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Impact of A Multimodal Educational Program on a Group of Elementary School Teachers' Knowledge and Attitude of Traumatic Dental Injury in Egypt: A Before and After Study

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Abstract

Background: Traumatic dental injuries (TDIs) are common among schoolchildren and often require immediate first aid. Teachers, as first respondents, play a critical role in managing TDIs. However, their knowledge and confidence in handling such injuries are often limited.

Methods: A before-and-after study was conducted among 147 elementary school teachers from 10 international schools in Cairo and Giza. Baseline knowledge and attitudes were assessed using a validated questionnaire. An educational intervention, including workshops, posters, and interactive sessions, was implemented. Post intervention assessments were conducted one and six months later to evaluate changes in knowledge and confidence. Statistical analysis included paired t-tests and chi-square tests.

Results: The intervention led to a substantial improvement in teachers' theoretical knowledge and attitude in managing TDIs. Pre intervention assessments revealed limited knowledge and confidence, with only 22.22% baseline knowledge which notably increased by 42.22% as improvement post 1 month, rising to 48.89% post 6 months with p value (< 0.001) compared to pre intervention scores. This suggests that the knowledge and Attitude gained during the intervention were retained and even further strengthened over time.

Conclusion: Multimodal educational programs significantly enhances teachers' awareness to manage TDIs. Integrating such programs into school curricula can improve public health outcomes and empower educators as first respondents.

1 Introduction

Traumatic dental injuries (TDIs) occur frequently to school-aged children, often resulting from accidents during play, sports or daily activities. Proper management of such injuries is crucial to obtain the best outcome. Although healthcare professionals can manage such incidents, schoolteachers play a significant role as they are the first responders in the school environment. [1]

The prevalence of TDIs is considerably high, affecting 25% of school children and 33% among adults, and it prevails as a public health problem and can have a negative influence on the quality of life. [2]. The treatment prognosis of some teeth injuries is heavily dependent on the actions taken at the place of injury immediately after the incident which is mainly done by teachers.

Besides pain and distress caused during and after a tooth injury, the damage to the pulp and periodontal

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ligament of a traumatized tooth which are the vital structures within a tooth are particularly vulnerable to injury. Damage to these tissues can disrupt the tooth's blood supply and support and eventually compromise its long-term prognosis, whereas in severe injuries, it can even lead to permanent tooth loss. [3]

Oro-dental trauma results from injury to the teeth, mouth and oral cavity. Latest estimates show that one billion people are affected, with a prevalence of around 20% for children up to 12 years old. It is caused by oral factors such as misaligned teeth and environmental factors (such as unsafe playgrounds, risk-taking behavior, road accidents and violence). Treatment is costly and lengthy if not managed properly. [4]

Although most teachers recognize the importance of immediate emergency management for (TDIs) in children, they often lack the knowledge, attitude and practice to effectively handle such situations. Specifically, many were unaware of the correct procedures, such as the appropriate storage medium for an avulsed tooth, and doubted their ability to provide emergency care, indicating a gap between their perceived importance and actual preparedness for managing TDIs. [5]

The aim of this study is to evaluate the knowledge and attitude of school teachers about management of TDIs and to evaluate the impact of the educational program.

2 Materials and Methods

2.1 Ethical Approval:

The method employed in this study was approved by the research ethical committee (The Institution Review Board of the Military Medical Academy). The research was granted confirmation of conductance number (47-2023)

2.2 Study Design

A before-and-after study design was employed to evaluate the impact of an educational intervention on teachers' knowledge and attitudes regarding TDI management

2.3 Study Setting and Participants

The study was conducted in ten international schools in New Cairo, Nasr City, El Obuor City, 6th of October and El Mokkatam in Egypt, from 2023 to 2024. A total of 147 teachers were included based on the following criteria:

-Inclusion: Currently employed teachers who interact daily with children.

- Exclusion: Teachers who declined participation.

- The sample size for this study is comparable to that reported in previous research by Al Sari *et al.* [6]

2.4 Materials Used

-Questionnaires: A comprehensive questionnaire was used to evaluate knowledge and attitudes before and after the program.

-Printed Materials: Posters and flyers based on "Save a Tooth" poster by IADT [7] that summarize key information and provide practical tips for managing TDIs.

-Informed consent: In accordance with ethical research protocols, written informed consent was secured from each participant to protect their anonymity and confirm that their participation was voluntary.

2.5 Educational Intervention

The intervention included:

- Interviews: one-to-one and group discussion on TDI management.

- Posters and leaflets: "Save a Tooth" posters outlining emergency procedures distributed to participants and in classes. [7]

2.6 Data Collection

A validated questionnaire assessed baseline knowledge and attitudes. Follow-up assessments were conducted at one- and six-months post intervention. The assessment of the validity of the questionnaire was established by three independent endodontists who were not participating in the study and who made comments about the questions, all of which were acceptable [3].

2.7 Statistical Analysis

Data were analyzed using SPSS version 26. Paired t-tests and chi-square tests assessed changes over time, with $p<0.05$ considered significant.

3 Results

To fulfill the aim of the intervention, the collected data were analyzed, tabulated and presented in the following order:

Part I: Socio-Demographic data and general knowledge:

Table 1. Socio-demographic Characteristics of the participating elementary school teachers" (N=147) and general dental knowledge.

	No.	%
Age (years)		
25-30 years	49	33.3
>30-35 years	39	26.5
>35-40 years	44	29.9
>40-45 years	15	10.2
Mean±SD	33.85±6.29	
Gender		
Male	95	64.6
Female	52	35.4
Teaching experience (years)		
<10	105	71.4
>10	42	28.6
Do you have children?		
Yes	122	83.0
No	25	17.0
Teaching specialization		
Physical education	104	70.7
Other	43	29.3
Have you ever been trained or informed about dental trauma injuries?		
Yes	11	7.5
No	136	92.5
If Yes How *(n=11)?*		
During first aid course	11/11	100.0
Formal expert training/information	0/11	0.0
Information leaflets	0/11	0.0
Internet courses	0/11	0.0
Would you like to be more informed on dental traumatic injuries?		
Yes	147	100.0
No	0	0.0
Have you ever helped a Child after a dental trauma injury at school?		
Yes	21	14.3
No	126	85.7
If yes, how many cases have you seen during school hours (n=21)?		
1-2	13/21	61.9
3-4	7/21	33.3
>5	1/21	4.8
Do you believe in your ability to help a child with dental trauma injury?		
Yes	42	28.6
No	105	71.4

Table 1 shows that the average age of participating elementary school teachers was 33.85 years, with a majority being male and having less than 10 years of teaching experience. Most were physical education teachers and parents themselves. However, only a small fraction had received any form of training on dental trauma injuries, typically during basic first aid courses. Despite this, every participant expressed interest in receiving more information. Notably, just 14.3% had previously assisted a child after a dental injury, and less than one-third felt confident in doing so.

Table 2. Number and percentage distribution of the participating elementary school teachers according to their trained, helping children and being able to help, comparing between (pre intervention and post intervention) (N=147).

	Pre intervention		P1	Post intervention after 1m		P2	Post intervention after 6m		P3
	No.	%		No.	%		No.	%	
Have you ever been trained or informed about dental trauma injuries									
Yes	11	7.5	<0.001**	147	100.0	<0.001**	147	100.0	1.000
No	136	92.5		0	0.0		0	0.0	
Have you ever helped a Child after a dental trauma injury at school?									
Yes	21	14.3	<0.001**	61	41.5	<0.001**	74	50.3	0.160
No	126	85.7		86	58.5		73	49.7	
If yes how many cases have you seen during school hours?									
1-2	13/21	8.8	0.969	40/61	27.2	0.551	44/74	29.9	0.173
3-4	8/21	5.4		21/61	14.3		26/74	17.7	
>5	0/21	0.0		0/61	0.0		4/74	2.7	
Do you believe in your ability to help a child with dental trauma injury?									
Yes	42	28.6	<0.001**	126	85.7	<0.001**	143	97.3	<0.001**
No	105	71.4		21	14.3		4	2.7	

P1: p-value for comparison between pre intervention and post intervention after 1 month

P2: p-value for comparison between pre intervention and post intervention after 6 months

P3: p-value for comparison between post intervention after 1 month and post intervention after 6 months

Using: x^2: Chi-square test for Number (%) or Fisher's exact test, when appropriate

*p-value >0.05 is insignificant; *p-value <0.05 is significant; **p-value <0.001 is highly significant*

Training, Experience, and Confidence (Pre and Post Intervention):

As shown in **Table 2**, there was a significant improvement in teacher training after the intervention—from only 7.5% pre intervention to 100% at both one- and six-months post intervention. Experience with assisting children in dental trauma cases rose significantly as well, reaching 50.3% at six months. Confidence in handling such incidents also improved markedly with (mean=70.5, SD=29.2), and nearly all teachers reporting they felt capable of helping a child by the six-month follow-up.

Part II: Elementary School Teachers' Knowledge and Attitude Of Traumatic Dental Injury In Egypt

Table 3. Number and percentage distribution of the participating elementary school teachers according to their dental trauma knowledge and attitude, comparing between (Pre intervention and post intervention) (N=147)

Dental trauma knowledge and attitude	Pre intervention		P1	Post intervention after 1m		P2	Post intervention after 6m		P3
	No.	%		No.	%		No.	%	
The broken teeth are likely to be:									
Temporary (primary) teeth	31	21.1	<0.001**	48	32.7	<0.001**	38	25.9	0.046*
Permanent teeth	85	57.8		95	64.6		109	74.1	
Do not know	31	21.1		4	2.7		0	0.0	
You find the broken pieces on the ground:									
Can be used again	21	14.3	<0.001**	145	98.6	<0.001**	147	100.0	0.478
Cannot be used anymore	73	49.7		0	0.0		0	0.0	
You don't know whether they can be used or not	53	36.1		2	1.4		0	0.0	
If the broken piece can be used this should be stored in:									
Dry environment	21	14.3	<0.001**	4	2.7	<0.001**	0	0.0	0.018*
Moist environment	94	63.9		143	97.3		143	97.3	
Do not know	32	21.8		0	0.0		4	2.7	

P1: p-value for comparison between pre intervention and post intervention after 1 month

P2: p-value for comparison between pre intervention and post intervention after 6 months

P1: p-value for comparison between post intervention after 1 month and post intervention after 6 months

Using: x^2: Chi-square test for Number (%) or Fisher's exact test, when appropriate

*p-value >0.05 is insignificant; *p-value <0.05 is significant; **p-value <0.001 is highly significant*

Understanding of Broken Teeth:

Knowledge of whether broken teeth are primary or permanent improved notably post intervention, with increasing recognition that permanent teeth are often involved.

Use and Storage of Broken Teeth:

Teachers initially lacked awareness about the potential to reuse broken teeth and proper storage conditions. After the intervention, nearly all teachers knew that broken fragments could be reused and should be stored in a (moist environment) that was retained at the six-month mark.

Table 3 ***Continue.*** Number and percentage distribution of the participating elementary school teachers according to their dental trauma knowledge and attitude, comparing between (Pre intervention and post intervention) (N=147)

Dental trauma knowledge and attitude	Pre intervention		P1	Post intervention after 1m		P2	Post intervention after 6m		P3
	No.	%		No.	%		No.	%	
What would you do?									
Calm down the child, rinse the area with plenty of water and advise the child to bite on a gauze for bleeding control before contacting the parents and referring to a dentist.	74	50.3	<0.001**	90	61.2	<0.001**	105	71.4	0.066
Calm down the child, contact the parents and advise them to go with the child immediately to a dentist	52	35.4		57	38.8		42	28.6	
Do not know	21	14.3		0	0.0		2	1.4	
Can the teeth be repositioned?									
Yes	21	14.3	<0.001**	147	100.0	<0.001**	143	97.3	0.131
No	126	85.7		0	0.0		4	2.7	
If yes within which time limit can this be performed?									
Immediately, within the first 30 minutes from the injury	11	7.5	<0.001**	126	85.7	<0.001**	112	76.2	<0.001**
Within the 1-2 hours after the injury	10	6.8		11	7.5		31	21.1	
Within the first 48 hours from the injury	0	0.0		8	5.4		0	0.0	
There are no time limits restrictions	0	0.0		2	1.4		0	0.0	
Do not know	126	85.7		0	0.0		4	2.7	
How would you store the teeth until the child visits a dentist?									
Inside water	37	25.2	<0.001**	17	11.6	<0.001**	13	8.8	0.498
Inside saline	25	17.0		54	36.7		59	40.1	
Inside cold milk	6	4.1		36	24.5		42	28.6	
In child's mouth	0	0.0		32	21.8		25	17.0	
Inside an antimicrobial solution	36	24.5		6	4.1		8	5.4	
Inside a clean handkerchief/ napkin	11	7.5		2	1.4		0	0.0	
Do not know	32	21.8		0	0.0		0	0.0	

P1: p-value for comparison between pre intervention and post intervention after 1 month

P2: p-value for comparison between pre intervention and post intervention after 6 months

P1: p-value for comparison between post intervention after 1 month and post intervention after 6 months

Using: x^2: Chi-square test for Number (%) or Fisher's exact test, when appropriate

*p-value >0.05 is insignificant; *p-value <0.05 is significant; **p-value <0.001 is highly significant*

Emergency Actions and Repositioning:

There was a clear upward trend in teachers selecting appropriate immediate actions (e.g., calming the child, rinsing with water, applying gauze, and contacting a dentist). Awareness that teeth can be repositioned, especially within the critical 30-minute window, improved significantly post intervention and remained high.

Storage Until Dental Care:

Initially, many teachers opted for suboptimal storage methods. After training, preferred choices shifted to saline, cold milk, or storing the tooth in the child's mouth—indicating a much better understanding of best practices.

Tooth Cleaning Before Storage:

While the majority initially knew to clean a tooth before storage, correct methods (like rinsing with cold water) became nearly universal post training with (mean = 76.7, SD = 26.0).

Healthcare Seeking Behavior:

Before the intervention, teachers were divided in their choice of healthcare providers. Following the sessions, most preferred referring the child to a nearby general dentist, reflecting improved judgment regarding appropriate emergency care.

Handling Dental Trauma: Knowledge and Practice Improvements

Following the intervention, teachers demonstrated a marked improvement in their ability to manage dental trauma cases. The proportion choosing the correct immediate response—calming the child, rinsing the area, applying gauze, and contacting a dentist—increased steadily over time with (mean = 60.3, SD = 8.5), indicating a growing familiarity with proper first-aid procedures.

Understanding of tooth repositioning also improved dramatically. Initially, very few teachers were aware that displaced teeth could be re-positioned immediately after trauma. One month post intervention, nearly all participants had acquired this knowledge, with most retaining it after six months.

Awareness of the critical time window for repositioning saw similar gains. While very few teachers knew that action should ideally be taken within 30 minutes before the intervention, the majority could identify this window after training, and knowledge retention remained high over time.

Regarding storage methods, teachers showed significant progress in identifying appropriate temporary storage solutions for avulsed teeth. Initially, many chose incorrect options like water or were unsure. Post training, preference shifted toward correct media such as saline, cold milk, and even the child's mouth, with these improvements largely sustained six months later.

Table 3 ***Continue.*** Number and percentage distribution of the participating elementary school teachers according to their dental trauma knowledge and attitude, comparing between (Pre intervention and post intervention) (N=147).

Dental trauma knowledge and attitude	Pre intervention		P1	Post intervention after 1m		P2	Post intervention after 6m		P3
	No.	%		No.	%		No.	%	
Before you store them, would you clean the teeth first?									
Yes	103	70.1	<0.001**	147	100.0	<0.001**	141	95.9	0.039*
No	44	29.9		0	0.0		6	4.1	
If yes, how would you do this?									
Rinse with plenty of cold water	41	39.8	<0.001**	143	97.3	<0.001**	131	92.9	0.041*
Gently brush the outer surface with a soft toothbrush	8	7.8		0	0.0		6	4.3	
Rinse with an antimicrobial solution	24	23.3		4	2.7		4	2.8	
Rinse with an oral mouthwash	8	7.8		0	0.0		0	0.0	
Do not know	22	21.4		0	0.0		0	0.0	
After a dental trauma injury which type of health service would you seek first?									
General physician	15	10.2	<0.001**	2	1.4	<0.001**	0	0.0	0.2519
Hospital	57	38.8		26	17.7		21	14.3	
Your own/family general dentist	6	4.1		4	2.7		2	1.4	
Nearest general dentist	27	18.4		109	74.1		116	78.9	
Dental school	15	10.2		0	0.0		2	1.4	
Pediatric dentist	27	18.4		6	4.1		4	2.7	
Endodontist (Specialist for root canal treatments)	0	0.0		0	0.0		2	1.4	

P1: p-value for comparison between pre intervention and post intervention after 1 month

P2: p-value for comparison between pre intervention and post intervention after 6 months

P1: p-value for comparison between post intervention after 1 month and post intervention after 6 months

Using: x^2: Chi-square test for Number (%) or Fisher's exact test, when appropriate

*p-value >0.05 is insignificant; *p-value <0.05 is significant; **p-value <0.001 is highly significant*

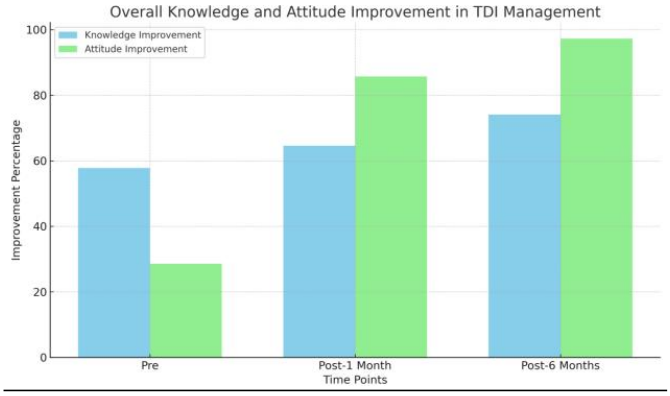
Tooth Cleaning and Health Service Preferences Post Trauma

Teachers' knowledge regarding proper cleaning of avulsed teeth showed a significant improvement after the intervention. Initially, just over 70% were aware that teeth should be cleaned before storage. One month after the training, all participants demonstrated correct understanding of this step, with nearly all retaining this knowledge at the six-month mark—reflecting a strong and lasting impact of the intervention ($p < 0.001$).

There was also a notable shift in teachers' understanding of where to seek appropriate care after a dental injury. Before the intervention, many teachers opted for general hospitals or were unsure of the proper

referral path. Following the training, most participants identified general dentists, especially those nearest in proximity—as the first point of contact. This awareness remained high at six months, indicating a significantly improved ability to identify suitable healthcare providers for dental emergencies ($p < 0.001$)

Part III: Over all knowledge and attitude Improvement



Knowledge Improvement:

1. **Pre intervention:** Knowledge of TDI management was at **57.8%**. This represents the baseline level of understanding among the teachers.
2. **Post 1 Month:** After one month of intervention, knowledge improved to **64.6%**, a significant increase of **6.8%** from pre intervention. This indicates an immediate boost in understanding after the intervention.
3. **Post 6 Months:** After six months, knowledge increased further to **74.1%**, showing a sustained improvement of **9.5%** compared to pre intervention and **9.5%** compared to post 1 month. The knowledge retention remains strong, indicating that the intervention had a lasting effect.

Attitude Improvement:

1. **Pre intervention:** Teachers' confidence in managing TDI was relatively low at **28.6%**, with limited experience in handling cases and using correct procedures.
2. **Post 1 Month:** After one month, there was a significant enhancement in confidence, rising to **85.7%**, an increase of **57.1%** from pre intervention. This suggests fast adaptation and growing self-assurance in handling dental trauma cases.
3. **Post 6 Months:** Confidence remained high at **97.3%**, maintaining 11.6% increase from post 1 month. This demonstrates not only an immediate improvement but also a strong retention of that confidence in the long term.

The program's quantitative success is highlighted by the overall knowledge and attitude scores. The mean score dropped sharply from a baseline of 23.00 (SD=7.79) to 12.02 (SD=3.00) at one month and was sustained at 11.96 (SD=3.14) at the six-month follow-up. This substantial decrease in the mean, coupled with the narrowing of the standard deviation from 7.79 to 3.14, confirms that the intervention not only greatly enhanced teachers' overall competence but also created a more uniform and consistent level of knowledge across the group.

4 Discussion

4.1 Key Findings

Initially, the aim of the study was to evaluate the knowledge and attitude of school teachers about management of dental traumatic injuries and to evaluate the impact of the educational program. A baseline assessment with a validated questionnaire was first conducted, revealing key gaps in understanding, particularly regarding first aid procedures and the proper storage of avulsed teeth. Following this, a comprehensive, multimodal educational program featuring interactive interviews, posters, and case studies was systematically delivered. Post intervention assessments at one and six months, analyzed using paired t-tests and chi-square tests, confirmed significant enhancements in both knowledge and confidence over time. The sustained impact underscores the effectiveness of such multimodal learning approaches in professional development.

Findings reveal a significant gap in baseline preparedness, with only 7.5% of participants having received prior training on TDI management. However, the universal desire for more information, expressed by 100% of teachers, highlighted a strong motivation for professional development in this area.

Furthermore, confidence levels in managing TDIs rose dramatically from 28.6% pre intervention to 97.3% post intervention ($p<0.001$). These results underscore the potential of targeted training programs in bridging knowledge gaps and fostering confidence among first responders in school settings.

Comparison with Previous Literature

A multimodal approach is employed, including posters and role-playing, which likely contributed to

sustained knowledge retention over six months. In comparison to a study conducted in the UAE, where a 30-minute lecture significantly improved teachers' knowledge about TDI. However, the UAE study relied solely on lecture-based interventions, and the use of interviews and interactive sessions in this study led to substantial improvements in knowledge and confidence. [8]

Behavioral changes were evident as the proportion of teachers who reported assisting with TDI cases increased from 14.3% pre intervention to 50.3% six months post intervention. The increase in self-reported ability to manage TDIs reflects the intervention's practical impact. Additionally, participants' ability to recognize permanent teeth as being more likely to experience TDIs improved significantly, with recognition rates rising from 57.8% pre intervention to 74.1% post intervention.

Another key area of comparison is the focus on proper storage media for avulsed teeth. Our study showed a marked improvement in this area, with an 83% increase in knowledge and sustained retention over 6 months. Similarly, Razeghi *et al.* found in schools in Iran that both lecture and poster-based interventions significantly enhanced teachers' knowledge, with lectures showing a slightly greater impact. However, Razeghi *et al.* did not assess long-term retention, which is a strength of this study. [9]

The sustained improvement observed for six months in our study highlights the importance of continuous engagement. This stands in contrast to the study by Tzimpoulas *et al.* in Greece, where knowledge retention declined three months post intervention. [3] The difference may stem from the inclusion of follow-up assessments and refresher activities in our study design, which helped reinforce knowledge.

The inclusion of workshops and role-playing likely contributed to its broader impact on participants' confidence and practical application. As a result, 97.3% of participants correctly identified milk as the preferred storage medium for avulsed teeth. In contrast, a study conducted in Syria by Al Zaher *et al.* used solely interactive posters, which resulted in over 90% of participants identifying the correct storage medium. [10]
The baseline findings of this study, where only 7.5% of participants had prior TDI training. Aligns with the Hungarian study that also found inadequate knowledge among schoolteachers regarding TDI management, underscoring the need for interventions. However, the Hungarian study did not evaluate the effectiveness of an educational intervention, whereas this study demonstrates the significant impact of such programs. [11]

Our study not only identified knowledge gaps but also demonstrated their resolution, with confidence in managing TDIs rising to 97.3%. This provides a crucial point of contrast with other research. For example, Khan *et al.* highlighted similarly inadequate baseline knowledge among schoolteachers in Saudi Arabia. However, while their study identified widespread knowledge gaps, it did not implement an intervention to address these deficits, a key strength of our approach. [12]

The sustained improvements observed in this study suggest that integrating TDI management training into teacher professional development programs can have lasting benefits. Policymakers and educational authorities should consider mandating such training as part of broader school health initiatives. Additionally, partnerships between educational institutions and healthcare providers could facilitate the development and dissemination of standardized training materials, ensuring consistency and quality.

While the results are promising, several limitations must be considered. First, the data on behavioral changes such as assisting in TDI cases were based on self-reporting. This introduces the potential for response bias, as participants might have been influenced by social desirability, reporting actions they felt were expected after the training.

Implications for Practice and Future Directions

The sustained improvements observed in this study strongly suggest that integrating TDI management training into standard teacher professional development is a viable and effective strategy. The findings provide a clear mandate for policymakers and educational authorities to consider making such training a required component of school health and safety protocols.
To facilitate this, partnerships between educational institutions and dental health providers are recommended. These collaborations can help develop and disseminate standardized, evidence-based training materials to ensure quality and consistency. Future research should focus on larger-scale implementation to confirm these findings and explore the long-term impact on actual clinical outcomes for students who suffer TDIs at school.

Future research should expand to include public schools, rural settings, parents, students, and explore digital education modules

4.2 Strengths and Limitations

The exclusive focus on international schools limits the generalizability of the findings to public or rural

school settings. Future research should explore the impact of similar interventions in diverse educational contexts, including under-resourced areas. Additionally, the reliance on self-reported data introduces the potential for response bias, underscoring the need for objective outcome measures in future studies.

Expanding the intervention's scope to include parents and students could further amplify its impact. For instance, incorporating digital education modules may enhance accessibility and engagement, particularly in remote or underserved regions.

5 Conclusion

- Elementary school teachers initially demonstrated limited knowledge and a less favorable attitude toward the management of traumatic dental injuries TDIs.
- Reliable dental Informational training strongly enhances Teachers' confidence in dealing with TDIs.
- Educational programs significantly improved teachers' confidence and knowledge in managing TDIs.

Authors' Contributions

Ezzat Said Ezzat Hegazy conducted the educational program, led manuscript writing, collected data and performed analysis.

Hala M. Eldin Abbas paved the way to conduct the study and made a substantial contribution to study idea, design and supervision on all over the study.

Samaa S. Hanafy Ahmed did an outstanding effort revising, analyzing and correcting manuscript, and supervised on all steps and procedures of the study.

Conflict of interest

The authors declare that they hold no competing interests.

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