

## MEDICO-ORTHODOX PROBLEMS OF DEAF CHILDREN IN UKRAINE

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Hearing disorders are one of the common diseases all over the world. In Ukraine, in 2008, there were about 300 thousand children and 1 million adults with hearing impairment.

The article deals with the problem of providing comprehensive dental, orthodontic care to children with hearing impairments. An analysis of the orthodontic problem of children with hearing impairments has been performed.

There is a high prevalence of bite anomalies in Ukrainian children with sensorineural hearing loss. Thus, the prevalence of hearing loss and deformities in children with hearing impairment in Ukraine is 100%. The most common bite pathology in deaf children is the 1st class according to Angle (70.50%). Caries occurs in 77.05% and increases with age. Only one fifth of children with hearing impairment (19.67%) did not detect abnormalities in the attachment of soft tissue.

In 94.74% of cases, when examined by an orthopedic doctor, children with hearing loss were diagnosed with certain disorders of the musculoskeletal system.

Complex medical and orthodontic care for children with hearing impairment requires taking into account the features of the dental-maxillary system and overcoming anomalies and deformations, which is the basis for full-fledged speech and mental development and a prerequisite for the formation of a future socially and physically adapted personality.

**Key words:** malocclusion, deaf children, caries.

### Connection of the publication with planned research works.

This study is a fragment of the research work «Features of rehabilitation of orthodontic patients of various ages», state registration № 022U201229.

### Introduction.

Hearing disorders are one of the common diseases all over the world. According to the World Health Organization (WHO), in the economically developed countries, including the USA and Western Europe, 7-9% of the population suffers from hearing loss, including deafness – from 0.1 to 0.4 % of newborn babies and about 1% of adults. Over 5% of the world's population requires rehabilitation to address their 'disabling' hearing loss. It is estimated that by 2050 over 700 million people – or one in every ten people – will have disabling hearing loss [1].

In Ukraine, in 2008, there were about 300 thousand children and 1 million adults with hearing impairment, including depression – 11 thousand children and 100 thousand adults. For hearing impaired people, the main form of communication is non-verbal communication [2].

During dental appointment the dentist must take into account patterns of children's behavior in contact with the doctor and peculiarities of the child's psyche at different age periods [3].

From year to year, scientists from all over the world are growing interest in studying the characteristics of dental and orthodontic health, providing dental care to hearing impaired children. The dental apparatus of children with hearing deprivation has a number of special morphological features because of the lack of specific linguistic articulation due to the pathology of the auditory analyzer [4].

Orthodontics is a branch of dentistry that is actively developing and pays special attention to the need for comprehensive patient treatment. According to world statistics, the number of speech disorders, as well as the

number of tooth-jaw anomalies (TJA), grows annually and approaches the 90% mark [5].

The prevalence of bite pathology in deaf patients is quite high and varies, depending on the region of residence, from 19% to 88.5% [6, 7]. However, orthodontic problems in deaf children occur more often by 12.65% compared with healthy ones [8].

Tooth-jaw anomalies are one of the causes of the occurrence of various forms of dyslalia in children, in particular, mechanical and, conversely, logopedic disorders is one of the etiological factors of bite disorders. In this regard, the relevance of complex orthodontic-speech therapist correction becomes global in nature and requires the joint work of speech therapist and orthodontist. Orthodontics is a medical specialty, and speech therapy is pedagogical, therefore, there is a need for interdisciplinary integration of both orthodontist and speech therapist professions [5].

Also, in children with hearing impairment, the prevalence of caries is quite high, ranging from 53.6% to 93% -95.75% [9, 10]. In adult deaf patients, the prevalence of caries is 100% [11].

Literary sources indicate that deaf children have special medical needs that require frequent medical intervention and observation, including that of dental health. Stomatological manipulations are often accompanied by a stressful situation for patients. The presence of significant communicative barriers in deaf children, their emotional lability, the fear of unfamiliar situations and people, further increase the negative attitude to medical manipulations [12]. 63% of deaf patients who applied for dental care had problems communicating with a dentist [13]. Therefore, the use of facilitated diagnostic methods for certain dental and orthodontic diseases is most appropriate in this category of patients [14].

### The aim of the study.

To evaluate dental health and tooth-jaw anomalies in hearing impaired children, to assess the level of

knowledge about oral hygiene, to study the soft tissues of the oral cavity, to study the relationship between damaging solid tissues of the teeth, posture disorders and anomalies bite in students with hearing impairments, the effect of concomitant somatic pathology on the development of tooth-jaw anomalies.

**Object and research methods.**

We were screened for 61 hearing impaired children who attend a specialized boarding school with daytime and round-the-clock stay. Among the surveyed 59.02% – 36 boys and 40.98% – 25 girls. Most of the examined children, namely 75.11% (n=46), had bilateral neuro-sensory deafness; 19.67% (n=12) – neuro-sensory tiredness; 4.92% (n=3) bilateral conductive tiredness.

Depending on the period of bite development, children with hearing impairments were divided into groups: I group – 6-9 years (alternating early) bite; Group II – 10-14 years (alternating late bite); Group III – over 15 years (constant bite). *The methods used are: method of bibliographic study, observation, method of evaluation, and recording of data and graphical presentation.*

Clinical examination was carried out according to generally accepted schemes, but with some differences due to the peculiarities of the physical and psychological state of this category of children

Before the review, each child was instructed about what would be done and what she needed to do. During our review, a school teacher attended a child who helped translate orthodontist's explanations into a well-understood child's sign language and was constantly in the sight of the child.

Due to the fact that children with hearing impairments do not understand the specific terms, all explanations of those or other manipulations were carried out without unnecessary complications and without the use of specific terminology. During the explanation the mask on the face of the doctor was not worn, so that a child with hearing impairment could clearly see his face. If the child did not understand what was to be done, the teacher translated it into a sign language, and the doctor preliminarily held a demonstration (open the mouth, show the tongue, swallow saliva). After each stage of the review, we were convinced that the child understood our explanation.

Clinical examination of the oral cavity was performed at daylight in the medical office of a specialized boarding school for deaf children.

In medical documentation, in children with hearing impairment, doctors noted the presence of dental anomalies, evaluated the condition of solid dental tissues using standard indexes of intensity determination (KPV + kp in a variable bite, KPV in constant bite). They evaluated the nature of attachment of soft tissues of the oral cavity and oral hygiene.

The condition of the musculoskeletal system was determined by the orthopedic physician visually and manually and instrumentally according to the generally accepted method with the help of devices: hardware-software anthropometric complex and a subosse. The evaluation of the musculoskeletal system was performed by 56 students with

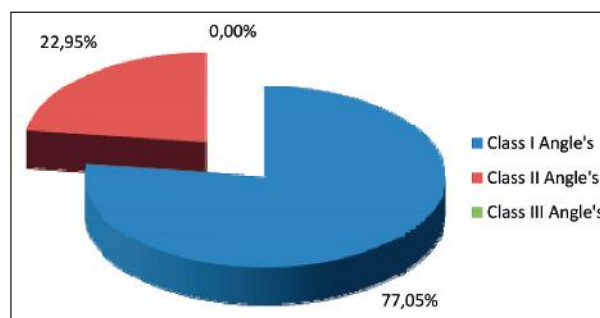


Figure 1 – The structure of tooth-jaw abnormalities in children with hearing impairments.

hearing impairments. In group 1 (period of occlusive bite), 29 children (51.79%) were included, in the 2nd group (period of formation of constant bite) – 27 children (48.28%).

Spearman's method was used for statistical processing of the research results.

The study was approved by the ethics committee of the Poltava State Medical University. Before the examination, all parents or representatives of the children gave informed consent for the examination.

**Research results and their discussion.**

Clinical examination of hearing impaired children showed that all of the subjects (100%) had abnormalities of the tooth-jaw system, there was not a single child with orthognathic bite. Their distribution according to the type of bite pathology according to the classification of E. Angle (1889) was conducted. The most common pathology of bite in the examined children is pathology class I Angle, that is, anomalies of the position of individual teeth, which occurred in 73.77% of cases (n=45), II – in 26.23% (n=16), pathology III – in 0% (n=0) (fig. 1).

In a clinical dental examination of children with hearing impairment, caries was found in 77.05% (n=47). The number of children with intact dentistry was 22.95% (n=14), that is, less than a quarter of children with hearing impairment had healthy teeth. With age, the number of children with at least one sign of caries (KPV) increased by 4 times (fig. 2).

Among the surveyed children with hearing impairment the intensity of caries under the index KPV + kp, KPV has a clear regularity. At 6-9 years, the intensity was 2.07, which corresponds to low values in Ukraine. The intensity of caries of children 10-14 years old increases to 2.29. The caries intensity at the age of 15 and older

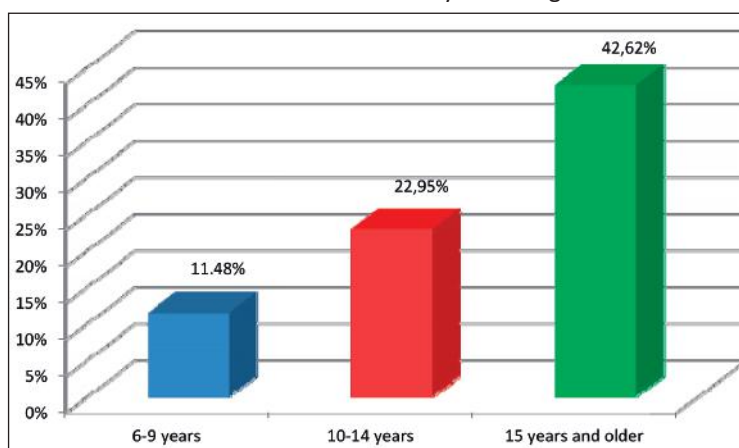


Figure 2 – Caries in children with hearing impairments of all ages.

reaches 3,04. The "K" indicator has a reliable inverse relationship with age ( $r=0.539$ ,  $p=0.0000$ ). These figures are average in Ukraine and, in most cases, are caused by inadequate oral hygiene. In the process of analyzing the structural components of the KPV + kp and KPV indexes, it was noted that component "K" predominates in the teeth in all age groups.

In children with hearing impairments in the variable bite, the indexes of the caries "K" and "k" are 1.72, the rate of treated teeth "P" and "n" is quite low – 0.39, which indicates insufficient level of dental care. The "k" indicator has a reliable inverse relationship with the age of the examinees ( $r=-0.528$ ,  $p=0.0000$ ).

In conducting an analysis of the structure of the KPV index in a constant bite of the children with hearing impairment, a high level of carious lesions of permanent teeth ("K" – 2.42) and a low level of the index of sealed teeth ("P" – 0.62) were also found. The "P" indicator has a reliable inverse relationship with the age of the examinees ( $r=0.406$ ,  $p=0.0011$ ).

The results of the review and assessment of the oral hygiene status were opposite to the questionnaire. Despite the fact that the majority of hearing impaired children in the questionnaire said that they brush their teeth 2 times a day, only 6 children with hearing impairments (11.54% of the examined ones) had good oral hygiene in an objective examination.

In the majority of examined children with hearing impairments, satisfactory oral hygiene was noted in 38 children (73.08%). In 8 children with hearing impairment (15.38%) unsatisfactory condition of oral hygiene was noted. At the same time in children younger (7-9 years) the state of hygiene is much better than in older children (10 years and older). In children, living in an orphanage, the hygienic state of the oral cavity is also better than those who go home after school.

The children with hearing impairments have knowledge of oral hygiene, but do not use them or do not have sufficient manual skills.

At a clinical examination of the cavity of the mouth, special attention was paid to the attachment of soft tissues of the oral cavity. Only one fifth of children with hearing impairment (19.67%) did not detect abnormalities in the attachment of soft tissue.

Among the anomalies of attachment most often met: a small brush -25 children with hearing impairment, which is 40.98%. Of these, 31.15% of small brine combines with:

– short brisquet of the upper lip (3.28%), short brisquet of the lower lip (3.28%), short brisquet of the upper lip and its low attachment (1.64%), low attachment of the upper lip bridle (4.92%), a short bridle of the tongue (1.64%), a short brisquet of the upper lip and tongue (4.92%), a short brisquet of the upper lip and lower lip (3.28%), a short brisquet of the upper lip, lower lip and tongue (1.64%), short brisquet of the lower lip and tongue (4.92%), short upper lip, low attachment and short tongue bristle (1.64%).

In 24 children with hearing impairment (39,34%) of prisms of normal depth, there were other anomalies of attachment of soft tissues of the oral cavity, namely:

– short brisquet of the upper lip (8.2%), short bristle of the lower lip (4.92%), short bridle of the tongue (13.12%), short brisquet of the upper lip and lower lip (1.64%), short bristle of the lower lip and tongue

(1.64%), low attachment of the upper lip lobe (3.28%), short upper lip bristle, lower lip and tongue – 4 (6.56%).

Only 5.26% of the examined children were relatively healthy, and in 94.74% of cases some or other disorders of the musculoskeletal system occurred. A direct correlation was established between pathology of the musculoskeletal system and age ( $r=0.277$ ,  $p=0.03$ ). Most often during the orthopedic examination various morpho-functional disorders of the foot in the form of flat feet and valgus deformation of the foot were diagnosed. This pathology was encountered both separately and along with the deformities of the spine.

Almost half of the surveyed schoolchildren with hearing impairments, namely 44.64%, found the following types of pathology of the foot, such as valgus deformation (M21.0) – 23.21% and acquired flattening (M21.4) – 21.43%. This pathology met more often among schoolchildren of group 1.

In 7.14% of schoolchildren with hearing impairments, the pathology of the locomotor system (kyphosis, lordosis, scoliosis) was diagnosed with the same frequency in children of both age groups – 1 group (3.57%) and 2 groups (3.57%) which indicates a lack of self-regulation of this pathology.

In 28.57% of pupils examined the disorders of the spine were combined with foot disorders. One-way shortening of the lower limb, with a difference in the length of the feet from 0.5 to 2 cm, was diagnosed in 14.29% of schoolchildren. If in the children of the first group, the difference in the length of the feet was only 1.79%, then with age (2 group) the number of asymmetries increased almost 7 times – 12.5%, which is a direct consequence of untimely referral to an orthopedic doctor and the absence of medical examination of schoolchildren with hearing impairments. Most often there was a shortening of the left leg.

### Conclusions.

Thus, in order to improve the efficiency of providing dental and orthodontic care to children with hearing impairments, dentists (orthodontists) need to take into account the anatomical-physiological features of patients and pay more attention to the facial reactions of deaf patients.

For the communication of the dentist and orthodontist with children who have hearing impairments: the doctor should allocate twice as much time for the initial examination, especially for younger children.

Modern informational methods, such as a short video clip with sign language or accompanying text, are effective in reducing the time required for a clinical examination.

Since the prevalence of malocclusion and deformities in children with hearing impairment is 100%, in order to prevent severe forms of dental-maxillary anomalies in such children, it is necessary to conduct scheduled examinations for the purpose of early diagnosis and timely elimination of the etiological factors of their development. The vast majority of examined in children with hearing impairments (80.36%) have attachment anomalies of the soft tissues of oral cavity. With 100% presence of malocclusion, this is a significant complication of orthodontic pathology, which will later affect the formation of phonemes.

Caries occurs in 77.05% of internal combustion engines and increases with age. Caries intensity indicators

in children with hearing impairments are average for Ukraine and depend not on the hearing impairment, but on the hygienic condition of the oral cavity.

Children aged 6–9 have better hygiene than older children. The hygienic condition of children living in a boarding school is better than that of children living at home, since in a boarding school, teachers monitor the hygienic care of the oral cavity, unlike parents at home. Systematic individual control of the quality of the oral cavity's hygienic condition should be carried out in the internal combustion engine.

The vast majority of examined children with hearing impairments, namely 80.36%, have attachment abnormalities of the soft tissues of oral cavity. With 100% presence of dental-maxillary anomalies, this is a significant complication of orthodontic treatment.

Therefore, comprehensive medical, orthodontic and psychological-pedagogical assistance unites three inter-related stages, which together form a complete system of medical-orthodontic, rehabilitation-corrective work, in particular: preparatory (diagnostic and familiarization), which includes a complex diagnostic procedure;

basic (corrective-orthodontic), which includes medical and orthodontic assistance, psychological support; final (rehabilitation-generalizing), which involves the successful mastering of age-appropriate communication skills and skills with the use of sign language and facial expressions and the correction of dental-maxillary anomalies and deformations.

Thus, complex medical and orthodontic care for children with hearing impairment requires taking into account the features of the dental-maxillary system and overcoming anomalies and deformations, which is the basis for full-fledged speech and mental development and a prerequisite for the formation of a future socially and physically adapted personality.

### Prospects for further research.

The study of this problem is quite relevant for the determination of prevention methods and the development of special recommendations for improving the provision of dental care to children and adults with hearing impairments. There is a need to create a dental disease prevention program for the hearing impaired, which will be available for their specific perception.

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### МЕДОКО-ОРТОДОНТИЧНІ ПРОБЛЕМИ ГЛУХИХ ДІТЕЙ В УКРАЇНІ

**Куроєдова В. Д., Сокологорська-Никіна Ю. К.**

**Резюме.** Порушення слуху є одним з найпоширеніших захворювань у всьому світі. Зубощелепний апарат дітей із депривацією слуху має низку морфологічних особливостей через відсутність специфічної мовної артикуляції внаслідок патології слухового аналізатора. Поширеність патології прикусу у глухих досить висока. Також у дітей з вадами слуху досить висока поширеність карієсу.

Метою нашого дослідження була оцінка стану зубів та зубо-щелепних аномалій у дітей із вадами слуху, оцінка їх рівня знань про гігієну порожнини рота, вивчення стану м'яких тканин ротової порожнини та виявлення супутньої патології, а саме патології постави.

Було проведено обстеження 61 дитини із вадами слуху. У всіх обстежених (100%) зустрічались аномалії зубощелепної системи. Найбільш поширеною патологією прикусу у обстежених дітей є патологія I кл. за Енгле – 73,77%. Карієс зустрічався у 77,05%, з віком кількість дітей, що мають хоча б одну ознаку карієсу (КПВ) збільшується в 4 рази. Лише у п'ятій частини глухих дітей (19,67%) при обстеженні не виявлено аномалій прикріплення м'яких тканин рота.

Під час огляду спільно з лікарем ортопедом встановлено, що лише 5,26% обстежених відносно здорові, в 94,74% випадків мали місце ті чи інші порушення опорно-рухового апарату.

Отже, для підвищення ефективності надання стоматологічної та ортодонтічної допомоги дітям з вадами слуху лікарям-стоматологам (ортодонтам) необхідно враховувати анатомо-фізіологічні особливості пацієнтів та приділяти більше уваги мімічним реакціям глухих пацієнтів. Оскільки поширеність неправильного при-

кусу та деформацій у дітей з вадами слуху становить 100 %, для попередження важких форм зубощелепних аномалій у таких дітей необхідно проводити планові огляди з метою ранньої діагностики та своєчасного усунення етіологічної фактори їх розвитку. Переважна більшість обстежених дітей з вадами слуху (80,36%) мають аномалії прикріплення м'яких тканин ротової порожнини, що є суттєвим ускладненням ортодонтичної патології. Дослідження даної проблеми є досить актуальним для визначення методів профілактики та розробки спеціальних рекомендацій щодо вдосконалення надання стоматологічної допомоги дітям і дорослим з вадами слуху.

**Ключові слова:** патологія прикусу, глухі діти, карієс, постава.

### MEDICO-ORTHODOX PROBLEMS OF DEAF CHILDREN IN UKRAINE

**Kuroedova V. D., Sokolohorska-Nykina Y. K.**

**Abstract.** Hearing impairment is one of the most common diseases worldwide. The maxillofacial apparatus of children with hearing deprivation has a number of morphological features due to the lack of specific speech articulation due to the pathology of the auditory analyzer. The prevalence of bite pathology in the deaf is quite high. Also, the prevalence of caries is quite high in children with hearing impairments.

The purpose of our study was to assess the condition of teeth and maxillofacial anomalies in children with hearing impairments, to assess their level of knowledge about oral hygiene, to study the condition of the soft tissues of the oral cavity and to identify accompanying pathology, namely posture pathology.

61 children with hearing impairments were examined. All the examined (100%) had abnormalities of the maxillofacial system. The most common pathology of the bite in the examined children is the pathology of the 1st class. according to Engle – 73.77%. Caries occurred in 77.05%, with age, the number of children with at least one sign of caries (KPV) increases 4 times. Only one-fifth of deaf children (19.67%) were not found to have abnormalities of attachment of the soft tissues of the mouth during the examination.

During the examination together with the orthopedist, it was established that only 5.26% of the examined were relatively healthy, in 94.74% of cases there were some or other disorders of the musculoskeletal system.

Therefore, in order to increase the effectiveness of providing dental and orthodontic care to children with hearing impairments, dentists (orthodontists) need to take into account the anatomical and physiological features of patients and pay more attention to the facial reactions of deaf patients. Since the prevalence of malocclusion and deformities in children with hearing impairment is 100%, in order to prevent severe forms of dento-maxillofacial anomalies in such children, it is necessary to conduct scheduled examinations for the purpose of early diagnosis and timely elimination of the etiological factor of their development. The vast majority of examined children with hearing impairments (80.36%) have abnormalities of the attachment of soft tissues of the oral cavity, which is a significant complication of orthodontic pathology. The study of this problem is quite relevant for the determination of methods of prevention and the development of special recommendations for improving the provision of dental care to children and adults with hearing impairments.

**Key words:** malocclusion, deaf children, caries, posture.

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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 25.11.2022**

**Accepted 05.05.2023**