Pesquisa Brasileira em Odontopediatria e Clínica Integrada 2022; 22:e210092
https://doi.org/10.1590/pboci.2022.057
ISSN 1519-0501 / eISSN 1983-4632

ORIGINAL ARTICLE

Evaluation of Knowledge on Emergency Management of Avulsed Teeth Among Turkish Medical and Dental Students

Gulsum Duruk[1], Ismail Cuneyt Daşkıran[2]

[1]Department of Pediatric Dentistry, Faculty of Dentistry, Inonu University, Malatya, Turkey.
[2]Erzincan Binali Yıldırım University Oral and Dental Health Training and Research Hospital, Erzincan, Turkey.

Correspondence: Gulsum Duruk, Department of Pediatric Dentistry, Faculty of Dentistry, Inonu University, Malatya, Turkey. **E-mail:** durukgulsum@yahoo.com

Academic Editor: Alessandro Leite Cavalcanti

Received: 11 May 2021 / **Review:** 12 November 2021 / **Accepted:** 22 December 2021

How to cite: Duruk G, Daşkıran IC. Evaluation of knowledge on emergency management of avulsed teeth among Turkish medical and dental students. Pesqui Bras Odontopediatria Clín Integr. 2022; 22:e210092. https://doi.org/10.1590/pboci.2022.057

ABSTRACT

Objective: To evaluate the knowledge of medical and dental students regarding the emergency management of avulsed teeth. **Material and Methods:** This cross-sectional survey study was performed on 1841 students. Medical (n=746) and dental (n=845) students from different universities were included in this study. A questionnaire about the emergency management of avulsed teeth was conducted on the students. Also, 250 medical students from 3rd grade were included in the study and trained. The questionnaire was applied twice, before and after the training on the subject. **Results:** The mean correct answer scores were similar among the medical students in different grades ($p>0.05$). There were no statistically significant differences between the trained medical students and clinical dental students' correct answer scores, but there was a significant difference between the pre-clinical (1st-2nd-3rd years) and clinical (4th-5th years) dental students ($p<0.01$). **Conclusion:** Medical and preclinical dental students had lack of knowledge about the emergency management of avulsed teeth, while clinical dental and trained medical students were very knowledgeable. This result indicates the importance of education.

Keywords: Tooth Injuries; Tooth Avulsion; School Dentistry; Schools, Medical; Students.

Introduction

Traumatic dental injuries are a very serious public health problem. The literature reports that one billion living-people have had traumatic dental injuries [1]. It means that about 14% of the world's population suffers from this problem.

Dental avulsion, one of the most severe traumatic dentoalveolar injuries, is defined as the complete displacement of the tooth from its socket [2]. Of the teeth, maxillary central incisors are the most prone to avulsion, which reportedly occurs in 0.5–3 % of all dental injuries [3]. Anterior tooth loss has severe social and physical consequences [2,4,5].

Physicians are often the first ones in contact with the patient and their parents and sometimes must deal with avulsed teeth. Of the injuries, 5% encountered in hospitals are traumatic dental injuries [6]. However, a review about medical doctors' knowledge of dental trauma management reported that overall, medical doctors' knowledge on dental trauma is inadequate and warrants intervention from medical educators to close this gap [7].

Both physicians and dentists can choose the best treatment option only if they have sufficient knowledge about dental trauma [8]. Therefore, a clinician's knowledge about emergency management of dental trauma can be related to the prognosis of the injured tooth/teeth. Their knowledge about dental trauma management is essential and should be built in the undergraduate degree. The dental undergraduate curriculum in Turkey consists of a dental trauma lecture in the 4th grade. After post-graduation, dentists are supposed to identify and handle dentoalveolar trauma.

We did not find any data regarding the knowledge about emergency management of avulsed teeth among dental and medical students in Turkey. Therefore, this study aimed to assess how well dental and medical students know about the emergency management of avulsed teeth and how effectively a single lecture on the subject improves their knowledge.

The null hypotheses of this study: (i) there is no difference between dental and medical students in the levels of knowledge about emergency management of avulsed teeth; (ii) the grades of dental and medical students do not have any effect on the levels of knowledge about emergency management of avulsed teeth; and (iii) there is no difference between trained dental and medical students regarding the levels of knowledge about emergency management of avulsed teeth.

Material and Methods

This study was carried out in three steps; 1st step: Creating the questionnaire and its development; 2nd step: The cross-sectional part. The questionnaire was completed in a randomly selected group; 3rd step: Interventional part. The training was given to a selected group and the questionnaire was filled before and after the training

Creating Questionnaire Questions

First, the content of the questionnaire was planned and it was decided that the questionnaire should include emergency management of avulsed teeth. The questionnaire was modified from the questionnaires used in previous studies [3,9,10].

Three pediatric dentists and one endodontist, and then five different pediatric dentists, verified as an expert the validity of the prepared questionnaire prior to the main study. Changes in the questions were made as per their suggestions.

Final Questionnaire

The final online questionnaire consisted of 3 sections. The 1st section was about sociodemographic status of dental and medical students, the 2nd section was about emergency management of avulsed teeth, and the 3rd section was about students' perspectives on dental trauma education and self-evaluation of their dental trauma knowledge.

The 2nd section consisted of 7 questions, 18 items (range 0-18). The question about cleaning the avulsed tooth consisted of 6 items, while the question about transporting the avulsed tooth consisted of 7 items.

The correct answers to the questions in the second section were determined according to the 2012 avulsion guidelines of the International Association of Dental Traumatology (IADT) [3]. Each question in the 2nd section (18-item) was scored as follows: Correct response – 1 point and Incorrect response – 0 points. Thus, the theoretical range was from 0 "no knowledge" to 18 "excellent knowledge".

Reliability Analysis

The reliability of the seven questions (18 items in the 2nd section) was assessed with test-retest reliability using Cohen's Kappa and internal consistency using Cronbach's alpha coefficient. For test-retest reliability, the questionnaire was initially piloted among 30 students from different grades (15 dental students, 15 medical students) twice in a two-week interval and then they were not included in the final sample.

Students were provided with information about the research prior to consent. An informative text was contained at the beginning of the questionnaire. It contains information about the definition of tooth avulsion, the significant proportion of the avulsion cases applied to the emergency departments and medical doctors, and how to distinguish between primary and permanent teeth. Also, pictures on the subject (avulsed tooth, primary and permanent anterior teeth) were added to the text.

Ethical Aspects

The study was approved by the Ethical Committee of Inönü University (2015/65). The survey design was used with IRB approval and providers' (all students) personal information were kept confidential, and it was emphasized in the first page of the questionnaire.

Conduct the Questionnaire

This cross-sectional study was conducted from January 2016 to June 2016. The online questionnaire was sent to 3000 dental and medical students (1500 dental students, 1500 medical students), randomly selected from various Turkish universities and whose contact information was provided through WhatsApp (WhatsApp Messenger - Apps on Google Play). One thousand eight hundred forty-one dental and medical students, all volunteers, participated in the questionnaire (the response rate was 61.4%). The participants were divided into four different groups:

- Preclinical Dental Students (PDS): Grade 1, 2 and 3 students in faculty of dentistry, n=540 (29.3%);
- Clinical Dental Students (CDS): Grade 4 and 5 students in faculty of dentistry, n=305 (16.6%);
- Medical Students (MS): Grade from 1 to 6 of students in faculty of medicine, n=746 (40.5%);
- Trained Medical Students (TMS): Grade 3 students in a faculty of medicine, n=250 (13.6%);

All of the students in group CDS had received a lecture about dental trauma.

The post-hoc power analysis revealed nearly 100% power, considering type I error (alpha) of 0.05, sample sizes of 540 and 305, an effect size of 3.46 for the difference in the mean knowledge score between PDS and CDS and a two-sided alternative hypothesis (H1).

Training Medical Students on Dental Trauma

The questionnaire on emergency management of avulsed teeth was conducted on the TMS group (250 participants from Inönü University Faculty of Medicine, 3th grade) without any education provided previously and then the same group completed the same questionnaire after a 1h-lecture on emergency management of avulsed teeth. The lesson was lectured by an experienced dental practitioner (G. D.) in the classroom.

Statistical Analysis

IBM SPSS Statistics for Windows, v. 22 (SPSS Inc., Chicago, IL, USA) was used for the statistical analyses. Test-retest reliability using Cohen's Kappa and internal consistency using Cronbach's alpha coefficient were used to measure the questionnaire's reliability. The data were firstly analyzed for the normal distribution with Kolmogorov–Smirnov test. Next, Kruskal-Wallis test was used to compare the number of correct answers among the groups. Mann-Whitney U test was used to compare the number of correct answers the participants gave based on their previous dental trauma experience. Wilcoxon signed-rank test was used to compare the number of correct answers in group TMS between baseline and after the training. Finally, Spearman rank correlation test was used to detect the correlation between the self-evaluation of participants' dental trauma knowledge and their correct scores. $P<0.05$ values were considered to be significant.

Results

Of 1841 participants, 1036 females (56.3%) and 805 males (43.7%), %29.3 were PDSs, %16.6 were CDSs, 40.5% were MSs, and 13.6% were TMSs. All participants' mean age and distribution by age, sex, grades, and previous dental trauma experience are presented in Table 1.

Table 1. Personal data of the dental and medical students (1st section).

	Gender		Age	Grades		Encountering Dental Trauma Case
	Female N (%)	Male N (%)	Mean±SD		N (%)	N (%)
PDS	284 (52.4)	256 (47.4)	20.63±1.55	1	171 (31.7)	175 (32.4)
				2	175 (32.4)	
				3	194 (35.9)	
CDS	172 (56.4)	133 (43.6)	23.15±1.31	4	187 (61.3)	62 (20.3)
				5	118 (38.7)	
MS	430 (57.6)	316 (42.4)	22.12±2.46	1	114 (15.3)	239 (32.0)
				2	103 (13.8)	
				3	171 (22.9)	
				4	105 (14.1)	
				5	150 (20.1)	
				6	103 (13.8)	
TMS	150 (60.0)	100 (40.0)	21.81±1.20	3	250 (100.0)	76 (30.4)

PDS: Preclinical Dental Students; CDS: Clinical Dental Students; MS: Medical Students; TMS: Trained Medical Students; SD: Standard Deviation.

For section 2, the kappa coefficient was 0.917 ($\kappa>0.75$; good agreement) and Cronbach's alpha was 0.903 ($\alpha>0.90$; excellent). The answers of the 7 questions (18 items) on the emergency management of avulsed teeth are presented in Table 2.

Table 2. The percentage distribution of the dental and medical student's opinions on the emergency management of tooth avulsion (2nd section).

Questions	PDS	CDS	MS	TMS
	N (%)	N (%)	N (%)	N (%)
Q1. Can the avulsed primary tooth be reimplanted?				
Yes	286 (53.0)	21 (6.9)	402 (53.9)	5 (2.0)
No	**164 (30.4)**	**270 (88.5)**	**266 (35.7)**	**245 (98.0)**
Do not know	90 (16.7)	14 (4.6)	78 (10.5)	0 (0.0)
Q2. Can the avulsed permanent tooth be reimplanted?				
Yes	**502 (93.0)**	**305 (100.0)**	**435 (58.3)**	**250 (100.0)**
No	32 (5.9)	0 (0.0)	295 (39.5)	0 (0.0)
Do not know	6 (1.1)	0 (0.0)	16 (2.1)	0 (0.0)
Q3. What to do in case of dental avulsion?				
Go to dentist	59 (10.9)	0 (0.0)	297 (39.8)	21 (8.4)
Go to dentist with avulsed tooth in proper storage media	**384 (71.1)**	**71 (23.3)**	**296 (39.7)**	**21 (8.4)**
Go to dentist after immediate reimplanting avulsed tooth	**83 (15.4)**	**234 (76.7)**	**42 (5.6)**	**208 (83.2)**
Doing nothing	8 (1.5)	0 (0.0)	89 (11.9)	0 (0.0)
Do not know	6 (1.1)	0 (0.0)	22 (2.9)	0 (0.0)
Q4. What is the critical time for avulsed tooth replantation?				
In the first hour	**419 (77.6)**	**289 (94.8)**	**386 (51.7)**	**220 (88.0)**
In a few hours	55 (10.2)	8 (2.6)	150 (20.1)	15 (6.0)
In 24 hours	48 (8.9)	8 (2.6)	171 (22.9)	15 (6.0)
within any time frame	8 (1.5)	0 (0.0)	19 (2.5)	0 (0.0)
Do not know	10 (1.9)	0 (0.0)	20 (2.7)	0 (0.0)
Q5. Where do you hold from of an avulsed tooth?				
Crown	**378 (70.0)**	**284 (93.1)**	**420 (56.3)**	**243 (97.2)**
Root	82 (15.2)	12 (3.9)	175 (23.5)	6 (2.4)
Anywhere	74 (13.7)	9 (3.0)	124 (16.6)	1 (0.4)
Do not know	6 (1.1)	0 (0.0)	27 (3.6)	0 (0.0)
Q6. If the avulsed tooth is dirty, it would be cleaned with……? (6 items)				

	PDS			CDS			MS			TMS		
	+	-	0	+	-	0	+	-	0	+	-	0
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Tap water	**74 (13.8)**	322 (59.6)	144 (26.7)	**208 (68.2)**	97 (31.8)	0 (0.0)	**64 (8.6)**	653 (87.5)	29 (3.9)	**198 (79.2)**	52 (20.8)	0 (0.0)
Alcohol	68 (12.6)	**276 (51.1)**	196 (36.3)	2 (0.7)	**299 (98.0)**	4 (1.3)	102 (13.7)	560 (75.0)	84 (11.3)	5 (2.0)	244 (97.6)	1 (0.4)
Normal saline	**270 (50.1)**	247 (45.7)	23 (4.3)	**279 (91.5)**	24 (7.9)	2 (0.7)	**291 (39.0)**	419 (56.2)	36 (4.8)	**227 (90.8)**	23 (9.2)	0 (0.0)
Scrubing with clean gauze	39 (7.2)	**428 (79.3)**	73 (13.5)	2 (0.7)	**303 (99.3)**	0 (0.0)	46 (6.2)	**666 (89.2)**	34 (4.6)	2 (0.8)	**248 (99.2)**	0 (0.0)

	or brush and washing with tap water											
	Wet gauze	18 (3.4)	**436 (80.7)**	86 (15.9)	2 (0.7)	**303 (99.3)**	0 (0.0)	39 (5.2)	**694 (93.1)**	13 (1.7)	0 (0.0)	**250 (100.0)**	0 (0.0)
	Doing nothing	125 (23.2)	**375 (69.4)**	40 (7.4)	10 (3.3)	**295 (96.7)**	0 (0.0)	228 (30.6)	**516 (69.1)**	2 (0.3)	1 (0.4)	**249 (99.6)**	0 (0.0)
Q7. If avulsed tooth were unable to be reimplanted, it could be kept in …… (7 items)													
	Sponge, cotton or napkin	229 (42.4)	**302 (55.9)**	9 (1.7)	0 (0.0)	**305 (100.0)**	0 (0.0)	480 (64.3)	**262 (35.0)**	4 (0.5)	0 (0.0)	**250 (100.0)**	0 (0.0)
	Ice	50 (9.3)	**462 (85.6)**	28 (5.2)	0 (0.0)	**305 (100.0**	0 (0.0)	57 (7.6)	**674 (90.0)**	11 (1.5)	0 (0.0)	**250 (100.0)**	0 (0.0)
	Normal saline	**97 (18.0)**	411 (76.1)	32 (5.9)	**267 (87.5)**	35 (11.5)	3 (1.0)	**115 (15.4)**	622 (83.4)	9 (1.2)	**230 (92.0)**	20 (8.0)	0 (0.0)
	Patient's saliva	**38 (7.0)**	487 (90.2)	15 (2.8)	**235 (77.0)**	63 (20.7)	7 (2.3)	**19 (2.5)**	724 (97.1)	3 (0.4)	**188 (75.2)**	60 (24.0)	2 (0.8)
	Tap water	**10 (1.9)**	525 (97.2)	5 (0.9)	**156 (51.1)**	136 (44.6)	13 (4.3)	**6 (0.8)**	740 (99.2)	0 (0.0)	**150 (60.0)**	86 (34.4)	14 (5.6)
	Cold milk	**104 (19.3)**	421 (78.0)	15 (2.8)	**303 (99.3)**	2 (0.7)	0 (0.0)	**29 (3.9)**	717 (96.1)	0 (0.0)	**250 (100.0)**	0 (0.0)	0 (0.0)
	Any aseptic solution	32 (6.0)	**481 (89.1)**	27 (5.0)	2 (0.7)	**303 (99.0)**	0 (0.0)	69 (9.2)	**670 (89.8)**	7 (0.9)	0 (0.0)	**250 (100.0)**	0 (0.0)

+: Preferable; -: Unpreferable; 0: No idea; Correct answers are in bold.

Almost all of the CDSs (99.3%) and the TMSs (100%) and only 3.9% of the MSs chose cold milk as transport media, while the majority of the PDSs and MSs preferred sponge, cotton or napkin as transport media (42.4% and 64.3%, respectively). The mean correct answer scores based on the 18 items were 9.78±2.04, 16.44±1.80, 8.59±1.80, and 16.68±1.57 in Group PDS, CDS, MS, and TMS, respectively. There were statistically significant differences between the groups ($p<0.001$), except for group CDS and TMS ($p>0.05$). The highest correct answer scores were in group CDS and TMS, while the lowest score was in group MS (Table 3).

Table 3. Mean (SD), median (min-max) values of correct answers for 2nd section.

Groups	Mean (SD)	Median (min-max)	p-value
PDS	9.78 (2.04)	9.5 (5 – 14)[a]	<0.001
CDS	16.44 (1.80)	17 (11 – 18)[b]	
MS	8.59 (1.80)	8 (5 – 13)[c]	
TMS	16.68 (1.57)	17 (12 – 18)[b]	

χ^2: Kruskal Wallis; [a-b]: Different superscript letters are significantly different; SD: Standard Deviation

The Wilcoxon's matched pair rank test determined that after a 1h lecture the level of knowledge about the emergency management of avulsed teeth significantly increased ($p<0.001$) in group TMS. The mean correct answer score increased from 9.24±2.29 (median (min-max): 10(5-14)) to 16.68±1.57 (median (min-max):17(12-18))(effect size: 3.2).

In the 2nd section of the questionnaire, 44.3% of the CDSs and 46% of the TMSs, who attended a 1h lecture on the emergency management of avulsed teeth, completed all the questions correctly. Their knowledge was excellent, with 18 points.

Most of the MSs (84%) had not received any information about dental trauma, while half of the PDSs (52.6%) and most of the CDSs (91.5%) stated that their faculty had provided them with information about dental trauma (Table 4). All the students were aware of the importance of training on the subject and especially the dental students (PDS: 91.7%, CDS: 91.8%) were more enthusiastic to learn than the medical students (MS: 73.6%, TMS: 75.6%) (p<0.01) (Table 4).

Table 4. The dental and medical students' approach to dental trauma education and self-evaluation of their dental trauma knowledge (3rd section).

Questions		PDS	CDS	MS	TMS	
		N (%)	N (%)	N (%)	N (%)	
Did you receive any information about dental trauma? If yes. from where? (multiple choice question)						
Yes	Faculty	284 (52.6)	279 (91.5)	32 (4.3)	13 (5.2)	
	TV/Radio/ Public Spotlight	21 (3.9)	3 (1.0)	12 (1.6)	2 (0.8)	
	Medical Journals	8 (1.5)	3 (1.0)	12 (1.6)	6 (2.4)	
	Dentist	58 (10.7)	13 (4.3)	23 (3.1)	4 (1.6)	
	Internet/ Social Media	70 (13.0)	6 (2.0)	18 (2.4)	7 (2.8)	
	Conferences, Panels, Seminars	8 (1.5)	1 (0.3)	13 (1.7)	4 (1.6)	
	Others	9 (1.7)	0 (0.0)	9 (1.2)	0 (0.0)	
No		126 (23.3)	0 (0.0)	627 (84.0)	214 (85.6)	
Do you think it is important to attend an educational program about "management of dental trauma"?						
Yes		522 (96.7)	305 (100.0)	666 (89.3)	234 (93.6)	
No		18 (3.3)	0 (0.0)	80 (10.7)	16 (64.0)	
Would you like to attend any educational program on "management of dental trauma"?						
Yes		495 (91.7)	280 (91.8)	549 (73.6)	189 (75.6)	
No		45 (8.3)	25 (8.2)	197 (26.4)	61 (24.4)	
How would you score self-evaluation of your dental trauma knowledge from 1 to 4?						
					Pre-education	Post-education
1: I have no idea		120 (22.2)	0 (0.0)	430 (57.6)	150 (60.0)	0 (0.0)
2: Insufficient		344 (63.7)	84 (27.5)	225 (30.2)	75 (30.0)	37 (14.8)
3: Sufficient but incomplete		73 (13.5)	184 (60.3)	46 (6.2)	11 (4.4)	155 (62.0)
4: Comprehensive		3 (0.6)	37 (12.1)	45 (6.0)	14 (5.6)	58 (23.2)

The level of self-evaluated knowledge about dental trauma was significantly higher among CDSs and TMSs than PDSs and CDSs. The training made a positive impact on medical students' self-evaluation of dental trauma knowledge. The self-evaluated knowledge about dental trauma significantly increased after a 1h lecture in Group TMS (p<0.001). There was a strong correlation between the self-evaluated knowledge and the correct answer scores (r=0.266 p<0.001). The mean correct answer score of the students who self-evaluated their knowledge of dental trauma as "comprehensive" or "sufficient but incomplete" was statistically higher than the others.

The percentage of the students who had encountered dental trauma case/cases was 30% (n=552). The correct answer score of the students who had encountered dental trauma case/cases was lower than the others (p<0.01).

Discussion

It is extremely important to educate physicians and dentists who have to handle traumatic dental injuries. However, it has not been studied enough to evaluate dental trauma knowledge among medical and dental students. Very few studies have examined undergraduate education for dental trauma and the impacts of a certain educational intervention on dental and medical students' knowledge acquisition [9,11-18]. The studies were mostly conducted on post-graduate practitioners [7,8,19-23]. Moreover, dental and medical

students were evaluated separately in published studies on dental trauma, except for a single study [15]. In this study, to emphasize the effectiveness of the training on emergency dental trauma management, students from all academic years from both faculties participated. Thus, the medical and dental students were evaluated, especially in the same questionnaire.

In this study, clinical competence in handling tooth avulsion was not considered. However, since the process can be very challenging after emergency management of tooth avulsion cases, a specialist knowledge may be required [8]. Thus, it should be focused on how students diagnose tooth avulsions correctly, and the right advice and knowledge about emergency management should be provided for them.

The IADT has recommended that an avulsed permanent tooth should be held from the crown, washed if dirty, and replanted in its socket [3,24]. If the avulsed tooth cannot be replanted, it is recommended that the tooth should be put into an appropriate transport medium and taken to the dentist as soon as possible [3,24]. This study was designed based on the IADT 2012 guideline [3]. However, in the mid-2020, a new guideline was published [24], and this new guideline on the emergency management of avulsed permanent teeth recommends washing a dirty avulsed tooth with milk, patient's saliva or saline instead of tap water. However, since this study was conducted while the previous guideline was still current, the participants' preference to wash the avulsed tooth with "tap water" was considered correct.

In Al-Shamiri et al.'s [16] study, around 77% of 307 clinical dental students (60% of 4th and 92.3% of 5th year students) chose milk as the best media of transportation for avulsed teeth. In this study, the ratio of the CDSs who chose milk for the transport of avulsed teeth was 99.3%.

Dental avulsion is one of the most severe dental trauma cases and it is crucial to take action immediately for the treatment. Medical students may think that emergency management of avulsed teeth is not a physician's job. In addition, even if they may have the knowledge about the management of avulsed primary teeth, they may not be able to distinguish between primary and permanent teeth. That's why, in order to make the survey more understandable, a small informative text and some pictures related to the topic were added to the beginning of the questionnaire.

In a previous study [15], a cross-sectional survey regarding dental trauma emergency management was conducted on 679 students in five different academic departments, including two health-related studies (Medicine and Dental Medicine) and three non-health-related studies (Teacher's Education, Pre-school Education, and Physical Education) from all academic years. They reported that dental students had shown the best results, compared to medical, physical education, preschool education, and teachers' education students (6.75±2.17 *vs.* 4.32±1.67, 3.69±1.67, 3.38±1.76, and 3.05±1.55, respectively, on a scale of 0 to 10; $p \leq 0.001$). Mahmood et al. [17] conducted on 301 dental students from all academic years and stated that compared to clinical students, a significantly lower percentage of preclinical students knew the emergency management of avulsed teeth. In this study, the results showed that the level of knowledge about the emergency management of avulsed teeth varied among the students. The highest correct answer scores were in groups CDS and TMS (16.44±1.80, 16.68±1.57, respectively, on a scale of 0 to 18) ($p<0.01$). This result emphasized the difference between those who received education and those who did not. Also, the mean correct answer score in group TMS was higher than in group CDS, although it was not statistically significant ($p>0.05$). The reason why the medical students had the highest level of knowledge about the emergency management of avulsed teeth is that they completed the questionnaire after attending a 1h lecture on the subject. In Alzoubi et al.'s [11] study, a survey about dental trauma was conducted on undergraduate dental students before, immediately after, and 6 months following a 1-h lecture. They reported that dental trauma knowledge was inadequate and a lecture on

dental trauma education could be an efficient method for undergraduate dental students to improve their knowledge. However, they stated that it did not last long to retain that information. Valdepeñas et al. [18] stated that the first-year dental students demonstrated inadequate basic knowledge of dental trauma management, and a lecture appears to be an effective educational intervention for improving their level of knowledge of the subject (before: 20.5±3.3; immediately after: 28.8±1.7; on a scale of 0 to 30; $p<0.001$). They noted that the notions referred to dental trauma decreased three years after the conference, but remained high (3 years after: 28.3±2.7).

In this study, the students, who did not attend a lecture on emergency management of avulsed teeth, had insufficient knowledge about the subject. Most of the 6th grade medical students had an internship in emergency department because the questionnaire was conducted towards the end of the semester. However, there was no statistically significant difference among the grades in terms of the knowledge level, since the subject of dental trauma is not included in the undergraduate curriculum. Kostopoulou and Duggal [19], stressed the importance of dental trauma in undergraduate and post-graduate programs for health professionals and suggested the diffusion of a standard protocol for follow-up and initial care of tooth avulsion cases for all health professionals and all the population.

The lack of knowledge about the emergency management of avulsed teeth was demonstrated in the literature [7,9,12-14,22,23,25]. One study compared the confidence levels in various procedures among senior pediatric dentistry students in the UK. These students stated that dentoalveolar trauma was the field they had the least confidence to deal with [13]. It is predicted that the students' self-confidence will increase when they received training on the subject. In this study, the correct answer scores were higher among the students who self-evaluated their dental trauma-related knowledge as "comprehensive" or "sufficient but incomplete", which is similar to other studies [13,15,21,26].

Interestingly, while CDS should be the group encountering the most trauma cases, this group reported that they have encountered the lowest number of cases. We think that the students in other groups may not have answered this question correctly. They may have thought that the situations such as fracture of the enamel on the carious dentin tissue due to the influence of occlusal forces and/or exfoliation of primary teeth are dental trauma case. The level of knowledge was lower among the students who reported that they had encountered dental trauma before than among the others who reported that they had not. So, this result justified our thinking.

Due to the limited number of participations, the findings may not be fully attributed to Turkish dental and medical students. On the other hand, the strength of the study is that the study group consisted of dental and medical students selected from different faculties, and it has never been studied in Turkish society before. In addition, another limitation of this study was the questionnaire was online, and so the students might have found the correct answers on the internet.

Conclusion

Through training, dental and medical students became more knowledgeable about the emergency management of avulsed teeth. Education/ training in the prevention and emergency management of dental trauma should be part of the curriculum content in health science degrees. Further studies are needed in larger populations of health professionals.

Authors' Contributions

GD	https://orcid.org/0000-0002-6756-6637	Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Writing - Original Draft and Writing - Review and Editing.
ICD	https://orcid.org/0000-0001-6157-3177	Data Curation, Writing - Review and Editing and Visualization.

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

Financial Support

None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

Acknowledgements

The authors wish to thank all participants for their invaluable contribution to this study.

References

[1] Petti S, Glendor U, Andersson L. World traumatic dental injury prevalence and incidence, a meta-analysis-One billion living people have had traumatic dental injuries. Dent Traumatol 2018; 34(2):71-86. https://doi.org/10.1111/edt.12389

[2] Andersson L. Epidemiology of traumatic dental injuries. Pediatr Dent 2013; 35(2):102-5.

[3] Andersson L, Andreasen JO, Day P, Heithersay G, Trope M, DiAngelis AJ, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. Dent Traumatol 2012; 28(2):88-96. https://doi.org/10.1111/j.1600-9657.2012.01125.x

[4] El-Kalla IH, Shalan HM, Bakr RA. Impact of dental trauma on quality of life among 11-14 years schoolchildren. Contemp Clin Dent 2017; 8(4):538-44. https://doi.org/10.4103/ccd.ccd_428_17

[5] Borum MK, Andreasen JO. Therapeutic and economic implications of traumatic dental injuries in Denmark: an estimate based on 7549 patients treated at a major trauma centre. Int J Paediatr Dent 2001; 11(4):249-58. https://doi.org/10.1046/j.1365-263x.2001.00277.x

[6] Lin S, Levin L, Goldman S, Peleg K. Dento-alveolar and maxillofacial injuries: a 5-year multi-center study. Part 1: General vs facial and dental trauma. Dent Traumatol 2008; 24(1):53-5. https://doi.org/10.1111/j.1600-9657.2006.00510.x

[7] Yeng T, O'Sullivan AJ, Shulruf B. Medical doctors' knowledge of dental trauma management: A review. Dent Traumatol 2020; 36(2):100-7. https://doi.org/10.1111/edt.12518

[8] Duruk G, Erel ZB. Assessment of Turkish dentists' knowledge about managing avulsed teeth. Dent Traumatol 2020; 36(4):371-81. https://doi.org/10.1111/edt.12543

[9] Fujita Y, Shiono Y, Maki K. Knowledge of emergency management of avulsed tooth among Japanese dental students. Bmc Oral Health 2014; 14:34. https://doi.org/10.1186/1472-6831-14-34

[10] Namdev R, Jindal A, Bhargava S, Bakshi L, Verma R, Beniwal D. Awareness of emergency management of dental trauma. Contemp Clin Dent 2014; 5(4):507-13. https://doi.org/10.4103/0976-237X.142820

[11] AlZoubi F, Mannocci F, Newton T, Manoharan A, Djemal S. What do dental students know about trauma? Dent Traumatol 2015; 31(6):482-6. https://doi.org/10.1111/edt.12198

[12] Raja S, Rajagopalan CF, Kruthoff M, Kuperschmidt A, Chang P, Hoersch M. Teaching dental students to interact with survivors of traumatic events: development of a two-day module. J Dent Educ 2015; 79(1):47-55.

[13] Rodd HD, Farman M, Albadri S, Mackie IC. Undergraduate experience and self-assessed confidence in paediatric dentistry: comparison of three UK dental schools. Brit Dent J 2010; 208(5):221-6. https://doi.org/10.1038/sj.bdj.2010.207

[14] Jokic NI, Bakarcic D, Grzic R, Majstorovic M, Sostarek M. What general medicine students of University of Rijeka know about dental avulsion? Eur J Dent Educ 2017; 21(4):E131-E134. https://doi.org/10.1111/eje.12235

[15] Ivkošić I, Gavić L, Jerković D, Macan D, Vladislavić NZ, Galić N, et al. Knowledge and attitudes about dental trauma among the students of the university of Split. Acta Stomatol Croat 2020; 54(3):302-13. https://doi.org/10.15644/asc54/3/8

[16] Al-Shamiri HM, Alaizari NA, Al-Maweri SA, Tarakji B. Knowledge and attitude of dental trauma among dental students in Saudi Arabia. Eur J Dent 2015; 9(4):518-22. https://doi.org/10.4103/1305-7456.172636

[17] Mahmood IA, Morshidi DNA, Hamzah SH, Baharuddin IH, Ahmad MS. Malaysian dental students' knowledge of managing dental trauma in children. Eur J Dent Educ 2021; 25(3):550-5. https://doi.org/10.1111/eje.12632

[18] Valdepenas J, Adanero A, Martinez EM, Planells P. Knowledge of dental trauma among dental students. Lecture intervention protocol and follow-up over four academic courses. Eur J Dent Educ 2021; 25(2):238-45. https://doi.org/10.1111/eje.12597

[19] Kostopoulou MN, Duggal MS. A study into dentists' knowledge of the treatment of traumatic injuries to young permanent incisors. Int J Paediatr Dent 2005; 15(1):10-9. https://doi.org/10.1111/j.1365-263X.2005.00588.x

[20] Westphalen VPD, Martins WD, Deonizio MDA, da Silva UX, da Cunha CB, Fariniuk LF. Knowledge of general practitioners dentists about the emergency management of dental avulsion in Curitiba, Brazil. Dent Traumatol 2007; 23(1):6-8. https://doi.org/10.1111/j.1600-9657.2005.00392

[21] Hartmann RC, Rossetti BR, Siqueira Pinheiro L, Poli de Figueiredo JA, Rossi-Fedele G, Gomes MS, et al. Dentists' knowledge of dental trauma based on the International Association of Dental Traumatology guidelines: A survey in South Brazil. Dent Traumatol 2019; 35(1):27-32. https://doi.org/10.1111/edt.12450

[22] Tewari N, Jonna I, Mathur VP, Goel S, Ritwik P, Rahul M, et al. Global status of knowledge for the prevention and emergency management of traumatic dental injuries among non-dental healthcare professionals: A systematic review and meta-analysis. Injury 2021; 52(8):2025-37. https://doi.org/10.1016/j.injury.2021.06.006

[23] Tewari N, Sultan F, Mathur VP, Rahul M, Goel S, Bansal K, et al. Global status of knowledge for prevention and emergency management of traumatic dental injuries in dental professionals: Systematic review and meta-analysis. Dent Traumatol 2021; 37(2):161-76. https://doi.org/10.1111/edt.12621

[24] Fouad AF, Abbott PV, Tsilingaridis G, Cohenca N, Lauridsen E, Bourguignon C, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. Dent Traumatol 2020, 36(4):331-42. https://doi.org/10.1111/edt.12576

[25] Levin L, Jeffet U, Zadik Y. The effect of short dental trauma lecture on knowledge of high-risk population: an intervention study of 336 young adults. Dent Traumatol 2010; 26(1):86-9. https://doi.org/10.1111/j.1600-9657.2009.00847.x

[26] Zaleckiene V, Peciuliene V, Brukiene V, Jakaitiene A, Aleksejuniene J, Zaleckas L: Knowledge about traumatic dental injuries in the permanent dentition: A survey of Lithuanian dentists. Dent Traumatol 2018; 34(2):100-6. https://doi.org/10.1111/edt.12388