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STUDY OF THE DENTOFACIAL SYSTEM STATUS IN SCHOOL-AGED CHILDREN OVER A NINE-YEAR EXAMINATION PERIOD

Dentofacial anomalies remain among the most common disorders of childhood and are characterized by considerable variability in prevalence and structure depending on age, sex, stage of dentition development, and functional conditions of dentofacial growth. Most available epidemiological data are based on cross-sectional comparisons of different age groups, whereas long-term follow-up of the same children makes it possible to assess more objectively the dynamics of the formation, persistence, and combination of dentofacial anomalies during growth. ***Aim of the study.*** *To investigate changes in the prevalence and structure of dentofacial anomalies in the same group of children over a 9-year observation period.* ***Materials and methods.*** *The study involved 768 children aged 6–16 years from School No. 121 in Odesa; 46.4% were boys and 53.6% were girls. Twice a year, the children underwent dental examinations accompanied by oral cavity sanitation and professional oral hygiene. During the examinations, the frequency and structure of dentofacial anomalies and deformities, as well as dental caries, were assessed. In 2007–2008, 129 children aged 6–7 years were selected from the examined cohort, and in 2015–2016, 108 children from this group were re-examined (62 girls and 46 boys). The results were recorded in specially designed charts. Statistical processing was performed using variation analysis methods with Microsoft Office Excel 2016 and Student’s t-test; differences were considered statistically significant at $p<0.01$.* ***Results.*** *At the age of 6–7 years, 56 children had no dentofacial pathology; at 12 years, this number decreased to 28, and at 15 years, to 26, indicating a progressive reduction in the number of children without anomalies during the observation period. By the age of 12 years, the prevalence of pathology had increased by an additional 25%, and from 12 to 15 years, by a further 2%. The most common pathology in the examined children was dental crowding: it was detected in 16 children at 6–7 years, in 36 at 12 years, and in 38 at 15 years. Diastema ranked second in frequency, being found in 18 children at 6–7 years, in 32 at 12 years, and in 32 at 15 years. Anomalies of individual teeth were observed in 18 children at 6–7 years, in 22 at 12 years, and in 24 at 15 years. Among occlusal pathologies, distal occlusion was the most prevalent: 16 cases at 6–7 years, 20 at 12 years, and 24 at 15 years. Deep bite was detected in 14, 20, and 20 children, respectively. Mesial occlusion, oblique bite, and open bite were considerably less common. Pronounced gender differences were identified: at an early age, dentofacial anomalies were observed more often in girls, which the author associates with their earlier developmental tempo. It was also shown that the same child frequently had a combination of several types of disorders; in particular, distal occlusion was often combined with deep bite, whereas neutral molar relationships were frequently accompanied by diastema, dental crowding, or anomalies of individual teeth.* ***Conclusions.*** *The study demonstrated that the main proportion of dentofacial anomalies develops during the early mixed dentition period and persists into the permanent dentition. Over the entire nine-year follow-up period, no cases of self-regulation of dentofacial anomalies were identified. The most common pathologies were dental crowding, diastema, anomalies of individual teeth, distal occlusion, and deep bite. Regular oral cavity sanitation likely prevented the development of secondary dental arch deformities, but did not eliminate primary anomalies. The obtained data substantiate the need for early prevention and treatment of dentofacial anomalies, as well as educational work emphasizing the role of natural breastfeeding and adequate masticatory load in the harmonious development of the jaws.*

Key words: *dentofacial anomalies, school-aged children, longitudinal observation, dental crowding, diastema, distal occlusion, deep bite, mixed dentition.*

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ВИВЧЕННЯ СТАНУ ЗУБОЩЕЛЕПНОЇ СИСТЕМИ ДІТЕЙ ШКІЛЬНОГО ВІКУ ЗА ДЕВЯТИРІЧНИЙ ПЕРІОД ОБСТЕЖЕННЯ

Зубощелепні аномалії залишаються однією з найпоширеніших патологій дитячого віку та характеризуються значною варіабельністю поширеності й структури залежно від віку, статі, етапу формування прикусу та функціональних умов розвитку зубощелепної системи. Більшість наявних епідеміологічних даних ґрунтується на поперечних порівняннях різних вікових груп, тоді як довготривале спостереження за одними й тими самими дітьми дає змогу об’єктивніше оцінити динаміку формування, збереження та поєднання зубощелепних аномалій у процесі росту. ***Метою дослідження було*** *вивчити зміни поширеності та структури зубо-*

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щелепних аномалій у групи одних і тих самих дітей протягом 9 років спостереження. ***Матеріали та методи****. У дослідженні взяли участь 768 дітей віком 6–16 років школи №121 м. Одеси, з яких 46,4 % становили хлопчики, 53,6 % – дівчатка. Двічі на рік дітям проводили стоматологічний огляд, санацію порожнини рота та професійну гігієну. У процесі обстеження вивчали частоту і структуру зубощелепних аномалій та деформацій, а також карієсу зубів. У 2007–2008 роках із числа обстежених було відібрано 129 дітей віком 6–7 років, із яких у 2015–2016 роках повторно обстежено 108 дітей (62 дівчинки та 46 хлопчиків). Результати вносили до спеціально розроблених карт. Статистичну обробку проводили методами варіаційного аналізу з використанням Microsoft Office Excel 2016 та критерію Стьюдента; різницю вважали статистично значущою при p<0,01.* ***Результати дослідження****. У віці 6–7 років без патології зубощелепної системи було 56 дітей, у 12 років – 28, у 15 років – 26, що свідчить про зменшення кількості дітей без аномалій упродовж періоду спостереження. До 12 років поширеність патології зросла ще на 25%, а з 12 до 15 років – ще на 2%. Найпоширенішою патологією в обстежених дітей було скупчене положення зубів: у 6–7 років його виявлено у 16 дітей, у 12 років – у 36, у 15 років – у 38. Друге місце за частотою посідала діастема: 18 випадків у 6–7 років, 32 – у 12 років і 32 – у 15 років. Аномалії окремих зубів спостерігалися у 18 дітей у 6–7 років, у 22 – у 12 років і у 24 – у 15 років. Серед патологій прикусу найчастішим був дистальний прикус: 16 випадків у 6–7 років, 20 – у 12 років і 24 – у 15 років. Глибокий прикус виявлено відповідно у 14, 20 і 20 дітей. Мезіальний, косий і відкритий прикуси зустрічалися значно рідше. Встановлено виражені гендерні відмінності: у ранньому віці зубощелепні аномалії частіше виявляли у дівчаток, що автор пов'язує з більш ранніми темпами їх розвитку. Показано, що в однієї дитини часто спостерігалося поєднання кількох видів порушень; зокрема, дистальний прикус нерідко поєднувався з глибоким, а при нейтральному співвідношенні молярів часто визначалися діастема, скупченість зубів або аномалії окремих зубів.* ***Висновки****. Дослідження продемонструвало, що основна частка зубощелепних аномалій формується у період раннього змінного прикусу та зберігається у постійному прикусі. Протягом дев'ятирічного спостереження не виявлено жодного випадку саморегуляції зубощелепних аномалій. Найчастішими патологіями були скупченість зубів, діастема, аномалії окремих зубів, дистальний і глибокий прикус. Регулярна санація порожнини рота, ймовірно, запобігала розвитку вторинних деформацій зубних рядів, однак не усувала первинні аномалії. Отримані дані обґрунтовують необхідність раннього початку профілактики та лікування зубощелепних аномалій, а також проведення роз'яснювальної роботи щодо ролі природного вигодовування і повноцінного жувального навантаження у гармонійному розвитку щелеп.*

Ключові слова: *зубощелепні аномалії, діти шкільного віку, динамічне спостереження, скупченість зубів, діастема, дистальний прикус, глибокий прикус, змішаний прикус.*

Malocclusion–broadly understood as deviations in tooth position, dental arch form, and/or interarch relationships–remains one of the most prevalent developmental conditions affecting the craniofacial complex during childhood and adolescence. Contemporary syntheses indicate wide inter-population variability in both overall prevalence and trait distribution, reflecting differences in ethnicity, dentition stage, diagnostic thresholds, and sampling frames [1–3]. In global pooled estimates across mixed and permanent dentitions, Angle Class I patterns dominate overall distributions, while clinically salient vertical and transverse traits (e.g., deep overbite, open bite, posterior crossbite) appear at lower but still meaningful frequencies [1]. At the same time, large systematic reviews of pediatric epidemiology emphasize that inconsistent definitions and measurement protocols can substantially inflate between-study heterogeneity and complicate cross-country comparisons, reinforcing the need for methodologically coherent, locally relevant surveillance [2,3].

Beyond classification metrics, malocclusion matters because it can influence function, aesthetics, and psychosocial well-being during sensitive phases of child development. Systematic review evidence demonstrates that malocclusions are associated with worse oral health–related quality of life (OHRQoL) in children, with impacts extending beyond appearance to domains such as emotional and social functioning [4]. In adolescents specifically, more recent meta-analytic work that accounts for potential confounders (e.g., caries, socioeconomic factors) similarly concludes that malocclusions can negatively affect OHRQoL, supporting the view that orthodontic anomalies have consequences that are clinically and socially consequential rather than merely cosmetic [5].

Despite the breadth of epidemiological and etiological literature, a major limitation persists: much of the available evidence derives from cross-sectional comparisons of age-defined groups, which can obscure individual developmental trajectories and overestimate the stability (or instability) of occlusal traits across growth. Large systematic reviews explicitly highlight inconsistent operationalization of malocclusion traits and the resulting unreliability of prevalence comparisons across settings, reinforcing the methodological value of longitudinal designs with consistent examination protocols [2]. In addition, the same exposure (e.g., a given oral habit or early tooth loss) may have different consequences depending on developmental timing and the child's craniofacial growth pattern, suggesting that etiologic

inference is strengthened when repeated observations track the same individuals through key dentition transitions [2,6,7].

By tracking the same individuals over a nine-year observation window with regular clinical examinations and preventive dental care, the study aligns with contemporary pediatric dentistry best-practice principles that emphasize early identification of developing malocclusions, documentation of occlusal development across dentition stages, and timely preventive/interceptive actions where indicated.

The purpose of the study was to investigate changes in the prevalence and structure of dentofacial anomalies in a group of the same children over a 9-year observation period.

Materials and methods. A total of 768 children aged 6–16 years from School No. 121 in Odesa participated in the study. Of these, 46.4% were boys and 53.6% were girls. Twice a year, the children underwent dental examinations accompanied by oral cavity санation and professional oral hygiene.

During the examinations, the frequency and structure of dentofacial anomalies (DFA) and deformities, as well as dental caries, were studied. In 2007–2008, 129 children aged 6–7 years were selected from the examined population. In 2015–2016, 108 children from this group remained available and were examined (62 girls, 57.4%; 46 boys, 42.59%). The examination results were recorded in specially designed charts developed at the State Establishment "The Institute of Stomatology and Maxillofacial Surgery of the National Academy of Medical Sciences of Ukraine".

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 $p<0.01$.

Results of the study and their discussion. Among the examined children aged 6–7 years, 56 had no dentofacial anomaly pathology (57.85%: 28 girls [45.16%] and 28 boys [60.86%]). By the age of 12 years, the number of children in the same group without dentofacial anomaly pathology had decreased twofold to 28 children (18 girls and 10 boys).

At the age of 15 years, the number of healthy children without dentofacial anomalies in the same group had decreased to 26 (24.07%: 18 girls and 8 boys).

As can be seen from Table 1, almost half of the children already demonstrated pronounced anomalies in the late primary and early mixed dentition stages, which, in our opinion, were associated with heredity, harmful habits, insufficient masticatory load on the dentofacial system as a result of improper artificial feeding, and subsequent consumption of soft food.

We are born with a distal position of the mandible. During natural breastfeeding, an infant is engaged

Table 1

Frequency of dentofacial anomalies in children aged 6–15 years

DFA \ Age, Gender	6–7 years, n=108		12 years, n=108		15 years, n=108	
	Girls, n=62	Boys, n=46	Girls, n=62	Boys, n=46	Girls, n=62	Boys, n=46
Tooth anomalies	16 25.80%	2 4.34%	12 19.35%	10 21.73%	16 25.8%	8 17.39%
Diastema	14 22.58%	4 8.69%	16 25.8%	16 34.68%	16 25.8%	16 34.78%
Crowding	14 22.58%	2 4.34%	22 35.48	14 30.43%	24 38.70%	14 30.43%
Distal occlusion	14 22.58%	2 4.34%	14 22.58%	6 13.04%	14 22.58%	10 21.73%
Mesial occlusion	2 3.22%	2 4.34%	2 3.22%	1 2.17%	1 1.61%	1 2.17%
Deep bite	8 12.90%	6 13.04%	12 19.35%	8 17.39%	12 19.35	8 17.39%
Open bite	1 1.61%	0 0%	1 1.61%	0 0%	1 1.61%	0 0%
Oblique bite (crossbite)	0 0%	1 2.17%	1 1.61%	1 2.17%	1 1.61%	1 2.17%
Normognathic occlusion	16 25.8%	8 17.39%	28 45.16%	28 60.86%	24 38.70%	26 56.52%
Without pathology	28 45.16%	28 60.86%	18 29.03%	10 21.73%	18 29.03%	8 17.39%

in the feeding process for about 5 hours per day to obtain maternal milk. In this process, a mesially directed force acts on the mandible, stimulating its growth, whereas a distally directed force acts on the maxilla, restraining its growth and thereby forming a neutral jaw relationship.

A further 25% increase in the prevalence of dentofacial anomaly pathology occurs by the age of 12 years, mainly due to the replacement of primary teeth under conditions of insufficient jaw growth caused by inadequate functional load on the dentofacial system.

From 12 to 15 years of age, a slight increase in dentofacial anomaly pathology is observed (by 2%), due to the early extraction of primary canines and the subsequent lack of space for eruption of the permanent canines. In gender terms, up to the age of 7 years, a greater number of boys are found without pathology, whereas by the ages of 12 and 15 years, the number of girls becomes higher.

Correct molar relationship (normognathic occlusion) in the selected group at the age of 6–7 years was observed in 24 children (25.8% girls and 17.39% boys); however, these children simultaneously presented other dentofacial abnormalities such as tooth anomalies, diastema, and dental crowding.

By the age of 12 years, the number of children with correct molar relationship increased more than twofold, reaching 56 individuals (45.16% girls and 60.86% boys).

By the age of 15 years, the number of children in this group with a neutral molar relationship decreased slightly to 50. The increase in the number of children with correct molar relationship during the period from 6–7 years to 12–15 years was associated with the fact that, in some children who had been free of pathology at 6–7 years of age, the molar relationship remained unchanged by the age of 12 years, but additional tooth anomalies such as diastema, crowding, or their combination appeared.

In gender terms, age-related changes in this subgroup occurred in the same manner as in children in whom no dentofacial anomalies were identified.

The most common pathology among the examined children was dental crowding. This condition was detected in the study group at the age of 6–7 years in 16 children (14 girls and 2 boys). By the age of 12 years, the number of children with this pathology had increased more than twofold and reached 36 children (22 girls and 14 boys). By the age of 15 years, the number of children with dental crowding had increased to 38 (24 girls and 14 boys). It should be noted that at the age of 6–7 years, the prevalence of dental crowding in girls was 7 times higher than in boys. By the age of 12 years, the prevalence of this pathology in girls and boys became approximately equal, and the same ratio was observed by the age of 15 years.

In our opinion, this gender difference at an early age is associated with the fact that girls' development precedes that of boys by an average of 1–2 years, while the main increase in the prevalence of dentofacial anomalies occurs during the mixed dentition period.

Dental crowding occurs both as an isolated pathology and in combination with occlusal disorders, and arises in cases of discrepancy between jaw size and tooth size, being a consequence of reduced masticatory load on the dentofacial system. If there is no functional load, there is no need for the development of massive jaws.

The next most frequent deviation from normal was such a dentofacial anomaly as diastema. In the group of children aged 6–7 years, this pathology was detected in 18 children (14 girls and 4 boys). By the age of 12 years, the number of children with this pathology had doubled and reached 32 children (16 girls and 16 boys). By the age of 15 years, the number of children with diastema remained the same. Gender differences showed a pattern similar to that observed for dental crowding. It is known that the main etiological factor in the development of diastema is the attachment of the frenulum.

Indicators of anomalies of individual teeth in the 6–7-year-old group were observed in 18 children (16 girls and 2 boys). Later, by the age of 12 years, the number of children with these disorders had increased to 22 (12 girls and 10 boys). By the age of 15 years, this pathology had increased slightly (24 children).

Pathology of anomalies of individual teeth, as in the case of dental crowding, is a consequence of a discrepancy between jaw size and tooth size. An analogy can also be traced here with the gender differences observed in the prevalence of dental crowding.

The most common occlusal pathology was distal occlusion. Thus, in the group of children aged 6–7 years, this type of occlusion was detected in 16 children (14 girls and 2 boys). By the age of 12 years, this pathology in the group had already been identified in 20 children (14 girls and 6 boys), and by the age of 15 years, the number of children with distal occlusion amounted to 24 (14 girls and 10 boys).

The prevalence of deep bite among the examined children was somewhat lower. Thus, in children aged 6–7 years, deep bite was observed in 14 individuals (8 girls and 6 boys). By the age of 12 years, this indicator had increased in the examined group, and the number of children with this pathology reached 20 (12 girls and 8 boys). By the age of 15 years,

the situation regarding deep bite in the children had remained practically unchanged.

Mesial occlusion was observed in the group of children aged 6–7 years in 4 individuals (2 girls and 2 boys). By the age of 12–15 years, this pathology had decreased as a result of treatment.

Oblique bite was noted in the 6–7-year-old group in 1 boy. By the age of 12 years, this pathology was observed in 2 children (1 girl and 1 boy). By the age of 15 years, the situation remained unchanged.

Such a pathology as open bite was observed only rarely.

The structure of dentofacial anomalies in the observed group of children is presented in Table 2.

As can be seen from Table 2, among 108 examined children aged 6–7 years, dentofacial anomalies were detected in 52 (34 girls and 18 boys). Tooth anomalies were found in 18 children, diastema in 18, dental crowding in 16, distal occlusion in 16, deep bite in 14, mesial occlusion in 4, open bite in 1, and normognathic occlusion in 24. A marked gender difference was observed here, associated with the earlier eruption of permanent incisors in girls, which leads to crowding in the anterior segment, primarily in the mandible. By the age of 12 years, the number of children with dentofacial anomalies had increased to 80 (44 girls and 36 boys) out of 108 examined children. Tooth anomalies were found in 22 children, diastema in 32, dental crowding in 36, distal occlusion in 20, mesial occlusion in 2, deep bite in 20, open bite in 1, oblique bite in 2, and normognathic occlusion in 6. By the age of 15 years, the structural indicators of dentofacial anomalies had changed only minimally.

Analysis of the children's examination charts indicates that the same child often exhibited a combination of several types of disorders. Thus, among 40 children with distal occlusion, deep bite was detected in 12 cases. In one case, deep bite was combined with oblique bite.

In practically all cases of pathological occlusion, such pathologies as dental crowding, diastema, or tooth anomalies were observed, and in some cases, their combination. Thus, by the age of 15 years, among 82 children in whom a neutral molar relationship (Angle Class I) had been recorded, 49 had such pathology as diastema and dental crowding.

Conclusions. The conducted studies demonstrated the presence of gender differences in dentofacial anomalies, with dentofacial anomalies being observed significantly more often in girls than in boys. In view of the fact that no secondary deformities of the dental arches were observed, it may be concluded that regular oral cavity sanitation is a reliable means of preventing their occurrence. The main proportion of dentofacial deformities manifests during the mixed dentition period and persists into the permanent dentition.

Throughout the entire observation period, we did not identify a single case of self-regulation of dentofacial anomalies.

Among pathological occlusions, distal occlusion and deep bite were the most common, and they were frequently combined, which confirms our opinion

Table 2

Structure of dentofacial anomalies in children aged 6–15 years

Age, Gender / DFA	6–7 years, n=52		12 years, n=80		15 years, n=82	
	Girls, n=34	Boys, n=18	Girls, n=44	Boys, n=36	Girls, n=44	Boys, n=38
Tooth anomalies	16 47.05%	2 11.11%	12 27.27%	10 27.77%	16 36.36%	8 21.05%
Diastema	14 41.17%	4 22.22%	16 36.36%	16 44.44%	16 36.36%	16 42.10%
Crowding	14 41.17%	2 11.11%	22 50.0%	14 38.88%	24 54.54%	14 36.84%
Distal occlusion	14 41.17%	2 11.11%	14 31.81%	6 16.66%	14 31.81%	10 26.31%
Mesial occlusion	2 5.88%	2 11.11%	2 45.45%	1 2.77%	1 2.27%	1 2.63%
Deep bite	8 23.52%	6 33.33%	12 27.27%	8 22.22%	12 27.27%	8 21.05%
Open bite	1 2.94%	0 0%	1 2.27%	0 0%	1 2.27%	0 0%
Oblique bite (crossbite)	0 0%	1 5.55%	1 2.27%	1 2.77%	2.27%	1 2.63%
Normognathic occlusion	16 47.05%	8 44.44%	28 63.63%	28 77.77%	24 54.54%	26 68.42%

regarding insufficient mandibular development caused by inadequate functional load on the dentofacial apparatus. This phenotypic variability is inherited.

Because the vast majority of dentofacial anomalies arise during the early mixed dentition period, treatment of children with dentofacial anomalies should begin during this same period, while prevention should start even earlier.

In addition, it is necessary to carry out educational work with parents regarding the importance of natural breastfeeding and masticatory load on the dentofacial apparatus for the harmonious development of the jaws.

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