

Local anesthesia in adolescents with high anxiety levels

Oksana V. Klitynska¹, Nataliya V. Layoch¹, Roksolana Yu. Kruchak², Viacheslav R. Gurando¹,
Volodymyr V. Shetelya¹, Stepan S. Sheveria¹, Iurii O. Mochalov¹

¹UZHGOROD NATIONAL UNIVERSITY, UZHGOROD, UKRAINE

²DANYLO HALYTSKY LVIV NATIONAL MEDICAL UNIVERSITY, LVIV, UKRAINE

ABSTRACT

Aim: To assess the effectiveness of local anesthesia in the treatment of acute forms of caries, pulpitis, and periodontitis in adolescents with a high level of baseline anxiety.

Materials and Methods: 1.7 ml of local amide anesthetic from the articaine series was used. The assessment of anxiety was carried out according to the method of Ch.D. Spielberg - Y.L. Khanina. Pain intensity was measured on the VAS scale. Statistical data processing was carried out in the program "MS Excel 7" Windows and "STATISTICA" v. 6.0.

Results: Complete pain relief was observed during anesthesia in 5.0% (4 cases) after 10 minutes and in 56.9% (45 cases) after 15 minutes for acute medium caries; in 3.9% (5 cases) after 5 minutes, in 19.6% (25 cases) after 10 minutes, and in 43.8% (56 cases) after 15 minutes for acute deep caries; in 29.0% (18 cases) after 10 minutes and in 45.2% (28 cases) after 15 minutes for acute pulpitis; and in 34.8% (8 cases) after 10 minutes and in 65.1% (15 cases) after 15 minutes for acute periodontitis.

Conclusions: The reduction in pain syndrome during the treatment of acute forms of medium and deep caries, pulpitis, and periodontitis was significant compared to premanipulation values ($p < 0.05$). Complete pain relief was observed during anesthesia in 5.0% (4 cases) after 10 minutes and in 56.9% (45 cases) after 15 minutes for acute medium caries; in 3.9% (5 cases) after 5 minutes, in 19.6% (25 cases) after 10 minutes, and in 43.8% (56 cases) after 15 minutes for acute deep caries; in 29.0% (18 cases) after 10 minutes and in 45.2% (28 cases) after 15 minutes for acute pulpitis; and in 34.8% (8 cases) after 10 minutes and in 65.1% (15 cases) after 15 minutes for acute periodontitis.

KEY WORDS: adolescents, dental visit, effectiveness of local anesthesia, acute periodontitis, acute pulpitis, acute caries, psychoemotional state, high anxiety

Wiad Lek. 2024;77(9):1922-1927. doi: 10.36740/WLek/195143 DOI

INTRODUCTION

Dental care is the most widespread type of medical care for the population. However, recently the issue of patients' demand for quality and safety of dental services has become particularly relevant [1, 2]. An important factor affecting the quality is effective pain relief, as almost all medical procedures are accompanied by pain of varying severity. At the same time, about 84% of patients suffer from various forms of dentophobia [3, 4]. That is why painless dental interventions are of great importance in the structure of the quality of treatment in general and eliminate the feeling of fear in patients [5-7].

The level of patients' anxiety, both personal and reactive, caused by a visit to the dentist plays a significant role during the visit, affects trust during communication, and affects the quality of dental services in general [8, 9].

According to some authors, the effectiveness of anesthesia in adolescents largely depends on the level

of the patient's baseline anxiety, and these factors are directly related [10-12].

AIM

To determine the effectiveness of local anesthesia in the treatment of acute forms of caries, pulpitis and periodontitis in adolescents with a high level of basic anxiety.

MATERIALS AND METHODS

The analysis was carried out by examining 244 patients (175 girls and 69 boys) aged 12-17 years, who had a high level of baseline anxiety according to the methodology of C.D. Spielberg (adapted by Y.L. Khanin).

Acute medium caries was diagnosed in 79 adolescents, acute deep caries in 80 adolescents, acute pulpitis in 62 adolescents, and acute periodontitis in 23 adolescents. All pathologies required treatment under local

anesthesia. As a local anesthetic, we used a local amide anesthetic of the articaine series, containing articaine hydrochloride 40 mg and epinephrine hydrochloride 0.012 mg (equivalent to 0.01 mg of epinephrine) in a volume of 1.7 ml.

In all patients, the level of pain was determined using a modified VAS scale, taking into account the level of baseline anxiety. Measurements were performed before medical procedures, 5, 10, and 15 minutes after anesthesia [13].

The study was performed in compliance with the basic provisions of the «Rules for Ethical Principles for Scientific Medical Research Involving Human Subjects» approved by the Declaration of Helsinki (1964-2013), ICH GCP (1996), EEC Directive 609 (24.11.1986), orders of the Ministry of Health of Ukraine No. 690 of 23.09.2009 No. 944 of 14.12.2009, No. 616 of 03.08.2012. All participants were informed about the objectives, organization, and methods of the study and signed an informed consent to participate in it, and all measures were taken to ensure patient anonymity.

The statistical analysis of the data obtained was carried out using the methods of mathematical statistics with the determination of the mean value, standard deviation, error of the mean value, reliability of the compared values with the determination of parametric indicators, as well as paired and partial Pearson correlations (r) with the reliability interval (p) based on absolute data were analyzed. All calculations were performed on a personal computer using licensed programs "MS Excel 7" for the Windows operating system and the standard software package «STATISTICA» v. 6.0. [14-16].

RESULTS

The intensity of pain syndrome in patients diagnosed with acute medium caries at the initial stage of testing according to the VAS scale was as follows: severely expressed pain was noted by 18 (22.8%) adolescents, moderate - 49 (62.0%) adolescents, and mild - 12 adolescents.

After anesthesia, there was a decrease in the intensity of PS and the frequency of its fixation. Unbearable pain was never noted. Severe pain syndrome was diagnosed in 5 minutes in 12 (15.2%) adolescents; in 10 minutes in 4 (5.0%) people; in 15 minutes severe pain syndrome was not noted (Fig. 1).

A decrease in moderate intensity PS was detected in 5 minutes in 49 (62.0%) adolescents; in 10 minutes in 35 (44.4%); in 15 minutes in 12 adolescents (15.3%). An increase in the percentage of adolescents with low-intensity PS was diagnosed in 10 and 15 minutes after the manipulation compared to the pre-treatment indicators (15.2%, 22.8%, 45.6%, 27.8%; $p < 0.05$);

complete disappearance of BS was observed in 10 minutes in 4 (5.0%) adolescents; in 15 minutes in 45 (56.9%) adolescents.

In adolescents with a high level of anxiety, the decrease in the intensity of BS was significant compared to the pre-manipulation values, with complete disappearance of BS in 5.0% (4 patients) in 10 minutes and in 56.9% (45 patients) in 15 minutes after anesthesia.

Investigating the intensity of the pain symptom in dental patients with a verified diagnosis of acute deep caries, it was found that in 100% of cases, before the start of manipulations, they indicated the presence of BS. Severe pain was noted by 16 (20.0%) adolescents, moderate intensity was noted by 38 (47.5%) patients; 26 patients (32.5%) characterized the intensity of the pain syndrome as «weak» and recorded as the violet-blue part of the scale ($0 < VAS \leq 4$) (Fig. 2).

Severe pain was observed in 5 adolescents (6.3%) after 5 minutes, and in 5 adolescents (6.3%) after 10 minutes. After 15 minutes, only 2 adolescents (2.5%) reported severe pain. The reduction in severe pain intensity was statistically significant ($p < 0.05$).

The reduction in moderate pain intensity also showed significant improvement over time. At 5 minutes, 33 adolescents (41.2%) experienced moderate pain, which decreased to 17 adolescents (21.3%) at 10 minutes, and 8 adolescents (10.0%) at 15 minutes.

Furthermore, the percentage of adolescents with low-intensity pain increased significantly 10 and 15 minutes after treatment compared to the initial levels (32.5%, 52.5%, 65.0%, 56.3%; $p < 0.05$).

Complete disappearance of PS was observed in 5 minutes in 1 (2.8%) adolescent; in 10 minutes in 6 (7.4%) adolescents; in 15 minutes in 25 (31.2%) adolescents. The decrease in the intensity of BS was significant compared with the pre-manipulation values; complete disappearance of PS was observed in 3.9%-5 patients in 5 minutes, in 19.6% (25 patients) in 10 minutes, and in 43.8% (56 patients) in 15 minutes after anesthesia.

In the treatment of acute pulpitis, the intensity of pain at the initial stage of testing according to the VAS scale was as follows: 8 (12.8%) patients indicated the presence of severe BS (unbearable degree of PS): $7 < VAS \geq 10$ (red-orange shades of the VAS scale); severely pronounced PS was noted by 28 (45.2%) adolescents; moderately pronounced intensity was noted by 20 (32.3%) patients (35.7%), which corresponded to $4 < VAS < 7$ (green and yellow shades of the scale). 6 patients (9.7%) characterized the intensity of the pain syndrome as «weak» and recorded it as the violet-blue part of the scale ($0 < VAS \leq 4$).

After 5 minutes, unbearable pain was recorded in 6 (9.7%) adolescents; after 10 minutes in 1 (1.5%)

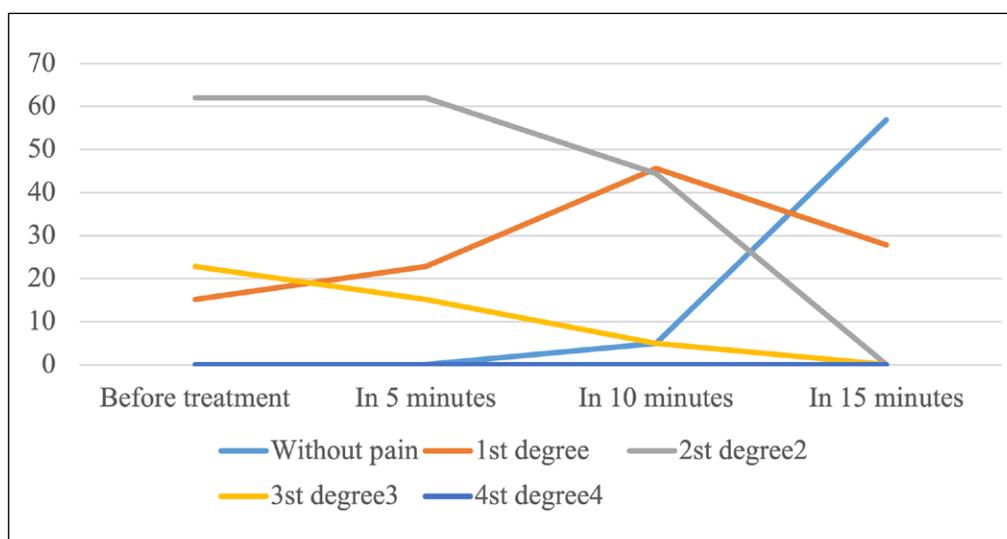


Fig. 1. Diagram of changes in the intensity of pain syndrome in acute medium caries in clinical groups in the dynamics of treatment in adolescents with high anxiety.

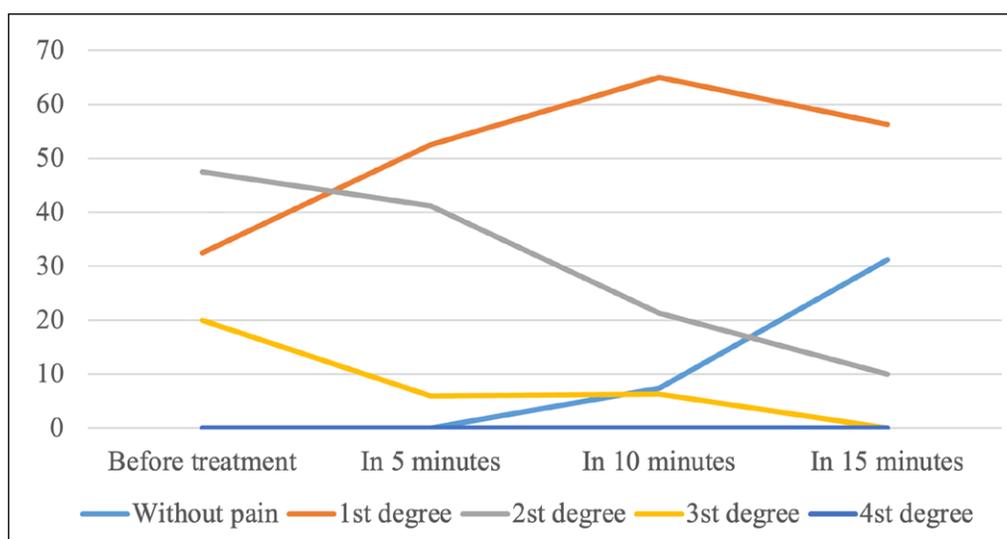


Fig. 2. Diagram of changes in the intensity of pain syndrome in acute deep caries in clinical groups in the dynamics of treatment in adolescents with high anxiety.

adolescent; after 15 minutes, no pain of this intensity was noted (Fig. 3).

The decrease in the intensity of unbearable pain was significant ($p < 0.05$). Severe pain syndrome was diagnosed in 6 (21.3%) adolescents in 5 minutes; in 10 minutes in 6 (9.8%) adolescents; in 15 minutes - in 1 patient (1.5%). Reduction of moderate intensity BS, in particular, in 5 minutes in 26 (41.9%) adolescents; in 10 minutes in 16 (25.8%) adolescents; in 15 minutes in 5 adolescents (8.1%). An increase in the percentage of adolescents with low-intensity BS was observed in all groups 10 and 15 minutes after the manipulation compared to the pre-treatment indicators (9.7%, 33.9%, 45.2%; $p < 0.05$); complete disappearance of BS was observed in 10 minutes in 18 (29.0%) adolescents; in 15 minutes in 28 (45.2%) adolescents.

In adolescents with a high level of anxiety, the decrease in the intensity of BS was significant compared to the pre-manipulation values, with complete disappearance of BS observed in 29.0% (18 patients) in 10 minutes and 45.2% (28 patients) in 15 minutes after anesthesia.

In the treatment of acute forms of periodontitis, before treatment, only 11 (47.8%) patients indicated the presence of severe BS (intolerable BS) (37.5%): $7 < VAS \leq 10$ (red-orange shades of the VAS scale). Severe BS was reported by 9 (39.1%) patients with $VAS < 7$ (37.5%) (Fig. 4).

Moderate intensity was noted by 3 patients (13.1%), which corresponded to $4 < VAS < 7$ (green and yellow shades of the scale); one patient (3.1%) characterized the intensity of the pain syndrome as «weak» and was recorded as the violet-blue part of the scale ($0 < VAS \leq 4$).

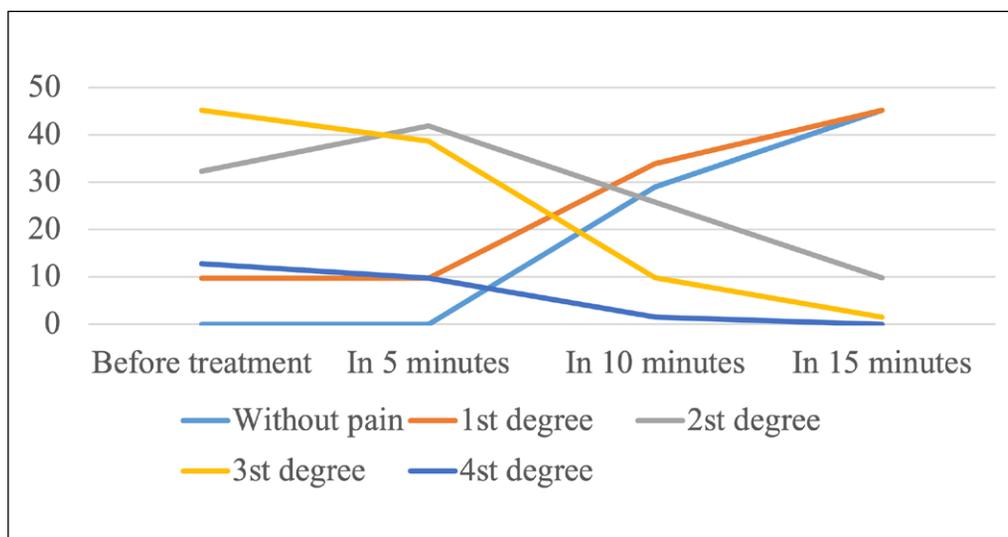


Fig. 3. Diagram of changes in the intensity of pain syndrome in acute pulpitis in clinical groups in the dynamics of treatment in adolescents with high anxiety.

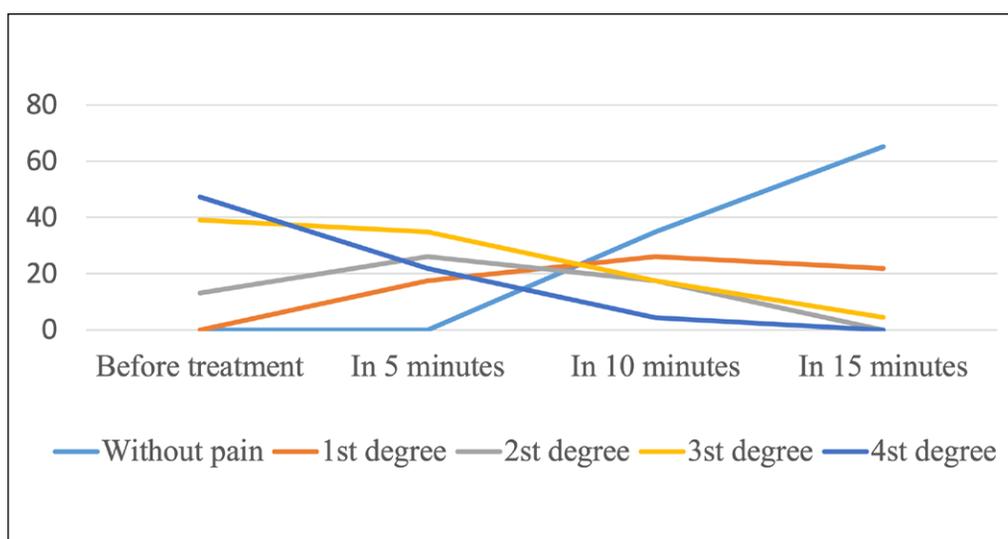


Fig. 4. Diagram of changes in the intensity of pain syndrome in acute periodontitis in clinical groups during the course of treatment in adolescents with high anxiety levels.

In all patients, a significant decrease in the intensity of PS and the frequency of its fixation in the dynamic zone was noted ($p < 0.05$). After 5 minutes, unbearable pain was recorded in 1 (4.4%) adolescent; after 15 minutes, no pain of this intensity was noted. Severe pain syndrome was diagnosed in 8 (34.8%) adolescents in 5 minutes; in 10 minutes in 4 (17.4%) people; in 15 minutes - in 1 (4.4%) patient. The decrease in moderate intensity PS was significant, in particular, in 5 minutes in 6 (26.0%) adolescents; in 10 minutes in 4 (17.4%) adolescents; in 15 minutes in 2 adolescents (8.7%). An increase in the percentage of adolescents with low-intensity PS was observed in 10 and 15 minutes after the manipulation compared to the pre-treatment indicators (0.0%, 17.4%, 26.0%, 21.8%; $p < 0.05$); Complete disappearance of PS was observed in 10 minutes in 8 (34.8%) adolescents; in 15 minutes in 15 (65.1%) adolescents.

The decrease in the intensity of BS was significant compared with the pre-manipulation values; complete disappearance of PS was noted in 34.8% - 8 patients in 10 minutes and in 65.1% - 15 patients in 15 minutes after anesthesia.

DISCUSSION

The implementation of modern anesthesia technologies is essential for safe and high-quality dental interventions, which was confirmed by the research of Boychenko O.M. et al. (2021), and Avetikov D.S. et al. (2022). Contemporary local anesthesia techniques require knowledge and practical skills in anesthesiology, anatomy, age-specific topography, psychophysiology, pediatrics, local anesthesia methods, anesthetic drugs (both anesthetics and vasoconstrictors), and the use of instruments (syringes, needles, and accessories) [1, 12].

Based on the Guideline on Use of Local Anesthesia for Pediatric Dental Patients. Council on Clinical Affairs, American Academy of Pediatric Dentistry (2015) and results from Janssen DF. (2021), modern anesthesia should ensure the patient's comfort and create optimal working conditions for the dentist. The authors confirm that, the primary requirements for anesthesia are its adequacy and safety [2, 4].

Pain management is particularly important in pediatric and adolescent dentistry, as there is a growing prevalence and severity of caries and its complications in children of all ages. Painful sensations limit the scope of treatment and reduce its quality, which is confirmed by the studies of Avetikov DS and co-authors (2022) [1].

Additionally, the pain a child may experience during a dental visit can lead to a refusal of treatment and foster a fear of visiting doctors of any specialty.

According to Bista P, Imlach W. (2019) a child's behavior is primarily driven by emotions, which can exacerbate their physiological intolerance to pain. The dentist should help the patient overcome fear and create an environment of safety and painlessness during examination and treatment. The unique physiological characteristics of children at different ages should guide the provision of differentiated dental care [10, 11].

Key conditions for providing quality treatment and preventive care for children include ensuring effective and safe anesthetic support for each child, preventing the development of fear, and fostering a positive attitude toward dental visits before addressing fears rooted in previous negative experiences. To assess the level of fear, we used the VAS scale proposed by Huang Z, Kohler IV, Kämpfen FA, 2019 [13].

Even with an appropriate choice of anesthesia method, correct dosage of the local anesthetic, and proper technique, anesthesia does not always achieve maximum effectiveness and may require additional measures to ensure comfortable, painless treatment. This is especially relevant for children and adolescents, where the psycho-emotional factor plays a significant

role, as evidenced by the studies of Klitynska OV, Layosh NV., 2022 [8].

The psycho-emotional state of patients can be negatively affected, leading to psychological disorders and social adaptation issues. Dental pathology not only impacts a patient's health but also their quality of life, potentially leading to stigmatization among peers, limiting future career choices, and affecting overall professional development [1, 9].

The available literature contains limited studies on the relationship between the effectiveness of local anesthesia and the patient's psycho-emotional state. There is also a lack of data on the criteria for addressing the emotional component, particularly in adolescents, highlighting the relevance of research conducted.

Effective anesthesia during dental procedures is one of the key factors in providing high-quality dental care, and its success is directly proportional to the patient's level of anxiety, particularly in children and adolescents. Managing anxiety in this population will enhance the effectiveness of local anesthesia and, consequently, improve the overall quality of dental treatment.

CONCLUSIONS

The reduction in pain syndrome during the treatment of acute forms of moderate and deep caries, pulpitis, and periodontitis was significant compared to pre-treatment levels ($p < 0.05$). Complete pain relief was observed during anesthesia in 5.0% of cases (4 cases) after 10 minutes and in 56.9% (45 cases) after 15 minutes in the treatment of acute forms of moderate caries; in 3.9% (5 cases) after 5 minutes, in 19.6% (25 patients) after 10 minutes, and in 43.8% (56 cases) after 15 minutes in the treatment of acute forms of deep caries; in 29.0% (18 cases) after 10 minutes and in 45.2% (28 cases) after 15 minutes in the treatment of acute pulpitis; and in 34.8% (8 patients) after 10 minutes and in 65.1% (15 patients) after 15 minutes in the treatment of acute periodontitis.

REFERENCES

1. Avetikov D, Lokes K, Ivanytska O et al. Features of incinal anesthesia in the treatment of acute periodontitis of the frontal teeth of maxilla in adolescent children. *Ukrainian Dental Almanac*. 2022;4:25-9. doi:10.31718/2409-0255.4.2022.04. [DOI](#)
2. Janssen DF. Etymology of Anesthesiology and Anesthesia, *Redux. Anesthesiology*. 2021;134(4):670-671. doi: 10.1097/ALN.0000000000003686. [DOI](#)
3. Lim KH, Salahudin MS, Hariri F. Evaluating full cup study, numeric pain rating scale, and visual analogue scale in assessing pain after surgical removal of lower third molar. *Annals of Dentistry University of Malaya*. 2018;24(2):16–23.
4. Council on Clinical Affairs, American Academy of Pediatric Dentistry. Guideline on Use of Local Anesthesia for Pediatric Dental Patients. *Pediatr Dent*. 2015;37(5):71–7.
5. Klitynska OV, Layosh NV, Zorivchak TI et al. Local anesthesia in childrens dental receptions. *Problems of clinical pediatrics*. 2021;4(54):77–80. doi: 10.24144/1998-6475.2021.54.77–80. [DOI](#)

6. Hasiuk NV, Radchuk VB. Obgruntuvannya dotsilnosti zastosuvannya mistsevoi anestezii v ambulatornomu stomatolohichnomu likuvanni pidlitiv. Ohliad literatury. [Justification of the feasibility of using local anesthesia in outpatient dental treatment of adolescents: (literature review)]. *Klinichna stomatolohiia*. 2023;4:28–34. doi:10.11603/2311-9624.2022.4.13588. (Ukrainian) [DOI](#)
7. Klitynska OV, Layosh NV. Osoblyvosti znebolivuvannya v pidlitiv pry provedenni ambulatornykh stomatolohichnykh vtruchan.. [Peculiarities of analgesia in adolescents during outpatient dental interventions]. *Ukraina. Zdorovia natsii*. 2016;3(39):50–3. (Ukrainian)
8. Klitynska OV, Layosh NV. Kliniko-statystychna otsinka psykhoemotsiinoho statusu pidlitiv na stomatolohichnomu pryomi. [Clinical-statistical assessment of the psycho-emotional status of adolescents at a dental appointment]. *Zhurnal medytsyny, biolohii ta sportu*. [Journal of medicine, biology and sports]. 2022;7(5):175–80. doi:10.26693/jmbs07.05.175. (Ukrainian) [DOI](#)
9. Klitynska OV, Stishkovskyy AV, Hasiuk NV. Analiz vplyvu rivnya stresu u ditey 6-7 rokiv, yaki postiyno prozhyvayut v umovakh biogeokhimichnogo defitsytu ftoru ta yodu na pokaznyky zakhvoryuvanosti na kariyes. [Analysis of the effect of stress level in children 6-7 years of age permanently living in conditions of biogeochemical deficiency of fluorine and iodine on caries incidence rates]. *Bukovynskyy medychnyy visnyk*. 2020;2(94):46–51. doi: 10.24061/2413-0737.XXIV.2.94.2020.42. (Ukrainian) [DOI](#)
10. Saikiran KV, Elicherla SR, Mounika SVM et al. Memojis Pain Scale: A novel pain assessment tool. *Int J Paediatr Dent*. 2023;33(4):364–371. doi: 10.1111/ipd.13044. [DOI](#)
11. Bista P, Imlach W. Pathological mechanisms and therapeutic targets for trigeminal neuropathic pain. *Medicines*. 2019;6:1–16. doi:10.1038/s41413-019-0047-x. [DOI](#)
12. Boychenko OM, Moshel TM, Popovych IU. Hrupy ryzyku patsientiv na stomatolohichnomu pryomi z obtiazhenym alerholohichnym anamnezom. [Risk groups of patients at a dental appointment with a burdened allergic history]. *Problemy bezperervnoi medychnoi osvity ta nauky*. 2021;1(41):59–62. doi:10.31071/promedosvity2021.01.059. (Ukrainian) [DOI](#)
13. Huang Z, Kohler IV, Kämpfen F. A Single-Item Visual Analogue Scale (VAS) Measure for Assessing Depression Among College Students. *Community Ment Health J*. 2020;56(2):355–367. doi: 10.1007/s10597-019-00469-7. [DOI](#)
14. Omar A. *Advanced Biostatistics for Dentistry*. 2017. https://www.researchgate.net/publication/333675008_Advanced_Biostatistics_for_Dentistry [Accessed 09 April 2024]
15. Golovanova IA, Belikova IV, Lyakhova NO. *Osnovy medychnoyi statystyky*. [Basics of medical statistics]. 2017; Poltava: UMSA. <http://repository.pdmu.edu.ua/handle/123456789/10614> [Accessed 09 April 2024] (Ukrainian).
16. Gravetter FJ, Wallnau LB. *Statistics for the Behavioral Sciences*. 10-th Edition. Printed in Canada, 2015, p.755.

CONFLICT OF INTEREST

The Authors declare no conflict of interest

CORRESPONDING AUTHOR

Oksana V. Klitynska

Uzhhorod National University

3 Narodna Square, 88000 Uzhhorod, Ukraine

e-mail: oksana.klitynska@uzhnu.edu.ua

ORCID AND CONTRIBUTIONSHIP

Oksana V. Klitynska: 0000-0001-9969-2833 [A](#) [D](#)

Nataliya V. Layoch: 0000-0003-4741-1731 [C](#)

Roksolana Yu. Kruchak : 0000-0002-9235-1662 [E](#)

Viacheslav R. Gurando: 0000-0001-6303-3799 [E](#)

Volodymyr V. Shetelya: 0000-0001-6058-9708 [B](#)

Stepan S. Sheveria: 0009-0007-6387-4521 [F](#)

Iurii O. Mochalov: 0000-0002-5654-1725 [D](#)

[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: 19.06.2024

ACCEPTED: 25.09.2024

