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# Evaluation of Turkish emergency medicine physicians' knowledge on emergency management of tooth avulsion

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**Purpose**
Tooth avulsion is a type of trauma that requires emergency intervention, and a significant number of patients apply to the emergency. The aim of this study is to evaluate the level of knowledge and the awareness about tooth avulsion among emergency medicine physicians throughout Turkiye.

**Materials and Methods**
The study was conducted with 545 physicians, working in emergency departments. An online questionnaire about tooth avulsion was applied to the participants. The questionnaire consisted of 3-section which evaluated personal information, the level of knowledge of avulsion cases in primary and permanent dentition, and the level of training on this subject.

**Results**
Of the physicians, 61.3% had not previously received education on dentoalveolar traumas, 58.7% would replant an avulsed permanent tooth, 28.3% would prefer replantation to be performed "immediately", and 28% would prefer milk as the ideal storage medium. The mean±SD and median(min-max) values of the correct answer scores on a scale of 0 to 35 were 16.42±7.08 and 17(0-32), respectively. 45.6% of the physicians' level of knowledge was below the median score.

**Conclusion**
The level of knowledge about tooth avulsion among Turkish emergency medicine physicians is not sufficient and there is a need to improve the knowledge level of physicians with comprehensive educational programs. This study indicates that the training of the physicians about the subject will reflect positively on the treatment of dental trauma patients.

***Keywords:*** *Dentofacial trauma, tooth avulsion, emergency medicine physicians, knowledge, Turkiye*

## Introduction

Although the oral region constitutes 1% of the body in total, 5% of traumatic injuries occur in this region (1). Dentoalveolar trauma is considered to be the most important oral health problem in children and young adults due to its functional, aesthetic, psychological, and economic consequences (2, 3).

Avulsion, one of the dental traumas, occurs when a tooth comes out of its alveolar socket completely due to trauma (4-6). The most common avulsed teeth in both primary and permanent dentition are maxillary central incisors (4, 6). The incidence of avulsion in primary teeth is 7-21%, whereas it is 0.5-3% in permanent teeth (7, 8). Furthermore, this trauma is most commonly seen between the ages of 7 to 9 years (9). While it has been stated that the immediate replantation of an avulsed permanent tooth has a 85-90% success rate, its exposure to the dry environment for long periods affects the prognosis negatively (10-12).

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It has been reported that the most common dentoalveolar trauma is avulsion in children under the age of 15 who received treatment in the emergency room (13). In a study conducted in 2010, it was reported that the percentage of dentoalveolar trauma patients who went to a children's hospital within 6 months were 36% for primary tooth avulsion and 22% for permanent tooth avulsion (14). However, there are no full-time dentists in emergency departments. In a study conducted in Turkey, it was reported that 68.1% of emergency medicine physicians witnessed emergency dentoalveolar trauma cases at least once in their professional careers, but 40.6% felt inadequate in the emergency management of dentoalveolar traumas observed in children (6). Since the possible delays in the treatment affect the prognosis negatively, the training and awareness of the physician performing the intervention in the emergency department are critical (15).

In many countries and in certain parts of our country, studies have been conducted on the knowledge and awareness of emergency medicine employees of dentoalveolar traumas (4-6, 16-22). However, it has not been found any studies focusing on tooth avulsion and involving emergency physicians from each region in Turkey. Therefore, the findings of the previous studies cannot be attributed to Turkish emergency medicine physicians (6, 21, 22).

In this study, it was aimed to evaluate the level of knowledge and the awareness of emergency medicine physicians throughout Turkey and to compare the physicians' level of knowledge according to their demographic status and experiences on the subject. The null hypothesis ($H_0$) of this study was that the physicians' personal data and their experiences on the subject do not affect their level of knowledge about emergency management of tooth avulsion.

## Materials and Methods

*Ethical approval*

This cross-sectional study was conducted from April, 2018 to February, 2019. Before starting the study, approval was obtained from Inönü University Health Sciences Non-Interventional Clinical Research Ethics Committee (ethics approval number: 2018/18-12).

*Creating the questionnaire*

An online questionnaire was created. The questions in the questionnaire were divided into 3 sections. The first section was about personal information, the second section was on measuring the physicians' level of knowledge about the management of tooth avulsion in primary and permanent dentition, and the last section was about the personal opinions of physicians on their level of knowledge and on the awareness of receiving dentoalveolar trauma training. In addition, a picture of an avulsed anterior central tooth was placed on the first page of the questionnaire and a description of the avulsed tooth was made under the picture.

For content validity, the questionnaire was sent to experts (four pediatric dentists, three endodontists, two maxillofacial surgeons, one general dentist, and one biostatistician). The necessary changes were made in the questionnaire according to the experts' comments, and language correction was made by a linguist for clarity of the language of the questionnaire.

A pilot study involving 50 physicians (20 emergency medicine physicians, 10 general practitioners, 10 physicians in emergency medicine rotation, and 10 medical students) who did not participate in the main study was conducted to test the suitability of the methodology, which revealed no need to change the proposed methods. For section 2, the reliability assessment of the questionnaire was done with internal consistency using Cronbach's alpha coefficient and test-retest reliability using Cohen's Kappa. For test-retest reliability, 50 physicians completed the final format of the questionnaire twice in a 1-week interval.

The final online questionnaire, which consisted of three parts, contained 23 questions- 49 items: first section- 6 questions; second section- 9 questions (35 items); the third section- 8 questions.

*Sample size determination*

The number of the emergency medicine physicians in Turkey were calculated separately for each city and totally from the data of the ministry of health, and then their numbers were calculated for seven geographical regions in Turkey. The number of the emergency medicine specialists and the residents working in the public sector in Turkey is 3297, and it was calculated that a minimum of 345 (10.5%) emergency medicine physicians have to be reached from Turkey with 95% confidence and 5% tolerance. In this study, 393 (11.9%) of emergency medicine physicians were reached throughout the country.

Based on the stratified random sampling method, the minimum number of emergency medicine physicians needed for each region in Turkey was determined by considering the targeted-sample size. While the minimum numbers needed to be reached in each region are 31 in Black Sea, 98 in Marmara, 52 in Aegean, 28 in Mediterranean, 74 in Central Anatolia, 40 in Eastern Anatolia, and 23 in Southeastern Anatolia, the numbers of Turkish emergency medicine physicians reached in each of these 7 regions were 32, 100, 88, 31, 75, 42, and 25, respectively.

In addition, 152 physicians working in the emergency department (115 general practitioners, 37 physicians in the emergency medicine rotation) participated in the questionnaire. A total of 545 physicians serving in emergency departments in different regions of Turkey participated in this study.

*Data collection*

The final online questionnaire was sent to all the physicians working in emergency departments whose contact information had been provided by email, WhatsApp, and social networking platforms, such as Facebook, Instagram, etc. In addition, the questionnaire was distributed to some forums on Facebook groups that are actively used by Turkish physicians working in emergency departments. A total of 545 Turkish physicians working in emergency departments, all volunteers, answered the questionnaire. The map of the provinces where the questionnaire was applied is shown in Figure 1.

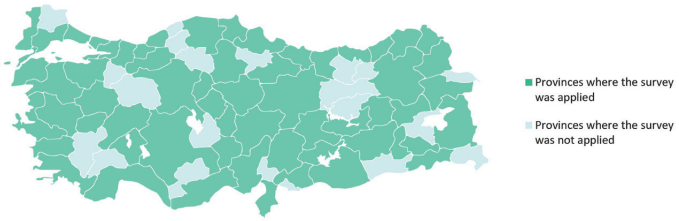


***Figure 1.*** *The map of the Turkish provinces where the questionnaire was applied.*

*Inclusion / Exclusion criteria*

The study included emergency medicine specialists, residents, general physicians working in emergency departments, and practitioners in emergency medicine rotation.

*Calculation of correct answer scores*

The physicians' level of knowledge on emergency management of tooth avulsion was calculated according to the section 2. The correct answers to the questions in Section 2 were determined with the reference to the 2012 avulsion guideline of the International Association of Dental Traumatology (IADT) (7). Each item in Section 2 was scored as "zero" for incorrect answers and "one" for correct answers, and thus, the total correct answer scores of the physicians were determined. The theoretical range was from 0 "no knowledge" to 35 "excellent knowledge" on a scale of 0 to 35 (23).

*Statistical analysis*

The data obtained were analyzed using IBM SPSS V22 (SPSS Inc., Chicago, IL, USA). Internal consistency and test-retest reliability to measure the reliability of the questionnaire were used with the Cronbach's alpha and Cohen's Kappa, respectively. The data were first analyzed for the normal distribution with Kolmogorov-Smirnov test, and as a result, the data were analyzed using non-parametric tests to determine statistical differences. The Mann-Whitney *U* and Kruskal-Wallis tests were used to compare the correct answer scores according to the physicians' personal data and experiences on the subject. Multiple linear regression analysis was used to estimate the relative parameters of the knowledge score of emergency management. The significance level was accepted as $p<0.05$.

## Results

In section 2 of the questionnaire, the results of the reliability tests showed that Cronbach's alpha was 0.92 ($\alpha > 0.90$ indicates excellent internal consistency) and Cohen's Kappa was 0.93 ($\kappa > 0.80$ is evaluated as very good agreement). The physicians' personal data are presented in Table 1. A total of 545 physicians working in emergency departments, consisting of 366 (67.2%) males and 179 (32.8%) females, participated in the study (mean age: 33.12 ± 6.7 years). Of the physicians, who participated in the questionnaire, 40.2% were residents, 31.9% were emergency medicine specialists, and 21.1% were general practitioners. More than half of the physicians (58%) had been working in the emergency department for 0-5 years.

The percentage of the participants who stated that they had reached information about tooth avulsion was 31.4%, and 52.3% of those reported that they had obtained the necessary information from their faculties. Furthermore, 61.3% of the physicians stated that the training they received did not include oral and dentoalveolar traumas. The percentage of the physicians who stated that they had encountered 1-5 avulsion cases where they worked in the last six months because of tooth avulsion was 39.4%, and the percentage of the physicians who did not encounter a tooth avulsion case within the 6 months was 51.6% (Table 1).

While 45.7% of the physicians stated that they could differentiate between primary and permanent teeth in avulsion cases, 63.7% stated that they would not replant the primary teeth.

The percentages of the physicians' answers to the questions about emergency management of avulsed permanent teeth are presented in Table 2.

The mean correct knowledge score (based on section 2) was 16.42±7.08 and median score (min-max) was 17 (0-32) (range 0 to 35). The physicians' level of knowledge was determined as low (45.6%), moderate (6.1%), and upper (48.3%) according to the median value of the correct answer scores (Figure 2).

The mean±SD and median (min-max) values of the level of knowledge on emergency management of avulsed teeth, and statistical comparisons of these values according to the questions in section 1 and section 3 are presented in Table 3. The knowledge level of the emergency medicine specialists was found to be higher compared to the general practitioners ($p<0.01$). The physicians' experience in emergency department was also statistically significant on the level of knowledge ($p<0.05$). Furthermore, the level of knowledge of the physicians who received training on tooth avulsion was higher than those who did not receive training ($p<0.001$). The physicians who reported their level of knowledge as "sufficient" had the highest level of knowledge ($p<0.001$).

When examining whether the physicians have received training on oral and dentoalveolar trauma according to their position, 51.7% of the emergency medicine specialists stated that they received training, while it was limited to 22.6% among the general practitioners. Of the physicians who received training on the subject (n=211), 42.7% were emergency medicine specialists, 39.3% were residents, and 12.3% were general practitioners.

Of the physicians, 93.4% stated that it is important to receive training on dentoalveolar traumas and 88.6% stated that they wanted to participate in a training program related to dentoalveolar traumas. Moreover, 84% of the physicians thought that their level of knowledge on dental traumas is inadequate.

According to the nine variables included in the regression model, 15.4% of the variances can be estimated in the correct answer scores on emergency management of dental avulsion among the physicians ($p<0.001$). The variable "whether to reach the information about tooth avulsion" had the most estimation power, which was significant ($p<0.001$) and positively related ($\beta=0.310$) to the higher knowledge scores (Table 4).

**Table 1:** *I- Personal data of the physicians, III- Knowledge and/or experience of the physicians about tooth avulsion.*

| **Section I. Personal Data of The Physicians** | | |
|---|---|---|
| **Q1. Age** | **mean±SD** | **min-max** |
| | 33.12±6.7 | 24-76 |
| | **n** | **%** |
| **Q2. Gender** | | |
| Male | 366 | 67.2 |
| Female | 179 | 32.8 |
| **Q3. Geographic regions where physicians working** | | |
| Black Sea | 47 | 8.6 |
| Marmara | 122 | 22.4 |
| Aegean | 126 | 23.1 |
| Mediterranean | 40 | 7.3 |
| Central Anatolia | 90 | 16.5 |
| Eastern Anatolia | 82 | 15.0 |
| Southeastern Anatolia | 38 | 7.0 |
| **Q4. Position of physicians** | | |
| Emergency medicine resident | 219 | 40.2 |
| Emergency medicine specialist | 174 | 31.9 |
| General practitioner | 115 | 21.1 |
| Practitioner in emergecy medicine rotation | 37 | 6.8 |
| **Q5. Academic title of the emergency medicine specialist (n=174)** | | |
| Professor | 3 | 1.7 |
| Associate professor | 11 | 6.3 |
| Academic specialist | 18 | 10.3 |
| Specialist | 142 | 81.6 |
| **Q6. Years of experience in emergency department** | | |
| 0-5 | 316 | 58.0 |
| 5-10 | 158 | 29.0 |
| 10-15 | 49 | 9.0 |
| 15-20 | 14 | 2.6 |
| > 20 | 8 | 1.5 |
| **Section III. Knowledge and/or Experience of The Physicians About Tooth Avulsion** | | |
| **Q1. Have you ever had access to any information about tooth avulsion?** | | |
| Yes | 171 | 31.4 |
| No | 374 | 68.6 |
| **Q2. Where did you receive the information about tooth avulsion?** | | |
| Faculty of medicine | 90 | 52.3 |
| Medical journals | 25 | 14.5 |
| Dentist | 35 | 20.3 |
| Internet/ social media | 34 | 19.8 |
| Conferences, panels, seminars | 60 | 34.9 |
| Others | 18 | 10.6 |
| **Q3. Does your education cover dentoalveolar traumas?** | | |
| Yes | 211 | 38.7 |
| No | 334 | 61.3 |
| **Q4. Have you ever face with a tooth avulsion case in your family/ patients or yourself?** | | |
| Yes | 215 | 39.4 |

| **Table 1:** *Continue.* | | |
|---|---|---|
| **Section III. Knowledge and/or Experience of The Physicians About Tooth Avulsion** | | |
| **Q4. Have you ever face with a tooth avulsion case in your family/ patients or yourself?** | **mean±SD** | **min-max** |
| No | 330 | 60.6 |
| **Q5. How many patients with tooth avulsion have you seen in the last 6 months?** | | |
| 0 | 281 | 51.6 |
| 1-5 | 215 | 39.4 |
| 5-10 | 10 | 1.8 |
| >10 | 39 | 7.2 |
| **Q6. Do you think it is important to get training on dental trauma?** | | |
| Yes | 509 | 93.4 |
| No | 36 | 6.6 |
| **Q7. Would you like to attend a training program on dental trauma?** | | |
| Yes | 483 | 88.6 |
| No | 62 | 11.4 |
| **Q8. Self-evaluation** | | |
| No idea | 40 | 7.3 |
| Insufficient | 458 | 84 |
| Sufficient | 43 | 7.9 |
| Comprehensive | 4 | 0.7 |

SD: Standard Deviation

| **Table 2:** *The percentage distribution of the physicians' opinion about the emergency management of tooth avulsion.* | | | | |
|---|---|---|---|---|
| **Section II. The Physicians' Knowledge Levels About Emergency Management of Tooth Avulsion** | | | | |
| **Q1. If a child who doesn't have any general health problem has refer to the hospital where you work with an avulsed tooth: (3 items)** | **Yes n (%)** | **No n (%)** | **Do not know n (%)** | |
| Can you differentiate that is the primary or permanent tooth? | **249 (45.7)** | 174 (31.9) | 122 (22.4) | |
| If you think it's a primary tooth, would you replace it? | 93 (17.1) | **347 (63.7)** | 105 (19.3) | |
| Does replantation of the primary tooth damage the underlying permanent tooth? | **77 (14.1)** | 134 (24.6) | 334 (61.3) | |
| **Q2. What do you think of the following statements about a patient whose permanent tooth has avulsed by trauma and who doesn't have any general health problem? (7 items)** | **Yes n (%)** | **No n (%)** | **Do not know n (%)** | |
| The permanent avulsed tooth can be replaced. | **320 (58.7)** | 34 (6.2) | 191 (35.1) | |
| Replantation is not preferred due to the risk of inflammation. | 58 (10.6) | **244 (44.8)** | 243 (44.6) | |
| If the avulsed tooth is not brought by the patient, the physician should recommend that the tooth be searched at scene of the accident. | **208 (38.2)** | 125 (22.9) | 212 (38.9) | |
| Extraoral period of the avulsed tooth is vital for replantation. | **327 (60)** | 36 (6.6) | 182 (33.4) | |
| The avulsed tooth that stayed more than 1 hour in extraoral area, should be replace by the dentist. | **183 (33.6)** | 66 (12.1) | 296 (54.3) | |
| If the tooth has been replaced. Antibiotics should be prescribed. | **423 (77.6)** | 13 (2.4) | 109 (20) | |
| If the tooth has been replaced. The tetanus vaccine of the patient should be checked. | **438 (80.4)** | 9 (1.7) | 98 (18) | |
| **Q3. If the avulsed tooth thought to be replaced, when should it be done?** | **Immediately n (%)** | **In a few hours n (%)** | **In a few days n (%)** | **Do not know n (%)** |
| | **154 (28.3)** | 162 (29.7) | 37 (6.8) | 192 (35.2) |

**Table 2:** *Continue.*

| **Section II. The Physicians' Knowledge Levels About Emergency Management of Tooth Avulsion** | | | | |
|---|---|---|---|---|
| **Q4. Which part of the avulsed tooth would you hold from?** | **Crown of the tooth n (%)** | **Root of the tooth n (%)** | **Anywhere of the tooth n (%)** | **Do not know n (%)** |
| | **273 (50.1)** | 47 (8.6) | 13 (2.4) | 212 (38.9) |
| **Q5. If the avulsed tooth is dirty, which one(s) can be preferred to clean it? (6 items)** | **Preferable n (%)** | **Not preferable n (%)** | **Do not know n (%)** | |
| Washing with tap water | **261 (47.9)** | 165 (30.3) | 119 (21.8) | |
| Washing with alcohol | 51 (9.4) | **349 (64)** | 145 (26.6) | |
| Washing with normal saline | **487 (89.3)** | 4 (0.7) | 54 (9.9) | |
| Scrubing the tooth with clean gauze or brush and washing with tap water | 112 (20.5) | **292 (53.6)** | 141 (25.9) | |
| Cleaning with wet gauze | 307 (56.3) | **114 (20.9)** | 124 (22.8) | |
| Doing nothing | 71 (13) | **308 (56.5)** | 166 (30.5) | |
| **Q6. While replacing the avulsed tooth; (3 items)** | **Yes n (%)** | **No n (%)** | **Do not know (%)** | |
| I align the avulsed tooth with the symmetrical tooth. | **395 (72.7)** | 7 (1.3) | 141 (26) | |
| If I face with obstacles, I can strech the alveolar socket slightly. | **146 (26.9)** | 102 (18.8) | 295 (54.3) | |
| If I can't replace, I direct the patient to the dentist immediately. | **447 (82.5)** | 6 (1.1) | 89 (16.4) | |
| **Q7. How do you fix the replaced tooth in alveolar socket while you're directing the patient to the dentist? (4 items)** | **Yes n (%)** | **No n (%)** | **Do not know n (%)** | |
| I tell the patient to bite a gauze. | **361 (66.2)** | 23 (4.2) | 161 (29.5) | |
| I advice the patient to avoid contacting his/her upper teeth with his/her lower teeth. | **170 (31.2)** | 121 (22.2) | 254 (46.6) | |
| I can fix the avulsed tooth with suturing it to the adjacent gingiva. | **98 (18)** | 157 (28.8) | 290 (53.2) | |
| I do nothing. | 31 (5.7) | **240 (44)** | | 274 (50.3) |
| **Q8. When should the dentist be consulted after replacing the avulsed tooth?** | **Immediately n (%)** | **In a few hours n (%)** | **Within a week n (%)** | **Do not know n (%)** |
| | **164 (30.1)** | 162 (29.7) | 89 (16.3) | 130 (23.9) |
| **Q9. Which storage media are appropriate for the avulsed tooth? (9 items)** | **Preferable n (%)** | **Not preferable n (%)** | **Do not know n (%)** | |
| Clean sponge, cotton or napkin | 366 (67.1) | **72 (13.2)** | 107 (19.6) | |
| Ice | 159 (29.2) | **189 (34.7)** | 197 (36.1) | |
| Normal saline | **394 (72.3)** | 45 (8.3) | 106 (19.4) | |
| Patient's mouth | **190 (34.9)** | 194 (35.6) | 161 (29.5) | |
| Patient's saliva | **208 (38.1)** | 162 (29.7) | 175 (32.1) | |
| Tap water | **106 (19.4)** | 280 (51,4) | 159 (29.2) | |
| Cold milk | **153 (28)** | 215 (39.4) | 177 (32.5) | |
| Alcohol | 34 (6.3) | **353 (64.8)** | 158 (29) | |
| Any aseptic solution | 127 (23.2) | **209 (38.4)** | 209 (38.4) | |

The percentages written in bold type indicate the correct answers.

## Discussion

Since traumatic dental injuries can occur during off-hours or during holidays, the emergency department is usually the first place to apply in these cases (18). Because there is rarely a dentist in emergency departments of public hospitals or university hospitals in Turkey, the first intervention has to be performed by a medical doctor (21). Therefore, the knowledge of emergency physicians about emergency management of tooth avulsion is very important. In this study, the level of knowledge about tooth avulsion among emergency physicians in Turkey was evaluated. Although there are the studies conducted in Turkey, neither the sample size nor the regional distribution of the participants can reflect the population of Turkish emergency medicine physician (6, 21, 22). In addition, none of these studies focused on tooth avulsion which is one of the most serious dental traumas and requires emergency intervention. In this study, every stage that should be followed according to IADT in the emergency management of avulsed teeth was questioned.

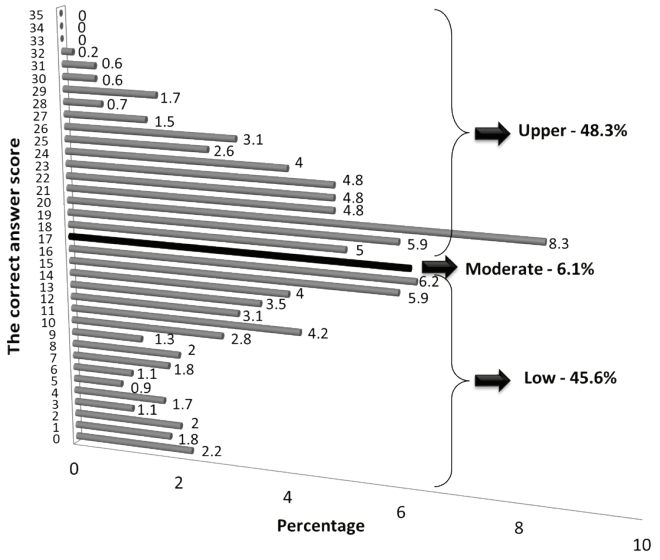


***Figure 2.*** *The percentage column chart of the physicians' low, moderate, and upper levels of the knowledge according to the median value of the correct answer score (range 0 to 35).*

Bahammam (24) asked the physicians about the definition of tooth avulsion. In our study, the definition of tooth avulsion was given with pictures at the beginning of the questionnaire. Thus, a participant could integrate the avulsion case he/she encountered in the clinic with the questionnaire questions without being stuck in terminology.

In the 2012 guideline of IADT, it was recommended that an avulsed permanent tooth should be held from the crown, washed under running tap water, replanted into the alveolar socket and taken to the dentist, if it cannot be replanted, it should be delivered to the dentist in the first 60 minutes in a suitable transport medium (7).

In this study, 58.7% of the physicians stated that an avulsed permanent tooth could be replanted, while 10.6% stated that they would not prefer it due to the possibility of developing inflammation after replantation. In the study conducted by Diaz et al.(17), 43.9% of physicians stated that they would replant an avulsed tooth despite the risk of tetanus. In another study, some physicians stated that they would avoid replantation only when multiple avulsions occurred and when the patient is unconscious (16).

**Table 3:** *The mean (SD) and median (min-max) values of the correct scores on the emergency management of avulsed teeth according to the physicians' characteristics and experiences on the subject, and the statisctical comparisions.*

| | Mean (SD) | Median (min-max) | Test statistic | *p*-values |
|---|---|---|---|---|
| **Gender** | | | | |
| Male | 16.32 (7.31) | 17 (0–32) | *U*= 33.182 | 0.806 |
| Female | 16.63 (6.60) | 17 (0–31) | | |
| **Geographic regions where the physicians working** | | | | |
| Black Sea | 17.34 (6.66) | 19 (0–30) | | |
| Marmara | 15.67 (7.43) | 16 (0–31) | | |
| Aegean | 16.40 (7.07) | 17 (0–32) | | |
| Mediterranean | 16.50 (6.91) | 17 (0–30) | = 3.496 | 0.744 |
| Cantral Anatolia | 15.87 (6.75) | 17.5 (0–26) | | |
| Eastern Anatolia | 17.46 (7.21) | 17 (0–31) | | |
| Southeastern Anatolia | 16.71 (7.24) | 19 (0–29) | | |
| **Position of the physicians** | | | | |
| Emergency medicine resident | 15.94 (7.47) | 17 (0 – 31)[ab] | | |
| Emergency medicine specialist | 17.77 (6.72) | 19 (0 – 30)[a] | = 11.251 | **0.010** |
| General practitioner | 15.58 (6.70) | 16 (0 – 32)[b] | | |
| Practitioner in emergecy medicine rotation | 15.51 (6.85) | 17 (0 – 26)[ab] | | |
| **Years of experience in emergency department** | | | | |
| 0-5 | 15.85 (7.03) | 17 (0 – 31) | | |
| 5-10 | 16.65 (7.32) | 18 (0 – 32) | | |
| 10-15 | 17.65 (6.94) | 20 (2 – 30) | = 10.195 | **0.037** |
| 15-20 | 20.79 (5.10) | 20 (15 – 30) | | |
| > 20 | 19.38 (4.31) | 19.5 (12 – 25) | | |
| **Accessing information about tooth avulsion** | | | | |
| Yes | 20.32 (6.08) | 21 (0 - 32) | *U*= 16.636 | **<0.001** |
| No | 14.64 (6.79) | 16 (0 - 28) | | |
| **Whether the education covers dentoalveolar traumas** | | | | |
| Yes | 18.50 (6.71) | 20 (0 - 32) | *U*= 25.416 | **<0.001** |
| No | 15.10 (7.00) | 16 (0 - 31) | | |

**Table 3:** *The mean (SD) and median (min-max) values of the correct scores on the emergency management of avulsed teeth according to the physicians' characteristics and experiences on the subject, and the statisctical comparisions.*

| | Mean (SD) | Median (min-max) | Test statistic | *p*-values |
|---|---|---|---|---|
| **Encountering with tooth avulsion before** | | | | |
| Yes | 17.24 (6.83) | 18 (0 - 31) | *U*= 32.002 | **0.053** |
| No | 15.89 (7.20) | 17 (0 - 32) | | |
| **Number of tooth avulsion cases encountered in the last 6 months** | | | | |
| 0 | 15.69 (7.32) | 17 (0-31) | = 4.150 | 0.246 |
| 1-5 | 17.28 (6.84) | 18 (0-32) | | |
| 5-10 | 17.10 (4.73) | 17.5 (10-24) | | |
| >10 | 16.77 (6.78) | 19 (2-29) | | |
| **Self-evaluation of the physicians** | | | | |
| No idea | 13.03 (8.50) | 14 (0-27)[a] | = 40.928 | **<0.001** |
| Insufficient | 16.19 (6.69) | 17 (0-30)[a] | | |
| Sufficient | 22.51 (6.08) | 23 (4-32)[b] | | |
| Comprehensive | 11.25 (9.71) | 11.5 (0-22)[a] | | |
| **Total** | 16.42 (7.08) | 17 (0-32) | | |

SD: StandardDeviation, *U*: Mann-Whitney *U*, χ2 : Kruskal-Wallis, a-b: There is no difference between the positions with the same letter.

**Table 4:** *The estimation power on the correct answer score of the independent variables in the multiple regression model.*

| | Estimate (β) | 95% CI | **p*-values |
|---|---|---|---|
| (Constant) | | -1.914-5.984 | .312 |
| Gender | .037 | -.639-1.751 | .361 |
| Geographic regions where physicians working | .027 | -.205-.418 | .502 |
| Position of physicians | -.001 | -.304-.295 | .977 |
| Years of experience in emergency department | .015 | -.263-.382 | .716 |
| Accessing information about tooth avulsion (1:No. 2:Yes) | **.310** | 3.404-6.059 | **<.001** |
| Whether the education covers dentoalveolar traumas | .067 | -.301-2.242 | .134 |
| Encountering with avulsion before | .015 | -.985-1.416 | .724 |
| Number of dental avulsion cases encountered in the last 6 months | .041 | -.397-1.224 | .317 |
| Self-evaluation (1:No idea…. 4: Comprehensive ) | **.135** | .913-3.579 | **.001** |
| **$R^2$ (Adjusted)** | .154 | | <.001 |

*Multiple linear regression analysis, Dependent variable: Correct answer score

Of the physicians, 50.1% stated that they would hold an avulsed tooth from its crown. This result was close to the results found by Aren et al. (48.4%) (21) and Bahammam (51.6%) (24).

Of the physicians, 47.9% preferred tap water to clean an avulsed tooth, while 89.3% of them preferred normal saline. Both of them are acceptable choices. However, since normal saline is widely used for many purposes in hospitals, it is expected that the physicians will mostly prefer saline for cleaning avulsed teeth. Furthermore, more than half of the physicians (56.3%) stated that avulsed teeth can be wiped with a wet sponge, which indicates that they were unaware that this practice would damage the periodontal ligaments. Bahammam(24) reported that 50.8% of the physicians preferred tap water to clean an avulsed tooth. After this study was carried out, the new guideline of IADT was published in the second half of 2020 (25). According to the new guideline, if an avulsed tooth is dirty, it is recommended to gently wash it with milk, serum or patient's saliva rather than washing it under tap water. Since this study was conducted before the publication of the new guideline, washing an avulsed dirty tooth under tap water was considered correct according to the previous guideline (7, 25). The authors of this study wanted to emphasize this important information which was included in the new guideline.

Clinical studies have shown that prognosis is the best for avulsed teeth replanted within 5 minutes (26). The correct treatment provided within the first 15 minutes after avulsion is critical for the long-term prognosis of the avulsed tooth (10, 27). In this study, the percentage of the phsicians who think that the tooth should be replanted "immediately" was 28.3%. In a study involving dentists, medical doctors and a portion of the population in Pakistan, the percentage of those who recommended immediate replantation was

10.1%, while the percentage obtained after the exclusion of dentists drops to 4.6% (20).

If the avulsed tooth cannot be replanted immediately, it should be delivered to the dentist in a suitable transport medium, such as HBSS, cold milk, salin, patient's saliva or tap water if necessary. It is not preferred to leave it inside the mouth because there is a risk for young children to swallow it (25, 28, 29). The first choices should be HBSS and milk which is more accessible. Since normal saline does not contain nutrients, unlike milk and HBSS, it can preserve the viability of fibroblasts for only 2 hours and is suitable for short-term storage of avulsed teeth (30). Periodontal ligament cells can not survive when the tooth remains in a dry environment for 60 minutes or more (7, 29). However, in this study, more than half of the physicians (67%) preferred dry environment. In other studies, the percentages of them were 33.3%, 25%, 8.7%, and 5.8% (5, 6, 18, 21). In this study, the most preferred option by the participants was normal saline (72%). The closest result to our study was observed in the study by Aren et al. (21) (62.7%), and the percentages of the physicians who prefer normal saline were lower in other studies (35.5%, 42.4%, respectively) (18, 19). Of the physicians, 28% reported that an avulsed tooth can be carried in cold milk. In other studies, the percentages of the physicians who preferred milk were 40%, 31.9%, 31.1%, 16.7%, and below 10% (6, 17-19, 21, 24, 31). It can be concluded that milk was not the most preferred media to consider as the ideal solution in many studies.

IADT recommends the tetanus vaccine and antibiotic prophylaxis after replantation of the avulsed teeth (7, 25). The proportion of Turkish physicians who were aware of the necessity of the tetanus vaccine and antibiotic prophylaxis was over ¾.

Replantation of avulsed primary teeth is not recommended because of the potential risk of damaging the underlying permanent teeth germs (7, 25). Unfortunately, 17.1% of the physicians thought that an avulsed primary tooth can be replanted. In another study conducted in Turkey, the percentage of physicians who stated that avulsed primary teeth can be replanted was reported as 24.1% (6).

While 39.4% of the physicians who participated in this study stated that they encountered at least one avulsion case during their professional lives, in the previous study conducted in Turkey, this percentage was reported as 68.1% (6). The percentages of the physicians who came across avulsion cases were 28% in Hashim et al.'s study (19) and 59% in Bahammam's study (24). In this study, the level of knowledge on emergency management of avulsed teeth among the physicians who had encountered tooth avulsion cases before was higher than those who had not (p=0.053), and this result was similar to Bahammam's study (24). Probably, the incidents experienced and/or witnessed by a physician have increased the physician's interest in the subject.

In this study, it was observed that the amount of experience that physicians had in the emergency department and their encounters with avulsion cases affected their level of knowledge about tooth avulsion (p=0.037). The level of knowledge among the physicians who worked in the emergency for long years was higher than among those who did not. In the study by Ulusoy et al., the length of emergency department experience did not affect the level of knowledge, whereas in another study conducted in Turkey in 2019, it was stated that the emergency department experience increased the level of knowledge of dentofacial trauma (6, 22).

In many studies, it was observed that the level of physicians' knowledge related to oral and dentoalveolar traumas was not high (5, 6, 17, 19-21, 24). In addition, a recent meta-analysis of fourteen studies concluded that the level of knowledge of non-dental healthcare professionals about dental trauma was inadequate (32). In this study, the median score of the knowledge level was 17 and the maximum score was 32 on the scale ranging from 0 to 35, in which the knowledge levels of Turkish physicians working in emergency departments were determined. The level of knowledge among the 45.6% of the physicians was below the median score (<17). These results are associated with the lack of comprehensive training in medical schools and/or during the residency. In our study, 61.3% of the physicians stated that the training they received did not include oral and dentoalveolar traumas. The percentages of the physicians who did not receive any training on dentoalveolar traumas were higher in the studies conducted in Kuwait (83.3%), Chile (90.2%), and England (76.5%), but it was lower in Saudi Arabia (47.5%) (5, 17, 24, 33).

In this study, the correct answer score of the physicians who received training on tooth avulsion was found to be higher than the score of the physicians who did not ($p<0.001$). In addition, the physicians who received training on the subject were mostly among the emergency medicine specialists. Therefore, the emergency medicine specialists had the highest level of knowledge (p=0.010).

Of the physicians, 84% were aware that the level of their knowledge was inadequate and 7.3% had no idea about dental trauma, and therefore, 93% thought that it was important to receive training on dentoalveolar traumas. In similar studies, 97% and 100% of physicians think that it is important to receive training on the subject (18, 19). Of the participants, 88.6% stated that they would be interested in attending a training program on the subject. In other studies, the percentages of the physicians interested in receiving information about the subject were 97.6% and 95.1% (19, 24).

According to the self- assessment, the knowledge level of the physicians who stated that the level of their knowledge was "sufficient" was found to be the highest, which is in accordance with the literature (23). The number of physicians self-reported having "comprehensive" knowledge about the management of tooth avulsion was only four. It would not be proper to comment on the data released by few physicians because it can not be statistically accurate. Similar results were obtained in a previous study, on the knowledge level of dentists on avulsion management (23). The self-assessments of the participants reflected the expected-level of knowledge.

Looking at the regression analysis results, it was significant to access the information about the management of tooth avulsion ($p<0.001$) and it was positively related ($\beta=0.310$) to higher knowledge scores, followed by the self- assessment of the physicians (p=0.001; $\beta=0.135$). The result of the regression analysis is a concrete indicator of the effect of training about the subject on the level of knowledge.

Although the number of general practitioners participating in the study is limited, the strength of the study is the number of the participants. The number of the volunteer

emergency medicine physicians participating in the questionnaire was larger than the required-sample size calculated for this study. The results of the study can be attributed to Turkish emergency medicine physician population.

Avulsion cases, which are mostly seen in anterior teeth,[16,31] cause some functional, psychological, and aesthetic problems if the tooth is not replanted (5). In some western countries, the cost of traumas (treatment costs and additional costs such as transport, rehabilitation, labor loss, etc) is estimated to be about 4-5% of the gross national product (1, 2). Therefore, it has been reported that dentoalveolar traumas and their consequences may exceed the cost of dental caries and periodontal diseases in the young population (2). As it can be seen from the results of this study, the negative effects of trauma on individuals and society can be prevented by simple interventions performed by physicians working in emergency departments, which are one of the critical occupational groups that determine the prognosis of an avulsed tooth. The training of physicians on the subject is of great importance for the victim, dentist, and national economy at the same time. Therefore, the training on oral and dentoalveolar traumas should be added to the curriculum as a course before graduating from a medical faculty, the course of oral and dentoalveolar traumas should be given to all emergency medicine residents as part of the residency training, and panels, symposiums, and seminars should be organized on the subject. In emergency departments, a subunit that treats dentoalveolar traumas can be established and physicians educated on the subject can be employed in these subunits.

## Conclusion

The findings from this study clearly suggest that the level of knowledge among Turkish physicians working in emergency departments on emergency management of tooth avulsion is not satisfactory. It is significant to design educational programs on this subject and train this critical occupational group in order to achieve more successful results in tooth avulsion. It is obvious that the emergency management of avulsed teeth will help physical and psychological growth and development, especially in children.

***Türkçe özet:*** *Türkiye'deki Acil Tıp Doktorlarının Diş Avülsiyonunun Acil Müdahalesine İlişkin Bilgi Düzeylerinin Değerlendirilmesi. Öz: Amaç: Diş avülsiyonu acil müdahale gerektiren bir travma türüdür ve önemli sayıda hasta acile başvurmaktadır. Bu çalışmanın amacı, Türkiye genelinde acil tıp hekimlerinin diş avülsiyonu konusunda bilgi düzeylerini ve farkındalıklarını değerlendirmektir. Gereç ve Yöntem: Çalışma acil servislerde çalışan 545 hekim ile gerçekleştirildi. Katılımcılara diş avülsiyonu ile ilgili online anket uygulandı. Anket, kişisel bilgileri, süt ve daimi dişlenme dönemindeki avülsiyon olgularına ilişkin bilgi düzeyini ve bu konudaki eğitim düzeyini değerlendiren 3 bölümden oluşmaktadır. Bulgular: Hekimlerin %61,3'ü dentoalveolar travmalar konusunda daha önce eğitim almamış, %58,7'si avülse olmuş bir daimi dişin replantasyonunu, %28,3'ü replantasyonun "hemen" yapılmasını ve %28'i ideal saklama ortamı olarak sütü tercih etmiştir. 0'dan 35'e kadar olan bir ölçekte doğru cevap puanlarının ortalama±SS ve ortanca (min-maks) değerleri sırasıyla 16,42±7,08 ve 17(0-32) idi. Hekimlerin %45,6'sının bilgi düzeyi ortanca puanın altındaydı. Sonuç: Türkiye'deki acil tıp hekimlerinin diş avülsiyonu ile ilgili bilgi düzeyi yeterli olmayıp, kapsamlı eğitim programları ile hekimlerin bilgi düzeylerinin yükseltilmesine ihtiyaç vardır. Bu çalışma, konu ile ilgili hekimlerin eğitilmesinin travma hastalarının tedavisine olumlu yansıyacağını göstermektedir. Anahtar kelimeler: Dentofasiyal travma, diş avulsiyonu, acil tıp doktorları, Türkiye*

**Ethics Committee Approval:** The ethics approval has been obtained from the Health Sciences Non-Interventional Clinical Research Ethics Committee (ethics approval number: 2018/18-12).

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**Author contributions:** RK, GD participated in designing the study. RK, GD participated in generating the data for the study. RK, GD participated in gathering the data for the study. GD participated in the analysis of the data. RK wrote the majority of the original draft of the paper. RK, GD participated in writing the paper. RK, GD have had access to all of the raw data of the study. RK, GD have reviewed the pertinent raw data on which the results and conclusions of this study are based. RK, GD have approved the final version of this paper. RK, GD guarantee that all individuals who meet the Journal's authorship criteria are included as authors of this paper.

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## References

1. Andersson L. Epidemiology of traumatic dental injuries. Pediatr Dent 2013;35:102-5. [CrossRef]
2. Lam R. Epidemiology and outcomes of traumatic dental injuries: a review of the literature. Aust Dental J 2016;61:4-20. [CrossRef]
3. Glendor U, Andersson L, Andreasen J. Economic Aspects of Traumatic Dental Injuries. In: Andreasen J, Andreasen F, Andersson L, editors. Textbook and color atlas of traumatic injuries to the teeth. 4th ed. Oxford: Wiley-Blackwell; 2007:217-23.
4. Addo M, Parekh S, Moles D, Roberts G. Knowledge of dental trauma first aid (DTFA): the example of avulsed incisors in casualty departments and schools in London. British Dent J 2007;202:E27. [CrossRef]
5. Abu-Dawoud M, Al-Enezi B, Andersson L. Knowledge of emergency management of avulsed teeth among young physicians and dentists. Dent Traumatol 2007;23:348-55. [CrossRef]
6. Ulusoy AT, Onder H, Cetin B, Kaya S. Knowledge of medical hospital emergency physicians about the first-aid management of traumatic tooth avulsion. Int J Paediatr Dent 2012;22:211-6. [CrossRef]
7. 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;28:88-96. [CrossRef]
8. Gábris K, Tarján I, Rózsa N. Dental trauma in children presenting for treatment at the Department of Dentistry for Children and Orthodontics, Budapest, 1985–1999. Dent Traumatol 2001;17:103-8. [CrossRef]
9. Blinkhorn F. The aetiology of dento-alveolar injuries and factors influencing attendance for emergency care of adolescents in the North West of England. Dent Traumatol 2000;16:162-5. [CrossRef]
10. Trope M. Clinical management of the avulsed tooth: present strategies and future directions. Dent Traumatol 2002;18:1-11. [CrossRef]

11. Longo DL, Fumes AC, Küchler EC, Paula-Silva FW, Nelson-Filho P, Silva LA. Efficiency of different storage media for avulsed teeth in animal models: a systematic review. Dent Traumatol 2018;34:12-9. [CrossRef]
12. Andreasen J, Borum M, Jacobsen H, Andreasen F. Replantation of 400 avulsed permanent incisors. 1. Diagnosis of healing complications. Dent Traumatol 1995;11:51-8. [CrossRef]
13. Bhat M, Li SH. Consumer product-related tooth injuries treated in hospital emergency rooms: United States, 1979–87. Community Dent Oral Epidemiol 1990;18:133-8. [CrossRef]
14. Warren M, Widmer R, Arora M, Hibbert S. After hours presentation of traumatic dental injuries to a major paediatric teaching hospital. Aust Dent J 2014;59:172-9. [CrossRef]
15. Needleman HL, Stucenski K, Forbes PW, Chen Q, Stack AM. Massachusetts emergency departments' resources and physicians' knowledge of management of traumatic dental injuries. Dent Traumatol 2013;29:272-9. [CrossRef]
16. Holan G, Shmueli Y. Knowledge of physicians in hospital emergency rooms in Israel on their role in cases of avulsion of permanent incisors. Int J Paediatr Dent 2003;13:13-9. [CrossRef]
17. Díaz J, Bustos L, Herrera S, Sepulveda J. Knowledge of the management of paediatric dental traumas by non-dental professionals in emergency rooms in South Araucanía, Temuco, Chile. Dent Traumatol 2009;25:611-9. [CrossRef]
18. Subhashraj K. Awareness of management of dental trauma among medical professionals in Pondicherry, India. Dent Traumatol 2009;25:92-4. [CrossRef]
19. Hashim R. Physicians' knowledge and experience regarding the management of avulsed teeth in United Arab Emirates. J Int Dent Med Res 2012;5:91-5.
20. Qazi SR, Nasir KS. First-aid knowledge about tooth avulsion among dentists, doctors and lay people. Dent Traumatol 2009;25:295-9. [CrossRef]
21. Aren A, Erdem AP, Aren G, Sahin ZD, Guney Tolgay C, Cayirci M, et al. Importance of knowledge of the management of traumatic dental injuries in emergency departments. Ulusal travma ve acil cerrahi dergisi = Turkish journal of trauma & emergency surgery : TJTES. 2018;24(2):136-44. [CrossRef]
22. Yigit Y, Helvacioglu-Yigit D, Kan B, Ilgen C, Yilmaz S. Dentofacial traumatic injuries: A survey of knowledge and attitudes among emergency medicine physicians in Turkey. Dent Traumatol 2019;35:20-6. [CrossRef]
23. Duruk G, Erel ZB. Assessment of Turkish dentists' knowledge about managing avulsed teeth. Dent Traumatol 2020;36:371-81. [CrossRef]
24. Bahammam LA. Knowledge and attitude of emergency physician about the emergency management of tooth avulsion. BMC Oral Health 2018;18:57. [CrossRef]
25. 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;36:331-42. [CrossRef]
26. Kinirons M, Gregg T, Welbury R, Cole B. Dental trauma: Variations in the presenting and treatment features in reimplanted permanent incisors in children and their effect on the prevalence of root resorption. Br Dent J 2000;189:263. [CrossRef]
27. Andreasen J, Andreasen F, Skeie A, Hjørting-Hansen E, Schwartz O. Effect of treatment delay upon pulp and periodontal healing of traumatic dental injuries–a review article. Dent Traumatol 2002;18:116-28. [CrossRef]
28. Adnan S, Lone MM, Khan FR, Hussain SM, Nagi SE. Which is the most recommended medium for the storage and transport of avulsed teeth? A systematic review. Dent Traumatol 2018;34:59-70. [CrossRef]
29. Osmanovic A, Halilovic S, Kurtovic-Kozaric A, Hadziabdic N. Evaluation of periodontal ligament cell viability in different storage media based on human PDL cell culture experiments-A systematic review. Dent Traumatol 2018;34:384-93. [CrossRef]
30. Khademi A, Saei S, Mohajeri M, Mirkheshti N, Ghassami F. Torabi nia N, Alavi SA. A new storage medium for an avulsed tooth. J Contemp Dent Pract 2008;9:25-32. [CrossRef]
31. Lin S, Levin L, Emodi O, Fuss Z, Peled M. Physician and emergency medical technicians' knowledge and experience regarding dental trauma. Dent Traumatol 2006;22:124-6. [CrossRef]
32. 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;52:2025-37. [CrossRef]
33. Trivedy C, Kodate N, Ross A, Al-Rawi H, Jaiganesh T, Harris T, et al. The attitudes and awareness of emergency department (ED) physicians towards the management of common dentofacial emergencies. Dent Traumatol 2012;28:121-6. [CrossRef]