

Research Article

Assessment of School-Teachers' Knowledge and Attitude toward The Management of Traumatic Dental Injuries in Makkah

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ABSTRACT

Background: Traumatic dental injuries (TDI) to primary and permanent teeth are not uncommon in children. Almost half of TDI in children occur at schools and the prognosis is time dependent. Hence, the teacher's knowledge towards management of TDI is important. The aim of this study is to assess the knowledge and attitude of female elementary school teachers in Makkah, regarding the management of TDI.

Methods: This is a descriptive cross-sectional questionnaire-based study, designed using Google forms to collect information from 350 female elementary school teachers from randomly selected schools in Makkah. The questionnaire collected data on participants' demographic characteristics, knowledge, and attitude towards management of TDI.

Results: 265 teachers participated in this study. 66.8% of the participants had positive attitude towards moral responsibility regarding the management of TDI. 63.4% of the participants lacked the proper knowledge regarding the management of TDI and 74.6% did not know the best storage media for an avulsed tooth. 60.7% of the participants were not satisfied with their knowledge, yet 94% had a positive attitude towards improving their knowledge.

Conclusions: Female elementary school teachers in Makkah, showed insufficient knowledge but a positive attitude and willingness towards improving their level of knowledge regarding management of TDI. Hence, strategies to improve teachers' knowledge about TDI must be planned and implemented.

1. INTRODUCTION

Traumatic dental injuries (TDI) are widespread among children and are considered a severe oral health problem in childhood as they can cause much pain and distress (Borges *et al.*, 2017). TDI are not a disease; therefore, unlike most diseases, they are not preventable and might affect anyone at any time. A literature review revealed that TDI and their consequences might exceed the burden of dental caries and periodontal diseases in children (Pettersson *et al.*, 1996; Flores *et al.*, 2007). These physical and economic consequences extend to psychosocial and life-changing effects on affected individuals (Traebert *et al.*, 2003; Bastone *et al.*, 2000; Bendo *et al.*, 2014). Global epidemiological studies on different populations have reported that TDI prevalence rates range widely, from 6% to 59% (Lam *et al.*, 2016; Eyuboglu *et al.*, 2009). A meta-analysis study revealed that TDI accounts for approximately 18% of facial injuries and affects over 1 billion people worldwide (Petti *et al.*, 2018). As regards TDI in children, 25% to 69% affect either primary teeth, which could lead to the development of disturbances in the permanent successors or affect permanent teeth with incomplete root development in children with mixed dentition (Andersson *et al.*, 2013; Marchiori *et al.*, 2013). In

Saudi Arabia, epidemiological studies have reported that the prevalence of TDI among primary school children ranges between 31% and 34%, with maxillary central incisors, followed by mandibular central incisors, being the most affected teeth (Al-Majed *et al.*, 2001; Al-Majed *et al.*, 2011). Managing cases of TDI presents a real challenge since emergency management should start at the time and place of injury rather than when the patient first arrives at the dental clinic, as this significantly impacts the prognosis. Hence, the first aid provided is essential, and there is a clear need to educate the public.

The two leading causes of TDI among children are accidental falls and sports activities, which could happen at home, school, or anywhere else. However, studies have shown that TDI in school accounts for approximately half of all TDI in children (Ozen *et al.*, 2010). The prognosis for the injured teeth is highly reliant on how quickly and appropriately those present manage the teeth at the site of the accident, including teachers and staff members (Bendo *et al.*, 2014; Nirwan *et al.*, 2016). The time which elapses between the trauma and the provision of dental help is critical and affects the prognosis (Al-Jundi *et al.*, 2004), thus increasing the responsibility of teachers,

supervisors, secretaries, and other school personnel in terms of providing prompt and proper action in the emergency management of TDI. Hence, teachers' awareness of the initial management of dental trauma cases is essential to save teeth and improve long-term treatment outcomes. Most studies, however, have reported a low level of knowledge about how to provide first aid for TDI cases (Mohandas *et al.*, 2009; Andersson *et al.*, 2006; McIntyre *et al.*, 2008a; McIntyre *et al.*, 2008b; Glendor *et al.*, 2009). Several international studies have reported that fewer than half the teachers investigated demonstrated knowledge of the management of TDI, particularly in cases of avulsed teeth.

A study on a sample of elementary school personnel in the USA to assess their knowledge, practice, and experience regarding TDI revealed poor dental trauma knowledge among the study sample (McIntyre *et al.*, 2008b). A questionnaire-based study in Brazil evaluating teachers' knowledge of the management of TDI showed that about half the participating teachers had insufficient knowledge (Pithon *et al.*, 2014). In Turkey, 500 primary school teachers responded to a questionnaire assessing their knowledge of TDI, revealing low levels of knowledge and the urgent need for them to be more informed on this issue (Arikan *et al.*, 2012).

A cross-sectional study assessing primary school teachers' knowledge and attitude regarding TDI management in Sudan (Abuaffan *et al.*, 2015) revealed that 62% of teachers had never received first aid training, and 39% believed dentists should entirely manage TDI. A cross-sectional study conducted in Riyadh, Saudi Arabia, to assess primary school teachers' knowledge of the management of TDI through a self-administered questionnaire reported that primary school teachers in Riyadh lacked sufficient knowledge concerning the management of such injuries in children (Alsadhan *et al.*, 2018). In recent years, more studies addressing school teachers' knowledge of and attitude toward the management of TDI in Saudi Arabia have been published (Alsadhan *et al.*, 2018; Obied *et al.*, 2018; Al-Zaidi *et al.*, 2017; Siddiqui *et al.*, 2017; Zakirulla *et al.*, 2011; Al-Obaida *et al.*, 2010; Ola *et al.*, 2020). However, our literature review revealed a lack of data regarding the knowledge and attitude of elementary school teachers in Makkah, Saudi Arabia.

The main aim of the present study is to assess the knowledge and attitude of female elementary school teachers towards the management of TDI in Makkah, Saudi Arabia. Moreover, it aims to identify areas of deficiency and investigate the need to improve knowledge of and attitude toward the management of TDI by organising TDI awareness campaigns.

2. MATERIALS AND METHODS

2.1 Study Design and ethical considerations This is a descriptive, cross-sectional, questionnaire-based study, which was designed using Google Forms. It was conducted between January 10, 2022, and March 10, 2022. By replying to and submitting the questionnaire,

participants were considered to have consented to participate. The study protocol, with approval number HAPO-02-K-012-2022-01-907, was approved by the Biomedical Research Ethics Committee of Umm Al-Qura University, Makkah, Saudi Arabia and permission to conduct the study was obtained from the Department of Planning and Development at the Ministry of Education.

2.2 Sample Selection and study questionnaire

An anonymous, detailed, structured questionnaire designed as an online Google form was distributed via the WhatsApp platform and through a link sent by the Ministry of Education website. It was sent to 350 female elementary school teachers from 16 private and government schools in Makkah. The schools were selected through stratified random selection to cover different districts. The sample size was calculated using an online sample size calculator at a 95% confidence level and 5% margin error and 4620 School teachers population size. However, the calculated sample size (355 school teachers) was adjusted to fit with the time and manpower limitations of the study, as all the participating schools received post-questionnaire educational lectures regarding the management of TDI. The sample inclusion criteria comprised the following: (1) female school teachers, (2) elementary class teachers only, (3) teachers who are currently working, and (4) teachers who do not currently hold nor previously held any administrative position.

The questionnaire was written in Arabic and comprised 22 questions divided into four sections. The questionnaire began with an introduction to the research that emphasised the confidentiality of the questionnaire data. The first section contained five questions about participants' demographic data (age, nationality, educational level, years of experience, and educational sector). The second section consisted of six questions focused on previous experience of and attitude toward TDI. The third section contained two clinical case scenarios focused on knowledge of emergency management of TDI. The first case concerned a fractured tooth in an 11-years old child, and the second presented a case of an avulsed tooth in a 9-year-old child. In previous studies, both scenarios were used to assess school teachers' knowledge of dental TDI (Ola *et al.*, 2020; Hashim *et al.*, 2011; Awad *et al.*, 2017; Katge *et al.*, 2021). For each case, the participants were given several options to choose from. Section 4 of the questionnaire contained the following general self-assessment questions: (a) "Are you satisfied with your knowledge of the management of TDI?" (b) "Do you need further education regarding the management of TDI?" (c) "What is your preferred means to improve your knowledge of the management of TDI?" and (d) "Are you in favour of establishing a remote dental consultation service through teledentistry to help with TDI cases?" For each question, participants were given multiple options to choose from.

2.3 Questionnaire Validity and Reliability

The questionnaire used in our study is similar to one used in previous studies (Ola *et al.*, 2020; Hashim *et al.*, 2011; Awad *et al.*, 2017). However, test-retest reliability was

carried on as our questionnaire was written in Arabic Language and to ensure language clarity. This included a pilot study to test the clarity and reliability of the survey questions. It was conducted with 10 participants. Based on their responses, four questions were modified, and the format was edited for clarity and comprehensibility. A second part of the pilot study (re-test) was conducted with another five participants to confirm the validity and reliability of the questionnaire.

2.4 Statistical analysis

All the collected data were entered from a Google link to an Excel sheet (Microsoft Excel, 2016, Microsoft Corp., Seattle, WA, USA) and analysed using the software SPSS package version 22.0 (SPSS; Chicago, IL, USA). The results were expressed by frequency distribution and percentage. The chi-square test was also used to evaluate the relationship between age, educational level, and years of experience with the school teachers' knowledge and attitude toward the management of TDI. For all assessments, the level of significance was set at $P < 0.05$.

3. RESULTS

Our study considered 265 female elementary school teachers with a response rate of 75.7%. Most participants (128; 48.3%) were between 36 and 45 years. Most of the respondents were Saudi nationals (236; 89.1%). Regarding the level of education, 217 (81.9%) had a bachelor's degree. Most teachers (131; 49.4%) had between 10 and 20 years of teaching experience. Only 47 (17.7%) of the elementary school teachers worked for the private sector, while the rest worked in government schools (Table 1).

Table 1. Demographic data of study participants.

Variables	Characteristics	Teachers (n)	Percentage (%)
Age group (years)	<25	7	2.6
	25–35	53	20.0
	36–45	128	48.0
	>45	77	29.0
Nationality	Saudi	236	89.1
	Non-Saudi	29	10.9
Educational level	Diploma	33	12.4
	Bachelor's degree	217	81.9
	Master's degree or higher	15	5.7
Experience (years)	<10	82	30.9
	10–20	131	49.4
	21–30	44	16.6
	>30	8	3.1
Work sector	Government	218	82.3
	Private	47	17.7

The results of the second section, which focused on previous experience of and attitude toward the emergency management of TDI, revealed that 177 schoolteachers had witnessed one or more cases of TDI, including 41 teachers (23.2%) who had witnessed cases where the injured child was a student at school (Figure 1).

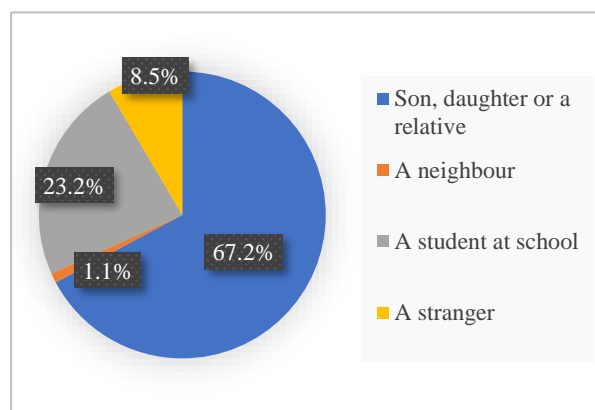


Figure 1. Distribution of types of TDI cases witnessed by schoolteachers as percentages (%).

The results showed that 62.3% of the schoolteachers had attended first-aid training. However, only 5.7% had attended a course/lecture on the emergency management of TDI. One hundred seventy-seven (66.8%) of the schoolteachers think that they are morally responsible for providing emergency management for TDI that occur during school hours, while 14.5% think otherwise. Regarding the importance of treating primary teeth, 29.8% of the school teachers believe that it is not essential to treat primary teeth because they will be naturally replaced by permanent teeth (Table 2).

The teacher's knowledge of the emergency management of TDI was assessed through two clinical case scenarios. Regarding the first clinical scenario, which concerned a permanent incisor crown fracture, fewer than half the participants (46.8%) responded that finding the fractured crown part is important. Only 27.9% knew that the correct action would be to find the broken piece and ask the parents to take the child to the dentist, while 32.1% thought there was no need to find the broken piece, 32.1% chose to reassure the child and send her back to the classroom, and 7.9% did not know what to do.

In the second case scenario, regarding tooth avulsion, only 30.9% of the participants knew that the avulsed tooth was a permanent tooth. Most participants (63.4%) thought stopping the bleeding socket by compression was the correct immediate action, while only 6.8% chose to find the tooth, wash it, and put it back in its place. Regarding the best time to return an avulsed tooth to its socket, 52.1% of the participants did not know the answer. Most participants (34.7%) did not know the best storage medium for an avulsed tooth, while 25.4% chose milk as the best storage medium (Figure 2).

The highest percentage (55.1%) of the participants did not know which part of the avulsed tooth should be held, and 24.9% chose to hold it by the crown. Table 3 summarises the participants' responses to knowledge questions regarding tooth avulsion.

Teachers' responses regarding self-assessment and willingness to improve their knowledge and skills in TDI management showed that 60.7% were unsatisfied with their knowledge of managing TDI, 29.1% were unsure, and 10.2% were satisfied. When asked if they wished to

Table 2. Participants’ previous experience with and attitude towards TDI.

Question	Option	Number (%)
Have you ever witnessed a case of TDI?	Yes	127 (66.8)
	No	88 (33.2)
Who was the injured child?	Son, daughter, or relative	119 (67.2)
	Neighbour	2 (1.1)
	A student at the school	41 (23.2)
	A stranger	15 (8.5)
Have you attended a first aid training course?	Yes	165 (62.3)
	No	100 (37.7)
Have you attended a TDI course/lecture?	Yes	15 (5.7)
	No	250 (94.3)
Teachers are not morally responsible for emergency management for TDI at school.	Strongly agree	28 (10.6)
	Agree	10 (3.9)
	Neutral	50 (18.7)
	Disagree	92 (34.7)
	Strongly disagree	85 (32.1)
Treating primary teeth is not essential, as permanent teeth will spontaneously replace them.	Strongly agree	16 (6)
	Agree	63 (23.8)
	Neutral	34 (12.9)
	Disagree	109 (41.1)
	Strongly disagree	43 (16.2)

attend a course or training on TDI, 49.8% strongly agreed, 44.2% agreed, 5.7% felt neutral, and 0.3% disagreed. Visual educational materials, such as videos and a practical training course, were the participant’s preferred methods to improve their knowledge of TDI (38.9%) in Figure 3.

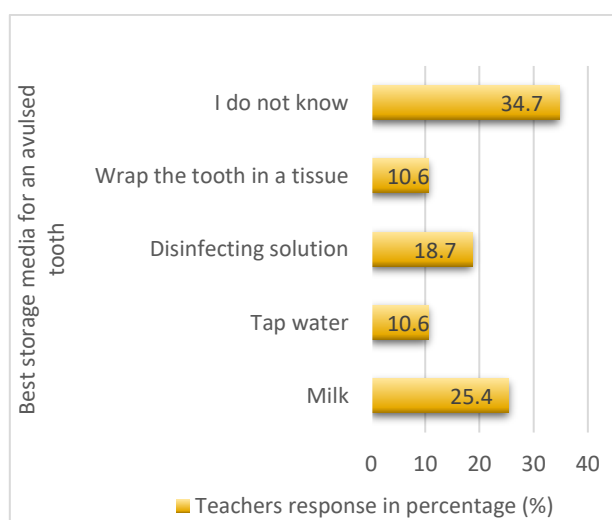


Figure 2. Participants responses to the best storage medium for an avulsed tooth.

Regarding establishing a tele-dentistry service to help manage TDI cases at schools, 49% of the participants strongly agreed, 33.2% agreed, 10.6% disagreed, and 0.8% of the participants strongly disagreed. Our results showed positive correlations with non-statistically significant differences were found when correlating the level of knowledge regarding management of TDI with different age groups ($P= 0.811$) and with groups of different years of experience ($P= 0.776$). However, regarding their

attitude, participants of different age groups and of different years of experience recorded positive correlation with statistically significant differences ($P= 0.028$) and ($P= 0.041$) respectively. Also, our results reported positive correlations with statistically significant differences between the educational level of the participants and their level of knowledge regarding management of TDI ($P=0.002$) as well as their attitude ($P=0.037$).

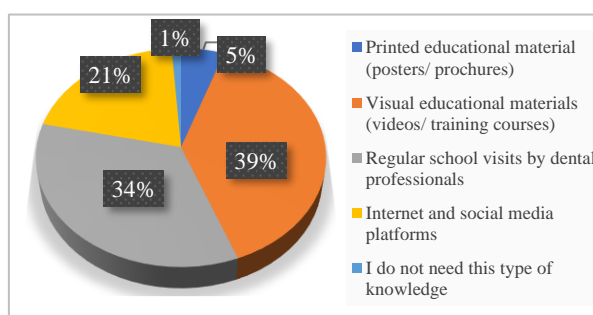


Figure 3. Participants preferred methods of learning to improve their knowledge of TDI.

4. DISCUSSION

This cross-sectional study investigated a randomly selected sample of female school teachers from both private and government sectors in Makkah, Saudi Arabia. The questionnaire response rate was good (75.7%). Most of the participants (48%) were relatively middle-aged, being in the age range of 36–45 years old, which aligns with the labor law in the Kingdom of Saudi Arabia that describes the working age of teachers as being up to the age of 60. Most of the participants were Saudis (89.1%). All the non-Saudi participants (10.9%) were working in the

private sector, which fits with the regulations of the Ministry of Education. Most of the teachers (81.9%) have a bachelor's degree, while only 5.7% have postgraduate education. The highest percentage of teachers (49.4%) had between 10 and 20 years of experience, and the lowest (3.1%) had more than 30 years of experience.

Table 3. Teachers' responses to clinical case scenarios of TDI involving an avulsed tooth.

Question	Number (%)
Is this a primary or permanent tooth?	
I. Primary tooth	106 (40)
II. Permanent tooth	82 (30.9)
III. I do not know	77 (29.1)
What would be your immediate action?	
I. Stop the bleeding in the socket by compression	168 (63.4)
II. Find the tooth, wash it, and put it back in its place	18 (6.8)
III. Store the tooth in the child's mouth and call for help	13 (4.9)
IV. Store the tooth in dry tissue and send the child to the dental clinic after school hours	21 (7.9)
V. I do not know	45 (17)
What is the best time to return an avulsed tooth to its socket?	
I. Immediately after the accident	60 (22.6)
II. Within 30 minutes after the bleeding stops	42 (18.8)
III. Within the same day	15 (5.7)
IV. Time is not an important factor	10 (3.8)
V. I do not know	138 (52.1)
What is the best storage medium for an avulsed tooth?	
I. Milk	67 (25.4)
II. Tap water	28 (10.6)
III. Disinfecting solution	50 (18.7)
IV. Wrap the tooth in a dry tissue	28 (10.6)
V. I do not know	92 (34.7)
Which part of the avulsed tooth should it be held by?	
I. The crown	66 (24.9)
II. The root	5 (1.9)
III. Any part	48 (18.1)
IV. I do not know	146 (55.1)

Our study reported that almost two-thirds of the participants (62.3%) had had first aid training at least once in their teaching career. A much lower percentage of participants (5.7%) had previously attended courses on the management of TDI. However, a literature review showed inconsistent reports on the conduct of first-aid training courses for school teachers. While similar previous studies from Brazil (Pithon *et al.*, 2014), the United Arab Emirates (Hashim *et al.*, 2011), and Saudi Arabia (Alsadhan *et al.*, 2018; Ola *et al.*, 2020), reported that one-third or fewer of participants had had first aid training, other studies recorded that almost half the school teachers had had such training (Obied *et al.*, 2018; Awad *et al.*, 2017). Studies from Hong Kong and the United Kingdom showed a much higher percentage of schoolteachers ($\geq 90\%$) attending first-aid training courses (Chan *et al.*, 2001; Addo *et al.*, 2007). Nonetheless, these studies emphasise the importance of establishing training

programs focused on managing traumatic dental injuries (TDI) in schools.

The findings of our study are in accordance with global data confirming that it is not uncommon for TDI to occur among school children during school hours. In our questionnaire, the participants were asked in detail regarding their relationship with the injured child as our study focuses on TDI occurring at school. 66.8% of the participants in our study reported witnessing TDI, of whom 23.2% had encountered at least one case of TDI in their schools. This finding aligns with other studies on school teachers' experiences of dental traumatic injuries (Eyuboglu *et al.*, 2009; Nirwan *et al.*, 2016; Mohandas *et al.*, 2009; McIntyre *et al.*, 2008a). Another reported finding in our study was that 66.8% of the participants strongly agreed/ agreed that schoolteachers are morally responsible for emergency management for TDI occurring at school, reflecting their positive attitude. Schoolteachers' attitudes showed positive statistically significant correlations with age and years of experience, which means that older school teachers and those more experienced showed more positive attitudes towards the moral responsibility of managing TDI. Since 29.8% of the participants strongly agreed/ agreed that treating primary teeth is not essential, as permanent teeth will spontaneously replace them. This finding further underlines the need to increase school teachers' awareness regarding the importance of primary dentition and the management of TDI through educational campaigns. It encourages them to play a positive role and take prompt action to handle such emergency cases.

In elementary schools in Makkah, children range in age from six to 12 years old. Since this age group is characterised by mixed dentition, knowledge of the type of traumatised tooth (primary/ permanent) at this age is fundamental to providing the proper management. For instance, an avulsed primary tooth must not be reimplanted in the oral cavity to avoid damage to the successor. In contrast, a permanent tooth should be reimplanted in its socket immediately. The outcome of our study regarding the assessment of teachers' knowledge of the management of TDI, using two clinical case scenarios, showed that fewer than half the participants recognised that the broken tooth was a permanent tooth and that it is essential to look for the fractured part. Accordingly, only 27.9% chose the correct course of management. In the second case scenario of an avulsed tooth, only 30.9% of the participants correctly identified the avulsed tooth as a permanent tooth, while 40% thought it was a primary tooth, and 29.1% did not know. This result indicates inadequate knowledge of teeth eruption timing, which has negative implications. Failure to correctly identify the tooth may lead to wrong decisions in TDI cases. Nevertheless, these results were anticipated as similar results have been reported in many studies from different countries (Mohandas *et al.*, 2009; Ola *et al.*, 2020; Hashim *et al.*, 2011; Awad *et al.*, 2017; Addo *et al.*, 2007; Blakytyn *et al.*, 2001).

In dental traumatology, it is verified that the prognosis of an avulsed tooth is multifactorial. Time and storage

medium play significant roles in defining the success of a reimplanted tooth. Furthermore, the manipulation of an avulsed tooth is considered a crucial factor. Avulsed tooth should be held by the crown with extra care to maintain the vitality of the cells over the root to increase the chance of tooth survival (Flores *et al.*, 2007; Andersson *et al.*, 2006; Glendor *et al.*, 2009). Our study reported that 24.9% of the school teachers chose the appropriate manipulation technique, while the majority (55%) did not know which part of the tooth they should hold. Regarding the storage medium, while almost a quarter of the participants chose the proper medium, 34.7% needed to know which storage medium is best for an avulsed tooth. Most of the participants in this study thought that the best immediate action was to stop the bleeding socket by compression and did not know when to return an avulsed tooth to its socket. 3.8% of the participants did not consider the time between injury and dental consultation an essential factor.

Our study results showed that general knowledge of the proper action to take in the event of TDI needs to be improved among school teachers. Corresponding findings have been reported by other studies (Al-Majed *et al.*, 2001; Al-Majed *et al.*, 2011; McIntyre *et al.*, 2008a; McIntyre *et al.*, 2008b; Glendor *et al.*, 2009; Alsadhan *et al.*, 2018; Obied *et al.*, 2018; Al-Zaidi *et al.*, 2017; Ola *et al.*, 2020). For instance, 6.8% of our study participants chose to wash the tooth and replant it in its socket as emergency management for an avulsed tooth. A similar study in Jeddah, Saudi Arabia, recorded that 7.6% of the participants chose the proper management for an avulsed tooth (Ola *et al.*, 2020). A study of Jordanian school teachers reported that only 1% of the participants would put the tooth back in its socket (Al-Jundi *et al.*, 2005).

Although no statistically significant differences were observed when correlating the knowledge level regarding TDI management with different age groups and groups of varying years of experience. Yet, educational level showed positive statistically significant relation with knowledge regarding the management of TDI ($P=0.002$). This emphasises the positive role of education.

Regarding self-assessment and willingness to improve their knowledge and skills in TDI management, the majority of the participants in our study were unsatisfied with their knowledge, and 94% were eager to improve their knowledge by attending courses/ training on the management of TDI and have regular school visits by dental professionals. Most school teachers (82.2%) favoured establishing a tele-dentistry service to help manage TDI cases at schools.

Overall, the results of our study clearly showed a substantial deficiency in knowledge and awareness of the management of TDI among elementary school teachers in the city of Makkah. On the other hand, the school teachers had a positive attitude and willingness to improve their level of knowledge. Due to the limitations of this study, namely that it was restricted to the holy city of Makkah and considered a relatively small sample size, the data

presented may only partially represent the knowledge levels of elementary school teachers in the entire Kingdom of Saudi Arabia. Therefore, a more extensive nationwide study could be conducted to shed light on this critical issue.

5. CONCLUSION AND RECOMMENDATION

This study highlighted the insufficiency of knowledge and awareness of emergency management of TDI among female elementary school teachers in the holy city of Makkah, Saudi Arabia. On the other hand, the school teachers had a positive attitude and willingness to improve their level of knowledge. Hence, strategies to improve school teachers' knowledge of TDI must be planned and implemented.

We highly recommend that the Ministry of Education collaborates with the Ministry of Health to implement appropriate measures to improve the level of knowledge in society, especially among school teachers who directly interact with children, regarding the emergency management of TDI. This can be accomplished through campaigns, educational training courses, and audio-visual aids. Furthermore, introducing a teledentistry service can be advantageous in supporting the management of TDI cases within schools.

AUTHOR CONTRIBUTION

All authors contributed to the research's design and implementation, the results analysis, and the manuscript's writing.

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CONFLICT OF INTEREST

The author declared no conflict of interest that could have appeared to influence the work reported in this paper.

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