9. Ananieva MM, Nazarchuk OA, Faustova MO, Basarab YaO., Loban G.A. Pathogenicity factors of Kocuria kristinae contributing to the development of peri-implant mucositis. Mal J Med Health Sci. 2018; 14 (3): 34-38.
10.Petrushanko TA, Chereda VV, Loban' GA. The relationship between colonization resistance of the oral cavity and individual - typological characteristics of personality: dental aspects. Wiad Lek. 2017;70(4):754-757.

Реферати

ВПЛИВ ПРЕПАРАТУ, ЩО ВМІЩУЄ ПРИРОДНИЙ МІНЕРАЛ БІШОФІТ, НА МІКРОФЛОРУ ПОРОЖНИНИ РОТА

Скрипников П.М., Скрипнікова Т.П., Лобань Г.А., Ганчо О.В., Хавалкіна Л.М., Зезекало С.В.

Порожнину рота можна розглядати як комплексну екологічну систему, в якій зовнішні фактори (біологічні, індивідуальні, соціальні) взаємодіють із внутрішніми (пародонт, бактеріальне співтовариство, локальна імунна система, епітелій порожнини рота). При виникненні сприятливих умов може розвинутись те чи інше захворювання яке необхідно лікувати. Ми вивчали ефективність впливу засобу по догляду за ротовою порожниною Antiqua Mare MAX, що вміщує природний мінерал Бішофіт Полтавський, на представників мікрофлори порожнини рота. Для вирішення поставленої мети використовували музейні штами E. Coli ATCC 25922, S. Aureus ATCC 25923, S. Epidermidis ATCC 14990, E. faecalis ATCC 29212, M. Lysodeicticus ATCC 4698 та C. Albicans ATCC1023. У якості контролю використовували відомий антимікробний засіб - 0,02% водний розчин хлоргексидину біглюконат. Фунгіостатична активність дослідного препарату перевищувала дію 0,02% розчину хлоргексидину біглюконату у 4 рази ($p<0,001$) , але фунгіцидна дія не відрізнялась.

Ключові слова: мікрофлора СОПР, хлоргексидин біглюконат, Antiqua Mare MAX.

Стаття надійшла 28.05.2019 р.

ВЛИЯНИЕ ПРЕПАРАТА СОДЕРЖАЩЕГО ПРИРОДНЫЙ МИНЕРАЛ БИШОФИТ НА МИКРОФЛОРУ ПОЛОСТИ РТА

Скрипников П.Н., Скрипникова Т.П., Лобань Г.А. Ганчо О.В., Хавалкина Л.М., Зезекало С.В.

Полость рта можно рассматривать как комплексную экологическую систему, в которой внешние факторы (биологические, индивидуальные, социальные) взаимодействуют с внутренними (пародонт, бактериальное сообщество, локальная иммунная система, эпителий полости рта). При возникновении благоприятных условий может развиться то или иное заболевание слизистой оболочки полости рта которое необходимо адекватно лечить. Мы изучали эффективность воздействия средства по уходу за полостью рта Antiqua Mare MAX, вмещающий природный минерал бишофит Полтавский, на представителей микрофлоры полости рта. Для решения поставленной цели использовали музейные штаммы E. coli ATCC 25922, S. aureus ATCC 25923, S. epidermidis ATCC 14990, E. faecalis ATCC 29212, M. lysodeicticus ATCC 4698 и C. albicans ATCC1023. В качестве контроля применяли известное антимикробное средство - 0,02% водный раствор хлоргексидина биглюконат. Фунгиостатическая активность исследуемого препарата Antiqua Mare MAX превышала действие 0,02% раствора хлоргексидина биглюконата в 4 раза ($p<0,001$), однако, фунгицидное действие не отличалась.

Ключевые слова: микрофлора СОПР, хлоргексидин биглюконат, Antiqua Mare MAX.

Рецензент Ткаченко П.І.

DOI 10.26724/2079-8334-2020-1-71-128-132
UDC 616.314:616.74

L.V. Smaglyuk, V.I. Smaglyuk, A.V. Liakhovska, M.V. Trofymenko
Ukrainian Medical Stomatological Academy, Poltava

EMG-ACTIVITY OF MUSCLES OF THE CRANIO-MANDIBULAR SYSTEM DURING FUNCTIONS OF THE DENTO-FACIAL REGION

e-mail: anvitatali@gmail.com

Electromyographic (EMG) activity of the temporal, masseter, orbicularis oris, mentalis, and sternocleidomastoid muscles was studied in 30 patients aged 20-28 years without somatic pathology, morphological, functional and aesthetic disorders in dento-facial region. The results of the study proved the involvement of the mimic and neck muscles in the teeth clenching, movements of the mandible and swallowing. The obtained data indicated the functional unity of the neuromuscular component of the stomatognathic system and the need to study the bioelectric activity of these muscles in subjects with functional disorders, especially associated with movements of the mandible and tongue at all stages of orthodontic treatment.

Key words: dento-facial region, electromyography, cranio-mandibular muscles, functions.

The work is a fragment of the research project "An interdisciplinary approach to the diagnosis, prevention and treatment of patients with dental malocclusion and jaw deformations", state registration No. 0018U004343.

Within the framework of the modern human functional development during the evolution of functions, such as speech, mental activity, self-awareness and social behavior, we can conclude: Masticatory organ is a highly organized multifunctional cybernetic system that works independently and interacts with various internal and external components, adapts permanently to the changing environmental factors, maintains a constant state of instable homeostasis (R. Slavicek, 2016) [2]. The dento-facial region is an integral part of the whole somatognathic system of the person. The structural components of this cybernetic system are the cranio-mandibular (TMJ), neuro-muscular systems of the dento-jaw area and occlusion. The cranio-mandibular system, as a component of the neuro-muscular system of the human body, consists of the muscular apparatus (temporalis, masseter, lateralis and medialis pterygoideus muscles) and ligaments (spheno-mandibularis, stylo-mandibularis, stylo-hyoideus) [2, 3, 4]. These

components are necessary for human life because of functions, that are perfomed (chewing, swallowing, speech, breathing, etc.), and can be indicators of overall somatic health [5, 7]. That is why, studies of the imbalance of neuromuscular connections between components of the dento-facial region are important for current diagnostic research.

The purpose of the study was to investigate the electromyographic activity of some muscles of the cranio-mandibular system during performing the functions of the dento-facial region.

Materials and methods. A clinical examination and a surface electromyography (EMG) of 30 patients of 20-28 years aged were used to find the peculiarities in the work of muscles of the cranio-mandibular system. The average age of patients was 23.4±2.1 years. 13 (30.0%) were men, 17 (70%) were women. All patients did not have any malocclusion. A clinical examination was carried out according to the standard algorithm (the form of the orthodontic card No. 043-1/o, confirmed by order of the Ministry of Health of Ukraine dated May 29, 2013). All patients were "healthy": without somatic pathology, morphological, functional and esthetic disorders of masticatory system. EMG of anterior temporal, masseter, orbicularis oris, chin (m. mentalis) and sternocleidomastoid muscles was performed according to the recommendations of Sforza et al. and Tartaglia et al [9]. The masseter, anterior temporal, sternocleidmastoid muscles of both sides (left and right) were examined. Disposable silver chloride surface electrodes (diameter 10 mm, Neirosoft, Russia) were positioned on the muscular bellies parallel to muscular fibers [6, 8, 9]. The skin was cleaned with 70% alcohol prior to the placement of the electrodes. The surface electrodes were attached to the skin, according to the relevant anatomical orientation. A disposable reference electrode was applied to the forehead. EMG-activity was recorded using a computerized instrument Synapsis and software by Neirotech (Russia). The analog EMG signal was amplified and digitized. Patients were sitting in a natural position without muscular tension, arms, legs were not crossed, head was held equally without support. Lips were kept closed slightly, tooth – in physiological rest. To avoid the effect of fatigue, there was three minutes-rest between each test.

EMG-activity was recorded in 4 tests, lasted 10s for each one: maximum voluntary clenching, moving the lower jaw forward (protrusion), swallowing of a sip of water and swallowing of saliva ("dry" swallowing). Maximum voluntary clenching was performed in intercuspal position (without any material placed on the molar teeth). The maximum activity of the muscle contractions (μV) was analyzed during the electromyography analysis. EMG data were processed using Neurotech's Synapsis software.

The procedures received approval from the Bioethics Committee of the Ukrainian Medical Stomatological Academy (Poltava, Ukraine). All girls and their parents signed a statement of informed consent.

The obtained data was statistically analyzed using the Student's t-test and the Fisher's criterion X2. The hypotheses were verified at the level of significance $p<0,05$.

Results of the study and their discussion. EMG-activity of muscles in a state of physiological rest was not detected in all tests that were carried out. EMG-activity was registered during muscle work and constrictions. The characteristics of the bioelectric activity of the muscles were different in each test. The EMG-characteristics of the muscles in the tests are presented in table 1.

Table 1

EMG - activity of masticatory, mimic and sternocleidomastoid muscles

Muscles		Maximum amplitude of constriction							
		Maximum teeth clenching test		Movement of the lower jaw forward (protrusion) test		A sip water swallowing test		Salvia swallowing («dry» swallowing) test	
		μV	%	μV	%	μV	%	μV	%
m.masseter	Left	1636,25 ±36,45	36,4	594,09 ±17,43	21,1	366,5 ±9,55	16,9	565,0 ±12,77	23,7
	Right	1722,25 ±38,92		630,0 ±18,76		416,75 11,39		575,25 ±12,85	
m. temporalis	Left	1335,75 ±26,54	27,4	379,75 ±13,28	17,5	392,75 ±10,04	27,3	530,5 ±12,04	21,2
	Right	1474,0 ±28,71		413,5 ±15,44		349,25 ±8,76		441,5 ±11,14	
m. orbicularis oris		839,5 ±15,34	11,4	350,53 ±9,54	15,2	625,0 ±13,45	20,8	498,75 ±11,69	18,2
m. mentalis		999,75 ±20,06	13,2	661,0 ±20,51	28,9	628,5 ±13,98	27,3	557,0 ±12,54	21,5
m. sternocleidomastoideus	Left	838,25 ±16,23	11,5	393,0 ±13,08	17,3	443,25 ±11,34	19,0	384,25 ±8,54	15,5
	Right	898,02 ±17,65		430,65 ±16,75		414,4 ±10,84		423,87 ±10,74	

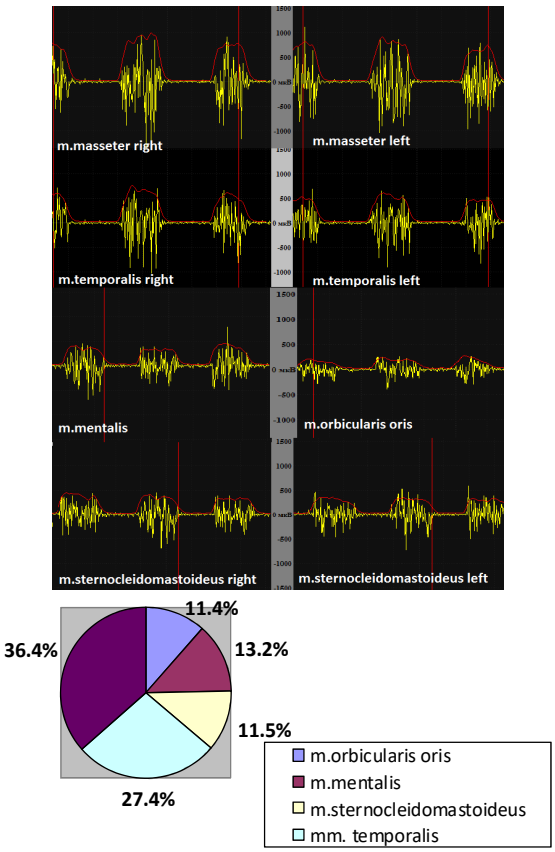

Fig. 1. Fragment of the electromyogram of patient K., 25 years. A graphical representation of the muscle activity in the maximum teeth clenching test.

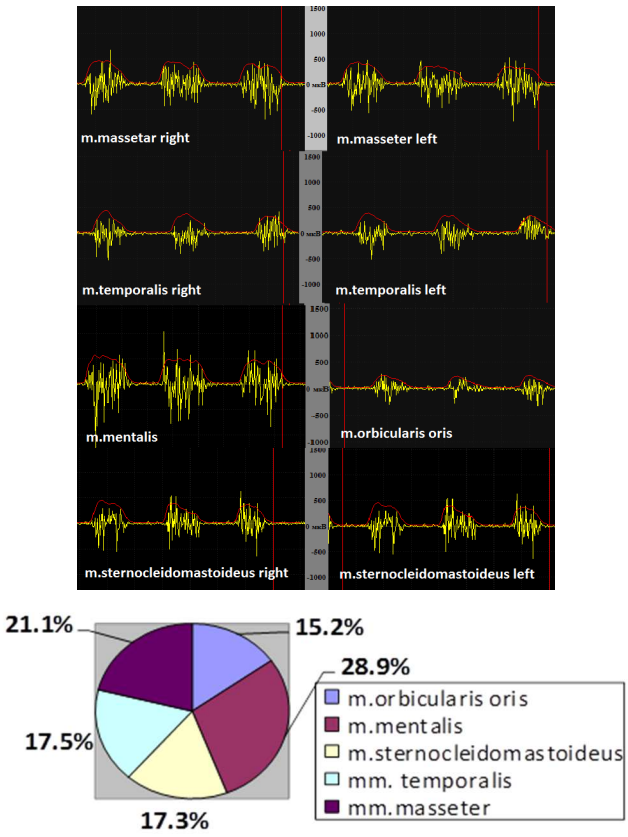

Fig. 2. Fragment of the electromyogram of patient K., 25 years. A graphical representation of the muscle activity in the protrusion test.

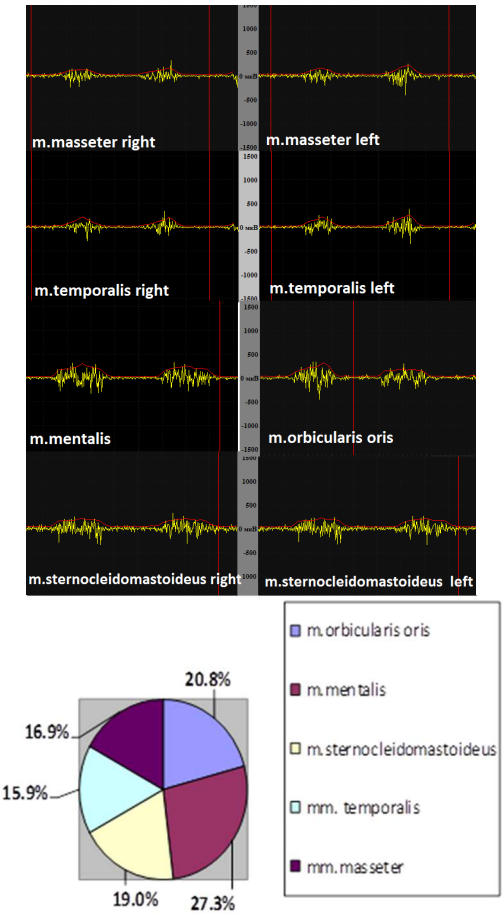

Fig. 3. Fragment of the electromyogram of patient B., 22 years. A graphical representation of the muscle activity in a swallowing test.

In the maximum teeth clenching test the highest EMG-activity was registered in the masticatory muscles (1679,25 μV±37,58), the lowest – in the sternocleidomastoid ($p < 0,05$) and the orbicularis oris muscles ($p < 0.05$) – 868.13±16.94 μV and 839.5±15.34 μV, respectively, as shown in fig. 1.

In the mandibular movements (protrusion) test, the highest EMG-activity was determined in the mentalis (661.8 μV±20.51) and masseter muscles (612.05 μV±18.09). EMG-activity of the temporal and sternocleidomastoid muscles in this test was almost the same (average for the temporalis muscle – 396,62 μV±1436, $p > 0,05$, sternocleidomastoid muscles – 411.82 μV±14.92, $p > 0.05$). An example of the electromyogram in this test is shown in fig. 2.

The orbicularis oris (625.0 μV±13.45) and chin muscles were observed the highest EMG-activity in the swallowing test (628.5 μV±13.98). The EMG-activity of the sternocleidomastoid muscle was significantly less (443.25±11.34 μV, 414.4±10.84 μV on the left and right sides, respectively, $p < 0.05$).

The values of the maximal amplitude of contractions of the temporal and masseter muscles were the lowest and did not significantly differ ($p > 0.05$). An example of the electromyogram in this test is shown in fig. 3.

In the "dry" swallow test, the highest EMG-activity was recorded in the orbicularis oris muscle and masseter muscles, while the values of the temporal,

sternocleidomastoid and mentlis muscles were at the same level and were not statistically different ($p > 0.05$).

We also investigated the symmetry of the EMG-activity of contractions of the muscles of the left and right sides (masseter, temporal and sternocleidomastoid muscles). In the majority of the examined patients (35.0 - 83.3%), symmetrical bioelectric activity of the masseter, temporal, and sternocleidomastoid muscles of the left and right sides was observed, what corresponds to the physiological norm. Asymmetric work of these muscles was determined in 5 (16.7%) patients. Increasing of the maximum amplitude of contractions on one side (in 3 people (10.0%) –EMG-activity of the temporal and masseter muscles was higher on the right, in 2 people (6.7%) – on the left side) was found. The asymmetric work of the sternocleidomastoid muscles was also observed in these subjects. It is important to note that the side with the increased EMG-activity of sternocleidomastoid muscles was opposite to the side with the increased EMG-activity of the temporal and masseter muscles (which can be characterized by the term "cross" activity).

Therefore, the EMG-activity evaluation of the muscles of the dento-facial region should be performed in conjunction with the EMG-activity evaluation of the stomatognathic system muscles, which coincides with other studies [1, 2, 3]. There are data in literature sources about EMG-activity of the upper and lower lip circular muscles, supra-, infragioid muscle during the following tests: physiological rest, pronunciation of certain sounds, swallowing, deep breathing, maximum teeth clenching and chewing [1]. Thus, it was found that the EMG-activity of the orbicularis oris muscle was higher in patients with impaired functions of lip closure and speech in comparison with subjects without such disorders. However, it should be noted that there are no a comparative study of the bioelectric activity of mimic, masticatory, and sternocleidomastoid muscles.

Conclusion

The study allowed us to determine the features of EMG-activity and the proportion of muscle work of the masticatory (masseter, temporal), mimic (chin, orbicularis oris muscles) and sternocleidomastoid muscle during functions of dento-facial region and movements of the mandible. The results of the study proved the involvement of facial and neck muscles in teeth clenching, mandible movements, swallowing. It was found that the EMG-activity of the orbicularis oris muscle during maximum teeth clenching, displacement of the mandible forward (protrusion) and swallowing correlated with the EMG-activity of the sternocleidomastoid muscles. The obtained data indicated the functional unity of the neuromuscular component of the stomatognathic system and the need to study the bioelectric activity of these muscles in subjects with functional disorders, especially associated with movements of the mandible and tongue at all stages of orthodontic treatment.

References

1. Gamboa NA, Miralles R, Valenzuela S, Santander H, Cordova R, Bull R, Espinoza DA, Martínez CA. Comparison of muscle activity between subjects with or without lip competence: Electromyographic activity of lips, supra- and infrahyoid muscles. Cranio. 2017; 35(6):385-391.
2. Greven M, Landry A, Carmignani A. Comprehensive dental diagnosis andtreatment planning for occlusal rehabilitation: a perspective. Cranio. 2016; 34(4):215-217. DOI:10.1080/08869634.2016.1186880.
3. Kiss G, Pácz M, Kiss P. Craniomandibular disorder/dysfunction. Characteristics and disorders of the masticatory organ. Orv Hetil. 2015; 156(4):122-34. doi: 10.1556/OH.2015.30073.
4. Mendes da Silva J, Pérola Dos Anjos Braga Pires C, Angélica Mendes RL, Palinkas M, de Luca Canto G, Batista de Vasconcelos P, Valéria Rancan S, Semprini M, Siéssere S, Regalo SC. Influence of mandibular tori on stomatognathic system function. Cranio. 2017; 35(1):30-37. doi: 10.1080/08869634.2015.1122417.
5. Murakami K, Hirano H, Watanabe Y, Edahiro A, Ohara Y, Yoshida H, Kim H, Takagi D, Hironaka S. Relationship between swallowing function and the skeletal muscle mass of older adults requiring long-term care. Geriatr Gerontol Int. 2015; 15(10):1185–1192.
6. Poorjavad M, Talebian S, Ansari NN, Soleymani Z. Surface electromyographic assessment of swallowing function. Iran J Med Sci. 2017; 42(2):194–200.
7. Smaglyuk L, Voronkova A, Karasiunok A, Liakhovska A. Interdisciplinary approach to diagnostics of malocclusion (review). Wiadomosci Lekarsrie. 2019; 72 (5): 918-922.
8. Stepp CE. Surface electromyography for speech and swallowing systems: measurement, analysis, and interpretation. J Speech Lang Hear Res. 2012; 55(4):1232–1246.
9. Tartaglia GM, Lodetti G, Paiva G, De Felicio CM, Sforza C. Surface electromyographic assessment of patients with long lasting temporomandibular joint disorder pain. J Electromyogr Kinesiol. 2011 ; 21(4):659-64.

Реферати

ЕМГ-АКТИВНІСТЬ М'ЯЗІВ КРАНІО-МАНДИБУЛЯРНОЇ СИСТЕМИ ПІД ЧАС ВИКОНАННЯ ФУНКЦІЙ ЗУБО-ЩЕЛЕПНОЇ ДІЛЯНКИ

Смаглюк Л.В., Смаглюк В.І., Ляховська А.В., Трофименко М.В.

Було проведено дослідження електроміографічної (ЕМГ) активності скроневого, власне жувального,

ЭМГ-АКТИВНОСТЬ МЫШЦ КРАНИО-МАНДИБУЛЯРНОЙ СИСТЕМЫ ВО ВРЕМЯ ВЫПОЛНЕНИЯ ФУНКЦИЙ ЗУБО-ЧЕЛЮСТНОЙ ОБЛАСТИ

Смаглюк Л.В., Смаглюк В.И., Ляховская А.В., Трофименко М.В.

Было проведено исследование электромиографи-ческой (ЭМГ) активности височной, собственно

колового, підборідного та грудино-ключично-сосцеподібного м'язів у 30 пацієнтів віком 20-28 років без соматичної патології, морфологічних, функціональних та естетичних порушень зубо-щелепної ділянки. Результати дослідження доводять участь мімічних м'язів та м'язів шиї у стисканні зубів, рухах нижньої щелепи та ковтанні, що вказує на функціональну єдність нейромускулярної складової стоматогнатичної системи. Це обумовлює необхідність вивчення роботи цих м'язів у осіб із порушенням функцій зубощелепної ділянки, особливо тих, що пов'язані із рухами нижньої щелепи та язика на всіх етапах ортодонтичного лікування.

Ключові слова: зубощелепова ділянка, електроміографія, м'язи краніо-мандибулярної системи, функції зубощелепної ділянки.

Стаття надійшла 28.04.2019 р.

жевательной, круговой, подбородочной и грудино-ключично-сосцевидной мышц у 30 пациентов 20-28 лет без соматической патологии, морфологических, функциональных и эстетических нарушений зубочелюстной области. Результаты исследования доказывают участие мимических мышц и мышц шеи в сжатии зубов, движениях нижней челюсти и глотании, что указывает на функциональное единство нейромускулярной составляющей стоматогнатической системы. Это обусловливает необходимость изучения работы этих мышц у лиц с нарушением функций зубочелюстной области, особенно тех, которые связаны с движениями нижней челюсти и языка на всех этапах ортодонтического лечения.

Ключевые слова: зубочелюстная область, электромиография, мышцы краниo-мандибулярной системы, функции зубочелюстной области./

Рецензент Аветіков Д.С.

DOI 10.26724/2079-8334-2020-1-71-132-136
UDC 616.314.25/.26-053.2

L.V. Smaglyuk, N.L. Chukhray[1]., E.V. Bezvushko[1], A.L. Miskiv[1], O.O. Shpotyuk[1]
Ukrainian Medical Stomatological Academy, [1]Danylo Halytsky Lviv National Medical University

THE RELATIONSHIP OF MALOCCLUSIONS WITH THE ERUPTION TIME OF PERMANENT TEETH IN CHILDREN LIVING IN DIFFERENT CLIMATIC AND GEOGRAPHICAL CONDITIONS

e-mail: anvitatali@gmail.com

The article highlights the prevalence and structure of malocclusion and terms of eruption of the permanent teeth in children living in different climatic and geographical conditions. It has been established that the prevalence of malocclusion and terms of eruption of the permanent teeth in children depends on the geographical and environmental living conditions. It is proved that there is a strong correlation between malocclusions and the number of erupted teeth.

Key words: malocclusions**,** permanent tooth eruption, climatic and geographical conditions.

The work is a fragment of the research project "Assessment of dental morbidity of children with regard to environmental and social aspects and the effectiveness of prevention of dental caries and periodontal diseases", state registration No. 0115U000037.

Dentofacial anomalies, with an average prevalence of 40% to 81%, are among the major dental diseases [3, 8]. The analysis of the literature data shows that there has not been a tendency to a downward trend in this pathology in recent years. Significant increase of dentofacial anomalies, along with other factors, is associated with the negative environmental impact, the presence of somatic diseases, and climatic and geographical living conditions of children [2, 5, 6]. Therefore, the prevalence of dentofacial anomalies can be fully considered as one of the indicators that characterize the health status of children in a particular region.

In addition, it is known that the formation of dentofacial anomalies is significantly affected by the eruption time of permanent teeth, which is an important criterion for indicators of normal development of the dentofacial system. Deviations from the average terms of eruption of permanent teeth serve as one of the prognostic symptoms of the development of the child's organism [4, 7].

Different internal and external factors cause the fluctuations in the time of permanent teeth eruption. Climatic, geographical, ecological, and regional peculiarities of the territory where children live have a significant impact on the term of permanent teeth eruption [1, 8]. In this regard, it is important to study the features of permanent teeth eruption for each individual region, which differ in their conditions and their relationship with the formation of dentofacial anomalies. Epidemiological studies have been devoted to evaluating the eruption time of permanent teeth in Ukraine [8]. In recent years, the issue of terms of permanent teeth eruption, the dynamics of their changes, the regional features of teeth eruption, their relationship with the physical development of children and with dentofacial anomalies have not been covered in the literature, which, in turn, causes difficulties in the choice of treatment and preventive measures. Therefore, it is important to further study the prevalence of dentofacial anomalies, to evaluate the eruption time of permanent teeth at the regional level and to assess their interconnection.