HEALTH, ENVIRONMENT, DEVELOPMENT

CONDITION OF HARD TISSUES OF TEETH IN CHILDREN WITH CEREBRAL PALSY

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Summary

The data we obtained on the prevalence of dental caries in children with cerebral palsy indicate a mass incidence, according to the WHO, 95.83 ± 3.29% (in the control group – 41.67 ± 2.29%) with the intensity of the lesion 9, 96 ± 0.21 conventional units for dental caries and 10.32 ± 0.48 conventional units for carious cavities. Analyzing the structure of the DMF index, it should be noted that dental caries is 5.57 ± 0.22, filled teeth – 2.34 ± 0.28, extracted teeth – 1.89 ± 0.1. Acute initial caries of permanent teeth was found in 45.83% of cases with an average intensity of 4.05 ± 0.21 conditional units. The evaluation of the oral hygiene index according to the OHI-S index showed its low index and, accordingly, the "good" state of oral hygiene in only 12.5% of cases. The average value of the OHI-S index and, accordingly, a "satisfactory" state of hygiene was recorded at 25.0%, a high index of OHI-S ("unsatisfactory" hygiene) – at 29.17% and a very high index of OHI-S ("poor" hygiene) – in 33.33% of cases. The evaluation of the timing of teeth eruption revealed a delay in their eruption in 45.83% of patients. The analysis of the condition of the hard tissues of the teeth, in particular acute initial caries, shows that motility disorders in children with cerebral palsy require corrective exercises to form the manipulative function of the hand, improve skills and abilities related to the performance of individual oral hygiene.

Key words: teeth, diseases, initial dental caries,oral hygiene,children.

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1. Introduction

The problem of childhood morbidity in Ukraine is of particular importance, since deep socio-economic problems have a negative impact on children's health indicators, including dental health. Today, according to the WHO, dental caries is the most common non-communicable

disease and a serious health problem worldwide. According to the Global Burden of Disease Study *(Dye B.A., 2017)*, oral diseases affect about 3.5 billion people worldwide. Among the most common conditions, the first place is occupied by caries of permanent teeth (2.3 billion people) and the 12th place is caries of temporary teeth (560 million children) *(World Health Organizatin. Oral health, 2020)*.

The health of a child's body is considered as an integral indicator that is formed as a result of the action of a complex complex of interconnected and mutually determined factors, including general somatic, psychoneurological diseases, various functional disorders *(Denga O.V. et al., 2012; Gevkaliuk N.O. et al., 2019; Savychuk NO. et al., 2013; Smoliar N.I. et al., 2020)*. Cerebral palsy (CP) takes the leading place in the structure of chronic childhood diseases. According to world statistics, the number of children with cerebral palsy is 1.7–7 per 1000 healthy children *(WHO, 2004)*, in Ukraine at present this indicator is an average of 6 per 1000 healthy children.

It is known that cerebral palsy is characterized by a delay in physical and neuropsychological development, and common to all patients with cerebral palsy are difficulties in controlling conscious movements and coordinating muscle work. A child with cerebral palsy often cannot coordinate and act skillfully with his fingers, so even a simple movement, including brushing his teeth on his own, is difficult to perform. At the same time, it is known that individual hygienic care of the oral cavity as prescribed by a dentist is one of the simplest and generally available methods to prevent dental diseases, in particular, dental caries *(Dienha O.V. et al., 2014; Kaskova L.F. et al., 2018; Pavlenkova O.S. et al., 2020).*

2. Goal of research – study of the prevalence and intensity of dental caries, index assessment of oral hygiene in children with cerebral palsy.

3. Materials and methods of research

The research was conducted on the basis of the Rokada "House of Mercy" charity organization (Chortkiv, Ternopil region), which takes care of children with special needs, in particular, with psychoneurological diseases. We performed a dental examination of 24 children with cerebral palsy aged 10-12 years who made up the main group. The control group consisted of 24 practically healthy children of the same age, who were examined on the basis of secondary school No. 2 in Chortkiv.

When conducting clinical research, the main provisions of the GCP (1996), the Helsinki Declaration of the World Medical Association on the Ethical Principles of Scientific Medical Research with Human Participation (1964–2013), the Council of Europe Convention on Human Rights and Biomedicine (1997), the order of the Ministry of Health were observed of Ukraine No. 690 (dated September 28, 2009), Order No. 616 (dated August 3, 2012) and Order No. 685 (dated October 20, 2015). The following factors were taken into account for children's participation in clinical research: a) informed consent of parents to conduct research; b) verified clinical diagnosis. Given the low level of communication ability of the children of the main group, we chose the methods of clinical research according to the following criteria: minimal invasiveness, ease of implementation, short-term duration, and informativeness.

During the initial examination, all examined children underwent an index assessment of individual oral hygiene.

The state of individual oral hygiene was determined clinically and according to the OHI-S (Green-Vermillion) oral hygiene index *(cit. for Zabolotnyi T.D., 2013).* Determining dental status included filling out the dental formula and matching it to the child's age. According to the recommendations of WHO, the prevalence and intensity of dental caries were evaluated according to the DMF, DMF + dm_t and DMF + dm_m indices. The indicator of dental caries intensity was interpreted according to the recommendations of L. F. Kaskova *(Kaskova L. F., 2011).*

Demineralization of tooth enamel was assessed in children of both the main and control groups. After cleaning the surface of the enamel from dental plaque, thoroughly drying it with an air jet, the state of the hard tissues of the tooth was visually determined. Affected areas of enamel were stained with a 0.1% aqueous solution of methylene blue and the intensity of staining was assessed on a 10-point scale *(Leus P. A., 2009)*. Determination of the intensity of dental caries was carried out in patients who were not treated with fixed orthodontic technology, because focal demineralization of enamel (FDE) in the form of white spots (surface caries) is a serious complication during orthodontic treatment *(Tufekci E. et al., 2011).*

Statistical analysis of research results was carried out using the computer program "Excel" and "Statistica for Windows. Version 8". Descriptive statistics included the calculation of relative and average values. Categorical signs are presented in the form of relative indicators (percentage of patients with the presence of the sign in the group). Quantitative indicators were presented in the form of $M \pm m$, where M is the average arithmetic value, m is the average error of the average value. Differences were considered reliable at a value of $p < 0.05$, which is generally accepted for medical and biological research. Statistical analysis of data (selection of patients, their examination, stratification by diagnosis, sex), processing of the received information was carried out using Statsoft Statistica 8.0 *(Lang T.A., Secic M., 2006)*.

4. Results of the studies and it's discussion

Clinical dental examination, determination of dental status and hygiene index in children with cerebral palsy and practically healthy children were performed during the initial examination.

When analyzing the OHI-S oral hygiene index, it was established that only 3 children (12.5%) had a low index of hygiene and, accordingly, a "good" state of oral hygiene. The average value of the OHI-S index and, accordingly, a "satisfactory" state of hygiene was recorded in 6 children (25.0%); a high index of OHI-S ("unsatisfactory" hygiene) was found in 7 children (29.17%) and a very high index of OHI-S ("poor" hygiene) was found in 8 children (33.33%).

The presence of dental deposits – soft plaque, calculus, dense pigmented plaque – was determined in 21 (87.5%) children with cerebral palsy, while pigmented plaque and calculus were more common in children with dental caries. inflammation of periodontal tissues. It is known that the microorganisms of dental deposits have a negative effect on local immunological processes, which contributes to the disruption of the structure and functions of the hard tissues of the tooth.

The data obtained by us on the prevalence of dental caries in children with cerebral palsy indicate a mass incidence, according to the WHO, of $95.83 \pm 3.29\%$ (in the control group – $41.67 \pm 2.29\%$) with a lesion intensity of 9.96 ± 0.21 conditional units for dental caries and 10.32 ± 0.48 conditional units for carious cavities (in the control group – $4.93 \pm 0.21\%$ and 6.05 ± 0.21 %, respectively). Analyzing the structure of the DMF index, it should be noted that

dental caries is 5.57 ± 0.22, filled teeth – 2.34 ± 0.28, extracted teeth – 1.89 ± 0.1. It should also be noted that 29.17 ± 0.19% of examined children with cerebral palsy have lost permanent teeth due to complicated caries. Only one child (4.17 ± 0.11%) from the examined cerebral palsy patients had intact, caries-free teeth.

In order to quantitatively assess the influence of oral hygiene on the course of dental caries, the relationship between the intensity of caries according to the DMF, DMF+dmt and DMF+dmm indices and the state of oral hygiene according to the OHI-S hygienic index was investigated. It was found that with a "satisfactory" state of hygiene, the intensity of caries increases only 1.21 times ($p > 0.05$), with "unsatisfactory" and "poor" hygiene – by 2.08 and 3.92 times, respectively ($p < 0.05$).

Unsatisfactory cleaning of the teeth from plaque leads to the multiplication of cariogenic microorganisms, causing demineralization of the hard tissues of the teeth. Acute initial caries of permanent teeth was found in 11 children, which is 45.83%. On average, the intensity of acute initial caries among sick children is 4.05 ± 0.21. In the examined children of the main group, 57 teeth with focal demineralization of the enamel were found, while areas of the enamel, mostly white in color, which lacked its inherent natural luster and looked dull, were identified. During atraumatic probing, the texture of the enamel surface was smooth and quite hard in only 19.3% of cases, but in 80.7% of cases, the surface texture was defined as uneven and rough, but painless.

Significantly more often (61.40%, $p < 0.01$) focal demineralization of enamel was localized on the teeth of the upper jaw, less often – in 38.60% of cases – on the teeth of the lower jaw. The favorite localization of FDE is the vestibular surface of the tooth – the cervical area (59.65%) and the central part (40.35%) of the tooth crown. Areas of focal demineralization were detected in 42.11% of incisors, 36.84% of premolars, 19.30% of canines, and only 1.75% of cases – on molars. On the vestibular surface of the teeth of children of the main group, lesions were more often detected on several teeth (91.67%, $p > 0.05$), and in 8.33% of cases – single lesions. FDE sites were crescent-shaped in 42.11% of cases, oval in 36.84%, and polygonal in 21.05%. Small lesions were detected in 50.88% of cases, large lesions in 38.60%, and small lesions in 10.52%.

Foci of demineralization mainly (52.63%) had a dull, white-matte shade, white-yellow foci with dull-matte shades were observed in 19.30% of cases. Pigmented yellow-brown areas of the FDE, which sharply contrasted against the background of a light shade of intact enamel, were found in 15.79% of cases. The contrasting snow-white color of the focus was noted in 12.28% of cases. In 54.39% of cases, spots were found that occupied more than 30% of the vestibular surface of the tooth. According to the intensity of staining, the majority (68.42%) of foci were intensely stained with dye, which reflected the activity of demineralization; 19.30% of carious spots were colored less intensively (from 40 to 60% blue), in 12.28% of demineralization foci, the staining intensity was weak. Areas of focal demineralization of enamel were more often detected in children with multiple dental caries.

Taking into account that patients with cerebral palsy lag behind in their motor development, while motor disorders are represented by weakness in various muscle groups, they have a "slowness" of chewing, which in turn leads to a violation of the timing of teething. The assessment of timing, parity, sequence of eruption of permanent teeth in children with cerebral palsy revealed a delay in their eruption in 45.83 ± 2.14 % of cases (8.33 ± 0.4% – in the control group).

5. Conclusions

Analysis of the state of the hard tissues of the teeth in children with cerebral palsy showed a high prevalence of dental caries, high caries intensity indicators, in particular acute initial dental caries, and a direct relationship between the state of oral hygiene and the intensity of the caries process. The analysis of the dental status shows that impaired motor development in children with cerebral palsy requires the implementation of corrective exercises for the formation of the manipulative function of the hand, the improvement of skills and abilities related to the implementation of individual oral hygiene with a targeted selection of individual hygiene products and controlled tooth brushing. The study of the main indicators characterizing the damage to the hard tissues of the teeth in children with cerebral palsy encourages the planning and implementation of rehabilitation and preventive measures in these patients.

Prospects for further research will be aimed at the development of differentiated approaches to the implementation of rehabilitation and preventive measures aimed at forming the manipulative function of the hand, improving skills and abilities related to the implementation of individual oral hygiene in patients with cerebral palsy.

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