

ORIGINAL ARTICLE

Evaluating the effect of oral health problems on athletic injuries in sports medicine

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ABSTRACT

Background: The study aims to investigate and evaluate the potential impacts of oral health problems on athletes' health and performance.

Methods: This study was carried out with 149 female athletes over 18. Survey questions were prepared to evaluate the oral-dental health and injury status of the athletes. SPSS 22.0 program was used for statistical analysis. Correlation, ANOVA, and crosstabs analyses were carried out within the scope of the research. It was accepted as the level of significance ($p < 0.05$).

Results: A significant difference was found between the frequency of brushing the teeth of the participants in one day, whether there was tooth loss, and the reasons for tooth loss ($p < 0.05$; $p = 0.046$). There was a weak and strong positive correlation between the presence of oral and dental diseases of the participants and their difficulty in participating in the training due to muscle system problems ($p < 0.05$; $p = 0.001$).

Conclusion: To maintain good health and performance, oral health is a crucial factor for all athletes. It is without a doubt that bad oral health directly influences the life quality and health of the athlete. For this reason, this study states that oral health is a key factor that should be taken proper care of for athletes to be in their total health and performance.

Keywords: Oral health, dental health, sports injuries, athletic performance

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INTRODUCTION

Sports injuries are quite common among elite athletes, especially tendon and muscle-related injuries [1]. Statistically, one is likely to injure themselves every 106 hours of exercising and training. Between 65 to 95 percent of athletes suffer from a sports injury at least once a year [1-3]. The cause of these injuries may

originate from several risk factors. Oral health is one of these risk factors [4]. It is without doubt that bad oral health directly influences the life quality and health of the athlete. When oral status is not in order, one is likely to suffer from aches, eating problems, systemic inflammation, and even psychological problems. In the long term, the impacts can

lead to tooth loss, partial loss of oral function, and serious psychological issues [5]. Yet, all of these negative outcomes are avoidable.

Periodontitis and dental cavities, the two most common oral health issues seen in people, are caused by dental plaque⁶. Dental plaque is a microbial biofilm created by microorganisms that are closely attached to the tooth surface and each other. Microorganisms are attached to the tooth and each other as biofilm and create dental plaque. In the mouth, there is a balance of microorganisms. Yet, the balance is fragile and may lead to oral health issues when it is damaged. When oral health problems occur, several levels in the human body change. In that case, cytokine levels are likely to rise. Cytokines are effective in the development of muscle fatigue while training as well as oxidative stress post-training [6-11]. There are several results of muscle fatigue such as muscle cramps. These cramps cause the body to be more fragile against strain injuries [12,13]. Muscle fatigue may also negatively affect the interaction between limbs. It is without doubt that oral health may result in more severe injuries in muscles, etc. [14,15]. Oral health cannot be considered in only its context. The health of the oral area of the body severely affects the entire body. A person's life quality is in fact, linked to how good their oral health is. Moreover, oral health is considered to have an impact on sports performance [16,17].

Athletes may have impaired oral hygiene, such as elevated levels of dental caries, dental decay, and dental injuries. Bad oral health can negatively affect one's life quality. As a result, bad oral health can affect athletic success [16-20]. By providing pain and ache to the body, bad oral health is likely to

have adverse effects on life quality. Furthermore, it is argued that bad oral health may decrease sports performance and cause systemic inflammation. When neglected, oral health problems can become a problem that will influence an athlete's career and personal life in the long term [16,21], and also athletes may be at increased risk for their elite Olympic and professional career [22]. Systemic changes such as shifts in serum levels of inflammatory biomarkers including C-reactive protein (CRP) and interleukin (IL), caused by dental or oral health complications also occur in muscle damage. Thereby it can have an impact on physical activity, primarily muscle mass, muscle strength, and muscle function [19,23--26].

Bad oral hygiene, tobacco smoking, systemic diseases like diabetes mellitus, rheumatoid arthritis, obesity, and stress are also considered to be risk factors for oral health problems [27,28]. Most athletes follow a nutrition program that aims to provide more energy and better athletic results. However, intake of excessive amounts of carbohydrates may cause oral health problems. Exercise-induced immune suppression is also a possible cause [29-31]. It is equally important to determine the potential causes of oral health issues in athletes. Proper nutrition intake is one of the key aspects to avoid oral health problems. It is equally important for athletes to educate themselves in terms of keeping their bodies healthy. Other reasons for oral health problems are oral dehydration and not paying enough attention to oral care [16,21]. To avoid oral health problems, athletes need to get their dental check up on time and a regular basis. This will help any health problem to be detected on time and fixed [32,33]. Therefore, the study aims to investigate and evaluate the

possible effects of oral health problems on athlete health and performance.

METHODS

Participants and Procedure

This study was carried out with 149 female athletes over the age of 18. Survey questions were prepared to evaluate the oral-dental health and injury status of the athletes. The oral-dental health status of the athletes and the types of sports injuries they experienced, the relationship between tooth extraction status and the severity of symptoms when they returned to training after injury, and the relationship between daily tooth brushing frequency and tooth loss and its causes were examined. In addition, the relationship between any dental filling or root canal treatment, the type of sports injuries, the presence of oral-dental diseases, and the difficulties of participating in training due to muscle system problems were analyzed.

Statistical Analysis

SPSS 22.0 program was used for statistical analysis. Correlation, ANOVA, and crosstab analyses were carried out within the scope of the research. A cross-table analysis was performed to evaluate the oral-dental health status of the athletes and what kind of sports injuries these athletes experienced. ANOVA analysis was used to search if there was a difference between the status of the athlete's teeth extraction and the severity of the symptoms when returning to their sporting activities after injuries. Anova analysis was used to determine the relationship between the daily tooth brushing frequency of the athletes

whether they had tooth loss and the causes of tooth loss. Crosstabs analysis was performed to determine the type of sports injury with any dental filling or root canal treatment. Correlation analysis was performed to determine the direction and strength of the relationship between the presence of oral-dental diseases of the participants and the difficulty of participating in training due to muscle system problems. It was accepted as the level of significance ($p < 0.05$).

RESULTS

The oral-dental health status of the athletes and the types of sports injuries they experienced are shown in Table 1.

Myotonia was observed in 23 (43.3%) and sprains in 14 (42.4%) of 60 participants (40%) who had no idea about oral and dental health. Myotonia was found in 8 (15%) of 24 participants (16%), who stated that their oral and dental health was excellent, and other injuries were found in 8 (40%) of them. Myotonia was found in 7 (13.2%) and sprains in 6 (18.1%) of 20 participants (13.3%) who stated that their oral and dental health was good. Myotonia was found in 8 (15%) of 29 participants (19.3%), who stated that their oral and dental health was poor, with sprain in 8 (24.2%) and muscle rupture in 6 (33.3%). Myotonia in 7 (13.2%), sprain in 3 (9%), and dislocation in 2 (33.3%) of 16 participants (10.6%) who stated that their oral and dental health was very poor.

The results of the athletes' dental symptoms, daily tooth brushing frequency, and the severity of symptoms when returning to training after injury are shown in Table 2.

Table 1. Injury Type* Oral and Dental Health Status Crosstabulation.

	Perfection of Oral and Dental Health					TOTAL
	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	
SPORT INJURIES						
Myotonia	8 (%15.0)	7 (%13.2)	23 (%43.3)	8 (%15.0)	7 (%13.2)	53 (%35.3)
Broken	0 (%0.0)	2 (%28.5)	4 (%57.1)	1 (%14.2)	0 (%0.0)	7 (%4.6)
Attachment disorder	0 (%0.0)	1 (%14.2)	3 (42.8)	2 (%28.5)	1 (%14.2)	7 (%4.6)
Sprain	2 (%6.0)	6 (%18.1)	14 (%42.4)	8 (%24.2)	3 (%9.0)	33 (%22.0)
Vertebral	0 (%0.0)	0 (%0.0)	2 (%66.6)	1 (%33.3)	0 (%0.0)	3 (%2.0)
Disk Issue	0 (%0.0)	1 (%50.0)	1 (%50.0)	0 (%0.0)	0 (%0.0)	2 (%1.3)
Dislocation	1 (%16.6)	0 (%0.0)	2 (%33.3)	1 (%16.6)	2 (%33.3)	6 (%4.0)
Muscle Tear	5 (%27.7)	1 (%5.5)	4 (%22.2)	6 (%33.3)	2 (11.1)	18 (%12.0)
Other	8 (%40.0)	2 (%10.0)	7 (%35.0)	2 (%10.0)	1 (%5.0)	20 (%13.3)
Total	24 (%16.0)	20 (13.3)	60 (%40.0)	29 (19.3)	16 (%10.6)	149 (%100)

Table 2. Athletes' dental symptoms, daily tooth brushing frequency, and severity of symptoms when returning to training after injury.

	N	Mean	Minimum	Maximum	F	P
Tooth extraction	63	2.79	1	5	1.115	0.352
Cariosity	64	2.86	1	5		
Extra tooth	15	2.80	1	5		
Broken tooth	7	3.00	2	5		
Total	149	2.81	0	5		

There was no significant difference between the groups regarding the dental symptoms of the athletes, the frequency of

daily tooth brushing, and the severity of the symptoms when returning to training after injuries ($p < 0.05$; $p = 0.352$).

	N	Mean	Between Groups			
			SS	Mean Square	F	P
Tooth extraction	63	2.79	6.506	1.626	2.486	0.046
Cariosity	64	2.86				
Extra tooth	15	2.80				
Broken tooth	7	3.00				
Total	149	2.81				

Table 3. Daily tooth brushing frequency of athletes and whether there is tooth loss and the causes of tooth loss.

The correlation results between daily tooth brushing frequency of the athletes and whether there is tooth loss and the cause of tooth loss are shown in Table 3.

A significant difference was found between the frequency of brushing the teeth of

the participants in one day, whether there was tooth loss, and the reasons for tooth loss ($p < 0.05$; $p = 0.046$).

The analysis results of any dental filling or root canal treatment and the type of sports injury are shown in Table 4.

	None	1-2	3-4	5 or more	TOTAL
SPORT INJURY TYPE					
Myotonia	12 (%27.2)	23 (%37.7)	13 (%43.3)	5 (%35.7)	53 (%35.3)
Broken	4 (%9.0)	2 (%3.2)	1 (%3.3)	0 (%0.0)	7 (%4.6)
Attachment disorder	2 (%4.5)	4 (%6.5)	0 (%0.0)	1 (%7.1)	7 (%4.6)
Sprain	13 (%29.5)	15 (%24.5)	3 (%10.0)	2 (%14.2)	33 (%22.0)
Vertabral	1 (%2.2)	1 (%1.6)	1 (%3.3)	0 (%0.0)	3 (%2.0)
Disk issue	0 (%0.0)	1 (%1.6)	1 (%3.3)	0 (%0.0)	2 (%1.3)
Dislocation	2 (%4.5)	1 (%1.6)	1 (%3.3)	2 (%14.2)	6 (%4.0)
Muscle tear	1 (%2.2)	8 (%13.1)	8 (%26.6)	1 (%7.1)	18 (%12.0)
Other	9 (%20.4)	6 (%9.8)	2 (%6.6)	3 (%21.4)	20 (%13.3)
TOTAL	44 (%29.3)	61 (%40.6)	30 (%20.0)	3 (%21.4)	149

		The presence of oral and dental disorders in the participants	The difficulty of participating in the training due to muscular system problems
The presence of oral and dental disorders in the participants	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	149	
The difficulty of participating in the training due to muscular system problems	Pearson Correlation	.266	1
	Sig. (2-tailed)	.001**	
	N	149	149

Table 5. The Relationship between Participants' Oral-Dental Health Problems and Difficulties in Participating in Training.

When Table 4 was examined, it was seen that 44 participants (29.3%) were injured without filling or root canal treatment. Sixty-one participants (40.6%) had 1-2 fillings or root canal treatment, 30 participants (20.0%) who had 3-4 fillings or root canal treatment, and 3 participants who had 5 or more fillings or root canal treatment (% 21.4) was found.

The relationship between the presence of oral and dental diseases of the participants and their difficulty in participating in training due to muscle system problems is shown in Table 5.

According to the results explained in Table 5. There was a weak and strong positive correlation between the presence of oral and dental diseases of the participants and their difficulty in participating in the training due to muscle system problems ($p < 0.05$; $p = 0.001$).

DISCUSSION

According to several researchers, there is a meaningful relationship between oral health and systemic diseases such as cardiovascular diseases [34]. The relationship is so important that even the research center MilanLab, which is responsible for maintaining the health of athletes within the famous football team AC Milan, considers oral health as a risk factor for sports injuries and proceeds accordingly [35].

A study by Gay-Escoda and colleagues focused on the link between oral health and sports injuries in the context of soccer players of F.C Barcelona. The study suggested that muscle injuries have a meaningful relationship with plaque index and periodontal pocket depth [36].

According to the data supplied by athletes themselves, oral health problems also affect their performance and welfare. The most common oral diseases detected among athletes

are dental caries, dental erosion, gum disease, and pericoronitis [32,33].

Several researchers examined the effect of oral health on athletic success [16,36,37,38]. Two of these researchers focused on Olympic athletes [16,36]. Each of these researchers indicated that oral health is to athletic success and performance.

One research's subject group included regular people and athletes. Approximately 8 out of 100 subjects reported that oral health problems had an impact on their exercise. 5 out of 100 people also reported that oral health issues influenced their athletic performance significantly [36].

Another study focused on Olympic athletes that took place in the London Olympics of 2012 [16]. The athletes who competed in the event received oral check-ups to examine how oral health problems affect the athlete's health and performance in a general sense [5]. The examination revealed that almost 40% of the athletes had an oral health problem. The results indicated that oral health affected the athletic performance and success of 18% of the athletes. Moreover, 28% stated that oral health issues lowered their life quality.

According to studies, IL-6 and cytokines levels are likely to rise proportionally with bad oral health. When these levels rise, fatigue occurs and fatigue is a potential factor that may lead to injuries [12,13].

CONCLUSION

In our research study, it was concluded that poor oral health may adversely affect training and sportive performance by causing systemic inflammation. However, it has also

been shown that the behaviours associated with routine tooth brushing can help sports injury prevention efforts and reduce the risk of injury in sportive performance.

In conclusion, to maintain good health and performance, oral health is a crucial factor for all athletes. Oral health problems are likely to affect other parts of the body and thus, lead to sports injuries and further health problems. Moreover, because of its physiological and psychological impacts, athletes' athletic performance is at risk because of oral health problems. Oral health will play a key role in the overall bodily health of the athlete and must be taken seriously. Athletes need to avoid potential risk factors that may lead to oral health problems, receive a regular dental examination, follow oral hygiene behaviors, and avoid unhealthy nutrition programs. For this reason, this study states that oral health is a key factor that should be taken proper care of for an athlete to be in their full health and performance.

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