

Original research article

# What do Turkish sports science students know about dental trauma and mouthguards? A descriptive study

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## ABSTRACT

**OBJECTIVE:** Sports-related dental and orofacial injuries can be reduced significantly through training on primary prevention and using proper equipment before engaging in sporting activities. This study aimed to determine the level of knowledge regarding dental trauma and prevention by mouthguards among the students in the Faculty of Sport Sciences.

**MATERIALS AND METHOD:** This was a descriptive study conducted at Ankara, Gazi, and Hacettepe Universities. Although intended to include all students at the faculties (N=3097), only those who were at the faculty and volunteered (28.2%) on the day the data were gathered participated. Data were gathered via a questionnaire comprising 31 questions on sociodemographic characteristics, dental trauma history, mouthguard use, and knowledge of dental trauma.

**RESULTS:** In total, 875 students with a mean age of 22.5±2.9 (60.3% male) participated. Of these students, 20.6% had dental trauma history, 72.0% had first aid and emergency training, and 20.9% had oral dental injuries training. Of the students, 69.5% had heard about mouthguards, although only 19.7% of these had used them. Mouthguards were mostly used in professional sports activities such as far-eastern sports and ice hockey. The average number of true answers out of ten dental trauma-related questions was 2.75±1.68 and 66.6% stated they wished to learn more about the topic.

**CONCLUSION:** Results showed a lack-of-knowledge about both dental trauma and mouthguards and inadequate use of mouthguards in sports activities. Therefore, basic information about these topics should be implemented in the curriculum to instruct students before they graduate.

**KEYWORDS:** Knowledge; mouthguards; sports injuries; students; tooth avulsion; trauma

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## INTRODUCTION

Orofacial and dental injuries might occur due to falls, collisions, contact with hard surfaces, or contact with equipment. For both children and adults, injury is a possibility during sports activities.<sup>1-3</sup> Facial injuries related to sport accidents account for 8% of all facial soft tissue injuries and 11-40% of all sports injuries involve the face.<sup>4,5</sup> Sports-related dental and orofacial injuries affect mostly the upper lip, maxillary jawbone, and maxillary incisors.<sup>2,6</sup> Children and adolescents, in particular, have increased risk for dental trauma from sporting activities due to the ongoing growth of the maxilla and alveolar bone, existence of immature permanent teeth, and behavioral challenges.<sup>7</sup> In the literature, baseball was the most risky sport for dental injuries among the 7-12 year age group, whereas basketball was the most risky in the 13-17 year age group.<sup>8</sup> Orofacial and dental trauma is a serious public dental health problem<sup>9</sup> with significant consequences for children and their parents, which may affect their quality of life due to the potential pain, negative psychological effects, and economic burden of treatment needs.<sup>2,10</sup>

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Dental and facial injuries can be reduced significantly through introducing training on primary prevention and using proper equipment before engaging in sporting activities. Most sports-related traumatic dental injuries are preventable with mouthguards.<sup>8,11</sup> The American Dental Association and International Academy of Sports Dentistry recommend mouthguard use in 29 sports/exercise activities.<sup>2,8</sup>

Athletes, coaches, athletic trainers, and recreation leaders should be aware of the risk for dental trauma in sports activities.<sup>12</sup> Studies of people involved in professional sports activities show they have low level dental trauma knowledge.<sup>13-15</sup> Considering that Sport Sciences Faculty students will continue their professional lives as physical education teachers or coaches, it is crucial for them to have correct sports-related dental trauma knowledge to protect their students as well as themselves. To the best of the authors' knowledge, there is no study in Turkey about dental trauma knowledge and mouthguard use of students in Sport Sciences Faculties. Therefore, this study aimed to reveal the knowledge of the students in the Faculty of Sport Sciences on the prevention and management of dental trauma and determine the level of mouthguard use.

## MATERIALS AND METHOD

### Place and time of research

This descriptive study was conducted with students enrolled in the Faculty of Sport Sciences of three universities located in Ankara, the capital city of Turkey (Ankara, Gazi, and Hacettepe Universities). Ethical approval from Hacettepe University Non-Interventional Clinical Research Ethics Board (Decision No: GO 17/369-27) and the Faculty deans' written official permissions were obtained. The data were gathered between April and December 2017.

### Universe and sample

The inclusion criteria were being a student of the targeted faculties and volunteering to participate. Although intended to cover all students of the faculties (3097 students), only 875 (28.3%) students participated in the study. There were four departments in the faculties: Physical Education and Sports Teacher Education, Recreation, Coaching Education, and Sports Management. Of the 875 participants, 333 were students in the Department of Physical Education and Sports Teacher Education, 146 were in the Department of Recreation Leaders, 223 were in the Department of Coaching Education, and 173 were in the Department of Sports Management.

### Data collection

The data were gathered via a structured, pre-tested, self-administered questionnaire. The pre-test was performed with 20 other faculty students of similar ages in order to check the comprehensibility of the questions. The questionnaire was developed by the researchers

**Table 1.** Distribution of the participants by dental trauma history

Dental trauma history	n	%
No	695	79.4
Yes <sup>a</sup>	180	20.6
Tooth	111	61.7
Tooth+tongue/labium/labial mucosa/ buccal mucosa/gingiva	25	13.1
Soft tissue (lip/tongue/buccal mucosa/gingiva)	34	19.6
Maxilla/mandibula	10	5.6

<sup>a</sup>Percentages were calculated in the dental trauma history group (n=180)

and had four parts with 31 questions. The first part consists of 10 questions about sociodemographic characteristics of the students. The second part consists of eight questions about dental trauma history, professional sports background, and mouthguard related knowledge and use. The third part consists of one question inquiring if the student can distinguish between the primary and permanent teeth and 10 questions related to dental trauma knowledge of the students. In the fourth part, there are two self-evaluation questions about the opinion on the adequacy of his/her oral dental injury knowledge and educational needs on the topic. Dental trauma knowledge questions were multiple-choice questions in which each question had a single correct answer. In order to facilitate the analysis and presentation of the knowledge questions, the number of true answers was counted for each participant with a minimum value of 0 and maximum of 10. Then, the authors determined three categories based on the quartiles and median as 0-1: 'low' (1<sup>st</sup> quartile=1), 2-4: 'fair' (2<sup>nd</sup> quartile=3), and 5-10: 'good' (3<sup>rd</sup> quartile=4).

### Statistical analysis

Data analysis was performed using the Statistical Package for the Social Sciences 20.0 software program (SPSS Inc., Chicago, IL, USA). Frequencies, percent distributions, mean, median, and standard deviation were used for descriptive statistics. The association between categorical variables was tested with the Chi square and Fisher's exact test. The t-test and Mann-Whitney U test were used for the comparison of means and medians, respectively. The level of significance was determined as p<0.05.

## RESULTS

### General characteristics

Approximately 60% of the participants (n=875) were male, the mean age was 22.5±2.9 (min-max: 18-36), and 13.5% of mothers and 26.3% of fathers had university or higher education. Among 5.0% (n=44) of the family members of the students, there was at least one

**Table 2.** Participants' knowledge and practice related to mouthguards

Knowledge and practice of mouthguards	n	%
<b>Aware of mouthguards (n=875)</b>		
No	267	30.5
Yes	608	69.5
<b>Wearing mouthguard during sports (n=608)</b>		
No	488	80.3
Yes	120	19.7
<b>Mouthguard type (n=120)</b>		
Custom- fabricated	40	33.3
Stocked	59	49.2
Both	21	17.5
<b>Necessity of using mouthguards during sporting activities (n=608)<sup>a</sup></b>		
Boxing, kick boxing, taekwondo, judo	568	93.4
American football	496	81.6
Rugby	391	64.3
Ice hockey	333	54.8
Basketball	316	52.0
Wrestling	288	47.4
Handball	240	39.5
Football (soccer)	175	28.8
Skiing	135	22.2
Cycling	84	13.8
Parachuting	83	13.7
Volleyball	53	8.7
Squash	37	6.1
Gymnastics	35	5.8
Diving	14	2.3
Ping pong	12	2.0
Swimming	11	1.8

<sup>a</sup>Percentages were calculated separately from the total number of 608

dentist. Among the students, 44.6% (n=390) were interested professionally in at least one sporting activity. Football was played the most (n=77, 19.7%), followed by volleyball and far-eastern sports (n=36, 9.2% each), and athletics (n=35, 8.9%).

#### Dental trauma and first aid-emergency training history

One-fifth of the students (n=180, 20.6%) had dental trauma history, and of them, 74.8% (n=136) had tooth or other oral tissue trauma (Table 1). Fifty students (5.7%) stated that their first-degree relative had dental trauma history.

Of the participants, 72.0% stated they had received first aid and emergency training. However, only 21.3% (n=134) reported that oral dental trauma was mentioned during the training and 20.9% (n=183) stated they had received some information on oral dental injuries from

lectures at university, conferences, or symposiums.

#### Mouthguard knowledge and practice

Many had heard about mouthguards (69.5%) but of these students, only one-fifth (19.7%, n=120) stated they used mouthguards when engaging in sports (Table 2). Among them, far-eastern sports professionals had the most mouthguard users with 21.7% (n=26). The reasons for not using mouthguards were 'not knowing the necessity' (33.0%), 'thinking unnecessary' (23.3%), 'not finding comfortable' (16.8%), 'not knowing how to use' (12.1%), 'not knowing where to obtain' (11.3%), and 'not finding it aesthetic' (5.5%). According to the study results, 25.1% of the females and 34.1% of the males had been unaware of mouthguards (p=0.005). Hearing about mouthguards did not significantly differ with the training history about dental injuries (p=0.76). Individual sporting activities as well as awareness and

**Table 3.** The proportion of correct answers on the questions related to dental trauma knowledge

Correct answers (n=145)	%
The anterior teeth of children aged 7 years or more are permanent teeth	59.7
When a permanent tooth is traumatized, emergency intervention is a necessity	56.8
Replantation is impossible when the primary tooth avulsed	52.5
The anterior teeth of children aged 6 years or less are primary teeth	48.3
When a primary tooth is traumatized, emergency intervention is a necessity	22.5
Replantation is possible when the permanent tooth avulsed	15.7
Correct practice in case of dental fracture	9.8
The correct part of the avulsed tooth to hold	7.1 (45.3 <sup>a</sup> )
Storage media for the transportation of an avulsed tooth	2.2 (13.9 <sup>a</sup> )
Immediate replantation possibility of the avulsed permanent tooth by the teacher	1.8 (11.7 <sup>a</sup> )

<sup>a</sup>Among the students who answered 'permanent tooth replantation is possible'

use of mouthguards were also evaluated. Football, volleyball, basketball, swimming, gymnastics, and far-eastern sports players were aware of mouthguards but mostly far-eastern sports and ice hockey players stated that they used one while engaging in sports.

### Dental trauma related knowledge

Among the students, 33.8% (n=296) stated that they can distinguish between the primary and permanent teeth. The dental trauma knowledge of the students were assessed with 10 questions and no student answered all questions correctly; only three students (0.3%) had 9 correct answers, and 7.8% had no correct answers (the mean number of correct answers was 2.75±1.68 for the whole group, 2.57±1.68 for males, and 3.07±1.61 for females). The most known three items were 'the distinction of anterior permanent teeth' (59.7%), 'necessity of emergency intervention for traumatized permanent teeth' (56.8%), and 'replantation impossibility of the avulsed primary teeth' (52.5%), and the least was 'true practice in case of dental fracture' (9.8%) (Table 3). For the transportation media of avulsed teeth, a glass of ice (23.4%), dry paper tissue (21.2%), a glass of tap water (4.4%), and a glass of hot water (2.2%) were chosen. Two-thirds of the students (60.8%) were grouped as moderate (2-4 true answers) and 27.1% as low (<2 true answers). Most of the students (92.3%) thought they did not have sufficient knowledge. However, only 66.6% stated that they wish to learn more about the topic.

The number of true answers significantly differed by sex (females>males, p=0.002) and having any training about dental injuries (trained>not trained, p=0.004). Among the students who evaluated themselves as having enough dental trauma knowledge, 41.8% were in the 'low level', and the difference was statistically significant (p≤0.001; Table 4).

### DISCUSSION

In sporting activities, athletes might be exposed injuries, which results in aesthetic, functional, physiological, and

economic problems. From this view point, the importance of prevention increases.<sup>2</sup> Sports-related dental and orofacial injuries are preventable, or at least reducible, by using the proper equipment when performing risky sporting activities.<sup>8</sup>

There are various studies about the use of mouthguards by professional athletes of different branches<sup>11,16</sup> and coaches.<sup>3</sup> The results of some studies performed on coaches-athletes,<sup>3</sup> physical education teachers/sport education teachers/dentists,<sup>17,18</sup> high school students,<sup>19</sup> sports participants,<sup>20</sup> basketball,<sup>21</sup> soccer,<sup>22</sup> and ice hockey players<sup>23</sup> show the low level of mouthguard use and knowledge related to tooth avulsion and dental emergencies. Furthermore, to our knowledge, there are few studies conducted on this issue in Turkey<sup>3,19-23</sup> and there is no study about both dental trauma knowledge and mouthguard use of students in Sport Sciences Faculties. In the current study, the results illustrating the low level of dental trauma knowledge (67.7%) and mouthguard use (19.7%) were similar to the literature.

One in five participants (20.6%) had dental trauma history, and of these students, 74.8% had tooth or tooth and tissue injuries. Although it was not evaluated if the student had a trauma history while doing a professional sporting activity, the evaluation of interest in professional sporting activity and dental trauma history showed more than 20.0% of basketball, athletics, horse-riding, ice skating, and far-eastern sports players had dental trauma history while 15.0%-20.0% of tennis, volleyball, and swimming athletes had. All 3 ice hockey players and 20 of taekwondo professional players had trauma history. According to the results of other studies, levels of dental trauma history range from 10.9% to 33.1%.<sup>17,23-25</sup> Lieger *et al.*<sup>11</sup> reports that of the participants interested in sports with high trauma risk and a trauma history, 41.0% had a tooth injury, which is similar to this study's results.

Properly-fitted mouthguards are mandated in all collision and contact sports such as ice hockey, football, lacrosse, and skateboarding.<sup>2</sup> Most of the participants

**Table 4.** Distribution of dental trauma knowledge levels by some student characteristics

Characteristics	Dental trauma knowledge level (n, % <sup>a</sup> )			Total	p
	Low	Moderate	High		
<b>Sex</b>					≤0.001 <sup>b</sup>
Female	64 (18.4)	226 (65.1)	57 (16.4)	347	
Male	173 (32.8)	306 (58.0)	49 (9.3)	528	
<b>Dentist among family members</b>					0.988 <sup>c</sup>
No	225 (27.1)	505 (60.8)	101 (12.2)	831	
Yes	12 (27.3)	27 (61.4)	5 (11.4)	44	
<b>Dental trauma history of the student</b>					0.257 <sup>b</sup>
No	197 (28.3)	415 (59.7)	83 (11.9)	695	
Yes	40 (22.2)	117 (65.0)	23 (12.8)	180	
<b>Dental trauma history in the family</b>					0.285 <sup>c</sup>
No	227 (27.5)	501 (60.7)	97 (11.8)	825	
Yes	10 (20.0)	31 (62.0)	9 (18.0)	50	
<b>First aid and emergency training</b>					0.076 <sup>b</sup>
No	78 (31.8)	144 (58.8)	23 (9.4)	245	
Yes	159 (25.2)	388 (61.6)	83 (13.2)	630	
<b>Oral dental health training</b>					0.259 <sup>b</sup>
No	196 (28.3)	415 (60.0)	81 (11.7)	692	
Yes	41 (22.4)	117 (63.9)	25 (13.7)	183	
<b>Self-reported oral dental health knowledge</b>					≤0.001 <sup>b</sup>
Not Enough	122 (20.4)	396 (66.3)	79 (13.2)	597	
Enough	8 (11.9)	40 (59.7)	19 (28.4)	67	
Have no idea	107 (50.7)	96 (45.5)	8 (3.8)	211	
<b>Total</b>	592 (67.7)	277 (31.7)	6 (0.6)	875	

<sup>a</sup>Row percentages, <sup>b</sup>Fisher exact test, <sup>c</sup>Chi square test

mentioned the necessity of using mouthguards while performing sporting activities and 69.5% heard about the protective function of mouthguards, similar to the results of various studies in the literature: 96.0% of taekwondo athletes,<sup>16</sup> 77.6% of physical education teachers, 36.5% of high school students,<sup>17</sup> 72.2% of coaches,<sup>3</sup> 62.0% of ice hockey players,<sup>23</sup> 56.0% of athletes,<sup>11</sup> and 55.4% of sport participants<sup>20</sup> knew the mouthguard's function. In this study, mostly football, volleyball, basketball, swimming, gymnastic, and far-eastern sports professional players were aware of mouthguards. However, only far-eastern sports players used them while engaging in sports. This is in parallel with the literature results that knowing the protective function of mouthguards does not mean athletes use them.<sup>3,11,20,23</sup>

The American Society for Testing and Materials classifies mouthguards in three categories: custom-fabricated, mouth-formed guards, and stock.<sup>8</sup> Custom-made mouthguards are the most predictable and effective.<sup>8</sup> Of the mouthguard-using participants, 33.3% used custom-fabricated and 17.5% used mouth-formed

or stock mouthguards. Custom-made mouthguard use was 90.0% in Lieger *et al.*<sup>11</sup> and 5.3% in Viodvic *et al.*<sup>16</sup> In this study, the reasons for not using mouthguards were 'not finding aesthetic and/or comfortable', 'not knowing the necessity', 'thinking unnecessary', and 'not knowing how to use'. These answers, except for 'not finding aesthetic and/or comfortable', might be related to the lack of knowledge on the topic. In addition, 'expensiveness' has been stated for not using mouthguards in a study of professional athletes.<sup>11</sup>

When dental trauma occurs, the type of the tooth (permanent/primary) and the injury must be examined carefully. Of all students, 59.7% gave the correct answer to the question 'whether the traumatized tooth is primary or permanent according to the age of the child', which was a higher proportion than in Chan *et al.* (47.0%).<sup>13</sup> In dental trauma occurrence, immediate intervention is needed to avoid or minimize complications. Most students (56.8%) knew the urgent need for intervention for a traumatized permanent tooth, similar to Sepet *et al.* (55.5%).<sup>20</sup> However, this rate was less than in other studies evaluating knowledge of the need

for urgent professional intervention for avulsed teeth (61.4%<sup>13</sup> and 64.1%<sup>24</sup>). One in eight students (15.7%) answered correctly about the replantation possibility of avulsed permanent teeth. This finding is less than some other study results: 37.3%,<sup>20</sup> 38.9%,<sup>24</sup> and 43.6%.<sup>16</sup> Of the students who knew the possibility of replantation, 11.7% stated that they could perform this process, which is higher than in Chan *et al.*,<sup>13</sup> but less than in Alencar *et al.*<sup>26</sup> with physical education teachers. Al-Arfaj *et al.* reported that 40.3% of athletes have re-implanted someone's avulsed tooth.<sup>25</sup> This higher proportion might be related to of time spent in professional sports.

In the case of avulsion, the duration the tooth stays dry is related to the risk of root resorption after repositioning. It is therefore important that the avulsed tooth be kept in suitable storage conditions (Hank's balanced salt solution, milk, saline, etc.), so that the fibers surrounding the root remain alive and is replaced quickly without touching the root surface.<sup>27</sup> Of all participants, only 2.2% knew the answer (a glass of cold milk) about the storage media of transporting the avulsed tooth. In the literature, knowing milk as the storage media was reported as 3.6%,<sup>13</sup> 5.3%,<sup>24</sup> 9.1%,<sup>20</sup> and 11.4%.<sup>19</sup>

In case of a dental fracture, the fractured part needs to be placed in a glass of milk and taken to the dentist as soon as possible for bonding. This study's results showed that 9.8% of the students knew this correct practice. However, Saritekin *et al.*<sup>17</sup> reported that only 3.5% of physical education teachers knew this.

According to the findings of this study, 72.0% of the students had first aid and emergency intervention training, similar to Natarajan *et al.* (71.0%)<sup>24</sup> and Chan *et al.*<sup>13</sup> (75.0%) but higher than Alencar *et al.*<sup>26</sup> (46.5%). Among the participants who had first aid and emergency training, 21.3% stated that information was given about oral and dental trauma, which was almost four times more than in Alencar *et al.* (4.4%).<sup>26</sup> Apart from first aid training, 20.9% of the students had training regarding oral dental injuries. In the literature, this proportion was between 5.4% and 33.5%.<sup>13</sup> These findings suggest that the content of first aid and emergency intervention trainings needs to be more comprehensive related to dental trauma.

Among the students, 7.7% thought that they had adequate dental trauma knowledge and two-thirds stated that they wished to learn more about the topic. In a study held with teachers, 25.9% were satisfied about their knowledge related to dental trauma,<sup>26</sup> which is higher than the current study. Similar to this study, some studies about the dental trauma knowledge of physical education teachers<sup>13,14</sup> and teacher candidates<sup>26</sup> show education is needed on the topic. The results show that the students do not have enough knowledge about dental trauma emergency procedures similar to studies comprising participants in sport activities.<sup>3,19,20,23-25</sup>

There were some limitations in this study. First, school attendance was not compulsory at the survey sites, and this might decrease the coverage rate. In ad-

dition, the time spent in professional sports and the age at trauma was not asked. Memory bias could have occurred, also.

## CONCLUSION

In conclusion, Sport Sciences Faculty students had an inadequate level of knowledge about dental trauma in general and protection from dental trauma by means of mouthguards.

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## Türk spor bilimleri fakültesi öğrencileri dental travma ve ağız koruyucular hakkında ne biliyor? Tanımlayıcı bir araştırma

### ÖZET

**AMAÇ:** Sporla ilgili diş ve orofasiyal yaralanmalar, birincil korunma eğitimleri ve spor aktivitesi sırasında uygun ekipmanın kullanılmasıyla önemli ölçüde azaltılabilir. Bu çalışmanın amacı, Spor Bilimleri Fakültesi öğrencilerinin diş travması ve ağız koruyucuları ile korunma konusundaki bilgi düzeylerini belirlemektir.

**GEREÇ VE YÖNTEM:** Bu çalışma Ankara, Gazi ve Hacettepe Üniversitelerinde yürütülmüş tanımlayıcı bir araştırmadır. Fakültelerin tüm öğrencilerinin (N=3097) dahil edilmesi planlanan çalışmaya, veri toplanan gün okulda olan gönüllüler (tüm öğrencilerinin %28.2) katılmıştır. Veriler öğrencilerin sosyodemografik özelliklerine, dental travma hikayelerine, ağız koruyucu kullanım durumlarına ve dental travma bilgilerine ilişkin toplam 31 sorudan oluşan bir anket aracılığı ile toplanmıştır.

**BULGULAR:** Yaş ortalaması 22.5±2.9 olan (%60.3 erkek) 875 öğrenci katılmıştır. Tüm öğrencilerin %20.6'sında dental travma öyküsü ve %72.0'ının ilk yardım ve acil durum eğitimi, %20.9'unun oral-dental yaralanma eğitimi almış olduğu öğrenilmiştir. Öğrencilerin %69.5'i ağız koruyucusunu duymuşken, %19.7'si kullandığını belirtmiştir. Ağız koruyucusu kullanımı en sık profesyonel olarak uzak doğu sporları yapan ve buz hokeyi oynayan sporcularda görülmüştür. Öğrencilerin genel dental travma doğru bilgi puanı 2.75±1.68 olarak bulunmuştur ve %66.6 öğrenci bu konu hakkında daha fazla bilgi edinmek istediklerini belirtmiştir.

**SONUÇ:** Bulgular, öğrencilerin hem dental travma hem de ağız koruyucuları hakkında yetersiz bilgilerinin olduğunu ve ağız koruyucularının spor etkinliklerinde yetersiz kullanıldığını göstermiştir. Her iki konuda da temel bilgilerin, öğrencilerin mezuniyet öncesi bilgi edinebilmeleri için müfredatlarına eklenmesi gerektiği düşünülmektedir.

**ANAHTAR KELİMELER:** Ağız koruyucu; bilgi; diş avulsiyonu; öğrenciler; spor yaralanmaları; travma