

Prevalence of Traumatic Dental Injuries in Children Who Attended Two Dental Clinics in Târgu Mureş Between 2003 and 2011

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Abstract

Aims: This retrospective study aimed to assess the prevalence of dental trauma in deciduous and permanent teeth among children and teenagers who attended two dental clinics in Târgu Mureş, Romania, between 2003 and 2011 and the correlation of their risk of dental trauma with factors, including gender, age, physical activities and extent of incisor overjet.

Methods: The study population consisted of patients aged between 1 and 18 years who attended the Clinic of Paediatric Dentistry and Orthodontics and the Clinic of Oral and Maxillofacial Surgery, Târgu Mureş, in the period between January 2003 and August 2011. Their records were reviewed and the following factors, relevant to dental trauma, were recorded: gender, age, type of dentition, injury aetiology, lesion type and location, number of teeth affected, occlusion, and radiography. For patients who attended the orthodontics clinic, the degree of overjet was also determined.

Results: The overall prevalence of dental trauma was 24.5%. The frequency of traumatic injuries to deciduous teeth was approximately equal for boys and girls, and the most for those between 1 and 2 years. In the permanent dentition, a dental trauma was more frequently found boys, and the most affected age group was between 11 and 12 years, for both boys and girls. The most common causes were falls, in deciduous teeth especially during learning to walk, and in permanent teeth particularly during cycling or other sporting mishaps. The most frequent type of trauma found in the deciduous dentition was lateral luxation and in the permanent teeth it was fracture with the involvement of enamel and dentine, but without the exposure of the dental pulp. A positive relationship was noted between the presence of overjet associated with lip incompetence and the frequency of dental trauma.

Conclusions: The prevalence of dental trauma in children and adolescents who attended the Clinic of Paediatric Dentistry and Orthodontics and the Clinic of Oral and Maxillofacial Surgery, Târgu Mureş, was broadly similar to that found in other studies. More epidemiologic studies are needed to gain a more comprehensive overview of the prevalence of dental trauma in Romania.

Key Words: *Dental Trauma, Dental Fracture, Prevalence*

Introduction

Dentofacial and dental trauma cause frequent problems, especially for children. This is unsurprising because teeth and the oral and maxillofacial area are very exposed to unexpected sudden contacts with a variety of sources.

Lost or broken anterior teeth create problems for both children and their parents, not only because they can cause problems with chewing, phonetics and aesthetics, but also because they can have an impact on the child's personality and qual-

ity of life [1]. Trauma of deciduous teeth is also relevant as it can lead to damage of the permanent teeth [2]. Most commonly it causes enamel hypoplasia, and can have other serious consequences, such as coronal dilaceration, coronal and root dilaceration, and cessation of the development of a permanent tooth bud or buds [3]. It is also worth noting that the therapy for traumatic dental injuries and their short and long term complications may represent a significant financial burden [4].

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The aetiology of dental trauma varies by age, socio-economic status, cultural and ethnic origins and education level of children [5]. Traumatic injuries to the teeth can occur during daily activities and as a result of numerous other events and activities, including contact sports, fights, other forms of aggression, and road accidents.

The prevalence of reported dental trauma varies from study to study and from country to country. For instance, a study conducted in Brazil found a prevalence of only 10.2% [6] whereas in most of the other countries it has been reported as being 30% [1,4]. This variation may be due to the methodology used for data collection. However, it gives important insights into the extent of the problem in different groups and countries. It can also help to provide motivation to develop appropriate preventive measures and to make the general population aware of the problem.

Aims

This retrospective study aimed to assess the prevalence of dental trauma in deciduous and permanent teeth among children and teenagers who attended two dental clinics in Târgu Mureş, Romania, between 2003 and 2011 and the correlation of their risk of dental trauma with factors, including gender, age, physical activities and extent of incisor overjet.

Methods

The study population comprised children and adolescents aged between 1 and 18 years who attended the Clinic of Paediatric Dentistry and Orthodontics and the Clinic of Oral and Maxillofacial Surgery, Târgu Mureş, during the period between January 2003 and August 2011. Data were derived from

treatment registers, patient records, study models and radiographs.

Inclusion criteria for the study sample were those aged between 1 and 18 years and the presence of dento-alveolar trauma. Patients over 18 years were excluded from the study.

Andreasen's classification [7] was used to describe the type of trauma. Patient classification was performed by gender, age, type of dentition, injury aetiology, lesion type and location, number of teeth affected, occlusion, and radiography. For patients who attended the Clinic of Orthodontics, the degree of overjet was also determined.

Descriptive and comparative statistical methods were used. Statistical indicators employed in the descriptive statistics were: proportion, arithmetic mean, standard deviation and median, and in the comparative statistics the chi-square test was applied. Data were processed using statistical software programs (Microsoft Excel; Redmond, WA, USA; Statistical Package for the Social Sciences, Version 15; SPSS Inc, Chicago, USA).

Because this was a retrospective review of records and patient anonymity was maintained, the ethics committee of the University of Medicine and Pharmacy, Târgu Mureş, advised that ethics approval was not required.

Results

The records of the 4638 patients who had attended the two clinics between January 2003 and August 2011 indicated that 1139 had suffered dental trauma, of whom 710 were boys and 429 were girls (a ratio of 1.65:1). The annual percentage of those who had suffered dental trauma varied from between 23.0% and 27.0% and averaged 24.8% (*Table 1*).

Table 1. The annual percentage of children with dental trauma attending the two clinics

Studied period	Total patients recorded	Number of injuries	Incidence (%) through 12 months
January 2003 - January 2004	498	119	23.9
January 2004 - January 2005	569	131	23.0
January 2005 - January 2006	587	136	23.2
January 2006 - January 2007	579	136	23.5
January 2007 - January 2008	627	169	27.0
January 2008 - January 2009	579	134	23.1
January 2009 - January 2010	622	160	25.7
January 2010 - January 2011	577	154	26.7
Total	4638	1139	24.8

In 204 cases, deciduous teeth were affected and in 935 cases permanent teeth were involved. The ratio of dento-alveolar injuries by gender in deciduous teeth was approximately 1:1. For permanent teeth, it was twice as high for boys 2:1 (65.3% vs. 34.7%). This was a statistically significant difference (chi-square test, $P<0.001$) (*Table 2*).

The frequency of dental trauma was virtually the same for both sexes up to the age of six years. After that age, with the eruption of permanent teeth, a higher number of injuries among boys was seen (*Figure 1*).

The most frequent causes of dental trauma were as a result of falls (484; 44.6%), followed by sports accidents (272; 25%). Car accidents were the cause of a relatively high number (108; 9.9%) of cases of dental trauma and fights/violence for 85 (7.8%) (*Table 3*).

Most frequently affected teeth were maxillary central incisors (630; 55%), followed by maxillary lateral incisors (319; 28%) (*Table 4*).

The vast majority of children who had suffered dental trauma had only one tooth (793; 69.6%) or two teeth (322; 28.3%) affected. Only five (0.4%) had more than three teeth affected (*Table 5*).

Table 2. Gender distribution of traumatised teeth

		Deciduous dentition	Permanent dentition	Total
Boys	Count	99	611	710
	% within gender	13.9%	86.1%	100.0%
	% within type of dentition	48.5%	65.3%	62.3%
Girls	Count	105	324	429
	% within gender	24.5%	75.5%	100.0%
	% within type of dentition	51.5%	34.7%	37.7%
Total	Count	204	935	1139
	% within gender	17.9%	82.1%	100.0%
	% within type of dentition	100.0%	100.0%	100.0%

Table 3. Causes of dental trauma

	Frequency	%	Valid %	Cumulative %
Falls	484	42.5	44.6	44.6
	63	5.5	5.8	50.4
	272	23.9	25.0	75.4
	108	9.5	9.9	85.4
	85	7.5	7.8	93.2
	74	6.5	6.8	100.0
Valid Total	1086	95.3	100.0	
Missing from records	53	4.7		
Total	1139	100.0		

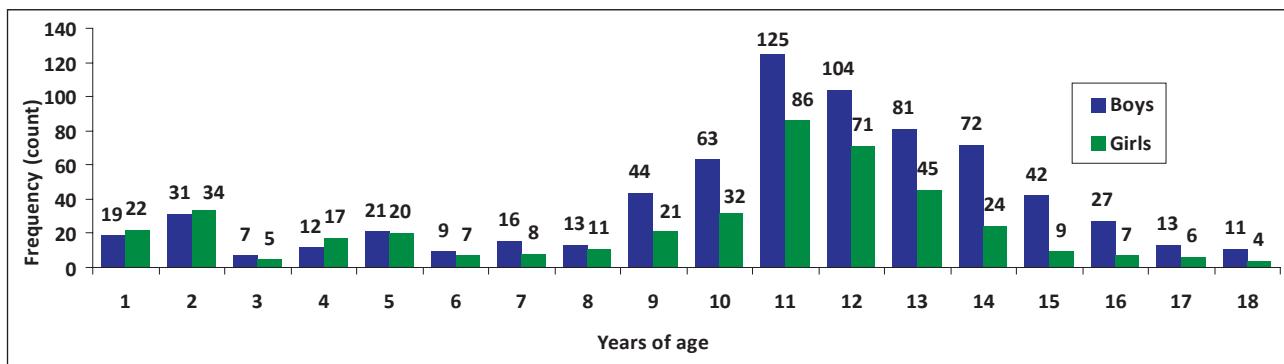


Figure 1. Distribution of dental trauma by gender based on age

Table 4. Dental trauma distribution by tooth type

	Frequency	%	Valid %	Cumulative %
Maxillary central incisor	630	55.3	55.3	55.3
Maxillary lateral incisor	319	28.0	28.0	83.3
Maxillary canine	66	5.8	5.8	89.1
Mandibular central incisor	49	4.3	4.3	93.4
Mandibular lateral incisor	27	2.4	2.4	95.8
Mandibular canine	11	1.0	1.0	96.8
Multiple lesions	37	3.2	3.2	100.0
Total	1139	100.0	100.0	

Table 5. Dental trauma distribution by number of affected teeth

Number of teeth	Frequency	%	Valid %	Cumulative %
1	793	69.6	69.6	69.6
2	322	28.3	28.3	97.9
3	19	1.7	1.7	99.6
More than 3	5	0.4	0.4	100.0
Total	1139	100.0	100.0	

Table 6. Dental trauma distribution by type of injury

	Frequency	%	Valid %	Cumulative %
Enamel fissure	24	2.1	2.1	2.1
Enamel fracture	142	12.5	12.5	14.6
Uncomplicated coronal fracture	297	26.1	26.1	40.6
Complicated coronal fracture	56	4.9	4.9	45.6
Uncomplicated coronal and root fracture	10	0.9	0.9	46.4
Complicated coronal and root fracture	16	1.4	1.4	47.8
Root fracture	38	3.3	3.3	51.2
Contusion	88	7.7	7.7	58.9
Subluxation	10	0.9	0.9	59.8
Extrusive luxation	3	0.3	0.3	60.1
Lateral luxation	128	11.2	11.2	71.3
Intrusive luxation	10	0.9	0.9	72.2
Avulsion	11	1.0	1.0	73.1
Enamel fracture and uncomplicated coronal fracture	100	8.8	8.8	81.9
Enamel fracture and uncomplicated coronal fracture	46	4.0	4.0	86.0
Uncomplicated coronal fracture and complicated root fracture	95	8.3	8.3	94.3
Uncomplicated coronal fracture and uncomplicated coronal and root fracture	7	0.6	0.6	94.9
Uncomplicated coronal fracture and contusion	35	3.1	3.1	98.0
Complicated coronal fracture and lateral luxation	9	0.8	0.8	98.8
Lateral contusion and luxation	10	0.9	0.9	99.6
Complicated coronal fracture and contusion	4	0.4	0.4	100.0
Total	1139	100.0	100.0	

The most common type of fracture was the fracture of enamel and dentine, without involvement of the pulpal chamber (297; 26.1%), followed by enamel fracture (142; 12.5%). Lateral luxation was also present in a relatively high percentage of cases (128; 11.2%) (*Table 6*).

Among the lesions associated with multiple types of trauma, uncomplicated coronal fracture was most commonly seen (100; 8.8%), followed by

the uncomplicated coronal fracture accompanied by complicated root fracture (95; 8.3%).

With respect to the uncomplicated coronal fractures there was a significant difference (chi-square test, $P<0.001$), as in permanent teeth they were present in 31.2% of cases, whereas in deciduous teeth in only 2.5% of cases. Lateral luxation was also more frequent in deciduous teeth (51.5%), compared with permanent teeth (2.5%) (*Table 7*).

Table 7. The frequency of different types of dental trauma to deciduous and permanent teeth (continued over)

Type of dental injuries		Primary dentition	Permanent dentition	Total
Enamel infraction	Count	0	24	24
	% within type of injuries	0%	100%	100%
	% within type of dentition	0%	2.6%	2.1%
Enamel fractures	Count	1	141	142
	% within type of injuries	0.7%	99.3%	100%
	% within type of dentition	0.5%	15.1%	12.5%
Uncomplicated crown fractures	Count	5	292	297
	% within type of injuries	1.7%	98.3%	100%
	% within type of dentition	2.5%	31.2%	26.1%
Complicated crown fractures	Count	13	43	56
	% within type of injuries	23.2%	76.8%	100%
	% within type of dentition	6.4%	4.6%	4.9%
Uncomplicated crown-root fractures	Count	0	10	10
	% within type of injuries	0%	100%	100%
	% within type of dentition	0%	1.1%	0.9%
Complicated crown-root fractures	Count	1	15	16
	% within type of injuries	6.3%	93.8%	100%
	% within type of dentition	0.5%	1.6%	1.4%
Root fractures	Count	0	38	38
	% within type of injuries	0%	100%	100%
	% within type of dentition	0%	4.1%	3.3%
Tooth contusion	Count	53	35	88
	% within type of injuries	60.2%	39.8%	100%
	% within type of dentition	26.0%	3.7%	7.7%
Subluxation	Count	5	5	10
	% within type of injuries	50.0%	50.0%	100.0%
	% within type of dentition	2.5%	0.5%	0.9%
Extrusive luxation	Count	2	1	3
	% within type of injuries	66.7%	33.3%	100%
	% within type of dentition	1.0%	0.1%	0.3%
Lateral luxation	Count	105	23	128
	% within type of injuries	82.0%	18.0%	100%
	% within type of dentition	51.5%	2.5%	11.2

Table 7. The frequency of different types of dental trauma to deciduous and permanent teeth (continued)

Type of dental injuries		Primary dentition	Permanent dentition	Total
Intrusive luxation	Count	2	8	10
	% within type of injuries	20.0%	80.0%	100%
	% within type of dentition	1.0%	0.9%	0.9%
Avulsion	Count	0	11	11
	% within type of injuries	0%	100.0%	100%
	% within type of dentition	0%	1.2%	1.0%
Enamel fractures and uncomplicated crown fractures	Count	0	100	100
	% within type of injuries	0%	100.0%	100%
	% within type of dentition	0%	10.7%	8.8%
Enamel fractures and complicated crown fractures	Count	0	46	46
	% within type of injuries	0%	100%	100%
	% within type of dentition	0%	4.9%	4.0%
Uncomplicated and complicated crown fractures	Count	0	95	95
	% within type of injuries	0%	100%	100%
	% within type of dentition	0%	10.2%	8.3%
Uncomplicated crown fractures and uncomplicated crown-root fractures	Count	0	7	7
	% within type of injuries	0%	100%	100%
	% within type of dentition	0%	0.7%	0.6%
Uncomplicated crown fractures and tooth contusion	Count	0	35	35
	% within type of injuries	0%	100%	100%
	% within type of dentition	0%	3.7%	3.1%
Complicated crown fractures and lateral luxation	Count	3	6	9
	% within type of injuries	33.3%	66.7%	100%
	% within type of dentition	1.5%	0.6%	0.8%
Tooth contusion lateral luxation	Count	10	0	10
	% within type of injuries	100%	0%	100%
	% within type of dentition	4.9%	0%	0.9%
Complicated crown fractures and tooth contusion	Count	4	0	4
	% within type of injuries	100%	0%	100%
	% within type of dentition	2.0%	0%	0.4%
Total	Count	204	935	1139
	% within type of injuries	17.9%	82.1%	100%
	% within type of dentition	100%	100%	100%

Overjet was only recorded at the orthodontic clinic, where of the 583 children who presented with dental trauma 268 (40.3%) had an overjet equal to or greater than 3.5 mm. Also at this clinic, 269 (46.1%) of children had a normal occlusion and 98 (8.6%) had an overjet equal to or greater than 9 mm (*Table 8*).

Discussion

The sample selected for this study included all chil-

dren and adolescents who attended the two clinics. The Clinic of Oral and Maxillofacial Surgery was chosen because patients with dentofacial trauma usually went there for treatment and the Clinic of Paediatric Dentistry and Orthodontics was selected as its patients are all the range from 0-18 years. In addition, some parents prefer to bring their children to the Clinic of Paediatric Dentistry because they are reluctant for their children to receive oral and maxillofacial surgery.

Table 8. The influence of overjet on the occurrence of dental trauma

		Frequency	%	Valid %	Cumulative %
Valid	Normal occlusion and dental anomalies other than overjet	269	23.6	46.1	46.1
	Overjet 0-3.5 mm	79	6.9	13.6	59.7
	Overjet 3.5-6 mm with the inappropriate lip seal	46	4.0	7.9	67.6
	Overjet 3.5-6 mm with inappropriate lip seal	15	1.3	2.6	70.2
	Overjet 6-9 mm	76	6.7	13.0	83.2
	Overjet >9 mm	98	8.6	16.8	100.0
	Total	583	51.2	100.0	
Missing		556	48.8		
Total		1139	100.0		

The sample was representative of the two clinics but not for the whole city of Târgu Mureş, as many children with dental trauma may have gone to private dental offices or may not have attended any dentist at all.

The study was conducted by assessing patient records, study casts, and radiographs. In some cases these did not provide some information; for example, there was generally no record of overjet for patients who attended the oral and maxillofacial clinic.

In the literature the frequency of dental trauma in children is reported as from 6% to 34% [1]. The relatively large difference between the extreme values can be due to variations in the experimental design. The age groups (any intervals between 1 and 18 years), the dentition (deciduous or permanent), demographics, regional characteristics, and the methods used to collect information can and do differ. Thus, some studies assess clinical records, whereas others gather their data by visiting schools and they are based on examinations conducted by the same examiner. Finally, there are review studies that are based on a secondary analysis of the existing data in the literature. A further complication is the lack of a universal classification of dental injuries.

The overall frequency of dental trauma in the under-18 year-olds assessed in the current study was 24.5%, which generally is in agreement with many other studies. Unfortunately, no comparisons can be made with other Romanian data because there have been no national epidemiologic studies regarding the incidence of dental trauma among children and adolescents.

The study revealed a greater prevalence of dental trauma in boys (62%) than in girls (38%). However, there was little difference between the sexes up to 6 years of age. Occasionally, in the literature this ratio is higher in boys, but most of the studies confirm the fact that at this age, gender has no particular importance in the aetiology of dental trauma [5]. Thus, one Scandinavian study found that in boys, there was a higher incidence of injuries between 2 and 4 years, and in girls between 2 and 3 years [8].

Among boys, dental trauma of permanent teeth was more frequent than in girls. This is probably contingent on the fact that boys are more active and they practise more aggressive sports or sports with a higher risk of accidents. Thus, sports such as judo, boxing, cycling, carting, athletics, hockey, and polo are more frequently practised by boys, whereas girls generally prefer dancing, ballet or swimming. Even while practising more dangerous sports, such as handball or basketball, girls appear more cautious than boys.

In the current study, trauma was more frequent in permanent dentition (82%). This may have been because as children are growing they become more active and can exert more powerful forces.

Also in the current study, for children under 6 years of age there were peaks for dental trauma at between 1 and 2 years, when children begin to walk and to run, increasing the risk of falling, and between 4 and 5 years, when children are starting to practise different sports and become more active. These results were similar to those found by Glendor (2008) [5], who concluded that the frequency of dental trauma rises with ascending age,

probably due to the fact that while children become more active and independent, their coordination of mobility does not keep pace with the increasing mobility.

In the current study, for permanent teeth a peak for the frequency of dental trauma occurred in the period between 11 and 12 years, for both boys and girls, possibly because at this stage children have been practising a specific sport and they feel self-confident with their own abilities and venture into high-performance attempts, increasing the risk of accidents.

This result differed from those of a study conducted by Noosheen *et al.* (2008) [9] in Pakistan, where most injuries were recorded among children aged from 9 to 11 years. The reason for the discrepancy is difficult to identify, but it may be related to cultural and social characteristics.

It has been suggested that adolescents aged 18 experience less dental trauma, possibly because of the fact that at this age most are forced to reduce their sports activities, in order to prepare themselves for the high school graduation examinations or they have become less interested in sport in general.

In the hierarchy of causes, it is found that on most occasions dental injuries are caused by falls, followed by accidents in various sports, car accidents, and for other reasons [4].

Regarding the injuries that occurred during sports activities, although the data collection method used in the current study did not allow elucidation of details about behaviour or the possible lack of any protective equipment, such as a mouthguard, it can be assumed that protective equipment was not worn or it was not sufficiently effective.

In some countries, such as India and Iraq, dental injuries produced by fights and violence have been reported to be more common [9].

Injuries caused by violence, beating or child abuse are characteristic especially for dysfunctional families or institutionalised children [4,10]. In the present study, these kind of injuries were present in 8% of cases, but as no data regarding the socio-economic status of these children were available, it was not possible to ascertain the circumstances of the families concerned. However, this percentage was alarmingly high.

Car accidents also represent a particular problem for dental trauma and in the current study had quite a high frequency (10%). This raises the question as to whether or not seat belts were being

worn. However, sometimes, albeit rarely, airbag-opening has been a cause of dental trauma. [11]

With respect to distribution of trauma by type of teeth among the 1139 registered traumas, the most common fractures were those that affected maxillary central incisors (55%), followed by maxillary lateral incisors (28%). These results were similar to those from most previous studies [5]. The literature also reveals that there are few studies in which the upper central incisor fracture is followed by fracture of the lower central incisor [12,13].

In the current study, in about 70% of cases dental trauma only affected one tooth. This result differs from that of a Glasgow study where dental trauma occurred in several teeth [14].

In the current study the most common injuries due to dental trauma among young children were dental luxation, especially lateral dislocation. This pattern differs from that reported in a Korean study [12], where the most frequent type of dental injury was the enamel fracture of deciduous teeth.

The results were similar to that of a Norwegian study [15] regarding the types of trauma in deciduous teeth, in that lateral luxation was followed by dental contusions. Among the reported trauma, periodontal or soft-tissue injuries were more common than hard-tissue lesions, probably because of the resilience of the facial bone structure and the alveolar bone architecture.

In the current study, a relatively small number of dentine fractures were found and of these, pulpal exposure was seen in a greater number than when there had been an uncomplicated fracture.

The study showed that in the children examined, the most common fracture in permanent teeth was the enamel and dentine fracture, without pulpal exposure, followed by the enamel fracture.

The literature describes that a pronounced overjet, protrusion and lip incompetence increase the risk of dental trauma to the anterior teeth [16]. In this study, there was a clear correlation between the presence of overjet and the occurrence and severity of dental trauma. Some authors define protrusion starting at 3 mm, others at 5 mm, and this makes it difficult to compare studies focused on the role of overjet as a contributing factor in the occurrence of dental trauma.

In the context of increased frequency of dental trauma a logical question arises: how can we diminish its frequency? Certainly, most injuries are difficult or almost impossible to prevent because they depend directly on the temperament, education

and focus of each of the victims. However, at least in car accidents and sports, some prevention can be attained through better publicity, protective measures and by wearing a seat belt, or using the appropriate protective equipment during risky sports.

Conclusions

The prevalence of dental trauma in children and adolescents who attended the Clinic of Oral and Maxillofacial Surgery, and the Clinic of Paediatric Dentistry and Orthodontics, Târgu Mureş, was broadly similar to that found in other studies.

The frequency of traumatic injuries to deciduous teeth was approximately equal for boys and girls, and the most for those aged between 1 and 2 years.

In the permanent dentition, dental trauma was more frequently found boys, and the most affected age group was between 11 and 12 years, for both boys and girls.

The most common causes were falls, in deciduous teeth especially during learning to walk, and in permanent teeth particularly during cycling or other sporting mishaps.

The most frequent type of trauma found in the deciduous dentition was lateral luxation and in the permanent teeth it was fracture with the involvement of enamel and dentine, but without the exposure of the dental pulp.

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A positive relationship was noted between the presence of overjet associated with lip incompetence and the frequency of dental trauma.

More epidemiologic studies are needed to gain a more comprehensive overview on the prevalence of dental trauma in Romania.

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Contributions of each author

- MK planned the study, reviewed the literature, collected the data and wrote the paper.
- MP planned and supervised the study, reviewed the drafts, and approved the final version.
- BP collected the data and translated the paper to English.
- CB collected the data and helped reviewing the preliminary paper.

Statement of conflict of interest

As far as the authors are aware, there is no conflict of interests.