.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

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A – Work concept and design, B – Data collection and analysis, C – Responsibility for statistical analysis, D – Writing the article, E – Critical review, F – Final approval of the article

RECEIVED: 07.06.2024
ACCEPTED: 19.09.2024

CREATIVE COMMONS 4.0