






Dental trauma and oral health-related quality of life among 7th-grade students of public elementary schools¹

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Dental trauma is a public health problem because of its high prevalence rates and treatment costs and for affecting mainly younger individuals. **Aim:** This cross-sectional study aimed to investigate the variables associated with dental trauma and its influence on oral health-related quality of life among 7th-grade students of public elementary schools.

Methods: The data was collected with semi-structured and self-administered questionnaires and an intraoral clinical examination (n = 204). The variables collected regarded dental trauma, lip coverage, overjet, oral health-related quality of life (Child Perceptions Questionnaire - CPQ₁₁₋₁₄ ISF: 8), and sociodemographic profile. Association tests and the Mann-Whitney test were performed at a 5% significance level.

Results: Dental trauma occurred in 12.3% of students, 94.6% had adequate lip coverage, and the mean overjet was 2.7 mm (± 2.0). Sex was the only variable with a statistically significant association with dental trauma ($p = 0.021$). There was no statistically significant difference in the CPQ₁₁₋₁₄ ISF: 8 score between students with and without dental trauma ($p = 0.136$).

Conclusions: Dental trauma was significantly associated with sex and did not impact the oral health-related quality of life of the students.

Keywords: Tooth fractures. Tooth injuries. Quality of life. Oral health.



¹ This paper is the product of a master's dissertation.

Introduction

Acute dental trauma is an injury that occurs unexpectedly in the oral cavity. It can affect the pulp, periodontal tissue, and associated structures. The pattern of this injury is determined by the direction of impact, causing different types of trauma, such as enamel and dentine fracture, crown-root fracture, root fracture, concussion and subluxation, extrusion, lateral dislocation, intrusion, avulsion, and fractures of the alveolar process¹. Dental trauma occurs mainly in children and adolescents, affecting their lives and potentially their oral health-related quality of life^{2,3}.

A recent meta-analysis determined an 18.1% global dental trauma (DT) prevalence in 12-year-old children⁴. In the general population, it is estimated that more than one billion people have had traumatic injuries, representing the fifth most common injury worldwide⁴. Thus, dental trauma has been considered a public health problem with a high prevalence and recurrence rate⁵. In Brazil, dental trauma prevalence at this age ranges from 11.9% to 24.0%, affecting the upper central incisor the most, especially with enamel fractures⁶⁻¹⁰.

The most frequent risk factors associated with traumatic injuries in the permanent dentition of the Brazilian population have been sex (male), severe overjet, inadequate lip coverage, and obesity¹¹. Two recent Brazilian systematic reviews also showed a higher dental trauma prevalence in male children and adolescents¹⁰ and that lip coverage and overjet were the main risk factors¹². Furthermore, contact sports practice has also represented a significant variable associated with traumatic injuries in permanent dentition^{13,14}.

The impact of dental trauma on oral health-related quality of life (OHRQoL) among individuals is still not well established. Studies suggest that this condition harms OHRQoL^{15,16}, especially when untreated, causes pain, and limits functional, emotional, and social aspects of children. However, other studies found that dental trauma, such as enamel/dentine fractures and tooth discolorations, did not impact OHRQoL^{2,17}.

Thus, this study investigated the variables associated with dental trauma and its influence on the oral health-related quality of life among 7th-grade students of public elementary schools in a municipality in São Paulo, Brazil. The null hypothesis is that sociodemographic and guardian-related variables, access to dental services, or clinical conditions neither influence dental trauma nor harm oral health-related quality of life.

Material and Methods

This study followed the ethical recommendations of Resolution #466 of December 12, 2012, by the Brazilian Health Council. The Institutional Research Ethics Committee approved the project (CAAE: 06971118.8.0000.5416). This is an observational, cross-sectional, and population-based (census) study with two stages: a) the application of semi-structured and self-administered questionnaires and b) an intraoral clinical examination.

The target population was students enrolled in the 7th grade of public schools in a countryside town (Sertãozinho) in São Paulo, Brazil, with an estimated population of 122,355 inhabitants and a municipal Human Development Index of 0.761¹⁸.

The inclusion criteria were a signed consent form from the students and their legal guardians, presence on the day of data collection, the absence of cognitive disorders (based on the information provided by teachers), and the absence of fixed orthodontic appliances. The exclusion criterion was unresponsiveness to the outcomes.

Before data collection, a pre-test was conducted with 20 randomly drawn 7th-grade schoolchildren to assess the study methodology and the challenges in understanding the questions and answer alternatives in the questionnaires. The questions with a rate of misunderstanding greater than or equal to 20%¹⁹ would be reviewed. The data collected in the pre-test were not included in the final analysis. Pre-test results showed no need for changing the questionnaires.

From a target population of 1,812 students enrolled in the 7th grade of public elementary schools, 1,073 were invited to participate in the study, and 251 returned the signed consent form (one school did not allow the participation of their students and several students missed the day of either study presentation/invitation to participate or data collection).

Forty-seven students used fixed orthodontic appliances and were excluded from the analysis, totaling a sample of 204 students. This sample size, calculated after data collection, provided a 0.80 test power at a 5% significance level for effect sizes above 0.20 (small effect size, according to Cohen)^{20,21}.

This study evaluated the following variables:

- A. Sociodemographic profile: age, sex, neighborhood, type of residence, the number of bedrooms in the house, and family income.
- B. Characteristics of guardians: education, paid work, and perception of their child's oral health.
- C. Access to dental services: the child's last dental appointment and the reason for the visit.
- D. Oral health-related quality of life: the presence of bad breath and food residues on the teeth, challenges in biting or chewing and drinking or eating hot and cold foods, level of stress and annoyance, avoiding smiling, and/or arguing due to the oral condition.
- E. Clinical condition: trauma in incisors, type of trauma, overjet measured in millimeters, and adequate or inadequate lip coverage.

The students or legal guardians filled out two semi-structured and self-administered questionnaires to obtain data on the sociodemographic profile, access to dental services⁶, and oral health-related quality of life (Child Perceptions Questionnaire - CPQ₁₁₋₁₄ ISF: 8). The short version of the CPQ₁₁₋₁₄ ISF: 8 has eight questions including four domains: oral symptoms, functional limitations, emotional well-being, and social well-being. The score of this questionnaire ranges from

0 to 32 points according to the 5-point Likert scale: never = 0, once or twice = 2, sometimes = 3, often = 4, every day or almost every day = 5; the higher the score, the higher the impact²². Torres et al.²³ translated and validated the CPQ₁₁₋₁₄ ISF: 8 in Brazil in a population aged 11 to 14 years.

The leading researcher collected the data on a previously scheduled day and time. After a brief explanation of the significance of the study, the questionnaire was applied to the classroom. According to school guidelines, the clinical examination occurred in an appropriate place to prevent the embarrassment or discomfort of research participants.

An examiner was trained and calibrated for the clinical examination by evaluating 28 digital images of different types of trauma to permanent teeth and recording them in a standardized form according to the proposed methodology for a Brazilian epidemiological survey⁶. An agreement of 96.4% was achieved in the test-retest application after one week.

The clinical examination was performed in a school environment, under natural light, with the student sitting in front of the examiner and facing a window, and using clinical mirrors and periodontal probes such as CPI (Community Periodontal Index) and the required personal protective equipment. Permanent upper and lower incisors were evaluated according to the pre-established criteria⁶ that codify the following conditions: the absence of trauma, enamel fracture, enamel and dentin fracture, enamel and dentin fracture with pulp exposure, and missing teeth due to trauma. Overjet measurement in millimeters was also evaluated with the CPI probe between the buccal surface of the most prominent upper incisor and its lower counterpart, with students in centric occlusion parallel to the occlusal plane⁶. Lip coverage was appropriate when the lips of the observed student touched completely, covering the anterior teeth²⁴.

The data were analyzed descriptively, and absolute and relative frequencies were presented for categorical variables, whereas mean, standard deviation, median, minimum, and maximum values were presented for quantitative variables.

Two outcomes were assessed: dental trauma and oral health-related quality of life. The outcome variable "the presence of dental trauma," considering one or more traumatic injuries (enamel and enamel and dentin fractures with or without pulp exposure or dental avulsion), was dichotomized into 'yes' or 'no'. Association tests (Chi-square and Fisher's Exact) investigated the associations between dental trauma and independent variables. The Mann-Whitney test compared the oral health-related quality of life (CPQ₁₁₋₁₄ ISF: 8) scores between students with and without dental trauma at a 5% significance level. All analyses used the SPSS (version 17.0, Chicago: SPSS Inc).

Results

The mean age of the 204 students participating in the study was 12.8 years (\pm 0.8). Most were women (59.3%), did not live in a downtown area (88.7%), lived in a rented property (33.3%) or owned a financed one (24.5%) with two (44.1%) or four bedrooms (21.6%), had a monthly family income of up to USD 599.52 (64.3%), and last visited

the dentist within two years or less (58.9%). As for their guardians, most completed high school (85.8%), did not perform paid work (51.0%), and said that their child's oral health was good (24.5%) or regular (35.8%) (Table 1).

Dental trauma occurred in 12.3% (n = 25) of students. The most frequent trauma was enamel fracture (76.0%). The upper central incisor was affected the most (88.6%). Among students who experienced trauma, the most common cause was unintentional falls (76.0%). Most students had adequate lip coverage (94.6%). The mean overjet was 2.7 mm (\pm 2.0), with a minimum of 0 mm and a maximum of 9 mm. As for oral health-related quality of life, the mean CPQ₁₁₋₁₄ ISF: 8 score was 8.9 points (\pm 4.9) of 32 total points (Table 1). The mean score for each domain was 2.47 for oral symptoms, 2.22 for functional limitations, 2.06 for emotional well-being, and 1.79 for social well-being.

Table 1. Sample characterization of 7th-grade students of public schools in Sertãozinho, SP, Brazil, 2019.

Variable	N (%) or MCTD†
Sex	
Male	83 (40.7)
Female	121 (59.3)
Neighborhood	
Downtown	13 (6.4)
Suburbs	181 (88.7)
No information	10 (4.9)
Level of education of guardians	
Elementary school	36 (17.7)
Middle school	59 (28.9)
High school	80 (39.2)
Higher education	19 (9.3)
None	2 (1.0)
No information	8 (3.9)
Paid work of guardians	
None	104 (51.0)
Yes	87 (42.6)
No information	13 (6.4)
Type of residence	
Owned, settled	47 (23.0)
Owned, financed	50 (24.5)
Rented	68 (33.3)
Provided by parents	30 (14.7)
In exchange for work	2 (1.0)
Ceded (homeless)	2 (1.0)
No information	5 (2.5)

Continue

Continuation

Number of bedrooms in the residence	
1	11 (5.4)
2	90 (44.1)
3	39 (19.1)
4	44 (21.6)
More than four	15 (7.4)
No information	5 (2.5)
Family income (USD)‡	
Up to 59.95	5 (2.5)
60.19 to 119.90	18 (8.8)
120.14 to 359.71	55 (27.0)
359.95 to 599.52	53 (26.0)
599.76 to 1,079.13	18 (8.8)
1,079.37 to 2,278.17	6 (2.9)
More than 2,278.17	0 (0.0)
No information	49 (24.0)
Child's last dental visit	
1 year ago or less	94 (46.1)
2 years	26 (12.8)
Between 3 and 5 years	22 (10.8)
Over 5 years	8 (3.9)
Never went to the dentist	18 (8.8)
No information	36 (17.7)
Reason for the dental visit	
Prevention or routine	87 (42.7)
Treatment	85 (41.7)
Never went to the dentist	24 (11.8)
No information	8 (3.9)
Perception of guardians of their child's oral health	
Excellent	12 (5.9)
Very good	18 (8.8)
Good	50 (24.5)
Regular	73 (35.8)
Poor	26 (12.8)
No information	25 (12.3)
Presence of dental trauma§	
No	179 (87.7)
Yes	25 (12.3)

Continue

Continuation	
Type of dental trauma	
Enamel fracture	19 (76.0)
Enamel and dentin fracture	5 (20.0)
Enamel and dentin fracture with pulp exposure	1 (4.0)
Traumatized tooth	
Upper central incisor	31 (88.6)
Upper lateral incisor	2 (5.7)
Lower incisor	2 (5.7)
Reason for trauma	
Sports practice	2 (8.0)
Unintentional falls	19 (76.0)
Intentional falls	2 (8.0)
Violence	1 (4.0)
Accident	1 (4.0)
Lip coverage	
Adequate	193 (94.6)
Inadequate	11 (5.4)
	Mean=2.7
	SD=2.0
Overjet	Median=2.5
	Minimum=0
	Maximum=9
	Mean=8.9
	SD= 4.9
Total CPQ ₁₁₋₁₄ score (0 a 32)	Median= 8.0
	Minimum= 0
	Maximum= 22

†MCTD: measures of central tendency and dispersion.

‡1 USD= 4.17 BRL at the time of data collection (October 1, 2019).

§The data of 47 students who used orthodontic appliances were not included.

Table 2 shows the association between dental trauma and independent variables. Sex was the only independent variable significantly associated with dental trauma ($p = 0.021$) in the bivariate analysis.

Table 2. Association between dental trauma and independent variables among 7th-grade students in public elementary schools, Sertãozinho, SP, Brazil, 2019.

Variable	n (%) [§]	Without trauma n (%)*	With trauma n (%)*	X ² or Fisher's exact	p-value	Effect size**
Sex						
Male	83 (40.7)	67 (80.7)	16 (19.3)	5.363	0.021	0.1774
Female	121 (59.3)	112 (92.6)	9 (7.4)			
Neighborhood						
Downtown	13 (6.4)	11 (84.6)	2 (15.4)	0.676	0.781	0.0200
Suburbs	181 (88.7)	158 (87.3)	23 (12.7)			
No information	10 (4.9)					
Level of education of guardians						
None and elementary school	38 (18.6)	34 (89.5)	4 (10.5)	0.791	0.851	0.0328
Middle school, high school, and higher education	158 (77.5)	137 (86.7)	21 (13.3)			
No information	8 (3.9)					
Paid work of guardians						
None	104 (51.0)	94 (90.4)	10 (9.6)	0.816	0.366	0.0204
Yes	87 (42.6)	74 (85.1)	13 (14.9)			
No information	13 (6.4)					
Residence						
Owned, settled or financed	97 (47.5)	82 (84.5)	15 (15.5)	0.981	0.322	0.0854
Rented, provided by parents, in exchange for work, ceded (homeless)	102 (50.0)	92 (90.2)	10 (9.8)			
No information	5 (2.5)					
Bedrooms						
1, 2, or 3	140 (68.6)	123 (87.9)	17 (12.1)	0.002	0.967	0.0195
4 or more	59 (28.9)	51 (25.6)	8 (13.6)			
No information	5 (2.5)					
Family income¶						
Up to 59.95 to 599.52	131 (64.2)	116 (88.5)	15 (11.5)	0.864	0.353	0.1013
Up to 599.76 to over 2,278.17	24 (11.8)	19 (79.2)	5 (20.8)			
No information	49 (24.0)					

Continue

Continuation						
Last dental visit						
1 year ago or less	94 (46.1)	79 (84.0)	15 (16.0)	0.226	0.634	0.0538
Between 2 and more than 5 years and never went to the dentist	74 (36.3)	65 (87.8)	9 (12.2)			
No information	36 (17.6)					
Reason for the dental visit						
Treatment	109 (53.4)	93 (69.5)	16 (30.5)	0.474	0.491	0.0646
Never went to the dentist	87 (42.6)	78 (61.0)	9 (39.0)			
Prevention or routine	8 (3.9)					
Child's oral health						
Excellent, very good, and good	80 (39.2)	73 (91.3)	7 (8.8)	2.026	0.155	0.1229
Regular or poor	99 (48.5)	82 (82.8)	17 (17.2)			
No information	25 (12.3)					
Lip coverage						
Adequate	193 (94.6)	170 (88.1)	23 (11.9)	0.021	0.886	0.0431
Inadequate	11 (5.4)	9 (81.8)	2 (18.2)			
Overjet						
≤2.5	103 (50.5)	94 (91.3)	9 (8.7)	1.388	0.239	0.1003
>2.5	92 (45.1)	78 (84.8)	14 (15.2)			
No information	9 (4.4)					

§ Percentage in the column; * Percentage in the row; ** Classification of effect size according to Cohen (1988): small: 0.10; average: 0.30; large: 0.50.

Table 3 shows the absence of a statistically significant difference between the oral health-related quality of life of students with and without dental trauma ($p = 0.136$).

Table 3. CPQ₁₁₋₁₄ ISF:8 measures according to the presence/absence of dental trauma among 7th-grade students of public elementary schools, Sertãozinho, SP, Brazil, 2019.

Measure	With dental trauma	Without dental trauma
Mean	10.48	8.70
Standard deviation	5.31	4.86
Median	9.00	8.00
p-value	0.136	

Discussion

The present study on dental trauma and its impact on oral health-related quality of life of schoolchildren seeks to contribute to decision-making in surveillance actions in the selected municipality and the construction of knowledge in the dental literature.

Dental trauma occurred in 12.3% of students (Table 1), similar to a Brazilian study in which the highest prevalence was 11.9%⁹. However, our results were lower than those of the last national epidemiological survey (20.5%⁶) and other Brazilian studies (21.5%⁷; 23.96%⁸). Moreover, a meta-analysis showed an 18.1%⁴ global dental trauma prevalence in 12-year-olds, and a recent systematic review found a 21% prevalence in Brazilian children and adolescents¹⁰. Distinct results may be due to regional differences, socioeconomic status, behavioral and phenotypic differences¹⁰, the criteria for recording dental trauma, sample size, study design, sampling, and randomization.

Enamel fracture was the most common trauma, and the upper central incisor was affected the most, corroborating previous studies with the same age group^{7,8,25-29}. Epidemiological studies indicate susceptibility to dental trauma due to its location in deciduous and permanent dentition³⁰, possibly because central incisors are more prominent in the arch. Unintentional falls were the main reasons for trauma in schoolchildren, agreeing with previous investigations²⁵⁻²⁹.

When studying the variables associated with trauma, only sex was significantly associated with injuries, which were more frequent in boys than in girls ($p = 0.021$; Table 2). Other studies have also shown a higher predisposition for men^{10,31-33}, which may be due to higher participation in contact sports, fights, automobile accidents, and more hyperactive habits and behavior^{10,11}.

There was no statistically significant association between overjet and dental trauma. A recent systematic review and meta-analysis showed a significant association between ≥ 5 mm overjet in permanent dentition and dental trauma³⁴. A Brazilian systematic review also found a significant association between ≥ 3 mm and ≥ 5 mm overjet and dental trauma in permanent teeth, which is the main risk factor for traumatic dental injuries¹². The present study dichotomized overjet by the median of 2.5 mm (Table 1), which could partially explain the absence of significant association with trauma.

A critical review of risk factors for dental trauma in the permanent dentition of the Brazilian population showed inadequate lip coverage as a predisposing factor for traumatic injuries¹¹. A recent Brazilian systematic review also found a positive association between lip coverage and dental trauma, in which children and adolescents with inadequate lip coverage were more likely to present dental trauma¹². Almost all students (94.6%) in this study showed adequate lip coverage fully covering the anterior teeth. There was a higher possibility of no significant association because variable distribution did not differ.

The socioeconomic level was not statistically significantly associated with dental trauma. The literature is controversial on such a relationship. Studies have

not found an association between lower socioeconomic levels and dental trauma^{29,35-37}. Others show the opposite, reporting that the main reasons for dental trauma are the lack of access to health promotion and disease prevention, living in rural areas, higher risk of accidents, lower level of education of parents, and lower school environment safety³⁸⁻⁴¹. Further studies with large samples must be conducted on the subject.

Overall, the impact of oral health-related quality of life on students was low and not influenced by dental trauma (Table 3), corroborating the findings of a recent study¹⁷ and a meta-analysis². This finding may concern trauma severity because almost all students experienced mild trauma, such as enamel fracture.

Conversely, a recent systematic review and meta-analysis³ showed a significant impact of dental trauma on the quality of life of adolescents. Such divergences may relate to distinct methodologies and criteria to record dental trauma because less severe injuries may not influence student perception and considering the time elapsed between the trauma and data collection. Further studies with a distinct study design, standardized methodology, validated questionnaires, and different cut-off points for dental trauma should be conducted to explain the impact of dental trauma on oral health-related quality of life and establish the cause and effect of events.

The cross-sectional design of this study makes it impossible to establish a causality relationship between the variables. One of the main limitations was the low response rate, especially compared to other studies^{29,32,35,36,42}. Another specific limitation was the low number of adolescents with inadequate lip coverage, which may have been insufficient to provide a statistically significant association with dental trauma, lacking robust statistics to investigate the influence of confounding factors on the findings (logistic regression). The strengths of the present study include a sufficient sample size to provide an adequate test power for the 5% significance level, the cross-sectional census design that allowed all 7th-grade students of public schools to be invited to participate, and the use of validated questionnaires that highly improved the quality of the study.

Conclusion

Dental trauma was significantly associated with sex. It did not impact the oral health-related quality of life of the participating students aged 12-13 years enrolled in the 7th grade of public elementary schools.

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Author Contribution

All authors have made substantial contributions to the conception and design of the study. ISC collected the data, SRCS analyzed and interpreted the data, and ISC and EPST were involved in drafting the manuscript. All authors revised the manuscript critically and have given final approval for the submitted version.

References

1. Andreasen JO, Andreasen FM. Examination of the traumatized patient, wound healing and treatment principles. In: Andreasen JO, Andreasen FM. Essentials of traumatic injuries to the teeth: a step-by-step treatment guide. 2nd ed. Munksgaard, Copenhagen; 2000. p.9-20.
2. Lopez D, Waidyatillake N, Zaror C, Mariño R. Impact of uncomplicated traumatic dental injuries on the quality of life of children and adolescents: a systematic review and meta-analysis. *BMC Oral Health*. 2019 Oct;19(1):224. doi: 10.1186/s12903-019-0916-0.
3. Antunes LAA, Lemos HM, Milani AJ, Guimarães LS, Kuchler EC, Antunes LS. Does traumatic dental injury impact oral health-related to quality of life of children and adolescents? Systematic review and meta-analysis. *Int J Dent Hyg*. 2020 May;18(2):142-62. doi: 10.1111/idh.12425.
4. Petti S, Glendor U, Andersson L. World traumatic dental injury prevalence and incidence, a meta-analysis-One billion living people have had traumatic dental injuries. *Dent Traumatol*. 2018 Apr;34(2):71-86. doi: 10.1111/edt.12389.
5. Magno MB, Neves AB, Ferreira DM, Pithon MM, Maia LC. The relationship of previous dental trauma with new cases of dental trauma. A systematic review and meta-analysis. *Dent Traumatol*. 2019 Feb;35(1):3-14. doi: 10.1111/edt.12449.
6. Brazilian Ministry of Health. [SB Brazil 2010: National Research on Oral Health: main results]. Brasília: Ministry of Health; 2012 [cited 2020 May 10]. Available from: http://189.28.128.100/dab/docs/portaldab/publicacoes/pesquisa_saude_bucal.pdf. Portuguese.
7. Goettems ML, Torriani DD, Hallal PC, Correa MB, Demarco FF. Dental trauma: prevalence and risk factors in schoolchildren. *Community Dent Oral Epidemiol*. 2014 Dec;42(6):581-90. doi: 10.1111/cdoe.12113.
8. Bomfim RA, Herrera DR, De-Carli AD. Oral health-related quality of life and risk factors associated with traumatic dental injuries in Brazilian children: a multilevel approach. *Dent Traumatol*. 2017 Oct;33(5):358-68. doi: 10.1111/edt.12348.
9. Feldens CA, Senna RA, Vargas-Ferreira F, Braga VS, Feldens EG, Kramer PF. The effect of enamel fractures on oral health-related quality of life in adolescents. *Dent Traumatol*. 2020 Jun;36(3):247-52. doi: 10.1111/edt.12526.
10. Vieira WA, Pecorari VGA, Figueiredo-de-Almeida R, Carvas Júnior N, Vargas-Neto J, Santos ECA, et al. Prevalence of dental trauma in Brazilian children and adolescents: a systematic review and meta-analysis. *Cad Saude Publica*. 2021 Dec;37(12):e00015920. doi: 10.1590/0102-311X00015920.
11. Soares TRC, Magno MB, Jural AL, Loureiro JM, Chianca TK, de Andrade Risso P, et al. Risk factors for traumatic dental injuries in the Brazilian population: a critical review. *Dent Traumatol*. 2018 Dec;34(6):445-54. doi: 10.1111/edt.12439.

12. Vieira WA, Pecorari VGA, Gabriel PH, Vargas-Neto J, Santos ECA, Gomes BPFA, et al. The association of inadequate lip coverage and malocclusion with dental trauma in Brazilian children and adolescents – A systematic review and meta-analysis. *Dent Traumatol.* 2022 Feb;38(1):4-19. doi: 10.1111/edt.12707.
13. Zaleckiene V, Peciuliene V, Brukiene V, Drukteinis S. Traumatic dental injuries: etiology, prevalence and possible outcomes. *Stomatologija.* 2014;16(1):7-14.
14. Lam R. Epidemiology and outcomes of traumatic dental injuries: a review of the literature. *Aust Dent J.* 2016 Mar;61 Suppl 1:4-20. doi: 10.1111/adj.12395.
15. El-Kalla IH; Shalan HM; Bakr RA. Impact of dental trauma on quality of life among 11-14 years schoolchildren. *Contemp Clin Dent.* 2017 Oct-Dec;8(4):538-44. doi: 10.4103/ccd.ccd_428_17.
16. Silva-Oliveira F, Goursand D, Ferreira RC, Paiva PCP, Paiva HN, Ferreira EF, et al. Traumatic dental injuries in Brazilian children and oral health-related quality of life. *Dent Traumatol.* 2018 Feb;34(1):28-35. doi: 10.1111/edt.12358.
17. Brignardello-Petersen R. There seems to be no association between uncomplicated traumatic dental injuries and impact on oral health-related quality of life in children and adolescents. *J Am Dent Assoc.* 2020 May;151(5):e40. doi: 10.1016/j.adaj.2019.12.004.
18. Seade Foundation. [Profile of Sao Paulo municipalities]. [cited 2020 Jun 5]. Available from: URL: <https://perfil.seade.gov.br/#>. Portuguese.
19. Tamanini JTN, D'ancona CAL, Botega NJ, Rodrigues NNJ. Validation of the Portuguese version of the 'King's Health Questionnaire for urinary incontinent women. *Rev Saude Publica.* 2003 Apr;37(2):203-11. Portuguese. doi: 10.1590/s0034-89102003000200007.
20. Cohen, J. *Statistical power analysis for the behavioral sciences.* 2nd ed. Hillsdale, New Jersey: Lawrence Erlbaum Associates; 1988.
21. Cohen J. A power primer. *Psychol Bull.* 1992 Jul;112(1):155-9. doi: 10.1037//0033-2909.112.1.155.
22. Jokovic A, Locker D, Guyatt G. Short forms of the Child Perceptions Questionnaire for 11-14-year-old children (CPQ₁₁₋₁₄): development and initial evaluation. *Health Qual Life Outcomes.* 2006 Jan 19;4:4. doi: 10.1186/1477-7525-4-4.
23. Torres CS, Paiva SM, Vale MP, Pordeus IA, Ramos-Jorge M, Oliveira AC, et al. Psychometric properties of the Brazilian version of the Child Perceptions Questionnaire (CPQ11-14) – short forms. *Health Qual Life Outcomes.* 2009 May;7:43. doi: 10.1186/1477-7525-7-43.
24. Traebert J, Almeida ICS, Garghetti C, Marcenes W. Prevalence, treatment needs, and predisposing factors for traumatic injuries to permanent dentition in 11-13-year-old schoolchildren. *Cad Saude Publica.* 2004 Mar-Apr;20(2):403-10. doi: 10.1590/s0102-311x2004000200007.
25. Dhand NK, Khatkar MS. Statulator: An online statistical calculator. Sample Size Calculator for Estimating a Single Mean. 2014 [cited 2020 May 10]. Available from: URL: <http://statulator.com/SampleSize/ss1M.html>.
26. Marcenes W, Alessi ON, Traebert J. Causes and prevalence of traumatic injuries to the permanent incisors of school children aged 12 years in Jaragua do Sul, Brazil. *Int Dent J.* 2000 Apr;50(2):87-92. doi: 10.1002/j.1875-595x.2000.tb00804.x.
27. Traebert J, Peres MA, Blank V, Boell Rda S, Pietruza JA. Prevalence of traumatic dental injury and associated factors among 12-year-old school children in Florianópolis, Brazil. *Dent Traumatol.* 2003 Feb;19(1):15-8. doi: 10.1034/j.1600-9657.2003.00138.x.
28. Soriano EP, Caldas Ade F Jr, Diniz de Cravalho MV, Amorim Filho HA. Prevalence and risk factors related to traumatic dental injuries in Brazilian schoolchildren. *Dent Traumatol.* 2007 Aug;23(4):232-40. doi: 10.1111/j.1600-9657.2005.00426.x.

29. Paiva PC, de Paiva HN, de Oliveira Filho PM, Cortes MI. Prevalence and risk factors associated with traumatic dental injury among 12-year-old schoolchildren in Montes Claros, MG, Brazil. *Cien Saude Colet*. 2015 Apr;20(4):1225-33. doi: 10.1590/1413-81232015204.00752014.
30. Glendor U. Epidemiology of traumatic dental injuries – a 12 year review of the literature. *Dent Traumatol*. 2008 Dec;24(6):603-11. doi: 10.1111/j.1600-9657.2008.00696.x.
31. Robson F, Ramos-Jorge ML, Bendo CB, Vale MP, Paiva SM, Pordeus IA. Prevalence and determining factors of traumatic injuries to primary teeth in preschool children. *Dent Traumatol*. 2009 Feb;25(1):118-22. doi: 10.1111/j.1600-9657.2008.00725.x.
32. Tumen EC, Yavuz I, Kaya S, Uysal E, Tumen DS, Ay Y, et al. Prevalence of traumatic dental injuries and associated factors among 8 to 12-years-old schoolchildren in Diyarbakir, Turkey. *Niger J Clin Pract*. 2017 Oct;20(10):1259-66. doi: 10.4103/1119-3077.219518.
33. Fonseca RCL, Antunes JLF, Cascaes AM, Bomfim RA. Individual and contextual factors associated with traumatic dental injuries in a population of Brazilian adolescents. *Dent Traumatol*. 2019 Jun;35(3):171-80. doi: 10.1111/edt.12469.
34. Arraj GP, Rossi-Fedele G, Dogramaci EJ. The association of overjet size and traumatic dental injuries - a systematic review and meta-analysis. *Dent Traumatol*. 2019 Oct;35(4-5):217-32. doi: 10.1111/edt.12481.
35. Damé-Teixeira N, Alves LS, Susin C, Maltz M. Traumatic dental injury among 12-year-old South Brazilian schoolchildren: prevalence, severity, and risk indicators. *Dent Traumatol*. 2013 Feb;29(1):52-8. doi: 10.1111/j.1600-9657.2012.01124.x.
36. Frujeri ML, Frujeri JA, Bezerra AC, Cortes MI, Costa ED Jr. Socio-economic indicators and predisposing factors associated with traumatic dental injuries in schoolchildren at Brasília, Brazil: a cross-sectional, population-based study. *BMC Oral Health*. 2014 Jul;14:91. doi: 10.1186/1472-6831-14-91.
37. Blokland A, Watt RG, Tsakos G, Heilmann A. Traumatic dental injuries and socioeconomic position – findings from the 'Children's Dental Health Survey 2013. *Community Dent Oral Epidemiol*. 2016 Dec;44(6):586-91. doi: 10.1111/cdoe.12252.
38. Freire MCM, Vasconcelos DN, dos Santos Vieira A, Araujo JA, da Silveira Moreira R, de Fátima Nunes M. Association of traumatic dental injuries with individual-, sociodemographic- and school-related factors among schoolchildren in midwest Brazil. *Int J Environ Res Public Health*. 2014 Sep 22;11(9):9885-96. doi: 10.3390/ijerph110909885.
39. Basha S, Mohammad RN, Swamy HS, Sexena V. Association between traumatic dental injury, obesity, and socioeconomic status in 6- and 13-year-old schoolchildren. *Soc Work Public Health*. 2015;30(4):336-44. doi: 10.1080/19371918.2014.1002598.
40. Mathur MR, Watt RG, Millett CJ, Parmar P, Tsakos G. Determinants of socioeconomic inequalities in traumatic dental injuries among urban Indian adolescents. *PLoS ONE*. 2015 Oct;10(10):e0140860. doi: 10.1371/journal.pone.0140860.
41. Bilder L, Stepco E, Uncuta D, Machtei E, Sgan-Cohen H, Bilder A, et al. Traumatic dental injuries among adolescents in Republic of Moldova. *J Clin Pediatr Dent*. 2019;43(4):269-73. doi: 10.17796/1053-4625-43.4.8.
42. Bratteberg M, Thelen DS, Kloks KS, Bardsen A. Traumatic dental injuries – Prevalence and severity among 16-year-old pupils in western Norway. *Dent Traumatol*. 2018 Jun;34(3):144-50. doi: 10.1111/edt.12399.