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Knowledge of teachers and students in physical education's faculties regarding first-aid measures for tooth avulsion and replantation

Kelly Oliva Jorge[1], Maria Letícia Ramos-Jorge[2], Flávia Fonseca de Toledo[1], Laila Caldeira Alves[1], Saul Martins Paiva[1], Patrícia Maria Zarzar[1]

[1]Department of Pediatric Dentistry and Orthodontics, Federal University of Minas Gerais, Belo Horizonte, Brazil; [2]Department of Pediatric Dentistry Department, Federal University of Vales of Jequitinhonha and Mucuri, Diamantina, Brazil

Correspondence to: Patrícia Maria Zarzar, Rua Henrique Cabral, 342/104 São Luiz, CEP 31270-760, Belo Horizonte, MG, Brazil
Tel.: +55 31 3234 6968
Fax: +55 31 3409 2470
e-mail: patyzarzar@hotmail.com

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Abstract – The aim of the present cross-sectional study was to investigate the knowledge of undergraduate students and teachers at all physical education courses in the city of Belo Horizonte (Brazil) regarding first-aid measures to be taken following tooth avulsion as well as the need for the preventative use of mouth guards. The sample consisted of 442 individuals (Group 1: 53 teachers; Group 2: 389 undergraduate students). Data collection was carried out with the administration of a questionnaire with both objective and subjective questions addressing definitions, first-aid measures in cases of avulsion and tooth replantation, together with an assessment of the use and indication of mouth guards. Data analysis involved descriptive statistics and the chi-square test. The results revealed that 45.1% of the participants in both groups knew what a tooth replantation was. However, 91.6% judged themselves incapable of performing an immediate replantation. Among the overall sample, 45.9% has no knowledge on first-aid measures regarding tooth avulsion; sending the patient with an avulsed tooth to the dentist was the most often cited measure (42.3%). Immediate replantation was cited by 20.6% of the individuals in Group 1 and 5.9% of the individuals in Group 2 ($P = 0.009$). Regarding the storage medium, 17.1% of the individuals would keep the avulsed tooth in a dry medium. The majority of participants (58.3%) stated that the ideal extra-alveolar time for replantation was more than 360 min. Although 74% of the overall sample stated having knowledge of mouth guards, few reported making use or indicating the use of this piece of equipment. The present study revealed that the majority of teachers and undergraduate students of physical education courses do not have adequate knowledge regarding first-aid measures for tooth avulsion and do not use or indicate the use of mouth guards during sports activities.

Introduction

Dental trauma is described in the literature as a common problem among children and adolescents throughout the world (1, 2). In Brazil, studies reveal a prevalence of trauma to the permanent dentition ranging from 10.6% to 58.6% among 12-year-old schoolchildren (3–8). A large number of studies reveal that dental trauma mainly affects the upper central incisors (4–6, 9) and can lead to a loss of function as well as a negative impact on quality of life, producing psychological and social discomfort, with lowered self-esteem, embarrassment upon smiling and difficulty in relating with others (10, 11).

Post-traumatic complications may occur, including crown discoloration, cervical root fracture, ankylosis, root resorption and tooth loss (12). Among the different types of dental trauma, avulsion results in the greatest functional and esthetic impairment due to its worse prognosis (13). The prognosis of an avulsed tooth depends upon prompt care (14), which is a determinant factor for the successful treatment of the traumatized tooth (13–18).

School is one of the locations with the greatest prevalence of the occurrence of dental trauma in adolescents (5). Falls and collisions, followed by sports activities such as cycling and soccer, are the most prevalent etiological factors (5, 7, 8, 19). Teachers are generally present at the time dental trauma occurs, as such accidents often take place during or after school activities. However, they have few/limited knowledge regarding the recommended course of action in such situations (20, 21). It is therefore of fundamental importance for coaches, teachers and undergraduate students in physical education to be duly informed with regard to the correct first-aid measures (2, 15, 16, 22–26).

The aim of the present study was to assess the knowledge of teachers and undergraduate students at all physical education courses in the city of Belo Horizonte (Brazil) regarding first-aid measures for tooth avulsion and replantation. The null hypothesis was that the levels of knowledge were similar among teachers and students.

Materials and methods

A cross-sectional study was carried out in 2006 with a representative sample of teachers and students from all the physical education courses in the city of Belo Horizonte, Brazil. Belo Horizonte is the capital of the state of Minas Gerais and has 2 412 937 inhabitants (27). The city has been indicated by the United Nations Population Crisis Committee as the metropolis with the best quality of life in Latin America and 45th among the 100 best cities in the world (28). However, Belo Horizonte has the same public health problems that afflict all large Brazilian cities and access to healthcare services is not distributed equally, as few people can afford dental treatment (29). Belo Horizonte is an industrialized city with considerable social, economic and cultural disparities (30, 31).

The target population was 4366 students (mean age 23 years) enrolled in undergraduate physical education programs at all six institutions in the city of Belo Horizonte and a total of 196 teaching staff members (mean age 41 years). The sample population was randomly derived from this target population.

The sample size was calculated to give a standard error of 5%. A 95% confidence interval level and a prevalence of 50% were used for the calculation. This was the percentage of students who knew what to do as first emergency measure after a tooth avulsion (13). In order to ensure representativity, the sample was randomly stratified according to the type of participant (teachers or undergraduate students). All institutions were included and the target number was reached. The calculation determined a minimal sample was 400 individuals, divided into two groups: Group 1, with 47 teachers, and Group 2, with 353 undergraduate students. The sample size was increased by 20% in order to compensate for possible losses.

The study received approval from the Research Ethics Committee of the Universidade Federal de Minas Gerais as well as the directors of the physical education courses throughout the city of Belo Horizonte. All participants signed terms of informed consent.

A self-completed questionnaire drafted and administered in Brazil by Panzarini et al. (2005) was used as the research instrument (13). This questionnaire is made up of both objective and subjective questions addressing definitions, first-aid measures in cases of tooth avulsion and replantation. Adaptation consisted of the inclusion of three questions on the use and indication of the use of a mouth guard. The questionnaires were delivered to the teachers by the department heads and to the undergraduate students by the researchers.

The results were entered and organized in a database, using the Statistical Package for Social Science (SPSS) software, version 12.0 (Chicago, IL, USA). Descriptions were carried out on the absolute and relative frequencies of the variables. Associations were then tested using univariate analysis between the independent variables and the outcome (chi-square test). The inexistence of an association between variables was considered the null hypothesis (significance value higher than 0.05).

The definition of adequate or inadequate knowledge regarding tooth avulsion and replantation was based on the criteria presented in the protocols most cited in the literature (14, 28).

Results

The overall response rate was 91.4% (94.6% from Group 1 and 91.7% from Group 2). The present study had a representative sample of 53 teachers (Group 1) and 389 students (Group 2) from all undergraduate physical education programs of the city of Belo Horizonte. The loss of 38 questionnaires (overall 8.6%; 0.7% from Group 1 and 7.9% from Group 2) occurred due either to their being filled out incorrectly or a failure to return them to the researchers.

No statistically significant difference was found between teachers and students in relation to knowledge regarding tooth replantation. Forty-nine individuals from Group 1 (92.5%) and 299 from Group 2 (76.9%) reported knowing what tooth replantation was. The definition of tooth replantation was reported incorrectly by 54.9% of the participants, whereas 45.1% defined the term 'tooth replantation' correctly (Table 1).

Knowledge on the procedures to be carried out in a case of dental avulsion was analyzed considering factors such as time elapsed between trauma and treatment, storage medium for the tooth and referral to a dentist. Among the overall sample, 239 participants (54.1%) reported knowing what to do in a case of tooth avulsion and 203 (45.9%) reported having no knowledge on the measures to be taken in this situation; the difference between groups was not statistically significant ($P = 0.117$). Table 2 displays the first-aid procedures cited. Immediate replantation was cited by 20.6% of the individuals in Group 1 and 5.9% of the individuals in Group 2, with a statistically significant difference between groups ($P = 0.009$). When asked about the possibility of immediate replantation, 72.9% of the overall sample answered that replantation was viable, 24.7% said it was not possible and 2.9% did not know how to respond.

Assessing the capability of the participants in replanting a dental element, 405 individuals (91.6%)

Table 1. Definition of tooth replantation according to reports of teachers and students, Belo Horizonte, 2008

Definition of replantation	Student, *n* (%)	Professor, *n* (%)	Total, *n* (%)	*P*-value[1]
Correct	135 (45.2)	22 (44.9)	157 (45.1)	
Incorrect	164 (54.8)	27 (55.1)	191 (54.9)	0.974
Total	299 (100)	49 (100)	348 (100)	

[1]Chi-square test.

Table 2. First-aid procedures according to reports of teachers and students, Belo Horizonte, 2008

Type of urgent procedure (n = 239)	Students, n (%)	Teachers, n (%)	Total, n (%)	P-value
Immediate replantation				
Yes	12 (5.9)	7 (20.6)	19 (7.9)	
No	193 (94.1)	27 (79.4)	220 (92.1)	0.009[1]
Place tooth in liquid medium				
Yes	60 (29.3)	10 (14.3)	70 (29.3)	
No	145 (70.7)	24 (85.7)	169 (70.7)	0.986[2]
Send to dentist				
Yes	33 (16.1)	6 (17.6)	39 (16.3)	
No	172 (83.9)	28 (82.4)	200 (83.7)	0.821[2]
Send to dentist with the tooth				
Yes	89 (43.4)	12 (35.3)	101 (42.3)	
No	116 (56.6)	22 (64.7)	138 (57.7)	0.375[2]
Store the tooth				
Yes	42 (20.5)	10 (29.4)	52 (21.8)	
No	163 (79.5)	24 (70.6)	187 (78.2)	0.243[2]
Sent to hospital				
Yes	4 (2.0)	1 (2.9)	5 (2.1)	
No	201 (98.0)	33 (97.1)	234 (97.9)	0.539[1]
Stop the bleeding				
Yes	7 (3.4)	2 (5.9)	9 (3.8)	
No	198 (96.6)	32 (94.1)	230 (96.2)	0.620[1]
Clean site with water				
Yes	6 (2.9)	0 (0.0)	6 (2.5)	
No	199 (97.1)	34 (100.0)	233 (97.5)	0.598[1]
Throw tooth out				
Yes	1 (0.5)	0 (0.0)	1 (0.4)	
No	204 (99.5)	34 (100.0)	238 (99.6)	1.000[1]

[1]Fisher exact test.
[2]Chi-square test.

reported being incapable. The following reasons were given for this: lack of specific knowledge (31.2%); requiring the presence of a professional from the field of dentistry (15.6%); fear of injuring other structures (1.4%); fear or nervousness (1.8%); not having the necessary locale or instruments (0.9%); the tooth would not be attached (0.9%); and the act would be painful (0.5%). A total of 39.4% were unable to explain their incapability. Only 41 (9.3%) participants had previously received information regarding tooth avulsion, with 2.9% having received this information within the previous one to five years. However, 98.1% of the individuals in Group 1 and 95.4% of those in Group 2 agreed that such information was both relevant and necessary.

There was considerable variability in responses regarding the extra-alveolar period of the tooth until replantation. Table 3 shows that 58.5% of the individuals in Group 1 and 58.4% of those in Group 2 incorrectly reported that the ideal time for replantation should be greater than 360 min. The storage medium for the tooth was also analyzed. Seventy-six (17.1%) individuals in the overall sample incorrectly recommended a dry medium and 100 participants (10% teachers and 90% students) reported not knowing the best storage medium for an avulsed tooth (Table 4). Regarding the handling of an avulsed tooth, 10% of the overall sample said they would brush the crown and root well, which is

Table 3. Extra-alveolar period of avulsed tooth according to reports of teachers and students, Belo Horizonte, 2008

Time for replantation	Student, n (%)	Professor, n (%)	Total, n (%)	P-value[1]
Immediately	90 (23.1)	15 (28.3)	105 (100)	
Up to 60 min	72 (18.5)	7 (13.2)	79 (100)	0.533
More than 360 min	227 (58.4)	31 (58 .5)	258 (100)	
Total	389 (88.0)	53 (12.0)	442 (100)	

[1]Chi-square test.

Table 4. Storage medium for avulsed tooth according to reports of teachers and students, Belo Horizonte, 2008

Storage medium for avulsed tooth	Students, n (%)	Teachers, n (%)	Total, n (%)	P-value
Dry medium				
Yes	72 (94.7%)	4 (5.3%)	76 (100.0)	
No	317 (86.6%)	49 (13.4%)	366 (100.0)	0.047[1]
Water				
Yes	38 (88.4%)	5 (11.6%)	43 (100.0)	
No	351 (88.0%)	48 (12.0%)	399 (100.0)	0.939[1]
Milk				
Yes	46 (83.6%)	9 (16.4%)	55 (100.0)	
No	343 (88.6%)	44 (11.4%)	387 (100.0)	0.286[1]
Saline solution				
Yes	171 (85.1)	30 (14.9)	201 (100.0)	
No	218 (90.5)	23 (9.5)	241 (100.0)	0.083[1]
Saliva				
Yes	5 (62.5)	3 (37.5)	8 (100.0)	
No	384 (88.5)	50 (11.5)	434 (100.0)	0.059[2]
Oxygenated water				
Yes	1 (100.0)	0 (0.0)	1 (100.0)	
No	388 (88.0)	53 (12.0)	441 (100.0)	1.000[2]
Does not know				
Yes	90 (90.0)	10 (10.0)	100 (100.0)	
No	299 (87.4)	43 (12.6)	342 (100.0)	0.486[1]

Note: The participant could mark more than one answer.
[1]Chi-square test.
[2]Fisher exact test.

not recommended; 43.4% would rinse the tooth with physiological solution; 19% would rinse it in tap water; 4.5% would rinse it with milk; 5.7% would not wash the tooth; and 20.4% reported not knowing how to proceed. Among the overall sample, 74.0% had knowledge regarding mouth guards, but just 7.7% of the participants made use of this piece of equipment during sport activities and 20.6% indicated that students made use of mouth guards during physical education classes.

Discussion

The present study revealed a low level of knowledge on the part of physical education teachers regarding first-aid measures for tooth avulsion. This result has also been encountered in other studies carried out in Brazil (13, 26) as well as in other countries (2, 22, 23, 29), demonstrating that it is not a merely Brazilian phenomenon. This may be explained by the absence of this topic in the classroom curriculum of physical education courses.

Although nearly half of the overall sample (45.1%) correctly defined the term *tooth replantation*, the majority of students (54.8%) and teachers (55.1%) either gave incorrect definitions or were unable to answer the question. This result is similar to the study carried out by Panzarini et al. (13), in which 73.5% of the participants reported knowing about the concept of tooth replantation, but only 26% defined it correctly. This demonstrates the lack of preparation of physical educators, who at times base their answers more on intuition than actual scientific knowledge.

Immediate replantation is the most indicated measure for the avulsion of a permanent tooth, as it is the conservative procedure most suggested in treatment protocols for dental trauma (14, 26). Although there was a statistically significant difference ($P = 0.003$) between students and teachers regarding tooth replantation, the percentage of teachers who would perform an immediate replantation was very low (20.6%). This may be explained by the lack of capability reported by the majority of participants, a lack of information regarding the procedure and the delegation of responsibility to a surgeon dentist, who is seen by other professionals as the most skilled in the practice of replantation. This is confirmed in the response given by 42.3% of the overall sample, who, when asked about the proper first-aid measure, said they would send the patient with an avulsed tooth to the dentist. A similar result is described by Chan et al. (2001) (23), who found that just 5.4% of the physical education teachers surveyed reported being capable of performing an immediate replantation and 48.8% said they would contact the nearest dentist.

In the present study, most of the overall sample reported knowing what to do in the case of a tooth avulsion. With regard to the extra-alveolar period, however, the majority of participants (58.3%) stated that it was possible to store the tooth for a more than 360 min prior to replantation. No statistically significant difference was found between groups on this issue ($P = 0.533$), revealing that perhaps the students were unable to respond correctly to this question because the teachers themselves do not have sufficient knowledge to orient their students. This is a worrisome result, as one of the most important factors is the time elapsed between the avulsion and replantation (18); the replantation should be performed as soon as possible in order to increase the likelihood of success. A shorter extra-alveolar time reduces the areas of root resorption following replantation (30), thereby favoring a better prognosis. Immediate replantation is the best measure in a case of avulsion of a permanent tooth. However, if this is not possible at the moment of occurrence of the dental trauma, the maximum possible time a tooth (in dry storage) can remain outside the alveolus is 120 min, for a better prognosis (31).

The present study found satisfactory responses regarding the storage medium. An aqueous medium was the most cited, highlighting physiological solution and milk, which are both good alternatives for short periods of time. However, 17.1% of the overall sample would keep the avulsed tooth in a dry medium, which is worrisome, as a dry storage medium can cause irreparable damage to the periodontal membrane, resulting in a low success rate for replantation after a certain amount of time has passed (32). Maintaining the avulsed tooth in milk for as much as six hours favors cell integrity of the periodontal ligament and contributes toward a good prognosis. Furthermore, milk is a storage medium of relatively easy access at the locale of the trauma and the six-hour period is sufficient to seek the help of a surgeon dentist (33).

Although a large portion of the teachers and students reported they would rinse the tooth with physiological solution (43.4%) or tap water (19%), 20.4% reported not knowing how to proceed when handling an avulsed tooth and 10% said they would brush the root and crown well. These results demonstrate the lack of preparation on the part of teachers and students at physical education courses regarding the correct first-aid measures to be taken in the case of tooth avulsion. According to Lin et al. (18), a large part of the success of a tooth replantation depends on the treatment of the root surface of the avulsed tooth. Touching and/or scraping the cells of the periodontal ligament may determine ankylosis and root resorption. When cleaning the tooth, it should be held by the crown and rinsed in a sterile saline solution until the macroscopic particles of impurities are no longer seen on the surface, without brushing the root (14, 34).

Although most of the teachers and undergraduate students in the physical education courses analyzed in the present study had knowledge on protection equipment for dental trauma and awareness of the importance of using a mouth guard, they rarely made use of this equipment or indicated its use for the prevention of dental trauma. This finding is in agreement with other studies in the literature (35–37) and is all the more worrisome when assessing the role of the teachers, who is a former of opinions. By not making use of a mouth guard and not requiring its use among the students, teachers have a negative impact on the formation of future physical educators in this respect.

This study has some limitations that must be recognized. Firstly, cross-sectional studies are carried out either at a single point in time or over a short period (38). Secondly, the participants' responses were self-reported; hence, caution with generalizations must be considered. However, the 91.4% response rate was excellent.

The majority of the students and teachers showed interest in learning more about first-aid measures. However, the desire to broaden knowledge does not ensure that the acquisition of this information results in proper attitudes and behavior. Collaborative actions between dental and physical education professionals are needed in order to develop continued education programs.

The inclusion of the subject in the curriculum may be a strategy for teachers to have the opportunity to do research on types of dental trauma and first aid. This would allow a better preparation of physical education undergraduates regarding activity directed at health promotion (20). All results and suggestions in the present study regarding first-aid procedures in a case of tooth avulsion are currently being discussed at all the institutions that participated in the present study, under the guidance

of the researchers. Furthermore, public oral health programs that address health promotion, prevention and education should stress the importance of knowledge regarding first-aid measures for tooth avulsion and replantation in order to minimize negative outcomes.

Conclusion

The present study found that teachers and undergraduate students at physical education courses in the city of Belo Horizonte (Brazil) had inadequate knowledge regarding first-aid measures in cases of tooth avulsion. Thus, there is a need for education programs and the future implantation of an information and training program in first-aid procedures regarding tooth avulsion, directed at physical education teachers and students at all teaching institutions in Belo Horizonte.

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