

PRACA POGLĄDOWA
REVIEW ARTICLE

ANALYSIS OF RISK FACTORS OF ORTHODONTIC PATHOLOGY: LITERATURE REVIEW

ANALIZA CZYNNIKÓW RYZYKA ZABURZEŃ ORTODONTYCZNYCH: PRZEGLĄD LITERATURY

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ABSTRACT

Introduction: The high dental morbidity of children's population of Ukraine remains one of the topical medical problems of nowadays: in different age groups the frequency of cases of caries, periodontal diseases, developmental disorders and teeth formation is steadily increasing. In recent years, due to the effect of a large number of various etiological factors the frequency of tooth-jaw abnormalities in children has increased significantly.

The aim: The main issue of the study was a comprehensive analysis of literary sources on the risk factors for orthodontic pathology in children.

Materials and methods: Analytical, bibliosemantic, systematic approach.

Review and conclusions: The main cause of an increasing of the prevalence of orthodontic pathology in children is the existence of persistent factors contributing to the formation of this pathology and maintains its stable high level among the population. Only eliminating or reducing the negative impacts of the most significant risk factors that affect the onset of orthodontic pathology, can reduce their prevalence.

KEY WORDS: orthodontic pathology, risk factors, dental anomalies

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INTRODUCTION

The current growth of the pace of life, urbanization, lowering of the quality of food, increasing of the stress level, environmental degradation affects the level of morbidity of the population, especially on the health of the children's population. The health of children and adolescents, including dental ones, is one of the most sensitive indicators that reflect the social and economic situation in Ukraine, the state of the environment, and is an indicator of the well-being of society. The high level of dental morbidity in the children's population of Ukraine remains one of the most urgent medical problems for many years: the frequency of cases of caries, periodontal diseases, developmental disorders and teeth formation has steadily increased in different age groups.

THE AIM

The main issue of the study was a comprehensive analysis of literary sources on the risk factors for orthodontic pathology in children.

MATERIALS AND METHODS

During the research, analytical, bibliosemantic, systematic approach methods were used.

REVIEW AND DISCUSSION

In recent years, the frequency of tooth-jaw abnormalities in children population has significantly increased, due to the effect of a large number of various etiological factors [1, 2, 3, 4, 5].

The probability of the causative factor is well understood in the very well-accepted term "risk factor". In this term, not the absolute force of this reason is shown, but only its possible effect, which under certain conditions may be quantified. This quantitative characteristic is determined by the frequency of the reproduced events [6].

Causes of tooth-jaw abnormalities are extremely diverse. All types of risk factors are divided into three groups on the manageability of their influence: "managed", "difficult to manage", "unmanaged". Most of all risk factors are manageable, that is, timely removal or relaxation of their action prevents the formation of tooth-jaw abnormalities. "Managed" risk factors for the formation of dental anomalies include: reduced or elevated level of fluoride in drinking water; reduction of immunological reactivity of the organism (frequent catarrhal diseases, rickets, etc.); early artificial feeding of infants; wrong position of the body (posture) during sleep and sitting at the table; predominance in the diet of soft food; impaired breathing, swallowing, chewing function; inappropriate use of nipples - dummies; bad habits (sucking fingers, objects, language,

lips, etc.). The “difficult to manage” risk factors include chronic and acute mother’s diseases during pregnancy; pregnancy toxicosis, the threat of abortion, the presence of anemia, premature and postpartum childbirth; complications during childbirth; asphyxia, hypotrophy, hemolytic disease, allergic and infectious diseases of the child, etc. “Unmanaged” risk factors include factors that we can not influence, such as heredity [7].

Factors that lead to the development of tooth-abdominal anomalies in the literature are also divided into endogenous and exogenous, and in the course of their actions - on the innate and acquired.

The etiopathogenetic mechanisms of development of tooth-jaw abnormalities should be considered starting from the intrauterine period, when the action of various etiological factors leads to pathological morphofunctional changes in the dento-jaw system [8].

The formation of bite and functions of the maxillofacial area begins in the fetal period, in close connection with the formation of tissues and organs of the head, neck and the entire bone and muscular system. This process continues after birth and finishing mainly until the age of 15 years.

In the formation of bite and its functions there is distinguish six main periods:

I - intrauterine period

II - period of newborn (from birth to 6 months);

III - period of formation of temporary bite (from 6 months to 3 years);

IV - period of the formed temporary bite (from 3 to 6 years);

V - period of mixed bite (from 6 to 12 years);

VI - period of formation of constant bite (from 12 to 15 years).

The tabling of the maxillofacial area and the formation of congenital functions occurs in the intrauterine (fetal) period [9].

The influence of various endo- and exogenous factors that cause the onset and formation of orthodontic pathology can take place at all stages of the formation of the maxillofacial area.

ANTENATAL FACTORS

According to the literature dates, the risk factors that have the greatest impact on the occurrence of dental anomalies there are antenatal factors [10, 11, 12]: short term after previous childbirth in the mother, complications of pregnancy and childbirth, etc. The burdened antenatal history increases the risk of buccal pathology formation by 3.7 times, the development of hypoplasia of enamel in 1,8 times, the development of caries of temporary teeth - 1.3 times among children population from 1.5 to 15 years old [13].

In the antenatal period, the jaw deformation becomes possible due to prolonged pressure on the fetus, which increases with an excess of amniotic fluid, with performing of large physical activity (sports, work), with wearing of a tight “masking” clothing, with excessive nutrition [9].

Proskokova S.V. and his co-authors (2008) conducted a detailed study of the course of pregnancy in mothers whose children had tooth-maxillary anomalies. As a result

of the study, it was found that in over 55% of children with dental anomalies, the pregnancy of the mother occurred with complications in the first and second trimesters. The greatest percentage was due to pregnancy complicated by gestosis, anemia and the threat of pregnancy interruption [14]. Premature infants born to mothers with pregnancy toxicity and diseases of the cardiovascular system, tooth-jaw abnormalities are observed in 40% of cases.

According to scientists views, at the present time, there are no qualitative methods for predicting the development of tooth-maxillary anomalies in children due to medical and social risk factors of a pregnant woman; an algorithm of measures for elimination of adverse risk factors that does not allow to reduce the frequency of this pathology in children is not developed. Therefore, the search for ways for prediction of the development of tooth-jaw anomalies in children, by using of the antenatal risk factors of a pregnant woman is very relevant, there is a need for further research in the prevention of this pathology. Based on the study of the influence of medical and social antenatal risk factors on the occurrence of dental anomalies in preschool children, an algorithm for their prognosis and prevention of these diseases should be developed. [15].

One of the most effective ways of solving this problem is the mandatory involvement of family physicians and pediatricians in the implementation of prevention aimed at reducing the impact of antenatal risk factors [16, 17, 18, 19].

Heredity also plays a significant role in the development of dental anomalies, because the features of the structure of the facial skeleton, the size and shape of the teeth, jaws, dental arches, and the soft tissue profile of the person are transmitted from parents to children. [20, 21]. However, the proportion of hereditary anomalies is small and approximately 14% of the total number of cases.

POSTNATAL FACTORS

As it confirmed by many studies, there is many groups of factors (causes) that can lead to orthodontic pathology, in the postnatal period of the child’s life [22, 23, 24].

Functions of the maxillofacial area (sucking, chewing, swallowing, speech, breathing) are the most significant of a number of postnatal factors that influence the bite formation [25, 26]. In order to avoid problems with the formation of bite, it is necessary to ensure that all functions of the maxillofacial area are formed timely and correct, and in a timely manner prevent the emergence of bad habits and the development of dental caries. In case of occurrence of deviations in the formation of breathing, swallowing, sucking functions as soon as possible, make efforts to normalize these functions.

Frequent cause of the development of anomalies of the tooth-jaw system is also a violation of the physiological balance of the muscles of the maxillofacial area. Formation of pathological types of occlusion is 2-3 times more common in artificial feeding of newborn babies than in children with natural feeding [27, 28]. It should be noted that the presence of one or several etiological factors leads to the appearance of other (cascade), thereby increasing the existing pathology [29].

General somatic diseases. An important role in the development of caries process in children is associated with diseases of the gastrointestinal tract, central and autonomic nervous system, different endocrinopathy, kidney disease, which is caused by a violation of mineral metabolism in these pathological conditions. Delay in physical development as a result of secondary disorders of metabolic processes also contributes to the development of deformations of the tooth-jaw system [30].

An analysis of the results of a comprehensive epidemiological survey [31] of 1562 children of preschool age revealed in 75,36% of the surveyed the presence of general-somatic diseases. The most commonly was found pathology of the organs of the digestive system - 30.02% (469 people). During the dental examination of this category of children in 68.65% of cases (322 persons) defects of the dentition were detected.

With concomitant diseases of other systems of the body, in particular with otorhinolaryngological pathology, the violation of the dental-jaw system is detected from 60% to 90% of cases. Among the anomalies in the form of dental rows in the transversal plane, the narrowing of the tooth rows in the permanent bite on the lower jaw occurs in 37.8% of cases, and in the upper jaw - in 57% of the cases. The distortion of the nasal septum and adenoid vegetation is the most relevant for the formation of maxillo-facial anomalies [32].

Among early childhood illnesses that cause tooth-maxillary anomalies, it is necessary to note rickets in which there is insufficient growth of the bones of the skull base and its height decrease, flattening of the neck, narrowing of the upper jaw, high ghost palate, lagging jaw growth [33].

Another factor that has a significant effect on the correct formation of the maxillofacial area is the trauma of this area [34].

Harmful habits. The presence of harmful habits in children is one of the important factors that leads to the occurrence of orthodontic pathology [35, 36]. In the examination of 12-year-old children (600 persons), tooth-jaw-drop anomalies were detected in 407 persons, which is $67.8 \pm 1.92\%$, while the harmful habits are found in 230 children ($56.5 \pm 3.27\%$) [35].

Caries. Caries of temporary and permanent teeth are one of the most important causes of orthodontic pathology. Caries and its complications (which in 78% of cases lead to defects in certain teeth and dentitions) is one of the main causes of teeth loss in early childhood [37, 38]. The problem of the high level of caries morbidity among the children of preschool age remains relevant both in Ukraine and in other countries. As an example, among the children of Poltava prevalence and intensity of caries are 36.08% and 1.11 for 4 years old children; 51.35% and 1.87 - 5 years old; 66.03% and 4.35 - 6 years old [39, 40, 41].

Such a risk factor as early loss of teeth - before their physiological change, which is associated with the removal of temporary teeth affected by caries, deserves of special attention. Early removal of any of the temporary teeth violates the structure of the dentition, which is lead to a change in the function of the

teeth, initially has a adaptive nature, and later becomes an etiological factor in the occurrence of tooth-jaw deformations [42].

The level of fluorine in drinking water. One of the exogenous factors is the influence of an unfavorable environment (high levels of fluorine in drinking water) on the human body as a whole, as well as on the formation of its organs and systems, including the dental-jaw system. In Ukraine, tooth-maxillary anomalies occupy a significant place and their prevalence is on average 40-65% [43, 44], and in regions with a high level of fluorine content in drinking water, which are Kharkiv, Kyiv, Donetsk, Sumy, Lviv, Poltava regions, etc., more than 80% [45, 46, 47].

Climate. Studies by several authors emphasize the negative impact of natural and climatic factors on the somatic health of children, which is closely related to the correct formation of the tooth-jaw area. For example, the high proportion of sagittal anomalies (36.1%) in some regions is due to the influence of climatic features: sharply continental climate, negative average annual temperature, which in turn are etiological factors in the development of acute respiratory diseases. In the analysis of registration cards surveyed patients have established that the average magnitude of the multiplicity of diseases for acute respiratory infections not less than 3-4 times a year. Conservative treatment for adenoiditis and adenoids was carried out in 74.2% of cases [48].

Socio-economic factors. Socio-economic factors, according to research data, occupy a significant place among the causes of orthodontic pathology [49]. For example, during an epidemiological survey of 528 children of boarding schools and 122 children of a general school (control group) at the age of 7, 9, 12 and 15 years of the city of Lviv, the results of the study showed that the prevalence of tooth-jaw abnormalities in the examined children of the main group is $84,09 \pm 1,59\%$, in control group its level is significantly lower - $66,39 \pm 4,28\%$ ($p < 0,05$). In the course of the survey, no children were found, among the surveyed children of boarding schools that would be on orthodontic treatment. At the same time, among the children of the control group these were fixed at level $19,67 \pm 3,60\%$. [50].

CONCLUSIONS

Thus, according to scientific literature, the reason for the increase in the prevalence of tooth-maxillary anomalies and deformations in children is the existence of persistent risk factors that contribute to the formation of this pathology and maintain a stable level of it among the population. In accordance with modern scientific concepts, orthodontic pathology is one of the multifactorial diseases and it arises as a result of the complex interaction of a large number of endogenous and exogenous factors, that is, the development of orthodontic pathology has a polyetiological character. Only by eliminating or reducing the negative impact of the most significant risk factors that affect the development of tooth-maxillary anomalies and deformities can reduce their prevalence.

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Conflict of interest:

The Authors declare no conflict of interest.

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