

## Original Article

# Impact of complicated and uncomplicated traumatic dental injuries on oral health-related quality of life of preschoolers and their family

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**Abstract:** The severity of a traumatic dental injury (TDI) can influence the prognosis of deciduous teeth and the formation of permanent successors. Consequently, it can have a negative influence on the daily lives of children and their parents. The present study aimed to evaluate the impact of complicated and uncomplicated TDI on the oral health-related quality of life (OHRQoL) of preschoolers and their families. A cross-sectional study was carried out according to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines. After sample calculation and application of the eligibility criteria, 76 children from public preschools (aged 2 to 5 years) with TDI were selected during a period of 5 months. TDI was diagnosed using the Dental Trauma Index and classified according to the severity as complicated or uncomplicated. The Brazilian version of the Early Childhood Oral Health Impact Scale (ECOHIS) was used to determine OHRQoL. The Poisson regression model and Poisson regression model with robust estimates were calculated according to  $p$ -values  $<0.05$ . The complicated group and the uncomplicated group presented low average impact according to ECOHIS scores and there was no significant difference in the total scale, subscale, and domains ( $P>0.05$ ) according to the type of TDI. Based on these findings, it can be concluded that severity of TDI did not influence the OHRQoL of preschoolers and their families.

**Keywords:** Quality of life, oral health, child, family, traumatic dental injury

## Introduction

Traumatic dental injuries (TDI) affect approximately one-third of the children in different countries [1]. In preschoolers, this finding may be attributed to the stage of cognitive and motor development, making them more susceptible to falls and consequently, to the occurrence of TDI [2]. According to systematic reviews [3-5], TDI negatively affects the oral health-related quality of life (OHRQoL) of preschoolers, causing pain and changes in function and esthetics. It also results in emotional and social consequences for children as well as for their families.

In the deciduous dentition, TDI needs special care and attention due to the intimate anatomical relation with the germs of permanent suc-

cessors, which can lead to harmful sequelae in both dentitions [2]. Thus, severity of TDI can influence the prognosis of deciduous teeth and the formation of permanent successors [6, 7], emphasizing the relevance of regular follow-up of traumatized deciduous teeth [8].

Impact of TDI has already been studied by evaluating the effect of its sequelae [9], risk factors [1], and the relationship of TDI with socioeconomic condition [10].

Several studies have evaluated the impact of TDI severity on the OHRQoL of preschoolers and their families [9, 11-24]. However, only one study presented this issue as the main objective, which hindered a detailed evaluation of the results and the possible implications of these results [17]. Hence, the main objective of the

present study was to evaluate the impact of complicated TDI on the OHRQoL of preschoolers and their families.

### Materials and methods

#### *Ethical considerations*

The present study was conducted in accordance with the Declaration of Helsinki and was approved by the local ethics committee (CAAE 2542412.0.0000.5243). Letters explaining the purpose of the survey were sent to the parents. Informed and written consent was obtained from the parents before recruitment, and permission was also obtained from the children.

#### *Study design and sampling*

This cross-sectional study was conducted in accordance with Strengthening the Reporting of Observational Studies in Epidemiology guidelines (STROBE) [25]. Preschoolers and their parents from 25 public daycare centers in the city of Nova Friburgo (Rio de Janeiro, Brazil) were recruited over a period of 5 months.

Among the children whose parents signed the informed consent were included: children from 2 to 5 year-old with TDI in the deciduous dentition, parents who spoke fluent Brazilian Portuguese. Preschoolers with special needs (motor and mental disabilities or some type of syndrome) or with systemic disease, children who did not allow completion of the dental examinations, children who were already in the mixed dentition phase, children who had another oral condition (caries, malocclusion), and children using interceptive orthodontic appliances were excluded.

The sample size was determined a priori using the mean and the standard deviation of the impact of TDI on OHRQoL in groups with complicated and uncomplicated outcomes from a pilot study. The statistical program OpenEpi (Open Source Epidemiologic Statistics for Public Health Version 3.01, <http://www.openepi.com>) was used. A 5% level of significance and 80% power was adopted for a two-tailed test. Ten percent more participants were added to compensate for any loss to follow-up. Thus, a minimum sample size of 29 participants was deemed adequate.

#### *Data collection*

*Sample characterization:* A questionnaire containing questions regarding socio-demographic characteristics was sent to the parents/legal guardians. The questionnaire obtained information on the following sample characteristics: i) children's sex, age, and ethnicity; ii) caregivers' schooling ( $\leq 9$  or  $\geq 10$  years); iii) daycare center localization (urban or rural); and iv) seek for dental treatment.

*Application of clinical indicator: traumatic dental injury index:* The preschoolers' oral examination was performed by two previously calibrated examiners (LAA and LSA). The training exercise for dental trauma was performed using images of different clinical situations. The calibration was carried out with oral examination of 17 preschoolers (minimum sample size was reached and it was not considered a part of the study population) on two separate occasions, with a 2-week interval between the sessions. Intra-examiner and inter-examiner reliability was assessed using kappa statistics. Inter-examiner reliability for dental trauma (each type of TDI) ranged from 0.80 (95% confidence interval: 0.80-0.95) to 1.00 and intra-examiner reliability was Kappa =1.00. The examination was performed using a spatula, gauze, disposable gloves, and natural illumination with the child lying down on the table, while the examiner was seated.

The type of TDI was noted according to the World Health Organization scale [26] as follows: 0= no sign of injury, 1= treated injury, 2= enamel fracture only, 3= enamel and dentin fracture, 4= pulp involvement (including teeth with color change), 5= teeth missing due to trauma, 6= other damage (including displaced teeth), and 9= excluded tooth.

TDI severity was classified according to the classification by Glendor [27], which was modified for epidemiological studies: i) Uncomplicated cases were defined as treated cases, and cases in which the pulp tissue was not exposed and the tooth was not displaced; ii) Complicated cases were defined as cases with pulp tissue exposure and/or tooth dislocation. When one or more diagnoses were applicable, the classification on the individual level was determined by the most complicated diagnosis.

### *Application of socio-dental indicator: OHRQoL instrument*

Early Childhood Oral Health Impact Scale (ECOHIS) as used as the socio-dental indicator [28], which was validated in the Brazilian language [29] for children aged 2 to 5 years. This instrument was self-applied. The ECOHIS consists of 13 items corresponding to four descriptive domains in the child impact section: child symptoms (1 item), child function (4 items), child psychological (2 items), child self-image/social interaction (2 items), and two domains for the family impact section including parent distress (2 items) and family function (2 items). This instrument evaluates the perception of parents on OHRQoL. Response categories of ECOHIS were coded on a five-point scale: 0= never, 1= hardly ever, 2= occasionally, 3= often, and 4= very often. Total ECOHIS scores and scores for individual domains were calculated as a simple sum of response codes. The total instrument scores ranged from 0 to 52 points. A higher ECOHIS score indicated a larger impact and/or more problems, indicating a poorer OHRQoL [28, 29]. For statistical analysis, the sample was dichotomized according to the presence of negative impact (ECOHIS  $\geq 1$ ) or the absence of negative impact (ECOHIS = 0).

### *Data analysis*

Statistical analysis was performed using IBM SPSS Statistics version 19.0 (IBM Corp., Armonk, NY, USA). The level of statistical significance was set at  $P < 0.05$ . The association between TDI severity and the independent variables was assessed. Based on the Kolmogorov-Smirnov test, the distribution of the sample was considered normal. The ECOHIS results were expressed as means and compared according to the TDI severity group. The association between TDI type and OHRQoL (presence or absence of negative impact) was also evaluated. The Poisson regression model was calculated for numerical variables. The Poisson regression model with robust estimates was calculated for categorical variables.

## Results

### *Sample characterization*

Among 606 preschool children invited to participate in this study, 98 met the inclusion

criteria. From these, some parents did not answer the social and OHRQoL questionnaires. The positive response rate was 77.55%. Thus, the final sample consisted of 76 children (39 males, 37 females, mean age:  $3.87 \pm 1.15$  years) and their family representatives (**Figure 1**). The main reasons for exclusion were children without TDI and parents who did not return the OHRQoL questionnaire.

### *Association between TDI severity and independent variables*

Among the included children, 54 (71%) presented with uncomplicated TDI and 22 (29%) presented with complicated TDI. No association was observed between TDI severity (complicated or uncomplicated) and independent variables ( $P > 0.05$ ) (**Table 1**).

### *Association between TDI severity (complicated and uncomplicated) and OHRQoL*

Both groups presented a low average impact according to ECOHIS scores. There was no significant difference in the total scale, subscale, and domains between the groups ( $P > 0.05$ ) (**Table 2**).

### *Association of OHRQoL according to WHO [26] TDI classification*

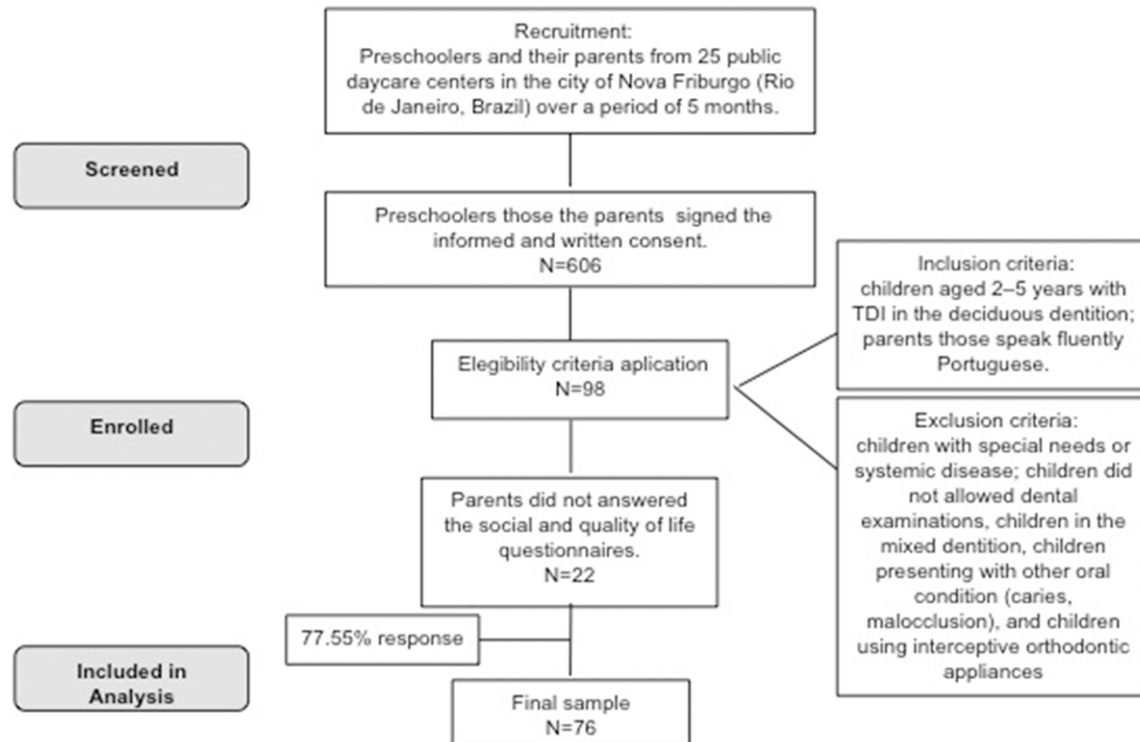
When the absence or presence of negative impact on OHRQoL was assessed according to the WHO TDI classification, no single type of TDI affected the OHRQoL ( $P > 0.05$ ) (**Table 3**).

## Discussion

The present study is extremely relevant for guiding humanized public health clinic conduct. The dentists should pay more attention to the importance of treatment need for the self-esteem and socialization of the individuals, which may directly interfere with the quality of life and the environment surrounding the individuals.

A few studies have evaluated the impact of TDI severity on the OHRQoL of preschoolers and their families [9, 11-24]. A systematic review and meta-analysis revealed that uncomplicated TDI does not influence the OHRQoL [24]. Some studies have reported a negative impact on the OHRQoL in complicated TDI cases [11, 15-17]. Therefore, this topic remains controver-

## TDI Severity and OHRQoL



**Figure 1.** Flow diagram of the sample.

**Table 1.** Sample characterization and association between TDI severity and independent variables

Variables	Total (n=76)	Uncomplicated (n=54)	Complicated (n=22)	OR (95% CI)	P-value
Caretaker's schooling** (%)					
≤9	29 (38.2%)	20 (37.0%)	9 (40.9%)	1.07 (0.34-3.33)	0.91
≥10	47 (61.8%)	34 (63.0%)	13 (59.1%)		
Children Mean age (SD)*	3.86 (1.15)	3.79 (1.17)	4.04 (1.13)	-	0.39
Age** (%)					
24 to 36 months	28 (36.8%)	21 (38.9%)	7 (31.8%)	0.53 (0.15-1.79)	0.31
37 to 60 months	48 (63.2%)	33 (61.1%)	15 (68.2%)		
Sex** (%)					
Female	37 (48.7%)	26 (48.1%)	11 (50.0%)	1.17 (0.36-3.74)	0.79
Male	39 (51.3%)	28 (51.9%)	11 (50.0%)		
Ethnicity** %					
Caucasian	53 (69.7%)	40 (74.1%)	13 (59.1%)	0.36 (0.11-1.24)	0.11
Afro-descendent	23 (30.3%)	14 (25.9%)	9 (40.9%)		
Nursery location** (%)					
Rural	12 (15.8%)	9 (16.7%)	3 (13.6%)	0.78 (0.19-3.24)	0.74
Urban	64 (84.2%)	45 (83.3%)	19 (86.4%)		
Treatment assessment** (%)					
No	47 (61.8%)	34 (63.0%)	13 (59.1%)	0.85 (0.30-2.34)	0.75
Yes	29 (38.2%)	20 (37.0%)	9 (40.9%)		

Footnote: Student's t-test\*; bivariate logistic regression model\*\*, with a statistical significance P<0.05.

## TDI Severity and OHRQoL

**Table 2.** Association between TDI severity and OHRQoL (Scale, Subscales, and domains)

Socio dental indicator (B-ECOHIS)	Clinical indicator - TDI severity		P value	Exp (β)
	Uncomplicated Mean (SD)	Complicated Mean (SD)		
SCALE/SUBSCALE/DOMAIN (VARIATION)				
TOTAL SCALE (0-52)	6.03 (5.82)	4.40 (6.60)	0.87	0.97
CHILD SUBSCALE (0-36)	3.48 (3.41)	2.86 (3.90)	0.69	1.14
Symptoms domain (0-4)	0.51 (0.86)	0.45 (0.91)	0.83	0.92
Function domain (0-16)	1.72 (2.05)	1.09 (1.63)	0.38	0.79
Psychological domain (0-8)	1.03 (1.31)	1.00 (1.63)	0.95	0.99
Self-image/social interaction domain (0-8)	0.20 (0.99)	0.31 (0.94)	0.61	1.10
FAMILY SUBSCALE (0-16)	2.55 (3.26)	1.54 (3.09)	0.25	0.86
Parental distress domain (0-8)	1.22 (0.98)	0.59 (1.33)	0.68	0.91
Family function domain (0-8)	1.33 (1.86)	0.95 (2.01)	0.68	1.11

Footnote: Poisson regression model; with a statistical significance  $P < 0.05$ .

**Table 3.** Association of OHRQoL according to WHO TDI classification

WHO TDI classification	Total	Absence of negative impact (B-ECOHIS =0)	Presence of negative impact (B-ECOHIS $\geq 1$ )	P-value	Exp (β)
<i>Treated injury</i>					
Presence	13 (17.1%)	4 (19.1%)	9 (16.4%)	0.28	0.64
Absence	63 (82.9%)	17 (81.0%)	46 (83.6%)		
<i>Enamel Fracture</i>					
Presence	32 (42.1%)	4 (19.0%)	28 (50.9%)	0.74	0.50
Absence	44 (57.9%)	17 (81.0%)	27 (49.1%)		
<i>Enamel dentin fracture</i>					
Presence	9 (11.8%)	1 (4.8%)	8 (14.5%)	0.76	0.50
Absence	67 (88.2%)	20 (95.2%)	47 (85.5%)		
<i>Pulp involvement<sup>a</sup></i>					
Presence	13 (17.1%)	7 (33.3%)	6 (10.9%)	0.93	0.96
Absence	63 (82.9%)	14 (66.7%)	49 (89.1%)		
<i>Other damage<sup>b</sup></i>					
Presence	9 (11.8%)	1 (4.8%)	8 (14.5%)	0.76	0.50
Absence	67 (88.2%)	20 (95.2%)	47 (85.5%)		

Footnote: Poisson regression model with robust estimative; with a statistical significance  $P < 0.05$ . <sup>a</sup>Included teeth with color change. <sup>b</sup>It was considered displacement and also missing tooth due to the small number of cases).

sial, suggesting a need for more studies to elucidate the results.

The present study showed low average impact of TDI severity (complicated and uncomplicated) on the OHRQoL in preschoolers and there was no significant difference in the total scale, subscales (children/family), and all ECOHIS domains between the groups. Our findings are consistent with the findings of other studies that compared complicated and uncomplicated TDI [9, 12-14, 18-23]. This may be attributed to the fact that the majority of the studies had a cross-sectional design, which is considered a limitation in some of the studies [1, 10].

In cross-sectional studies, past occurrence of TDI may induce a biased memory regarding the severity of the TDI (complicated or uncomplicated). In addition, the absence of radiographic examination in cross-sectional studies may lead to an underestimation of TDI [10]. A cross-sectional design may have limited ability to derive conclusions on the nature of this association. However, it allows obtaining a larger population-based sample size with a representative epidemiological sample [10, 24].

Another important point is the methodological differences in the study design. Study locations such as schools, daycare centers, and vaccina-

tion campaigns can result in underestimation of the prevalence of severe dental trauma. Therefore, trauma would be more recent and the OHRQoL could be detected with more certainty in a trauma center. A better understanding and detection of the impact of TDI on the OHRQoL in children from different age groups (with different cognitive behaviors) is of paramount importance. Therefore, this methodology should be explored including the same as well as other age groups to confirm or refute those results.

The findings of this study demonstrated no difference in the impact of TDI on OHRQoL between preschoolers with uncomplicated TDI and those with complicated TDI. This fact could be due to the low age of the children, and consequently, to their psychological immaturity. However, a worrying fact could be attributed to the parent's lack of care regarding dental trauma in deciduous teeth. Parents do not give a special attention to the primary dentition, since these teeth are temporary and will be replaced by the permanent teeth. According to ECOHIS scores, despite the low impact average, TDI in deciduous teeth deserves a special attention from the clinician. Dental traumas injuries in deciduous teeth are very common. Furthermore, they can cause harmful sequels to the permanent dentition, due to the proximity of the primary teeth with the permanent germs. Although traumatic dental injury has no effect on the oral health-related quality of life of pre-school children and their families, we emphasize the need for greater public awareness about the importance of seeking treatment when a dental trauma in primary teeth occur. Future problems can be generated due to parent's negligence and lack of knowledge in seeking a specialized care.

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### Disclosure of conflict of interest

None.

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