Impact of traumatic dental injuries on the quality of life of schoolchildren

Jefferson Traebert[1]**, Josimari Telino de Lacerda**[2]**, Lyndie A. Foster Page**[3]**, William M. Thomson**[4]**, Marcelo Carlos Bortoluzzi**[5]

[1]Public Dental Health Research Group, Universidade do Sul de Santa Catarina, Tubarão; [2]Department of Public Health, Universidade Federal de Santa Catarina, Florianópolis, SC, Brazil; [3]Department of Oral Rehabilitation, School of Dentistry, University of Otago; [4]Department of Oral Sciences, School of Dentistry, University of Otago, Dunedin, New Zealand; [5]School of Dentistry, Universidade do Oeste de Santa Catarina, Joaçaba, SC, Brazil

Abstract – *Background*: Knowledge of the impact of traumatic dental injuries (TDI) on children's quality of life is sparse. *Aim*: To determine the association between TDI and oral health–related quality of life (OHRQoL) among schoolchildren aged 11–14 years. *Material and methods*: A cross-sectional study was carried out involving a representative sample of 409 schoolchildren from 13 municipalities in the Midwest Region of the Brazilian Southern State of Santa Catarina. Clinical examination included the presence and type of TDI and the treatment provided (or needed) according to criteria used in the UK Children's Dental Health Survey. Dental caries in anterior teeth and malocclusion status were also collected according to WHO criteria. OHRQoL was assessed using the short form of the Child Perceptions Questionnaire (CPQ11–14), and the outcome was the prevalence of one or more adverse impacts on quality of life occurring often/very often. *Results*: The prevalence of TDI was 16.6% (95% CI 13.0–20.2). The prevalence of one or more adverse impacts occurring often/very often was 46.6% (95% CI 41.7–51.5). Logistic regression modeling for the outcome indicated an independent and significant association between the prevalence of one or more adverse impacts occurring often/very often and the presence of TDI even after adjustment for gender, presence of dental caries in anterior teeth and malocclusion. A prevalence ratio of 1.79 (95% CI 1.16–2.76) of one or more adverse impacts occurring often/very often in schoolchildren with TDI was found, compared to those without TDI. *Conclusions*: Traumatic dental injuries appear to affect schoolchildren's OHRQoL.

Oral health problems have been increasingly recognized as important causes of negative impact on the quality of life of individuals and society. It is essential that the social and psychosocial factors are considered along with clinical conditions in the study of oral health (1).

An individual's quality of life is strongly influenced by their health condition. In the field of dentistry, physical and psychological constraints may directly influence aspects of feeding, speech, locomotion, social interaction, and self-esteem (2). There is consensus among authors that studies on oral health–related quality of life (OHRQoL) should address four dimensions: pain and discomfort; functional aspects concerning the ability to chew and swallow food without difficulty, as well as speaking and pronunciation; appearance and self-esteem; and social aspects reflecting social interaction and communication with people (3, 4).

The need to determine the impact of oral health problems in people's quality of life led to the development of instruments for assessing the OHRQoL, which have been used with increasing frequency in dental research (5). However, most developed indicators were elaborated to adults and to the elderly. Children's

OHRQoL instruments remained unknown and are object of study of several researchers. Jokovic et al. (5) developed the CPQ (Child Perception Questionnaire) for the age groups 8–10 years and 11–14 years, Gherunpong et al. (6) developed the Child-OIDP (Oral Impacts on Daily Performances for children), Broder et al. (7) developed the COHIP (Child Oral Health Impact Profile), and Pahel et al. (8) developed the ECOHIS (The Early Childhood Oral Health Impact Scale). The instrument used in this study was the CPQ11–14 developed by Jokovic et al. (9) for several reasons. It is one of the first instruments developed for assessing quality of life specifically in children; its psychometric properties have been confirmed in several countries such as the UK (10, 11), New Zealand (12), Saudi Arabia (13), China (14), and Brazil (15). In addition, other instruments were developed based on the CPQ. Broder et al. (7) have developed the COHIP based on Jokovic's initial item pool used for the development of CPQ (16).

As noted, dental esthetics and the position of anterior teeth have great potential to impact on children's quality of life, particularly in social and psychological dimensions. Consequently, traumatic dental injuries (TDI) that

result in pain and discomfort, discolouration, and other esthetic alterations can lead children to avoid smiling or speaking in a natural way, perhaps affecting self-concept and social relationships. Also, consequences of TDI include feeling embarrassed to smile, laugh and show teeth, difficulty in social relationships, irritability and an inability to maintain a healthy emotional state (17).

Knowledge of the impact of TDI on children's quality of life is sparse, with only few published studies. A study conducted in Brazil almost 10 years ago showed that children with fractured teeth were 20 times more likely to suffer an adverse impact on their quality of life than children without TDI, and this included emotional effects (18). A more recent study (in Brazil) also found a statistically significant association between the presence of traumatized treated teeth and children's OHRQoL (19). However, both studies used an OHRQoL instrument that was not designed specifically for children; this was the Oral Impacts on Daily Performance Scale (20). Nevertheless, a third published study (17) was the first Brazilian one to use an OHRQoL instrument designed for children (the CPQ11–14). That study showed no difference in overall scores between groups with treated or untreated TDI and without TDI but found that children with untreated TDI experienced a negative impact on social well-being (SW), mainly with regard to avoiding smiling or laughing, and in being concerned about what other people think or say.

The aim of the current study was to determine the association between TDI and OHRQoL among Brazilian schoolchildren aged 11–14 years.

Methods

A cross-sectional study was conducted involving 11–14-year-old schoolchildren of public and private schools from 13 municipalities in the Midwest Region of the Brazilian Southern State of Santa Catarina in 2009.

The research project was submitted to and approved by the Ethics Committee of the Universidade do Oeste de Santa Catarina. After that, permission was granted by the administration of the selected schools. An invitation letter was then sent to parents of the selected children, explaining the aim, characteristics, importance, and methods of the study and asking for permission for their child's participation.

The sample size was calculated to give 80% power to demonstrate difference of 50% in the occurrence of frequent adverse impact on quality of life between exposed (schoolchildren presenting TDI) and not exposed (schoolchildren not presenting TDI) groups, at the 5% significance level. Owing to the design of the study with a sample selection in two stages, a correction factor of 1.5 was established. Twenty percent was added to the total sample to compensate for possible refusals. The final sample was 409 schoolchildren.

For sample selection, schools were categorized into three groups according to the number of students aged 11–14; these were small schools (up to 50 students), medium-sized schools (between 51 and 100 students), and large schools (over 100 students). Schools were numbered and then grouped according to size. A random number table was used to randomly select 20 schools, proportionally from the three groups. Simple random sampling was used to obtain the necessary number of students.

Clinical data were collected through examinations of permanent incisors by a team of seven dentists previously trained and calibrated according to methodology described elsewhere (21). Clinical examinations were performed in large venues with enough natural light, with children lying stretched out on their desks. All biosafety procedures were strictly observed. The reproducibility of clinical diagnosis was tested through duplicate examinations on 10% of the sample by each of the examiners and showed κ values > 0.8, calculated on a tooth-by-tooth basis, by both intra- and interexaminer.

Traumatic dental injuries classification criteria were those used in the UK Children's Dental Health Survey (22). These criteria included fractures, discoloration, and tooth loss owing to TDI in the permanent dentition. The need for treatment owing to TDI was reported in cases of signs of untreated TDI or loss of restoration carried out earlier because of TDI. In the absence of other signs, small enamel fractures that would not compromise esthetics were not included in the treatment needs. The required treatment included adhesive restorations, endodontic treatments, whitening, dental crowns, and mobile prostheses. Type of treatment provided owing to TDI included adhesive restorations exclusively, endodontic treatments and adhesive restorations, dental crowns, and prostheses.

Data on dental caries in anterior teeth and malocclusions were also collected using current World Health Organization criteria (23). Dental caries experience was recorded using the number of decayed, missing and filled teeth (DMFT) index. Data relating to malocclusion were collected through the Dental Aesthetic Index (DAI), which records features of the occlusion such as dental crowding and spacing, irregularities in tooth position, and the occlusal relationship between the upper and lower dental arches (24). Information on dental caries and malocclusion were collected to observe their potential roles as confounder variables in the association between TDI and OHRQoL.

Non-clinical data were collected through structured interviews, conducted after the clinical examination. They included socio-demographic characteristics and data on self-perceived quality of life using the CPQ11–14, developed by Jokovic et al. (9) and validated in Brazil by Goursand et al. (15). The short form of the CPQ11–14 is composed of 16 items distributed among the four domains: oral symptoms (OS), functional limitation (FL), emotional well-being (EW) and SW. A five-point Likert scale ranging from 'never' (scoring 0) to 'every day' (scoring 4) is used. The CPQ11–14 score is computed by summing the item scores, with the lowest possible score being zero and the highest possible score being 64. A low score is indicative of a negligible impact.

A pilot study was performed in a neighboring municipality involving 10% of the proposed sample size ($n = 40$) to test the proposed methods. No adjustments were found to be necessary.

Statistical analysis was performed using the Statistical Package for Social Sciences version 16.0 (SPSS for

Windows; SPSS Inc., Chicago, IL, USA). The outcome was the prevalence of one or more adverse impacts occurring often/very often according to CPQ11–14 scale. Gender, age, mother's education level, father's education level, whether fathers were currently working, the presence of TDI, caries experience in the anterior dentition, and presence of malocclusion were used as independent variables. Mothers' and fathers' education level were categorized as < 8 years of schooling or 8 or more completed years of schooling. The variable 'father currently working' was dichotomized as yes or no. TDI was dichotomized as present or absent. Malocclusion was dichotomized as absent (DAI ≤ 25) or present (DAI > 25). Dental caries experience in anterior teeth was dichotomized as present (DMFT > 0) or absent (DMFT = 0).

The chi-square test was used to determine statistical significance of associations between the outcome and independent variables. Multiple logistic regression was carried out using the stepwise method (25) to test the independence of the association between outcome with independent variables. All variables with a *P*-value < 0.20 in the bivariate analysis were entered into the model ordered by significance. Prevalence ratios were calculated from the observed odds ratio (26). Gender, presence of

dental caries in anterior teeth, and malocclusion were retained independently of their significance.

Results

Four hundred and three students were examined and interviewed, yielding a participation rate of 98.5%. The prevalence of TDI was 16.6% (95% CI 13.0–20.2). Enamel fractures were the most common form of TDI, while the adhesive restoration was the most common form of treatment need for TDI (Table 1).

The mean CPQ11–14 score was 12.4 (SD = 9.2). The prevalence of one or more adverse impacts occurring often/very often according to overall CPQ11–14 scale was 46.6% (95% CI 41.7–51.5). The prevalence for the OS domain was 29.5% (95% CI 25.1–33.9), for the FL was 25.3% (95% CI 21.1–29.5), for the EW was 17.6% (95% CI 13.9–21.3), and for the SW was 15.6% (95% CI 12.1–19.1).

The mean CPQ11–14 score was significantly higher among those who had TDI. The scores found by domain are shown in Table 2. There were significant differences in the OS, FL, and EW domains (Kruskal–Wallis test, *P*-values = 0.026; 0.016; 0.031, respectively).

Table 3 shows significant associations between the prevalence of one or more adverse impacts occurring often/very often through the overall CPQ11–14 scale and caries in anterior teeth (*P* = 0.019) and TDI (*P* = 0.007). Significant associations were also observed between TDI, and the OS domain (*P* = 0.036), FL domain (*P* = 0.013) and EW domain (*P* = 0.030).

Logistic regression modeling for the prevalence of one or more adverse impacts occurring often/very often (CPQ11–14 overall scale) indicated an independent and significant association with the presence of TDI. A prevalence ratio of 1.79 (95% CI 1.16–2.76) of one or more adverse impacts occurring often/very often in schoolchildren with TDI was found, compared to those without TDI (Table 4).

Discussion

This study showed a statistically significant and independent association between TDI and OHRQoL among Brazilian 11–14-year-old schoolchildren. It used the short-form version of the CPQ11–14, a child-specific measure, considered appropriate for use in this age

Table 1. Prevalence of different types of TDI, treatment provided, and treatment needs

	Frequency of schoolchildren *n* (%)	Frequency of traumatized incisors[1] *n* (‰)
Type of TDI		
Fracture of enamel	51 (12.6)	65 (20.7)
Fracture of enamel and dentin	19 (4.7)	23 (7.1)
Signs of pulp involvement	1 (0.2)	1 (0.3)
Type of provided TDI treatment		
Adhesive restoration	16 (4.0)	18 (5.6)
Endodontic treatment and adhesive restoration	5 (1.2)	5 (1.5)
Treatment needs owing to TDI		
Adhesive restoration	43 (10.7)	56 (17.4)
Endodontic treatment and adhesive restoration	1 (0.2)	2 (0.6)

TDI, traumatic dental injuries.
[1]Number of examined permanent incisors = 3224.

Table 2. Mean CPQ11–14, range of observed scores, and prevalence of one or more adverse impacts occurring often/very often by presence or not of TDI

	Mean CPQ11–14 (SD)					Range of observed scores	Prevalence of one or more adverse impacts often/very often (95% CI)
	Overall	OS	FL	EW	SW		
Schoolchildren with TDI	14.6 (8.6)	4.7 (2.3)	3.4 (3.0)	3.7 (3.1)	2.8 (2.7)	2–33	62.1 (50.4–73.8)**
Schoolchildren without TDI	9.6 (7.5)	3.8 (2.4)	2.3 (2.4)	1.8 (2.5)	1.7 (2.1)	0–49	44.0 (38.7–49.3)
P-value	0.019*	0.026*	0.016*	0.031*	0.869*		0.019**
All children	12.4 (9.2)	4.1 (2.6)	2.8 (2.9)	3.4 (3.5)	2.1 (2.5)	0–49	46.5 (41.6–51.4)

CPQ, Child Perceptions Questionnaire; EW, emotional well-being; FL, functional limitation; OS, oral symptoms; SW, social well-being; TDI, traumatic dental injuries.
* *P*-value – Kruskal–Wallis test.
** *P*-value – Mann–Whitney test.

Table 3. Prevalence of one or more adverse impacts occurring often/very often by socio-demographic characteristics

Variables	CPQ11–14 Overall n	%	χ^2	P-value	OS n	%	χ^2	P-value	FL n	%	χ^2	P-value	EW n	%	χ^2	P-value	SW n	%	χ^2	P-value
Gender																				
Male	98	48.3	0.320	0.571	62	30.2	0.103	0.749	52	25.4	0.003	0.956	33	16.1	0.627	0.429	36	17.7	1.320	0.251
Female	90	45.5			57	28.8			50	25.1			38	19.1			27	13.6		
Mother's education (years completed)[1]																				
≤8 years	113	50.7	1.715	0.190	71	31.7	0.572	0.450	62	27.7	0.029	0.865	43	19.2	1.324	0.250	39	17.5	1.251	0.263
>8 years	31	41.9			20	27.0			20	26.7			10	13.3			9	12.0		
Father currently working[1]																				
No	34	54.8	1.978	0.160	26	41.3	5.156	0.023*	17	26.6	0.050	0.823	14	21.9	1.117	0.291	12	19.0	0.678	0.410
Yes	148	45.1			89	27.1			83	25.2			49	16.4			49	14.4		
Dental caries in anterior teeth (DMFT)																				
>0	29	63.0	5.464	0.019*	22	47.8	8.471	0.004*	15	32.6	1.547	0.214	12	26.1	2.536	0.111	6	13.0	0.239	0.625
0	159	44.8			97	27.0			87	24.2			59	16.6			57	15.8		
Malocclusion																				
DAI > 25	126	49.6	1.737	0.188	73	28.6	0.369	0.544	70	27.3	1.446	0.229	52	20.3	3.406	0.065	39	15.3	0.110	0.740
DAI ≤ 25	62	42.8			46	31.5			32	21.9			19	13.0			24	16.6		
TDI																				
Yes	41	62.1	7.255	0.007*	27	40.3	4.414	0.036*	25	37.3	6.125	0.013*	18	26.9	4.735	0.030*	11	16.7	0.055	0.815
No	147	44.0			92	27.5			77	22.9			53	15.8			52	15.5		
Total	188	46.6			119	29.5			102	25.3			71	17.6			63	15.6		

CPQ, Child Perceptions Questionnaire; DAI, Dental Aesthetic Index; EW, emotional well-being; FL, functional limitation; OS, oral symptoms; SW, social well-being; TDI, traumatic dental injuries.
*$P < 0.05$.
[1]Missed information.

group (9, 25). Nearly half of the children (46%) answered often/very often in one or more items of the scale. The prevalence of TDI (16.6%) was found to be similar to those of several studies involving the same type of population, age, and methodology (27–29). To minimize the role of potential confounding variables, we included in the analysis information on oral health conditions such as caries experience in anterior teeth and malocclusion status as well as gender.

There have been only few studies that have reported the impact of TDI on the quality of life in children in Brazil. Two recent studies used OHRQoL measures that were not designed specifically for children (18, 19), making any comparisons to this study difficult. This study is the first one to highlight a statistically significant association between the validated short-form measure of the CPQ11–14 and TDI using the prevalence of one or more adverse impacts occurring often/very often as the outcome.

In the most recent study carried out in Brazil, Bendo et al. (17) failed to show any difference in quality of life among children with treated and untreated TDI in relation to children without TDI, despite using the overall score of the same questionnaire. However, they showed that children with an untreated TDI were 1.4-times more likely to report impact on the item 'avoided smiling/laughing' than those without TDI, whereas children with a treated TDI were twice as likely to report impacts on the item 'other children asked questions' than those without TDI. Using a 10-item modified questionnaire yet to be validated, Fakhruddin et al. (30) also failed to show significant differences using the

overall score of CPQ (11–14) in a case–control study of children with and without TDI in Canada. However, when analyzing the CPQ11–14 in an item-by-item basis, they concluded that dental appearance and dental health–related problems can affect psychological and SW, leading to harmful complications to children's well-being that impact quality of life. The authors highlighted that untreated TDI were more likely to generate an impact on children's daily life than restored injuries (30).

Differences in the overall CPQ11–14 cutoff points could explain why our results were not similar to those from Bendo et al. (17) and Fakhruddin et al. (30). These authors have used the presence or not of at least one adverse impact, even a sporadic one as the outcome. On the other hand, we have used the presence of at least one adverse impact occurring often or very often. In the perspective of this study, sporadic impact can result from other factors, as it does not repeat.

When analyzing our results by domain, associations between TDI, and OS, FL and EW domains were observed. Fakhruddin et al. (30) have pointed out that even children with a treated incisor crown fracture may have some of the same FLs with respect to chewing as those with untreated crown fractures. According to these authors, the findings that both treated and untreated tooth injuries affect chewing is related to the fact that a restored crown can be considered only a part of the injury treatment. Pulpal pain and periodontal ligament damage must be considered as having long-term effects on chewing and possibly on sensibility and pain.

The cross-sectional design of this study can be considered an important limitation because a longitudinal study

Table 4. Logistic regression model for one or more adverse impacts occurring often/very often by socio-demographic variables and oral conditions

Variables	PR crude (95% CI)[1]	PR adjusted (95% CI)[1]
Gender		
Male	1.00	1.00
Female	1.12 (0.76–1.66)	1.19 (0.85–1.66)
β	0.113	0.252
P-value	0.571	0.306
Mother's education (years completed)		
<8 years	1.00	1.00
≥8 years	1.21 (0.91–1.61)	1.30 (0.89–1.89)
β	0.354	0.390
P-value	0.190	0.167
Father currently working		
Yes	1.00	1.00
No	1.21 (0.93–1.59)	1.20 (0.78–1.85)
β	0.390	0.268
P-value	0.160	0.410
Dental caries in anterior teeth (DMFT)		
0	1.00	1.00
>0	1.40 (1.05–1.86)	1.12 (0.65–1.94)
β	0.744	0.164
P-value	0.019	0.686
Malocclusion (DAI)		
DAI ≤ 25	1.00	1.00
DAI > 25	1.16 (0.93–1.44)	1.33 (0.94–1.88)
β	0.276	0.417
P-value	0.188	0.107
TDI		
No	1.00	1
Yes	1.41 (1.09–1.82)	1.79 (1.16–2.76)
β	0.735	0.939
P-value	0.007	0.008

DAI, Dental Aesthetic Index; TDI, traumatic dental injuries.
[1]Prevalence ratio.
Hosmer and Lemeshow test P = 0.369.

could provide information on possible etiological relationship between the adverse impacts occurring often/very often and TDI. In this way, this study can evidence only associations between both. On the other hand, the sample procedure, the high response rate, the high inter- and intraexaminer reliability, and the good reproducibility of clinical diagnosis can be considered strengths of this study.

Using a child-specific measure such as CPQ11–14 is another important characteristic of this study. In assessing OHRQoL in children, it is appropriate to use an instrument developed for their particular age group. Children are not independent beings, and family and friends play important roles on children's relationships and feelings, affecting markedly children's perception of quality of life. Despite progress in this area of study, there are still many issues to be discussed and answered, such as which specific questionnaire is most valid for different populations and what domains are more important in the assessment of quality of life of children, adolescents, and their families (31).

In conclusion, TDI appears to affect schoolchildren's OHRQoL, but more research is required on the actual nature of this relationship and its impact on children and their OHRQoL.

References

1. Cortes MI, Marcenes W, Sheiham A. Prevalence and correlates of traumatic injuries to the permanent teeth of schoolchildren aged 9–14 years in Belo Horizonte, Brazil. Dent Traumatol 2001;17:22–6.
2. Sheiham A, Steele JG, Marcenes W, Tsakos G, Finch S, Walls AWG. Prevalence of impacts of dental and oral disorders and their effects on eating among older people; a national survey in Great Britain. Community Dent Oral Epidemiol 2001;29:195–203.
3. Locker D. Concepts of oral health, disease and quality of life. In: Slade GD, editor. Measuring oral health and quality of life. Chapel Hill, NC: University of North Carolina, Dental Ecology; 1997. p. 11–23.
4. Slade GD. Assessment of oral health-related quality of life. In: Inglehart MR, Bagramian RA, editors. Oral health-related quality of life. Chicago, IL: Quintessence; 2002. p. 66–79.
5. Jokovic A, Locker D, Stephens M, Kenny D, Tompson B, Guyatt G. Validity and reliability of a questionnaire for measuring child oral-health-related quality of life. J Dent Res 2002;81:459–63.
6. Gherunpong S, Tsakos G, Sheiham A. Developing and evaluating an oral health-related quality of life index for children; the CHILD-OIDP. Community Dent Health 2004;21:161–9.
7. Broder HL, McGrath C, Cisneros GJ. Questionnaire development: face validity and item impact testing of the Child Oral Health Impact Profile. Community Dent Oral Epidemiol 2007;35(Suppl. 1):8–19.
8. Pahel BT, Rozier RG, Slade GD. Parental perceptions of children's oral health: the Early Childhood Oral Health Impact Scale (ECOHIS). Health Qual Life Outcomes 2007;5:6.
9. Jokovic A, Locker D, Guyatt G. Short forms of Child Perceptions Questionnaire for 11–14-year-old children (CPQ11–14): development and initial evaluation. Health Qual Life Outcomes 2006;4:4.
10. Marshman Z, Rodd H, Stern M, Mitchell C, Locker D, Jokovic A et al. An evaluation of the Child Perceptions Questionnaire in the UK. Community Dent Health 2005;22:151–5.
11. O'Brien C, Benson PE, Marshman Z. Evaluation of a quality of life measure for children with malocclusion. J Orthod 2007;34:185–93.
12. Foster Page LA, Thomson WM, Jokovic A, Locker D. Validation of the Child Perceptions Questionnaire (CPQ 11–14). J Dent Res 2005;84:649–52.
13. Brown A, Al-Khayal Z. Validity and reliability of the Arabic translation of the child oral-health-related quality of life questionnaire (CPQ11–14) in Saudi Arabia. Int J Paediatr Dent 2006;16:405–11.
14. McGrath C, Pang HN, Lo EC, King NM, Hägg U, Samman N. Translation and evaluation of a Chinese version of the Child Oral Health-related Quality of Life measure. Int J Paediatr Dent 2008;18:267–74.
15. Goursand D, Paiva SM, Zarzar PM, Ramos-Jorge ML, Cornacchia GM, Pordeus IA et al. Cross-cultural adaptation of the Child Perceptions Questionnaire 11–14 (CPQ11–14) for the Brazilian Portuguese language. Health Qual Life Outcomes 2008;6:2.
16. Broder HL. Children's oral health-related quality of life. Community Dent Oral Epidemiol 2007;35(Suppl 1):5–7.
17. Bendo CB, Paiva SM, Torres CS, Oliveira AC, Goursand D, Pordeus IA et al. Association between treated/untreated

traumatic dental injuries and impact on quality of life of Brazilian schoolchildren. Health Qual Life Outcomes 2010;8:114.

18. Cortes MI, Marcenes W, Sheiham A. Impact of traumatic injuries to the permanent teeth on the oral health-related quality of life in 12–14-year-old children. Community Dent Oral Epidemiol 2002;30:193–8.

19. Ramos-Jorge ML, Bosco VL, Peres MA, Nunes AC. The impact of treatment of dental trauma on the quality of life of adolescents: a case–control study in southern Brazil. Dent Traumatol 2007;23:114–9.

20. Adulyanon S, Sheiham A. Oral impacts on daily performances. In: Slade GD, editor. Measuring oral health and quality of life. Chapel Hill, NC: University of North Carolina; 1997. p. 151–60.

21. Peres MA, Traebert J, Marcenes W. Calibração de examinadores para estudos epidemiológicos de cárie dentária. Cad Saude Publica 2001;17:153–9.

22. O'Brien M. Children's dental health in the United Kingdom 1993. Office of population censuses and surveys. London: Her Majesty's Stationery Office; 1994.

23. World Health Organization. Oral health surveys. Basic methods, 4th edn. Geneva: World Health Organization; 1997.

24. Cons NC, Jenny J, Kohout FJ. DAI: the dental aesthetic index. Iowa City, IA: College of Dentistry, University of Iowa; 1986.

25. Hosmer DM, Lemeshow S. Applied logistic regression. New York: J. Wiley; 1989.

26. Schiaffino A, Rodriguez M, Pasarin MI, Regidor E, Borrell C, Fernandez E. Odds ratio o razón de proporciones? Su utilización en estudios transversales. Gac Sanit 2003;17:51.

27. Traebert J, Marcon KB, Lacerda JT. Prevalência de traumatismo dentário e fatores associados em escolares do município de Palhoça (SC). Cien Saude Colet 2010;15:1849–55.

28. Soriano EP, Caldas AF, Carvalho MV, Caldas KU. Relationship between traumatic dental injuries and obesity in Brazilian schoolchildren. Dent Traumatol 2009;25:506–9.

29. Traebert J, Bittencourt DD, Peres KG, Peres MA, Lacerda JT, Marcenes W. Aetiology and rates of treatment of traumatic dental injuries among 12-year-old school children in a town in southern Brazil. Dent Traumatol 2006;22:173–8.

30. Fakhruddin KS, Lawrence HP, Kenny DJ, Locker D. Impact of treated and untreated dental injuries on the quality of life of Ontario schoolchildren. Dent Traumatol 2008;24:309–13.

31. Barbosa TS, Gavião MB. Oral health-related quality of life in children: part II. Effects of clinical oral health status. A systematic review. Int J Dent Hyg 2008;6:100–7.