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PATHOLOGY OF THE ORAL CAVITY IN CHILDREN WITH DIABETES MELLITUS

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Abstract. Based on the dynamic observation of the oral cavity condition of 49 (26 boys and 23 girls) children aged 5 to 8 years, of which 23 children suffered from diabetes mellitus, the impact of the disease under consideration on the condition and level of individual oral hygiene was assessed. During the year, the children used ASEPTA KIDS toothpaste for oral care. It was found that children with type I diabetes mellitus, more often than healthy children, suffer from periodontal inflammatory pathology, and their dental caries proceeds more intensively. Optimal indicators of their dental health are achieved provided that professional oral hygiene is carried out quarterly. Carrying out preventive work with parents and children in order to increase the level of dental literacy, as well as age-appropriate oral care products in sufficient quantities can significantly reduce inflammatory processes in the oral cavity.

Key words: *children; diabetes mellitus; dental health of children; teeth; hygiene of an oral cavity; hidden inflammation of a gingiva; toothpaste*

ПАТОЛОГИЯ ПОЛОСТИ РТА У ДЕТЕЙ ПРИ САХАРНОМ ДИАБЕТЕ

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Резюме. На основании динамического наблюдения за состоянием полости рта 49 детей (26 мальчиков, 23 девочки) в возрасте от 5 до 8 лет, из которых 23 ребенка страдали сахарным диабетом, проведена оценка влияния рассматриваемого заболевания на состояние и уровень индивидуальной гигиены полости рта. В течение года дети использовали для ухода за полостью рта зубную пасту «АСЕПТА KIDS». Установлено, что дети с сахарным диабетом 1-го типа чаще, чем здоровые дети, страдают воспалительной патологией пародонта, а кариес зубов у них протекает более интенсивно. Оптимальные показатели их стоматологического здоровья достигаются при условии проведения профессиональной гигиены полости рта ежеквартально. Проведение профилактической работы с родителями и детьми с целью повышения уровня стоматологической грамотности, а также соответствующие возрасту средства по уходу за полостью рта, позволяют значительно уменьшить воспалительные процессы в полости рта.

Ключевые слова: *дети; сахарный диабет; стоматологическое здоровье детей; патология полости рта; гигиена полости рта; скрытое воспаление десны; зубная паста*

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Diabetes mellitus (DM) is defined as a dysmetabolic systemic disease that disrupts many types of metabolism in the human body, including carbohydrate metabolism. As a result of these disorders, macro- and microangiopathies are formed, which can be considered as one of the numerous complications of this disease [1, 2]. Complex neuroendocrine mechanisms lead to morphofunctional changes in many organs and systems of the human body at all ages [1, 3]. Type 1 diabetes mellitus (insulin-independent) occurs as a result of decreased insulin secretion by beta-cells of the pancreatic islets of Langerhans and it is less common [2, 4]. Its severe forms more often affect children and young adults (juvenile diabetes) [5]. Due to the weakening or loss of specific effects of insulin, as well as various morphofunctional and metabolic disorders in the body, dental manifestations of diabetes mellitus are noted in the vast majority of patients. Some dental specialists indicate 100% lesions of oral organs and tissues in patients suffering from diabetes mellitus [1, 5, 6]. In modern literature, the relationship between periodontal pathology and diabetes mellitus is noted [7, 8]. The authors note that when the course of endocrine pathology worsens, inflammatory changes in periodontal tissues worsen [4, 7]. The duration of remission of the inflammatory process in periodontal tissues depends on the form of diabetes mellitus [2, 4]. In children with diabetes mellitus, inflammatory processes usually occur with frequent exacerbations [5, 7].

Nowdays there is not enough attention to improving the dental health of children, as well as the prevention of exacerbations of inflammatory process in periodontal tissues in them, despite the large number of complications of diabetes mellitus in the oral cavity.

The aim of our study was to investigate the pathology of the oral cavity and improve the condition of periodontal tissues in children with diabetes mellitus.

MATERIALS AND METHODS

The study included 49 children (26 boys and 23 girls) aged 5 to 8 years, living in St. Petersburg or Leningrad region. They were divided into 3 groups (Fig. 1). Dynamic observation of the children was carried out for 12 months. The 1st (control) group consisted of 26 (12 boys and 14 girls) children who did not have type 1 diabetes mellitus. Group 2 included 12 children (7 boys and 5 girls) with mild to moderate type 1 diabetes mellitus and an average disease duration of 24 months. Group 3 consisted of 11 children (6 boys and 5 girls) with mild to moderate type 1 diabetes mellitus with an average disease duration of 29 months. Therapeutic and preventive measures were carried out for children of all three groups due to the condition of the hard tissues of the teeth and periodontal. Parents were counselled on the care of children's teeth and oral cavity, including recommendations on the use of toothbrushes and toothpastes. Children in group 2 received dental treatment and preventive measures 2 times a year, and children in group 3 — once a quarter. Children of the three observation groups were provided with gel-based toothpaste "ACEPTA KIDS" after completion of oral cavity sanitation, which would be sufficient for them to use for 12 months. Calcium lactate in its composition strengthens and mineralises the tooth enamel of deciduous and permanent teeth, while extracts of chamomile and aloe provide an anti-inflammatory effect. The paste does not contain aggressive components, so it is completely safe to swallow and is suitable for regular use.

The degree of dental caries was determined using the following indicators: prevalence and intensity. The PMA index according to C. Parma (1968) and periodontal index (PI) according to Russel (1971) were used in order to assess the periodontal condition in patients of the three groups. In order to detect latent inflammation in periodontal tissues Schiller-Pisarev test and oral hygiene index according to Yu. Volodkina [3, 4] were used. In-depth study of the children's dental status was carried out 6 and 12 months after the beginning of dynamic follow-up.

The criterion for excluding children from the clinical study was general somatic diseases, namely the combination of diabetes mellitus with other endocrine diseases and the child's inability to independently and fully care for his or her teeth.

The study performed was in full compliance with the ethical standards of the Committee on

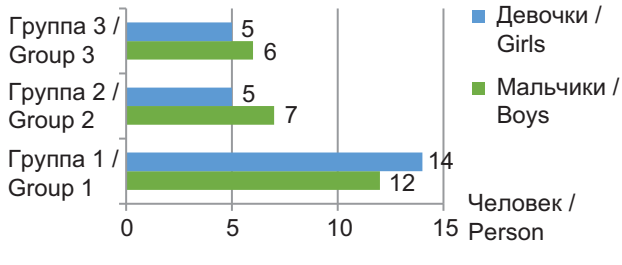

Fig. 1. Distribution of children by gender in the study groups (persons)

Рис. 1. Распределение детей по полу в исследуемых группах (чел.)

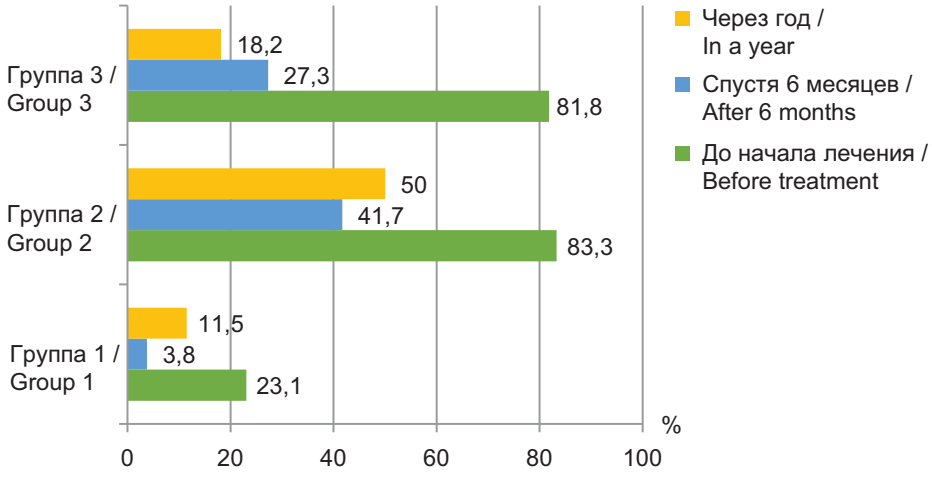

Fig. 2. Incidence of gingivitis in children in the study groups (%)
Рис. 2. Частота встречаемости гингивита у детей в исследуемых группах (%)

Human Experiments of the Helsinki Declaration on Human Experiments of 1975 and its 2000 revision.

The digital material obtained from the clinical study was processed on a PC using a specialised statistical analysis package — STATISTICA 7.0 for Windows. Differences between the compared groups were considered reliable at $p \leq 0.05$.

RESULTS

The value of dental caries intensity index in children of the control group was 4.06±0.27, which corresponds to a compensated process. In children of the 2nd and 3rd groups the intensity index was 6.86±0.23 and 6.89±0.31 ($p \leq 0.05$), which showed a subcompensated process of the carious process. In children of groups 2 and 3 suffering from diabetes mellitus, inflammatory periodontal diseases were more frequent. Catarrhal gingivitis and periodontitis were detected in 10 (83.3%) and 2 (16.7%) children of group 2, and in 9 (81.8%) and 2 (18.2%) children of group 3 respectively. Catarrhal inflammation of the gingiva was detected in 6 (23.1%) children in the control group. A positive Schiller-Pisarev test was detected in all children (100%) with diabetes mellitus and in 7 (26.9%) children from group 1. The indicators of individual oral hygiene were also worse in children with diabetes mellitus (Fig. 2), which was confirmed by the PMA index and periodontal index (Figs. 3, 4).

The analysis of the material showed that there were no sex differences in the frequency of occurrence and intensity of the caries in children of the control group and those suffering from DM ($p \geq 0.05$). As a result of the study, we found no fundamental differences between the data obtained on periodontal pathology in children with diabetes mellitus and the data of other authors.

In the clinical study we noted that when the course of DM worsens, the pathological process in the periodontium worsens, and remissions have a positive effect on it. The specific feature of the course of inflammatory periodontal pathology in children of 5–8 years old suffering from DM is the presence of frequent exacerbations of inflammatory gingival pathology, more pronounced oedema and congestive hyperaemia of the gingiva, its friability and bleeding, as well as pathological mobility of teeth (Fig. 6, a).

The study of the dental status after 6 months (Fig. 6, b) showed that dental health improved in children of all groups studied. Thus, in the control group, individual oral hygiene improved (hygiene index 1.49±0.11), the number of individuals suffering from gingivitis decreased to 1 (3.8%), which corresponded to a positive PMA and periodontal index. After 12 months, gingivitis was determined in 3 (11.5%) children, latent gingival inflammation in 4 (15.4%) individuals, and there was a slight worsening of the PMA index and PI compared to the previous examination ($p \geq 0.05$).

Group 2 children also showed an improvement in oral hygiene scores after 6 months (hygiene index 1.85±0.09). The number of children with inflammatory periodontal pathology decreased. Catarrhal gingivitis was detected in 5 (41.7%) children and a positive Schiller-Pisarev test in 4 (33.3%), which corresponded to the PMA index and periodontal index (Figs. 2, 3). One year later, gingivitis was determined in 6 (50%) children and the latent gingival inflammation — in 5 (41.7%) people. The PMA index ($p \geq 0.05$) and PI index

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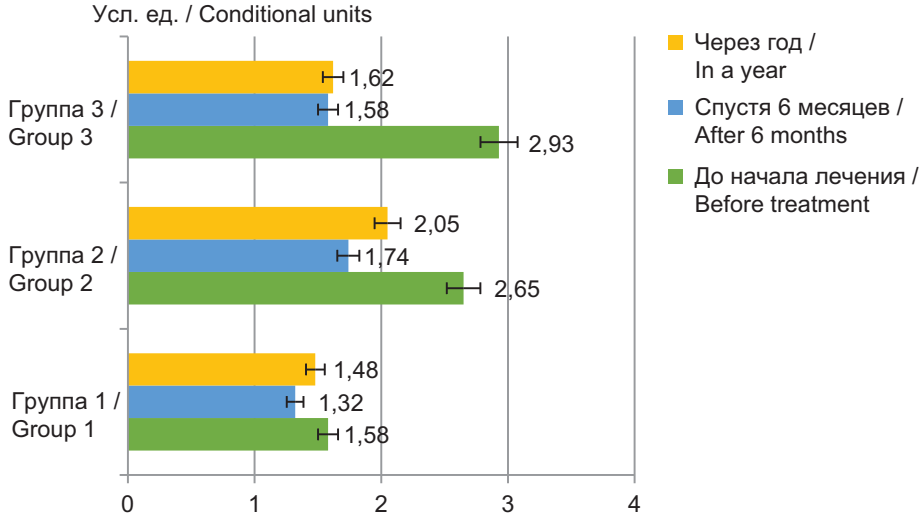


Fig 3. Hygiene index indicators Yu.A. Fedorova - V.V. Volodkina during dynamic observation of children in the studied groups (conventional units)

Рис. 3. Показатели индекса гигиены Ю.А. Федорова — В.В. Володкиной в ходе динамического наблюдения за детьми в исследуемых группах (усл. ед.)

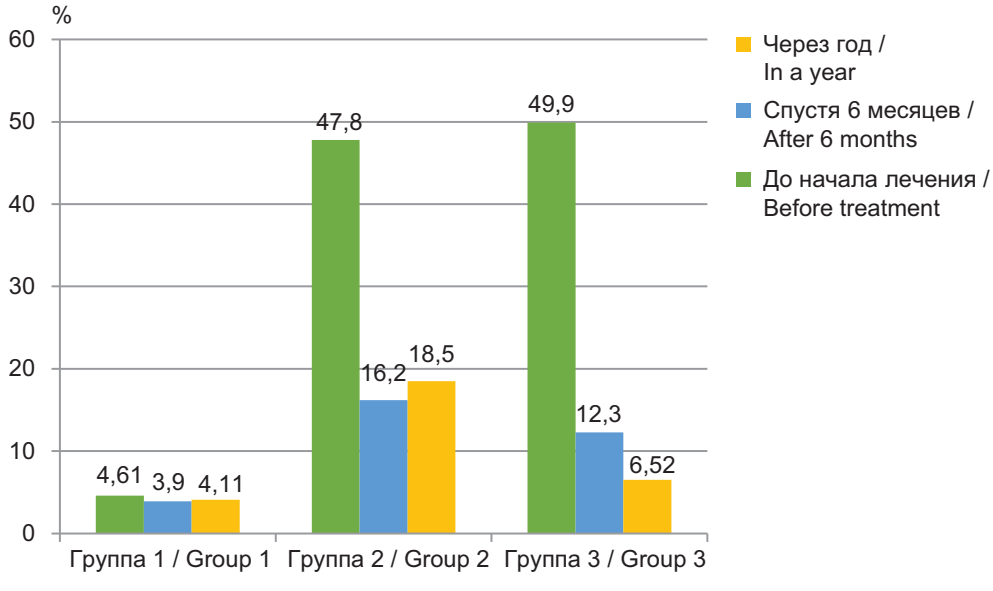


Fig 4. RMA index values during dynamic observation of children in the study groups (%)

Рис. 4. Значения индекса РМА в ходе динамического наблюдения за детьми в исследуемых группах (%)

($p \leq 0.05$) slightly worsened compared to the previous examination.

In group 3 children oral hygiene significantly improved after 6 months (hygiene index 1.73±0.17) and inflammatory periodontal pathology decreased. Catarrhal gingivitis was detected in 3 (27.3%) children, and a positive Schiller-Pisarev test — in 4 (36.4%) (Fig. 5). Positive dynamics of the PMA index and periodontal index were observed (Figs. 2, 3). The dental health of children in Group 3 improved markedly after one year compared to the previous examination. Thus, catarrhal gingivitis was determined only in 2 (18.2%) children, and latent gingival inflammation — in 3 (27.8%) people. Positive dynamics (Figs. 2, 3) of oral hygiene indexes ($p \geq 0.05$), PMA ($p \leq 0.05$) and PI ($p \leq 0.05$) were observed.

CONCLUSION

The study of the oral cavity of children with endocrine pathology has allowed us to establish that they suffer from inflammatory periodontal diseases (gingivitis, periodontitis) more often than healthy children. According to the results of the clinical study, taking into account the therapeutic and preventive measures aimed at improving the oral cavity of children with type 1 diabetes mellitus, optimal indicators of dental health are achieved if professional oral hygiene

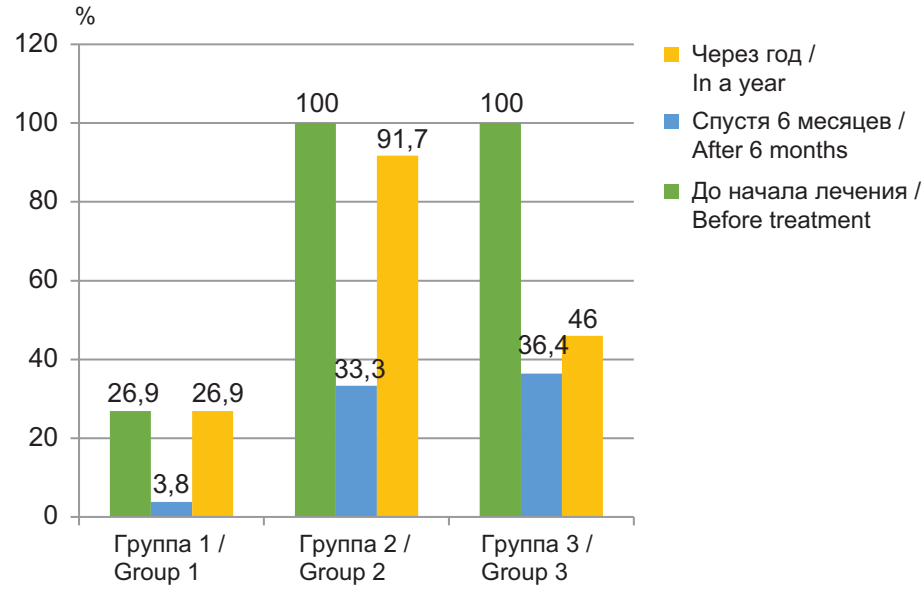
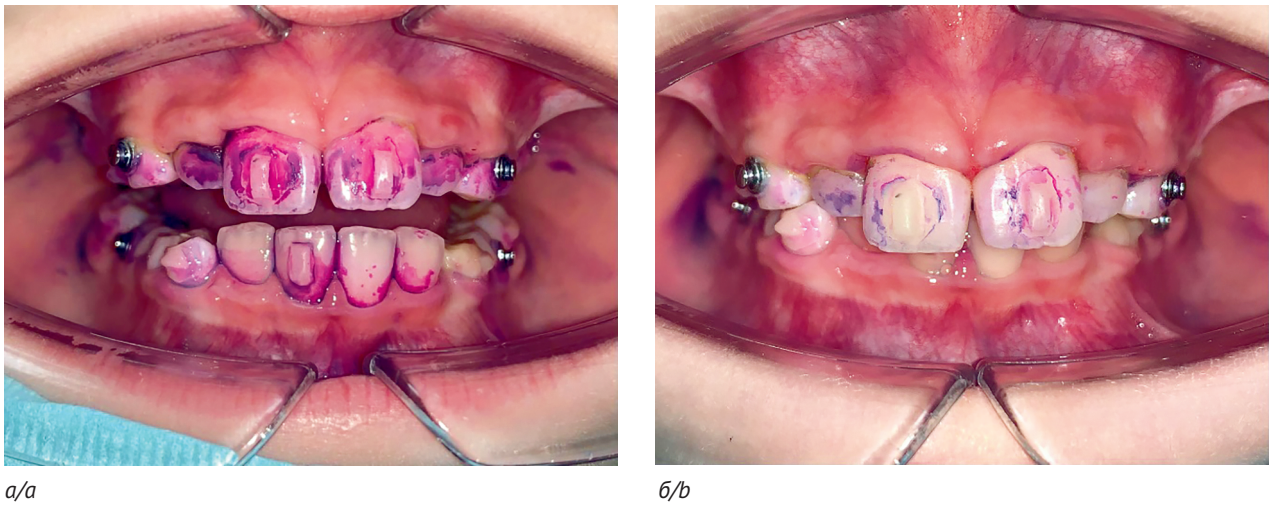


Fig. 5. Frequency of occurrence of a positive Schiller-Pisarev test during dynamic observation of children in the study groups (%)

Рис. 5. Частота встречаемости положительной пробы Шиллера–Писарева в ходе динамического наблюдения за детьми в исследуемых группах (%)



а/a *б/b*

Fig. 6. The state of oral hygiene in an 8-year-old girl suffering from type 1 diabetes mellitus: *a* — before treatment; *b* — 6 months after treatment

Рис. 6. Состояние гигиены полости рта у девочки 8 лет, страдающей сахарным диабетом 1-го типа: *а* — до лечения; *б* — через 6 месяцев после проведенного лечения

is carried out quarterly. Preventive work with parents and children to improve dental literacy and age-appropriate oral care products can significantly reduce inflammatory processes in the oral cavity.

ADDITIONAL INFORMATION

Author contribution. Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

Competing interests. The authors declare that they have no competing interests.

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Consent for publication. Written consent was obtained from the patient for publication of relevant medical information within the manuscript.

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи,

прочли и одобрили финальную версию перед публикацией.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

Информированное согласие на публикацию. Авторы получили письменное согласие пациентов на публикацию медицинских данных.

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