

An Educational Initiative for Dubai School Nurses and Physical Education Teachers on the Management of Traumatic Dental Injuries

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Abstract

The aim of this study was to assess the knowledge of school nurses and physical education teachers (SN and PE teachers) about the emergency management of traumatic dental injuries (TDIs) in schools and to measure the impact of education on their knowledge. A longitudinal prospective study based on a questionnaire survey completed by 68 SN and PE teachers at three time periods (prior to, immediately after, and 3 months-post-educational intervention). Pre- and post *t*-test and repeated measures (analysis of variance) were used to compare the three group means for the same participants ($p < .05$ was considered significant). Significant improvement in the knowledge score among participants was observed between the initial survey to immediately after the educational session and to 3 months after ($p = .047$). Significant improvement in the choice of immediately seeking attention after tooth avulsion was observed ($p = .001$). The initial knowledge deficiency about the emergency management of TDIs among SN and PE teachers was improved and sustained.

Keywords

schools, nurses, avulsion, dental trauma, PE teachers

Traumatic dental injuries (TDIs) occur more frequently in children and young adults than adults and account for 5% of all traumatic injuries (Glendor, 2008). Among all school-children, 25% experienced dental trauma while 33% of adults experienced trauma to the permanent dentition, especially before age 19 (Glendor, 2008). Approximately 19% of dental-related injuries will occur at schools (Traebert, Peres, Blank, Böell Rda, & Pietruza, 2003). In the primary dentition, luxation injuries are the most common TDIs while in permanent teeth, crown fractures are more common (Glendor, 2008). Eighty percent of elementary school students will seek help from school nurses (SNs) when they face a trauma situation (Di Scala, Gallagher, & Schneps, 1997). For a favorable outcome, proper diagnosis, treatment planning, and follow-up are essential (Andersson et al., 2012). Avulsion of permanent teeth, one of the most serious dental injuries, is seen in 0.5–3% of all TDIs (Andreasen, Andreasen, & Andersson, 2007; Glendor, Halling, Andersson, & Eilert-Petersson, 1996), and its prognosis is highly dependent on actions taken immediately at the scene of the accident. The best management is immediate replantation in most situations (Andersson et al., 2012).

The role of the SNs and physical education (PE) teachers is crucial in cases of TDIs. SNs and PE teachers should have the proper knowledge of the emergency early management of TDIs to ensure the best possible prognosis for the injured teeth. They are the first assistance available in trauma situations with students at school, the most frequent scene of TDIs.

Numerous studies had been conducted globally concerning TDIs emergency management in general (such as parents, teachers, children, and even emergency unit staff) and the role of SNs and PE teachers in particular, which demonstrated a lack of the proper knowledge of TDIs management

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especially dental avulsion and the pressing need for training and education (Al-Asfour, Andersson, & Al-Jame, 2008; Andersson, Al-Asfour, & Al-Jame, 2006; Blakytyn, Surbut, Thomas, & Hunter, 2001; Diaz, Bustos, Herrera, & Sepulveda, 2009; Glendor, 2009; Holan & Shmueli, 2003; Santos, Habecost, Gomes, Weber, & de Oliveira, 2009; Traebert et al., 2009). In the United Arab Emirates (UAE), little published data exist on the prevalence of TDIs, although one of the few studies reported a prevalence of 25.9% for TDIs (Fakhrudin & Kawas, 2010). Two separate studies conducted in Ajman (one of the seven emirates that make up the UAE), to test the level of knowledge of dental trauma management of avulsed teeth among mothers (Hashim, 2012) and schoolteachers (Hashim, 2011), revealed that their knowledge was inadequate and educational campaigns were recommended.

There are no published data regarding the knowledge of the emergency management of TDIs among SNs and PE teachers in Dubai, UAE. Thus, the aims of this study were to assess SNs' and PE teachers' knowledge regarding the management of emergency TDIs and to identify the effect of an educational intervention on their knowledge along with the sustainability of this effect.

Method

A longitudinal pre- and post *t*-test design study was conducted in Dubai, UAE, among SNs and PE teachers in both private and public schools. Ethical approval was obtained from the Research and Ethics Committee at Hamdan Bin Mohammad College of Dental Medicine. All SNs ($N = 200$) and PE teachers ($N = 315$) from 159 private and 41 public schools were invited by an e-mail and a telephone follow-up to attend an educational session about TDIs. The final sample size of SNs and PE teachers was 68 (54 SNs and 13 PE teachers). One of the participants did not specify the position in the school. Data were collected by means of a questionnaire, which was designed using a modified versions of the questionnaires used in several published studies (Al-Asfour et al., 2008; Arian & Sönmez, 2012; Baginska & Wilczynska-Borawska, 2012; Bayrak, Tunc, & Sari, 2012; Kane et al., 2011; McIntyre, Lee, Trope, & Vann, 2008; Mesgarzadeh, Shahamfar, & Hefzollasan, 2009; Pujita, Nuvvula, Shilpa, Nirmala, & Yamini, 2013). A pilot study was conducted to validate the questionnaire among pediatric dentistry residents and faculty at Mohammed Bin Rashid University of Medicine and Health Sciences, and minor modifications were made to improve wording and clarity. SNs and PE teachers were invited to one of two educational workshops in the form of a 1-hr presentation including videos on the emergency management of TDIs. The workshop discussed in detail all the issues included in the questionnaire, and a large colored informatics poster, outlining the emergency steps needed in case of TDIs, was given to the participants at the conclusion of the

presentations. The poster is a bilingual Arabic and English adaptation of the poster available for reproduction on the International Association of Dental Traumatology (IADT) website (Figure 1).

The questionnaire included a total of 15 *demographic* questions and 16 questions about the *knowledge and management of TDIs*. The knowledge questions were divided into two parts: Part 1 tested the participants' knowledge about types of dental injuries, their ability to differentiate between primary and permanent tooth injuries, and their management, while Part 2 tested the knowledge specifically about the management of avulsion in primary and permanent teeth.

The questionnaire was paper based and was completed by all the SNs and PE teachers. All the 68 participants were asked to complete the paper-based questionnaire before and after the workshop, and they all consented to do so. After 3 months, the participants were all interviewed by phone by the primary investigator (S.A.) to answer the questionnaire again to test their knowledge retention from our educational program.

An average score of knowledge was determined by calculating the number of correct answers according to the IADT guidelines (Andreasen et al., 2007) each participant chose. The maximum score a participant could achieve was 16 representing all the questions testing the knowledge.

Data were entered into the computer using SPSS for Windows Version 20.0 (SPSS Inc., Chicago, IL). Statistical analysis was performed using χ^2 for test of association and Fisher's exact test, as appropriate. Where two or more continuous independent variables were examined, the *t* test and analysis of variance (ANOVA) were used with repeated measures to compare the three group means for the same participants, a *p* value of less than .05 was considered significant in all statistical analyses.

Results

Demographic Characteristics and Participants' Baseline Knowledge

Table 1 demonstrates the demographical characteristics of the study participants and baseline knowledge. The response rate was 100% of the SNs and PE teachers attending the educational program, but the overall response rate counting all invited nurses was 54/200 (27%) and for the PE teachers was 13/315 (4.1%). Most of the survey participants were females, which reflects the demographics of SNs in Dubai. The table also demonstrates the participants' previous experience and knowledge about the TDIs (see Table 1).

The Answers of the Participants Over the Three Time Intervals of the Survey to the Knowledge Questions

Table 2 demonstrates the answers of the participants over the three time intervals to the knowledge questions with the yes or no choice of answer. The table demonstrates an overall



عيادة دبي لطب الأسنان
DUBAI DENTAL CLINIC

أنقذ سنك Save your tooth

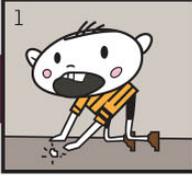
يمكنك المحافظة على أكثر الأسنان "الدائمة" إذا كنت تعلم ماذا تفعل بعد تلقي صدمة على الفم
Most of your permanent teeth may be saved if you know what to do after a blow to the mouth

Emergency contact No.
800-DENTAL

ماذا تفعل إذا
كُسر سنك
What to do if your tooth is
BROKEN

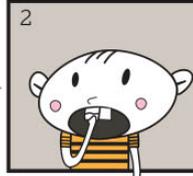


1



ابحث عن قطعة السن المكسورة
وضعها في مكان آمن
Find the piece of tooth

2



إن قطعة السن يمكن إصاقها
في عيادة الأسنان
The piece can be
glued on

3



لأجل ذلك اطلب حلاً مساعدة
طبيب الأسنان
For this to be possible,
seek attention immediately
from a dentist

ماذا تفعل إذا
انخلع سنك
What to do if your tooth is
KNOCKED OUT



1



ابحث عن السن
Find the tooth

2



امسك السن من التاج
(الجزء غير المدب من السن)
Hold it by the crown
(The non-pointy part of the tooth)

3



(اغلق المعسلة بسداة)
اغسل السن بماء الصنبور البارد
(Plug the sink)
Rinse in cold tap water

4

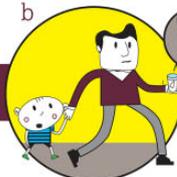
اتبع إحدى البدائل التالية
Follow one of these alternatives

a



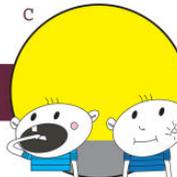
ضع السن في مكانه
Put the tooth back
on its place

b



ضع السن في كوب حليب او محلول
ملحي فيسيولوجي
Place the tooth in a
cup of milk or saline

c



إذا لم يتوفر الحليب، ضع السن
بحذر في الفم بين الخد واللثة
When milk is not
available, carefully
place the tooth in
the mouth between
the cheeks and gums

5



اطلب حلاً علاج الأسنان التخصصي،
خلال ساعتين من الزمن
Seek immediately
specialized dental
treatment, within a
two hour time period



International Association
of Dental Traumatology

Hamdan Bin Mohammed
College of Dental Medicine
Mohammed Bin Rashid UMHS



كلية حمدان بن محمد
لطب الأسنان
جامعة محمد بن راشد للطب والعلوم الصحية

مدينة دبي الطبية، بناءة ٣٤، الطابق الأرضي، ص.ب. ٥٠٥٠٩٧، دبي، أ.ع.م. |
Dubai Healthcare City, Building 34, Ground floor, P.O. Box 505097, Dubai, UAE | www.hbmcdm.ac.ae

Figure 1, Bilingual emergency TDI management poster

Figure 1. Bilingual emergency traumatic dental injury management poster.

Table 1. Demographical Data of Study Sample.

Variables	n (%)
Gender	
Male	10 (14.7)
Female	58 (85.3)
Position	
Physical education teacher	13 (19.4)
Nurse	54 (80.6)
One didn't specify his or her position	1
Type of school	
Preschool	2 (3.2)
Primary	23 (35.9)
Middle	7 (10.9)
Secondary	8 (12.5)
School of all grades	24 (37.5)
Qualification	
High school	9 (13.6)
Associate diploma	11 (16.7)
Bachelor	41 (62.1)
Master	5 (7.6)
Having children of their own	
Yes	52 (76.5)
No	16 (23.5)
Ever observed children with TDIs	
Yes	40 (58.8)
No	28 (41.2)
Ever attending training about TDIs (advice)	
Yes	23 (33.8)
No	45 (66.2)
Feeling adequately informed about TDIs	
Yes	11 (16.2)
No	44 (64.7)
Don't know	13 (19.1)
First Aid course covering the management of TDIs	
Yes	17 (25)
No	51 (75)
Variables	Mean (SD)
Age	36.35 (8.71)
Experience in years	11.78 (8.74)
Current position duration	7.88 (7.56)

Note. SD = standard deviation; TDIs = traumatic dental injuries.

increase in the correct answers to these questions. The only exception to that was the question regarding saving a knocked out primary tooth as there was an improvement in knowledge between the first (A) and the second surveys (B), while 3 months later (C), there was deterioration in knowledge (see Table 2).

The results of the other five survey questions that had different options for answers are summarized next.

When asked to *identify whether a central incisor in a 9-year-old child is a primary or a permanent tooth*, 44 (64.7%) of the participants chose the correct answer of the tooth being a permanent one before the educational session compared to 65 (95.6%) immediately after and 51 (75%) 3 months later.

Table 2. The Answers of the Participants to Knowledge Questions Over the Three Intervals.

Questions	A	B	C
	n (%)	n (%)	n (%)
Q: Consideration of broken/chipped tooth as a dental injury			
Yes	59 (86.8)	62 (91.2)	68 (100)
Q: Consideration of tooth that moved from its original position as a dental injury			
Yes	42 (61.8)	57 (83.8)	62 (91.2)
Q: Consideration of knocked out tooth as a dental injury			
Yes	53 (77.9)	66 (97.1)	67 (98.5)
Q: Looking for broken/chipped tooth			
Yes	46 (67.6)	66 (97.1)	68 (100)
Q: Need for treatment of broken/chipped tooth			
Yes	65 (95.6)	68 (100)	68 (100)
Q: Informing parents about broken/chipped tooth and advising them to contact their dentist			
Yes	65 (95.6)	68 (100)	68 (100)
Q: Saving a knocked out primary tooth			
Yes	15 (53.6)	40 (58.8)	8 (28.6)
Q: Finding a knocked out permanent tooth			
Yes	52 (76.5)	68 (100)	68 (100)
Q: Need for treatment of knocked out permanent tooth			
Yes	65 (95.6)	66 (97.1)	68 (100)
Q: Informing parents regarding knocked out permanent tooth and advising them to contact their dentist			
Yes	67 (98.5)	68 (100)	67 (98.5)
Q: Tetanus toxoid injection need for referral			
Yes	42 (61.8)	63 (92.6)	66 (97.1)

Note. A = before the educational session; B = immediately after the educational session; C = 3 months after the educational session.

Regarding When to Seek Professional Help for a Knocked Out Tooth

The participants' responses improved over the three intervals of the survey toward the most favorable answer of seeking help within 30 min. Before the educational session, 39 (57.3%) answered that they would seek help within 30 min of the injury, while immediately after the educational session 52 (76.5%) and 3 months later 64 (94.1%) chose that answer. These results are demonstrated in Figure 2.

When Asked About the Appropriate Part a Knocked Out Tooth Should Be Held From

There was a consistent improvement over the three time intervals in the correct answer of holding the tooth by the crown part. Before the educational session, 33 (48.5%) answered by the crown, while immediately after the educational session 59 (86.7%) did and 3 months later 60 (88.2%) answered correctly.

The Response of the Participants to the First Action Taken for a Knocked Out Permanent Tooth

Before the educational session, the most frequently chosen response was "calling the patients' parents and advising

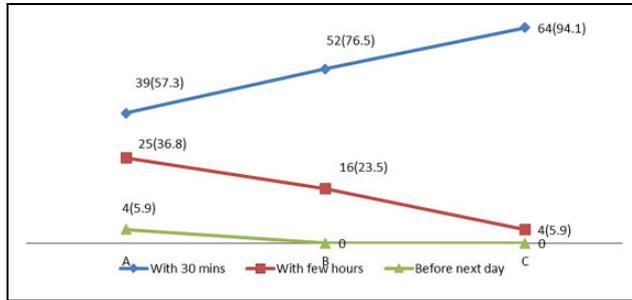


Figure 2. The change of the response over time to the urgency of seeking professional help after avulsion.

them to take the child to the dentist” 31 (45.6%). Immediately after the educational session, the most desirable answer that is “putting the tooth back in its place” was most frequently chosen 58 (85.3%). Moreover, 3 months after the educational session, the correct answer of “putting the tooth back in its place” was chosen by 55 (80.9%) of the participants.

When Asked About Their Action When a Knocked Out Permanent Tooth Falls to the Ground and Gets Contaminated With Dirt

Before the educational session, the participants chose to rinse the tooth with normal saline as their most common answer 36 (52.9%). Immediately after the educational session, 50 (73.5%) chose to “rinse the tooth under tap water” (correct answer according to the IADT recommendations), and 3 months after the educational session, 36 (52.9%) chose that same answer.

The Overall Knowledge Scores

Table 3 and Figure 3 demonstrate the repeated ANOVA results for the overall score of knowledge. In our study, we calculated the average score of knowledge for each participant in the three surveys that were collected. We also tried to assess the improvement in the score of knowledge over the period of the study. There was a significant improvement in the score of knowledge between all the three surveys (A, B, and C; see Table 3, Figure 3).

Discussion

A review of the literature reveals that many studies had been conducted worldwide assessing SNs and PE teachers’ knowledge about the management of dental trauma. The majority of these studies revealed inadequate knowledge (Al-Asfour et al., 2008; Arikan & Sönmez, 2012; Baginska & Wilczynska-Borawska, 2012; Bayrak et al., 2012; Kane et al., 2011; McIntyre et al., 2008; Mesgarzadeh et al., 2009; Pujita et al., 2013). This is the first study assessing such knowledge in the UAE. A study by Fakhruddin and Kawas (2010) in Sharjah, UAE, suggested interventions such as educating parents, caretakers, and older siblings on how to reduce and prevent dental injuries. Another study conducted in Ajman, UAE, recommended educational campaigns about the importance of managing emergency dental injuries (Hashim, 2012). These studies underlined the importance of educating the public in general and SNs in particular about dental injury management.

Only one third of our participants indicated they had previously attended any training, and fewer reported attending training as part of a first aid course covering the management of TDIs. This was a sharp contrast to the study by Baginska and Wilczynska-Borawska (2012), which reported that more than two thirds of their study participants had received dental trauma education. This highlighted the need for the improvement in formal training of SNs and PE teachers in UAE regarding the topic of TDIs.

Self-reported confidence in knowledge is an important indicator for proper practice. Similar to prior training and education, our study participants indicated low confidence in management of TDIs in the initial survey. These findings are similar to the findings of Pujita, Nuvvula, Shilpa, Nir-mala, and Yamini (2013). McIntyre, Lee, Trope, and Vann (2008) and Bayrak, Tunc, and Sari (2012) reported even lower levels of confidence among their study participants.

The ability to differentiate between primary and permanent incisors is essential for the proper emergency management of TDIs. In the present study, the majority of the participants reported the correct answer in recognizing the type of incisor (permanent) in a 9-year-old before the educational session. This initial knowledge was further improved over the following intervals of the survey. These results were similar to those of the Bayrak et al. (2012) study.

Table 3. The Knowledge Score Over the Three Periods Using Analysis of Variance Repeated Model and Pairwise Post Hoc Test.

Time of Intervention	Time of Intervention	Mean Difference (I – J)	p Value	95% Confidence Interval	
				Lower	Upper
A	B	(10.75–14.34) – 3.597	<.001*	–4.237	–2.957
A	C	(10.75–14.82) – 4.075	<.001*	–4.662	–3.487
B	C	(14.34–14.82) – 0.478	.047*	–0.949	–0.006

*Statistically significant.

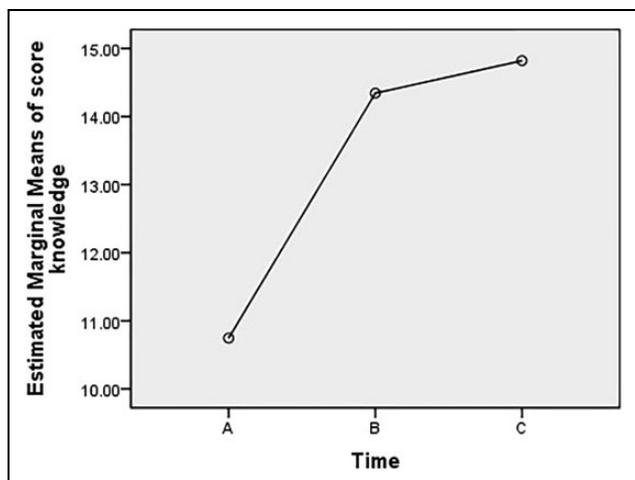


Figure 3. The repeated analysis of variance results of the overall knowledge score.

Overall, regarding the management of a chipped or broken front tooth, the study participants demonstrated adequate knowledge in different aspects of the management ranging from contacting the parents to looking for the broken piece. We also observed sustainability of this knowledge over the period of the study. The majority of the participants were able to recognize a chipped or a broken tooth as a TDI, and this recognition was sustained and improved over the three intervals of the survey. This was a much better response compared to Mesgarzadeh, Shahamfar, and Hefzolesan (2009), recognizing the proper management of a chipped front tooth. Arikan and Sönmez (2012) reported similar results to our study regarding the issue of looking for the broken piece of the tooth.

We singled out avulsion (knocked out) permanent and primary tooth management in this study, as it is considered the most serious of TDIs where quick action is needed (Andersson et al., 2012).

A majority of the participants of the study initially agreed that a knocked out permanent tooth should be saved. As for the second and third surveys, all participants agreed with this concept. Comparing this to the Pujita et al. (2013) study, many teachers knew that knocked out teeth required emergency treatment, but the concept of management of avulsed teeth was not fully understood. This is a fundamental issue in the emergency management of the TDIs, and the improvement observed in our study would hopefully translate into better action in case of an emergency.

Additionally, in the present study, concerning the issue of the immediate replantation of a knocked out permanent tooth, the participants demonstrated a very high level of agreement in the first survey and a 100% agreement with the issue in the 3-month survey. Conflicting results were observed in other studies (Bayrak et al., 2012; Pujita et al., 2013).

A controversial issue was noted in our study regarding the saving of an avulsed primary tooth in order to take to a

professional consultation. This is supported by a study done in Singapore, which stated that people had poor knowledge regarding the replantation of permanent and primary teeth (Sae-Lim & Lim, 2001). In the present study, during the third interval survey, the participants demonstrated a sharp deterioration in their knowledge regarding this issue. This inconsistency in knowledge might be due to the participants' confusion between the issue of saving a knocked out primary tooth to take to the dental consultation and replanting it.

A very crucial aspect of improvement observed in our study was regarding seeking help within 30 min of an avulsed permanent tooth. The improvement of knowledge in this aspect was demonstrated in the three intervals of the survey. Al-Asfour, Andersson, and Al-Jame (2008) reported similar results. Proper handling of the tooth from the crown part after avulsion is crucial to prevent damage to the periodontal ligament cells. The knowledge of the participants of our study regarding this issue was initially below average but was significantly improved and sustained throughout the study. Similar improvement was observed in the study by Arikan and Sönmez (2012).

In the case of an avulsed permanent tooth, the most critical aspect that affects the long-term prognosis of the tooth is the length of time the tooth stays out of its socket. The vitality of the periodontal ligament cells will not be sustained if the extraoral dry time is longer than 60 min. The message we tried to deliver to our study participants is that the best course of action in such an incident is to immediately place the tooth back in its socket (Andersson et al., 2012). The remarkable increase in the participants' choice of this option as the first action in response to a knocked out permanent tooth between the first and second surveys was sustained in the third survey. These results were better than those reported in the literature (Kane et al., 2011; Mesgarzadeh et al., 2009).

The IADT guidelines (Andersson et al., 2012) recommend rinsing the avulsed tooth for about 10 seconds under running water for a dirty avulsed tooth. A noteworthy improvement in the knowledge of our study participants regarding this issue was observed in the second survey compared to the first one and was sustained after 3 months. In the Pujita et al. (2013) study, improvement in the knowledge regarding this issue was also achieved.

Contamination of an avulsed tooth or an open wound with dirt will require further investigation to ascertain the status of tetanus immunization (Andersson et al., 2012). When questioned about the need for tetanus prophylaxis after certain TDIs, there was an overall increase in the appropriate answer to this issue in the three time intervals in our study. These results were similar to the findings of the study by Pujita et al. (2013).

When calculating the overall score of knowledge of the participants, a significant improvement in that score was observed. Between the first and the second survey, the score of knowledge improved from 10.75 (0.24%) to 14.34

(0.19%). This improvement was statistically significant. There was also a significant improvement of knowledge between immediately after the educational session and 3 months after the educational session 14.34 (0.19%) to 14.82 (0.16%), respectively. These results demonstrate the sustainability of the overall knowledge in the subject acquired during the educational session, thus highlighting the importance and the effectiveness of education regarding this topic.

The limitations of the current study include the fact that the number of the PE teachers was low and might have not resulted in a clear and accurate representation of the knowledge regarding TDIs in this specific study group. The authors postulate that due to the fact that the educational sessions were scheduled in a time during the school session, the PE teachers might have been unable to attend due to their teaching obligations. The low number of PE teachers did not allow for proper comparison of knowledge between the SNs and PE teachers, which might have been an interesting comparison as these two professions have different educational backgrounds and a comparison might have had more information regarding the need to differentiate our communication about TDIs depending on the audience. Although improvement of knowledge was demonstrated, some deficiencies were exposed such as confusion regarding the question of saving an avulsed primary incisor until the professional consultation. Another study limitation is the fact that in the survey, there was no question specific for the ideal transport medium of an avulsed tooth. In addition, the questionnaire might have been too long leading to some of the participants skipping questions and answering hastily. Finally, the third survey was conducted over the phone, while the first two were paper surveys and that was due to the fact that many SNs and PE teachers came from different areas of the Emirate of Dubai and conducting a paper survey was logistically challenging. In addition to that, similar to any questionnaire survey, variation in participants' ability to understand and interpret questions, the inability to tell how truthful a respondent is being and how much a respondent's thought was put in to it are always possible limiting factors.

The findings of our study demonstrated the initial lack of knowledge in many aspects of the management of dental trauma. As studies estimate about 25% of schoolchildren experience dental trauma, it is imperative that SNs and PE teachers receive basic TDIs prevention and emergency management in their formal curricula as well as periodic updates and upgrades to their knowledge in the form of continuing education during their career. The participants of the study reported a lack of training regarding the issue of TDIs during their education. The study demonstrated the positive effect of education even in the form of a single session on the improvement of knowledge and the sustainability of this knowledge after 3 months. A telephone "hotline" could be established to provide school personnel with the needed appropriate advice.

Follow-up on the sustainability of knowledge 12 months from the educational session in this study is recommended. An IADT TDIs poster distributed to the participants of the study should be distributed to all schools to be posted in the nurses' station. Finally, a (Tooth Save Kit) should be distributed to be kept in the emergency inventory of all school clinics to provide an ideal medium to save avulsed teeth until professional dental care.

Conclusions

In the sample of Dubai PE teachers and SNs studied, the study demonstrated an initial deficiency in knowledge about the emergency management of TDIs. There was a significant decrease in the participants' choice for seeking help within few hours after an avulsion both between the first and the second surveys and the second and third surveys. There was a remarkable improvement in the score of overall knowledge of TDIs throughout the study especially between the periods prior to and immediately after the educational session. This improvement was sustained 3 months after educational session.

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Author Contributions

All authors contributed to the design, conduction, analysis of the study and the writing of this manuscript. We applied the "first-last-author-emphasis" norm (FLAE) for the sequence and credit of authors' contributions.

Declaration of Conflicting Interests

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