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ABSTRACT

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ASSESSMENT OF THE DENTAL STATUS OF INTERNALLY DISPLACED CHILDREN DUE TO THE ARMED CONFLICT IN UKRAINE

Introduction. Modern epidemiological studies show that the child population is highly vulnerable to the effects of social, environmental and economic factors, which is particularly relevant in the context of forced displacement due to military conflict. Internally displaced children are a group at increased risk of developing dental pathologies due to a number of adverse factors, including psycho-emotional stress, limited access to medical and preventive dental care, changes in diet and deterioration of hygiene skills.

The aim of the study: to study the characteristics of the dental status of children internally displaced as a result of the armed conflict in Ukraine.

Materials and methods. The study was conducted at the Department of Paediatric Dentistry of the I. Horbachevsky Ternopil National Medical University of the Ministry of Health of Ukraine and included a comprehensive assessment of the dental status of internally displaced children affected by the armed conflict in Ukraine. International standards for the diagnosis of dental caries were used to assess the dental status of the study participants. In particular, the prevalence of caries was determined as a percentage and its intensity was assessed using the DMFT index (DMFT+dft, dft). The condition of the periodontal tissues was analysed using the modified PMA index (C. Parma, 1960), which allows the degree of inflammatory changes in the gingival tissues to be assessed. The oral hygiene status was determined using the OHI-S index (Green, Vermillion, 1964), which is a generally accepted standard for assessing the level of oral hygiene.

Results. The prevalence of caries in temporary teeth in internally displaced children aged 6–7 years was 86,27±4,82 %, in permanent teeth – 23,53±5,94 %, and increased to 89,34±2,79 % in adolescents aged 14–16 years. The intensity of caries (DMFT index) of temporary teeth in

children aged 6 years was high (6,01±0,231), that of permanent teeth in children aged 12 years was average (3,52±0,122) and that of adolescents aged 15 years was high (4,91±0,242). In the structure of the DMFT index, the “D” component was predominant in all age groups, ranging from 57,67 % to 87,10 %. The level of oral hygiene (OHI-S index) was described as unsatisfactory, ranging from 1,86±0,020 to 2,08±0.025, and the PMA index values corresponded on average to moderate gingivitis.

Conclusions. Thus, the dental and oral hygiene status of internally displaced children is significantly worse than that of their peers from the general population of children and adolescents in Ukraine.

Keywords: children, internally displaced persons, caries, prevalence, intensity, condition of periodontal tissues, oral hygiene, dentoalveolar anomalies.

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ОЦІНКА СТОМАТОЛОГІЧНОГО СТАТУСУ У ВНУТРІШНЬО ПЕРЕМІЩЕНИХ ДІТЕЙ ВНАСЛІДОК ЗБРОЙНОГО КОНФЛІКТУ В УКРАЇНІ

Вступ. Сучасні епідеміологічні дослідження свідчать про високу чутливість дитячої популяції до впливу соціальних, екологічних та економічних чинників, що особливо актуально в умовах вимушеного переміщення внаслідок військових конфліктів. Внутрішньо переміщені діти є групою з підвищеним ризиком розвитку стоматологічних патологій через низку несприятливих факторів, серед яких: психоемоційний стрес, обмежений доступ до медичної та профілактичної стоматологічної допомоги, зміни у харчуванні та погіршення гігієнічних навичок.

Мета. Дослідити особливості стоматологічного статусу у внутрішньо переміщених дітей, внаслідок збройного конфлікту в Україні.

Матеріали та методи дослідження. Дослідження було проведене на базі кафедри дитячої стоматології Тернопільського національного медичного університету імені І. Я. Горбачевського МОЗ України та передбачало комплексну оцінку стоматологічного статусу внутрішньо переміщених дітей, постраждалих унаслідок збройного конфлікту в Україні. Для оцінки стоматологічного статусу учасників дослідження використовували міжнародні стандарти діагностики каріозного процесу. Зокрема, поширеність карієсу визначали у відсотковому співвідношенні, а його інтенсивність оцінювали за допомогою індексу КПВ (КПВ+кп, кп). Стан тканин пародонта аналізували за допомогою модифікованого індексу PMA (C. Parma, 1960), що дозволяє оцінити рівень запальних змін у тканинах ясен. Гігієнічний статус ротової порожнини визначали за допомогою індексу OHI-S (Green, Vermillion, 1964), який є загальноприйнятим стандартом для оцінки рівня гігієни порожнини рота.

Результати дослідження та їх обговорення. Поширеність карієсу тимчасових зубів у внутрішньо-переміщених дітей віком 6–7 років становила 86,27±4,82 %, карієсу постійних зубів – 23,53±5,94 % та підвищувалася до 89,34±2,79 % у підлітків віком 14–16 років. Інтенсивність карієсу (індекс КПВ) тимчасових зубів у

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дітей віком 6 років відповідала високому рівню (6,01±0,231), карієсу постійних зубів у дітей віком 12 років – середньому рівню (3,52±0,122) та високому рівню у підлітків віком 15 років (4,91±0,242). У структурі індексу КПВ в усіх вікових групах превалював компонент «К», який становив від 57,67 % до 87,10 %. Рівень гігієни порожнини рота (індекс OHI-S) характеризується як незадовільний та коливався від 1,86±0,020 до 2,08±0,025, значення індексу PMA в середньому відповідали гінгівіту середнього ступеня тяжкості.

Висновок. Таким чином, стоматологічний статус та стан гігієни порожнини рота у внутрішньо-переміщених дітей, помітно гірші, ніж в однолітків із загальної сукупності дітей та підлітків в Україні.

Ключові слова: діти, внутрішньо переміщені особи, карієс, поширеність, інтенсивність, стан тканин пародонту, гігієнічний стан порожнини рота, зубощелепні аномалії.

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ABBREVIATIONS
IDP – internally displaced persons
DMFT – caries index (Decayed, Missing, Filled Teeth)

INTRODUCTION

Oral health is an important component of a person's overall somatic and psychosocial well-being, and dental disease can have long-term medical and social consequences [1]. According to the concept of the relationship between dental and general health, poor dental health is associated with an increased risk of developing systemic diseases, reduced quality of life and cognitive function, especially in childhood [2].

Modern epidemiological studies indicate that the child population is highly vulnerable to the effects of social, environmental and economic factors, which is particularly relevant in the context of forced displacement due to military conflict [3]. Internally displaced children are a group at increased risk of developing dental pathologies due to a number of adverse factors, including psycho-emotional stress, limited access to medical and preventive dental care, changes in diet and deterioration in hygiene skills [4]. As a result, these children have a much higher prevalence of dental caries, periodontal disease, non-carious lesions of hard tooth tissue and dentoalveolar anomalies [5].

The increase in dental morbidity among internally displaced children can be explained not only by changes in access to health services, but also by psychosocial factors that influence oral health care behaviours [6]. Increased stress is known to alter the body's immune response, contributing to an imbalance in the oral microbiota and an increased risk of periodontal disease [7]. In addition, unstable social conditions and the inability to maintain adequate oral hygiene contribute to the accumulation of plaque and the formation of cariesogenic biofilm [8].

In light of the above, this study will make it possible to assess the dental status of internally displaced children, identify the main risk factors for dental pathology in this group of patients, and identify effective approaches for the prevention and correction of identified disorders. The results can be used as a basis for the development of national programmes to improve the dental health of children affected by military conflict and to improve dental care in crisis situations.

Objective: to study the characteristics of the dental status of children internally displaced as a result of the armed conflict in Ukraine.

MATERIALS AND METHODS

This study was conducted at the Department of Paediatric Dentistry of the I. Horbachevsky Ternopil National Medical University of the Ministry of Health of Ukraine, which has been systematically providing free dental care to IDPs, including children, to maintain and improve their dental health since the beginning of the full-scale military conflict in Ukraine.

To achieve this goal, we conducted a dental examination of 447 internally displaced children aged 6–16 years, divided into three age groups: 102 children

– aged 6–7 years, 223 children – aged 11–13 years, and 122 adolescents – aged 14–16 years.

The dental status of patients was assessed based on external and intraoral examinations. External examination included assessment of the patient's appearance, skin condition, facial configuration, and condition of visible mucous membranes; palpation of lymph nodes in the face, neck, temporomandibular joint (TMJ), and masticatory muscles; and assessment of TMJ movements. The oral examination included assessment of the condition of the mucous membranes of the lips, cheeks, soft and hard palate, tongue (color, moisture, swelling, presence of pathological elements; anatomical features (depth of the vestibule of the oral cavity, attachment of the frenula of the lips and tongue), the condition of the teeth and their position in the dental arch, the nature of the bite, and the relationship between the dental arches.

To diagnose caries, we used international standards approved by the World Health Organization (WHO, 2000), namely: the prevalence of caries was determined as a percentage (%) and its intensity was assessed using the DMFT+dft index, which characterises caries lesions in children during the period of alternating occlusion [9]. A modified papillary-marginal-alveolar index (PMA) (C. Parma, 1960) was used to assess the condition of the periodontal tissues, which allows the intensity and prevalence of the inflammatory response in the periodontal tissues to be quantified [10]. The hygienic status of the oral cavity was assessed using the OHI-S index (Green, Vermillion, 1964) [11].

The study was conducted in accordance with the ICH GCP (1996), the 1975 Declaration of Helsinki (revised in 2000), the Council of Europe Convention on Human Rights and Biomedicine (2007), and the recommendations of the Committee on Bioethics at the Presidium of the National Academy of Medical Sciences of Ukraine (2002). The study was subject to the approval of the bioethics committee of the I. Horbachevsky Ternopil National Medical University, Ministry of Health of Ukraine.

The standard statistical software package Statistica 8.0 was used to analyse the results. Descriptive statistics of the data were calculated using means and standard deviations M±σ if the distribution of the characteristics followed the law of normal distribution. Student's t-test was used to assess the reliability of differences between groups. Statistically significant differences were considered at $p \leq 0.05$.

RESULTS AND DISCUSSION

A dental examination of internally displaced children who were forced to leave their homes as a result of the war in Ukraine revealed a high prevalence of dental caries. The prevalence of caries in temporary teeth among children aged 6–7 years was 86,27±4,82 %, and in permanent teeth, it was 23,53±5,94 % (Fig. 1).

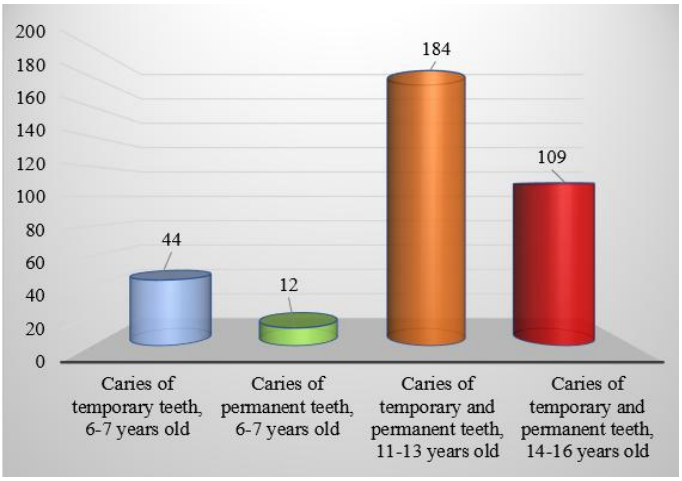

Figure 1 – Prevalence of dental caries (in persons) in internally displaced children

The prevalence of dental caries in internally displaced children has been found to exceed the average for this demographic in Ukraine. According to numerous studies [12, 13], the average prevalence of caries in temporary teeth among children aged 6 years is 81,0 %, while the incidence of caries in permanent teeth is 14,0 %.

In internally displaced children aged 11–13 years, the prevalence of caries was 82,51±2,54 %, and this increased slightly in adolescents (14–16 years) to 89,34±2,79 %. These results are also higher than those found in a number of epidemiological studies. For instance, research [14] revealed an average prevalence of dental caries in children aged 12 and 15 in Ukraine of 70 % and 81 %, respectively.

Concurrently, the prevalence of caries was found to be statistically significantly higher among internally

displaced children who had resided in rural areas prior to relocation (Table 1). A number of authors attribute the higher prevalence of caries in rural areas compared to urban areas to the peculiarities of access to dental care [15].

The results of the caries intensity study are presented in Table 2. The caries intensity of temporary teeth in children aged 6–7 years was found to be significantly higher than the national average (dft = 4,55). Furthermore, the intensity of caries in permanent teeth among internally displaced children within this age group was found to exceed that of their counterparts in Ukraine (DMFT = 0,23). The structure of the caries intensity index in the children examined is dominated by the "D"component. The proportion of untreated caries in their temporary teeth is 83,5 %, and in permanent teeth it is 87,1 %, while in their peers in Ukraine it is 61,9 % and 74,7 %, respectively [16].

Table 1 – Prevalence of dental caries (%) among internally displaced children according to the area in which they lived before displacement

Type of terrain, residence before relocation	Age, in years			
	6-7 years old, temporary teeth, n=51	6-7 years old, permanent teeth, n=51	11-13 years old, temporary and permanent teeth, n=223	14-16 years old, temporary and permanent teeth, n=122
City	80,39±5,56	19,61±5,56	75,34±2,89	86,07±3,14
Village	88,24±4,51 p<0,001	27,45±6,25 p=0,012	87,44±2,22 p=0,007	92,62±2,37 p=0,036

Table 2 – Intensity of dental caries in internally displaced children

Age, in years	DMFT+dft	Components		
		D	M	F
6-7 years old, temporary teeth, n=51	6,01±0,231	5,02±0,223	0,23±0,091	0,76±0,045
6-7 years old, permanent teeth, n=51	1,08±0,094	0,94±0,047	0	0,14±0,026
11-13 years old, n=223	3,52±0,122	2,03±0,072	0,26±0,024	1,23±0,031
14-16 years old, n=122	4,91±0,242 p=0,013	3,11±0,115 p<0,001	0,14±0,011 p<0,001	1,66±0,033 p<0,001

Note: p – significant difference between the values for the age groups 11-13 years and 14-16 years

In internally displaced children aged 11–13 years, the intensity of the caries process (DMFT+dft index) of permanent and temporary teeth was 3,52±0,122. This indicator is also higher than that of their peers in Ukraine in general – 2,41 [17]. The "D" component also prevails in the structure of the DMFT in this age group, accounting for 57,67 % in the study group, although the "F" component already accounts for 34,94 %. However, on average, in Ukraine, the share of these components among peers is 48,0 % and 48,0 %, respectively.

The intensity of caries in adolescents aged 14–16 years increases to 4,91±0,242 (p<0,001) compared to children of the previous key age, as does the proportion of teeth with untreated caries, which reaches 63,34 % (p<0,001). According to epidemiological studies in Ukraine, the caries intensity at the age of 15 years is 3,75, and the share of the "D" component in the structure of the DMFT index is 42,4 %. At the same time, the "F" component is lower (1,66 ± 0,033) and the "M" component is higher (0,14 ± 0,011) than the average values of these components in Ukraine ("F" = 2,06; "M" = 0,08) [18].

In internally displaced children who were forced to leave their homes as a result of the war in Ukraine, the most common caries complications were pulpitis and periodontitis (Table 3). The high incidence of caries complications in temporary teeth at the age of 6–7 years is probably due to the fact that at this age the hard tissues of the tooth are not sufficiently mineralised and the pathological process is rapid and aggressive. This leads to significant destruction of crowns with the involvement of the pulp in the inflammatory process [19]. Undoubtedly, the circumstances that led children to leave their homes also contribute to the development of complications [20].

Similar results have been reported by other authors [21], indicating a higher prevalence and intensity of caries in internally displaced children forced to leave their homes due to armed conflict.

Table 3 – Intensity of complicated caries in internally displaced children

Age, in years	Pulpitis	Apical periodontitis
6-7 years old, permanent teeth, n=102	0,22±0,079	0,49±0,130
11-13 years old, n=223	0,079±0,015	0,39±0,147
14-16 years old, n=122	0,029±0,016	0,49±0,119

The intensity of caries in IDP (children) was more pronounced in those living in rural areas than in those living in urban areas (Table 4).

Statistically significant differences were found in the calculation of the DMFT index, component "D" of permanent teeth in children aged 6–7 years, as well as in other age groups of children living in rural areas. Component "F", on the other hand, predominates in children who lived in urban areas before moving.

Table 4 – Intensity of dental caries in internally displaced children, depending on the area in which they lived before relocation

Age, in years	Type of terrain	DMFT+dft	Components		
			D	M	F
6-7 years old, temporary teeth, n=51	City	6,29±0,182	5,22±0,193	0,22±0,010	0,85±0,012
	Village	5,83±0,163 p=0,05	5,72±0,279 p=0,056	0,11±0,002 p=0,034	0
6-7 years old, permanent teeth, n=51	City	0,88±0,073	0,71±0,107	0	0,17±0,009
	Village	1,19±0,134 p=0,076	1,08±0,086 p=0,012	0	0,11±0,004 p<0,001
11-13 years old, n=223	City	3,19±0,215	1,75±0,019	0,05±0,003	1,39±0,145
	Village	3,85±0,184 p=0,008	2,63±0,133 p=0,036	0,32±0,014 p=0,042	0,90±0,277 p=0,049
14-16 years old, n=122	City	4,59±0,222	2,73±0,212	0,09±0,003	1,77±0,117
	Village	5,09±0,176 p=0,05	3,55±0,217 p=0,014	0,15±0,005 p<0,001	1,39±0,089 p=0,009

Examination of periodontal tissue status using the PMA index showed a high prevalence and intensity of inflammatory response in IDP (children) in all age groups (Table 5).

The median papillary-marginal-alveolar (PMA) index in the children studied corresponded to moderate gingivitis. At the same time, an intact periodontium was diagnosed in 19,27 % of children aged 6–7 years, 47,18 % of children aged 11–13 years, and 16,67 % of children aged 14–16 years. According to epidemiological studies, the proportion of healthy periodontium in the Ukrainian population is 64 % in 12-year-old children and 56 % in 15-year-old adolescents [22].

Table 5 – Condition of periodontal tissues and oral hygiene in internally displaced children

Paraclinical indices	Age, in years		
	6-7 years old	11-13 years old	14-16 years old
PMA	43,44±2,05	34,60±1,22	39,51±1,87
OHI-S	2,08±0,025	1,86±0,020	1,98±0,015

Bacterial plaque and poor oral hygiene are the main pathogenic factors in the development of caries and inflammation in periodontal tissues. The oral hygiene status of all age groups of IDP children was described as unsatisfactory according to the OHI-S index. The median OHI-S index was higher than 1,7 and was: for children aged 6–7 years – 2,08±0,025, 11–13 years – 1,86±0,020 and 14–16 years – 1,98±0,015. In the group of children aged 6–7 years, the OHI-S index was satisfactory in only 21,10 %, in 11–13 years – in 29,02 %, in 14–16 years – in 17,05 %.

The need for treatment of dental diseases among internally displaced children was 65,10±2,25%, including 52,94±3,65 % for children living in urban areas before displacement and 68,46±2,88 % for children living in rural areas (Fig. 2).

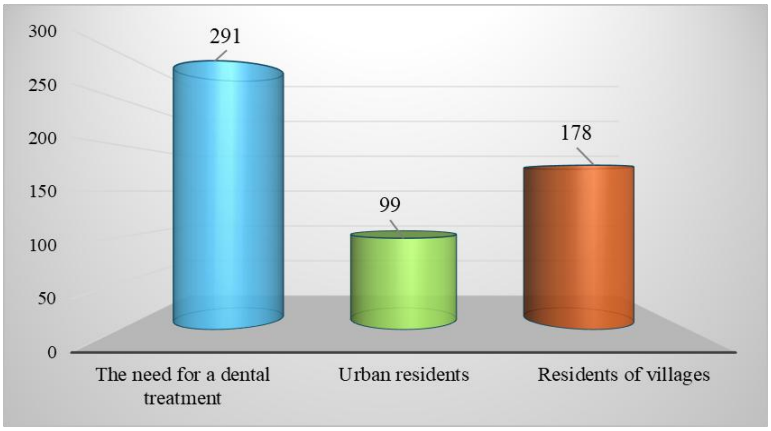

Figure 2 – Need for dental treatment (in persons) among children in the study group

In internally displaced children during a dental examination, the vermilion border of the lips exhibited a physiological coloration, while the mucous membrane of the vestibule and oral cavity appeared pale pink. Normal vestibular depth was observed in 260 (58,17 %) children, a deep vestibule in 67 (14,99 %), and a shallow vestibule in 120 (26,85 %) of the examined children. A low attachment of the upper lip frenulum was found in 68 (15,21 %), while a high attachment of the lower lip frenulum was detected in 52 (11,63 %) children.

Non-carious lesions were found in 25 children (24,51±4,26 %) aged 6–7 years, in 61 children (27,35±2,99 %) during the variable bite period, and in 27 adolescents (22,13±3,76 %) during the permanent bite period.

The need for orthodontic treatment was 15,21 % (68 persons), including 20,86 % (39 persons) among children living in urban areas and 12,69 % (33 persons) among those surveyed in rural areas.

The prevalence of temporomandibular joint changes was assessed based on the detection of clinical signs of pathological conditions, including joint clicking during mastication, restricted mandibular mobility (mouth opening less than 3 cm), tenderness upon palpation, and intermittently occurring symptoms such as transient pain or temporary hypersensitivity. Temporomandibular joint dysfunction was identified in 33 (7,38 %) of internally displaced children.

The prevalence of dentofacial anomalies in children aged 6–7 years was 16,67±3,69 % (17 children), in children aged 11–13 years – 62,33±3,24 % (139 children), and in adolescents aged 14–16 years – 67,21±4,25 % (82 adolescents).

When assessing the prevalence of dentofacial anomalies (Fig. 3), it was found that combined malocclusion anomalies were present in 28,38±5,24 % of cases among 12–13-year-old children (variable bite period) and in 32,50±7,41 % of cases among 15–16-year-olds (permanent bite period). Malocclusions were diagnosed in 13,51±3,97 % during the variable bite period and in 12,50±5,23 % during the permanent bite period. Dental arch anomalies were detected in 10,81±3,61 % children and 15,00±5,65 % adolescents in the variable and permanent bite periods, respectively. Individual tooth anomalies were found 10,81±3,61% in children and 10,0±4,74 % adolescents.

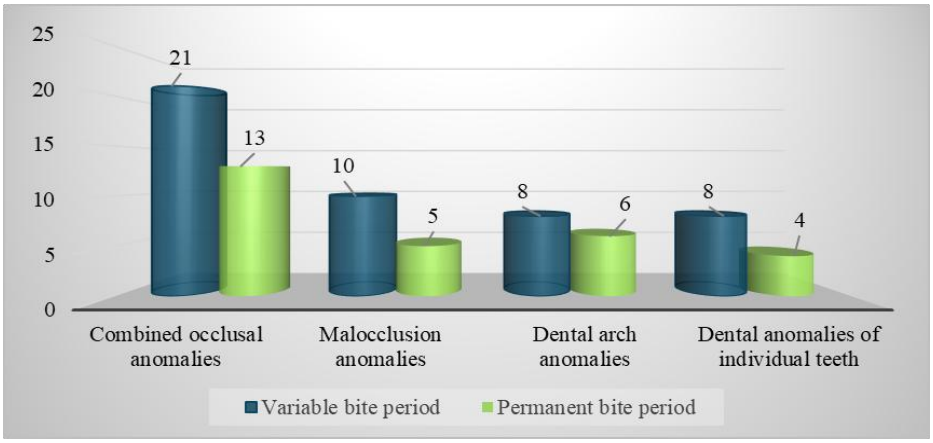

Figure 3 – Prevalence of dentoalveolar anomalies (in persons) in internally displaced children

Thus, internally displaced children exhibit a relatively high prevalence of dentoalveolar anomalies. This prevalence differs only slightly from the frequency of dentoalveolar anomalies detected among their peers in the general population of children and adolescents in Ukraine. According to [23], among children aged 7–15 years residing in regional centers of Ukraine, the prevalence of dentoalveolar anomalies ranges from 57,9 % to 73,2 %.

The findings of this study, which examined the dental health of internally displaced children, are consistent with the existing literature on the subject. The findings do, however, indicate a significant deterioration in the dental status and oral hygiene of internally displaced children as a result of the war. This finding is consistent with the conclusions of previous studies that have also highlighted the impact of military conflicts on the oral health of children and adolescents [24, 25].

A significant contributing factor to the deterioration of dental health in internally displaced children is the psycho-emotional stress experienced by these children as a result of hostilities. Numerous studies have demonstrated that prolonged stress has a detrimental effect on the immune response of the body, increasing the risk of inflammatory processes in periodontal tissues [26]. Furthermore, the psychological impact of stress frequently manifests in behavioural alterations, such as a diminished focus on personal hygiene, and a dietary shift towards high-carbohydrate foods and sugary beverages. These behavioural changes, in turn, contribute to the development of caries and periodontal disease [27].

Another important aspect is the disruption of access to dental care. Military operations and forced displacement significantly limit the possibility of regular preventive examinations and the necessary treatment, which contributes to the progression of dental diseases. Similar trends have been observed during other humanitarian crises, in particular among refugee children from Syria and Afghanistan [28, 29]. In addition, the social adaptation of children plays a significant role in the deterioration of dental health. Internally displaced children may experience difficulties in the new environment, reduced social support and emotional distress, which indirectly affects their oral health care habits [30]. Psychosocial factors, such as anxiety, depression and post-traumatic stress disorder, can reduce motivation for proper dental care, which requires special attention from health professionals.

The results of the study demonstrate the necessity of a multifaceted strategy to enhance the dental well-being of internally displaced children. This strategy should encompass not only preventive measures and access to dental care, but also the provision of psychological support to mitigate the repercussions of stress. The establishment of government and charitable programmes with the objective of providing dental care to children affected by war is imperative to reduce the burden of dental disease in this population.

CONCLUSIONS

Thus, the dental and oral hygiene status of internally displaced children is significantly worse than that of their peers from the general population of children and adolescents in Ukraine.

PROSPECTS FOR FUTURE RESEARCH

Future research directions may encompass the creation of a comprehensive set of preventive measures and rehabilitation programs specifically tailored to internally displaced children. In this regard, it is imperative to consider the multifaceted determinants of dental health, including socio-economic, psycho-emotional, medical, and biological factors.

ETHICAL CONSIDERATIONS

The study was conducted in accordance with the ICH GCP (1996), the 1975 Declaration of Helsinki (revised in 2000), the Council of Europe Convention on Human Rights and Biomedicine (2007), and the recommendations of the Committee on Bioethics at the Presidium of the National Academy of Medical Sciences of Ukraine (2002). The study was subject to the approval of the bioethics committee of the I. Horbachevsky Ternopil National Medical University, Ministry of Health of Ukraine.

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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.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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