Paediatr Croat. 2025;69:1-8
IZVORNI ZNANSTVENI RAD / *ORIGINAL SCIENTIFIC PAPER*
journal.paedcro.com
http://dx.doi.org/10.13112/pc.967

Knowledge on pre-hospital emergency management of tooth avulsion among primary school teachers from eastern Croatia

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Aim: Tooth avulsions in children are a significant oral health issue. Deciduous and permanent anterior teeth are not only important for aesthetic reasons but are also necessary for phonetics, mastication integrity of supporting tissues, and the psychological and mental well-being of children. A schoolteacher's initial management of tooth avulsions is crucial to the injured tooth's long-term prognosis. Previous studies have suggested that teachers lack the necessary knowledge to manage tooth avulsions appropriately. The study aimed to determine the knowledge of primary school teachers (PSTs) from eastern Croatia about the pre-hospital emergency management response to tooth avulsions.

Methods: A cross-sectional descriptive study was conducted among 370 PSTs (mean age 39.5±10.6; 96 % women; mean service length 14.8±11.1 years). The questionnaire contained 10 closed-ended questions with two to eleven possible answers. Statistical significance was determined using a chi-square test.

Results: Most participants had never received any information on the management of a knocked-out tooth. Questions about the domain of tooth injuries, a knocked-out tooth, tooth replantation, and whether the knocked-out tooth should be placed back were answered confirmatively by 23.78 %, 89.19 %, 60.54 % and 69.46 % of participants, respectively. The questionnaire showed that 13.78 % of participants were aware that replantation should be performed within 30 min. The appropriate cleaning and transport medium was chosen by 39.19 % and 23.78 % of participants, respectively. A nearby dentist would be visited by 61.89 % of participants.

Conclusion: The current study confirmed that PSTs lack the knowledge for immediate response to tooth avulsions, leaving small chances for a successful prognosis of tooth replantation.

Key words: TOOTH AVULSION; SCHOOL TEACHERS; CROATIA

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INTRODUCTION

Traumatic dental injuries (TDIs) are classified into a group of health conditions called oral traumas. Out of all body injuries, around 5 % account for oral traumas, and for younger children, the percentage gets even higher (1). Among oral injuries, 95 % are diagnosed as TDIs (2). Medical staff working in emergency departments or other medical institutions, as well as the general population, do not perceive TDIs as urgent as they should because, in most cases, TDIs do not represent a life-threatening emergency (3). Nevertheless, it has been proven that the prorogation of providing needed medical care can significantly worsen the result of the treatment or even provoke new complications (4-8). While this can be harmful to the tooth itself, the alveolar bone can also become negatively affected in terms of growing and developing. That can consequently change the choice of treatment and the outcome, or it could lead to some problems of a functional and aesthetic nature (9-12).

Since avulsion of permanent teeth is seen in 0.5 % - 16 % of all dental injuries, the International Association of Dental Traumatology (IADT) published guidelines for the management of permanent teeth avulsions (2, 13, 14). According to their guidelines, an avulsed tooth needs to be instantly found; it should be washed out briefly in case of any dirty areas and either be immediately replanted at the place or put in a glass of milk or some other appropriate medium for tooth transfer before paying a visit to the dentist. Non-professionals among various groups of the general population frequently do not have the right amount of awareness of the proper response to tooth avulsion (15-21). Successful tooth replantation is much more likely to happen if people who witness the incident with tooth avulsions respond and have the correct reaction immediately.

As mentioned before, the young population is at high risk of different injuries to primary and permanent teeth. It is found that among children younger than 5 years and children between 6 and 10 years, dental injuries are reported at 24.9 %, and when it comes to patients of all ages, the percentage is estimated at 23.6 % (22). Some studies showed that the avulsion of primary teeth happens more often than the avulsion of permanent teeth (23, 24).

Every individual, including children's parents and other non-professionals, but especially employees who work as childcare professionals, including the primary school teachers (PSTs) who look after children with primary teeth and work with them daily, needs to be well educated and informed to differentiate between primary and permanent teeth in case of a tooth avulsion and to know how to react correctly in both cases. The study aimed to determine the knowledge of PSTs from eastern Croatia about the pre-hospital emergency management response to tooth avulsions, while the hypothesis of this research claims that there is no satisfactory amount of knowledge on pre-hospital emergency management of tooth avulsion among PSTs from eastern Croatia.

PARTICIPANTS AND METHODS

Participants

A cross-sectional descriptive study was conducted on 370 PSTs from 5 counties of eastern Croatia (mean age 39.5±10.6 years; 96 % women; mean length of service 14.8±11.1 years). PSTs were both eligible to participate and informed about self-administered questionnaires. Participants were asked to fill out a self-administered questionnaire. The objectives of the study were explained, and the information on the study's purpose was provided at the beginning of the questionnaire. Every participant could withdraw from the study at any time.

Questionnaire procedures

The aim of the study and all the crucial information were presented to PSTs before starting the questionnaire. The voluntary nature of the study was emphasised, and confidentiality was assured. All involved PSTs could end participation in the study at any point. The questionnaire was adopted and, with minor changes, translated into Croatian (24-26). Participants had 2-11 possible answers on 10 closed-ended questions. The first part of the questionnaire was about PST's general knowledge of tooth avulsions (yes/no questions).

Table 1. Primary school teacher's response to the applied questionnaire

Number of question	Questions	N (%)
Q1	Do you know what tooth injuries are?	
a	Yes	88 (23.78)
b	No	282 (76.22)
Q2	Do you know what a knocked-out tooth is?	
a	Yes	330 (89.19)
b	No	40 (10.81)
Q3	Do you know what tooth replantation is?	
a	Yes	224 (60.54)
b	No	146 (39.46)
Q4	If the tooth is knocked out and falls on the ground, do you know what should be done?	
a	Yes	167 (45.14)
b	No	203 (54.86)
Q5	Should the knocked-out tooth be placed back into the socket?	
a	Yes	257 (69.46)
b	No	113 (30.54)
Q6	How immediately the tooth replantation should be performed after the tooth comes out of the socket?	
a	5 minutes *	14 (3.78)
b	30 minutes *	37 (10.00)
c	1 hour	57 (15.41)
d	6 hours	17 (4.59)
e	24 hours	18 (4.86)
f	72 hours	1 (0.27)
g	I do not know	226 (61.09)
Q7	If the tooth falls on the ground and gets dirty, what should you do?	
a	Brush crown and root	3 (0.81)
b	Wash with tap water *	30 (8.11)
c	Wash with milk *	23 (6.22)
d	Wash with saline *	92 (24.86)
e	Do not wash	28 (7.57)
f	I do not know	194 (52.43)
Q8	First place to seek for replantation treatment?	
a	First aid ambulance	103 (27.84)
b	General hospital *	9 (2.43)
c	Dentist nearby *	229 (61.89)
d	Medical doctor	6 (1.62)
e	Medical College	1 (0.27)
f	Dental College	1 (0.27)
g	I do not know	21 (5.68)
Q9	Transport media?	
a	Tissue paper	101 (27.30)
b	Toilet paper	3 (0.81)
c	Cotton rolls	7 (1.89)
d	Pocket	0 (0)
e	Poly bags	62 (16.76)
f	Tap water	6 (1.62)
g	Saline water *	58 (15.68)
h	Milk *	22 (5.94)
i	Saliva *	8 (2.16)
j	Others	9 (2.43)
k	I do not know	94 (25.41)
Q10	Have you ever received any kind of information on management of knocked-out tooth?	
a	Yes	23 (6.22)
b	No	347 (93.78)

* correct answer

The second part consisted of four knowledge-based questions with multiple correct answers.

Data collection and statistical analysis

Each PST could choose only one correct answer. Summing up, answers were conducted, and a percentage of answers were calculated. A statistically significant difference between the expected and observed frequencies of incorrect and correct answers in the second part was determined by the chi-square test. Statistical analysis was done using Statistica software version 14.0.0.15 (TIBCO Software Inc., Palo Alto, CA, USA). The level of significance was set to $p < 0.05$.

RESULTS

More than one-half of PSTs knew what a knocked-out tooth is, what tooth replantation is, and that the knocked-out tooth should be placed back into the socket. Less than half of the PSTs knew what tooth injuries were and what needed to be done if knocked-out teeth fell on the ground. Only 6.22 % of PSTs answered that they were not informed about the management of a knocked-out tooth. Regarding the questions about the optimal time for knocked-out tooth replantation, the procedure of cleaning the dirty knocked-out tooth, and the way of transport of the avulsed tooth before professional treatment, PSTs answered them correctly by 13.78 %, 39.19 %, and 23.78 %, respectively. On the question about where to treat the knocked-out tooth, 64.32 % of PSTs chose the correct answer (Table 1).

In the current study, the observed frequency of incorrect and correct answers was tested. It was determined that there is a statistically significant difference ($p<0.05$) between the observed and expected frequency (Table 2).

Table 2. Distribution of incorrect and correct response frequency on knowledge-based questions

Question	Incorrect response	Correct response	p-value
Q6	319	51	<0.01 *
Q7	225	145	<0.01 *
Q8	132	238	<0.01 *
Q9	282	88	<0.01 *

* significant difference (Chi-square, p<0.05)

DISCUSSION

To the best of our knowledge, this is the second study in Croatia that investigates the knowledge of PSTs from eastern Croatia regarding the emergency management response to tooth avulsions, following studies conducted among students and kindergarten teachers. We found it highly necessary and important to investigate the knowledge of PSTs from eastern Croatia about the emergency management response to tooth avulsions because PSTs spend the majority of their working time with children, who were confirmed to be the most usual population group to develop tooth avulsions. The findings of this paper were discussed in light of published literature on emergency management in the TDI domain from approximately 50 years ago to the present.

PSTs in Croatia provide primary school education to pupils until the beginning of middle school when they reach fourteen or fifteen years. As mentioned before, PSTs spend their working time with children confirmed to be the most common population group in developing TDIs, so it is of great importance that teachers know how to react properly if an accident, including TDIs, occurs. Speaking about Croatia, several studies on this theme were conducted. *Uzarevic et al.* conducted similar research using the same questionnaire on a population of students of the Faculty of Education in Osijek and kindergarten teachers (25, 26). The overall results showed that neither group of participants showed satisfying levels of knowledge on this theme. It was suggested to implement various improvement measures aimed at increasing the level of knowledge on this subject. Except for students and kindergarten teachers, there was also a study that was earlier conducted on PSTs by *Salaric et al.*, and according to their findings, 95.29 % of participants were estimated to have a lack of competence to effectively treat avulsed teeth in case of tooth avulsions (27). Another regional study on the theme of tooth avulsion was conducted by *Markovic et al.* (24).

In our study, only 6.22 % of PSTs were informed on the management of a knocked-out tooth, which may indicate that they could not tell the difference between the primary and permanent teeth and how they were supposed to react if TDIs, including tooth avulsions, occurred. A study conducted in

Singapore showed that almost all participants, including preschool children and PSTs, showed enthusiasm about the idea of public education measures in which they saw a chance of improvement in their knowledge of tooth avulsions (28).

Looking at the results of the questionnaire, only 23.78 % of participants correctly answered the first question, meaning that 76.22 % of them did not know what tooth avulsions stand for, but most PSTs understood the meaning of knocked-out teeth (89.19 %) and tooth replantation (60.54 %). Although 54.86 % of participants did not know how they should react if a tooth avulses and falls to the ground, 69.46 % of them knew that they should place the avulsed tooth back into the socket. This result is similar to the findings of research by *Naploszek and Lewtak*, which was conducted among PSTs in Poland (29).

Most participants (61.89 %) would visit the closest dentist to ask for the replantation. However, 35.68 % of participants gave the wrong answer, which is similar to the study on schoolteachers conducted by *Prasanna et al.* (16). This result points out the need for increasing awareness about tooth avulsions, and leads us to the conclusion that tooth avulsions should be treated by the nearest dental surgery or by a general hospital if a dentist is working in it (24). Only 10 % of participants knew that the replantation process should be performed within 30 minutes since the avulsion of the tooth was caused by TDI. Even less, 3.78 % of PSTs thought that the replantation should be done within 5 minutes, which tells us that replantation, which would be done by them or some other non-professional at the place where the incident occurred, was not an option for them. Due to the guidelines of IADT, the avulsed permanent tooth should be replanted as quickly as possible at the place of incident (14). So that PSTs can cope with tooth avulsion, they must use the container with the transport medium of the avulsed tooth and transport it to the nearest professional instead of doing the replantation by themselves (30).

Some scientists found that non-professional participants feared legal consequences for not performing the tooth replanting process correctly (19). Speaking of professionals other than dentists, they need clarification regarding issues of responsibility and acceptable levels of competence to perform replanting processes, meaning that dentists remain the professionals from whom people expect to receive the best emergency care in case of TDIs such as tooth avulsion (20).

Regarding the cleaning medium, 39.19 % of participants answered milk, saline, or tap water, which were the correct answers. That result is slightly worse than the ones measured in similar studies on non-professionals other than PSTs (15-17). If the tooth falls on dirty ground, the individual should pick the tooth up by the crown and wash it briefly for a maximum of 10 seconds with the mentioned cleaning mediums (14). The positive result is that only 0.81 % of the PSTs answered that in case of dirty avulsed teeth, it is necessary to brush the crown and the root of the tooth to avoid mechanical damage to the root cells. IADT suggests that it is best if the cleaning medium could be the same one as the transport medium (31). Only 15.68 % of PSTs chose saline water for the transport medium, and 24.86 % chose it for cleaning the avulsed tooth, which leads to the provision of needed sanitary conditions necessary for appropriate replantation of the knocked-out tooth. The best physiological storage media accessible near the place of the incident are milk and patient saliva (32). In our study, 5.94 % of PSTs chose milk as a transport medium and 6.22 % chose it for cleaning, while only 2.16 % would use saliva as a storage medium.

8.11 % of participants chose tap water for cleaning and 1.62 % for transport medium. For transport of the knocked-out tooth, it is not recommended to use a container with tap water because prolonged storage in water has been associated with lower vitality of the periodontal ligament cells and an increased resorption of the external root (32). The IADT guidelines suggest a short wash under cold running water before replantation of the tooth back in place, and it is also recommended to bite on a cotton tissue or napkin to enable holding the tooth in place (14). Different types of dry transport were chosen by 46.76 % of PSTs, which is again similar to the research conducted on school teachers from rural areas (15). According to our results, most of the PSTs wanted to use tissue paper (27.30 %) while fewer people chose to use either poly bags (16.76 %) or cotton rolls (1.89 %). All types of dry transport are acceptable if the dry period is correlated with the

success of tooth replantation. It is crucial that the drying of the knocked-out tooth does not surpass the critical period of 15 minutes (33). 5 or fewer minutes of tooth drying in storage has a smaller potential for an early onset of tooth resorption; the best effect has been seen after the earlier mentioned 15-minute time period (34).

The correct emergency response to tooth avulsion is of great importance because even non-professionals can increase their chances for a successful tooth replantation if educated and if they follow the guidelines (35, 36). As many as 39.19 % of PSTs answered correctly when asked what they would do if the tooth was avulsed and fell on the ground. That is a similar result to those found by similar studies conducted on non-professionals (15, 17). However, our study showed a not-so-good knowledge of PSTs of pre-hospital responses to an emergency event in case of tooth avulsions, since only a small number of PSTs would choose its management, which would combine the usage of the correct medium for cleaning and transport and seeking help from the closest dentist within first 30 minutes of the incident. Due to that, the majority of participants were not conscious that they would not react properly and provide needed support in case of tooth avulsions.

Most of our findings agree with the results from relevant studies regarding the knowledge of the emergency management response to tooth avulsion.

CONCLUSIONS

According to the results of our study, the research hypothesis was confirmed because it was proved that PSTs from eastern Croatia do not have a satisfactory amount of knowledge for quick response to tooth avulsion, which decreases the chances for a successful prognosis of tooth replantation. It is recommended that the IADT guidelines for the pre-hospital emergency management of tooth avulsion become an obligatory educational component for PSTs. Educational programs on this theme should be held periodically; moreover, educational materials such as leaflets should be delivered to PSTs, and their knowledge should be evaluated. It is necessary to improve communication between dental professionals and PSTs at both local and regional levels.

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SAŽETAK

Znanje o prehospitalnom hitnom zbrinjavanju avulzije zuba među učiteljima osnovnih škola iz istočne Hrvatske

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Cilj: Avulzija zuba u djece značajan je problem oralnog zdravlja. Mliječni i trajni prednji zubi nisu važni samo iz estetskih razloga, već su neophodni i za fonetiku, žvačnu cjelovitost potpornih tkiva te psihološku i mentalnu dobrobit djece. Inicijalno liječenje i zbrinjavanje avulzije zuba od strane učitelja ključno je za dugoročnu prognozu ozlijeđenog zuba. Prethodna istraživanja pokazala su da učiteljima nedostaje potrebno znanje za prikladno zbrinjavanje avulzije zuba. Cilj istraživanja bio je utvrditi znanje učitelja osnovnih škola iz istočne Hrvatske o prehospitalnom hitnom zbrinjavanju avulzije zuba.

Metode: Presječno opisno istraživanje provedeno je na 370 učitelja osnovnih škola (prosječna dob 39,5±10,6; 96 % žene; prosječna duljina radnog staža 14,8±11,1 godina). Upitnik je sadržavao 10 pitanja zatvorenog tipa s dva do jedanaest mogućih odgovora. Statistička značajnost određena je hi-kvadrat testom.

Rezultati: Većina sudionika nikada nije dobila nikakve informacije o liječenju izbijenog zuba. Na pitanja iz domene ozljeda zuba, izbijenog zuba, replantacije zuba te treba li izbijeni zub vratiti na mjesto, redom je točno odgovorilo 23,78 %, 89,19 %, 60,54 % i 69,46 % ispitanika. Upitnik je pokazao da je 13,78 % sudionika svjesno da replantaciju treba izvršiti unutar 30 minuta. Odgovarajuće sredstvo za čišćenje i transport odabralo je 39,19 %, odnosno 23,78 % sudionika. Obližnjeg stomatologa posjetilo bi 61,89 % sudionika.

Zaključak: Trenutačno istraživanje potvrdilo je da učiteljima osnovnih škola nedostaje znanje za trenutačni odgovor na avulzije zuba, što ostavlja male šanse za uspješnu prognozu replantacije zuba.

Ključne riječi: AVULZIJA ZUBA; UČITELJI; HRVATSKA