

# Elementary school teachers' knowledge and attitudes toward emergency management of traumatic dental injuries

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**Abstract:** The consequences of traumatic dental injuries can be even more serious when their emergency management procedures are inadequate. Since traumatic accidents frequently occur at school, it is crucial that teachers be knowledgeable enough to assist an injured child. This study aimed to assess the knowledge and attitudes of the elementary school teachers of a Brazilian city toward dental trauma in permanent teeth, and its emergency practices. A combination of convenience and snowball sampling methods was used. An online questionnaire was distributed through social media, consisting of three parts: demographic characteristics and professional information; previous experiences and attitudes toward dental trauma; teachers' knowledge of this subject. Descriptive and statistical analyses were carried out. Pearson chi-squared test ( $p < 0.05$ ) was used. A total of 217 teachers participated in the study. The power of the sample was 95%. Half of the teachers had already witnessed a dental trauma incident involving students, and 70.5% never received any information on the subject. The teachers who were provided previous information were the ones who opted to search for the tooth fragment ( $p=0.036$ ) in cases of crown fracture, and for the lost tooth ( $p = 0.025$ ) in cases of avulsion. They were also the ones who chose to wash the tooth in running water ( $p = 0.018$ ), and look for a dentist in the first 30 or 60 minutes after the trauma ( $p = 0.026$ ). Most of the teachers assessed did not have adequate knowledge of dental trauma. Having previous information was associated with more assertive practices in trauma management.

**Keywords:** Tooth Injuries; Knowledge; School Teachers.

## Introduction

Traumatic dental injuries (TDIs) correspond to one fifth of the most frequent acute/chronic injuries worldwide, in addition to 85% of all oral injuries,<sup>1</sup> a scenario that represents a significant public health problem.<sup>1-4</sup> Dental injuries range from simple fractures of the enamel to extensive dentoalveolar damages, which may involve supporting tissues, tooth displacement, or avulsion.<sup>3,5,6</sup> These injuries can have aesthetic,

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functional and psychological repercussions, which have a negative impact on the quality of life of the affected individuals.<sup>4,5,7-13</sup>

Most TDIs occur in childhood, and can affect about 20% of the children.<sup>1,13,14</sup> In permanent dentition, TDIs are more prevalent from 6 to 12 years of age,<sup>1,5</sup> and in the school environment,<sup>6,15-18</sup> owing to the frequent practice of recreational and sports activities, added to the large amount of time that children spend in school.<sup>2,4,6,19</sup>

The prognosis of some TDIs depends on the decisions and actions taken to manage the trauma at the time of the accident.<sup>20-22</sup> Since elementary school teachers are the first to provide care to a child immediately after an injury,<sup>15,18</sup> it is crucial that these professionals know about the emergency management of dental trauma to minimize possible post-traumatic complications.<sup>18,19</sup> Moreover, an immediate knowledgeable reaction to dental trauma can reduce the children's and parents' level of anxiety toward subsequent dental treatment.<sup>21</sup>

Thus, it is important for school teachers to be aware of emergency management of TDI in permanent teeth. Some issues still remain as to the degree of information of this population, and whether their lack of knowledge results from an inadequate method of transmitting TDI-related information, or the total lack of training for TDI management.<sup>4,15</sup> Before implementing educational strategies for teachers, it is important to understand their level of TDI-related knowledge, and consequential TDI restrictions and impairments.

Therefore, the aim of this study was to assess the knowledge and attitudes of elementary school teachers in a Brazilian city toward TDIs involving permanent teeth, and the emergency practices that should be taken in regard to these injuries.

## Methodology

This cross-sectional study was carried out in Juiz de Fora, a city in the state of Minas Gerais, in southwestern Brazil, from January to March 2021. It was approved by the Human Research Ethics Committee of the Federal University of Juiz de Fora

(UFJF) (n. 4350591). All the participants agreed to take part in the study, and signed the informed consent form that was sent in electronic format.

The sample size was non-probabilistic. A combination of convenience and snowball sampling methods was used to recruit the participants. The study population was composed of teachers who work with elementary education in the public and private schools of Juiz de Fora, Minas Gerais, Brazil, regardless of their age, sex and educational level. Elementary schools in Brazil are divided into elementary school 1, attended by children aged six to ten years, and elementary school 2, enrolling children aged eleven to fourteen years.

An online questionnaire was designed by using *Google Forms*. Head teachers from public and private schools were contacted individually by email or phone, and those who consented were given the questionnaire and a brief written explanation of the survey scope, sent by email or social media apps, such as WhatsApp, Instagram and Facebook. Participants were encouraged to pass on the research to their colleagues through social media groups. Questionnaires that were not fully completed were excluded from the study.

The questionnaire was composed of 21 objective questions, developed in Portuguese by researchers, and reviewed by two experts in the field of pediatric dentistry. It was based on the validated instrument proposed by McIntyre et al.<sup>23</sup> and Raoof et al.,<sup>24</sup> and on the study by Marcano-Caldera et al.<sup>25</sup> A pilot study was carried out with thirty elementary teachers, and minor adjustments were made in the final texts. These teachers were not included in the final sample.

The questionnaire was divided into three parts. The first part (Q1-Q7) included questions about the demographic characteristics of the participants, such as sex (Q1) and age (Q2), as well as professional data, such as the practices of teachers in school grades (Q3), their practice in public and/or private schools (Q4), highest academic qualification (Q5), range of teaching experience (Q6) and whether they were provided previous information (Q7). The second part (Q8-Q14) comprised questions regarding the teachers' previous experiences

and attitudes toward TDIs, such as witnessing a situation of dental trauma (Q8), and willingly volunteering to enroll in a first-aid course in dental trauma management (Q9), as well as questions about opinions and attitudes toward TDI (Q10–Q14). The last part of the questionnaire (Q15–Q21) consisted of two clinical cases (crown fracture and avulsion), with respective illustrations (Figure a and Figure b), which were reported for the purpose of assessing how well teachers knew about TDIs in permanent teeth, and how they would act in an emergency situation, such as searching for a lost fragment (Q16) or a lost tooth (Q17); immediate reimplantation (Q18); tooth rinsing (Q19); tooth storage medium (Q20); and immediate intervention time by a dentist (Q21). Questions 10 to 21 presented the answer options on a Likert scale. See the tables in the results for more details on the questions in the questionnaire.

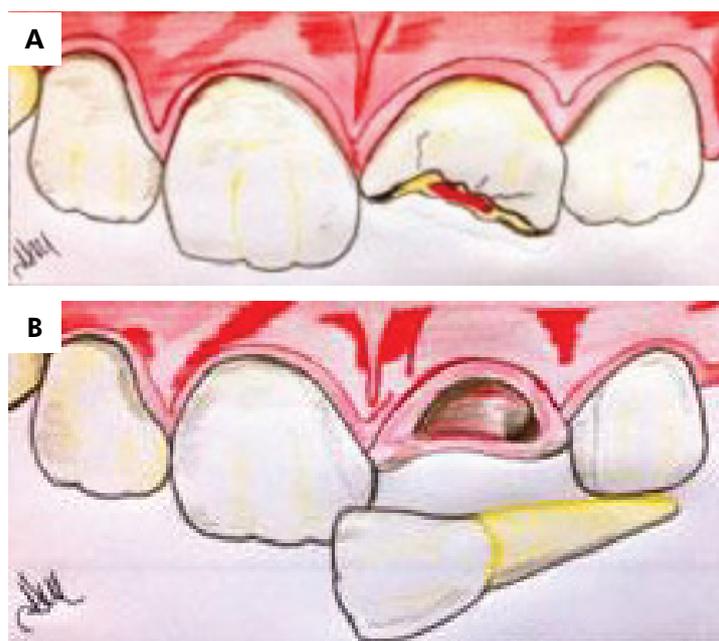
The data were organized in the SPSS statistical program (Chicago, USA). Descriptive analysis was performed, and the Pearson chi-squared test was used to evaluate the association of the teachers' attitudes in different situations of traumatic injuries (Q16 to Q21) with the teachers' degree of training (Q5), the

range of teaching experience (in years) (Q6), whether they were provided previous information (Q7), and the teachers' experience with dental trauma (Q8). The level of significance was set at  $p < 0.05$  for all statistical tests.

## Results

A total of 217 elementary teachers undertook the study, 93 (42.9%) from private schools, 92 (42.4%) from public schools, and 32 (14.7%) from both. The predominant age group was between 30 and 39 years of age (44.2%), 88.9% were female, and more than half of those interviewed (60.4%) had more than 10 years of teaching experience. The power of the sample ( $n = 217$ ) for this study was 95.0% ( $1 - \beta = 0.950$ ), with a type  $\beta$  error of 0.05. There was a minimum effect of 0.30, and  $\beta/\alpha = 1$  was considered. The demographic and professional characteristics of the participants are shown in Table 1.

Of the teachers assessed, 50.7% had already witnessed a situation involving dental trauma among students (Q8), and 70.5% never received any information on the subject (Q7). However, the vast majority of teachers (82.5%) showed interest in



**Figure.** a: Illustration of a crown fracture in a permanent tooth; b: Illustration of avulsion in a permanent tooth.<sup>25</sup>

**Table 1.** Demographic characteristics/professional information of the participants (n = 217).

Variable	n	%
Age (years)		
20–29	30	13.8
30–39	96	44.2
40–49	49	22.6
≥ 50	42	19.4
Sex		
Female	193	88.9
Male	24	11.1
Teacher practices in school grades		
Elementary school 1 (1st to 5th grades)	137	63.1
Elementary school 2 (6th to 9th grades)	52	24.0
Both	28	12.9
Teachers' practice in public and/or private schools		
Public	92	42.4
Private	93	42.9
Both	32	14.7
Highest academic qualification		
Incomplete higher education	5	2.3
Complete higher education	39	18.0
Incomplete postgraduate course	18	8.3
Complete postgraduate course	155	71.4
Range of teaching experience (years)		
< 5	23	10.6
5–10 years	63	29.0
> 10	131	60.4
Already witnessed a situation of dental trauma among students		
Yes	110	50.7
No	107	49.3
Interest in voluntarily doing a course or some training on the subject		
Yes	179	82.5
No	38	17.5

Data are presented as whole numbers (n) and percentages (%).

voluntarily taking a course or doing some training on the subject (Q9).

As for the questionnaire section on previous experiences and attitudes toward questions Q10 and Q13, respectively, 95.9% of the teachers agreed that dental trauma is an emergency situation, and

most of them (86.1%) considered that immediate attention by the teacher is important to save the tooth. However, approximately 17.5% believed that TDI emergency care is solely the dentist's responsibility, hence dismissing the need for the teacher's intervention (Q12). About 70% of the teachers believed they could provide better emergency TDI assistance after undergoing some specific training (Q14). The answers to the questions about the teachers' previous experiences and attitudes are shown in Table 2.

In the section of the questionnaire about the teachers' knowledge of dental trauma and emergency procedures, 66.8% classified a fractured tooth as a dental trauma; 77.9%, as a tooth which underwent luxation, and 76%, as a tooth avulsion. More than one answer could be given to this question (Q15).

Regarding the clinical case of a crown fracture, 77.4% of the participants believed that a search should be made for the lost fragment of the tooth. As to cases of permanent tooth avulsion, almost all the teachers (90.3%) agreed that the lost tooth should be searched for. In reference to the most suitable storage medium for the avulsed tooth, only 13.3% chose milk, and 65% decided to wrap the tooth in gauze or a napkin. Only 6.4% of the teachers chose to rinse the tooth, and then re-implant it, whereas 53.4% preferred to store the tooth, and then send it to the dentist. Moreover, 31.8% of the teachers recommended that an intervention by the dentist should be made in the first 30 to 60 minutes.

Table 3 showed the association between teachers who were provided previous information on TDIs and their conduct of searching for the dental fragment in a crown fracture case ( $p = 0.036$ ). In the case of an avulsed permanent tooth, being provided previous information on TDI was directly associated with the choice to search for the lost tooth ( $p = 0.025$ ), the recommendation of rinsing the tooth in running water without rubbing it ( $p = 0.018$ ), and seeking intervention in the first 30 or 60 minutes after the trauma ( $p = 0.026$ ). The range of teaching experience (in years) was positively related to the storage of tooth in milk ( $p = 0.049$ ), and the search for the fragment of a fractured tooth ( $p = 0.004$ ). The study also revealed an association between the teachers'

**Table 2.** Teachers' answers about their opinions and attitudes toward a dental trauma incident (n = 217).

Question (Q)	Strongly agree	Agree	Don't know	Disagree	Strongly disagree
	n; %	n; %	n; %	n; %	n; %
Q10 - Dental trauma is an emergency situation.	116; 53.5	92; 42.4	9; 4.1	0; 0	0; 0
Q11 - After a tooth has been knocked out of the mouth, it will definitely be lost.	5; 2.3	19; 8.8	83; 38.2	85; 39.2	25; 11.5
Q12 - Immediate care of dental trauma is a totally professional matter; therefore, it does not require the intervention of the teacher.	12; 5.5	26; 12	48; 22.1	107; 49.3	24; 11.1
Q13 - Immediate attention to dental trauma by the teacher is important to save the tooth.	85; 39.2	102; 46.9	28; 12.9	1; 0.5	1; 0.5
Q14 - Teachers could offer better assistance for dental trauma if they received brief and relevant training.	47; 21.7	107; 49.2	47; 21.7	8; 3.7	8; 3.7

Data are presented as whole numbers (N) and percentages (%)

degree of education and the search for an avulsed tooth ( $p = 0,041$ ). No significant association was found between teachers who witnessed a traumatic situation and their knowledge and attitudes. The associations performed with the chi-squared test are shown in Table 3.

## Discussion

This study revealed that the teachers assessed were unprepared, and that there is a lack of knowledge about emergency practices in TDI incidents, since the vast majority of the teachers were not aware of the need for immediate reimplantation, storage of the avulsed tooth in milk, or recommended intervention in the first 30/60 minutes after the trauma in cases of tooth avulsion. This was also observed in other studies in Brazil,<sup>16,26</sup> and in several countries worldwide (Saudi Arabia,<sup>27-29,33</sup> Australia,<sup>22</sup> Colombia,<sup>25</sup> Croatia,<sup>21,34</sup> Arab Emirates,<sup>31</sup> Greece,<sup>18</sup> India<sup>32,36</sup> and Iran<sup>30,35,37</sup>).

The lack of preparation and inappropriate emergency management practices of teachers can lead to serious consequences, especially in cases of avulsed permanent teeth, since the prognosis in these cases is highly dependent on the actions taken at the accident site.<sup>14,38</sup> In cases, for example, of late reimplantation (after 60 minutes), there is a greater possibility of ankylosis and root resorption, which

may even lead to loss of the tooth,<sup>38</sup> a consequence that can cause a child to have lower self-esteem and post-traumatic feelings of stress/anxiety.<sup>2</sup> Since teachers may be among the first to witness a dental trauma incident, having basic knowledge of this subject will enable them to understand the consequences of inappropriate emergency management actions, and will make them feel more motivated and better prepared to assist a child who has suffered a TDI.

As reported in previous studies<sup>16,24,28,30,32,33</sup>, more than half of school teachers worldwide have already experienced a TDI emergency. In contrast, a Brazilian study<sup>26</sup> revealed that less than 20% of teachers had witnessed a dental trauma incident involving students. This difference can be explained by the awareness that many teachers in the cited study considered a dental trauma as involving only a visible dental fracture or the loss of the tooth. However, the present study classifies injuries in dental and support tissues as a trauma.

The present study found that teachers who had had previous experience in dental trauma did not show any greater knowledge or skill in managing a traumatic incident than those who had never witnessed such a situation, as also reported in the study by Pithon et al.<sup>16</sup> On the other hand, although a lack of knowledge on the subject was observed, 86.2% of the teachers assessed agreed that it is

**Table 3.** Knowledge and attitudes toward dental trauma considering the independent variable: Academic Qualification, Teaching Experience (years).

Variable	In relation to crown n relation to crown fracture				In relation to avulsion							
	Search for tooth fragment	p-value	Search for lost tooth	p-value	Immediate reimplantation	p-value	Rinse tooth in running water without rubbing it	p-value	Store tooth in milk	p-value	Recommend intervention in the first 30/60 minutes	p-value
	n; %		n; %		n; %		n; %		n; %		n; %	
Total Sample (n = 217)	168; 77.4		196; 90.3		14; 6.4		111; 51.1		29; 13.3		69; 31.8	
Academic qualification												
Without postgraduation (n = 62)	44; 70.9	0.150	52; 83.8	0.041*	2; 3.2	0.359**	36; 58.0	0.075	6; 9.6	0.218	18; 29.0	0.350
With postgraduation (n = 155)	124; 80.0		144; 92.9		12; 7.7		74; 47.7		23; 14.8		51; 32.9	
Teaching experience (y)												
< 10 (n= 86)	58; 67.4	0.004*	74; 86.0	0.069	3; 3.5	0.171**	48; 55.8	0.139	7; 8.1	0.049*	24; 27.9	0.199
> 10 (n = 131)	110; 83.9		122; 93.1		11; 0.4		62; 47.3		22; 16.8		45; 34.4	
Previous Information												
Yes (n = 64)	55; 85.9	0.036*	62; 96.9	0.025*	7; 10.9	0.079	40; 62.5	0.018*	11; 17.2	0.197	27; 42.2	0.026*
No (n = 153)	113; 73.9		134; 87.6		7; 4.6		70; 45.8		18; 11.8		42; 27.5	
Trauma experience												
Yes (n = 110)	88; 80.0	0.224	100; 90.0	0.473	9; 8.2	0.220	56; 50.9	0.528	16; 14.5	0.375	38; 34.5	0.231
No (n = 107)	80; 74.8		96; 89.7		5; 4.7		54; 50.5		13; 12.1		31; 28.9	

Chi-square test \*p < 0.05 statistical significance; \*\*Fisher's exact test. Data are presented as whole numbers (N) and percentages (%).

important for teachers to take immediate action in dental trauma in order to save the tooth, and 70.9% believed that they would feel empowered to do what was needed to manage the emergency if they received some training. This result highlights the teachers' awareness toward their role in delivering first aid to a TDI victim, based on how frequently they witnessed a dental trauma involving students.

In the case of permanent tooth avulsion, inadequate management may compromise the viability of the periodontal ligament cells, hence the prognosis of the traumatized tooth. Almost all teachers (90.3%) answered that they would

search for the lost tooth. Nevertheless, only a small number of teachers stated that they would follow the International Association of Dental Traumatology (IADT)<sup>38</sup> recommendations for emergency management of permanent tooth avulsion. Only 6.4% would opt for immediate replantation, similar to what was reported by Marcano-Caldera et al., and 13.3% would store the tooth in an adequate medium (milk); these findings are corroborated by those of previous studies.<sup>5,16,18,37</sup> The vast majority (68.2%) does not know that the time interval for keeping an avulsed tooth in an extra alveolar medium is up to 60 minutes. It should

be pointed out that this time option appeared in the questionnaire as the shortest time interval (“30 to 60 minutes”). Therefore, the participants may have conjectured logically that it was the best choice for making the quickest intervention in an emergency. These results show the teachers’ limited knowledge about TDIs, since the questions with the highest percentage of accuracy were those that contained the most basic information on the subject.

The highest number of hits on the questions addressing the search for the fragment/avulsed tooth, the appropriate storage medium, the correct cleaning of the tooth, and the shortest intervention time, was associated with teachers who were provided previous information or undertook some training on the subject, contrary to what was found by other Brazilian studies.<sup>16,26</sup> This association emphasizes the importance of educational strategies that include periodic training to better qualify and update teachers and school staff.

As reported by Ivanda et al.<sup>34</sup>, since the study was cross-sectional and conducted through social media, its attendance was based on the volunteers’ availability and willingness. There could have been selection bias, since people without WhatsApp, Instagram, or Facebook accounts, email or internet access were not allowed to take part in the survey. We consider this a limitation in our study; however, the data collection period coincided with the historical moment of the Covid-19 pandemic, hence posing a challenge to making contact with the schools. The

best way of acquiring this data collection would have been in person and supervised.

Although there is no questionnaire validated in Portuguese, most questions were selected from questionnaires applied in previous studies,<sup>23,24</sup> and the present questionnaire was analyzed by experts in the field of pediatric dentist. In addition, a pilot study was conducted to make adjustments to the questionnaire, just as was done in other studies.<sup>25,26,34</sup>

The association between teachers’ who were provided previous information and who took the correct attitudes in face of a dental trauma incident reinforces the need to develop guidance and training programs on the subject. Some studies recommend some methods of transmitting information on TDIs,<sup>6,19,39</sup> such as, posters, lectures, leaflets and audio-visual resources. However, there is still no consensus on the most effective means of guiding the school team; therefore, systematic reviews and/or well-detailed studies should be designed to further these efforts.

## Conclusions

The majority of Juiz de Fora, Minas Gerais, Brazil, elementary school teachers assessed do not have adequate knowledge on dental traumas and respective emergency management. In addition, the providing of previous information to teachers was associated with more assertive approaches to the emergency management of traumatic dental injuries.

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