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DENTAL STATUS OF CHILDREN BEFORE AND AFTER PREVENTIVE MEASURES

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The total of 117 children aged 6-12 years were examined at the Department of Pediatric and Preventive Dentistry of the Bogomolets National Medical University. Children were divided into two groups: I - persons with chronic diseases of the internal organs at the stage of compensation, II - children with risk factors for somatic diseases. The above two groups were divided into several groups, taking into account disturbances in tooth formation. Group I included children with systemic enamel hypoplasia (group 1) and children with molar incisor hypomineralization of enamel (group 2). Group II consisted of children with systemic enamel hypoplasia (group 3), children with molar incisor hypomineralization of enamel (group 4), children without disturbances in tooth formation (group 5). The efficacy of the developed and implemented set of treatment and prevention measures for prevention of complications in children with dental disorders is confirmed by positive changes in dental status (improvement of oral hygiene, reducing the severity of inflammation in periodontal tissues).

Key words: disturbances in tooth formation, systemic enamel hypoplasia, molar incisor hypomineralization of enamel, caries, periodontium, prevention, children.

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СТОМАТОЛОГІЧНИЙ СТАТУС ДІТЕЙ ДО ТА ПІСЛЯ ПРОВЕДЕННЯ ПРОФІЛАКТИЧНИХ ЗАХОДІВ

Обстежено 117 дітей віком 6-12 років на кафедрі дитячої терапевтичної стоматології та профілактики стоматологічних захворювань Національного медичного університету імені О. О. Богомольця. Діти були розподілені на дві групи: I-а – особи з хронічними захворюваннями внутрішніх органів в стадії компенсації, II-а – діти з чинниками ризику соматичних захворювань. Дві вищевказані групи були розподілені на декілька груп з урахуванням порушень формування зубів. До групи I увійшли діти з системною гіпоплазією емалі (група № 1) та діти з молярно різцевою гіпомінералізацією емалі (група № 2). Групу II склали діти з системною гіпоплазією емалі (група № 3), діти з молярно різцевою гіпомінералізацією емалі (група № 4), діти без порушень формування зубів (група № 5). Ефективність розробленого та впровадженого комплексу лікувально-профілактичних заходів щодо профілактики ускладнень у дітей з порушеннями формування зубів підтверджена позитивними змінами стоматологічного статусу (покращення гігієнічного стану порожнини рота, зменшення вираженості запального процесу в тканинах пародонту).

Ключові слова: порушення формування зубів, системна гіпоплазія емалі, молярно різцева гіпомінералізація емалі, карієс, пародонт, профілактика, діти.

The work is a fragment of the research project "Features of the clinic, diagnosis, treatment and prevention of dental diseases in children with congenital abnormalities", state registration No. 0119U100454.

The priority goals set by the WHO and the International Federation of Dentists (2003) are to "promote dental health and minimize the impact of dental and maxillofacial diseases on general health and psychosocial development". The last decades have been marked by an increase of the incidence in the pediatric population of Ukraine, including dental [3, 7]. In particular, the share of disturbances in tooth formation (DTF) has increased (ICD-10, 1990). Enamel hypoplasia occupies a leading place among DTF in terms of prevalence [1, 2, 4, 5, 6]. A type of enamel hypoplasia is molar incisor hypomineralization of enamel (MIH). The main complication of DTF is caries and periodontal tissue disease [4, 6, 10]. That is why it is important to study the indices of dental status in children with DTF before and after the application of a set of treatment and prevention measures (TPM) developed by us, in order to prevent complications.

The purpose of the study was to increase the efficacy of complications prevention in children with disturbances in tooth formation through development and implementation of a set of treatment and prevention measures.

Materials and methods. The study object was DTF (systemic enamel hypoplasia (SEH), molar incisor hypomineralization of enamel (MIH)).

The study subject was development and implementation of a complex of TPM aimed at prevention of DTF complications in children.

The total of 117 children aged 6-12 years were examined at the Department of Pediatric and Preventive Dentistry of the Bogomolets National Medical University. The inclusion of children in the study was subject to the written consent of the patients' parents. Prior to the study, in compliance with the terms of the Declaration of Helsinki (2000), children's parents and children of older age were informed about the

purpose of the study, research methods, potential benefits and risks, and possible discomfort during diagnostic and other manipulations.

Children were divided into two groups: I - persons with chronic diseases of the internal organs at the stage of compensation, II - children with risk factors for somatic diseases. Information on the overall morbidity of children was obtained from outpatient cards. The above two groups were divided into several groups taking into account DTF. Group I included children with SEH (group 1) and children with MIH (group 2). Group II consisted of children with SEH (group 3), children with MIH (group 4), children without DTF (group 5).

Determination of the non-carious teeth lesions nature was carried out according to ICD-10 (1990). Clinical forms of SEH were described according to the classification of Fedorov Yu.A. et al. [8]: spotted, erosive, sulcated and mixed. The degree of enamel MIH was determined according to the recommendations of Jalevik [9].

Dental examination of children was carried out in the dental offices of the department and included an assessment of the oral cavity hygienic condition, the condition of the teeth and periodontium hard tissues. The hygienic condition of the oral cavity was determined using the Green-Vermillion index (1964), which estimates the tooth crown area covered with plaque [8]. For the differential diagnosis of hypoplasia and caries, the method of vital staining of enamel with 2% aqueous solution of methylene blue and the method of transillumination were used, the principle of which is based on the use of a halogen lamp and a fiber-optic element, which produces a stream of cold light, in case of teeth hard tissue pathological changes reducing their transillumination [8].

One of the criteria for the differential diagnosis of DTF and caries was the presence or absence of tooth damage from the moment of their eruption, determined by the parents' words. The study and assessment of the prevalence and intensity of permanent teeth caries were carried out in compliance with the recommendations of the WHO Committee of Experts (2013) and included determination of the permanent teeth caries prevalence (in %), the permanent teeth caries intensity by the decayed, missing, and filled teeth (DMF) index and decayed, missing, and filled surfaces (DMFS) index. Under the conditions of mixed occlusion, the intensity of caries was determined using the indices $df+DMF$ and $dfs+DMFS$. To assess the severity of gingivitis the papillary marginal alveolar (PMA) index, the condition of periodontal tissues - community periodontal index (CPI) was used [8]. Assessment of the prevalence and intensity of periodontal tissue damage was performed based on the criteria proposed by the WHO.

Statistical processing of the material was performed using the IBM SPSS Statistics 20.0.0 statistical package.

Results of the study and their discussion. Identified as a result of previous studies, significant violations of dental status indices, mineral metabolism, which can be important factors in the development of complications in children with DTF, in particular, dental caries, created the basis for the development of complexes with the inclusion of remineralizing drugs which it is feasible to use immediately after revealing teeth with defects at the stage of eruption.

The developed TPM complex included:

- 1) control by a pediatrician or doctors of the relevant profile over the state of general health;
- 2) measures for the prevention and treatment of dental caries, as an independent pathology, and as a complication of DTF:
 - correction of the diet aimed at prevention of dental caries;
 - training in the proper care of the oral cavity with prescription of the most effective means and hygiene methods for each case;
 - remineralization of dental hard tissues using deep fluoridation of tooth enamel using a drug containing magnesium fluorosilicate, copper fluorosilicate, highly dispersed calcium hydroxide and copper hydroxide (State Registration Certificate No. 7105/2007 dated November 9, 2012);
 - fissure sealing.
- 3) measures for prevention and treatment of gingivitis:
 - training in proper oral care with prescription of the most effective means and hygiene methods for each case;
 - removal of non-mineralized and mineralized dental layers with subsequent grinding and polishing of tooth surfaces;
 - treatment of gingivitis depending on its form with the use of appropriate pharmacological drug groups;
 - regular professional oral hygiene;
 - recommendations for orthodontic or surgical treatment to eliminate local irritants.

Preventive measures as a component of the TPM were prescribed to children with macular form of SEH and mild severity MIH.

The efficacy of the proposed TPM complex was taken into account after 3, 6 and 12 months. The most significant results were diagnosed after 1 year.

Hygienic condition of the oral cavity in children with DTF, according to the Green-Vermillion index, before treatment with the TPM complex, was assessed as satisfactory (table 1). Significant changes were found when comparing the above index values of group 1 – (1.26±0.61) to that of group 5 – (1.09±0.53) ($p<0.05$).

The highest indices of the dental caries and dental surface caries intensity were diagnosed in children of group 1 – (7.00±2.65) and (10.00±3.54), respectively, being significantly different when compared to the data of group 5 (4.53±3.25) and (5.97±3.57) ($p<0.05$) (table 1).

Table 1

Oral cavity hygienic condition and caries intensity indices in children with disorders of tooth formation before performing a set of treatment and prevention measures

Index (M±SD)	Groups of examined children, taking into account the state of health and dental status				
	Group I		Group II		
	No. 1, n=20	No. 2, n=12	No. 3, n=22	No. 4, n=14	No. 5, n=49
Green-Vermillion index	1.26±0.61 ¹	1.23±0.55	1.21±0.57	1.12±0.46	1.09±0.53
df + DMF	7.00±2.65 ¹	6.86±1.68	5.82±2.48	5.92±2.02	4.53±3.25
dfs + DMFS	10.00±3.54 ¹	9.00±2.31	8.45±3.30	8.46±2.33	5.97±3.57

Note: 1 – significant difference between the indices of groups 1, 2, 3 and group 5 ($p<0.05$).

The mean severity of gingivitis, according to the PMA index, was found in group 1 – (29.13±26.06)%, which differed significantly from the values of the group № 5 – (14.12±12.97)% 0.05) (table 2). In other groups of patients, the above index indicated a mild severity of gingivitis and did not differ significantly. The percentage of intact sextants (SI) of the CPI index in children with DTF before the TPM complex was performed ranged from (50.69±32.78) to (68.23±31.47) % and did not differ significantly from the control group – (69.30±27.60) % (table 2).

The same tendency was characteristic of the sextants' prevalence with bleeding (SB), the value of which in all groups of patients were consistent with a low level. The percentage of sextants with dental calculus (SC) indicated a low level of its prevalence among all groups of subjects. Although it should be noted that in children of group 3 this component was the highest and was equal to (11.11±9.23) %. Significant changes were found when comparing the prevalence of sextants with dental calculus of group 2 (3.10±2.78) % with the above values of group 3 ($p<0.01$) (table 2).

Table 2

Severity of gingivitis and the condition of periodontal tissues in children with disorders of tooth formation before performing a set of treatment and prevention measures

Index (M±SD)	Groups of examined children, taking into account the state of health and dental status				
	Group I		Group II		
	No. 1, n=20	No. 2, n=12	No. 3, n=22	No. 4, n=14	No. 5, n=49
PMA, %	29.13±26.06 ¹	20.12±13.36	20.01±12.51	16.99±12.04	14.12±12.97
CPI, %	54.17±37.01	54.99±30.48	50.69±32.78	68.23±31.47	69.30±27.60
SI					
SB	34.72±27.94	41.91±30.48	35.42±23.73	28.19±25.08	24.85±23.81
SC	4.17±3.43	3.10±2.78 ²	11.11±9.23	3.58±2.36	5.85±3.90
CPI, SI	3.25±2.22	3.3±1.83	3.04±1.97	4.09±1.89	4.16±1.66
SB	2.08±1.68	2.51±1.83	2.13±1.42	1.69±1.50	1.49±1.33
SC	0.25±0.17	0.19±0.11 ²	0.67±0.27	0.22±0.18	0.35±0.25

Note: ¹ – significant difference between the indices of group 1 and group 5 ($p<0.05$); ² - significant difference between the indices of group 2 and group 3 ($p<0.01$).

A similar tendency was observed with respect to the intensity of CPI index sextants in children with DTF before the treatment with TPM complex. The largest number of intact sextants was in the examined control group – (4.16±1.66). The intensity of bleeding sextants in children with both SEH and MIH was high and did not differ significantly from the control data.

It should be noted that the values of the above index in children of group 5 were at the upper limit compared to the mean intensity of sextants with bleeding – (1.49±1.33) (table 2). The intensity of sextants with dental calculus was low in all groups of patients. Reliable changes in the above index were established when comparing the values in group 2 - (0.19±0.11) with the values in group 3 - (0.67±0.27) ($p<0.01$).

1 year after the TPM complex performing in children with DTF, improved oral hygiene, reduction of inflammation in periodontal tissues were diagnosed.

Despite the decrease in the values of the Green-Vermillion index in groups 1 – 5, they were consistent with the mean level and the hygienic condition of the oral cavity remained satisfactory. Significant changes in this index occurred when comparing the data of group 2 with those of the control group ($p<0.05$) (table 3).

Indices of the dental caries and the surface caries intensity in the variable occlusion of the examined patients in all groups after 1 year increased moderately, possibly due to the prevalence of the pathological process in deciduous teeth that were at the stage of tooth root resorption. The indices $df + DMF$ and $dfs + DMFS$ differed significantly when comparing the data of group 1 with the indices of group 5 ($p<0.05$) (table 3).

Table 3

Oral cavity hygienic condition and indices of caries intensity in children with disorders of tooth formation 1 year after applying the treatment and prevention measures complex

Index (M±SD)	Groups of examined children, taking into account the state of health and dental status				
	Group I		Group II		
	No. 1, n=20	No. 2, n=12	No. 3, n=22	No. 4, n=14	No. 5, n=49
Green-Vermillion index	1.14±0.43	1.21±0.30 ¹	1.03±0.38	0.9±0.29	0.89±0.42
$df + DMF$	6.86±2.61 ¹	6.29±1.60	5.63±2.42	5.67±1.56	5.38±2.39
$dfs + DMFS$	9.29±3.73 ¹	9.57±2.23 ¹	7.75±3.21	9.17±1.75	6.56±2.62

Note: ¹ – significant difference between the indices of group 1, 2 and 5 ($p<0.05$).

The severity of gingivitis in the examined groups 2 – 5, as before the beginning of TPM complex performing, was mild. It should be noted that the set of measures contributed to a significant reduction in the mean severity of gingivitis, according to the PMA index, in SEH children of group 1 compared to the control group ($p<0.05$) (table 4).

Table 4

Severity of gingivitis and the condition of periodontal tissues in children with disorders of tooth formation 1 year after performing a set of treatment and prevention measures

Index (M ± SD)	Groups of examined children, taking into account the state of health and dental status				
	Group I		Group II		
	No. 1, n=20	No. 2, n=12	No. 3, n=22	No. 4, n=14	No. 5, n=49
PMA,%	22.83±13.16 ¹	17.59±7.79	17.53±7.80	15.60±5.39	12.97±6.81
CPI,% SI	69.04±24.40 ¹	69.45±12.54	71.11±17.21	79.28±11.14	83.33±20.79
SB	22.63±13.41	30.55±11.57 ³	27.30±18.23 ¹	20.72±12.17	16.67±11.16
SC	8.33±3.57 ²	0	1.59±0.27	0	0
CPI, SI	4.14±1.46 ¹	4.17±0.75	4.27±1.03	4.76±0.67	4.99±1.25
SB	1.36±1.14	1.83±1.19 ³	1.63±1.03 ¹	1.24±0.65	1.01±1.27
SC	0.50±1.41 ²	0	0.10±0.44	0	0

Note: ¹ - significant difference between the indices of group 1, 3 and group 5 ($p<0.05$); ²- significant difference between the indices of group 1 and group 3 ($p<0.01$); ³- significant difference between the indices of groups 2 and 5 ($p<0,01$).

An increase in the percentage of intact sextants, according to the CPI index, occurred in all five groups. In contrast to the initial stage, significant changes were found in the above criterion when comparing the data of group 1 (69.04±24.40) % with those of group 5 (83.33±20.79) % ($p<0.05$) (table 4). The prevalence of sextants with bleeding, as well as before TPM in the examined children, answered to a low level, although it should be noted that there was a tendency to decrease its values. Significant changes in the above component of the CPI index were diagnosed when comparing the values in the groups 2 (30.55±11.57) % and 3 – (27.30±18.23) % to the control group – (16.67±11, 16) %, ($p<0.01$ and $p<0.05$ respectively). There was a positive tendency in the prevalence of sextants with dental calculus. Mineralized dental plaque in groups 2, 4 and 5 was not diagnosed.

The above index in groups 1 and 3 corresponded to low prevalence according to WHO criteria. Significant changes occurred among the patients of group 1 in comparison with the control group ($p < 0.01$) (table 4). A similar tendency was observed both concerning the intensity of CPI index intact sextants, which number increased in all groups of patients, and concerning sextants with bleeding and dental calculus, which number decreased (table 4).

There are few studies in the literature on certain aspects of preventing complications in children with SEH, in particular dental caries [1, 4, 5]. The prevalence of SEH complicated by caries in children aged 6-9 and 9-12 years was 43-56.7 % and 47-68 %, respectively [2], which partly coincides with the results of our previous studies. In order to prevent the development of complications in children with hard tissues dental defects [1, 5], preventive measures were used, which included: determining the risk of complications degree, motivating parents and patients to maintain dental health; nutrition correction; individual oral cavity care; identification and, if possible, correction of the general factors impact (somatic diseases, medication, etc.). The work by Bilous I.V. (2004) is devoted to studying the efficacy of a set of measures including drugs with remineralizing effect, aimed at improving the hard tissues condition of the teeth in children with SEH. The issue of preventing caries development as a complication of teeth hard tissues damage due to SEH is presented in the work by Labiy Yu.A. (2016). Carrying out measures aimed at increasing the resistance of enamel within three years in children with SEH has shown their efficacy. The both authors noted an improvement in the hygienic condition of the oral cavity, which is consistent with our data.

However, our proposed TPM complex, in addition to the impact on the condition of the teeth hard tissues, significantly contributed to the improvement of periodontal tissues condition in children with DTF. Also, we were the first to show the efficacy of the developed TPM complex in terms of dental status in children with MIH.

In our opinion, for children with DTF proper individual care of the oral cavity is extremely important with the control of its quality by the doctor and parents, the prescription of the necessary basic and additional means of personal hygiene. The prevention program should include regular professional oral hygiene and local administration of drugs that improve enamel mineralization.

Conclusion

The efficacy of the developed and implemented set of treatment and prevention measures for prevention of complications in children with dental disorders is confirmed by positive changes in the dental status (improvement of oral hygiene, reducing the severity of inflammation in periodontal tissues).

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