

Causes and prevalence of dental and oral soft tissue injuries in school children in Zagreb, Croatia

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The purpose of this study was to identify the etiology and types of traumatic dental injuries in permanent teeth, as well as the presence of oral soft-tissue injuries among school children in Zagreb, Croatia. A retrospective study was conducted at Department of Pediatric Dentistry, University Dental Clinic in Zagreb, Croatia using documentation on 319 patients (203 male and 116 female) aged 7 to 16 years with injuries of permanent teeth recorded between February 2009 and January 2013. Trauma was seen in 542 permanent teeth, yielding a mean of 1.7 injured permanent teeth per child. The majority of children sustained tooth injury at the age of nine. The most frequently affected teeth were maxillary central incisors (81%), followed by maxillary lateral incisors and mandibular central incisors as least often affected. Traumatic dental injuries involved hard dental tissue and pulp tissue that were twice as frequently affected as periodontal tissue. The most commonly observed traumatic dental injuries of the hard dental tissue and pulp was enamel-dentin fracture without pulp exposure, while subluxation was the most common type of periodontal tissue injury. The main cause of tooth injury was fall and the majority of injuries occurred at school. Of all patients included in the study, 132 (41.4%) had also oral soft-tissue injuries. Comparing the group of children with traumatic dental injuries and soft-tissue injuries and the group of children with traumatic dental injuries without soft-tissue injuries, a statistically significant difference was found in the time that had elapsed from the injury to initial treatment ($P < 0.01$).

Keywords: dentition, permanent; tooth injuries; soft tissue injuries; children; adolescents; Croatia

INTRODUCTION

Facial traumas that result in fractured, displaced or lost teeth can have significant negative functional, aesthetic and psychological effects on children (1). As children progress into late childhood and adolescence, factors such as collision with each other, traffic accidents, sports injuries and violence contribute to their etiology (2). Traumatic dental injuries (TDI) occur more frequently in children between 8 and 15 years of age, although lately an increase in the incidents of dental injuries has been reported among patients older than 18 (3).

A decline in the prevalence and severity of dental caries among children in many countries has made TDI a more serious dental public health problem among the young and dental trauma may exceed dental caries and periodontal disease as the most significant threat to dental health

among young people (4, 5). Boys experience more dental injuries than girls (6-8) and the majority of TDI involved anterior teeth (9, 10), which may lead to restriction in biting, difficulty to speak clearly, and feeling embarrassed to show the teeth (11).

Statistics from other countries show that one-fourth of all school children have suffered a dental trauma to perma-

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dentition before leaving school (7, 12). Information on the prevalence and severity of dental trauma in various age groups in a population is highly relevant for planning public dental care strategies in that population. The purpose of this study was to identify the etiology, types of TDI in permanent dentition and the presence of soft-tissue injuries among school children in Zagreb, Croatia.

MATERIALS AND METHODS

A retrospective study was conducted at Department of Pediatric Dentistry, University Dental Clinic in Zagreb, Croatia, using medical documentation on 319 patients (203 male and 116 female) aged 7 to 16 years with permanent TDI recorded between February 2009 and January 2013. All dental trauma medical files were completed by a pedodontist. Incomplete medical files were excluded from the study. Data collected from dental trauma medical files were classified by age, gender, location and type of dental trauma, time of the day and time of the year when trauma occurred, time elapsed from the injury to treatment, number of traumatized teeth, types of dental injuries, and types of soft-tissue injuries. Radiographs were used to classify hard and periodontal tissue damage. The type of TDI was determined according to Andreasen and Andreasen (13) classification:

hard tissue and pulp injuries: enamel fracture, enamel-dentin fracture without pulp exposure, enamel-dentin fracture with pulp exposure, crown-root fracture, root fracture and alveolar fracture; and

periodontal tissue injuries: concussion, subluxation, displacement, intrusion, extrusion and avulsion.

Furthermore, soft tissue injuries were recorded separately for upper and lower lips, tongue, gingiva, and lip and gingiva. If an individual tooth was affected by more than one type of injury, TDI was classified according to the most serious one.

Approval for the study was obtained from the Ethics Committee of the School of Dental Medicine, University of Zagreb, Zagreb, Croatia.

Statistical analysis was carried out using descriptive statistics and Pearson's χ^2 -test using Predictive Analytics SoftWare (PASW) for Windows version 17.0 (SPSS Inc, Chicago, IL, USA). The level of significance was set at 5%.

RESULTS

Of the 319 study patients, 63.6% were male and 36.4% females, yielding a 1.6:1 male to female ratio, and difference between genders was statistically significant ($P < 0.001$). Their age ranged from 7 to 16 (mean \pm SD = 9.99 \pm 2.37)

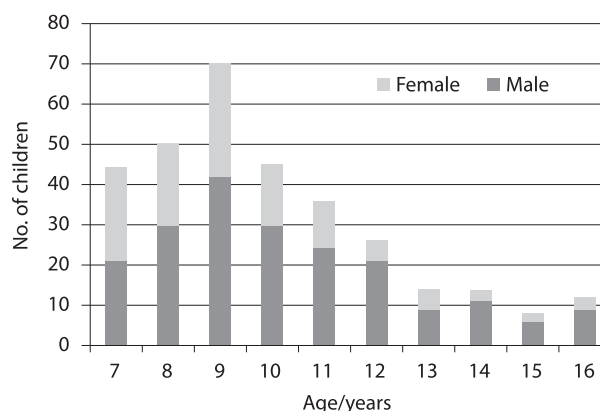


FIGURE 1. Age and gender distribution of traumatic dental injuries

years. The age and gender distribution of children suffering trauma is shown in Figure 1. There were 542 permanent teeth affected by trauma, yielding a mean of 1.7 permanent teeth *per* child. The majority of children sustained tooth injury at the age of nine. One hundred and fifty-two children (47.6%) had only one tooth traumatized, whereas one hundred and sixty-seven (52.4%) children had more than one tooth traumatized. Maxillary central incisors were the teeth most frequently affected (81%), followed by maxillary lateral incisors (11%), while the least affected were mandibular central incisors (4.3%).

Traumatic dental injuries involved hard dental and pulp tissue twice as frequently as periodontal tissue. The most commonly observed TDI of dental hard tissue and pulp was enamel-dentin fracture without pulp exposure (40.2%), followed by enamel-dentin fracture with pulp exposure (21.6%) and enamel fracture (13.8%). Analyzing the periodontal tissue injury, subluxation was the most common type (21%) and far behind were avulsion (6.3%) and extrusion (4.6%) (Table 1).

The most frequent cause of tooth injury were falls (46.1%), followed by collision with objects (18.5%), bicycle falls (11.9%), sports accidents (8.2%) and violence (2.5%). The majority of the injuries occurred at school (28.2%) ($P < 0.05$) (Table 2).

In the 7-12 and 13-16 age groups, the highest dental trauma frequency was noted in spring (28.5%) and summer (31.1%), respectively. There was a statistically significant difference in the seasonal distribution of TDI between the two age groups ($P < 0.05$). In the majority of children (37.6%), TDI occurred between 4.00 and 7.00 p.m.

Of all 319 patients, 132 (41.4%) also had soft tissue injuries. The highest proportion of soft tissue injuries was found in 9-year-old children (21.9%). Of all study children, injury of the upper lip was recorded in 26%, gingiva in 8.2%, upper lip and gingiva in 6.9%, whereas tongue injury was recorded

TABLE 1. Number of teeth affected by different types of dental injuries

Type of dental injury	Number of teeth (n)
Enamel fracture	75
ED fracture without pulp exposure	218
ED fracture with pulp exposure	117
Crown-root fracture	8
Root fracture	9
Subluxation	117
Intrusion	22
Extrusion	25
Avulsion	34
Displacement	7

ED = enamel-dentin

TABLE 2. Distribution of traumatic dental injuries according to location of occurrence

Age (yrs)	Location of dental trauma (n)*				
	Home	School	Sports	Outside	Other
7	13	9	11	4	7
8	7	19	8	10	6
9	13	22	18	11	6
10	8	13	11	6	7
11	4	8	11	8	5
12	1	7	7	9	2
13	4	1	2	5	2
14	2	7	1	3	1
15	0	2	3	3	0
16	1	2	3	5	1
Total	53	90	75	64	37

*n = number of injured teeth

TABLE 3. Distribution of time elapsed between dental trauma and initial treatment according to presence or absence of soft tissue injuries (STI)

Time elapsed	Without STI n (%)	With STI n (%)
Up to 2 hours	17 (9.1%)	19 (14.4%)
2-24 hours	39 (20.9%)	49 (37.1%)
1-7 days	67 (35.8%)	43 (32.6%)
8-30 days	17 (9.1%)	16 (12.1%)
>31 days	47 (25.1%)	5 (3.8%)
Total	187	132

in only one (0.3%) patient. There was a statistically significant difference ($P < 0.001$) in the distribution of different types of soft tissue injuries.

In the group of children with permanent tooth injuries, 34.5% received treatment within 1-7 days, followed by the

group of children (27.6%) that received initial treatment in 2-24 hours. Information on the time elapsed from the injury changed when soft tissue injuries were included. Comparison of the children with and without soft tissue injuries yielded a statistically significant difference in the time of arrival ($P < 0.01$) (Table 3).

DISCUSSION

Traumatic dental injuries in patients result in pain, color change, aesthetic discomfort and consequences following injuries such as abscess formation, which is the reason why children and their parents seek dental care (14). There is general consensus that boys have a higher risk of TDI than girls during adolescence (15). In our study, boys were nearly twice as likely as girls to have TDI, which is in agreement with *Navabazam et al.* (6). This can be explained by the fact that girls are generally more mature in their behavior than boys at that age.

As in other studies (6, 11, 16), this study showed the highest frequency of TDI of permanent teeth at the age of nine. Similarly, this study confirmed that the most commonly affected teeth were maxillary central incisors, as also reported elsewhere (17-19). This can be related to the anatomy of the maxillary arch, which is slightly more protruded than the mandible, thus serving as a shock absorber.

In contrast to *Calvalcanti et al.* (17), who stated that most of children who experienced TDI had only one tooth damage (71.3%), our study showed that the majority of children had more than one tooth damage (52.4%). The reason for this is the fact that children with complicated dental injuries come to our department, while the rest are treated at their primary dentist. The same reason can explain why the most frequent hard dental and pulp tissue injury was enamel-dentin fracture without pulp exposure (40.2%), which is in contrast to some other studies (14, 16, 20, 21), which showed that enamel fracture was the most frequent hard dental tissue injury.

This present study showed that the main type of accidents that resulted in dental injury was fall. Falls have been reported as the major cause of traumatic dental injuries in children (10, 16, 22). Most of TDI occur at school and during sports activities. The role of the school environment as a determinant of TDI is well established. At schools that had supportive social and physical environment, TDI are less likely to occur (23, 24). This shows the need of educating school teachers as well as sports coaches in preventive activities and dental first aid at school and sports fields.

The frequency of dental trauma in permanent teeth is highest in spring. This is in contrast with *Eyuboglu* (25), who claims that TDI most frequently occur in cold weather. The

majority of injuries that occurred in spring are connected with children passage from indoor life to outdoor life following warm weather.

It was found that the highest frequency of patients received initial treatment in 1-7 days (34.5%), which is similar to other studies (25). These data point to the necessity of education of parents and school teachers in ensuring more urgent initial treatment of TDI because it is well known that the consequences are fewer when treatment is received promptly. Further, shorter initial treatment was recorded in children with soft tissue injuries (2-24 hours). This can be explained with the fact that soft tissue injuries cause bleeding and edema, which results in a more dramatic clinical picture and parents tend to be more anxious about bleeding injuries.

Nowadays, traumatic dental injuries are frequent and their expected impact on the children's daily life in terms of psychological and physical discomfort may be significant. Therefore, it is concluded that TDI of permanent teeth have a large potential to be considered as an urgent public health concern. Thus, it is important that dental profession provides the highest possible standards of care for traumatized children.

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SUKOB INTERESA/CONFLICT OF INTEREST

Autori su popunili the *Unified Competing Interest form* na www.icmje.org/coi_disclosure.pdf (dostupno na zahtjev) obrazac i izjavljuju: nemaju potporu niti jedne organizacije za objavljeni rad; nemaju financijsku potporu niti jedne organizacije koja bi mogla imati interes za objavu ovog rada u posljednje 3 godine; nemaju drugih veza ili aktivnosti koje bi mogle utjecati na objavljeni rad./All authors have completed the *Unified Competing Interest form* at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare: no support from any organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous 3 years; no other relationships or activities that could appear to have influenced the submitted work.

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SAŽETAK

Prevalencija i uzroci trauma zuba i mekih tkiva u školske djece u Zagrebu, Hrvatska

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Cilj ovog istraživanja je bio istražiti etiologiju i vrste traumatskih ozljeda stalnih zuba kao i prisutnost ozljeda mekih tkiva oralne regije među školskom djecom u Zagrebu, Hrvatska. Retrospektivno istraživanje provedeno je na Odjelu dječje stomatologije Stomatološkog fakulteta Sveučilišta u Zagrebu služeći se dokumentacijom 319-ero bolesnika (203 dječaka i 116 djevojčica) u dobi od sedam do 16 godina s ozljedama trajnih zuba između veljače 2009. i siječnja 2013. Trauma je zapažena na 542 trajna zuba, što nam pokazuje da je broj ozlijeđenih trajnih zuba 1,7 po djetetu. Većina djece s ozljedom zuba je u dobi od devet godina. Gornji središnji sjekutići su najčešće zahvaćeni zubi (81%), zatim slijede gornji lateralni sjekutići, dok su najmanje zahvaćeni donji središnji sjekutići. Traumatske dentalne ozljede koje zahvaćaju tvrda zubna tkiva i pulpu dva su puta češća od ozljeda parodontnog tkiva. Najčešće promatrana traumatska dentalna ozljeda tvrdoga zubnog tkiva i pulpe je fraktura cakline i dentina bez izloženosti pulpe, a subluksacija je najčešća vrsta parodontne ozljede tkiva. Najčešći uzrok ozljede zuba je pad, a većina se ozljeda dogodila u školi. Od bolesnika koji su primili terapiju 132-je (41,4%) ih je imalo ozljede mekog tkiva oralne regije. Uspoređujući djecu s ozljedama zuba i mekih tkiva i onu s ozljedama zuba bez ozljeda mekih tkiva, postoji statistički značajna razlika u vremenu dolaska ($P < 0,01$).

Ključne riječi: trajni zubi; ozljeda zuba; ozljeda mekih tkiva; djeca; adolescenti; Hrvatska