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ОГЛЯДИ

PATHOLOGY OF THE THYROID GLAND IN CHILDREN AS A FACTOR OF DENTAL MORBIDITY (mini review)*

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According to the WHO reports, pathologies caused by thyroid diseases and developing as a consequence of iodine deficiency rank the third place in the list of 38 most common non-communicable diseases. About 30% of all people around the world are at risk of developing iodine deficiency disorders. Various types of thyroid disorders are registered in about 300 million people [1, 2].

The high prevalence of thyroid diseases is a special challenge for Ukraine that is associated with radiation exposure as a result of the accident at the Chernobyl Nuclear Power Plant against the background of stable iodine deficiency [3–5].

It has been reported that the frequency of thyroid disorders in children not only has been decreasing, but has been increasing thus occupying a leading place among all endocrine disorders [6–8].

According to the data of the Endocrinological Service of Ukraine, over the recent years there has been a tendency towards the increase in the prevalence of endocrine diseases among children; and the percentage of children diagnosed with these disorders has tripled over the last ten years [6–8].

As stated by the official statistics of the Ministry of Public Health of Ukraine, endocrine disorders are the fourth in the structure of the overall pediatric morbidity, primarily due to thyroid pathology [6, 9].

In 2015, thyroid disorders were found predominant in the overall incidence of endocrine diseases: diffuse goitre (I stage) constituted 38.2%, diffuse goitre (II–III stages) made up 2.64%. The incidence rate of other thyroid disorders including hypothyroidism, nodular goitre, thyrotoxicosis, thyroiditis, post-operative hypothyroidism was reported as lower [7, 8].

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There has been found out children with thyroid disorders demonstrate a high prevalence of common oral and dental diseases, including dental caries [10–16]. The tendency to more active progression of dental caries in the children with thyroid disorders due to possible impairment of mineral metabolism in comparison with the children without endocrine pathology necessitates searching for effective preventive measures to support oral health for this group of children. Thyroid disorders have manifestations, which should be considered before, during and after any dental treatment. All mentioned above emphasizes the relevance of the issue we are investigating and requires further more detailed study.

The **aim** of this investigation is to analyze scientific sources on the prevalence of oral and dental diseases in children with thyroid disorders in order to determine the effective therapeutic and preventive measures, which would contribute to the oral health of the children.

DISCUSSION

There are recent reports confirming thyroid hormonal disorders are among the risk factors for focal demineralization of dental enamel, non-carious lesions of hard dental tissues, inflammatory processes in periodontal tissues; they can lead to delayed root resorption of temporary teeth, delayed eruption of both temporary and permanent teeth, impaired tooth eruption patterns, inadequate root length. Thyroid hormonal disorders can also contribute to the development of dentomaxillary anomalies, occlusion anomalies, dehiscence and fenestration of alveolar bone, etc. [17—21].

In her work Novikova N. P. (2011) provided hard evidence that the extent and severity of the diseases of the hard dental tissues change in synchrony with on the severity and duration of hypothyroidism. The prevalence of dental disease in patients with hypothyroidism is 17.4% higher than in healthy individuals. The patients with hypothyroidism have been found out to have separate carious lesions and caries complications of masticatory teeth that lead to the tooth extraction in 86.9–98.9% of cases. The patients with hypothyroidism demonstrate a 3-fold increase in the dental enamel solubility and a decrease in the rate of dental enamel remineralisation [22].

Allbritten J. R. (2019) demonstrated that the course of hypothyroidism can be accompanied with salivary gland enlargement, macroglossia and glossitis, dysgeusia (distortion of the sense of taste), delayed teething, enamel hypoplasia in temporary and permanent occlusion, front bite, periodontitis. In cases of hyperthyroidism the researcher points out an increased risk of caries and periodontitis, osteoporosis of the upper and lower jaw, accelerated tooth eruption, systemic lupus erythematosus, enlargement of the pancreas, burning mouth syndrome, Sjogren's syndrome [23].

Dharmani C. K. (2017) states children with thyroid pathology demonstrate poor oral hygiene habits and increased prevalence of caries and periodontal disease [24].

Kuznyak N. B. and Hodovanets O. I. (2013) contributed much to the investigation of the prevalence and intensity of hard dental lesions and periodontal diseases in children with diffuse non-toxic goitre [17]. The authors have demonstrated that carious lesions are registered in 88.9% of cases among children, the prevalence of caries is 80%, which is interpreted as high and widespread; the intensity of dental caries is also high and ranges from 3.1 to 4.2 affected teeth per an examined individual and correlates with the severity of the disease. There has been found out a significant prevalence of complicated forms of caries in permanent teeth, reaching 71% of children. Frequent gingival bleeding is reported as an alarming sing of periodontal diseases. The values of oral hygienic indices have demonstrated an unsatisfactory level of oral care in all children.

A number of national and international sources evidence the impact of thyroid disorders on the dental structure as thyroid hormones play an important role in the mesenchymal differentiation of tooth germ (dentinogenesis) and epithelium (amelogenesis) [15, 25–27]. The formation of thyroid function occurs earlier than functions of others glands in human embryogenesis and coincides with the period of formation of the germs of temporary teeth: during the 10^{th} week of gestation ameloblasts are formed; during the 12^{th} week of gestation odon-

toblasts start to develop; the 16th week of gestation is the period when dentinogenesis and amelogenesis begins; during the 17th week of gestation the development of permanent teeth begins.

Hypothyroidism in the second half of pregnancy is reported to result in the delayed tooth eruption, abnormalities in the dental enamel development, and systemic hypoplasia, an insufficient formation of elements of dental tissues. Congenital hypothyroidism in the baby may also be due to iodine deficiency in the mother and the formation of antibodies to thyroid receptors in the foetus.

There are strong facts pointing to the impact of thyroid hormones in cases of thyroid disorders in children on metabolic processes that can be regarded as a risk factor for various non-carious lesions of the hard dental tissues. The commonly known clinical anomaly of the dental enamel is systemic hypoplasia, which is observed in some types of hypothyroidism (myxedema, cretinism, endemic goitre). Different etiology of hypothyroidism (reduced thyroid function in some cases and iodine deficiency in others) may manifest with the following enamel lesions: transverse grooves, ripples, strokes, pits, white and yellow spots [24, 26, 27].

Assessment of the hypoplasia localization at different levels of dental crowns enables to determine with high accuracy the stage of tooth development, at which the effect of pathogenetic factor was the most significant as well as to determine the severity and type of hypoplasia. Typically such teeth are described as «corrugated», «lattice», «ugly» [24, 26, 27].

Venkatesh-Babu N. S., Patel P. B. (2016) also point to the enamel defects in patients with thyroid dysfunction. These enamel defects can range from small white spots to diffuse or limited opacity. The presence of enamel defects is influenced by changes in the level of thyroid hormones during tooth mineralization. Enamel defects are found in both temporary and permanent teeth. Besides of increased susceptibility to dental caries and signs of inflammation of periodontal tissues, the children are also found out to have the most common oral manifestations as macroglossia (46%), open bite (23%) and changes in tooth eruption timing, delay in most of cases (33%) [12].

A recent study by Pavlov T. V. et al (2012) concluded that patients with hypothyroidism have an increase in values of the OHI-S index and the oral hygiene index. In hypothyroidism, the function of the salivary glands changes: the saliva becomes more viscous that deteriorates oral self-cleaning and, accordingly, the oral hygiene index grows. This proves the relationship between the presence of the disease and an increase in the number of dental layers [25].

Prior research of Artemenko T. V. and Saharuk N.A.(2014) illustrated that patients with hypothyroidism have significantly higher indicators characterizing the diseased periodontal tissues (gingival index (GI) and complex periodontal index (CPI)) and caries intensity (DEF index), and lower indicators of the oral hygiene level (OHI-S index). They also showed the relationship between the severity of endocrine disorders and oral and dental status. When comparing the severity of endocrine pathology with the deft index, a higher correlation was found out; the comparison of the severity of endocrine pathology with the OHI-S, GI and CPI index values demonstrated a moderate correlation [28].

According to the work of Kovach I. V. and Volyak L. M. (2012), 50% of pediatric patients with endemic goitre were diagnosed to have decompensated type of dental caries, 31% of the children showed signs of systemic and focal hypoplasia of teeth, and 23% of the children had dental caries and enamel hypoplasia simultaneously. In general, systemic enamel hypoplasia was found in 93% of the patients that indicates profound metabolic disorders in epidemic goitre. Having analyzed the data obtained, the authors claim that among the clinical types of systemic enamel hypoplasia in children with endemic goitre, there are 43%, who have spotted or chalky-dotted types, 24% of the children have grooved and dashed, and only 8% of the children have the most severe lesions of a destructive type in hard dental tissues. Densitometry revealed 25% of cases of osteopenia, which were accompanied by severe symptoms of maxillofacial deformities [26, 29].

The reports of Kolesnyk K. O. (2012; 2014) evidence the thyroid disorders including diffuse goitre of I–III degrees, autoimmune thyroiditis, congenital hypothyroidism are asso-

ciated with high frequency of dentomaxillary anomalies. The most pronounced abnormalities in dentofacial system is diagnosed in children with congenital hypothyroidism in all age groups (90.6% of cases in 6–7 year old children, 93.5% of cases in 12 year old children, 90.33% of cases in 15 year old children) [30, 31]. The studied have confirmed that children with autoimmune thyroiditis, congenital hypothyroidism and diffuse nontoxic goitre tend to have low levels of oral hygiene, pronounced intensity of inflammation in periodontal tissues; children with diffuse non-toxic goitre demonstrate the highest values of gingival bleeding index. Findings of biochemical studies have shown the children with dental anomalies and diffuse non-toxic goitre have an increased metabolic activity of osteoclasts and bone resorption against the background of suppression of osteoblast function and bone formation; the children also demonstrate reducing local and systemic adaptive responses. It should also be emphasized that the orthodontic movement of the teeth in experimental goitre provokes a sharp increase in the resorption of bone tissue of the alveolar process and demineralization of the hard dental tissues that is clinically relevant [31, 32].

CONCLUSION

This review article provides the thorough analysis of relevant national and foreign sources elucidating the relationship between thyroid disorders and their impact on the development of dental and oral diseases in children. The data presented in special literature give strong evidence of the relationship between the oral mucosa lesions, periodontal diseases and thyroid disorders in children.

Based on the results, it can be concluded that different types of goitre are associated with focal and systemic hypoplasia in temporary and permanent dentitions, macroglossia and glossitis, dysgeusia, salivary gland enlargement, changes in the tooth eruption patterns, dentofacial anomalies and deformities. Children have been found out to demonstrate higher prevalence and intensity of dental caries and its complications, a higher percentage of periodontal tissue damage that necessitates further detailed study of dental status in concomitant thyroid pathology in order to establish causal relationship and to elaborate the effective preventive measures to reduce oral and dental diseases.

The further development of diagnostic algorithms and strategies for integrated treatment and prevention of common dental and oral diseases in children with thyroid disorders is of paramount clinical importance. Therefore, the cooperation between dentists and endocrinologists is an indispensable component of effective and safe treatment of dental diseases in children with thyroid disorders.

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Introduction. According to the data of the Endocrinological Service of Ukraine, over the recent years there has been a tendency towards the increase in the prevalence of endocrine diseases among children; and the percentage of children diagnosed with these disorders has tripled over the last ten years. There has been found out children with thyroid disorders demonstrate a high prevalence of common oral and dental diseases, including dental caries. All mentioned above emphasizes the relevance of the issue we are investigating and requires further more detailed study.

The aim of this investigation is to analyze scientific sources on the prevalence of oral and dental diseases in children with thyroid disorders in order to determine the effective therapeutic and preventive measures, which would contribute to the oral health diseases of the children.

Materials and methods. The methods of systematic, analytical and semantic bibliography analysis of studying the modern view of the relationship between thyroid disorders and their impact on the development of dental and oral diseases in children were applied to search for the information.

Discussion. There are recent reports confirming thyroid hormonal disorders are among the risk factors for focal demineralization of dental enamel, non-carious lesions of hard dental tissues, inflammatory processes in periodontal tissues; they can lead to delayed root resorption of temporary teeth, delayed eruption of both temporary and permanent teeth, impaired tooth eruption patterns, inadequate root length. Thyroid hormonal disorders can also contribute to the development of dentomaxillary anomalies, occlusion anomalies, dehiscence and fenestration of alveolar bone, etc.

Conclusions. This review article provides in-depth analysis of recent sources on the issue of oral findings in children with thyroid disorders. The article highlights the impact of thyroid diseases and dysfunctions on the development and progression of oral and dental diseases in childhood. A number of foreign and national researches report on the relationship between the thyroid functioning and oral health in children. This work investigates the prevalence, intensity and severity of hard dental tissue affection, periodontal diseases, dentofacial abnormalities and oral hygiene status in children with thyroid disorders.

Key words: children, thyroid gland disorders, dental and oral diseases.

ПАТОЛОГІЯ ЩИТОПОДІБНОЇ ЗАЛОЗИ У ДІТЕЙ ЯК ФАКТОР СТОМАТОЛОГІЧНОЇ ЗАХВОРЮВАНОСТІ (огляд літератури)

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Актуальність. Згідно даних ендокринологічної служби України за останні роки спостерігається тенденція до збільшення поширеності захворювань ендокринної системи серед дитячого населення. Встановлено високу поширеність основних стоматологічних захворювань, в тому числі карієсу у дітей із патологією щитоподібної залози. Все вищеперераховане вказує на актуальність проблеми, яку ми розглядаємо, та потребує подальшого більш детального вивчення.

Мета роботи — проаналізувати наукові джерела з питань поширеності стоматологічної патології у дітей із хворобами щитоподібної залози для визначення лікувально-профілактичних заходів, які будуть попереджати розвиток стоматологічних захворювань у дітей.

Матеріали та методи. Для пошуку інформації були застосовані методи систематичного, аналітичного та бібліосемантичного аналізу вивчення сучасного погляду на взаємозв'язок розладів щитоподібної залози та їх впливу на розвиток захворювань зубів та порожнини рота у дітей.

Основна частина. У сучасній науковій літературі є відомості, що гормональні порушення щитоподібної залози є фактором ризику розвитку осередкової демінералізації емалі, некаріозних уражень твердих тканин зубів, запальних процесів в тканинах пародонту, призводять до затримки розсмоктування коренів тимчасових зубів, затримки прорізування як тимчасових, так і постійних зубів, а також порушення їх послідовності, затримки росту кореня у довжину, зубо-щелепних аномалій, аномалій прикусу, кореневої резорбції, дигесценції і фенестрації альвеолярної кістки та ін.

Висновок. В статті наведені данні літературних джерел, які висвітлюють питання актуальності проблеми проявів захворювань щитоподібної залози у порожнині рота дітей. Проведено аналіз отриманих даних відносно впливу захворювань, дисфункції, тиреопатій на формування стоматологічної патології в дитячому віці. В останні роки більшість закордонних та вітчизняних авторів спостерігають взаємозв'язок захворювань щитоподібної залози із стоматологічним здоров'ям дітей. На підставі даних спеціалізованої літератури досліджено залежність між ураженням твердих тканин зубів, тканин пародонту, станом гігієни порожнини рота, патологією прикусу та захворюваннями щитоподібної залози у дітей.

Ключові слова: діти, захворювання щитоподібної залози, стоматологічна патологія.