

ORAL HEALTH ISSUES AND DENTAL CARIES PREVENTION

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Abstract: This article examines the prevalence of dental caries, the primary etiological factors contributing to its development, and its frequency across various age groups. The role of factors such as oral microflora, dietary habits, hygiene standards, and the body's overall resistance in caries pathogenesis is analyzed based on scientific literature. Furthermore, the effectiveness of modern preventive strategies—including fluoride prophylaxis, hygiene education, dietary rationalization, personal and professional hygiene practices, and fissure sealing technologies—is elucidated. The research findings underscore the importance of comprehensive preventive measures in reducing caries incidence and substantiate the necessity of their widespread implementation in dental practice.

Keywords: Dental caries, plaque, saliva, preventive treatment, etiological factors, metabolites.

Today, dental caries represents one of the most significant threats to human health globally. According to World Health Organization (WHO) data, more than 2.3 billion people worldwide (approximately 60-70%) have at least one carious tooth. The highest caries prevalence rates are found in Southeast Asia, Africa, and Latin America.

In Africa, caries prevalence among children reaches up to 80% in certain regions. In European countries, the indicator among children ranges from 40-50%, although this figure is considerably higher in adults. In the United States and Canada, caries prevalence among children is approximately 60%, but severe complications are less common due to higher treatment quality. In Uzbekistan, according to WHO and local research, more than 80% of school-age children have at least one carious tooth. This indicator demonstrates the necessity of strengthening preventive measures in the field of dentistry.

The primary etiological factor in caries development is microbiological plaque. Plaque is a complex biofilm formed on tooth surfaces consisting of microorganisms, their metabolites, salivary proteins, and food debris. According to scientific evidence, plaque forms on tooth surfaces within 12-24 hours. If mechanical cleaning (tooth brushing) is not performed during this period, bacteria such as *Streptococcus mutans* and *Lactobacillus* rapidly multiply. After 24 hours, plaque becomes denser and acid production intensifies. After 48 hours, the demineralization process begins: whitish-yellowish spots appear on the enamel surface. After 72 hours, initial clinical signs of caries can be observed. Therefore, brushing teeth twice daily, particularly in the evening, plays a crucial role in caries prevention.

According to WHO and Global Burden of Disease Study (2020) data, dental caries is currently one of the most widespread diseases among humanity. Globally, 2.3 billion adults and 530 million children have been diagnosed with caries. This indicator represents a significant economic and social burden for the global healthcare system.

African continent: In less developed countries, caries prevalence among children reaches 70-80% due to insufficient access to hygiene products. However, due to limited treatment availability, severe forms—pulpitis and periodontitis—are highly prevalent. **Europe:** In Western European countries (Germany, Sweden, Denmark), although caries prevalence among children is

40-50%, significant reduction has been observed over the past 20 years due to robust prevention programs. However, in Eastern European countries (Poland, Romania, Bulgaria), this indicator is considerably higher—approximately 65-70%.

Central Asia and Uzbekistan: According to local research (Irsaliyev et al., 2019), caries has been detected in more than 80% of school-age children. This indicator is 1.5-2 times higher compared to developed countries. The reasons include insufficient use of hygiene products, excessive consumption of sweets, and inadequate prevention programs.

Plaque is a complex biofilm consisting of microorganisms, salivary proteins, polysaccharides, and food debris, and its formation occurs over a specific time period: 0-24 hours: The initial plaque layer is formed by salivary proteins and glycoproteins (pellicle). This layer serves as the "base platform" for bacterial adhesion. 24-48 hours: Cariogenic microorganisms such as *Streptococcus mutans*, *Lactobacillus acidophilus*, *Actinomyces* rapidly multiply. During the glycolysis process, they produce organic acids (primarily lactic acid). 48-72 hours: Plaque becomes denser, anaerobic conditions intensify, and under acid influence, calcium and phosphate ions are washed away from the enamel surface (demineralization). Clinically, this manifests as whitish-yellowish spots. After 72 hours: If hygiene measures are not taken, the cariogenic process deepens and clinical caries develops.

The human organism is so complex that it possesses defense mechanisms against various microorganisms. Consider oral saliva, for instance—saliva is physiologically one of the primary protective factors against caries. It performs a buffering function, maintaining oral pH at a neutral level. Components such as lysozyme, lactoferrin, and immunoglobulin A exhibit antimicrobial effects. Saliva's remineralization properties facilitate the restoration of calcium and phosphate ions to the enamel surface. When salivary flow decreases (xerostomia, medications, stress, Sjögren's syndrome), caries development sharply increases.

Expert Opinions

Fejerskov O. (Denmark, 2015): "Caries is not an infectious disease but rather a multifactorial disease." Rationale: *Streptococcus mutans* is typically present in everyone, but if salivary flow is adequate and hygiene is sufficient, caries does not develop.

Pitts N. (United Kingdom, 2017): "Caries cannot be completely eradicated, but it can be arrested through early detection and prevention." Rationale: Clinical research has demonstrated that during the initial white spot stage of caries, remineralization occurs through fluoride and salivary effects.

Professor Sh. Irsaliyev (Uzbekistan): "The primary issue in our context is low hygiene culture." Rationale: A significant portion of Uzbekistan's population does not brush their teeth regularly, consumes excessive sweets, and does not adequately utilize saliva's protective capabilities.

Scientific Evidence-Based Caries Prevention Measures

Fluoride application: Fejerskov O. (Denmark, 2015) noted that low-concentration fluoride forms fluorapatite on the enamel surface, increasing its resistance to acids and slowing remineralization. This includes fluoridated toothpaste (1000-1450 ppm), fluoride varnishes, and gel application. Result: According to WHO reports, regular use of fluoride toothpaste reduces caries prevalence by 25-30%.

Limiting sugar consumption: Evidence: Moynihan & Kelly (2014) meta-analysis demonstrated that reducing daily sugar intake to less than 5% of total calories sharply decreases caries risk. Reason: Sugar is the primary substrate for *Streptococcus mutans*, intensifying acid production.

Regular mechanical hygiene (tooth brushing): Evidence: Axelsson & Lindhe (Sweden, 2002) identified in a 30-year observational study that individuals who brushed their teeth twice daily had 50% less caries. Reason: Plaque forms within 12-24 hours; regular mechanical cleaning disrupts it and slows microbial colonization.

Stimulating salivary flow: Evidence: According to Dawes C. (Canada, 2016), saliva buffers pH and ensures remineralization. In patients with reduced flow (xerostomia), caries risk is 3-5 times higher. Recommendations include chewing xylitol-containing gum as a sugar substitute, drinking plenty of water, and exercising caution with certain medications.

Preventive dental treatments: Evidence: Pitts N. (United Kingdom, 2017) reported that school-based "Dental Sealant Programs" (fissure sealing) reduced caries by up to 60%. This involves applying sealants to deep fissures in children's permanent teeth when they erupt.

Conclusion

Dental caries remains a global problem not only for individual health but for society as a whole. This issue can be significantly reduced through daily hygiene practices, preventive dental measures, and strengthening healthcare policies at both international and national levels. In conclusion, caries prevention is not limited to personal hygiene alone but encompasses a comprehensive set of measures including government policy, dental practice, and the population's cultural level. Only such an approach can reduce high caries prevalence and ensure the dental health of future generations.

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