Predisposing factors for traumatic dental injuries in Brazilian preschool children

ABSTRACT

The aim of the present study was to assess the prevalence of traumatic dental injury (TDI) in primary teeth and determine predisposing factors.

Methods A cross-sectional study was carried out on 388 male and female Brazilian preschool children between 60 and 71 months of age. A questionnaire addressing demographic data and history of TDI was sent to parents/caregivers. Socioeconomic status was determined using the Social Vulnerability Index (SVI), family income, number of people in the household and parents/caregivers’ schooling. The chi-square test was used for the statistical analysis.

Results The prevalence of TDI was 62.1%; 61.7% of the teeth were affected by enamel fracture. Statistically significant associations were found between TDI and increased overjet (OR = 2.24, 95% CI = 1.11-4.55) and anterior crossbite (OR = 0.38, 95% CI=0.17-0.87). No statistically significant associations were found between TDI and number of people in the household, family income, social vulnerability, parents/caregivers’ schooling, lip competence, overbite, anterior open bite and dental caries (p>0.05).

Conclusion The prevalence of TDI was high and enamel fracture was the most common sign of TDI. Children with an increased overjet suffer more TDIs. Socioeconomic factors had no influence over the prevalence of TDI.

Keywords: tooth injuries, prevalence, primary teeth, socioeconomic factors.

Introduction

Traumatic dental injury (TDI) is an injury to teeth or in the oral cavity caused by an external impact on the teeth and surrounding tissues [Lam et al., 2008; Ferreira et al., 2009]. TDI usually occurs suddenly, circumstantially and most often requires urgent care [Lam et al., 2008]. TDI is considered a serious health problem, especially in children [Cardoso and de Carvalho Rocha, 2002]. The most affected teeth are the upper anterior teeth, causing physical, aesthetic and psychological problems in children and their parents [Cardoso and de Carvalho Rocha, 2002; Saroğlu and Sönmez, 2002]. TDI in the primary dentition causes pain and loss of function and can affect the development and eruption of the permanent successors [Bijella et al., 1990; Carvalho et al., 1998; Skaare and Jacobsen, 2005; Robson et al., 2009]. Few studies have investigated the prevalence of TDI and associated factors in preschool children [Garcia-Godoy et al., 1987; Llarena del Rosario et al., 1992; Oliveira et al., 2007]. Epidemiological studies are needed in order to understand the complex epidemiology of TDI and enable the implementation of strategies for reducing the frequency of this event [Kramer et al., 2003]. There is no agreement on the prevalence of TDI [Beltrão et al., 2007]. According to epidemiological data in different countries and populations, the prevalence of TDI in primary teeth ranges from 9.4% to 71.4% [Zadik, 1976; Bijella et al., 1990; Jones et al., 1993; Jones and Nunn, 1995; Carvalho et al., 1998; Al-Majed et al., 2001; Cardoso and de Carvalho Rocha, 2002; Kramer et al., 2003; Oliveira et al., 2007; Jorge et al., 2009; Robson et al., 2009]. Comparisons between studies should be performed with caution due to lack of uniformity in the samples, clinical diagnostic criteria and age groups [Oliveira et al., 2007]. Predisposing biological factors for TDI include increased overjet and inadequate lip coverage [Robson et al., 2009]. Moreover, the association between TDI and socioeconomic indicators remains unclear [Oliveira et al., 2007].

The aim of the present study was to evaluate the prevalence of TDI in primary teeth and predisposing factors in preschool children of Belo Horizonte, Brazil.

Methods

The study received approval from the Ethics Committee of the Federal University of Minas Gerais, Brazil. Prior to data collection, parents/caregivers agreed to participate and allow the participation of children by signing an informed consent.

Study design and sample characteristics A cross-sectional survey was carried out in the city of Belo Horizonte, Brazil, which has an optimal level of fluoride in the public water supply (0.6 to 0.85 ppm). The sample was made up of 388 male and female preschool children between 60 and 71 months of age. Since TDI is an irreversible and cumulative condition, the 5-year-old age group was chosen as this is an age group with a higher possibility of occurrences of TDI. Moreover, the replacement of primary teeth with permanent teeth begins after five years of age and the focus of the present study was not related to permanent teeth.

The sample size was calculated to give a standard error of 5.06%. A 95% confidence interval level and the prevalence of TDI from a pilot study (50.6%) were used for the calculation. The minimal sample size was estimated as 375 children. In order to compensate for possible losses during the survey, the sample size was increased by 10%, totalling 413 children. Three hundred eighty-eight children were examined. The sample size was larger than minimum due to the excellent response rate (93.95%).
The subjects were randomly selected using a two-stage sampling method. The first stage was the randomization of preschools and day care centres and the second was the randomization of the children. It should be stressed that the sample is representative of three of the nine administrative districts of Belo Horizonte.

Eligibility criteria
The inclusion criteria were the following: age ranging from 60 to 71 months; enrolment in preschool or day care centre; and absence of braces. The exclusion criterion was having four or more missing incisors due to caries or physiological exfoliation, as this would compromise the clinical diagnosis of TDI.

Pilot study
A pilot study was carried out involving 88 preschool children at a day care centre to test the methodology, the comprehension of the instruments and perform the calibration of the examiner. The children in the pilot study were not included in the main sample. The results of the pilot study revealed the need to make changes to the questionnaire in order to improve its understanding. Based on the report of the individuals tested, further questions were added to ensure the quality of data collected.

The calibration exercise consisted of two steps. The theoretical step involved a discussion of the criteria for the diagnosis of TDI and analysis of photographs. A specialist in paediatric dentistry (gold standard in this theoretical framework) coordinated this step, instructing two general dentists on how to perform the examination. The second step was the clinical step, in which the dentists examined eight previously selected children from 60 to 71 months of age. The dentist with the best degree of intra-examiner and inter-examiner agreement in the theoretical step was considered the gold standard in the clinical step. Inter-examiner agreement was tested comparing each examiner with the gold standard. The interval between evaluations of the pictures and the children for the determination of lip competence was categorized as lip covering teeth, lip competence with the mouth closed and lip not covering the teeth with the mouth closed.

Non-clinical data collection
A questionnaire addressing the history of TDI and demographic data (child’s birth date, child’s gender, parents/caregivers’ schooling, place of residence) was sent to the parents/caregivers. Socioeconomic status was determined using the Social Vulnerability Index (SVI), which was developed for the city of Belo Horizonte. This index measures the vulnerability of the population through the determination of neighbourhood infrastructure, access to work, income, sanitation services, healthcare services, education, legal assistance and public transportation [Nahas et al., 2000]. Each region of the city has a social exclusion value, which is divided into five classes. For the statistical tests, this variable was dichotomized as more vulnerable (classes I and II) and less vulnerable (classes III, VI and V). Residence address was used to classify the social vulnerability of the families. Other features were also used as socioeconomic indicators: monthly family income (categorized based on the minimum wage used in Brazil - one minimum wage is equal to US$258.33); number of people in the household (number of people living in the child’s home); and parents/caregivers’ schooling (categorised in years of study).

Clinical data collection
The clinical examination was performed after the return of the questionnaires. Exams were performed by a single dentist at the preschool or day care centre under natural light in the knee-to-knee position. The dentist used individual cross-infection protection equipment (cap, gloves, mask, tunic and uniform). packaged and sterilized mouth mirrors (PRISMA®, São Paulo, SP, Brazil), WHO probes (Golgran Ind. e Com. Ltda., São Paulo, SP, Brazil) and dental gauze were used for the examination. The criterion for the clinical diagnosis of TDI used was the classification proposed by Andreasen et al. [2007]: enamel fracture, enamel-dentin fracture, complicated crown fracture, extrusive luxation, lateral luxation, intrusive luxation and avulsion. A visual assessment of tooth discoloration was also performed. It should be stressed that the clinical diagnosis of TDI was based on the visual clinical exam alone; parents’/caregivers’ reports were not considered. The examiner used the WHO probe to measure overjet, which was categorized as less than or equal to 2 mm and greater than 2 mm [Grabowski et al., 2007]. Lip competence was evaluated before the clinical examination without the child noticing he/she was being observed. Lip competence was categorized as lip covering teeth with the mouth closed and lip not covering the teeth with the mouth closed.

Statistical analysis
Data analysis included descriptive statistics. Associations were tested using univariate analysis (chi-square test) between the independent variables and the outcome (TDI). The chi-square test was also used for independent observations. The level of significance was set at 5%. Data organisation and statistical analysis were carried out using the Statistical Package for Social Science (SPSS for Windows, version 15.0, SPSS Inc, Chicago, Ill., USA).

Results
Intra-examiner and inter-examiner agreement achieved Kappa values of 0.87 and higher. The frequency distribution of the preschool children according to socioeconomic and clinical data is displayed in Table 1.

Prevalence
The prevalence of TDI in primary teeth was 62.1% (241 children); 58.5% (141) in boys and 41.5% (100) in girls. There was no statistically significant difference in prevalence between boys and girls (p=0.294) (Table 2). Among the children with TDI experience, 119 (49.4%) had only one tooth affected and 122 (50.6%) had two or more teeth affected. The most frequently affected teeth were the maxillary central incisors (65.0%), followed by maxillary lateral incisors (30.4%), mandible lateral incisors
TRAUMATIC DENTAL INJURIES IN BRAZILIAN CHILDREN

TDI was significantly related to the presence of increased overjet. Children with overjet greater than 2 mm had twice as many TDIs in the primary teeth than children with normal overjet [OR = 2.24, 95% CI = 1.11-4.55] (Table 2). Moreover, the presence of anterior crossbite appeared to be a protective factor against the occurrence of TDI [OR = 0.38, 95% CI=0.17-0.87] (Table 2).

TDI history
The prevalence of TDI was significantly different when reported by the parents/caregivers (28.9%) from that determined by the clinical examination (p<0.000). Among children who had the TDI reported by parents/caregivers 83.9% had a clinical diagnosis of TDI. Moreover, 147 (61.0%) of the 241 children with a clinical diagnosis of TDI had no traumatic episode reported by their parents/caregivers. The severity of the TDI affects the perception of caregivers and consequently their reports of its occurrence (p<0.000). Parents/caregivers reported the occurrence of TDI more often when it was more severe (enamel-dentin fracture, avulsion, luxation, different signs of TDI in the same tooth).

Among the cases in which parents/caregivers reported a history of TDI, in most cases (26.8%), the traumatic event occurred when the child was 4 years old. The home was the most frequent place of occurrence among the cases in which parents/caregivers reported a history of TDI (71.4%), followed by school (18.8%). The most common event cited by parents/caregivers as the cause of TDI was falling (80.4%), followed by collision (9.8%) (Table 3).

Among the 112 children whose parents/caregivers reported a history of TDI, only 46.4% (52 children) received dental care for the TDI. Access to treatment as a result of TDI was influenced by family income [OR = 3.5, 95% CI=1.51-8.29], number of people in the household [OR = 2.5, 95% CI=1.07-5.77] and parents/caregivers' schooling [OR = 2.9, 95% CI=1.23-6.59] (Table 4).

Discussion
The prevalence of TDI in this study (62.1%) was greater than that of other studies carried out in Brazil, in which the prevalence of TDI in primary teeth ranges from 9.4% to 41.6% [Bijella et al., 1990; Mestrinho et al., 1998; Kramer et al., 2003; Granville-Garcia et al., 2006; Beltrão et al., 2007; Oliveira et al., 2007; Ferreira et al., 2009; Jorge et al., 2009; Robson et al., 2009]> 3 minimum wages 119 30.7
≤ 3 minimum wages 269 69.3

Social Vulnerability Index (SVI)
Less vulnerable 263 67.8
More vulnerable 125 32.2

Parents/caregivers' schooling
> 8 years of study 265 68.3
≤ 8 years of study 123 31.7

Lip competence
Present 326 84.0
Absent 62 16.0

Overjet
≤ 2 mm 340 87.6
> 2 mm 48 12.4

Anterior crossbite
Present 25 6.4
Absent 363 93.6

Anterior open bite
Present 31 8.0
Absent 357 92.0

Overbite
Present 79 20.4
Absent 309 79.6

Occurrence of dental caries
DMFT = 0 198 51.0
DMFT > 1 190 49.0

Dental caries (upper anterior teeth)
Present 73 18.8
Absent 315 81.2

Developmental defects of enamel
Present 156 40.2
Absent 232 59.8

Developmental defects of enamel (upper anterior teeth)
Present 62 16.0
Absent 326 84.0

TABLE 1 - Frequency distribution of preschool children according to socioeconomic and clinical data. Belo Horizonte, Brazil, 2009.
improve comparisons between the studies on the prevalence of TDI, authors should adopt standardized methods and diagnostic criteria. The difference in prevalence from other studies may be explained by the fact that TDI is a cumulative condition and the present sample was made up of older children (over five years old). Most other studies use samples comprising younger children or have a larger age range.

The present investigation found that boys and girls are equally affected by TDI (p=0.294), which corroborates some previous studies [Bijella et al.,1990; Cardoso and de Carvalho Rocha, 2002; Beltrão et al., 2007; Oliveira et al., 2007; Jorge et al., 2009]. However, other studies state that boys are more affected by TDI [Garcia-Godoy et al., 1987; Saroğlu and Sönmez, 2002; Sandalli et al., 2005; Skaare and Jacobsen, 2005; Granville-Garcia et al., 2006; Robson et al., 2009]. This may be explained by the fact that boys participate more often in aggressive games with more physical contact [Saroğlu and Sönmez, 2002]. However, differences in the age range of the children may influence the prevalence of TDI between the genders [Jorge et al., 2009].

![Table 2: Frequency distribution of preschool children according to independent variables and clinical diagnosis of TDI in primary teeth. Belo Horizonte, Brazil, 2009.](image)

**Table 2**: Frequency distribution of preschool children according to independent variables and clinical diagnosis of TDI in primary teeth. Belo Horizonte, Brazil, 2009.

Variables | TDI No (%) | TDI Yes (%) | Total (100%) | P-value* | OR [IC 95%]
--- | --- | --- | --- | --- | ---
Gender of child | | | | | |
Male | 78 (35.6) | 141 (64.4) | 219 | 0.294 | 0.80
Female | 69 (40.8) | 100 (59.2) | 169 | [0.53 - 1.21]
Number of people in the household | | | | | |
≤ 4 people | 93 (35.8) | 167 (64.2) | 260 | 0.220 | 0.76
≥ 5 people | 54 (42.2) | 74 (57.8) | 128 | [0.49 - 1.18]
Family income | | | | | |
< 3 minimum wages | 42 (35.3) | 77 (64.7) | 119 | 0.484 | 0.85
≥ 3 minimum wages | 105 (39.0) | 164 (61.0) | 269 | [0.54 - 1.33]
Social Vulnerability Index (SVI) | | | | | |
Less vulnerable | 101 (38.4) | 162 (61.6) | 263 | 0.761 | 1.07
More vulnerable | 46 (36.8) | 79 (63.2) | 125 | [0.69 - 1.66]
Parents/caregivers’ schooling | | | | | |
> 8 years of study | 97 (36.6) | 168 (63.4) | 265 | 0.445 | 0.84
≤ 8 years of study | 50 (40.7) | 73 (59.3) | 123 | [0.54 - 1.31]
Lip competence | | | | | |
Present | 127 (39.0) | 199 (61.0) | 326 | 0.319 | 1.34
Absent | 20 (32.3) | 42 (67.7) | 62 | [0.75 - 2.39]
Overjet | | | | | |
≤ 2 mm | 136 (40.0) | 204 (60.0) | 340 | 0.022 | 2.24
> 2 mm | 11 (22.9) | 37 (77.1) | 48 | [1.11 - 4.55]
Anterior crossbite | | | | | |
Present | 15 (60.0) | 10 (40.0) | 25 | 0.018 | 0.38
Absent | 122 (36.4) | 231 (63.6) | 363 | [0.17 - 0.87]
Anterior open bite | | | | | |
Present | 10 (32.3) | 21 (67.7) | 31 | 0.501 | 1.31
Absent | 137 (38.4) | 220 (61.6) | 357 | [0.60 - 2.86]
Overbite | | | | | |
Present | 28 (35.4) | 51 (64.6) | 79 | 0.616 | 1.14
Absent | 119 (38.5) | 190 (61.5) | 309 | [0.68 - 1.91]
Occurrence of dental caries | | | | | |
DMFT = 0 | 75 (37.9) | 123 (62.1) | 198 | 0.997 | 1.00
DMFT > 1 | 72 (37.9) | 118 (62.1) | 190 | [0.66 - 1.51]
Dental caries (upper anterior teeth) | | | | | |
Present | 27 (37.0) | 46 (63.0) | 73 | 0.860 | 1.05
Absent | 120 (38.1) | 195 (61.9) | 315 | [0.62 - 1.77]
Developmental defects of enamel | | | | | |
Present | 64 (41.0) | 92 (59.0) | 156 | 0.296 | 0.80
Absent | 83 (35.8) | 149 (64.2) | 232 | [0.53 - 1.21]
Developmental defects of enamel (upper anterior teeth) | | | | | |
Present | 30 (48.4) | 32 (51.6) | 62 | 0.063 | 0.60
Absent | 117 (35.9) | 209 (64.1) | 326 | [0.35 - 1.03]

*Chi-squared test. Bold type denotes significant results at 5% level.
ground during falls and are the first affected in cases in which a person is hit by an object [Lam et al., 2008]. Thus, the most affected teeth by TDI in the present investigation as well as other studies are the maxillary central incisors [Bijella et al., 1990; Fried et al., 1996; Osuji, 1996; Mestrinho et al., 1998; Cardoso and de Carvalho Rocha, 2002; Saroğuğlu and Sönmez, 2002; Kramer et al., 2003; Sandalli et al., 2005; Skaare and Jacobsen, 2005; Beltrão et al., 2007; Oliveira et al., 2007; Lam et al., 2008; Ferreira et al., 2009; Jorge et al., 2009; Robson et al., 2009].

Enamel fracture (61.7%) was the most frequent TDI, which is in agreement with results found in the literature [Kramer et al., 2003; Granville-Garcia et al., 2006; Beltrão et al., 2007; Oliveira et al., 2007; Jorge et al., 2009; Robson et al., 2009]. As these are retrospective studies, some signs of TDI may not be present on the day of the exam. A number of studies report that the most prevalent sign of TDI in primary teeth is luxation [Bijella et al., 1990; Llarena del Rosario et al., 1992; Osuji, 1996; Borsén and Holm, 1997; Cardoso and de Carvalho Rocha, 2002; Saroğuğlu and Sönmez, 2002; Skaare and Jacobsen, 2005]. According to many authors, the higher prevalence of periodontal injuries over hard tissue injuries in the primary teeth is due to the greater elasticity and resilience of the

### TABLE 3 - Frequency distribution of preschool children according to independent variables of the parents/caregivers' report of TDI. Belo Horizonte, Brazil, 2009 (n = 112).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
</tr>
<tr>
<td>Age at time of TDI</td>
<td></td>
</tr>
<tr>
<td>Before 1 year</td>
<td>4 (3.6)</td>
</tr>
<tr>
<td>1 year</td>
<td>11 (9.8)</td>
</tr>
<tr>
<td>2 year</td>
<td>26 (23.2)</td>
</tr>
<tr>
<td>3 year</td>
<td>23 (20.5)</td>
</tr>
<tr>
<td>4 year</td>
<td>30 (26.8)</td>
</tr>
<tr>
<td>5 year</td>
<td>13 (11.6)</td>
</tr>
<tr>
<td>TDI recurrent</td>
<td>3 (2.7)</td>
</tr>
<tr>
<td>Don’t remember</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>Place of TDI</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>80 (71.4)</td>
</tr>
<tr>
<td>School</td>
<td>21 (18.8)</td>
</tr>
<tr>
<td>Other</td>
<td>9 (8.0)</td>
</tr>
<tr>
<td>Don’t remember</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>Cause of TDI</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>90 (80.4)</td>
</tr>
<tr>
<td>Collision</td>
<td>11 (9.3)</td>
</tr>
<tr>
<td>Other</td>
<td>9 (8.0)</td>
</tr>
<tr>
<td>Don’t remember</td>
<td>2 (1.8)</td>
</tr>
</tbody>
</table>

### TABLE 4 - Frequency distribution of preschool children according to independent variables and report of dental care for TDI in primary teeth. Belo Horizonte, Brazil, 2009.

<table>
<thead>
<tr>
<th>Variables</th>
<th>DENTAL CARE FOR TDI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (%)</td>
</tr>
<tr>
<td>Gender of child</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>42 (60.0)</td>
</tr>
<tr>
<td>Female</td>
<td>18 (42.9)</td>
</tr>
<tr>
<td>TDI</td>
<td></td>
</tr>
<tr>
<td>No TDI</td>
<td>11 (61.1)</td>
</tr>
<tr>
<td>Tooth discoloration</td>
<td>8 (53.3)</td>
</tr>
<tr>
<td>Enamel fracture</td>
<td>17 (53.1)</td>
</tr>
<tr>
<td>EDF, CCF, avulsion or luxation</td>
<td>7 (38.9)</td>
</tr>
<tr>
<td>2 types of TDI in the same tooth</td>
<td>13 (61.9)</td>
</tr>
<tr>
<td>3 or more types of TDI in the same tooth</td>
<td>4 (50.0)</td>
</tr>
<tr>
<td>Number of teeth affected by TDI</td>
<td></td>
</tr>
<tr>
<td>No TDI</td>
<td>11 (61.1)</td>
</tr>
<tr>
<td>1 tooth</td>
<td>23 (52.3)</td>
</tr>
<tr>
<td>2 or more teeth</td>
<td>26 (52.0)</td>
</tr>
<tr>
<td>Assessment of parents/caregivers on the child's oral health</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>38 (48.7)</td>
</tr>
<tr>
<td>Bad</td>
<td>22 (64.7)</td>
</tr>
<tr>
<td>Number of people in the household</td>
<td></td>
</tr>
<tr>
<td>≥ 4 people</td>
<td>36 (46.8)</td>
</tr>
<tr>
<td>5 or more people</td>
<td>24 (68.6)</td>
</tr>
<tr>
<td>Family income</td>
<td></td>
</tr>
<tr>
<td>&gt; 3 minimum wages</td>
<td>11 (32.4)</td>
</tr>
<tr>
<td>≤ 3 minimum wages</td>
<td>49 (62.8)</td>
</tr>
<tr>
<td>Social Vulnerability Index (SVI)</td>
<td></td>
</tr>
<tr>
<td>Less vulnerable</td>
<td>39 (49.4)</td>
</tr>
<tr>
<td>More vulnerable</td>
<td>21 (63.6)</td>
</tr>
<tr>
<td>Parents/caregivers' schooling</td>
<td></td>
</tr>
<tr>
<td>&gt; 8 years of study</td>
<td>34 (45.3)</td>
</tr>
<tr>
<td>≤ 8 years of study</td>
<td>26 (70.3)</td>
</tr>
</tbody>
</table>
* Chi-squared test. Bold type denotes significant results at 5% level.
The prevalence of TDI was not influenced by socioeconomic factors (number of people in the household, family income, SVI, parents/caregivers schooling). In contrast, a previous study used the SVI and mother’s schooling to assess the association between the prevalence of TDI in primary teeth and the socioeconomic factors in the city of Belo Horizonte and found that vulnerable families and mothers with fewer years of schooling have a higher prevalence of TDI [Jorge et al., 2009]. The difference between results may be explained by the fact that the sample of the present study was restricted to three of the nine administrative districts of Belo Horizonte, whereas the other study covered all administrative districts of the city. However, another study also carried out in Belo Horizonte was unable to find an association between the prevalence of TDI and socioeconomic level, using an index other than the SVI to assess socioeconomic level [Robson et al., 2009]. A study carried out in Brazil found that family income influenced the prevalence of TDI, in which the prevalence increased with the increase in family income [Ferreira et al., 2009]. The authors attribute this increase to greater access to swimming pools, bicycles, roller skates and skateboards as well as the non-observance of safety regulations in developing countries [Ferreira et al., 2009]. However, another study found no association between the presence of TDI and mother’s schooling or house ownership [Oliveira et al., 2007]. Thus, the association between TDI and socioeconomic factors is inconsistent and there are few studies in the literature that address the issue [Oliveira et al., 2007]. There was no statistically significant association between the prevalence of TDI and lip competence, overbite, anterior open bite or carries experience. A previous Brazilian study also found no association between TDI in primary teeth and dental caries or lip competence [Jorge et al., 2009]. Conversely, another study carried out in Brazil found an association between TDI in primary teeth and lip competence and another investigation found a statistically significant association between TDI in primary teeth and an anterior open bite [Oliveira et al., 2007; Robson et al., 2009].

TDI was significantly related to increased overjet. Children with an overjet greater than 2 mm had more than double the chances of having TDI, whereas anterior crossbite served as a protective factor against TDI. A previous study also found a strong association between overjet and the prevalence of TDI [Robson et al., 2009], whereas another study found no association between these factors [Al-Majed et al., 2001]. Al-Majed et al. [2001] also found a significant association between TDI and increased overjet in the permanent dentition and report that cooperation between dentists and orthodontists is important so that orthodontic treatment can be instituted as soon as possible in cases of increased overjet in order to prevent TDI as well.

In the present study, the difference between the prevalence of TDI reported by parents/caregivers and that recorded during the clinical examination was statistically significant. Parents/caregivers may have underreported the occurrence of TDI. The perception of TDI by caregivers is influenced by its severity. Thus, there is a tendency to report the occurrence of TDI when it is more severe. These results are in agreement with those described in another Brazilian study [Robson et al., 2009]. The prevalence of TDI is always underreported due to the suppression of symptoms and forgetfulness of the parents [Ferreira et al., 2009]. In a study conducted in Brazil with children from 11 to 13 years of age, some children responded “unknown cause” when asked about the activities related to TDI. The authors attribute this result to recall bias and the possibility that some TDIs may occur in victims of physical abuse, who tend to report not knowing the cause [Traebert et al., 2003]. Recall bias, the suppression of symptoms and violence may also be related to the underreporting of TDI occurrences by parents in the present study.

Four years old was the most prevalent age of the children at the time of TDI according to the parents/caregivers’ reports. Other authors have also found that the age group with the highest prevalence of TDI ranges from 3 to 4 years [Osuji, 1996; Borsén and Holm, 1997; Saroğlu and Sonmez, 2002; Kramer et al., 2003; Skaare and Jacobsen, 2005]. Others have found a greater prevalence of TDI among children from one to two years of age [Garcia-Godoy et al., 1987; Harrington et al., 1988]. In another study, the most frequently cited age at the time of TDI by parents was two years [Robson et al., 2009]. The age at which TDIs occur is important to drafting strategies for predicting and preventing more serious consequences to the germ of the permanent successor. At three years of age, the mineralization of permanent incisors has not yet been completed and any injury may affect the permanent tooth germ, which may trigger aesthetic changes [Skaare and Jacobsen, 2005].

The parents/caregivers most reported the home as the place where the TDI occurred. This result corroborates findings in the literature [Garcia-Godoy et al., 1987; Harrington et al., 1988; Jorge et al., 2009; Robson et al., 2009]. Falls were the most common cause of TDI in primary teeth in both the present study and the literature [Garcia-Gogoy et al., 1987; Harrington et al., 1988; Fried et al., 1996; Osuji, 1996; Cardoso and de Carvalho Rocha, 2002; Saroğlu and Sonmez 2002; Kargul et al., 2003; Sandalli et al., 2005; Skaare and Jakobsen, 2005; Jorge et al., 2009; Robson et al., 2009]. Therefore, preventive education programs targeting TDI should be directed at parents, highlighting the importance of considering the physical environment of the child [Garcia-Godoy et al., 1987; Jorge et al., 2009].

According to the parents/caregivers’ reports, 46.4% of the children received dental care for TDI. This access to treatment was influenced by socioeconomic factors, such as family income, number of people in the household and parents/caregivers’ schooling, and was not influenced by the sign of the TDI, assessment of parents/caregivers regarding the child’s oral health or the SVI. Children living in lower-income homes, with more people and with a lower degree of parents/caregivers’ schooling were more susceptible to not receiving dental care after the occurrence of TDI. A previous study carried out in Belo Horizonte found similar results: 55.2% of children had no access to treatment; most privileged children saw the
dentist more often; and the severity of TDI did not determine access to treatment [Robson et al., 2009]. The high rate of children without care may be explained by the fact that parents believe that treatment is not necessary since primary teeth are replaced as well as the limited access to dental treatment in Belo Horizonte [Jorge et al., 2009; Robson et al., 2009]. A study carried out in Saudi Arabia found no evidence of dental care for fractured primary incisors due to reduced dental awareness – parents often seek treatment only for symptomatic teeth [Al-Majed et al., 2001]. This may also have influenced the outcome of the present study as the vast majority of injuries encountered were enamel fractures.

This study has a limitation that should be considered: the sample is representative of three of the nine administrative districts in Belo Horizonte. However, the results demonstrate that it is important to improve knowledge on the prevalence of TDI in primary teeth through the evaluation of biological predisposing factors in order to prevent accidents, plan dental treatment services and provide better quality of treatment [Robson et al., 2009].

Conclusion

The results of the present study revealed a high prevalence of TDI in primary teeth among preschool children in the city of Belo Horizonte, Brazil (62.1%), with enamel fracture as the most common sign of trauma. The prevalence of TDI was influenced by increased overjet and anterior crossbite. Socioeconomic factors, lip competence, overbite, anterior open bite and dental caries had no influence over the prevalence of TDI. Few children had access to dental treatment after TDI and lack of this access was influenced by socioeconomic factors.

Acknowledgments

This study was supported by the National Council for Scientific and Technological Development (CNPq), the Ministry of Science and Technology, and the State of Minas Gerais Research Foundation (FAPEMIG), Brazil.

References

Cardoso M, de Carvalho Rocha MJ. Traumatized primary teeth in children assisted at the Federal University of Santa Catarina, Brazil. Dent Traumatol 2002;18:129-133.