

**ASSESSMENT OF THE EFFECTIVENESS OF TEETH FISSURAL  
SEALING IN THE PREVENTION OF CARIES OF PERMANENT TEETH  
IN CHILDREN WITH DAUN**

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**ANNOTATION**

The prevalence of dental caries in mentally retarded children studying in specialized schools depends on their level of socialization, nutrition and the presence of Down syndrome. The risk group includes socialized children without Down syndrome: the caries intensity index was 3.8 4.9; 5.8, and the prevalence is 42.0, 76.0 and 85.0% in children 8, 10 and 12 years old, respectively. The prevalence of caries in children with Down syndrome was lower - 33.0, 64.0 and 72.0% in children 8, 10 and 12 years old, respectively.

According to the results of applying a special preventive algorithm, the number of cariogenic microorganisms on the teeth slightly decreased from the initial values. Thus, the most optimal treatment regimen with a high therapeutic effect in mentally retarded patients has been identified, which makes it possible to increase the effectiveness of treatment and reduce its time.

**Key words:** dental caries, periodontal disease, epidemiological study, caries intensity, mental retardation.

**«ОПТИМИЗАЦИЯ МЕТОДОВ ГЕРМЕТИЗАЦИИ ФИССУР ЗУБОВ  
ПРИ ПРОФИЛАКТИКЕ КАРИЕСА ПОСТОЯННЫХ ЗУБОВ У ДЕТЕЙ  
С СИНДРОМОМ ДАУНА»**

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## **АННОТАЦИЯ**

Распространенность кариеса зубов у умственно отсталых детей, обучающихся в специализированных школах, зависит от уровня их социализации, питания и наличия синдрома Дауна. В группу риска входят социализированные дети без синдрома Дауна: показатель интенсивности кариеса составил 3,8 4,9; 5,8, а распространенность - 42,0, 76,0 и 85,0% у детей 8, 10 и 12 лет, соответственно. Распространенность кариеса у детей с синдромом Дауна оказалась ниже - 33,0, 64,0 и 72,0% у детей 8, 10 и 12 лет, соответственно. По результатам применения специального профилактического алгоритма количество кариесогенных микроорганизмов на зубах незначительно уменьшилось от исходных значений. Таким образом, выделена наиболее оптимальная схема лечения с высоким терапевтическим эффектом у умственно отсталых больных, позволяющая повысить эффективность лечения и сократить его сроки.

**Ключевые слова:** умственная отсталость, кариес зубов, заболевания пародонта, эпидемиологическое исследование, интенсивность кариеса, индекс распространенности кариеса.

## **DAUN SINDROMLI BOLALAR DOIMY TISHLARI PROFILAKTİKASIDA TISH FISSURALARINI MUHRLASH USULLARINI TAKOMILLASHTIRISH**

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## **ANNOTATSIYA**

Ixtisoslashtirilgan maxsus maktablarda tarbiyalanuvchi aqliy zaif bolalarda tish kariyesining tarqalishi ularning ijtimoiylashuviga, ovqatlanishiga va Daun sindromining mavjudligiga bog'liq. Xavf guruhiga Daun sindromisiz ijtimoiylashgan bolalar kiradi: kariyesning intensivligi 8, 10 va 12 yoshlarda mos ravishda 3,8; 4,9; 5,8, tarqalishi esa 42,0; 76,0 va 85,0 % ni tashkil etdi. Daun

sindromiga ega bo'lgan bolalarda kariyes tarqalish darajasi past bo'lib, 8, 10 va 12 yoshli bolalarda mos ravishda 33,0; 64,0 va 72,0 % ni tashkil etdi. Maxsus profilaktik algoritmni qo'llash natijalariga ko'ra, tish karashi tarkibidagi kariyesogen mikroorganizmlar miqdorining boshlang'ich ko'rsatkichlarga nisbatan birmuncha kamaygani aniqlandi. Shunday qilib, aqliy zaif bolalarda yuqori terapevtik samaraga ega bo'lgan, davolash samaradorligini oshirishga va davolash muddatlarini qisqartirishga imkon beruvchi davolashning eng maqbul sxemasi ajratib olindi.

**Kalit so'zlar:** aqliy zaif bolalar, tish kariyesi, parodont kasalliklari, epidemiologik ko'rsatkichlar, kariyes tarqalish indeksi, kariyes intensivligi indeksi.

## INTRODUCTION

In global dental practice, there is a high prevalence of various orthopedic and orthodontic defects, including manifestations of partial or complete adentia of varying severity. The prevalence of adentia has increased significantly and, according to available data, ranges from 35.4% to 62.9% [1].

It has been proven that oral diseases have considerable humanitarian, social, and economic significance in modern society. Today, dental caries and periodontal diseases remain the most common oral health problems not only among adults but also among younger populations worldwide. According to recent epidemiological studies conducted among healthy children, the incidence of dental pathology remains high. The prevalence of dental caries among healthy individuals aged 12–15 years ranges from 63.3% to 83.4% and from 81.7% to 88.7%, while caries intensity ranges from 3.02–3.75 and 4.6–5.73, respectively. The prevalence of periodontal tissue diseases among healthy 12-year-old children varies from 37.8% to 50%, whereas among 15-year-old children it ranges from 57.7% to 84.7%.

The prevalence of dental caries is also high among preschool and school-aged children with intellectual disabilities, while caries intensity is particularly elevated

in children aged 13–18 years with mild intellectual disability. These indicators increase with age and depend on the severity of the underlying condition.

According to the World Health Organization (WHO), approximately 15% of the world's population consists of people with disabilities, corresponding to about 650 million individuals, of whom 200 million are children. The prevalence of intellectual disability (ID) in the general population ranges from 1% to 3%.

Providing dental care to children with intellectual disabilities is associated with a number of difficulties due to their limited cooperation caused by the underlying condition (mental and behavioral disorders, as well as diseases of the nervous system). As a result, dental treatment for this group of children often requires general anesthesia. However, the use of general anesthesia is not always possible because many of these children have severe concomitant somatic diseases. In addition, not all specialized institutions for children with disabilities are equipped with dental offices.

These circumstances necessitate the development of new approaches to the provision of dental care for children with intellectual disabilities, with preventive measures being one of the most important components. We implemented a preventive program aimed at reducing the incidence of dental diseases among children with disabilities. However, most preventive strategies were designed primarily for children with mild to moderate intellectual disabilities and took into account not only the degree of intellectual impairment but also the development of oral hygiene skills, the level of socialization, and the child's dietary habits.

Aim of the study. To improve methods for the prevention of permanent tooth caries in children with intellectual disabilities through the development of a specialized IT-based preventive program, as well as to evaluate the effectiveness and clinical efficacy of ozone therapy in the prevention of dental caries.

## **Materials and Methods**

A total of 220 children with intellectual disabilities from Specialized Boarding School No. 62 in Samarkand and Boarding School No. 63 in the Akdarya district

were examined. The study included children aged 6, 9, and 12 years. Depending on age, gender, dietary regimen, type of underlying neurological disorder, presence of Down syndrome, and level of socialization, the oral hygiene status of the participants was assessed. A specialized preventive program aimed at preventing dental caries in permanent teeth was implemented over a specified period, and its effectiveness was evaluated.

To achieve the objectives of the study, general clinical, instrumental, functional, and statistical methods were employed. The following parameters were assessed:

Prevalence of dental caries;

Caries intensity of permanent teeth using the DMFT (Decayed, Missing, and Filled Teeth) index;

Clinical condition of periodontal tissues using the PMA index (Papillary-Marginal-Alveolar index) modified by Parma.

To evaluate the risk of developing dental diseases, a microbiological examination of dental plaque was performed. For this purpose, children were randomly selected from subgroup 1 (n = 26) and subgroup 2 (n = 24). Supragingival dental plaque samples were collected by scraping with a sterile dental excavator.

The preventive program included oral hygiene education for the children, as well as health education activities for the institution's staff and for the parents of those children who regularly visited the boarding school.

In addition, the following individual preventive measures were carried out:

Professional oral hygiene procedures (Figure 1);

Remineralization therapy through the application of fluoride-containing varnish to the teeth;

Fissure sealing of permanent teeth using ozone technology (Figure 2).



**Figure 1. Professional oral hygiene and fluoride treatment of teeth.**

In recent years, due to the increasing prevalence of allergic conditions in the population, the growing resistance of microorganisms to antibiotics, and the rising cost of pharmaceutical products, non-pharmacological treatment methods have become increasingly popular. Among these methods, ozone therapy has gained widespread recognition and application worldwide.

This growing interest is associated with the ability of ozone to enhance oxygen transport and release in tissues, as well as its pronounced antimicrobial and disinfecting properties. Ozone therapy is currently used in various fields of medicine, including internal medicine, surgery, obstetrics and gynecology, dermatology, dentistry, and cosmetology.



**Figure 2. Fissure sealing of permanent teeth in a 12-year-old child after treatment with ozonated water.**

## **Results**

The study demonstrated that children with Down syndrome are less susceptible to the development of dental caries. Therefore, within the subgroups with different levels of socialization, an additional stratification was performed based on the presence of Down syndrome.

Among the socialized children aged 6, 12, and 15 years, subgroups were identified consisting of children without Down syndrome (10, 32, and 40 children, respectively) and children with Down syndrome (12, 8, and 5 children, respectively). Similarly, among the non-socialized children aged 6, 12, and 15 years, subgroups were formed consisting of children without Down syndrome (11, 30, and 15 children, respectively) and children with Down syndrome (4, 6, and 13 children, respectively). The prevalence and intensity of dental caries were evaluated in all of these subgroups.

To assess the risk of developing dental diseases, a microbiological analysis of dental plaque was performed. Children were randomly selected from subgroup 1 (n = 23) and subgroup 2 (n = 21). Supragingival dental plaque samples were collected by scraping with a sterile dental excavator.

Analysis of the obtained data revealed that microorganisms belonging to the genus *Streptococcus* were isolated most frequently from dental plaque samples. In subgroup 1, streptococci accounted for 25.8% of all detected microorganisms, whereas in subgroup 2 they constituted 34.0%.

Among the streptococci isolated from subgroup 1, *Streptococcus oralis* (12.9%) and *Streptococcus gordonii* (3.53%) predominated. Other species, including *S. cristatus*, *S. sinensis*, *S. mitis*, *S. sanguinis*, and *S. pneumoniae*, were detected at lower frequencies (1.2%, 1.2%, 1.2%, 2.4%, and 1.2%, respectively).

In subgroup 2, *S. oralis* was also the predominant species and was detected in a higher proportion (14.2%) than in subgroup 1. Lower frequencies were observed for *S. gordonii* (4.4%), *S. sinensis* (5.5%), and *S. mitis* (5.5%). Single isolates of *S. cristatus* (1.1%), *S. constellatus* (1.1%), *S. agalactiae* (1.1%), and *S. anginosus* (1.1%) were detected only in subgroup 2 and were not identified in subgroup 1.

In addition to streptococci, other microbial species were isolated from dental plaque samples. Notably, staphylococci constituted a substantial proportion of the total number of isolated strains.

Staphylococci were isolated in 9.9% of cases among children in subgroup 1. In this subgroup, *Staphylococcus aureus* predominated (5.9%), while *Staphylococcus epidermidis* accounted for 3.5% of isolates. In subgroup 2, staphylococci were detected in 6.6% of cases, with *S. epidermidis* being the predominant species (5.5%), unlike subgroup 1.

A notably high frequency of *Candida* species was isolated from dental plaque samples. These fungi were detected four times more frequently in children from subgroup 1 than in subgroup 2, accounting for 17.6% and 4.4% of isolates, respectively. Among the *Candida* species, *Candida albicans* predominated, representing 12.9% of all isolated strains in subgroup 1 and 3.3% in subgroup 2.

Actinomycetes were also identified in a considerable proportion of dental plaque samples. They were detected in 10.6% of cases in subgroup 1, whereas in subgroup 2 they were found more frequently, accounting for 14.3% of isolates.

*Neisseria* species were detected twice as often in subgroup 2 as in subgroup 1, comprising 15.4% and 8.2% of isolates, respectively.

Fusobacteria were also identified in dental plaque samples. They were detected in 5.9% of children in subgroup 1 and in 7.7% of children in subgroup 2. *Acinetobacter lwoffii* was isolated exclusively from children in subgroup 1, where it was found at a relatively high frequency (14.1%). In subgroup 2, *Capnocytophaga* species were isolated in a small proportion of cases (3.3%). Other microbial species accounted for 8.2% of isolates in subgroup 1 and 14.3% in subgroup 2.

The third stage of our study involved the development, implementation, and evaluation of an adapted dental caries prevention program for children with intellectual disabilities in a specialized school setting. The program included oral hygiene education for children, as well as health education activities for institutional staff and the parents of children who regularly visited the boarding school.

In addition, individual preventive measures were implemented, including professional oral hygiene procedures, application of fluoride-containing varnish, and fissure sealing using ozone technology.

The effectiveness of the adapted preventive program, which considered the medical, psychological, and pedagogical characteristics of the children, was evaluated using the Oral Hygiene Index (OHI-S) and the condition of periodontal tissues assessed by the PMA index at baseline and after 1, 2, and 3 years of follow-up.

Data obtained from 9- and 12-year-old children before implementation of the program served as internal controls for groups of children who entered the preventive program at the ages of 6–8 and 9–11 years. The group of 9-year-old children served as a comparison group for the other 9-year-old participants and subsequently became the main study group after reaching the age of 12 years. For children who entered the preventive program at the age of 12 years, previously examined 15-year-old children served as the control group.

The prevalence and intensity of dental caries among children with intellectual disabilities were found to depend on the degree of socialization, which influences lifestyle and dietary habits, as well as on the presence of Down syndrome.

The incidence of dental caries among children with intellectual disabilities living in boarding schools depends on their level of socialization, which determines certain lifestyle and dietary characteristics. The highest-risk group consisted of socialized children without Down syndrome. In this group, the prevalence of dental caries was 31.0%, 62.0%, and 83.0%, with caries intensity values of 0 [0;1.17], 2 [0;4], and 4 [3;5] among children aged 6, 12, and 15 years, respectively.

Among non-socialized children without Down syndrome, the prevalence of dental caries was considerably lower, accounting for 0%, 18.0%, and 22.5% in children aged 6, 12, and 15 years, respectively. No cases of dental caries were observed among children with Down syndrome.

Mild gingivitis predominated among socialized children, affecting 55%, 50%, and 50% of children aged 6, 12, and 15 years, respectively. In contrast, non-socialized children more frequently exhibited moderate gingivitis (47.1% and 41.6% among 6- and 15-year-old children, respectively) and severe gingivitis (38.6% among 12-year-old children). The PMA index reached 45 [26;67.5]. The inability to perform

adequate independent oral hygiene makes this group of children particularly vulnerable to periodontal diseases.

The prevalence of dental caries among children with intellectual disabilities attending specialized schools was found to depend on their level of socialization, dietary habits, and the presence of Down syndrome. The risk group included socialized children without Down syndrome, in whom caries intensity values reached 3.8, 4.9, and 5.8, while caries prevalence was 42.0%, 76.0%, and 85.0% among children aged 8, 10, and 12 years, respectively.

The prevalence of dental caries among children with Down syndrome was lower, amounting to 33.0%, 64.0%, and 72.0% among children aged 8, 10, and 12 years, respectively.

Microbiological examination of dental plaque revealed significant unfavorable changes in the oral microflora of children without Down syndrome compared with socialized children with intellectual disabilities. In particular, an increased prevalence of *Streptococcus* species, which are considered cariogenic microorganisms, indicated a high potential for the development and progression of the carious process.

## **Conclusions**

1. The prevalence of dental caries among children with intellectual disabilities attending specialized schools depends on their level of socialization, dietary habits, and the presence of Down syndrome. The highest-risk group consisted of socialized children without Down syndrome. In this group, caries intensity values were 3.8, 4.9, and 5.8, while caries prevalence reached 42.0%, 76.0%, and 85.0% among children aged 8, 10, and 12 years, respectively. The prevalence of dental caries among children with Down syndrome was lower, amounting to 33.0%, 64.0%, and 72.0% in children aged 8, 10, and 12 years, respectively.
2. Microbiological examination revealed significant unfavorable changes in the composition of the oral microflora of children without Down syndrome compared with socialized children with intellectual disabilities. In particular, the increased

prevalence of *Streptococcus* species, which are considered cariogenic microorganisms, indicates a high potential for the development and progression of the carious process.

3. During the two-year implementation of the preventive program, a positive improvement in oral hygiene indicators was observed. Satisfactory oral hygiene status was recorded in 64.2% of the children, good oral hygiene status in 35.2%, and unsatisfactory oral hygiene status in only 0.6% of the participants.
4. The use of ozone therapy as part of a comprehensive caries prevention program for children with intellectual disabilities, taking into account their cognitive and physical capabilities, produced positive outcomes. No adverse complications associated with ozone–oxygen therapy were observed. Furthermore, the procedure remained comfortable, safe, and painless for the patients throughout the preventive intervention period.

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