



THE EFFECTS OF SPORTS ON ORAL AND DENTAL HEALTH

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ABSTRACT

Introduction: During growth and development, sportive activities are found to be useful for physical, mental, and personal development of children. Although many studies have examined effects of sports on physical development, few have examined effects on oral and dental health.

Aim: To determine effects of sports on oral and dental health and to provide an accurate guidance for children and adolescents.

Method: A literature review of effects of sportive activities on oral and dental health was performed.

Results: In researches; dental caries, gingival health, dental erosion, salivary properties, dental anomalies, and occlusion status were examined in sporting individuals. Dental caries and gingival diseases were common in athletes, and risk factors included inadequate oral hygiene, decrease in salivation, and frequent consumption of acidic sports drinks. Sports drinks and decrease in salivation have also been shown to be factors for dental erosion. Dental anomalies have been stated to be able to occur due to traumas experienced during sports, which mainly include crown fractures, luxation and avulsion injuries. Besides, development of maxillary and mandibular arches was compatible with each other and occlusal relationship was favorable for majority of professional athletes. Correct breathing techniques, tongue positioning and movements have been emphasized to be important for jaw development and positioning of teeth.

Conclusion: Good oral health of athletes contributes to an increase in sporting performance and success, as well as, a boost to morale and self-confidence level. For good oral health; suitable dietary habits, regular/effective oral hygiene habits, and preventive methods of traumatic injuries are necessary.

Introduction

Today, various sports are popular among children and adolescents. Sportive activities are regarded as necessary for physical, mental, and personal development of children during growth and development period. Although many studies have examined the effects of sports on physical development, there are limited studies examining the effects of sports on oral and dental health.

The oral health of sporting individuals affects their general health, self-confidence level, and sports performance (1). On the other hand, it was expressed that sport of interest, amount of training and dietary habits affected the oral health (2). Most studies have pointed out the presence of a widespread belief that professional athletes have poor oral hygiene (1). At

2012 Summer Olympic Games in London, 30% of the athletes with various health problems visited the physicians due to dental problems (3).

The rate of dental caries, amount of dental erosion, gingival health, salivary characteristics, dental anomalies, and occlusal relationships of teeth have been investigated in researches for sporting and not sporting individuals (1,2,4-6). While some researchers reported that sporting individuals had a generally better oral health (2), others indicated that there were no differences in oral health, salivary characteristics varied due to dietary and oral hygiene habits, and the rate of dental caries, dental erosion, gingivitis (7) and dental anomalies (8) were high.

This paper aims to present the effects of sports on oral and dental health by reviewing the literature and to

make providing an accurate guidance possible for children and adolescents.

1. The Relationship Between Sports and Dental Caries

When the pH of saliva drops below the value of 5.5 that is assumed as the "critical pH", hydroxyapatite crystals in enamel begin to dissolve and decalcified areas occur (9). The factors which can decrease the pH value in sporting individuals include inadequate oral hygiene habits, acidic salivary pH and frequent consumption of acidic sports drinks. *Streptococcus mutans* and *Lactobacillus* species have been reported to the most common microorganisms determined in dental plaque of school-age children. These microorganisms have been indicated to ferment dietary carbohydrates, to drop the pH of saliva, and to begin the demineralization process (10,11). The concentration of them in saliva and plaque plays an important role in determining the individual's caries risk (12). The salivary concentration of microorganisms was found to be significantly lower in competitive swimmers than in non-competitive swimmers (8).

There are previous studies evaluating the relationship between the sportive activities and the development of dental caries. Frese et al. (2) reported that although there was no significant difference in the caries incidence, there was a direct correlation between the weekly training hours of athletes and their caries index, and 1-hour increase for the weekly training increased the caries index value by 0,24. This is explained by the fact that an increase in the training time also increases the nutrient intake and affects the caries rate. Randomly selected athletes who filled out a questionnaire related to their training order, nutrition and oral hygiene habits were examined and found to have high caries activity in a study by Bryant et al. (13). Another study examining the athletes participating in 2012 Summer Olympic Games in London showed that a majority of the athletes had poor oral hygiene and many dental treatment needs (7). It was reported that the carbohydrate and citric acid content in sports drinks, which are frequently consumed by professional athletes, decreased the salivary flow rate

and facilitated the formation of caries (9). In an in vitro study, acidic sports drinks were detected to adversely affect tooth restorations by causing discoloration, which then paved the way for secondary caries (14). The number of *Streptococcus mutans* was significantly higher in non-competitive swimmers, but there were no significant differences in the caries index values between two groups in the study conducted among competitive and non-competitive swimmers (8). It was suggested that poor oral hygiene and then dental caries resulting in pain, stress, systemic inflammation, and difficulty in eating and sleeping could negatively affect an athlete's performance (7,15). In a study conducted in Brazil, it was found that treatment of dental infections related to caries or trauma among the players of a football team improved their performance and the players took more active roles in the team (16).

It is thus important to inform athletes and coaches about the factors leading to dental caries and oral hygiene and nutrition considerations.

2. The Relationship Between Sports and Gingival Health

Sports drinks are considered as the main nutrient that may negatively affect the oral health of athletes (1). The high carbohydrate content of these drinks could result in gingival diseases through the exhibition of a proinflammatory effect (17). The antimicrobial properties of saliva provide protection against the gingival diseases (18). It has been stated that a decrease in salivary flow rate due to loss of fluids during sportive activities may cause gingival diseases (19). These diseases have been reported to affect sports performance unfavorably as well as decrease the quality of life (7).

Although the number of studies evaluating the gingival health in sporting individuals is limited, the plaque and gingival index values and the presence of gingival inflammation around third molars have been examined in present studies. Providing information about the gingival health by the plaque and gingival indexes determining the amount of dental plaque, presence of gingival bleeding and periodontal

pockets, and the color and consistency of gingiva has been aimed (1,7,8,20). In the study conducted with professional footballers of Barcelona Football Club, a positive correlation between the plaque and gingival index values was reported. However, the absence of gingivitis in athletes has been associated with the young age range of them (20). In the study of 302 athletes participating in 2012 Summer Olympic Games in London, it was found that the number of athletes with good gingival health was very low. In addition, this study also stated that the ethnic origin of the athletes was important for the gingival health (7). The study performed at competitive and non-competitive swimmers presented no significant differences between the two groups in terms of plaque and gingival index values (8).

In order to prevent gingival diseases; to change the routine oral hygiene behaviors, regular and effective daily plaque removing by tooth brushing and interdental cleaning, and to avoid sports drinks which have high carbohydrate content are essential.

3. The Relationship Between Sports and Dental Erosion

Dental erosion can be defined as the pathological and irreversible loss of dental hard tissue by various chemicals. It has been stated that bacterial factors do not play a role in dental erosion and that enamel loss occurs as a result of the long-term and frequent use of beverages with a pH lower than the critical pH (21,22). The frequent consumption of sports drinks and carbon dioxide/mineral waters is an important cause of dental erosion (2,9,23). Sports drinks have been reported to be more erosive than fruit juices (24). At the same time, a decrease in salivary flow rate due to dehydration of the body during sports and the occurrence of an acidic oral environment create the conditions to facilitate dental erosion (2,19). The oral hygiene of an individual has also been pointed out as an important factor in the emergence of dental erosion (18).

In a study evaluating the relationship between dental erosion and the consumption of sports drinks among swimmers and cyclists, it was found that the cyclists

consumed more sports drinks and that dental erosion in the upper jaw was statistically significant (9). The frequency of dental erosion has been reported to be high in swimmers using chlorinated pools with low pH values and in athletes participating in 2012 Summer Olympic Games in London too (7,25).

The first step in treating dental erosion is to eliminate the causative agent. Information on the effects of consuming acidic food and beverages should be provided and dietary habits should be regulated (26). Increasing water consumption, avoiding acidic beverages or preferring calcium-containing beverages, avoiding tooth brushing within 1 hour following acidic beverages, and consumption of calcium and phosphate-containing products such as cheese after food and beverage intake would be beneficial in reducing their erosive properties (18,23,27,28).

4. The Relationship Between Sports and Saliva

It has been reported that the concentration of proteins and hormones in saliva and the salivary flow rate may change depending on physical activities (29). The decreased salivary flow rate in sporting individuals is associated with the increased sympathetic nervous system activity, decreased parasympathetic innervation, and vasoconstriction in the salivary glands (4). Frese et al. (2) observed that there were no significant differences between the salivary flow rates of individuals who did or did not play sports regularly, while the salivary flow rate decreased significantly and the pH increased significantly in both groups after physical activity. Increases or decreases in the pH of saliva in sporting individuals were also related to the beverages consumed. The consumption of foods and beverages that are acidic and have high carbohydrate content has been expressed to be able to exacerbate the decrease in salivary flow rate during physical activity and to cause dry mouth (2,30).

Since physical activities reduce the amount of saliva, water should be drunk abundantly, and the frequency of consumption and content of sports drinks should be considered.

5. The Relationship Between Sports and Dental Anomalies

Dental anomaly is a term that denotes a deviation from normal in terms of the number, shape, and development of teeth. Dental anomalies in sporting individuals have been identified to occur after trauma during sportive activities (31). It was stated that dental trauma occurred most commonly during jiu-jitsu, handball, basketball, football, judo, and hockey, and that the possibility of dental trauma was high in individual sports such as mountain biking and skiing (16). The majority of dental trauma types in sporting individuals have been signified to be crown fractures, luxation and avulsion injuries (5). Post-traumatic bone cysts, pulpal sclerosis, root dilaceration, internal and external resorption, and hard tissue accumulation have been reported (31,32). These anomalies can be seen severely in individuals who are interested in defense sports such as boxing, taekwondo and judo as a result of repeated impact on the chin (31).

For the prevention of dental trauma and dental anomalies, informing athletes and coaches about the necessity of mouth guards and the use of face masks for sports that require more protection are important.

6. The Relationship Between Sports and Dental Occlusion

Neuromuscular functions such as correct breathing habits and tongue movements during sportive activities have been reported to be able to positively affect the development and shaping of the upper jaw dental arch and palate (6,33,34). In a study included competitive and non-competitive swimmers, it was determined that competitive ones had wider, symmetrical, and compatible dental arches with lesser incidence of occlusion problems and bad oral habits (6). Most professional athletes also showed good occlusal relationships (20).

It is known that there must be a balance between the external and internal muscles for the dentoalveolar development of the lower and upper jaws compatibly with each other and tooth eruption properly. Muscular dysfunctions, incorrect tongue positioning and movements, and abnormal perioral muscle

contractions cause deviations in the normal dentoalveolar development (6). In a study on Rhesus monkeys, it was detected that there was a linear relationship between mouth breathing and the development of maxilla and maxillary anterior teeth and that mouth breathing caused malocclusion and palate contraction and elongation (34). There are studies reporting that incorrect tongue positioning and movements can result in the development of orthodontic anomalies (6,35).

It is important for individuals involved in sports to practice correct breathing techniques, tongue positioning and movements and to be educated on this subject in order to ensure the development of the lower and upper jaws compatibly with each other and the formation of the occlusal relationships of teeth properly.

Conclusion

Good oral and dental health improves the quality of life of athletes and contributes to the sporting performance and success in training and competitions, as well as, a boost to morale and self-confidence level.

This beneficial effects of sports may positively affect the oral and dental health along with the suitable nutrition, regular and effective oral hygiene habits, preventive measures for dental trauma, and correct breathing techniques and tongue positioning. It is important that athletes and coaches are informed about the nutritional factors, oral hygiene methods, equipments to prevent dental trauma, and regular monitoring.

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