

Knowledge and Attitudes of Female Teachers Towards the Emergency Management of Traumatic Dental Injuries in Jeddah City: A Cross-Sectional Study

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Submission: 27 Dec 2019

Accepted: 22 Apr 2020

Citation

Balkhair OJ, Al-Maghrabi HA, Baakdah RA. Knowledge and attitudes of female teachers towards the emergency management of traumatic dental injuries in Jeddah City: A cross-sectional study. *JKAU Med Sci* 2020; 27(1): 63-73. DOI: 10.4197/Med. 27-1.9

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Abstract

Teachers are the primary contact point, when an incident occurs in school. Traumatic dental injuries had been frequently reported among school children. The purpose of this study was to assess the attitudes and knowledge of female teachers in Jeddah City in the management of emergency traumatic dental injuries and the referrals of cases to dental clinics within a limited time. In this cross-sectional study, a questionnaire was used to collect information from 503 female teachers from schools that were randomly selected. The survey focused on the general demographic characteristics, attitudes, and knowledge among the school teachers, in addition to their preferred strategies for the management of dental emergencies. This findings revealed that 64% of the teachers had positive attitudes about dental emergency management in school, while only 37% of them had sufficient knowledge about these emergencies. There was no significant association between the attitudes of the participant their knowledge. Despite these positive attitudes displayed by the teachers, there is a significant lack of knowledge among them about the management of dental emergencies, in particular, about tooth avulsion.

Keywords

Attitude; Dental emergency; Knowledge; Teachers; Tooth avulsion

Introduction

The increasing prevalence of traumatic dental injuries (TDI) among school children is an overwhelming public health concern due to its influences as an economic burden, its frequent occurrences, and its impacts on the quality of life of those involved^[1]. The injury or loss of a tooth can also impact the further development of the dentoalveolar region and the

psychological well-being of a child^[2]. Based on the recent meta-analyses, TDI accounts for nearly 18% of all facial injuries^[3] and is experienced by more than one billion people globally^[4]. More than a quarter of all dental emergencies occur during school hours, with 25% to 69% of the TDIs involving the primary teeth, which lead to the possible developmental disturbances in the permanent successor teeth^[5]. Similarly, in Saudi

Arabia, epidemiological studies have reported the prevalence of TDI to be 34–31% among primary school boys and girls, which mostly affects the maxillary central incisors, followed closely by the mandibular central incisors^[6,7].

Delayed or incorrect intervention may result in tooth loss, or in the irreversible damage to the orofacial region, in addition to its negative impact on the patient's self-esteem and quality of life^[1]. More than a third of all dental injuries among children are permanent tooth avulsions^[5]. The prognosis of tooth avulsion is dependent on the initial management that is done onsite or where incident occurs^[8]. The first recommended line of treatment is immediate tooth replantation, which was reported to have a very high success rate at 93%^[9]. In the event, where tooth replantation is not possible, there are several different storage media that are used for the transportation of the avulsed tooth to the clinic for subsequent treatment^[10]. Therefore, it is imperative that teachers or other school employees, who are at or close to the accident site, are trained to manage the TDI appropriately and in a timely fashion^[11].

Numerous international studies have discussed the knowledge and attitudes of school teachers, in addition to the levels of training on initial TDI management^[8,11-15]. In studies from India^[8], Croatia^[11], Iran^[12], and the United Arab Emirates (UAE)^[13], less than half of the teachers were reported to have demonstrated knowledge and awareness regarding TDI management, especially of an avulsed tooth at the site of the incident. Similarly, in recent years, accumulating evidence about the knowledge and attitudes of school teachers concerning TDI management has been reported in the Kingdom of Saudi Arabia^[16-21]. However, despite reports on the inadequate knowledge and the lack of adequate dental emergency training of school teachers in the different provinces, the data have not yet been published about the attitudes of school teachers that are related to the management of TDIs in Jeddah City. Additionally, with the recent introduction of sports for girls in schools, the need to upgrade facilities and to prioritize emergency training programs for female teachers was identified. To the best of the authors knowledge, this is the first study that has been undertaken regarding the attitude and knowledge assessments of female school teachers in the Kingdom of Saudi Arabia. Therefore, the purpose of this study was focused on the evaluation of the knowledge and attitudes of female school teachers for emergency TDI management in Jeddah, Saudi Arabia.

Also, we aimed to describe the awareness of teachers about dental emergency protocols and to assess the relationships between their knowledge and their attitudes towards TDI management. By identifying areas of deficiencies, local educational programs can be established in order to improve the knowledge and attitudes of female teachers on the management of emergency TDIs in schools.

Methods and Materials

In this cross-sectional study undertaken in October 2017, a web-administered questionnaire was used to collect the information on the female school teachers' knowledge and attitudes towards TDIs and dental emergency management. The data were collected from randomly selected school teachers across Jeddah City. The permission to distribute the questionnaire was obtained from the Ministry of Education in its North Jeddah office. A link to the survey, together with relevant explanations, was posted on the Ministry of Education's website, which was considered as a consent agreement for the teacher participation. The participants had the option to respond to the questionnaire in either English or Arabic to also allow the involvement of international school teachers. The survey was electronically distributed to the Jeddah schools, which could be accessed by all teachers. The questionnaire was also reported by Sharma *et al.*^[14] due to its established reliability and validity.

The questions were presented with multiple choice answers in order to facilitate the ease of use of the questionnaire, which was pretested as a pilot study on 20 teachers to ensure that the questions can be easily understood. The questionnaire was divided into three main parts, with the first and second parts consisting of eight questions each. The questions in the first part were related to general demographic characteristics, such as age, educational level, teaching experience, place of work, length of experience, first aid training, and experiences with traumatic tooth injuries in school. The second part consisted of questions that were related to the attitudes of female school teachers with respect to TDI management. The third part was related to the self-assessment of school teachers regarding the emergency management of dental trauma and was divided into two dental injury case scenarios. The first case was based on a minor incident, involving an uncomplicated crown fracture in a 9-year old student, while the second case was based on a severe accident, involving tooth avulsion in

a 12-year old student. Previous studies have reported the use of both scenarios for the assessment of the knowledge levels of school teachers^[8,15]. The objective of the last part of the questionnaire was to identify the strategies that can be used to improve the knowledge of female teachers that is related to dental emergency management.

The collected data were entered from a Google link to an Excel sheet (Microsoft Excel 2016, Microsoft Corp., Seattle, WA USA). For the descriptive statistical analysis, the responses to each question were categorized as either negative or positive for the attitude questions and correct or incorrect for the knowledge questions.

The data from the completed questionnaires were encoded, and statistical analyses were performed using IBM SPSS Statistics for Windows, Version 20 (IBM Corp., Armonk, NY USA). A chi squared test was used to determine the associations among the categorical variables. The significance level for this analysis was set at 0.05 for all of the statistical correlations.

Results

Response Rates and the Profile of Study Participants

In this study, a sample size of 500 teachers was used as an arbitrary choice for convenience, compared to

the multiple choices of previous studies. To ensure randomization, a link to the questionnaire, together with the relevant explanations, was posted on the websites of the Jeddah schools. The electronically designed website, which is used for work announcements and progress reports, could not be accessed by non-teachers. The approximate number of female teachers in Jeddah is five thousand. Only 503 responded, which represents 10% of all teachers in Jeddah.

The data collection started in October 2017, with a total of 503 female teachers, completing the questionnaire. The participants were composed of 41–50 year-old (50%) and 31–40 year-old (38%) teachers, with more than three-quarters (75%) of them having formal graduate degrees. About 84% of the female teachers had more than six years of teaching experiences, with 63% of them working in primary schools (Table 1). Many of the female teachers (62%) had no prior knowledge or formal training in first aid, and the remaining teachers had either acquired first aid training or knowledge mainly from different means, such as attending relevant courses (13%), social media platforms (10%), and television (7%), among other means (Table 2). Nearly a quarter of all of the respondents (21%) reported to have witnessed at least one case of dental trauma in children in their schools during their teaching careers (Table 2). In this study, no statistical significance (two-tailed $P = 0.21$) was found between the attitudes and the knowledge of participants regarding TDIs.

Table 1. Basic demographic characteristics of the participants.

Variables	Characteristics	Value (n)	Percentage (%)
Age Group (years)	21–30	30	6.00
	31–40	189	38.00
	41–50	251	50.00
	≥51	33	6.00
Workplace	Primary school	318	63.00
	Intermediate school	84	17.00
	High school	101	20.00
Education	Diploma	128	25.00
	Undergraduate Degree	352	70.00
	Postgraduate Certificate	23	5.00
Experience	≤3 years	19	4.00
	3–6 years	60	12.00
	≥6 years	424	84.00
Position	Administrator	61	12.00
	Health care officer	4	1.00
	School nurse	2	0.00
	Teacher	421	84.00
	Teacher + Administrator	15	3.00

Table 2. Knowledge of the study participants about first aid and experience with dental emergencies in the school

Variables	Source(s)	Value (n)	Percentage (%)
Participants with prior first aid training certificate or familiarity with the application of first aid	None	314	62.00
	Television	33	7.00
	Social magazines	2	0.00
	Social media and internet	48	10.00
	Courses	67	13.00
	Educational books	14	3.00
	Others	25	5.00
Participants, who witnessed dental trauma cases on school grounds last year	None	368	73.00
	1–2 cases	105	21.00
	3–4 cases	19	4.00
	>5 cases	11	2.00

Table 3. Percentages of the attitude-based responses

Attitude-based Responses to the Questionnaire	Correct Response	Incorrect Response	Correct Percentage (%)	Incorrect Percentage (%)
It is the moral responsibility of teachers to take care of the tooth injuries that happened during school hours.	426	77	84.7	15.3
Time plays an important role in saving a tooth.	407	96	80.9	19.1
When a tooth is lost due to injury, it can be saved, so there is an utmost need for treatment.	377	126	75.0	25.0
Dental trauma management is an emergency situation.	301	202	59.8	40.1
Teacher's intervention in school dental injuries plays an important role in saving a tooth.	298	205	59.2	40.7
In case of dental emergencies, there is no legal liability of the teacher involved in the situation.	198	305	39.4	60.6
Wearing a mouth guard should be made compulsory in all outdoor or contact sports.	231	272	45.9	54.1
The management of tooth injuries must be included during the training of teachers.	310	193	61.6	38.4
You feel that receiving a training in the management of dental trauma will be helpful in handling the situation better.	364	139	72.4	27.6

Assessment of the Attitude-Based Responses in the Management of Dental Trauma

The overall response of 64% of the school teachers on the attitude questionnaire was positive. The majority of them considered that it was their moral duty to manage tooth-related injuries while in school sessions (84%). In addition, many teachers agreed that swift action is critical to the survival of an injured tooth (80%) and that dental trauma constitutes an emergency situation (60%). Furthermore, nearly three-quarters of the study participants (70%) agreed that prompt treatment is necessary to save an injured tooth. Over half of the responders believed that the training of teachers should include the management of dental emergencies in schools (62%), with close to three-quarters (72%) expressing certainty that such training can assist them better in managing emergency dental

situations. Although the majority of teachers (59%) agreed that their role in dental injury management could potentially save a tooth, many respondents (61%) believed there could be legal implications that may arise from such dental emergency situations, if they were involved. More than half of the teacher respondents (54%) did not agree with the wearing of compulsory mouthguards by students for their participation in all outdoor or contact sports (Table 3).

Assessment of General Knowledge in the Management of Dental Traumatic Injuries

Overall, only 37% of the responders had adequate knowledge about dental emergency management. All responses from the two case scenarios on the questionnaire are summarized in Table 4. In case one,

Table 4. Percentages of each knowledge-based response

Knowledge Response	Correct Response	Incorrect Response	Correct %	Incorrect %
Identify the type of the injured tooth	309	194	61.4	38.6
Identify the importance of the fractured crown piece	111	392	22.0	78.0
Identify the proper management of fractured tooth	437	66	86.9	13.1
Identify the importance of the avulsed tooth	338	165	67.1	32.8
Identify the proper management of avulsed tooth	38	465	7.6	92.4
Identify the immediate action of contacting a pediatric dentist	411	92	81.8	18.2
Identify the immediate action required to seek professional help for avulsion cases	339	164	67.4	32.6
Identify the proper store media for avulsed tooth	130	373	25.8	74.2

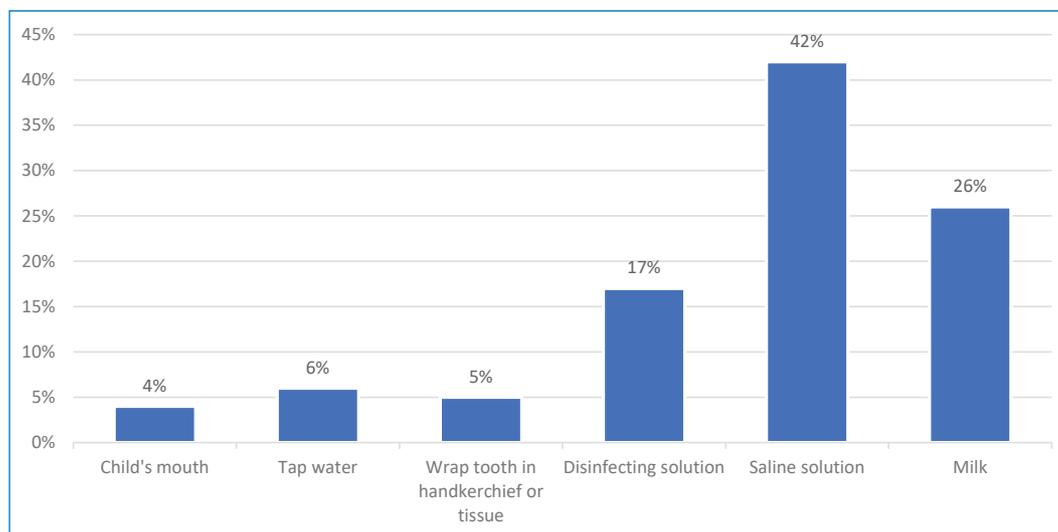


Figure 1. Teachers' responses to the storage media for avulsed tooth.

61% of the female teachers correctly identified the fractured tooth of the 9-year old student to be likely a permanent tooth. The majority (87%) identified the correct management of the fractured tooth by contacting the student's parents. However, less than a quarter of the teachers (22%) considered to look for the fractured tooth as an immediate action (Table 4).

In the second case on the management of anterior avulsed tooth, the majority of the teachers (67%) correctly identified the importance of an avulsed tooth, and the need to immediately seek help from a health professional for its treatment. Furthermore, many of the teachers (82%) recognized that a pediatric dentist should be the first line of contact for the avulsion cases. However, only 3% of the responders were able to identify the proper management of avulsed tooth. Just over a quarter (26%) of the teachers were able to identify the appropriate storage medium as the milk for the avulsed tooth (Table 4).

In case of choosing a storage medium for the avulsed tooth, 42% of the teachers stated that they would store the tooth in saline solution, 26% in milk, 17% in a disinfecting solution, 6% in tap water, 5% in a tissue, and 4% in the child's mouth (Fig. 1).

Strategies to Improve General Knowledge of the Teachers on Dental Emergencies

The responses of the teachers with reference to the strategies recommended for the improvement of their skills in dental emergency management are summarized in Figure 2. A significant number of participants (93%) acknowledged that there is a need for further education, in order to improve the quality of management of dental emergencies, whereas, 7% of the teacher respondents did not feel the need for any improvement on the quality level of their existing knowledge (Fig. 1). The most frequent response for improving their knowledge would be their attendance

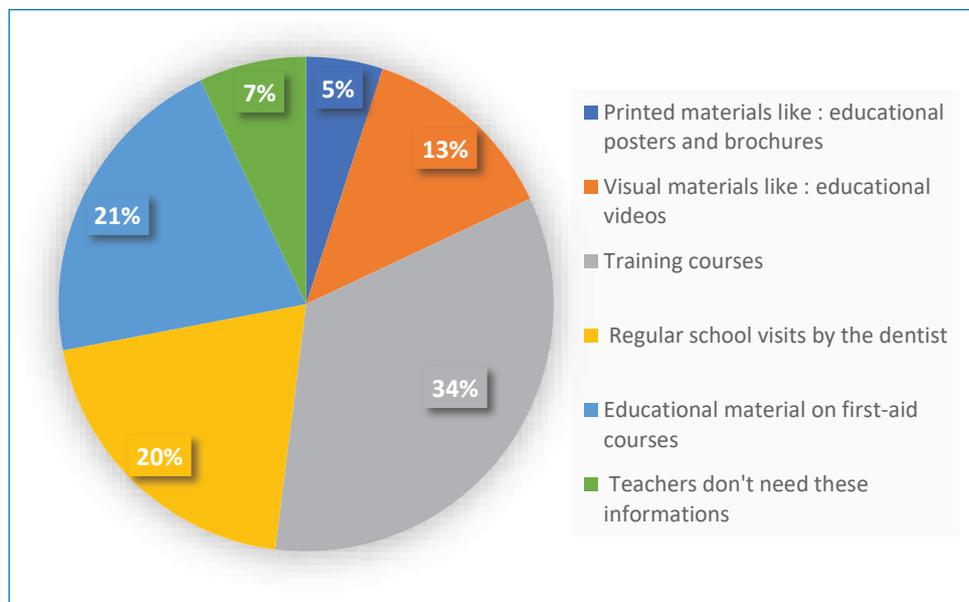


Figure 2. Teachers' preferred method of learning and improving their knowledge about traumatic dental injuries.

in relevant dental-related training courses (34%) with specific emphasis on educational materials on first aid courses (21%), followed closely by the regular dentist visits in the schools (20%), the use of visual materials, such as educational videos (13%), and printed materials, including educational brochures or posters (5%).

Discussion

In Saudi Arabia, this is the first study that was undertaken regarding the attitude and knowledge assessments of female teachers on TDIs after the introduction of sports for girls in the schools. These results revealed that there is a general lack of knowledge and training that is related to the management of oro-dental injuries, especially tooth avulsion, among teachers, despite their high motivation and willingness to be involved in the management of such dental emergencies. Consistent with previous studies, the majority of the teachers (84%) agreed that it is their responsibility to manage dental emergencies in their schools. The teachers further recognized that prompt action is necessary to reduce the loss of the traumatized tooth (80%)—a finding that further highlights the importance of tailored training to improve dental-related injury management. Furthermore, more than a third (72%) of the teachers indicated that educational training programs can potentially allow them to better manage dental emergencies in their school. Similarly, previous studies have reported the lack of satisfaction

among school teachers with regards to their existing knowledge concerning TDI management^[16,21].

Reports on the conduct of first aid training are inconsistent in the available literature. Similar to previous reports from the UAE^[15] and Riyadh^[16], only about a third of the respondents in this study had undergone first aid trainings. This number is double the number of teachers in Saudi Arabia (18%), who had done first aid trainings^[21]. In contrast, reports from the UAE^[13] and Saudi Arabia^[17] found out that more than half of the school teachers had a prior first aid training. However, all of these reports emphasized the need to establish training programs that are focused on the management of traumatic dental emergencies in schools. In fact, almost a quarter (21%) of the teachers had encountered at least one case of dental emergency in their school, which is consistent with recent reports on teachers' experiences with dental traumatic injuries^[8,15,17,20]. This finding further identifies the need to increase the number of awareness programs for school teachers concerning the TDI management and to encourage them to implement prompt action for the handling of these types of situations.

Some studies have reported that many of the teachers did not know the difference between a permanent and deciduous tooth^[13,15]. However, other recent studies, including this study, found out that more than half of participants (61%) were aware

that the nine-year old child had a permanent broken tooth^[8,14]. Collectively, from all of the reported studies, it can be deduced that teachers, in general, have limited knowledge regarding the importance of a fractured tooth. This finding further highlights the need to educate teachers about the importance of keeping the broken tooth fragment, as using the bonding of the fractured part of the tooth has been shown to be a much more conservative and cost effective means, in addition to an aesthetic approach, than in using resin bonding^[22].

The avulsion of a permanent tooth occurs frequently during sporting events in schools, and it requires prompt treatment in order to improve its prognosis and avoid tooth loss. While more than half of the female teachers (67%) identified the importance of avulsion and its management by a pediatric dentist (82%), there was a lack of awareness on the correct management process of the avulsed tooth (7.5%). Just over a quarter of the female teachers were able to identify the most appropriate storage solution for the damaged tooth, which is an important factor in determining the prognosis of the tooth. These findings are consistent with the findings of previous studies^[8].

In case of avulsion emergencies, while immediate replantation is considered as the best treatment in the place of the incident, in this study, we did not consider replantation of the avulsed tooth in the questionnaire, because previous findings indicate that the teachers in Saudi Arabia are not in favor of this procedure due to their lack of confidence in carrying out replantation^[15-16,18]. The International Association of Dental Traumatology has recommended various suitable storages and transport medium for the avulsed permanent tooth to facilitate favorable tooth replantation outcomes^[23]. An ideal transport medium for an avulsed tooth should be provide the preservation of the function of the periodontal ligament cells^[24]. One of the most suitable storage medium is considered to be milk because of its physiological properties, in addition to its compatibility with periodontal cells^[10]. In this study, more than half of the respondents identified saline (42%) and milk (26%) as the best transport medium for the avulsed tooth, with 6% of them selected tap water as the storage medium. Tap water is the least desirable storage medium due to its being hypotonic, which leads to the rapid viability of the peridontal ligament^[25]. This is in contrast to the findings of other studies in Saudi Arabia which reported that more than a third of the teachers would transport the tooth in water^[18,20]. Similar to our findings,

previous studies found that 19%^[16,18] and 28%^[20] of the teachers would choose milk as the transport medium of choice, whereas Hashim^[15] reported only 4% of the teachers considered milk as the most suitable transport medium. In addition, in this study, 4% of the female teachers favored saliva as the most suitable transport medium, which is similar to water as a hypotonic solution that contains microorganisms and is not a suitable medium, compared to the other types of medium. Likewise, an antiseptic solution, which was selected by 17% of the teachers, is not recommended due to the damage that could effect on the periodontal ligament. These findings further emphasize the need to educate the teachers about the importance of the biological properties of the transport medium in order to attain clinical success in replanting an avulsed permanent tooth.

Consistent with the findings of a recent study by Sharma *et al.*^[14], more than half of the teachers (54%) did not agree that mouthguards should be included as a mandatory requirement for students' participation in contact sports, which further highlights the importance of improving the knowledge of teachers about preventative approaches to reduce DTIs in schools. The use of mouthguard has been shown to significantly reduce the risk of dental injuries during contact sports^[26]. It is mandatory to wear a mouthguard, when participating in international competitive contact sporting events.

Now that sports was included in the education curriculum for girls, it is much more important to educate now the teachers on initiating prompt actions to implement dental emergency protocols for the TDI management among school children. In particular, the significance of shortening the time interval from the avulsion to the replantation of the tooth needs to be markedly emphasized^[44]. The lack of knowledge among Saudi teachers also further emphasizes the necessity to include educational seminars or workshops on the types of teeth that are likely to be affected by traumatic injuries, in addition to the appropriate handling of such teeth in order to increase the chances of its long-term survival. Previous reports indicate that addressing the knowledge gap among the teachers had led to the significant improvements of their TDI knowledge and management skills^[28,29].

The majority of the teachers stated that their current knowledge on the management of TDI was not adequate. Nearly three-quarters of them were eager

to attend lectures and trainings on the management of dental emergencies—a finding that is consistent with the findings of previous studies^[14,16]. Therefore, education and further training on TDI management should be given priority for inclusion in the learning programs in the schools.

In order to determine the strategies to include educational programs on dental emergencies into the school training curriculum for teachers, we found that majority of study participants preferred the direct incorporation of dental-related training courses, in addition to the regular dentist visits in the schools. In a recent study, the addition of smartphone applications to provide information on dental emergency managements to the lectures was found to be more effective than the conduct of seminars alone^[30]. In the current technological society, in which everyone owns a mobile phone, it is pragmatic to integrate technology as a way of facilitating effective knowledge transfer and learning.

It is imperative to implement an effective initial TDI management system to improve long-term prognosis and the survival of the involved tooth. Understanding and improving knowledge on the TDI, in addition to the correct and timely management of an acute situation, would greatly enhance the confident handling of dental injuries by the teachers in general. Thus, the findings of this study reveal gaps in the knowledge of teachers in Jeddah City, in addition to their attitudes toward the management of dental emergencies during school hours. The results further indicate the areas of priority to be included in educational programs for teachers, in order to improve their confidence and their involvement in TDI management.

The main limitation of this study relates to the data collection, which was done in only one major city, and therefore, the generalization of the study findings may be limited and may not be applicable to the other provinces. Thus, in light of the upgrades in terms of training and educating teachers in the management of sports-related dental injuries among female students, the investigation of knowledge levels and attitudes of teachers toward TDI management should be extended to the other Saudi provinces.

Strengths and Limitations of this Study

This is the first study that explored the female school teachers' knowledge and attitudes toward the management of TDIs in the City of Jeddah.

The findings of our study confirmed the need for the inclusion of further training emergency management in schools in order to address the TDIs.

The participating respondents consisted of a group of female teachers.

Conclusions

The findings of this study indicate that the school teachers in Jeddah City are motivated and willing to assist with TDI during school hours. However, there is a general lack of knowledge of the teachers, in addition to training that is related to the management of such emergencies, and in particular, to tooth avulsion. An urgent need to implement educational programs or workshops as part of the training courses for all teachers should be given attention in order to improve the knowledge levels of the teachers for the appropriate and timely management of DTIs. In addition, the inclusion of the guidelines on TDI management as part of teachers' school orientation should be seriously considered.

Contributions of the Authors

The study design, including the development of the original questionnaire and the data entry, was done by OJB and HA. The manuscript was drafted by OJB, and all authors had contributed to the writing and the final revision of the manuscript.

Data Availability Statement

The questionnaire used to support the findings of this study are available from the corresponding author upon request.

Conflict of Interest

The authors declares that they have no conflict of interest that is related to this study and this article.

Disclosure

The authors did not receive any type of commercial support either in the form of compensation or financial support for this case report. The authors have no financial interest in any of the products, devices, or drugs mentioned in this article.

Ethical Approval

Ethical approval was not obtained, because this study is not an experimental trial, and all of the participants had read the explanatory notes that were posted with the questionnaire. The main approval from the North Jeddah Office was already obtained.

Acknowledgments

The authors are grateful to the Ministry of Education - Jeddah/Female North Centre for the assistance in promoting the participation of teachers in this study. Also, we are grateful for the assistance of Dr. Negar Jamshidi in proofreading this manuscript.

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معرفة وسلوك المعلمات تجاه إدارة إصابات الأسنان الطارئة في مدينة جدة: دراسة مستعرضة

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المستخلص. المعلمون هم نقطة الإتصال الرئيسية عند وقوع حالة طارئة في المدرسة، ولأن إصابات الأسنان شائعة بين أطفال المدارس، كان الغرض من هذه الدراسة هو تقييم سلوك ومعرفة المعلمات في مدينة جدة فيما يتعلق بالتعامل مع إصابات الأسنان الطارئة، وإحالة الحالات إلى عيادة الأسنان في غضون فترة زمنية محدودة، وفي هذه الدراسة المقطعية تم استخدام استبيان لجمع المعلومات من ٥٠٣ معلمة، وتم اختيار المدارس بشكل عشوائي، ركز الاستبيان على الخصائص الديموغرافية العامة، السلوك، المعرفة، إضافة إلى الإستراتيجيات المفضلة لإدارة حالات إصابات الأسنان الطارئة بين معلمات المدارس، وبينت النتائج أن ٦٤٪ من المعلمات أظهرن سلوكاً إيجابياً، بينما كان لدى ٣٧٪ منهن فقط معرفة كافية عن كيفية التصرف عند حدوث إصابات للأسنان في المدرسة، ولم يكن هناك ارتباط عملي بين السلوك والمعرفة للمشاركات وكشفت هذه الدراسة - على الرغم من الموقف والسلوك الإيجابي للمشاركات - أن هناك نقصاً كبيراً في المعرفة لدى معلمات المدارس في إدارة حالات إصابات الأسنان الطارئة، ولا سيما في حالات سقوط أحد الأسنان.