

S.V. Shpak, O.V. Dienha<sup>1</sup>, A.E. Dienga<sup>1</sup>, T.O. Pyndus<sup>2</sup>, V.B. Pyndus<sup>3</sup>, S.V. Skulska<sup>4</sup>, S.A. Shnaider<sup>1</sup>  
Odesa National Medical University, Odesa, <sup>1</sup>State Establishment "The Institute of stomatology  
and maxilla-facial surgery National academy of medical sciences of Ukraine", Odesa  
<sup>2</sup>Pavol Jozef Safarik University and Academy of Kosice, Kosice, Slovakia  
<sup>3</sup>Private higher education institution "Lviv medical university", Lviv, <sup>4</sup>Municipal non-profit  
enterprise of Bila Tserkva city council "Children's dental clinic", Bila Tserkva

## STUDY OF THE STATE OF THE PERIODONTAL TISSUES IN CHILDREN WITH SENSORY DEPRIVATION OF VISION

e-mail: oksanadenga@gmail.com

The study was devoted to studying the condition of periodontal tissues in children with sensory deprivation of vision. 116 blind children of different ages took part in the research. Children were divided by age into two groups – 6–8 years old (61 children) and 11–14 years old (56 children). All children underwent a comprehensive examination of the main disease and dental status according to a single scheme. The dental examination was carried out in a dental office. As a result of the conducted research, it was established that the obtained data are proof of the poor condition of periodontal tissues in children with blindness. These data are the basis for the development and implementation of a medical and preventive complex aimed at helping the children of this contingent.

**Key words:** periodontal tissues, oral health, pathology of vision, blindness, children.

С.В. Шпак, О.В. Дєньга, А.Е. Дєньга, Т.О. Пиндус, В.Б. Пиндус,  
С.В. Скульська, С.А. Шнайдер

## ВИВЧЕННЯ СТАНУ ТКАНИН ПАРОДОНТУ У ДІТЕЙ З СЕНСОРНОЮ ДЕПРИВАЦІЄЮ ЗОРУ

Дослідження було присвячено вивченню стану тканин пародонту у дітей з сенсорною депривацією зору. У дослідженнях брали участь 116 дітей різного віку. Діти були поділені за віком на дві групи – 6–8 років (61 дитина) та 11–14 років (56 дітей). Усі діти проходили комплексне обстеження основного захворювання та стоматологічного статусу за єдиною схемою. Стоматологічний огляд було проведено в умовах стоматологічного кабінету. В результаті проведених досліджень було встановлено, що отримані дані є доказом поганого стану тканин пародонту у дітей з сліпотою. Ці дані є підґрунтям для розробки і впровадження лікувально-профілактичного комплексу спрямованого на допомогу дітям даного контингенту.

**Ключові слова:** тканини пародонту, здоров'я порожнини рота, патологія зору, сліпота, діти.

*The study is a fragment of the research project "Improvement of diagnostics, prevention and treatment of teeth hard tissues mineralization processes violations in children", state registration No. 0121U114421.*

Sensory deprivation of vision, commonly known as blindness, is a significant global health problem that affects millions of people worldwide. Visual impairment in children not only hampers their development and education but also has a broader impact on their overall health and quality of life [4]. One of the lesser-known consequences of visual impairment in children is its potential influence on oral health, particularly the health of the periodontal tissues.

Periodontal tissues comprise the structures that support and surround the teeth, including the gingiva (gums), alveolar bone, cementum, and periodontal ligament [7, 10]. Good oral health is crucial for overall health, and maintaining healthy periodontal tissues is vital to prevent periodontal diseases such as gingivitis and periodontitis. These diseases can cause tooth loss, pain, and have been linked to systemic health issues such as cardiovascular disease, diabetes, and adverse pregnancy outcomes [11].

Children with sensory deprivation of vision face unique challenges in maintaining good oral health due to their impaired ability to perceive their surroundings and perform daily oral hygiene practices effectively. Consequently, it is essential to study the state of periodontal tissues in children with sensory deprivation of vision to develop tailored oral health interventions and improve their overall health and well-being.

The study of the state of periodontal tissues in children with sensory deprivation of vision is an important and under-researched area in oral health. There is a pressing need to better understand the relationship between visual impairment and periodontal health in children to address the unique challenges they face in maintaining good oral health.

**The purpose** of the study was to establish the condition of periodontal tissues in children with sensory visual deprivation.

**Materials and methods.** To achieve the research objective, 116 children with sensory deprivation of vision aged between 6 and 14 years from the municipal institution “Odesa Special School No. 93” were surveyed. They were divided into two age groups. The first group consisted of 61 individuals aged 6–8 years old. The second group included 56 individuals aged 11–14 years old.

All patients underwent a comprehensive examination of their main disease and dental status using a unified scheme.

For the objective assessment of the state of the periodontal tissues in children, a comprehensive study of the periodontal tissues was performed using periodontal indices. Using the PMA index (Parma), the prevalence of the inflammatory process in the periodontal tissues was assessed and the severity of gingivitis was determined: up to 25 % – mild, from 25 % to 50 % – moderate and above 50 % – severe. The degree of the inflammatory process was determined by the intensity of staining of the gum tissue with an iodine-containing solution using a Schiller-Pisarev test. Bleeding was determined by probing the gingival sulcus according to Muhnleemann, Son (1971) [2].

All children and their parents were informed about the nature of the clinical study, and only after signing, an informed consent form was the child finally enrolled in the study. Dental examination was conducted in the dental office at the clinical base of the department of pediatric dentistry of Odesa national medical university (Department of pediatric dental health of the multidisciplinary medical center of ONMedU) and the Department of Epidemiology and Prevention of Major Dental Diseases, Pediatric Dentistry and Orthodontics of the SE “The Institute of stomatology and maxilla-facial surgery National academy of medical sciences of Ukraine” (SE “ISMFS NAMS”) and the municipal institution “Odesa Special School No. 93”.

The results were processed by variational statistical methods of analysis using the Microsoft Office Excel 2016 software. Statistical processing of the experimental study results was carried out by the methods of variation analysis using the Student's test. The difference was considered statistically significant at  $p < 0.01$  [1].

**Results of the study and their discussion.** For the purpose of further effective planning of preventive work with children with sensory visual deprivation, we studied the state of periodontal tissues in this contingent in comparison with the average indicators of children in Ukraine.

The state of periodontal tissues in the studied children aged 6–8 years with sensory visual deprivation is presented in Table 1.

Table 1

**Condition of periodontal tissues in the examined 6–8 years old children with sensory deprivation of vision, (M±m)**

Groups	Indices	Index PMA, %	Index of bleeding of Muhnleemann, Son, points	Schiller-Pisarev test
6–8 years old, n=61		8.445±1.100 $p < 0.001$	0.290±0.085 $p > 0.1$	0.815±0.120
Average in Ukraine, 6–8 years old, n=1800		5.720±0.540	0.550±0.195	–

Note. p – index of the probability of differences in clinical indices of children with mean indices in Ukraine.

As a result of the data analysis of the index assessment of the periodontal tissues, it was found that in the children with sensory deprivation of vision the PMA, % (Parma) index values were significantly worse than in the children of the average in Ukraine.

Presented data shows a comparison of the periodontal tissue condition between children aged 6–8 years with sensory visual deprivation (n=61) and the average indicators of children in the same age range in Ukraine (n=1800). Three indicators are examined: the index PMA, % (Papillary Marginal Attachment Index); index of bleeding of Muhnleemann and Son; and Schiller-Pisarev test.

For the group of children with sensory visual deprivation, the Index PMA was 8.445±1.100 ( $p < 0.001$ ), which is higher than the mean Index PMA in Ukraine (by 1.48 times higher), which was 5.720±0.540. The Index of bleeding of Muhnleemann and Son for the children with sensory visual deprivation was lower, at 0.290±0.020 ( $p > 0.1$ ), compared to the mean in Ukraine, which is 0.550±0.070. Lastly, the Schiller-Pisarev test result for the children with sensory visual deprivation is 0.815±0.120, while there is no data available for the mean children in Ukraine.

In summary, the data shows that children aged 6–8 years with sensory visual deprivation have significantly worse periodontal tissue conditions, as indicated by the higher Index PMA and Index of bleeding of Muhnleemann and Son, compared to the mean indices for children in the same age range in

Ukraine. The state of periodontal tissues in the studied children aged 11–14 years with sensory visual deprivation is presented in Table 2.

Table 2

**Condition of periodontal tissues in the examined 11–14 years old children with sensory deprivation of vision, (M±m)**

Groups	Indices	Index PMA, %	Index of bleeding of Muhnleemann, Son, points	Schiller-Pisarev test
11–14 years old, n=56		13.965± 1.400 p<0.001	0.315± 0.015 p<0.001	1.175± 0.190
Average in Ukraine, 11–14 years old, n=1800		6.320± 0.950	0.250± 0.030	–

Note. p – index of the probability of differences in clinical indices of children with mean indices in Ukraine.

For the group of 11–14 years old children with sensory visual deprivation, the Index PMA was  $13.965 \pm 1.400$  ( $p < 0.001$ ), which was higher than the average Index PMA in Ukraine, which was  $6.320 \pm 0.950$ . The Index of bleeding of Muhnleemann and Son for the children with sensory visual deprivation was also higher, at  $0.315 \pm 0.015$  ( $p < 0.001$ ), compared to the mean in Ukraine, which was  $0.250 \pm 0.030$ . Lastly, the Schiller-Pisarev test result for the children with sensory visual deprivation is  $1.175 \pm 0.190$ , while there is no data available for the mean children in Ukraine.

In summary, the table shows that children aged 11–14 years with sensory visual deprivation have significantly worse periodontal tissue conditions, as indicated by the higher Index PMA and Index of bleeding of Muhnleemann and Son, compared to the mean indices for children in the same age range in Ukraine.

Comparing the Schiller-Pisarev test results between children aged 6–8 years and children aged 11–14 years, it can be observed that the test result for the older age group ( $1.175 \pm 0.190$ ) is higher than that for the younger age group ( $0.815 \pm 0.120$ ). This suggests that the periodontal tissue condition may worsen with age among children with sensory visual deprivation.

Children with sensory visual deprivation have worse periodontal tissue conditions compared to the mean children in Ukraine, which can be attributed to various factors. Oral hygiene practices: Children with sensory visual deprivation may have difficulties performing regular oral hygiene practices, such as brushing and flossing, due to their vision impairment. This can lead to an increased risk of plaque accumulation, gingivitis, and periodontitis [9]. Reduced access to dental care: Visual impairment might make it difficult for children to access dental care, either due to mobility challenges or communication barriers. This can result in delayed diagnosis and treatment of periodontal diseases [6]. Altered immune response: Some studies have suggested that individuals with sensory deprivation may exhibit a dysregulated immune response, which could contribute to the development and progression of periodontal diseases [8]. Increased stress and anxiety: Living with sensory visual deprivation can lead to increased stress and anxiety. Psychological stress has been associated with the progression of periodontal diseases, as stress can affect the immune system, making individuals more susceptible to infections, including periodontal infections [3]. Medications: Children with sensory visual deprivation may be taking medications to manage their condition or associated comorbidities. Some medications, such as antihypertensive drugs, antiepileptic drugs, and antidepressants, have been reported to have side effects that can negatively affect oral health, including dry mouth, gingival overgrowth, and altered salivary flow [12]. Limited awareness and education: Parents and caregivers of children with sensory visual deprivation may not have adequate knowledge about oral health care and the specific needs of visually impaired children. This can contribute to the poor oral health status of these children [5]. Therefore, ensuring accessible and quality dental care for children with disabilities is an extremely important task for modern society. Our research confirms the need for the development and implementation of effective approaches to primary prevention of dental diseases in this group of children.

## Conclusions

1. As a result of the data analysis of the index assessment of the periodontal tissues, it was established that the obtained data is evidence of worse condition of periodontal tissue in children with sensory deprivation of vision compared to the average indicators among children of the same age in Ukraine.

2. Further research is needed to elucidate the mechanisms underlying the increased risk of periodontal diseases in children with sensory deprivation of vision and to develop tailored oral health

interventions that cater to their specific needs. By improving the periodontal health of children with sensory deprivation of vision, we can significantly enhance their overall health, well-being, and quality of life.

### References

1. Lang TA, Sesik M. Kak opisyyvat statistiku v meditsine. Moskva: Prakticheskaya meditsina. 2016; 480. [in Russian]
2. Khomenko LO, Chaykovskyy YB, Smolyar NI. Terapevtychna stomatolohiya dytyachoho viku. Kyiv: Knyha plyus, 2014. 432p. [in Ukrainian]
3. Akcali A, Huck O, Tenenbaum H, Davideau JL, Buduneli N. Periodontal diseases and stress: a brief review. *J Oral Rehabil.* 2013;40(1):60–8. doi: 10.1111/j.1365-2842.2012.02341.x.
4. Bourne RRA, Flaxman SR, Braithwaite T, Cicinelli MV, Das A, Jonas JB, et al. Vision Loss Expert Group. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. *Lancet Glob Health.* 2017;5(9): e888–e897. doi: 10.1016/S2214-109X(17)30293-0.
5. D'Addazio G, Santilli M, Sinjari B, Xhajanka E, Rexhepi I, Mangifesta R, et al. Access to Dental Care-A Survey from Dentists, People with Disabilities and Caregivers. *Int J Environ Res Public Health.* 2021;18(4):1556. doi: 10.3390/ijerph18041556.
6. Hajishengallis G. Immunomicrobial pathogenesis of periodontitis: keystones, pathobionts, and host response. *Trends Immunol.* 2014;35(1):3–11. doi: 10.1016/j.it.2013.09.001.
7. Kinane DF, Stathopoulou PG, Papapanou PN. Periodontal diseases. *Nat Rev Dis Primers.* 2017; 3:17038. doi: 10.1038/nrdp.2017.38.
8. Makkar A, Indushekar KR, Saraf BG, Sardana D, Sheoran N. A cross sectional study to evaluate the oral health status of children with intellectual disabilities in the National Capital Region of India (Delhi-NCR). *J Intellect Disabil Res.* 2019;63(1):31–39. doi: 10.1111/jir.12553.
9. Petrovic BB, Peric TO, Markovic DLJ, Bajkin BB, Petrovic D, Blagojevic DB, et al. Unmet oral health needs among persons with intellectual disability. *Res Dev Disabil.* 2016; 59:370–377. doi: 10.1016/j.ridd.2016.09.020.
10. Savchuk OV, Gasyuk NV, Klytynska OV, Yeroshenko GA, Zaliznyak MS. Clinical and morphological aspects of complex treatment of generalized periodontitis. *World of medicine and biology.* 2020;2(72):115–119. doi: 10.26724/2079-8334-2020-2-72-115-119
11. Tonetti MS, Jepsen S, Jin L, Otomo-Corgel J. Impact of the global burden of periodontal diseases on health, nutrition and wellbeing of mankind: A call for global action. *J Clin Periodontol.* 2017;44(5):456–462. doi: 10.1111/jcpe.12732.
12. Torres SR, Pedrazas CH, Correia MP, Azevedo MN, Zamprogno T, Silva A Junior, et al. Drugs or disease: evaluating salivary function in RA patients. *Braz Oral Res.* 2016;30(1): e106. doi: 10.1590/1807-3107BOR-2016.vol30.0106.

Стаття надійшла 22.05.2022 р.