

Evaluation of parents' awareness levels of traumatic dental injuries: The ToothSOS mobile application and "Save Your Tooth" posters

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Abstract

Aim: This survey study aimed to assess the awareness of parents of pediatric dental patients regarding the "ToothSOS" mobile application and the "Save Your Tooth" posters created by the International Association of Dental Traumatology.

Methodology: This study included 303 participants who applied to Health Sciences University, Gülhane Faculty of Dentistry, Department of Pediatric Dentistry, between 02/01/2021 and 05/31/2021. The survey comprised visually supported questions to measure the participants' demographic features, previous dental trauma experiences, awareness of mobile dental trauma applications, and knowledge of traumatic dental injuries (TDIs). Categorical variables were summarized as frequencies and percentages and were compared using the chi-square test ($p < 0.05$).

Results: The results showed that parents' awareness levels regarding TDIs were insufficient. No significant difference was detected in the knowledge levels of parents of children with and without a history of dental trauma. However, significantly correct answers were obtained to the avulsion injury questions from parents with high education levels.

Conclusion: Given the results of this study, it is recommended that dental health providers focus on TDI education for parents.

Keywords: ToothSOS, mobile app, dental trauma, pediatric dentistry, questionnaire, Dental Traumatology Treatment Guideline

Introduction

Traumatic dental injuries (TDI) are generally seen in children and young adults and constitute 5% of all injuries. According to a recent meta-analysis research, 15.2% of the world's 1 billion people had a traumatic dental injury. While many types of dental injuries occur individually, combinations of these injuries are frequently encountered. Crown fractures were the most commonly detected type of TDI in the permanent dentition, while luxations were more common in the primary dentition. (1-3). The Dental Traumatology Treatment Guideline, which was published by the International Association of Dental Traumatology (IADT) in 2020, details emergency and progressive treatments that should be applied in all kinds of dental injuries (1,4-6).

Previous studies have shown that parents' level of knowledge of the correct procedures to be followed in cases of TDI is insufficient. Notably, children's TDIs frequently occur at home (2, 7-22). The final prognosis of a traumatized tooth may depend on parents' knowledge of dental trauma as well as their dentist's intervention (2, 14-16).

"ToothSOS", a free mobile app for smartphones created by the IADT, offers visual information as well as a step-by-step strategy for each type of tooth injury, contains information on procedures to be performed in the case of dental injuries, including the avulsion of a permanent tooth. This smartphone app is a useful training tool to improve knowledge. Information about such emergency approaches is also given in the "Save Your Tooth" posters, which have been prepared in many languages, including Turkish. These kinds of applications not only raise awareness of TDIs but also inform people about how to respond after these severe and unexpected injuries (5, 23, 24).

A literature search found no studies on the awareness of parents regarding the ToothSOS mobile application or "Save Your Tooth" posters. Accordingly, this study aimed to determine the knowledge of parents about TDIs and their awareness of these two educational tools.

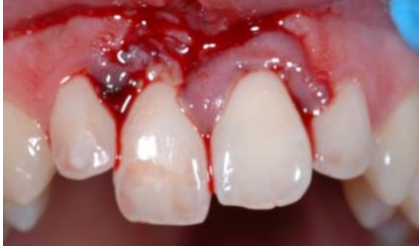
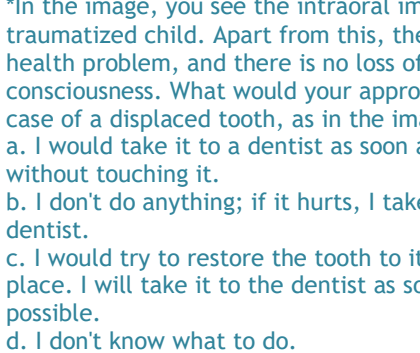
Materials and Methods

In total, 303 parents of pediatric patients aged 0-15 years who applied to the Health Sciences University, Gülhane Dentistry Faculty, Department of Pediatric Dentistry (02/01/2021-05/31/2021) were included in the current study. The study group was determined using Sample Size Calculator, Version 2.0.4 (Relief Applications, UK) for survey studies (90% power, $\alpha = 0.05$). The study protocol was conducted in line with the Helsinki Declaration's principles and with the approval of the Health Sciences University, Gülhane Board of Ethics Committee (2021/29). Informed consent was obtained from all participants. The questionnaire was designed

with great care. After an extensive literature review evaluating parents' knowledge and attitudes on traumatic dental injuries, a targeted 22-item questionnaire was designed (Table 1). Experts in the dentistry field (two pediatric dentists) reviewed the draft version of the questionnaire and agreed on the final suitability. A questionnaire comprised of visually supported questions was directed to the participants. The demographic characteristics of individuals, experiences of previous dental trauma, and knowledge levels of TDIs with current mobile applications served by the IADT were examined in the questionnaire. Up-to-date information was given to all participants at the end of the study.

Table 1. The questionnaire used in the study.

Question	
Q1	Age and gender of the parent?
Q2	What is your education status? a. No b. Primary School c. High School d. University e. Master
Q3	What's your job?.....
Q4	How old are your children?.....
Q5	Have you received any information about Traumatic Tooth Injuries before? (Yes / No)
Q6	If yes, how did you get this information? a. Television b. Book c. Dentist d. Friend / family e. Internet
Q7	Have your children encountered any dental injury before? (Yes / No)
Q8	If your answer is yes, what kind of situation did you encounter?
Q9	If you encounter any dental injury, what is the unit you would apply to? a. Family Practitioner b. Pediatrician c. Dentist d. Pediatric dentist e. Hospital emergency clinic f. Faculty of Dentistry
Q10	Do you have any information about the ToothSOS (IADT) mobile application? (Yes / No)
Q11	Do you know about the Save Your Tooth Poster (IADT)? (Yes / No)
Q12	 * Do you use a mouth guard as in the image for your child or children during sports activities? (Yes / No)
Q13	

	* A 9-year-old boy fell in the schoolyard and had his front tooth broken, as in the picture. Apart from this, there is no health problem, and there is no loss of consciousness. What would your approach be if you encountered such a situation? a. If the child does not have pain, I do not do anything. b. I would take the child to the dentist as soon as possible. c. I would try to find the broken piece and take it with the piece to the dentist as soon as possible. d. I don't know what to do.
Q14	 *In the image, you see the intraoral image of a traumatized child. Apart from this, there is no health problem, and there is no loss of consciousness. What would your approach be in case of a displaced tooth, as in the image? a. I would take it to a dentist as soon as possible without touching it. b. I don't do anything; if it hurts, I take it to the dentist. c. I would try to restore the tooth to its original place. I will take it to the dentist as soon as possible. d. I don't know what to do.
Q15	 *A 9-year-old boy fell during a sports activity, and his front tooth was displaced, as shown in the image. What would you do if the child had no other health problems and there was no loss of consciousness? a. I take the child to the dentist as soon as possible b. I try to find the dislodged tooth and take the child to the dentist as soon as possible. c. I don't know what to do.
Q16	If you find a tooth that has come out of its place, where do you hold the tooth first? a. Root of the tooth. b. Crown of the tooth (the part that is visible in the mouth). c. I don't know what to do
Q17	If you find the tooth, can you replace it? (Yes / No)
Q18	If yes, how do you clean the surface of the tooth? a. I would not prefer to clean the tooth surface. b. I would wash the tooth with tap water without rubbing it. c. I would rub the tooth and wash it with tap water.

	d. I would clean the tooth with toothpaste and brush.
Q19	If you are not going to replace the tooth and take it to the dentist, which of the following materials would you take? a. Milk b. Tap water c. Saliva d. Saltwater e. Alcohol f. Ice g. Napkin
Q20	Which of the following is the ideal time to replace the tooth? a. Immediately b. In 1 hour c. In 12 hours d. Within 24 hours
Q21	Can you distinguish between primary and permanent teeth? (Yes / No)
Q22	Do you think a primary tooth that has been displaced as a result of injury should be replaced? (Yes / No)

*The images used in this questionnaire are taken from the Tooth SOS (IADT) application.

Statistical analysis

Analyses were performed by using SPSS software (IBM SPSS Statistics version 21, IBM Inc., Armonk, NY, USA).

Categorical variables were summarized as frequencies and percentages and were compared using the chi-square test. A *p*-value of less than 0.05 was considered significant.

Results

Information containing the demographic data of the participants is given in Table 2. Accordingly, 303 parents (210 female and 93 male) participated in the study. The average age of the participants was 38.9 years, and all participants had at least one child. Additionally, 17.5% of the parents stated that they had encountered dental injuries previously, and 75.5% of those with a history of TDI encountered crown fractures.

Considering the parents' awareness of the ToothSOS mobile application and "Save Your Tooth" posters, it was observed that 98.3% of the participants did not know about ToothSOS, and 94.1% did not know about the "Save Your Tooth" posters.

The last part of the questionnaire evaluated the knowledge levels of parents of children with and without a history of dental trauma. Visual images of several dental injuries supported this part of the questionnaire. Correct answers were detected according to recent IADT dental trauma guidelines (1). The answers obtained from the participants are shown in Table 3. There was no significant difference between the two groups with or without dental trauma (*p* > 0.05).

Table 2. The demographic data of the participants

		History of Trauma + (%)	History of Trauma - (%)	Total
Gender	Female	40 (75.5%)	170(68%)	210
	Male	13 (24.5%)	80 (32%)	93
Age	20-29	3 (5.7%)	12 (4.8%)	15
	30-39	28 (52.8%)	122(48.8%)	150
	40-49	21 (39.6%)	100 (40%)	121
	50-59	1 (1.9%)	16 (6.4%)	17
Number of child(ren)	1	5 (9.4%)	53 (21.2%)	58
	2	25 (47.2%)	108(43.2%)	133
	3	19 (35.8%)	76 (30.4%)	95
	4	4 (7.5%)	10 (4%)	14
	5	0 (0%)	3 (1.2%)	3
Education status	Illiterate	1 (1.9%)	0 (0.0%)	1
	Primary school	19 (35.8%)	63 (25.2%)	82
	High school	19 (35.8%)	93(37.2%)	112
	University	14 (26.4%)	77(30.8%)	91
	Degree	0(0%)	17(6.8%)	17

Table 3. The knowledge levels of participants with and without a history of dental trauma ($p > 0.05$).

Question number		History of Trauma + (%)	History of Trauma - (%)	Total	P-value
13	True	53 (100%)	233(93.2%)	286	0.05
	False	0 (0%)	17 (6.2%)	17	
14	True	52(98.1%)	236(94.4%)	288	0.4
	False	1 (1.9%)	14 (5.6%)	15	
15	True	15(28.3%)	55 (22%)	70	0.4
	False	38(71.7%)	195 (78%)	233	
16	True	34(64.2%)	140 (56%)	174	0.3
	False	19(35.8%)	110 (44%)	129	
17	True	1 (1.9%)	7 (2.8%)	8	1
	False	52(98.1%)	243(97.2%)	295	
18	True	0 (0.0%)	1 (14.3%)	1	-
	False	1(100.0%)	6 (85.7%)	7	
19	True	8 (15.1%)	42 (16.8%)	50	0.9
	False	45(74.9%)	208(83.2%)	253	
20	True	43(84.3%)	214(85.6%)	247	0.9
	False	8 (15.7%)	36 (14.4%)	44	
21	True	33(62.3%)	139(55.6%)	172	0.4
	False	20(37.7%)	11 (44.4%)	31	
22	True	9 (17%)	23 (9.2%)	32	0.1
	False	44 (83%)	227(90.8%)	271	

The relationship between the demographic data and the correctness of the answers is shown in Table 4. No significant difference was found between the demographic characteristics of the participants (age, gender, number of children, occupation) and the correct response rates ($p > 0.05$). However, parents with high education levels gave significantly correct answers to the questions about avulsion injury ($p < 0.05$).

Additionally, 39.9% of the parents stated that they would prefer a dentist as the first unit to be applied in the case of any TDI, and 37% stated that they would prefer a pediatric dentist.

Discussion

Studies have shown that 25% of school-age children have dental trauma (1). The treatment of TDIs is a challenging process for the child's parents and dentists (2). Immediate treatment is essential for a good prognosis, and incorrect or delayed intervention has a negative effect (13, 25). Because TDIs often occur in the home environment, the importance of parental awareness and knowledge of the issue is essential (2, 7, 17, 15, 18).

Today, technology such as the Internet allows parents who have had a child with a TDI quickly obtain information about the current treatment. In addition, awareness could be expected in the level of parents' knowledge about dental trauma issues. However, our study found no statistically significant difference between the knowledge level of parents with a history of TDI and that of parents without a history of TDI, and the knowledge level of both groups was low. Although some previous studies concluded otherwise (22, 26, 27), the results of our study concur with those of a study by Kebriaei et al. (16).

In this study, as in previous studies (2, 11, 10, 16), no significant difference was found between the demographic characteristics of the participants, such as age, gender, number of children, and occupation. Although it was determined that education status did not affect the level of knowledge in general, those with higher education levels gave correct answers to the questions about avulsion at a significantly higher rate. This agrees with the findings of previous studies (2, 14, 16, 17).

In this study, the incidence of avulsion injuries, which was defined as the complete protrusion of the tooth from the alveolar socket, was 0.5-16% (2). As noted in the dental traumatology guide published by the IADT, the ideal approach to an avulsed permanent tooth is to replace the tooth as soon as possible; the tooth should be kept in the crown part and gently washed with tap water (5). Consistent with previous studies, only 2.6% of the participants stated that they would replant the tooth, while the remaining majority said they would not (2, 16, 17, 22, 28).

Table 4. The relation between the demographic data and the correctness of the answers.

Question number		Gender (%)		Age (%)				Education status (%)			
		Female n (%)	Male n (%)	20-29 n (%)	30-39 n (%)	40-49 n (%)	50-59 n (%)	Illiterate n (%)	High school n (%)	University n (%)	Degree n (%)
13	True	199 (94.8)	87 (93.5)	15 (100)	140 (93.3)	114 (94.2)	17 (100)	78 (94.6)	106 (94.6)	86 (94.5)	16 (94.1)
	False	11 (5.2)	6 (6.5)	0 (0.0)	106.7 (6.7)	75.8 (5.8)	0 (0.0)	5 (6.0)	6 (5.4)	5 (5.5)	1 (5.9)
14	True	200 (95.2)	88 (94.6)	15 (100)	143 (95.3)	113 (93.4)	17 (100)	78 (94.0)	105 (93.8)	88 (96.7)	17 (100)
	False	10 (4.8)	5 (5.4)	0 (0.0)	7 (4.7)	8 (6.6)	0 (0.0)	5 (6.0)	7 (6.2)	3 (3.3)	0 (0.0)
15	True	52 (24.8)	18 (19.4)	2 (13.3)	30 (20.0)	33 (27.3)	5 (29.4)	10 (12.0)	22 (19.6)	31 (34.1)	7 (41.2)
	False	158 (75.2)	75 (80.6)	13 (86.7)	120 (80.0)	88 (82.7)	12 (70.6)	73 (88.0)	90 (80.4)	60 (65.9)	10 (58.8)
16	True	119 (56.7)	55 (59.1)	10 (66.7)	83 (55.3)	71 (58.7)	10 (58.8)	37 (44.6)	62 (55.4)	63 (69.2)	12 (70.6)
	False	91 (43.3)	38 (40.9)	5 (33.3)	67 (44.7)	50 (41.3)	7 (41.2)	46 (54.4)	50 (44.6)	28 (30.8)	5 (29.4)
17	True	7 (3.3)	1 (1.1)	0 (0.0)	3 (2.0)	4 (3.3)	1 (5.9)	2 (2.4)	3 (2.7)	3 (3.3)	0 (0.0)
	False	203 (96.7)	92 (98.9)	15 (100)	147 (98.0)	117 (96.7)	16 (94.1)	80 (97.6)	109 (97.3)	88 (96.7)	17 (100.0)
18	True	0 (0.0)	1 (100)	0 (0.0)	1 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)	0 (0.0)
	False	7 (100)	0 (0.0)	0 (0.0)	2 (66.7)	4 (100)	1 (100)	0 (0.0)	2 (100)	2 (66.7)	3 (100.0)
19	True	35 (16.7)	15 (16.1)	4 (26.7)	22 (14.7)	23 (19.0)	1 (5.9)	9 (10.8)	17 (15.2)	19 (20.9)	5 (29.4)
	False	175 (83.3)	78 (83.9)	11 (73.3)	128 (85.3)	98 (81.0)	16 (94.1)	74 (89.2)	95 (84.8)	72 (79.1)	12 (70.6)
20	True	180 (86.5)	77 (82.8)	10 (66.7)	133 (89.3)	98 (81.7)	16 (94.1)	74 (90.2)	92 (82.9)	74 (81.3)	17 (100.0)
	False	28 (13.5)	18 (17.2)	5 (33.3)	16 (10.7)	22 (18.3)	1 (5.9)	8 (9.8)	19 (17.1)	17 (18.7)	0 (0.0)
21	True	127 (60.5)	45 (48.4)	9 (60.0)	81 (54.0)	74 (61.2)	8 (47.1)	47 (57.3)	60 (53.6)	54 (59.3)	11 (64.7)
	False	83 (39.5)	48 (51.6)	6 (40.0)	69 (46.0)	47 (38.8)	9 (52.9)	35 (42.7)	52 (46.4)	37 (40.7)	6 (35.3)
22	True	23 (11.0)	9 (9.7)	2 (13.3)	12 (8.0)	16 (13.2)	2 (11.8)	5 (6.1)	10 (8.9)	13 (14.3)	4 (23.5)
	False	187 (89.0)	84 (90.3)	13 (86.7)	138 (92.0)	105 (86.8)	15 (88.2)	77 (93.9)	102 (91.1)	78 (85.7)	13 (76.5)

If an avulsed permanent tooth cannot be replanted, it should be held by its crown and placed in an appropriate medium, and the dentist should be visited as soon as possible (5, 29). As stated in the 2020 IADT dental trauma guidelines, milk is an ideal and accessible storage medium for preserving cell viability. Saliva, physiological saline, and tap water are also acceptable mediums (5).

In the replantation of avulsed teeth, it is essential to distinguish whether the tooth is permanent or primary. In cases of deciduous tooth avulsion, replantation is not recommended (6), as it may affect the eruption and development of the permanent tooth. The risk of aspiration of the replanted tooth must also be

considered (3, 15, 17). Contrary to the results of a previous study (16), 56.8% of the participants in the current study stated that they could distinguish between primary and permanent teeth, and 89.4% reported that primary teeth should not be replanted again, which supports the results of some previous studies (11, 14).

While the most common dental injury in primary teeth is luxation, crown fractures are often seen in permanent teeth (1). In the current study, 75.5% of crown fractures occurred in those with a history of TDI. This was followed by luxation with 13.2%, concussion with 5.7%, and avulsion, extrusion, and intrusion with 1.9%.

It is essential that parents be provided with information about TDI (2). In this study, 86.5% of the participants stated that they had no prior knowledge of TDI. Of the 41 participants who had prior knowledge on the subject, 78% said they received the information from a dentist.

The rate of correct answers to questions on the appropriate approach to avulsion in this survey increased in relation to the parents' level of education. Responses to the question of the ideal storage medium were distributed as follows: napkin, 50.5%; ice, 19.8%; salt water, 11.9%; tap water, 5%; saliva, 1.7%; and alcohol, 1.3%. Consistent with the results of other studies, the ideal response (milk) rate was only 9.9% (2, 10, 16, 22, 30).

The ToothSOS mobile application created by IADT and the "Save Your Tooth" poster contain information for both professionals and the general public about the appropriate response to a dental injury (5, 23). In a study by Iskander et al., both the poster and the mobile application were found to be effective in conveying dental trauma information to parents regardless of the parent's education level, age, or ethnic origin (23). A previous study on the awareness of young dentists about the ToothSOS application found that 72.3% did not know about the application (31), while a study investigating the worldwide number of downloads of the ToothSOS mobile application between April 2018 and May 2020 revealed the number of downloads in Turkey to be less than that of other countries (24). Similarly, the current study found participants' awareness of the ToothSOS mobile application and "Save Your Tooth" posters to be insufficient. The awareness of participating healthcare workers was also found to be inadequate.

Early orthodontic treatments and mouth guards are recommended for the prevention of TDIs. The use of mouth guards, particularly in sports activities, is known to effectively prevent dental injuries. In this study, the rate of mouthguard use during sports activities was 3.8% in those with a history of trauma and 4.8% in those without a history of trauma. Overall, however, the use of mouthguards during sports activities was found to be low. These results are consistent with those of Yassen et al. (11).

Conclusion

TDI is a frequently encountered situation, and the emergency and treatment protocol for TDI is often updated. To ensure optimal outcomes, it is essential to apply up-to-date information.

This study revealed that parents frequently lack knowledge of the appropriate actions to take after a TDI, even when the parents have a history of TDI. Thus, there is a need for programs aimed at increasing parents' knowledge and awareness of current practices in the treatment of TDIs.

Disclosures

Ethical Approval: Ethics committee approval was received for this study from Health Sciences University, Gülhane Board of Ethics Committee, in accordance with the World Medical Association Declaration of Helsinki, with the approval number: 2021/29).

Peer-review: Externally peer-reviewed.

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