

Traumatic dental injuries in primary teeth: severity and related factors observed at a specialist treatment centre in Brazil

V. P. P. Costa · A. D. Bertoldi · E. Z. Baldissera ·
M. L. Goettems · M. B. Correa · D. D. Torriani

Received: 15 March 2013 / Accepted: 27 June 2013
© European Academy of Paediatric Dentistry 2013

Abstract

Aim This retrospective study aimed to analyse demographic data and the severity of traumatic dental injuries (TDIs) to the primary dentition based on children's dental records at a university clinic.

Study design A cross-sectional retrospective study.

Methods The records of all patients were analysed according to gender, age, aetiology, teeth involved, number of affected teeth, place of occurrence, witness to the trauma, time elapsed between trauma occurrence and care-seeking, type of trauma and severity of injury.

Results A total of 576 children aged 8–89 months suffered injuries to 1,043 teeth. Severe injuries were the most prevalent (45.5 %). These occurred at all ages, but their frequency was higher in children aged between 13 and 24 months. The prevalence of mild injury was higher when

the cause was a fall from one's own height. No differences were detected in severity according to the place of occurrence and witnesses of the accident. The prevalence of severe injury was higher in cases where three or more teeth were involved.

Conclusions In this specialist treatment centre, severe injuries were the most common TDIs, which occurred in children aged 13–24 months, mainly due to falls and most occurred at home. Professionals must be prepared to deliver the best and most efficient care to this population.

Keywords Tooth injuries · Cross-sectional studies · Primary teeth · Dental records

Introduction

In the last 10 years, a number of Brazilian studies have investigated the prevalence of traumatic dental injuries (TDIs) in the primary dentition. This increased interest of clinicians and researchers is probably due to a high prevalence of TDIs in primary teeth (Bonini et al. 2009; Wendt et al. 2010; Viegas et al. 2010), in addition to its high potential to cause sequelae in primary (Borun and Andreasen 1998; Cardoso and Carvalho Rocha 2002) and permanent dentitions (Sandalli et al. 2005; Jácomo and Campos 2009).

Many studies have analysed TDIs and their associated factors. However, few of these factors are well established in the literature, such as the occurrence of injuries predominantly in the anterior teeth (Cunha et al. 2001; Choi et al. 2010), a higher incidence in boys (Eyuboglu et al. 2009; Choi et al. 2010), and falls as the main cause of TDIs (Eyuboglu et al. 2009). Regarding the type of dental trauma, TDIs involving hard tissue prevail in population

V. P. P. Costa
Post-Graduate Program in Dentistry, School of Dentistry,
Federal University of Pelotas, Pelotas, RS, Brazil

A. D. Bertoldi
Post-Graduate Program in Epidemiology, School of Medicine,
Federal University of Pelotas, Pelotas, RS, Brazil

E. Z. Baldissera
Department of Semiology and Clinic, School of Dentistry,
Federal University of Pelotas, Pelotas, Brazil

M. L. Goettems · D. D. Torriani (✉)
Department of Social and Preventive Dentistry, School of
Dentistry, Federal University of Pelotas, Rua Gonçalves Chaves
457, 4° andar, Pelotas, RS CEP 96015-560, Brazil
e-mail: dionedt@gmail.com

M. B. Correa
Department of Restorative Dentistry, School of Dentistry,
Federal University of Pelotas, Pelotas, RS, Brazil

studies (Hargreaves et al. 1999; Kramer et al. 2003; Wendt et al. 2010), whereas TDIs to supporting tissue are most common in studies based on health services and private clinic sources (Kirzioglu et al. 2005; Avsar and Tapaloglu 2009).

Nevertheless, the level of severity of primary tooth injuries has been poorly investigated in the primary dentition (Oikarinen and Kassila 1987; Schatz and Joho 1994; Glendor et al. 1996). However, it is important to identify the factors associated with trauma severity of primary tooth injuries. According to the degree of severity, treatment becomes more complex or specialised staff for diagnosis and follow-up examinations are required (Oikarinen and Kassila 1987; Rasmusson and Koch 2010). In addition, economic consequences in the community can vary according to the level of severity of the injury, and it is important to determine the incidence of different types of injuries (Glendor et al. 1996). This knowledge could support the training of professionals to address different trauma situations, especially those that are the most severe.

This study analysed data from dental records of children with TDIs in the primary dentition who were cared for at a university clinic. Data were analysed according to the severity of injury and related factors, such as demographic and aetiological data, place of occurrence, teeth involved, number of affected teeth, witness to the trauma, and time elapsed between trauma and dental care.

Materials and methods

Study design

This cross-sectional study was carried out based on records of all patients of 0–7 years treated for different dental injuries at the Centre of Studies and Treatment of Traumatic Dental Injuries in Primary Dentition (NETRAD is the acronym in Portuguese) for a 9-year period (May 2002–July 2011). This service is connected to the Paediatric Dentistry Clinic of the School of Dentistry of the Federal University of Pelotas, southern Brazil. This clinic provides access, treatment, and follow-up assistance for TDIs in primary dentition, until the eruption of permanent teeth, as recommended by the International Association of Dental Traumatology (IADT) Guidelines (Flores et al. 2001, 2007).

Data collection

Data were collected from NETRAD records. Information gathered from the patients' records included age, gender, cause, place of occurrence, witness to the injury, number of affected teeth, teeth involved, time elapsed between the

trauma occurrence and care-seeking, type of TDI [classified according to Andreasen and Andreasen's (2001) criteria], and injury severity. The injuries were classified as mild, moderate, and severe (Oikarinen and Kassila 1987). Mild injuries included subluxation, concussion, enamel fracture, and enamel–dentine fracture. Moderate injuries included lateral luxation, extrusion and enamel–dentine–pulp fracture. Serious injuries included avulsion, intrusion, crown root fracture, and root fracture. When two or more types of TDIs were present in the same children, the most severe injury was considered. In this study, the term “serious” was changed to “severe” to comply with other studies (Skaare and Jacobsen 2005; Rasmusson and Koch 2010).

Data analysis

Data were entered twice into the EpiInfo 6.04 statistical software package and checked for consistency. Statistical analyses were performed using Stata 11.0 (Stata Corp. LP, College Station, TX, USA). Data analysis included descriptive statistics, such as frequency distribution and cross-tabulation. Statistical significance for association was determined using the Chi-square test. The level of significance was set at 5 %.

Ethical considerations

The parents or caregivers were asked to sign an informed consent agreement prior to initiating clinical activities, where they agreed that children's data could be used in future research. The study was approved by the local Human Research Ethics Committee (Protocol 187/2011). Children received full dental treatment.

Results

Of the 707 records of children who sought assistance during the studied period, 131 records were excluded for at least one or more of the following reasons: incomplete documentation (51), diagnoses other than TDIs (47), and TDIs in permanent teeth (6). Twenty-seven children showed only soft tissue trauma, and therefore, were not classified according to severity. Consequently, a total of 576 records from children with TDIs in primary dentition were analysed.

Table 1 shows the distribution of severity, according to factors related to trauma. Severe injuries were the most prevalent (45.5 %), followed by mild injuries (33.7 %). This occurred for all ages, but the frequency was higher in children aged 13–24 months. The prevalence of mild injury was higher when the cause was falling from one's own

Table 1 Distribution of children by severity of TDIs and independent variables

| | TDI severity | | | <i>p</i> |
|----------------------|----------------------|--------------------------|------------------------|----------|
| | Mild <i>n</i> (%) | Moderate <i>n</i> (%) | Severe <i>n</i> (%) | |
| Total | 194 (33.7) | 120 (20.8) | 262 (45.5) | |
| Age (months) | | | | |
| 0–12 | 6 (37.5) | 4 (25.0) | 6 (37.5) | <0.001 |
| 13–24 | 37 (34.9) | 14 (13.2) | 55 (51.9) | |
| 25–36 | 50 (35.0) | 29 (20.2) | 64 (44.8) | |
| 37–48 | 41 (31.0) | 36 (27.3) | 55 (41.7) | |
| 49–60 | 33 (35.9) | 23 (25.0) | 36 (39.1) | |
| >60 | 27 (31.0) | 14 (16.1) | 46 (52.9) | |
| Gender | | | | |
| Male | 116 (33.9) | 78 (22.8) | 148 (43.3) | 0.281 |
| Female | 78 (33.3) | 42 (18.0) | 114 (48.7) | |
| Cause** | | | | |
| Fall from own height | 84 (36.4) | 47 (20.3) | 100 (43.3) | 0.002 |
| Fall from height | 56 (32.4) | 35 (20.2) | 82 (47.4) | |
| Collision | 35 (31.2) | 25 (22.3) | 52 (46.5) | |
| Traffic/others | 13 (28.9) | 12 (26.7) | 20 (44.4) | |
| Place of occurrence* | | | | |
| Home | 92 (33.8) | 59 (21.7) | 121 (44.5) | 0.779 |
| School | 13 (48.1) | 4 (14.8) | 10 (37.0) | |
| Street | 29 (33.7) | 20 (23.2) | 37 (43.1) | |
| Other | 25 (36.2) | 14 (20.3) | 30 (43.5) | |
| TDI witness** | | | | |
| Mother | 49 (33.3) | 26 (17.7) | 72 (49.0) | 0.870 |
| Other caregiver | 48 (28.6) | 40 (23.8) | 80 (47.6) | |
| No one | 12 (25.5) | 7 (14.9) | 28 (59.6) | |
| No. of teeth | | | | |
| 1 | 81 (31.4) | 59 (22.9) | 118 (45.7) | <0.001 |
| 2 | 95 (39.6) | 44 (18.3) | 101 (42.1) | |
| ≥3 | 18 (23.1) | 17 (21.8) | 43 (55.1) | |
| Time care-seeking** | | | | |
| Until 24 h | 57 (21.3) | 71 (26.6) | 139 (52.1) | <0.001 |
| 1–2 days | 16 (29.6) | 11 (20.4) | 27 (50.0) | |
| Until 30 days | 67 (50.4) | 24 (18.0) | 42 (31.6) | |
| ≥31 days | 49 (48.0) | 14 (13.8) | 39 (38.2) | |

NETRAD, Pelotas, Brazil (*n* = 576* children)

* Twenty-seven children presented with only soft tissues lesions

** Values less than 576 are due to missing information

height, walking, or running, whereas the prevalence of severe injury was higher when the causes were falling from height and falling off furniture (e.g., bed or sofa). No differences were detected in severity according to the place of occurrence and witness of the accident. The number of teeth involved was associated with severity: the prevalence

of severe injury was higher in cases where three or more teeth were involved. Time taken to attend for care was lower for children with severe injuries than for children with moderate and mild injuries.

The total number of traumatised teeth was 1,043 and 77.8 % of injuries involved upper central incisors. Injuries to supporting tissue were the most frequent type of TDI, occurring in a total of 814 teeth. Subluxation (21.8 %) was the most common injury, followed by avulsion (15.5 %), and intrusion (15.0 %). There were fewer injuries to hard tissue (229), with the most prevalent being enamel fractures (8.9 %), followed by enamel-dentine fractures (7.3 %, Table 2).

Discussion

Retrospective studies provide a realistic view of services, allowing the training of future professionals to develop the necessary knowledge to handle any type of injury. Few studies have performed TDI analyses using an injury severity classification. The injury profile could be important when preparing professionals and services to treat TDIs. In this study, the classification of Oikarinen and Kassila (1987) was used. This classification divided the injuries according to their severity to describe the need for treatment. Mild injuries were those that did not require active therapy, except for restoring the fractured crown and/or regular follow-up examinations. Moderate injuries required immobilisation and/or some degree of pulp treatment. Serious injuries were those that could be considered to require specially trained staff for immediate treatment, and for the diagnosis and treatment of later complications.

Severe injuries were the most prevalent (45.5 %) in the present study. The study of Oikarinen and Kassila (1987) in the Helsinki Health Center Oral Surgery Clinic found that among children up to 7 years, the prevalence of mild injuries was 66 %, that of moderate injuries was 17 % and that of severe injuries was 17 %. This finding differs from that of Skaare and Jacobsen (2005), who found that mild injuries, such as concussion and subluxation, represented 59 % of all diagnoses, whereas severe traumas represented 22 %. This difference can be explained by the fact that the present study was performed in a specialised care centre where more serious cases are referred to, whereas the study by Skaare and Jacobsen (2005) examined the general children population of Norway.

In children's earlier years, developmental milestones and stages of growth are associated with risks of injury (Needleman 2011). The present study showed a considerable increase in injuries, especially severe injuries, when children began to walk (13 months onwards) and when they started to run, jump, and climb stairs (25 months

Table 2 Distribution of teeth according to the type of trauma

| Severity level | TDI type | Total <i>n</i> (%) | Molars <i>n</i> (%) | Canines <i>n</i> (%) | Lower incisors <i>n</i> (%) | Upper central incisors <i>n</i> (%) | Upper lateral incisors <i>n</i> (%) |
|----------------|---------------|-----------------------|------------------------|-------------------------|--------------------------------|--|--|
| Total | | 1,043 (100) | 12 (1.2) | 20 (1.9) | 40 (3.8) | 812 (77.8) | 159 (15.3) |
| Mild | E fracture | 93 (8.9) | 2 (16.7) | – | 1 (2.5) | 72 (8.9) | 18 (11.3) |
| | ED fracture | 76 (7.3) | 3 (25.0) | 1 (5.0) | 1 (2.5) | 61 (7.5) | 10 (6.3) |
| | Concussion | 88 (8.4) | – | 4 (20.0) | 1 (2.5) | 62 (7.6) | 21 (13.2) |
| | Subluxation | 227 (21.8) | – | 1 (5.0) | 18 (45.0) | 183 (22.5) | 25 (15.8) |
| Moderate | EDP fracture | 29 (2.8) | 1 (8.2) | – | – | 26 (3.2) | 2 (1.2) |
| | L luxation | 135 (13.0) | 2 (16.7) | 2 (10.0) | 3 (7.5) | 97 (11.9) | 31 (19.6) |
| | Extrusion | 45 (4.3) | – | – | 3 (7.5) | 34 (4.2) | 8 (5.0) |
| Severe | Intrusion | 157 (15.0) | – | – | 1 (2.5) | 134 (16.5) | 22 (13.8) |
| | Avulsion | 162 (15.5) | 2 (16.7) | 12 (60.0) | 11 (27.5) | 117 (14.4) | 20 (12.6) |
| | CR fracture | 25 (2.4) | 2 (16.7) | – | – | 21 (2.5) | 2 (1.2) |
| | Root fracture | 6 (0.6) | – | – | 1 (2.5) | 5 (0.6) | – |

NETRAD, Pelotas, Brazil (*n* = 1,043 teeth)

E enamel, D dentine, P pulp, CR crown root, L lateral

p < 0.001

onwards). These are the times when children begin to explore their environment more actively. However, there is limited coordination of movements. Additionally, they show great curiosity at this stage, although they lack judgment and the ability to recognise hazards (Flavin et al. 2006). Skaare and Jacobsen (2005) stated that the energy of an impact that causes a severe injury may reflect the time when the child starts running or exploring his/her surroundings without the necessary coordination, which may increase the risk of severe trauma.

In our study, there was no significant sex difference in TDIs, despite the fact that boys had a higher number of injuries. Morrongiello et al. (2004) found that boys were more likely to engage in behaviour that resulted in injury to their heads than girls, suggesting that either their misbehaviour or physical activities made them more prone to potentially severe injuries. However, in the present study, girls had a higher proportion of severe injuries, although this difference was not significant. This finding may be because boys' and girls' activities are currently not much different (Jácomo and Campos 2009).

Falls are the most frequent cause of injury in children. In the present study, falling from one's own height was the most prevalent aetiology in severe injuries. Severity was associated with the cause of TDI.

The present study showed that the majority of injuries occurred at home, which is in agreement with other studies (Morrongiello et al. 2004; Schatz and Joho 1994; Choi et al. 2010). Injuries did not occur frequently at school, and those that did occur were mostly mild. This finding can be explained by the fact that children are supervised constantly, and their behaviour with respect to games or sports is more

restricted at school. The low frequency of injuries in school may also be accounted for by the fact that most children in this sample are not likely to have started school yet. An investigation should be performed to determine whether children's freedom at home is associated with the severity of TDIs because educational measures could be implemented so that household caregivers could prevent TDIs.

In the present study, witnesses of children's TDIs were investigated, because these persons play an important part in injury prevention. Although healthy children should be able to move independently and overprotection is not recommended, this freedom may be questionable when children face risky situations. Adults should be advised to provide children with appropriate supervision for each age. This is especially true for small children, where the ideal supervision is that which keeps the child "within both sight and reach" (Flavin et al. 2006), because accidents happen owing to reduced parental supervision and not because of household hazards (Alwash and McCarthy 1988).

In this study, most children were referred to NETRAD during the first days of injury, similar to findings in other studies (Shayegan et al. 2007; Cardoso and Carvalho Rocha 2002; Kirzioglu et al. 2005; DeAmorim et al. 2011). A high percentage of children sought care within 48 h after trauma occurrence. This behaviour can be explained by the fact that trauma involves bleeding, swelling, haematoma, dental displacement, or occlusion interference (Andreasen and Andreasen 2001; De Jesus et al. 2010), which frightens the family, encouraging them to search for immediate assistance (Cardoso and Carvalho Rocha 2002). Aldrigui et al. (2011) showed that the presence of complicated TDIs was associated with a negative impact on oral health-

related quality of life in children aged between 2 and 5 years. This was probably due to symptoms that are frequently related to TDI complications, such as pain, irritation, and difficulty in eating. In addition, severe injuries require immediate treatment, often involving complex procedures and a long follow-up period.

A great number of the children who experienced severe dental injuries in the present study had TDIs involving three or more teeth, similar to other studies (Osuji 1996; Shayegan et al. 2007). The maxillary central incisors were more frequently traumatised in our study, which is consistent with previous findings (Schatz and Joho 1994; Osuji 1996). This finding was related to the vulnerable position of the maxillary central incisors in the arch (Saroglu and Sönmez 2002) and/or overjet presence, a common condition in primary dentition due to pacifier use. Importantly, affected canines suffer avulsion. This can be considered a developmental problem because these teeth are important for occlusion and their absence in small children can cause orthodontic problems. In the present study, children also showed fractured molars, and this suggests the importance of a careful clinical examination of the entire mouth and the intra- and extra-oral regions.

The majority of TDIs involved injuries in supporting tissue. These injuries, which involve displacement or tooth loss, are characterised as severe. Injuries in primary dentition usually consist of luxations because of the presence of immature supporting structures and the resilience of the bone surrounding the teeth (Kirzioglu et al. 2005). The elastic nature of the bone tends to cause tooth displacement rather than crown or root fractures (Oikarinen and Kassila 1987).

This study has some limitations. Some of the data were lost because patients did not attend follow-up visits, or contact was lost because of address and phone number changes. However, this rate of loss was low and a large number of children were followed-up. In addition, information about the treatment required, the treatment provided, or the outcome with respect to periodontal or pulpal healing, or tooth survival, was not collected because the main objective was to assess differences in types of injuries, severity level, and related factors.

Conclusions

In this specialist treatment centre, we conclude that severe TDIs were the most common type of TDI affecting children of all ages, especially those aged 13–24 months. The most prevalent cause of TDIs was falls from height. Most of these injuries occurred at home. Three or more teeth were predominantly involved. The high occurrence of injuries classified as severe requires attention because of the possible physical and psychological implications, and

because severe injuries may demand specially trained staff for immediate treatment and for the diagnosis and treatment of later complications.

Acknowledgments Vanessa Polina Pereira Costa received support from CAPES (Brazilian Council for Improvement of Research).

Conflict of interest The authors declare that they have no conflicts of interest.

References

- Aldrigui JM, Abanto J, Carvalho TS, et al. Impact of traumatic dental injuries and malocclusions on quality of life of young children. *Health Qual Life Outcomes*. 2011;9:78.
- Alwash R, McCarthy M. Measuring severity of injuries to children from home accidents. *Arch Dis Child*. 1988;63:635–8.
- Andreasen JO, Andreasen FM. Textbook and color atlas of traumatic injuries to the teeth. 3rd ed. pp. 151–180 Copenhagen: Blackwell Munksgaard; 2001.
- Avsar A, Tapaloglu B. Traumatic tooth injuries to primary teeth of children aged 0–3 years. *Dent Traumatol*. 2009;25:323–7.
- Bonini GAVC, Marcenes W, Butini L, et al. Trends in the prevalence of traumatic dental injuries in Brazilian preschool children. *Dent Traumatol*. 2009;25:594–8.
- Borun MK, Andreasen JO. Sequelae of trauma to primary maxillary incisors I. Complications in the primary dentition. *Endod Dent Traumatol*. 1998;14:31–44.
- Cardoso M, Carvalho Rocha MJ. Traumatized primary teeth in children assisted at the Federal University of Santa Catarina, Brazil. *Dent Traumatol*. 2002;18:129–33.
- Choi SC, Park JH, Pae A, et al. Retrospective study on traumatic dental injuries in preschool children at Kyung Hee Dental Hospital, Seoul, South Korea. *Dent Traumatol*. 2010;26:70–5.
- Cunha RF, Pugliesi DMC, Vieira AEM. Oral trauma in Brazilian patients aged 0–3 years. *Dent Traumatol*. 2001;17:210–2.
- De Jesus MA, Antunes LAA, Risso PA, et al. Epidemiologic survey of traumatic dental in children seen at the Federal University of Rio de Janeiro, Brazil. *Braz Oral Res*. 2010;24:89–94.
- DeAmorim LFG, Costa LRRS, Estrela C. Retrospective study of traumatic dental injuries in primary teeth in a Brazilian specialized pediatric practice. *Dent Traumatol*. 2011;22:368–73.
- Eyuboglu O, Yilmaz Y, Zehir C, et al. A 6-year investigation into types of dental trauma treated in a paediatric dentistry clinic in Eastern Anatolia Region, Turkey. *Dent Traumatol*. 2009;25:110–4.
- Flavin MP, Dostaler SM, Simpson K, et al. Stages of development and injury patterns in the early years: a population-based analysis. *BMC Public Health*. 2006;6:187–97.
- Flores MT, Andreasen JO, Bakland LK, et al. Guidelines for the evaluation and management of traumatic dental injuries. *Dent Traumatol*. 2001;17:49–52.
- Flores MT, Malmegren B, Anderson L, et al. Guidelines for the management of traumatic dental injuries III. Primary teeth. *Dent Traumatol*. 2007;23:196–202.
- Glendor U, Halling A, Andersson L, et al. Incidence of traumatic tooth injuries in children and adolescents in the county of Vastmanland, Sweden. *Swed Dent J*. 1996;20:15–28.
- Hargreaves JA, Cleaton-Jones PE, Roberts GJ, et al. Trauma to primary teeth of South African pre-school children. *Endod Dent Traumatol*. 1999;15:73–6.
- Jácomo DRES, Campos V. Prevalence of sequelae in the permanent anterior teeth after trauma in their predecessors: a longitudinal study of 8 years. *Dent Traumatol*. 2009;25:300–4.

- Kirzioglu Z, Hüseyin K, Ertürk MSO, et al. Epidemiology of traumatized primary teeth in the west-Mediterranean region of Turkey. *Int Dent J*. 2005;55:329–33.
- Kramer PF, Zembruski C, Ferreira SH, et al. Traumatic dental injuries in Brazilian preschool children. *Dent Traumatol*. 2003;19:299–303.
- Morrongiello BA, Ondejko L, Littlejohn A. Understanding toddlers' in-home injuries: I. Context, correlates, and determinants. *J Pediatr Psychol*. 2004;29:415–31.
- Needleman HL. The art and science of managing traumatic injuries to primary teeth. *Dent Traumatol*. 2011;27:295–9.
- Oikarinen K, Kassila O. Causes and types of traumatic tooth injuries treated in a public dental health clinic. *Endod Dent Traumatol*. 1987;3:172–7.
- Osuji OO. Traumatized primary teeth in Nigerian children attending university hospital: the consequences of delays in seeking treatment. *Int Dent J*. 1996;46:165–70.
- Rasmusson CG, Koch G. Assessment of traumatic injuries to primary teeth in general practise and specialized paediatric dentistry. *Dent Traumatol*. 2010;26:129–32.
- Sandalli N, Cildir S, Guler N. Clinical investigation of traumatic injuries in Yeditepe University, Turkey during the last 3 years. *Dent Traumatol*. 2005;21:188–94.
- Saroglu I, Sönmez H. The prevalence of traumatic injuries treated in the pedodontic clinic of Ankara University, Turkey, during 18 months. *Dent Traumatol*. 2002;18:299–303.
- Schatz JP, Joho JP. A retrospective study of dentoalveolar injuries. *Endod Dent Traumatol*. 1994;10:11–2.
- Shayegan A, Maertelaer V, Abbeele AV. The prevalence of traumatic dental injuries: a 24-month survey. *J Dent Child*. 2007;74:194–9.
- Skaare AB, Jacobsen I. Primary tooth injuries in Norwegian children (1–8 years). *Dent Traumatol*. 2005;21:315–9.
- Viegas CM, Scarpelli AC, Carvalho AC, et al. Predisposing factors for traumatic dental injuries in Brazilian preschool children. *Eur J Paediatr Dent*. 2010;11:59–65.
- Wendt FP, Torriani DD, Assunção MCF, et al. Traumatic dental injuries in primary dentition: epidemiological study among preschool children in South Brazil. *Dent Traumatol*. 2010;26:168–73.