Dental trauma in children in Budapest. A retrospective study

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Abstract

Aim Traumatic dental injuries (TDIs) are among the most serious dental public health problems in childhood. This study aimed to determine the prevalence of anterior tooth TDIs in 7- to 18-year-old children who presented for treatment over a period between January 2007 and December 2016, and to survey the effect of an increased health awareness and educational campaign about the risk of TDIs and the importance of prevention methods in decreasing their prevalence compared with data published in the years 1985–1999.

Materials and methods The current study was carried out on 454 children who presented for treatment at the Department of Paediatric Dentistry and Orthodontics in Budapest, Hungary.

Results The prevalence of TDIs was 1%. Males experienced more dental injuries than females. The incidence of dental trauma peaked at 9 years of age. The most observed injury was luxation. Most accidents occurred during playtime at home. TDIs occurred most frequently in the spring.

Conclusion The increased health awareness, a wide educational campaign about the risk of TDIs and the importance of prevention methods have essentially contributed to the decrease in the prevalence of TDIs, with an increase of luxation injuries and a decrease of teeth fractures.

KEYWORDS Anterior teeth, Children, Dental trauma, Permanent teeth, Prevalence

Introduction

Traumatic dental injuries (TDIs) are one of the most serious dental public health problems among children who seek emergency dental treatment [Bani et al., 2015; Chopra et al., 2014; de Amorim et al., 2011]. They are highly prevalent from infancy to adolescence, as approximately 50% of children experience a dental injury before the age of 18 [Ritwik et al., 2015]. These injuries may influence further tooth growth, resulting in irreversible damage if they occur during the initial stages of development [Bani et al., 2015; Patel and Sujan, 2012]. TDIs cause painful, distressing events and aesthetic, functional, economic and psychosocial effects, which occur in addition to the loss of teeth in some cases [Bani et al., 2015]. Furthermore, malocclusions may occur in a short time due to the loss of proximal and incisal contacts [Patel and Sujan, 2012]. TDIs have been observed in 4.2–35% of various age groups, and they affect approximately 20–30% of permanent dentition [Chopra et al., 2014].

Several publications have discussed dental trauma of the permanent dentition during childhood. Andreasen et al. [2007] conducted one of the most complex surveys in this field, involving epidemiological, diagnostic and treatment data from several countries. Reports about TDIs in several countries show a wide variation in frequency rates [de Amorim et al., 2011]. This variation is attributed to differences in the types of studies, classification of traumas, and study groups [Yeng and Parashos, 2008], as well as to differences in populations, geographical locations and cultural behaviours [Yeng and Parashos, 2008; Faus-Damia et al., 2011]. In the event of tooth structure loss, the tooth damage ranges from minimal enamel loss to complex fractures involving the pulp tissue (crown fractures, root fractures) and in some cases it ranges from subluxation to avulsion [Andreasen et al., 2007].

The severity of dental caries in children in many countries may have made TDIs a more serious dental public health problem [Faus-Damia et al., 2011]. For a considerable period, clinical studies emphasised that the main factors predisposing children to TDIs were gender and age [de Amorim et al., 2011]; in later studies, however, other factors, such as falls, driving accidents, sports, violence, inadequate lip protection and protrusion,

received more attention [Andreasen et al., 2007; Bilder et al., 2016; Rouhani et al., 2015]. The present article reports a statistical analysis of dental trauma in children in Budapest during a period of 10 years and compares it with analyses from other countries in regard to classification of trauma, gender, age, teeth involved, type of injury, aetiology, place of injury, and season over a 9-year period.

In addition, our aim was to compare the present results with previously published Hungarian data in order to assess the effect of a wide awareness campaign (lectures in dental praxis, and postgraduate courses) aimed at parents and paediatricians about the risk of TDIs and the importance of prevention methods in the reduction of prevalence and complications of dental trauma in Hungary.

Materials and methods

This retrospective study evaluated records of children who presented with dental trauma to the Department of Paediatric Dentistry and Orthodontics in Budapest between January 2007 and December 2016. The study included healthy children aged 7 to 18.

One of the main dental medical services at this Department is the complex therapy of dental injuries during childhood, and this department has the highest patient turnover than any other department of the same function in Hungary.

This study recorded the following items: clinical examination and dental trauma classification; gender; age of the child at the time of trauma; teeth affected by dental trauma; type and aetiology of the injury; and the season. At the time of injury, the following parameters were registered: affected tooth, type of injury. For each tooth, clinical information was recorded including dislocation, mobility, tenderness to percussion and thermal sensitivity.

TDIs were recorded according to the World Health Organization [WHO] classification system (Application of the International classification of Diseases and Stomatology, 1995] that was slightly modified by Andreasen et al. [2007], which included the following.

- Injuries to the hard dental tissues and pulp: enamel and enamel-dentin fractures without pulp exposure (uncomplicated crown fractures), enamel-dentin fractures with pulp exposure (complicated crown fracture), and root fracture.
- Injuries to the periodontal tissues: luxation and avulsion.

Tooth type	n	%
Maxillary central incisors	572	63.62
Maxillary lateral incisors	154	17.13
Mandibular central incisors	52	5.78
Mandibular lateral incisors	24	2.66
Maxillary canine	81	9.01
Mandibular canine	16	1.77
Total	899	100.00

TABLE 1 Distribution of dental trauma by tooth type.

Type of dental trauma	n	%
Luxation injuries	486	50
Uncomplicated crown fractures	364	37.44
Complicated crown fractures	94	9.67
Avulsion	18	1.85
Root fractures	10	1.02
Total	972	100.00

TABLE 2 Distribution of dental trauma by injury type.

Radiographic examination

Intraoral or panoramic radiographs were taken. Three different angles for each traumatised tooth were used, a traumatised anterior region was covered by one occlusal film and three periapical exposures. The central beam was directed between the two affected teeth. This method ensures diagnosis of even minor dislocation or root fractures.

Statistical analysis

The data were organised into files (Microsoft Excel) and analysed using the statistical package for the social sciences statistical software programme SPSS version 10.2 (IBM, 2015).

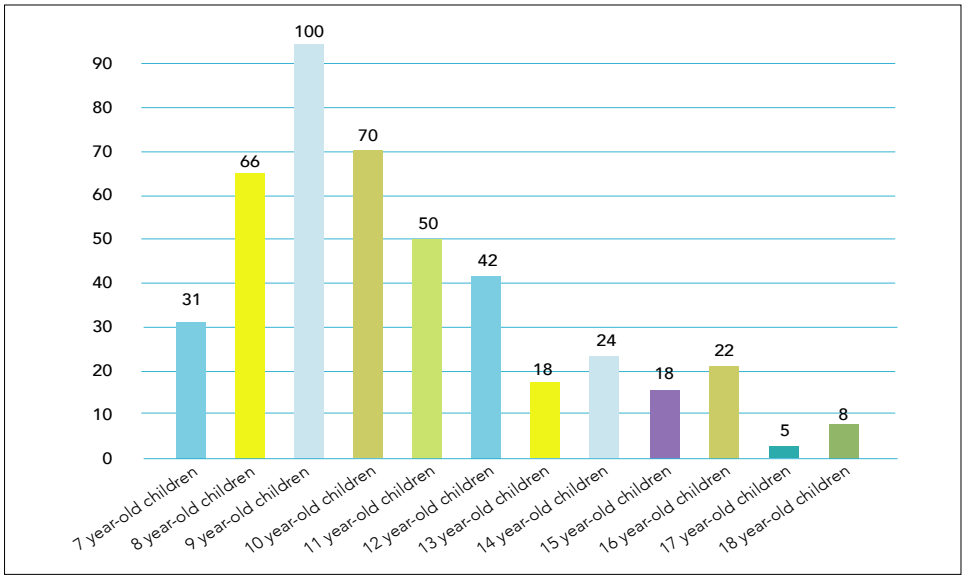

FIG 1 Age distribution of dental trauma.

	Hungarian Data			
	1985-1999		2007-2016	
	N	%	N	%
Number of patients	547	100.00	454	100.00
Girls	228	41.68	175	38.54
Boys	319	58.32	279	61.45
Number of affected teeth	729	100	920	100
Most frequently affected teeth Maxillary central incisors (11,12)	626	85.87	572	63,62
Most frequent type of dental trauma	Enamel- dentin fracture		Luxation injuries	
	587	78.16	486	50

TABLE 3. Comparison of results of 1985–1999 and 2007–2016

Results

The results of the current study, which was performed on the affected permanent anterior teeth of 454 children (1% of the total patient number), showed a higher prevalence of dental trauma among males than females, 61.45% and 38.54%.

The total number of affected teeth was 899. Of all 454 children, 247 (54.40%) had one damaged tooth.

The distribution of the traumatic injuries according to the different tooth types is listed in Table 1. The maxillary central incisors were found to be the most affected by dental trauma (63.62%) followed by maxillary lateral incisors (17.13%).

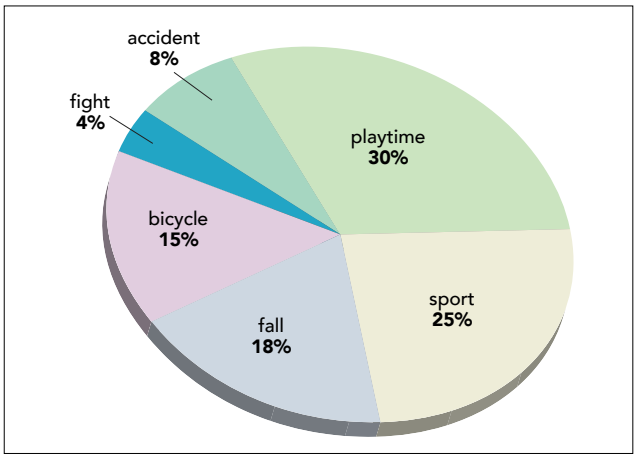

FIG 2 Activity during which trauma occurred.

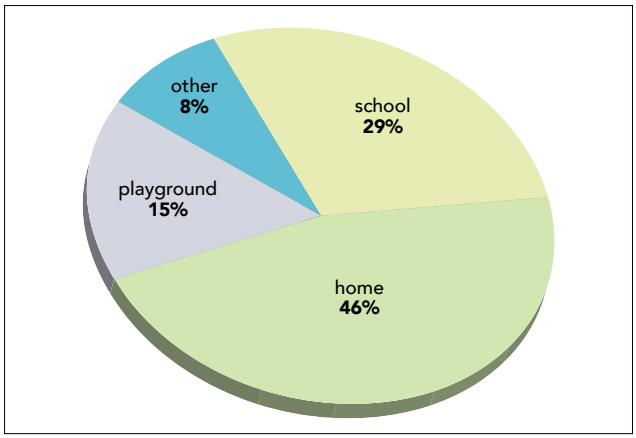

FIG 3 Place where trauma occurred.

The traumatised maxillary central incisors were more common among males than females. While the number of affected upper incisors among males was 397 (69.40%), the number of affected upper incisors was 175 (30.59%) among females. There was a statistically significant relationship between gender and injured maxillary central incisors (p=0.01). The injuries were most frequent between the ages of 8 and 10 years. The peak occurred around the age of 9 (Fig. 1). The nine-year-old children comprised about 22.02% of all patients.

Table 2 shows the distribution of dental trauma according to type of injury. Luxation injuries were the most common type of trauma. They were present in 50% of the teeth, followed by uncomplicated crown fractures (37.44%). A statistically significant difference between gender in the case of uncomplicated crown fractures was found (p=0.001), while there was no significant difference between boys and girls in the case of luxation injuries, complicated crown fractures, root fractures and avulsion (p=0.6, p=0.09, p=0.5, p=0.7 respectively).

Most accidents occurred during playtime (29.37%) and sports activities (25.33%) at home (46.47%) (Fig. 2) and at school (28.63%) (Fig. 3).

Figure 4 shows that the highest rate of dental trauma in children occurred in the spring, followed by fall, as the children who were affected by dental trauma in the spring made up 34.14% of total number of children. As far as season is concerned, a statistically significant difference between boys and girls was found (p=0.002).

The prevalence of TDIs was 1% during the last ten years, while it was 2.5% in the period between 1985 and 1999.

Table 3 includes the comparison between the current data over a period between January 2007 and December 2016, and the previously published data in the years 1985–1999. This comparison shows the increase of luxation injuries over the past ten years.

Discussion

The total prevalence of TDIs among children in this study was 1%, which appeared to be relatively very low compared to other prevalence in literature, e.g., to the 10,4% reported by Bilder et al. in Georgia and the 30% reported by Forsberg and Tedestam [1990]. The rate of 2.2% reported by Lexomboon et al. [2016] is close to the current result.

The increase in the prevalence of dental trauma in the recent years is confirmed by many studies in the literature. Lexomboon

et al. [2016] reported an increase of TDIs in Brazilian preschool children in the last 10 years and in children living in the county of Värmland, Sweden in the past 20 years, respectively. The current Hungarian data reveal a clear decrease in the prevalence of TDIs in the last ten years (1% current data, 2.5% former data). Corresponding outcomes were not reported in the literature. The increased health awareness, the wide information and educational campaigns about the risk of dental trauma and the prevention methods have largely contributed to this change, as presentations for paediatricians within the frame of a postgraduate course and the continuous advice of dentists to parents on protective methods and procedures to protect their children from traumatic dental injuries or to minimise the complications thereof. Children with maxillary overjet are more prone to TDIs than other children, so it is necessary to initiate a preventive orthodontic treatment for these individuals to be completed before the age of 11, i.e. in the early stage to mixed dentition, in the attempt to reduce the risks of trauma. In addition, it might be strategic to pay special attention to children and young teenagers who have a history of previous oral trauma, because they seem more likely to have another injury compared to those who have not experienced any. Also, the use of mouthguards during sport activities is considered an important factor in decreasing the complications of TDIs. We suppose that the decrease in the complications of dental trauma might be due to the increased use of mouthguards in Budapest. Unfortunately, there were no data proving this fact in Hungary, but many surveys in the literature hypothesise the effective role of mouthguards in this field. For example, significant risk reduction for complications following dental injuries in rugby union players in Australia after using mouthguards is reported by Ilia et. al. [2014]. Also Green J.I. [2017] reported the role of mouthguards in preventing and reducing sports-related traumas.

A large variability in the reported prevalence of TDIs can be found in the literature. Differences in sample composition as well as in the definitions and classifications of trauma make the comparison between various data on uniform basis difficult [Yeng and Parashos, 2008; Gábris et al., 2001]. Different classification systems have been used in the literature. Noori and Al-Obaidi used the Garcia Godoy's classification [Noori and Al-Obaidi, 2009]. Chopra and Lakhanpal assessed dental injuries according to the Elis classification modified by Holland [Chopra et al., 2014]. In the present study, dental trauma was classified according to the World Health Organization [WHO] classification system that was slightly modified by Andreasen et al. [2007], which is the same classification used in the study reported by Bagattoni et al. [2017].

This study identifies the prevalence of dental trauma of permanent teeth among children according to their gender, age, type of affected tooth, type of trauma, aetiological factors of traumatic dental injuries, season and location of the injury.

In this survey, the results confirm the general findings in the literature that boys suffer dental trauma more frequently than girls [Chopra et al., 2014]. The present results (61.45% males, 38.54% females) come close to the results published by Nemtoi et al. [2013], who reported dental trauma frequencies of 62.1% in males and 37.9% in females, and to the former results in Hungary (58.32% males, 41.68% females) [Gábris et al., 2001]. The difference by gender is explained by the fact that boys are more inclined to pursue vigorous and aggressive leisure activities or sports with a greater risk of accident than girls [Moradi Majd et al., 2012].

According to Bani et al. [2015] hyperactivity and social problems were found to be additional risk factors for male patients.

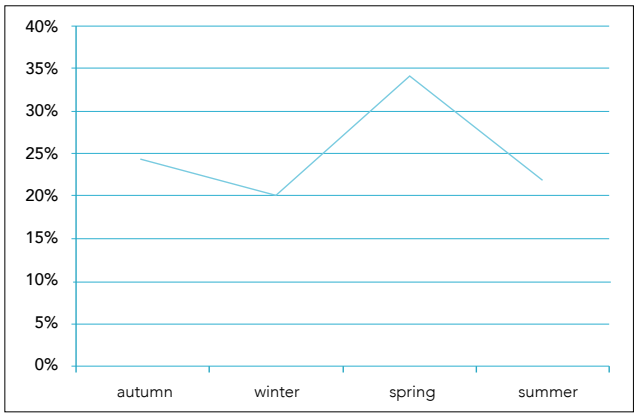

FIG 4 Season of occurrence of dental trauma.

The age at which children are most susceptible to dental trauma was investigated in several studies. The highest frequency of TDIs in the permanent dentition was among 12-year-old Iraqi children in the study by Yassen et al. [2013]. Our results are similar to those of Ritwik et al. [2015], who also found the highest incidence of dental trauma at the age of 9 years. The variation in the peak incidence of dental trauma from one study to another was attributed to the different restrictive age ranges [Fidel et al., 2011]. When we compared the former Hungarian data published by Gábris et al. [2001] to our findings, we noticed that there was a change in the peak incidence of TDIs from the age of 10 years in the earlier study to the age of 9 in the current study. The occurrence of peak dental trauma around the age of 9 can be explained by the fact that younger children have less sense of fear, which makes them more susceptible to dental injuries [Yeng and Parashos, 2008].

Maxillary central incisors were the most commonly traumatised teeth in this study (63.62%). This result was close to that of the previous study (60%) by Thomas et al. [2016], but lower than the finding (85.87%) by Gábris et al. [2001]. The decrease in the anterior teeth affected by dental trauma might have contributed to the decline in the prevalence of dental trauma during the last ten years. The prominent and most vulnerable position of the maxillary incisors makes these teeth more susceptible to injuries compared to the lower teeth [Traebert et al., 2004].

In the current study, the most common type of dental injury was luxation (50%). This outcome was contrary to the results of other studies, where uncomplicated crown fractures were the most common type of dental trauma [de Amorim et al., 2011]. The proportion of 50% compares well with the corresponding data of Rouhani et al. [2015] (46.1%) in an East Iranian school and with those of Muriithi et al. [2005] (47.5%) in Nairobi, but it is considered high compared to the average given by Hecova et al. [2010] (23.3%). Uncomplicated crown fractures comprised 37.44% in the current survey. This result is higher than the average found by Sari et al. [2014] (25%) and lower than the percentage (56%) reported by Yassen et al. [2013]. The literature includes very high values with respect to enamel-dentine fractures, e.g., 91.3% observed by Bilder et al. [2016] in Georgia. Overall, the proportion of crown fractures (complicated and uncomplicated) was 47.11%. This rate is within the range reported by Andreasen et al. [2007] (26-76%).

In the present study, avulsion (1.85%) was the less frequent dental trauma compared with the result of Yeng et al. [2008], which was 1.9%.

Based on the comparison between current and former data

(Table 3), there has been significant increase in luxation injuries in the last ten years, and significant decrease in crown fractures. In regard to avulsion injuries, the decrease in proportion of avulsed teeth was clearly visible (1.85% current data, 4.39% former data) [Gábris et al., 2001]. These changes between the previous and current data are attributed to: elasticity of alveolar bone in the younger studied age groups and increased attention of parents about the importance of mouthguards not only for certain sports activities but also with active children.

Many of previously published surveys studied the aetiological factors of dental trauma among children. Falls were the main factor of dental injuries among the patients in many studies [Chopra et al., 2014; de Amorim et al., 2011; Patel and Sujan, 2012; Rouhani et al., 2015]. The main factors of dental injuries among the patients of this survey were play and sports injuries. Nemtoi et al. [2013] stated that sporting activities were a frequent cause of traumatic injuries with the rate 23.1%, which was close to our own data of 25.33%.

In the present study, 17.62% of traumatic dental injuries were caused by fall. This rate is considered low when compared to other rates, such as 42.9% in an East Iranian school, and 51.4% which was reported by Chopra et al. [2014; Rouhani et al., 2015].

The relationship between seasons and dental trauma was studied, and there is a clear indication of increased traumatic injuries in the spring, as 34.14% of children affected by traumatic injuries during this season. The highest frequency of dental injuries was found in the summer in Schatz's study and in the winter in the study reported by Llarena et al. [1992; Schatz and Joho, 1994].

The patients involved in this study often suffered dental trauma at home (46.47%) followed by school (28.63%). Our results come in line with those registered by Rouhani et al. [2015], as the dental injuries at home comprised 46.8% and those at school comprised 29.9% of cases.

Conclusion

The decrease in the prevalence of dental trauma in Hungary, the increase in the luxation injury, the decrease in avulsion injuries and crown fractures were evident during the last ten years. These changes can be attributed to the increased awareness of the population towards the risk of dental trauma, and of the importance of prevention. The number of dental trauma cases dramatically rises in the spring.

Conflict of interest

The authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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