*Dental Traumatology 2004; 20: 251–254*
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**DENTAL TRAUMATOLOGY**

# Prevalence of crown fractures in 8–10 years old schoolchildren in Canoas, Brazil

Tovo MF, dos Santos PR, Kramer PF, Feldens CA, Sari GT. Prevalence of crown fractures in 8–10 years old schoolchildren in Canoas, Brazil. Dent Traumatol 2004; 20: 251–254. © Blackwell Munksgaard, 2004.

Abstract – The objective of this work was to evaluate the prevalence of children with crown fractures in permanent anterior teeth in 206 schoolchildren (104 girls and 102 boys) between the ages of 8 and 10 years, enrolled in three public schools in the city of Canoas, Brazil. The prevalence found was 17% with no significant difference between boys and girls, as well as between the ages. The most affected tooth was the maxillary central incisor, and a majority of the children showed only one affected tooth (88.6%). The types of fracture most commonly found were oblique and horizontal, and the portions of dental structures most affected were 'enamel only' and 'enamel and dentin'. Only seven children (20%) sought out dental treatment.

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Key words: dental trauma; fracture of teeth; epidemiology

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Accepted 21 October, 2003

The traumas involving anterior teeth are frequently the cause of esthetic and psychologic problems in children and their parents (1, 2). Dental trauma is presently on the increase in dental clinics. This can be verified by all dentists, and with even more frequency among pediatric dentists, being that the traumatic dental lesions appear with more frequency among children and adolescents than among adults, because of their exposure to sports and games (3).

Besides its importance, there is a small number of evaluations registering the prevalence of children with traumatic lesions in teeth in developing and industrialized countries, principally when compared to epidemiologic data about dental caries and periodontal disease (4).

The upper central incisor is the tooth that has been the most affected (5), and coronal fractures are the most prevalent in permanent dentition (6, 7).

The type of coronal fracture line that is most common is the oblique, followed by fractures that are horizontal and vertical (8). The portions of dental structures that are most affected are enamel only and fractures involving enamel and dentin (9).

The present work evaluated the prevalence of crown fractures in schoolchildren aged 8–10 years, using the parameters of gender, age, affected tooth, number of affected teeth, type of fracture line and affected coronal portion. In addition, the percentage of children that sought out treatment as a result of the dental trauma was also evaluated.

## Materials and methods

This study was part of a survey, in which prevalence of fluorosis and dental trauma in schoolchildren were investigated. The subjects were children from primary school.

Two hundred and six students aged 8–10 years were examined (104 girls and 102 boys), from three state public schools in the city of Canoas, Brazil. Its population is 305 711 inhabitants, all living in an urban area.

The school selection was made according to the number of registered schoolchildren. From the total population of 4000 schoolchildren aged 8–10 years, a statistical calculation was made to determine an appropriate sample size. The minimum sample size was calculated at 187 children based on a confidence interval of 95%. The expected prevalence was 15%. The schools and children included in the study were randomly chosen.

The selected schoolchildren were given a consent form explaining the objectives of the study.

The children were examined in school, and the examination of the anterior permanent teeth was made according to the following standards: in a separate classroom, with the student standing up and in front of the examiner. The examiner wore gloves and completed the clinical examination under natural lighting.

A standard data sheet for clinical evaluation of trauma was used for the children that presented traumatic lesions in maxillary and/or mandibular permanent anterior teeth; the data included identification (name, age and gender), number of the fractured tooth and type of fracture line (a drawing for orientation). The children were asked if dental care was sought as a result of the trauma (accident).

In addition, the lesions were classified by the examiner considering enamel crazing, fracture in enamel, fracture in enamel and dentin, fracture in crown with pulpal exposure, and fracture in enamel, dentin and cement (10).

In order to determine if the study was reproducible, 20% of the sample size (41 children) were re-examined using a kappa-test to evaluate the examiner. The kappa index was 0.836 (good agreement).

An analysis of the data was made by using the percentage, and the differences were established by *t*-test and Chi square.

## Results

A total of 206 children representing students aged 8–10 years from the city of Canoas, Brazil, were examined. Of those, 49.5% were boys and 50.5% were girls. The sample was more than the minimum estimate that would satisfy the requirement ($n = 187$).

The prevalence of children with crown fractures was 17%. There was no statistically significant difference in relation to gender (boys, 18.6%; girls, 15.4%) and age (8 years, 12.5%; 9 years, 17%; and 10 years, 19.6%), as shown in Table 1.

The tooth that was most affected was the right superior central incisor (19, 48.8%), followed by left superior central incisor (14, 35.7%), left inferior central incisor (4, 10.3%), and both the inferior lateral incisors (2, 5.2%), as shown in Table 2. The majority of the traumas involved only one tooth, and only four children (11.4%) had two affected teeth. No children had three or more teeth affected. The most prevalent fracture lines were horizontal and oblique, both with 46.1%, followed by vertical fracture lines with 7.8%.

Fractures in enamel (73.7%), fractures in enamel and dentin (15.8%), and enamel crazing (10.5%) were the most common types of hard tissue lesions. None of the fractures found involved the pulp.

Only 20% of the schoolchildren that suffered traumatic lesion sought out a dentist.

## Discussion

This study was a survey about prevalence of schoolchildren with crown fractures in Canoas, south of Brazil. In the studied region, there is a lack of information about dental health status, especially regarding schoolchildren. This cross-sectional study was conducted to reveal the status of this population. Besides, actions in public health must be based on prevalence data, to implement adequate policy measures.

A review of the literature shows that coronal fractures are the most frequent lesions in permanent dentition (6, 7, 11–14). The age range studied was chosen based on related findings, for which the peak occurrence of dental lesions was observed in children between 8 and 10 years of age (3, 12).

It was also observed that there is a lack of data referring to the evaluation of the prevalence of children with traumatic dental lesions from developing and industrialized countries. Notwithstanding, the few cases registered reveal a notable discrepancy between the published results (4, 15, 16).

Table 1. Distribution of sample in relation to gender, age and the prevalence of traumatic lesions

| | Gender | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Boys | | | Girls | | | | | |
| | | With lesions | | | With lesions | | | Total (with lesions) | |
| Age (years) | Total | *n* | % | Total | *n* | % | Total | *n* | % |
| 8–9 | 36 | 6 | 16.7 | 20 | 1 | 5.0 | 56 | 7 | 12.5 |
| 9–10 | 21 | 3 | 14.3 | 32 | 6 | 18.8 | 53 | 9 | 17.0 |
| 10–11 | 45 | 10 | 22.2 | 52 | 9 | 17.3 | 97 | 19 | 19.6 |
| Total | 102 | 19 | 18.6 | 104 | 16 | 15.4 | 206 | 35 | 17.0 |

Age: $\chi^2 = 1.265$; $P = 0.531$.
Gender: $\chi^2 = 0.384$; $P = 0.535$.

Table 2. Distribution of crown fractures in relation to affected tooth

| Affected tooth | *n* | % |
|---|---|---|
| Right superior central incisor | 19 | 48.8 |
| Left superior central incisor | 14 | 35.7 |
| Left inferior central incisor | 4 | 10.3 |
| Inferior lateral incisors (right/left) | 2 | 5.2 |
| Total | 39 | 100 |

The prevalence of children with permanent anterior teeth crown fractures in the present study (17%) can be considered high if compared to the 5.2% found by (8) in Brazilian children and the 5.7% found by (17) in the province of Valencia (Spain).

Some studies reported closer approximation to the results (4, 18). In Amã (Jordan), the prevalence found was 10.5% and in Jaraguá do Sul (Brazil), 15.3%. Recently, in the study by Tapias et al. (14), the prevalence of traumatic crown fractures in a 10-year-old Spanish population was 17%. Some studies showed slightly higher values of trauma prevalence, reaching 21% (19, 20).

Publications indicate, as a reason for this variability, factors related to the samples selected (age range studied, *n*, socio-demographic and behavioral indicators, rural/urban population, among others), and the type of study and the methodology used (samples collected in the school environment – with limited conditions for clinical examination – or ambulatory, with optimal examination conditions – including radiographic exams). Prospective studies from representative populations could aid to understand the complexities of dental trauma epidemiology (21, 22).

In this study, there was no statistically significant difference as far as the presence of dental trauma in relation to the gender is concerned, a finding that differs for some authors (2, 9, 19, 23), for whom the boys were the most affected. Maybe the disparity occurred as a result of the time period when some studies were carried out (approximately 30 years ago) and because of the socio-demographic and behavioral differences among the samples studied. In this study, both boys and girls seemed to be equally exposed to etiologic factors of trauma (sports practised, domestic accidents, playing, etc.).

Different from other publications that contemplated broader age ranges (1, 2, 9, 18, 19, 21, 23), age did not influence the prevalence of children with traumatic lesions. This difference between the results may have occurred because of the age range in this study.

The most affected tooth was the right superior central incisor (48.8%), in accordance with (5, 13, 18).

A majority of the trauma cases involved only one tooth (88.6%). This finding agrees with studies made by (9, 15, 17, 24, 25).

The types of fracture lines most commonly found were the oblique and the horizontal, both with 46.1%. These findings may be explained by the fact that when a tooth suffers a frontal impact, a horizontal fracture occurs that follows the course of enamel prisms. If the impact comes from another direction, other fracture lines may be observed (3, 8).

The distribution of trauma in hard tissues shows that lesions in enamel are the most common, followed by lesions in enamel and dentin and enamel crazing. Several publications also found that the coronal portions most affected by traumatic lesions are 'enamel' and 'enamel and dentin' (1, 9, 17, 26).

An important fact revealed by the study is that only seven children (20%) who suffered traumatic lesions sought dental treatment. Of these seven children, three had two teeth involved in trauma. As the study found four children with two affected teeth, the number of teeth involved in a traumatic accident could be considered an important factor in the decision of seeking dental treatment. Notwithstanding, the data lead to the conclusion that the parents/guardians have not tried to find therapeutic opportunities if their dependants suffered crown fractures. The data is corroborated by the results of Marcenes et al. (15), for whom the treatment of traumatic lesions was highly neglectful (96.7%). Limited access to dental care and lack of information about dental trauma could explain it.

The information that the majority of the fractured crowns did not receive therapeutic aid (e.g. composite restoration) contribute to the confidence of the examination, especially in this study which was conducted under natural light.

## Conclusion

According to the results presented, it can be concluded that in a sample of schoolchildren aged 8–10 years from the city of Canoas the prevalence of children with coronal fractures was 17%. In addition, the most affected teeth are the superior central incisors and that the search for dental treatment is rare.

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