Dental Caries Prevention

Dental caries is one of the major health problems in Indonesia. Data from Indonesian Basic Health Research in 2013, 2015 and 2018 showed a consistent increase in the prevalence of dental caries in 12-year-old schoolchildren: 43.4%, 53.2%, and 65.5%, respectively. More detailed results at 5 years of age show that 67.3% suffer from severe dental caries with a number (def-t) of more than 6, but only 10% get dental treatment. To overcome this problem, sufficient number of dentist is necessary. Data from the Indonesian Medical Council shows that one dentist serves about 9000 residents, therefore, every year a total of 1700 new dentists take the Hippocratic oath to carry out health services throughout Indonesia. Other than the number of dentists, dental caries prevention programs need to be developed.[1]

High-tech dentistry for curative treatment such as CAD/CAM to support the installation of dental implants, veneers, root canal treatment technology, and orthodontic treatment are very attractive to dentists practicing in urban areas.[2] Other than curative treatment is considered as an instant treatment, curative treatment also benefits both the patient and the dentist since it is supported by high technology and relatively easy to perform. Preventive treatment is becoming less popular and the short-term impact of the treatment is not felt.[3] The individual preventive treatment method is stuck to old technology that is slow to develop, while community empowerment method is stuck to conservative health education method. The advancement in information technology service is still not much help to preventive treatment.[4]

If there is no preventive treatment innovation, then in 2023, the prevalence of dental caries in children aged 12 years old will reach to 79.2%. It means 80 out of 100 Indonesian children in their growth and development period will suffer from dental caries and bear all the consequences of other diseases due to dental caries, such as malnutrition, growth and development disorders, and other infectious diseases.[5] Dental caries during mixed dentition stage can cause disruption in arrangement of the teeth (malocclusion) and will result in disturbances in masticatory and aesthetic functions. The more severe tooth and the oral disorder will reduce the immunity and increase the susceptibility to the disease.[6,7]

Advances in artificial intelligence in the detection of dental caries in the oral cavity are not enough to suppress the growth of the prevalence of dental caries

Various high technologies in the early detection of dental caries have been carried out, but the impact has not been significant. Fluorescence laser technology has been used to measure bacterial products in carious lesions (DIAGNOdent), whereas fiber-optic technology has been used to detect the initial area of demineralization, cracks, or fractures, and to provide a quantitative characterization of the caries process (Digital Imaging Trans Illumination Fiber-Optic (DIFOTI)).[8–10]

Demineralization of human enamel can also be detected by quantitative light-induced fluorescence (QLF).[11] Changes in electrical impedance between normal enamel and tooth structure and demineralized enamel can be measured by Electronic Caries Monitor (ECM).[12]In fact, high-tech tools have not been used optimally in everyday dental practice because dentists and patients are more interested in curative treatment. Surveys have shown that patients have no intention to maintain their dental health routinely and continuously. Dental caries is considered a temporary disease that can heal itself or with the help of a dentist. Dental caries is considered not a serious threat to general health.

Technological advances in efforts to prevent dental disease have not been enough to suppress the growth of the prevalence of dental caries

Fluoride is believed to be able to prevent dental caries by inhibiting the demineralization of the crystal structure in the teeth and increase remineralization. The enamel surfaces that are mineralized with fluoride are more resistant to acid attack.[13,14] Topographic occlusal fissures of teeth are more susceptible to dental caries because of the contours that are more likely a place for plaque accumulation. This occlusal fissure conditions can be protected by filling the fissure with flowing composite material so that the surface of the occlusal becomes morphologically stronger. Xylitol and Sorbitol have been developed to be used as sugar substitutes to reduce the risk of caries. It prevents the sucrose molecule from binding to Streptococcus mutans, thus inhibiting metabolism.[15] Sorbitol also reduces the ability of adhesion and the number of Streptococcus mutans. Since dental caries is an infectious microbiological disease, vaccine technology has also been applied in the prevention of dental caries. Experimental studies have succeeded in strengthening the effectiveness of vaccines against Streptococcus mutans.[16] The form of the vaccines is protein, recombinant or synthetic peptides, protein-carbohydrate conjugates, as well as DNA-based vaccines. However, none of these vaccines appear on the market due to difficulties in inducing and maintaining high levels of antibodies in oral fluids. Current research is still ongoing for clinical applications.

The prevention of dental caries is not possible to be done effectively if understanding the risks and benefits of dental caries prevention, the norm of dental maintenance in the community, and the ease of its implementation are still not integrated to raise the awareness of the community and dental service providers. Evidence-based dentistry regarding the prevention of dental and oral diseases in the community as well as in private clinic and hospital settings need to be socialized. Research that emphasizes the development of basic biological sciences in efforts to prevent dental caries is absolutely necessary, as well as clinical application research and evidence-based effectiveness of drugs or materials for dental caries prevention must be developed.[17] Likewise, community empowerment research to improve the mindset of preventing oral and dental diseases, norms of dental prevention in the community, and the presence of facilities and methods need to be deepened and supported with adequate artificial intelligence technology.

It can be concluded that: Research in Regenerative Dentistry, Clinical and Evidence-based Dentistry, and Dental Public Health and Primary Health Care will direct the promotion of promotive, preventive, curative and rehabilitative treatment for effective efforts to prevent dental caries and its consequences.

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