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A prevalence study of traumatic dental injuries in brazilian schoolchildren

Estudo de prevalência de traumatismos dentários em escolas brasileiras

Un estudio de prevalencia de traumatismos dentales en escolares brasileños

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ABSTRACT

Objective: To assess the prevalence of traumatic dental injuries (TDIs) and treatment demands among elementary schoolchildren. **Methods:** Eight Federal District (Brazil) schools were selected, and 914 students aged 11 to 14 were examined by a single calibrated operator. Data collected included age, gender, teeth affected, causes, location, type of trauma, and treatment performed or needed. O'Brien's classification was used to identify TDIs. Quantitative analysis was applied. **Results:** The prevalence of TDIs was 20,24%. The most affected tooth was the maxillary right central incisor (37,1%). Most injuries were enamel fractures (1,65%), followed by enamel and dentin fractures without pulp exposure (0,31%). The mean age at the time of injury was 10,3 (± 2,2) years. Falls were the main cause (36,2%), and most accidents occurred at home (44,3%). Recurrent TDIs were reported by 34 children (18,4%). Prevalence by gender was similar, with 20,4% in boys and 20,0% in girls. Of the 185 injured children, 37 (20%) received treatment, while 148 (80%) did not. **Conclusion:** TDIs were prevalent among Brazilian schoolchildren, and adhesive procedures were the most required and performed treatments.

Keywords: Child, Oral health, Prevalence, Tooth injuries.

RESUMO

Objetivo: Avaliar a prevalência de traumatismos dentários (TDIs) e as demandas de tratamento entre estudantes do ensino fundamental. **Métodos:** O estudo envolveu oito escolas do Distrito Federal (Brasil), com 914 alunos de 11 a 14 anos. Um operador calibrado realizou exames clínicos, registrando idade, gênero, dentes afetados, causas, local e tipo do trauma, além do tratamento realizado ou necessário. A classificação de O'Brien identificou os TDIs, e os dados foram analisados quantitativamente. **Resultados:** A prevalência de TDIs foi de 20,24%. O dente mais afetado foi o incisivo central superior direito (37,1%). A maioria das lesões consistiu em fraturas de esmalte (1,65%), seguidas por fraturas de esmalte e dentina sem exposição pulpar (0,31%). A média de idade no trauma foi 10,3 (± 2,2) anos. Quedas foram a principal causa (36,2%), e a maioria dos acidentes ocorreu em casa (44,3%). TDIs recorrentes foram relatados por 18,4% das crianças. A prevalência foi semelhante entre meninos (20,4%) e meninas (20,0%). Das 185 crianças afetadas, 37 (20%) receberam tratamento, enquanto 148 (80%) não foram tratadas. **Conclusão:** A prevalência de TDIs na região avaliada foi alta, e os tratamentos mais necessários e realizados foram procedimentos adesivos.

Palavras-chave: Criança, Saúde bucal, Prevalência, Traumatismos dentários.

RESUMEN

Objetivo: Evaluar la prevalencia de traumatismos dentales (TDIs) y las demandas de tratamiento entre estudiantes de primaria. **Métodos:** El estudio se realizó en ocho escuelas del Distrito Federal (Brasil), con

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914 alumnos de 11 a 14 años. Un operador calibrado realizó exámenes clínicos registrando edad, género, dientes afectados, causas, lugar y tipo de trauma, además del tratamiento realizado o necesario. La clasificación de O'Brien se utilizó para identificar los TDIs, y los datos fueron analizados cuantitativamente. **Resultados:** La prevalencia de TDIs fue del 20,24%. El diente más afectado fue el incisivo central superior derecho (37,1%). La mayoría de las lesiones fueron fracturas de esmalte (1,65%) y fracturas de esmalte y dentina sin exposición pulpar (0,31%). La edad promedio al momento del trauma fue de 10,3 (± 2,2) años. Las caídas fueron la principal causa (36,2%), y la mayoría de los accidentes ocurrió en casa (44,3%). El 18,4% de los niños reportó TDIs recurrentes. La prevalencia fue similar entre niños (20,4%) y niñas (20,0%). De los 185 niños afectados, 37 (20%) recibieron tratamiento, mientras que 148 (80%) no fueron tratados. **Conclusión:** La prevalencia de TDIs en la región evaluada fue alta, y los tratamientos más necesarios y realizados fueron procedimientos adhesivos.

Palabras clave: Niño, Salud bucal, Prevalencia, Lesiones dentales.

INTRODUCTION

The prevalence of traumatic dental injuries (TDIs) in permanent teeth, especially among individuals, is a significant concern in dentistry, as these injuries can impact not only aesthetics but also oral function and long-term oral health. The most common traumas include enamel and dentin fractures, luxations, and avulsions, each requiring specific treatments. Immediate intervention is crucial since the initial treatment greatly influences the long-term prognosis. Therefore, dental professionals must be well-prepared to manage various types of trauma and their respective therapeutic approaches (RODRIGUES CST, et al., 2014).

Dental trauma affects approximately 4.5% of the global population, Lam R (2016), and is more prevalent in primary than in permanent dentition, especially among school-aged children (JORGE KO, et al., 2012). In addition to compromising oral health, TDIs also affect patients emotional and social well-being. In southern Brazil, Schuch HS, et al. (2013). found that 12.6% of the children evaluated experienced TBIs, with enamel fractures being the most common injury. The study also revealed low treatment-seeking behaviour, influenced by socioeconomic factors such as maternal education, underscoring the importance of preventive estrategies, early diagnosis, and proper management of these injuries.

Dental trauma is prevalent among adolescents and significantly impacts their quality of life. Factors such as dental morphology, lip coverage, and behavioral habits (e.g., excessive alcohol consumption) have been identified as potential risk factors. However, the influence of socioeconomic variables shows conflicting results. A systematic review and meta-analysis by Corrêa-Faria P, et al. (2015). found no consistent evidence linking family income, parental education, or homeownership with TDIs in children with primary dentition, although some associations were observed at extreme income levels, highlighting the need for further research.

With a high prevalence rate, considerable psychosocial impact, and high treatment costs, traumatic dental injury (TDI) is considered a public health problem by the World Health Organization (WHO), according to Baxevanos K, et al. (2017). Furthermore, Antunes LAA, et al. (2012). state that it ranks, along with dental caries and oral cancer, among the most significant oral health issues worldwide. The occurrence of TDI varies according to the country, as noted by Zaleckiene V, et al. (2014), as well as age group, socioeconomic and cultural factors, highlighted by Lam R (2016), and the clinical diagnostic criteria employed, as observed by Barbosa Neves ÉT, et al. (2017).

Studies indicate that TDI is more prevalent in men than in women, according to Caldas Junior AF and Burgos ME (2001), El-Kalla IH, et al. (2017), and Naidoo S, et al. (2009), although Lam R (2016) highlights that no individual is entirely risk-free. Rajab LD, et al. (2019) report that in certain groups, TDI accounts for up to one-fifth of all bodily injuries. The most affected teeth are the upper anterior ones, as noted by Alonge, Narendranand Williamson (2001) and Zaleckiene V, et al. (2014), especially the central incisors, according to El-Kalla IH, et al. (2017). Glendor, et al., (2007) observe that the most common types of TDI are enamel fractures and fractures involving enamel and dentin, although dental avulsion can occur in more severe cases.

Certain orofacial characteristics, such as pronounced over jet and inadequate lip coverage, may also be associated with the occurrence of TDI (GLENDOR U, 2009). The most comprehensive survey on the

prevalence of TDIs among children in Brazil was conducted by SB Brasil (2010), which reported a 21.5% rate among 12-year-olds. Recent studies, such as Vieira R, et al. (2021), suggest that the prevalence of dental trauma among Brazilian children and adolescents is higher than the global average, reaching 35% in permanent dentition and 21% in primary dentition.

Boys tend to be more affected than girls, with the maxillary central incisors being the most frequently involved teeth, followed by the maxillary lateral incisors (Zaleckiene V, et al., 2014). According to Taiwo OO and Jalo HP (2011) and Kumar A, et al. (2011), enamel fractures are the most frequent injuries, followed by fractures involving both enamel and dentin.

Most TDIs occur at home, although schools also pose a risk, as highlighted by Shreya S, et al. (2020), with falls and sports-related accidents being the leading causes of these injuries. Prevalence studies are essential for providing data to guide prevention policies and treatment strategies for dental trauma (HARDER T, 2014). This study aims to investigate the prevalence, types of TBIs, affected teens, and necessary treatments among children aged 11 to 14, using O'Brien's classification system (1994) to address gaps in knowledge.

METHODS

This cross-sectional, descriptive, and observational epidemiological study was approved by the University Research Ethics Committee (CEP/FS, protocol no. 714451 and CAAE 30867814.3.0000.0030) in accordance with the guidelines of CNS Resolution 466/12 and the principles of the Declaration of Helsinki. All participants signed an assent form, and their legal guardians provided informed consent. The sample consisted of 914 students aged 11 to 14, enrolled in public schools in the Federal District, and randomly selected. The sample size calculation considered an 80% confidence level, a 5% margin of error, and an estimated 11% frequency of dental trauma.

The reference population included 9,447 students, with a minimum required sample of 800 participants. To ensure representativeness, 914 students were included, representing approximately 10% of the target population. Schools were randomly chosen, with eight units selected proportionally to the number of eligible students. A pilot investigation with 100 students was conducted to calibrate the examiner. Each participant was evaluated twice, with a seven-day interval, and intra-examiner agreement was measured using the Kappa coefficient and intraclass correlation ($\kappa = 0.83$).

Data from this phase were not included in the final analysis. The exams were conducted in private rooms within the schools, using natural light. Permanent anterior teeth were examined with mirrors (#5) and periodontal probes (WHO), using a headlamp. Dental trauma was identified and classified according to O'Brien's criteria (1994).

The collected data included the presence and type of trauma, affected teeth, treatment type and needs, students' age and sex, as well as the cause and location of the trauma. Lip sealing and overjet were also recorded. Lip sealing was assessed while reading a text and was considered adequate when the lips covered the upper incisors. Overjet was measured with a probe and classified as ≤5 mm or >5 mm, following the method described by Tumen S, et al. (2017).

Data analysis was performed using the survey command in STATA 10 (Stata Corp, USA) to account for sample weights and the complex design effect. Descriptive statistics, such as frequency distributions and cross-tabulations, were used to estimate the prevalence of dental trauma. Additional analysis was carried out using SAS 9.3 software.

RESULTS

This study involved 914 students to assess the prevalence of dental trauma (TDI) and its association with factors such as gender, age, ethnicity/race, and overjet. The analysis encompassed clinical and demographic data provided by the participants, offering a comprehensive understanding of the occurrence of TDI among Brazilian schoolchildren. The findings provide valuable insights into oral health conditions and potential risk factors influencing the development of dental trauma during childhood and adolescence.

Table 1- Associations between TDI and gender, age, color/race, and overjet in Brazilian schoolchildren.

Characteristics	N	%
Dental Trauma		
Present	185	20,2
Absent	729	79,8
Gender		
Female	503 55	
Male	41145	
Ethnicity/Race		
White	217 23,7	
Black	168 18,4	
Brown	468 51,2	
Yellow or Asian	28 3,1	
Indigenous	31 3,4	
Not declared	2 0,2	
Lip Seal		
Adequate	872 95,5	
Inadequate	42	4,5
Overjet		
Normal (≤ 5 mm)	834	89
Accentuated (> 5 mm)	80 11	

Font: Silva RLC, et al., 2025.

It was examined 914 schoolchildren, of which 411 (45%) were boys and 503 (55%) girls. The mean age was 12.9 (±1.0) years, and 23.7% declared themselves according to color/race: white, 18.4% black, 51.2% brown, 3.1% yellow or Asian, and 3.4%, indigenous. From the sample investigated, 95.5% had adequate lip coverage, and only 4.5% had inadequate coverage. Eighty-nine percent of the population had an overjet ≤ 5 mm, and for 11% it was > 5 mm with increased incisal projection. **Table 1** displays the associations between dental trauma and age, gender, ethnicity, and overjet. The prevalence of TDI in the population studied was 185 (20.2%), and 729 did not present clinical signs of TDI. From that TDI was diagnosed in 20.4% of boys and 20.0% of girls (**Table 1**).

Table 2- Classification and distribution of teeth as sample units according to the occurrence and type of dental trauma.

Characteristics Types of dental trauma	N	%
No trauma (control)	10723	97,7
Discoloration	2	0,02
Enamel fracture	181	1,65
Enamel and dentin fracture without pulp exposure	34	0,31
Enamel fracture and dentin with pulp exposure	13	0,12
Tooth missing due to trauma	5	0,05
Subluxation	1	0,01
Lateral luxation	1	0,01
Intrusive luxation	0	0,00
Extrusive luxation	0	0,00
Others	8	0,07
Total group	**10968**	**100.00**

Font: Silva RLC, et al., 2025.

The analysis of dental trauma types revealed that enamel fractures were the most frequent, totaling 181 cases (1.65%). These were followed by enamel and dentin fracture without pulp exposure (34 teeth, 0.31%) and enamel and dentin fracture with pulp exposure (13 teeth, 0.12%). Additionally, 5 teeth (0.05%) were missing due to trauma, while luxations (subluxation and lateral luxation) were rarely observed, with just 1 case each (0.01%). No cases of intrusive or extrusive luxation were reported.

Other forms of trauma accounted for 0.07% (8 teeth) (**Table 2**). Regarding teeth as sample units, 245 teeth presented with dental trauma (TDI). The most affected teeth were the upper central incisors, with the right incisor involved in 37.1% of cases and the left in 32.3%. The classification and distribution of teeth as sample units were analyzed based on the treatments performed and the treatment needs to be identified through clinical evaluation.

The majority of the cases (97.35%) required restorative treatment, and no teeth needed endodontic procedures or full crowns. Only 2 teeth (1.06%) required whitening, and 1 tooth (0.53%) needed a partial prosthesis. Other procedures were indicated for 2 teeth (1.06%), totaling 189 evaluated teeth.

Regarding the treatments performed, 36 teeth (64.29%) received restorative treatment, while 14 (25.00%) underwent both endodontic and restorative procedures. There were no cases requiring full crowns, and 3 teeth (5.36%) received partial prosthetic treatment, with the same number needing other procedures, totaling 56 treated teeth.

A significant difference in treatment was observed by gender: boys had 26 treated cases and 58 untreated, while girls had 11 treated cases and 90 untreated. Girls also presented more enamel-only injuries, with 87 cases compared to 52 among boys. Conversely, 14 girls and 32 boys had enamel and dentin injuries (p = 0.001). Among the 185 students with TDI, 133 (71.9%) reported the exact age at which the trauma occurred, with an average of 10.3 years (±2.2), ranging from 5 to 14 years.

Table 3- Location of Dental Trauma Occurrence.

Characteristics Location	N	%
At home	82	44,3
At school	21	11,4
On the street	35	18,9
Unknown	33	17,8
Other places	14	7,6
Total	**185**	**100,00**

Font: Silva RLC, et al., 2025.

Most incidents (44.3%) occurred at home, followed by street accidents (18.9%) and school incidents (11.4%). Additionally, 33 participants (17.8%) could not recall where the trauma occurred, and 14 cases (7.6%) took place at other locations such as clubs, hotels, or shopping malls (**Table 3**).

Table 4- Causes of Dental Trauma.

Characteristics Causes	N	%
Falls	67	36,2
Collisions	42	22,7
Improper tooth use	8	4,3
During sports activities	7	3,8
Traffic accidents	2	1,1
Unknown	44	23,8
Other causes	15	8,1
Total	**185**	**100,00**

Font: Silva RLC, et al., 2025.

The most common cause of trauma was falls (36.2%), followed by collisions (22.7%). Additionally, 8 participants (4.3%) attributed the trauma to improper use of teeth, and 7 (3.8%) reported that the injury occurred during sports activities. Two cases (1.1%) were related to traffic accidents. Others could not identify the cause (23.8%), while some mentioned various other causes (8.1%) (**Table 4**).

When asked about multiple TDI episodes, 34 participants (18.4%) confirmed trauma recurrence, 148 (80%) denied it, and 3 (1.6%) were unsure.

DISCUSSION

Prevalence studies play a crucial role in assessing the extent of diseases and conditions in different populations, providing valuable data for public health policies and clinical practices (Wendt RP, et al., 2010). The finding soft his study reveal a significant prevalence of traumatic dental injuries (TDI) among schoolchildren aged 11 to 14 years in the Central-West region of Brazil, consistent with other studies conducted in the country (VIEIRA PS, et al., 2021). Lam R (2016) reported a global average prevalence of 4.5%, compared to the observed prevalence of 20.2% in this study, highlighting the need for targeted public health strategies to address dental trauma among Brazilian children.

The study confirms previous research showing that the anterior maxillary region is most vulnerable to trauma, with central incisors being the most frequently affected teeth (EL-KALLA IH, et al., 2017; ZALECKIENE V, et al., 2014). This pattern aligns with the anatomical position of these teeth, which makes them more susceptible to injuries. Additionally, the finding that most injuries occurred at home (44.3%) emphasizes the importance of domestic environments as high-risk settings for dental trauma (WENDT RP, et al., 2010). Educational intervention targeting parents and caregivers could help reduce these risks.

Falls were identified as the leading cause of TDI (36.2%), followed by collisions (22.7%). These results align with studies indicating that children are particularly vulnerable to falls and accidents during play and physical activities (PAIVA PC, et al., 2015). While schools are another common setting for injuries, this study found a lower incidence of TDIs occurring at school (11.4%), suggesting that further investigations into the impact of school safety policies could provide insights into preventive measures.

A key finding is the equal prevalence of TDI between boys (20.4%) and girls (20.0%), which contrasts with studies reporting a higher incidence among boys (CALDAS JUNIOR AF and BURGOS ME, 2001; NAIDOO S, et al., 2009). This result suggests that risk factors in contemporary settings may affect both genders equally, highlighting the need for gender-neutral prevention strategies. Behavior factors, such as physical activities, should also be considered, as these can increase the risk of trauma (CORRÊA-FARIA P, et al., 2015).

Another important aspect is the relationship between orthodontic factors and TDI. Children with malocclusions, such as increased overjet, are more prone to dental injuries (GLENDOR U, 2009). This finding under lines the importance of regular orthodontic assessments, which could play a preventive role by reducing exposure to trauma.

The study also highlights a concerning trend: 80% of injured children did not receive treatment, despite many injuries requiring care. This result aligns with previous findings that a lack of awareness, socioeconomic barriers, and misconceptions about the need for treatment contribute to low treatment-seeking behavior (KURT RA, et al., 2019). Public health campaigns should aim to increase awareness among parents and children about the importance of early dental intervention to prevent complications such as pulp necrosis and root resorption (MAGNO MB, et al., 2021).

Finally, although this study provides valuable insights, some limitations should be acknowledged. The cross-sectional design limits the ability to infer causality or assess trauma recurrence over time. Future longitudinal studies could offer more robust data on injury recurrence and the long-term impact of TDIs. Additionally, further research is needed to explore the role of socioeconomic factors, as conflicting evidence in the literature suggests the need for more comprehensive analysis (CORRÊA-FARIA P, et al., 2015).

In summary, this study underscores the need for continuous monitoring, early intervention, and targeted educational strategies to reduce the prevalence and impact of dental trauma among schoolchildren. The findings should inform public health policies and clinical guidelines, promoting more effective prevention and treatment strategies for dental injuries.

CONCLUSION

The prevalence of dental trauma (TDI) among schoolchildren aged 11 to 14 in the Central-West region of Brazil highlights the need for effective prevention and treatment strategies. The results emphasize that most

injuries occur in domestic settings, with falls being the primary cause. This finding reinforces the importance of educational interventions targeting parents, caregivers, and children to minimize household risks. Additionally, the low rate of treatment observed suggests a lack of awareness regarding the severity of TDIs and the importance of timely dental interventions. Awareness campaigns and educational programs within schools and communities are essential to promote early diagnosis and encourage treatment-seeking behavior. Given that both boys and girls are equally exposed to risk factors, future strategies should not be gender-biased. The findings also highlight the need for orthodontic monitoring, as malocclusions such as increased overjet can predispose children to dental trauma. Finally, continuous monitoring of the behavioral and environmental factors contributing to TDIs is necessary. Future research should focus on longitudinal studies to better understand trauma recurrence and its impact over time. Policymakers can use these findings to develop targeted prevention programs and promote oral health policies aimed at reducing the incidence of dental trauma in children and adolescents.

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