Knowledge and Attitudes Towards Emergency Management of Traumatic Dental Injuries Among Elementary School Teachers in Sakaeo, Thailand

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Abstract

Objective: This study aimed to evaluate the knowledge and attitudes of elementary school teachers towards the emergency management of traumatic dental injuries (TDIs) and to identify their associated factors.

Materials and Methods: A cross-sectional study was conducted using a structured self-administered questionnaire distributed to 385 elementary school teachers across 31 schools in Sakaeo province. The questionnaire assessed demographic characteristics, knowledge, and attitudes regarding the emergency management of TDIs. A validity test evaluated the questionnaire through content validity, and a reliability test through Cronbach's alpha. Knowledge was evaluated through two scenario cases involving fractured teeth and avulsion. Descriptive analysis and Pearson Chi-square tests were employed to analyze the data and examine the association between knowledge and teachers' characteristics at a significance level of 0.05.

Results: The study revealed significant gaps in knowledge, particularly regarding the evaluation period for neurological symptoms (14.0% correct responses) and ideal replantation time (31.9%). Conversely, a majority of teachers correctly answered the questions on permanent tooth identification (74.5%) and on-site management of fractured teeth (70.9%). Regarding attitudes, a substantial proportion of teachers (86.0%) acknowledged their responsibility to assist students in dental emergencies, and most recognized the importance of permanent teeth for a high quality of life (96.6%). However, only 22.3% of teachers expressed confidence in managing TDIs. No association of overall knowledge was found with teachers' characteristics.

Conclusions: Our study indicates that while elementary school teachers in Sakaeo province have insufficient knowledge about managing TDIs, their attitudes towards handling such emergencies are generally positive. This suggests a need for targeted training programs to enhance teachers' knowledge and confidence in managing TDIs effectively.

Keywords: Traumatic dental injuries, knowledge, attitudes, school teacher

Received Date: Jul 26, 2024
Revised Date: Sep 20, 2024
Accepted Date: Oct 09, 2024

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Introduction

An oral injury is defined as an injury to the teeth or the hard and soft tissues inside or around the mouth (1). Traumatic dental injuries (TDIs) constitute 85% of oral injuries and are regarded as a public health issue due to their prevalence and negative impact on quality of life. TDIs are a significant childhood oral health issue, causing considerable discomfort and tooth loss. They can range from minor enamel chips to severe damage of supporting structures, or tooth loss (2). The most common cause of TDIs is falls, particularly in children whose neuromuscular systems are not fully developed (3).

Children aged 6 to 12 are especially prone to TDIs due to their active involvement in sports and physical activities at school (3). Common complications of TDIs include crown or root fractures, luxation injuries, avulsion, and damage to alveolar bone, soft tissue, gingiva, and dental pulp. These injuries often result in significant pain, discomfort, and a course of cosmetic, functional, psychological, and social issues, adversely affecting the patient's quality of life (3). Teachers play a crucial role in managing severe oral injuries as they are often in close contact with students. In cases of dental trauma, teachers can provide first aid by knowing the proper procedures and referring students to dental professionals (4). However, numerous studies have revealed significant deficiencies in teachers' knowledge of TDIs (5). A study in Brazil found that teachers lacked exceptional understanding regarding TDIs and often relied on incorrect information and practices (6). Similarly, a study by Nirwan M. et al. in South Jaipur, India, reported that 46% of elementary school teachers had inadequate knowledge of TDIs, while only 7% had adequate knowledge (7). Inappropriate initial treatment increases the probability of persisting problems and reduces the probability of the teeth remaining vital, causing distress to the damaged child and his/her parents in the form of unnecessary suffering and cost (8).

In Thailand, Malikaew et al. reported in 2006 that 35.0% of children experienced TDIs, with a higher prevalence among children from disadvantaged households and those with less educated parents (9). A 2022 study in Thailand found that teachers lacked the necessary knowledge and were not adequately prepared to handle dental injuries (10). Despite the high prevalence of dental trauma among Thai children, public awareness remains insufficient, and there are limited studies on TDIs in Thai elementary schools.

Sakaeo province, located approximately 237 kilometers from Bangkok, is one of Thailand's eastern provinces with a socio-economic status slightly below average. This makes Sakaeo a representative area for assessing the reach of public health education programs. School teachers in rural areas like Sakaeo province likely lack sufficient understanding of TDI management.

This study aimed to evaluate the knowledge and attitudes of Thai elementary school teachers regarding TDIs in Sakaeo province. Additionally, the study explored factors associated with the teachers' knowledge.

Materials and methods

A cross-sectional survey using a structured self-administered questionnaire was conducted to collect information on the management of TDIs regarding the knowledge and attitudes of elementary school teachers in Sakaeo province, Thailand. The study received approval from the Human Research Ethics Committee of the Faculty of Dentistry/Faculty of Pharmacy, Mahidol University, Institutional Review Board (COA.No.MU-DT/PY-IRM 2023/073.2311).

A sample size of 385 teachers was calculated using the Yamane formula (11) and based on all registered teachers (N = 3140) in Sakaeo province, which has 278 elementary schools. A proportional stratified random sampling technique was applied to recruit subjects from 31 elementary schools across seven districts in Sakaeo province.

Data collection was performed using a self-administered questionnaire comprising three sections: demographic data, ten questions on knowledge, and ten questions on attitudes. The questionnaire was modified from a previous study, and the content validity of each question was assessed using the Item-Objective Congruence (IOC) scores. Additionally, the reliability of the questionnaire was determined by calculating Cronbach's alpha, resulting in a value of 0.84. The knowledge questions were based on two scenario cases concerning fractured and avulsed teeth, with each question having only one correct answer, except for the question on storage media, which had three correct answers. The attitude questions were presented on a five-point Likert scale. The questionnaire was initially assessed by a group of 20 elementary school teachers for clarity and subsequently validated using Cronbach's alpha, which yielded a value of 0.84. During the survey, questionnaires were distributed directly to the respondents at their schools by the researchers, with the permission of the school and the written consent of the participants.

During data analysis, the sum of the correct answers was calculated to determine the knowledge scores. A score of "1" was assigned for each correct answer, while a score of "0" was given for wrong or "do not know" answers. For attitude scores, responses of "strongly agree" and "agree" were scored as "1" (considered "agree"), whereas responses of "uncertain," "disagree," and "strongly disagree" were scored as "0" (considered "disagree"). Descriptive analysis and Pearson Chi-square tests were used to evaluate knowledge and attitude levels and to identify factors associated with knowledge, using SPSS version 18 (IBM, Armonk, NY, USA).

Results

A total of 385 teachers from 31 elementary schools responded to the questionnaire. The personal and professional profiles of the teachers are summarized in Figure 1. The majority of respondents were female (78.4%), below the age of 40 (63.9%), had more than 5 years of teaching experience (51.7%), and held a bachelor's degree (84.2%). Almost 80% were employed by public schools and had never received special training on dental emergencies.

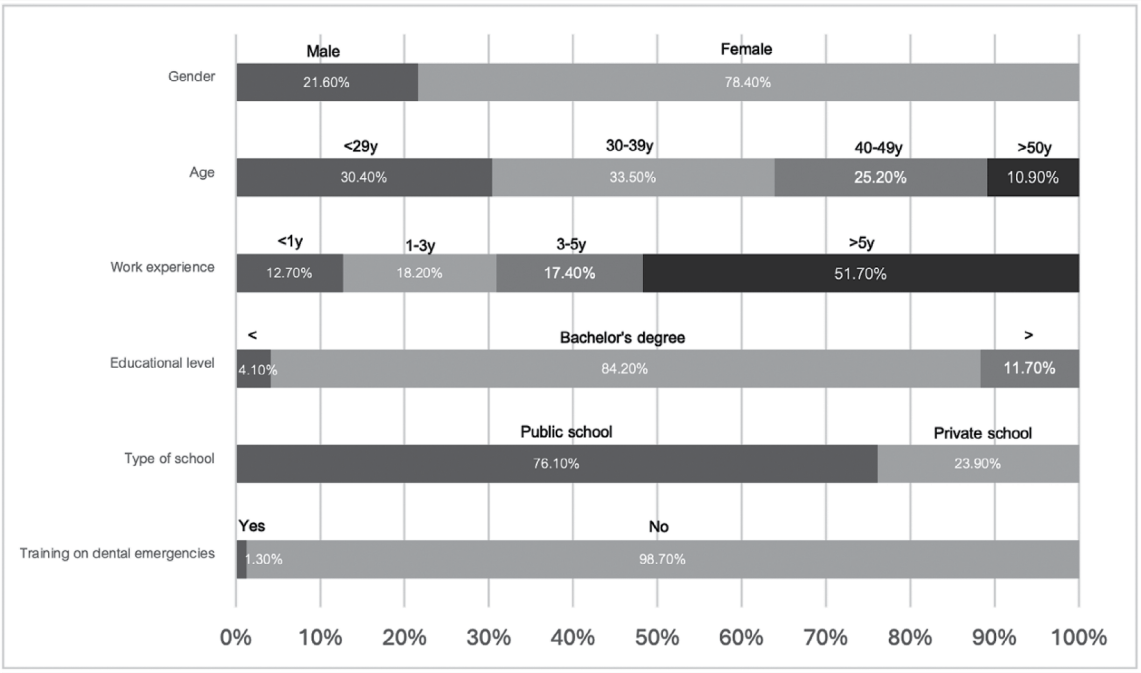

Fig.1 Demographic characteristics of 385 school teachers.

The assessment of the teachers' knowledge of the management of TDIs is shown in Table 1. Regarding knowledge on neurological impacts, 34% of school teachers responded correctly to the initial evaluation of neurological effects after TDIs, with only 14% answering correctly on the duration of the neurological symptoms.

Table 1. Assessment of teachers' knowledge of TDI management (n = 385), (10,12,13,14,15).

Case I "A 9-year-old child was hit by a ball in physical education class, breaking his top front teeth and injuring his face, teeth, and head."		
Topics	**Responses (n)**	**%**
Knowledge on neurological impact		
1. How should you take care of your students FIRST?		
☐ Find out what happened, when it happened, and where it happened.	53	13.8
☐ **Evaluate any parts of the head that may be affected.**	**131**	**34**
☐ Examine the teeth that most likely got impacted.	32	8.3
☐ Find out about any facial or dental pain.	158	41
☐ Do not know.	11	2.9
2. For students who suffered from significant impacts to the head, face, and teeth in an accident, how long is the follow-up period to assess their brain symptoms?		
☐ 15 minutes.	133	34.5
☐ 2-3 hours.	124	32.2
☐ **2-3 days.**	**54**	**14**
☐ 2-3 weeks.	74	19.2
Knowledge on emergency management in fractured teeth		
3. What should you do if so much blood flows that the situation in the mouth is invisible?		
☐ Contact his/her parents to get the student to the hospital promptly.	126	32.7
☐ Rinse his/her mouth out with normal saline solution to clean it.	178	46.2
☐ **Try to stop the bleeding by applying manual pressure. Determine the source of the persistent hemorrhaging.**	**60**	**15.6**
☐ Do not know.	21	5.5
4. If the student's front tooth is split in half due to an accident and is extremely sensitive to air blow, how should you give support and help to him/her?		
☐ No emergency treatment is required. Wait until the symptoms subside on their own.	13	3.4
☐ **Avoid biting against hard objects, or drinking ice-cold water, and then promptly visit a dentist.**	**273**	**70.9**
☐ Inform the parents so they can take their child to the dentist after the class finishes.	76	19.7
☐ Do not know.	23	6

Table 1. (Continued)

Topics	Responses (n)	%
5. If you find a fragment of the broken tooth, what additional care should you provide before referring him/her to the dentist?		
☐ Clean the tooth fragment properly. Replace and fix it on to the damaged tooth. Ask the students to hold it until he/she can visit the dentist.	45	11.7
☐ **Clean the tooth fragment properly and store it in a box or wrapper until being used.**	**175**	**45.5**
☐ Do not try to wash or clean the tooth fragment but store it in normal saline solution immediately.	58	15.1
☐ Do not try to wash or clean the tooth fragments but store it in milk or wrap it with gauze.	38	9.9
☐ Do not know.	68	17.7
Knowledge on the set of dentitions		
6. Which tooth is the broken upper front tooth?		
☐ **Permanent tooth.**	**287**	**74.5**
☐ Primary tooth.	63	16.4
☐ Do not know.	35	9.1
Case II “A 12-year-old child was hit, resulting in an avulsed tooth with bleeding but no significant pain.”		
Knowledge on emergency management for an avulsed tooth		
1. If you face a student with an avulsed tooth, how should you manage the situation?		
☐ There is no reason to search for an avulsed tooth because it is of no benefit for further treatment.	148	38.4
☐ The tooth can be held at any part of the tooth.	50	13
☐ **Hold it at the crown part. Avoid touching the root surface.**	**179**	**46.5**
☐ Hold it at the root part. Avoid touching the tooth crown.	8	2.1
2. If the avulsed tooth is found dirty on the ground, how should you manage the avulsed tooth?		
☐ **Wash the tooth gently with water or saline solution and replant it back to the socket.**	**171**	**44.4**
☐ Scrub the tooth with a sponge and soap, and replace it back to the socket.	18	4.7
☐ Replace it back to the socket immediately without cleaning.	2	0.5
☐ No need to use the avulsed tooth for treatment.	123	31.9
☐ Do not know.	71	18.4

Table 1. (Continued)

Knowledge on storage media		
3. What is the best storage media for keeping the avulsed tooth if it cannot be replaced back to the socket on the site?		
☐ Water.	112	29.1
☐ **Milk.**	**64**	**16.6**
☐ **Saliva.**	**2**	**0.5**
☐ Alcohol.	15	3.9
☐ **Normal saline solution.**	**124**	**32.2**
☐ Do not know.	68	17.7
Knowledge on replantation time		
4. When is the appropriate time to replace the avulsed tooth back to the socket?		
☐ **Immediately after the accident.**	**123**	**31.9**
☐ Any time on the same day.	25	6.5
☐ 30 minutes after the bleeding stops.	98	25.5
☐ Do not know.	136	35.3

Bold letters indicate “correct answers”.

In terms of emergency management of fractured teeth, 15.6% and 45.5% knew how to manage the bleeding and the tooth fragment, respectively. However, a high number of respondents (70.9%) correctly answered how to help their students before meeting with a dentist, and 74.5% had knowledge of permanent tooth identification. Regarding the management of avulsed teeth and appropriate storage media, almost half of the respondents answered correctly. Conversely, most respondents answered incorrectly or admitted having no idea about the appropriate replantation time for avulsed teeth.

Examination of the association between knowledge topics and teachers’ characteristics revealed that no association was found between overall knowledge score and any of the teachers’ characteristics. However, some characteristics, such as age, work experience, and type of school, were associated with specific knowledge topics on the management of TDIs (Table 2). The teacher’s age was significantly associated with knowledge scores on permanent tooth identification, storage media, and replantation time ($p = 0.019$, 0.002, and 0.006, respectively). Work experience was associated with knowledge on replantation time ($p = 0.003$). Additionally, the type of school was associated with knowledge regarding the neurological impact, permanent tooth identification, and emergency management of fractured teeth.

Table 2. Association between knowledge of TDI management and teachers' characteristics.

Variables	n	Number of respondents with correct answers (%)						Overall knowledge score
		Knowledge on neurological impact	Knowledge on emergency managemen in fractured teeth	Knowledge on teeth the set of dentitions	Knowledge on emergency management in avulsed teeth	Knowledge on storage media	Knowledge on replantation time	Mean ± SD
Gender								
Male	83	36(43.3)	80(90.4)	66(79.5)	57(68.7)	42(50.6)	28(33.7)	4.43 ± 1.55
Female	302	127(42.1)	248(82.1)	221(73.2)	201(66.6)	148(49.0)	95(31.5)	4.18 ± 1.73
p-value		0.829	0.070	0.240	0.716	0.797	0.693	0.231
Age								
< 29	117	49(41.9)	98(83.8)	77(65.8)	78(66.7)	73(62.4)	26(22.2)	4.19 ± 1.66
30-39	129	44(34.1)	107(82.9)	95(73.6)	81(67.4)	51(39.5)	52(40.3)	4.12 ± 1.72
40-49	97	49(50.5)	82(84.5)	79(81.4)	64(66.0)	43(44.3)	36(37.1)	4.42 ± 1.61
> 50	42	21(50.0)	36(85.7)	36(85.7)	29(69.0)	23(54.8)	9(21.4)	4.31 ± 1.92
p-value		0.064	0.974	0.019*	0.986	0.002*	0.006*	0.574
Work experience								
< 1	49	23(46.9)	43(87.8)	31(63.3)	36(73.5)	31(63.3)	6(12.2)	4.20 ± 1.57
1-3	70	21(30.0)	56(80.0)	53(75.7)	48(68.6)	39(55.7)	23(32.9)	4.11 ± 1.65
3-5	67	26(38.8)	54(80.6)	46(68.7)	38(56.7)	33(49.3)	30(44.8)	4.18 ± 1.71
> 5	199	93(46.7)	170(85.4)	157(78.9)	136(68.3)	87(43.7)	64(32.2)	4.31 ± 1.74
p-value		0.082	0.530	0.088	0.224	0.059	0.003*	0.850
Education level								
<Bachelor's degree	16	9(56.3)	15(93.8)	12(75.0)	7(43.8)	9(56.3)	5(31.3)	4.56 ± 1.59
Bachelor's degree	324	138(42.6)	268(82.7)	242(74.7)	220(67.9)	156(48.1)	108(33.3)	4.23 ± 1.74
>Bachelor's degree	45	16(35.6)	40(88.9)	33(73.3)	31(68.9)	25(55.6)	10(22.2)	4.13 ± 1.39
p-value		0.346	0.314	0.980	0.128	0.553	0.325	0.684
Type of school								
Public	293	136(46.4)	240(81.9)	209(71.3)	207(70.6)	145(49.5)	95(32.4)	4.24 ± 1.84
Private	92	27(29.3)	83(90.2)	78(84.8)	51(55.4)	45(48.9)	28(30.4)	4.24 ± 1.09
p-value		0.004*	0.059	0.010*	0.007*	0.923	0.721	0.982

* indicates "statistical significance".

The results of the attitude assessment are shown in Table 3. The majority of teachers responded positively to most of the positive statements, except that concerning their confidence in managing TDIs (g), and disagreed with the negative statements (c and f). Specifically, 86.0% agreed that it is their responsibility to help students in dental emergencies. According to 79.0% of the teachers, dental incidents were a common occurrence in schools.

Table 3. Assessment of teachers' attitudes towards TDI management.

		n	%
(a) You think that teachers have a role and responsibility in helping students with dental accidents.	**Agree**	**331**	**86.0**
	Disagree	54	14.0
(b) You agree that dental accidents occur frequently in schools.	**Agree**	**304**	**79.0**
	Disagree	81	21.0
(c) You think that an avulsed tooth should not be replaced back to the socket but had better be treated by the professional at the site.	Agree	169	43.9
	Disagree	**216**	**56.1**
(d) You agree that basic dental accident management training should be provided.	**Agree**	**351**	**91.2**
	Disagree	34	8.8
(e) You think a dental accident is an urgent situation that requires immediate proper first aid.	**Agree**	**344**	**89.4**
	Disagree	41	10.6
(f) You believe that a delay in TDI management at the site does not have much impact on treatment success.	Agree	90	23.4
	Disagree	**295**	**76.6**
(g) You are confident that a school teacher like you can manage the dental emergency.	Agree	86	22.3
	Disagree	**299**	**77.7**
(h) You agree that wearing a sport guard should be mandatory for school sports.	**Agree**	**220**	**57.1**
	Disagree	165	42.9
(i) You agree that tetanus vaccinations are necessary for TDIs in some cases.	**Agree**	**267**	**69.4**
	Disagree	118	30.6
(j) You agree that permanent teeth are crucial for quality of life.	**Agree**	**372**	**96.6**
	Disagree	13	3.4

Bold letters indicate "most responses".

Negative statements are shown in shaded boxes.

A high percentage of respondents (96.6%) strongly supported the belief that permanent teeth are essential for a high quality of life, that dental accidents require immediate proper first aid without delay, and that tetanus vaccination should be considered. However, only 22.3% of respondents reported sufficient confidence in their ability to manage dental emergencies. Accordingly, over 90% of respondents agreed that teachers should receive training in dental injury management.

Discussion

The prognosis of TDIs depends on appropriate emergency management and early professional treatment. Previous research has found that school teachers frequently encounter dental injuries in children at school and consider knowledge of TDI management crucial (16).

In our study, only about one-third recognized that trauma might impact the head, and just 14% knew they should follow up with children 2-3 days after the incident, which is interpreted as most school teachers showing insufficient knowledge regarding the evaluation of the neurological effects following TDIs. According to a study in the United Kingdom, a force strong enough to fracture, intrude, or avulse a tooth in a child is strong enough to cause cervical spine or intracranial damage, potentially leading to physical disability, seizure disorders, and developmental delays in children (17).

However, it is encouraging that 74.5% of respondents could recognize whether a damaged front tooth in a 9-year-old child is primary or permanent, which is critical in determining the emergency treatment and prognosis of the tooth. This finding aligns with a study in Karnataka, India, where 72.4% of teachers could distinguish between deciduous and permanent teeth (18).

Our study found that most teachers had a satisfactory understanding of emergency management for fractured teeth: 45.5% recognized the importance of preserving and taking the tooth fragment to the dentist. This contrasts with a study conducted in South Jaipur in 2016, where only 1.4% of participants considered it essential to save the tooth fragment for treatment (7). The availability of public health information in Thailand and the educational level of Thai school teachers (95.9% with a bachelor's degree or higher) may have contributed to greater awareness of this issue compared to those in the study conducted in India.

The prognosis of avulsed teeth depends on immediate replantation in the alveolar socket or storage in an appropriate medium and rapid transportation to a dentist (19). Unexpectedly, a significant percentage of teachers (38.4%) believed there was no reason to search for an avulsed tooth as it was of no benefit for further treatment. Moreover, only 31.9% knew the appropriate time to replace the avulsed tooth back to the socket. These findings were consistent with research by Prasanna et al., who found that only 23% of teachers had knowledge of managing tooth avulsion injuries (20). Most previous research indicated that teachers recommended referring patients with avulsed tooth injuries to a dentist without taking any initial action. Additionally, our study found that about half of the respondents provided inaccurate answers or admitted no knowledge regarding the appropriate storage medium for the avulsed tooth. Similar to the

South Jaipur study, only 20.4% of participants could correctly select a suitable storage medium for tooth avulsion (7). It is well-accepted that avoiding drying time (less than 30 minutes) and storing in a suitable medium can facilitate the survival of the periodontal ligament cells, resulting in a high success rate for tooth avulsion treatment (21,22).

The study found no association between overall knowledge scores and school teachers' characteristics. However, specific characteristics, such as age, work experience, and type of school, were associated with particular knowledge topics on the management of TDIs. For example, age was significantly associated with knowledge scores on permanent tooth identification, storage media, and replantation time ($p = 0.019$, 0.002, and 0.006, respectively). Work experience was associated with knowledge on replantation time ($p = 0.003$). Additionally, the type of school was associated with knowledge regarding the neurological impact, permanent tooth identification, and emergency management of fractured teeth. These findings are helpful for designing focused TDI management programs.

Regarding attitudes towards TDI management, 86.0% believed they had a role and responsibility in helping students with dental accidents. This positive attitude could promote effective TDI management in schools. Contrarily, a survey from Lithuania found that most respondents mistakenly believed that only professionals could provide effective emergency management in cases of TDI (23). In the present study, 77.7% of teachers did not have enough confidence in TDI management, while 89.4% considered dental accidents urgent situations requiring immediate proper first aid. Moreover, over 90% of teachers were enthusiastic about receiving further training in dental injury management. Teachers at elementary schools in Sakaeo province demonstrated a positive attitude towards TDI management.

A study from Brazil reported that the teachers who received prior knowledge were more likely to actively search for a tooth fragment in the event of a crown fracture and for a lost tooth in the case of avulsion (24). Similarly, a study from South India found that teachers' confidence in administering first aid was significantly associated with prior training (25). Emergency management training programs should incorporate TDI management to provide teachers with the necessary skills to effectively respond to such situations. This would promote knowledge regarding preventative measures and the use of appropriate safety gear, such as properly fitted mouthguards, face cages, and helmets during sports and leisure activities that provide a possible risk of unexpected facial impact (26).

Our study found that school teachers in rural areas of Thailand like Sakaeo province understand the importance of first aid in TDIs and are willing to support school policies or public health prevention programs on this issue.

Although this study successfully achieved its intended objectives, the results are based on a restricted sample size. Further studies to evaluate the knowledge and attitudes towards emergency management of TDIs in other regions would provide a broader perspective. The present study was limited by its focus only on school teachers. Future research should aim to evaluate the understanding of TDI management among

the general public, parents, and medical professionals. This would aid in identifying any gaps in knowledge within society. Additionally, a study in Brazil revealed an association between a teacher's dental trauma experience and their knowledge of TDI management. Therefore, further research is necessary to clarify the extent of teachers' experiences in this area (27).

Conclusion

Our study indicates that elementary school teachers in Sakaeo province have insufficient knowledge about the management of TDIs, while their attitudes are generally positive. This study suggests that an educational program that focuses on specific topics related to TDI management should be a mandatory component of the public policy curriculum for elementary school teachers. The study further asserts that such a curriculum would be beneficial and useful.

Acknowledgments

We owe gratitude to all staff from the Khlonghad Hospital for their kind coordination with the elementary schools. We are thankful to Associate Professor Dr. Chulaluk Komoltri for her statistical advice and to Assistant Professor Dr. Ariya Chantaramanee for providing valuable suggestions for discussion.

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