Traumatic dental injuries and socioeconomic position – findings from the Children's Dental Health Survey 2013.

Running head: Traumatic dental injuries and socioeconomic status

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Abstract

Objectives

The aim of this study was to assess whether traumatic dental injuries (TDI) were socially graded among children and adolescents in England, Wales and Northern Ireland, using nationally representative data from the Children's Dental Health Survey (CDHS) 2013.

Methods

This cross-sectional study used data from the Children's Dental Health Survey 2013 which was conducted among a nationally representative sample of schoolchildren in England, Wales and Northern Ireland. Children's family socioeconomic position (SEP) was measured through free school meal eligibility and relative area deprivation using the Indices of Multiple Deprivation. The analytical sample included 6,707 schoolchildren aged 8, 12 and 15. Multiple logistic regression was used to model the associations between experience of TDI and the two markers of SEP, after adjusting for sex and age.

Results

The overall prevalence of traumatic dental injuries to permanent incisors was 9% (n=590). There were no statistically significant associations between TDI and either SEP measure. Further subgroup analyses (n=2,650) showed also no significant associations between TDI and additional SEP markers (parental education and social class). The odds of having sustained a traumatic dental injury were higher for boys than for girls, and were greater in older age groups.

Conclusions

This study found no significant relationships between the experience of traumatic dental injuries and two markers of family socioeconomic position among children living in England, Wales and Northern Ireland. This implies that rather than specifically targeting the more deprived sectors of society, TDI prevention policies should use upstream public health strategies incorporating a whole-population approach.

Introduction

Traumatic dental injuries (TDI) are an often overlooked dental condition, despite being prevalent, preventable and having a significant impact on both individuals and societies [1,2]. TDI are common, with approximately 33% of pre-schoolers worldwide experiencing trauma to primary teeth, and about 25% of schoolchildren and one third of adults globally reporting trauma to permanent teeth [3]. There are however substantial differences in prevalence between and within countries, as well as across different age groups. TDI can affect both the aesthetics and function of the mouth, and studies have shown that the condition negatively impacts on the quality of life of individuals and their families [4,5]. Furthermore, the treatment of dental trauma is costly and time-consuming [6].

Both general and oral diseases are socially patterned, with the association between socioeconomic position (SEP) and health following a stepwise social gradient indicating worse health for each more deprived population group. [7–9]. It could therefore be expected that TDI follow a similar pattern. However, the available evidence is scarce. Bendo et al. [10] conducted the only review on the relationship between SEP and TDI with inconclusive results. Some of the available studies reported associations between TDI and high SEP, mostly in middle and low income countries [11–13]. In contrast, other studies carried out in high (e.g. UK) as well as middle and low income countries (e.g. Brazil) reported that TDI was associated with low SEP [14–19]. Finally, some studies found no association between TDI and SEP in either high, middle or low income countries [20–26]. Very few studies have investigated potential social gradients in TDI, however the results were conflicting [12,27].

Many studies exploring the association between TDI and SEP used non representative opportunistic samples, limiting the generalizability of their findings. Secondly, the variety of TDI classifications used limits direct comparisons between different studies. Additionally, the aetiology of TDI may differ between high income to middle and low income countries; for example, greater access to swimming pools, skateboards and horse riding among those in higher socioeconomic groups in middle and low income countries may result in higher TDI risk [20,28]. In contrast, higher risk of dental trauma in high income countries was recorded among those of lower SEP who live and play in less safe environments [28].

The aim of this study was to assess whether TDI were socially graded among children and adolescents in England, Wales and Northern Ireland, using nationally representative data from

the Children's Dental Health Survey (CDHS) 2013. It was hypothesised that children from more advantaged backgrounds would present lower levels of TDI.

Methods

The CDHS 2013 is the fifth in the series of decennial cross-sectional national UK surveys of children. Pupils aged 5, 8, 12 and 15 and attending mainstream state and independent schools in England, Wales and Northern Ireland were the target population. Scotland did not participate in the CDHS 2013. In total, 13,628 pupils were sampled. A multistage cluster random sampling process with oversampling of more disadvantaged children (based on free school meal eligibility) was designed to ensure a representative sample [29].

Data were collected through a clinical dental examination, a pupil's self-completion questionnaire (for older children) and a parental questionnaire. Consent for the dental examination was based on parental positive written consent (opt-in) for younger children and on negative consent (opt-out) for older children. The CDHS 2013 was approved by the Research Ethics Committee at University College London. Further details on the survey design have been published elsewhere [29].

The primary outcome of this study was any clinically assessed trauma to permanent incisors, including minor damage confined to enamel (dichotomous variable: yes/no). Both untreated and treated TDI (defined as acid etch composite, temporary or permanent restoration due to trauma) were included in the assessment according to the CDHS criteria [30]. Trauma to primary teeth was not recorded. An additional outcome variable was derived for sensivity analyses. It included 3 categories: severe trauma (identified as trauma with pulp involvement, teeth missing due to trauma and/or treated trauma), less severe trauma (all other trauma) and no trauma.

Two variables were chosen to assess family SEP. Eligibility for free school meals (FSM) was used to identify children from low income families [29]. In addition, country-specific Indices of Multiple Deprivation (IMD) provided a measure of area deprivation. Each country's IMD rank quintiles were combined into one variable to derive a measure of relative area deprivation i.e. those in the most affluent areas in England were classified in the same quintile as those in the most affluent areas in Wales and Northern Ireland regardless of absolute deprivation levels.

The analytical sample included children aged 8, 12 and 15. Five-year-olds were excluded as only very few had permanent incisors. Analyses were based on complete cases and weighted to account for the survey design and unequal probability of being sampled. Very few children

had missing data for dental trauma (0.9%). Characteristics of children with and without missing data were compared, confirming that those with missing values in any of the variables included in the analysis were not significantly different from the analytical sample regarding experience of TDI and SEP. Unadjusted associations between sociodemographic characteristics and TDI were examined through chi-squared tests (for dichotomous variables: sex, FSM) and chi-squared tests for trend (for ordinal variables: age, IMD).

We then used multiple logistic regression to assess the associations between experience of TDI and SEP, while adjusting for child age and sex. Model 1 assessed associations with each of the SEP indicators (FSM and IMD) separately whereas Model 2 included both SEP markers (mutually adjusted). Model 3 additionally adjusted for child age and sex. Positive overjet was considered as a covariate but was not related to TDI in preliminary analyses and therefore not included in the final models. Data analysis was performed using the STATA/SE 12.1 (StataCorp) software package.

Results

The analytical sample comprised 6,707 children (3,273 males and 3,434 females) aged 8, 12 and 15. Almost a quarter of all children were eligible for FSM. The overall weighted prevalence of TDI to permanent incisors among all children was 9.1%. Table 1 shows the distribution of dental trauma by socioeconomic and demographic characteristics. Almost twice as many boys presented with any traumatised incisors compared to girls (11.2% vs 6.9%, p=0.002). Dental trauma prevalence (weighted) varied significantly by child age, with the lowest prevalence (5.4%) found among 8-year-olds, while among 12- and 15-year-olds it was 12.5% and 9.4%, respectively (p<0.001). There was no statistically significant variation in the weighted prevalence of dental trauma by free school meal eligibility or by Index of Multiple Deprivation (Table 1).

[Insert Table 1]

Logistic regression models were suggestive of a U-shaped relationship between dental trauma and IMD, where the odds of trauma to permanent incisors decreased between the 1st and 2nd quintiles and increased again throughout the 3rd to 5th quintiles. These associations were

however not statistically significant. There were also no statistically significant associations between TDI and FSM eligibility. After adjustment for socioeconomic indicators boys were 1.75 (1.25-2.44) times more likely to have traumatised incisors when compared to girls. Compared to 8-year-olds, 12-year-olds were 2.55 (1.68-3.87) times more likely and 15-year-olds 1.83 (1.28-2.63) times more likely to present with TDI (Table 2).

[Insert Table 2]

We also tested interaction effects between the two SEP measures (FSM and IMD) as well as between each SEP measure and child age or sex. None of the interaction terms were statistically significant (results not shown). Additional analyses were undertaken on a subsample of 2,650 children for whom two further SEP indicators (parental education and social class) were available. Similarly to the main analysis, the results showed no associations between TDI and these SEP measures (results not shown).

Furthermore, sensitivity analyses were carried out to assess whether a social gradient existed for more severe cases of trauma, defined as trauma with pulp involvement, teeth missing due to trauma, and/or treated trauma. Severe trauma was recorded for 156 children (2.3%) and was more prevalent among boys when compared to girls: 2.1% vs. 1.7%. As before, no significant associations were found between severe TDI and any of the SEP indicators (Table 3).

[Insert Table 3]

Discussion

Using a nationally representative sample of schoolchildren aged 8, 12 and 15 in England, Wales and Northern Ireland, this study found no statistically significant associations between TDI and markers of SEP.

Our results are in line with studies among adolescents in Canada [21] and 5-year-olds in Scotland [24] that also found no association between dental trauma and SEP. Similar results were also reported from several studies conducted in low and middle income countries such as South Africa [22] and Brazil [20,23,31,32,26]. All these studies used the same criteria for dental trauma as our analysis. Standardising dental injury classifications is important as using a variety of different indices hinders comparison across different studies. However, studies on similar age groups (8-14-year-olds) but with different TDI classifications also support our findings [25,22].

The aforementioned studies have collectively used a wide range of SEP measures. SEP is a broad construct and results from studies using different SEP measures are not necessarily directly comparable.

The lack of association between SEP and dental trauma in our study might be partly due to the combination of two conflicting tendencies. On the one hand, children in more disadvantaged groups experience less safe environments than their counterparts, as evidenced by their higher likelihood for injuries [14,16,19,33]. On the other hand, there is some evidence that children in high socioeconomic strata are more likely to participate in sports and leisure activities which pose a high risk of dental trauma, for example rugby, horse riding or surfing [11,13], although little is known about the social patterning of high-risk sports in the UK. Overall it is possible that the balance between activities presenting high trauma risk, such as sports, and environment safety provisions could partially mask any associations between dental trauma and SEP [31].

The overall prevalence of TDI to permanent incisors in this study was 9%, with a higher prevalence among boys than girls. Severe trauma was present in almost 2% of the sample and was also more prevalent in boys. Higher odds of TDI amongst boys when compared to girls are in accordance with previous studies [2,3,20,28]. Unsurprisingly, the odds of dental trauma were higher among older children (12 and 15 years old) when compared to 8-year-olds. As dental trauma is cumulative, the highest prevalence of TDI was expected amongst the oldest children. However, the highest prevalence was reported in children aged 12 which can be explained by the cross-sectional nature of the survey. Compared to the last three CDHS surveys [34,35], the overall prevalence of dental trauma remained almost the same among 8-year-olds (6%, 5% and 5% in 1993, 2003 and 2013 respectively) while the trend showed a decrease in the prevalence among 15-year-olds from 17% in 1993 to 9% in 2013. For children aged 12, there was a decrease in trauma prevalence from 17% in 1993 to 11% in 2003, whereas in the last survey a slight increase to 12.5% was observed. These trends were similar for both sexes.

Previous studies reported increased overjet as a risk factor for TDI [37,38]. We found no such association, however overjet was rare in our sample and only recorded for 12- and 15-year-olds, therefore this study might have limited statistical power to detect a possible correlation.

It is important to recognise the limitations of this study. First, we were unable to examine potential social gradients in relation to primary teeth, as trauma to primary teeth was not recorded. Second, it might have been useful to distinguish between intentional (resulting from

violence and abuse) and unintentional trauma, however such information is not available in the CDHS. Our study also has a number of strengths. The CDHS 2013 includes a large and representative sample of children living in England, Wales and Northern Ireland and provides high quality clinical data. SEP was measured through relative area deprivation, a robust marker of the physical and social environment, and free school meal eligibility, both of which are relevant in the context of dental injuries. Additional analyses were undertaken on a subsample of children for whom individual level SEP indicators were available, and the results confirmed the lack of associations between TDI and SEP.

In conclusion, we found no association between traumatic dental injuries in the permanent incisors and socioeconomic position among children in England, Wales and Northern Ireland. Therefore, upstream public health action incorporating a whole-population approach should be considered in TDI prevention policies [39], rather than specifically targeting only the deprived sectors of society. Specifically, creating safe physical environments for children, as well as supportive social environments are key aspects of the policies. Future studies should examine potential social gradients in dental trauma to primary teeth, and also collect data on trauma aetiology.

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Table 1. Unweighted sample size and weighted prevalence of dental trauma to permanent incisors by sex, age and markers of socioeconomic position.

	Unweighted number	Weighted prevalence of trauma	
	N (%)	Percentage (95%CI)	p-value
Child's sex			
Female	3,434 (51.2)	6.9 (4.93-9.49)	**0.002**
Male	3,273 (48.8)	11.2 (9.53-13.08)	
Child's age			
8-year-olds	2,208 (32.9)	5.4 (3.88-7.39)	**<0.001**
12-year-olds	2,306 (34.4)	12.5 (9.69-16.02)	
15-year-olds	2,193 (32.7)	9.4 (7.61-11.53)	
Free school meals eligibility			
No	5,114 (76.3)	9.2 (7.46-11.19)	0.684
Yes	1,593 (23.8)	8.6 (6.37-11.42)	
Index of Multiple Deprivation (IMD, quintiles)			
Least deprived quintile	717 (10.7)	8.8 (5.26-14.23)	0.240
2nd quintile	1,044 (15.6)	6.1 (4.16-8.79)	
3rd quintile	1,135 (16.9)	8.9 (6.27-12.57)	
4th quintile	1,477 (22.0)	9.6 (7.23-12.51)	
Most deprived quintile	2,334 (34.8)	10.7 (8.21-13.77)	

Table 2. Logistic regression models predicting dental trauma (n =6,707)

	Model 1		Model 2		Model 3	
	OR (95%CI)	p-value	OR (95%CI)	p-value	OR (95%CI)	p-value
Free school meals eligibility						
No	1		1		1	
Yes	0.93 (0.65-1.33)	0.684	0.80 (0.52-1.22)	0.293	0.78 (0.51-1.20)	0.253
IMD (quintiles)						
Least deprived quintile	1		1		1	
2nd quintile	0.67 (0.33-1.39)	0.282	0.68 (0.33-1.39)	0.285	0.68 (0.34-1.35)	0.265
3rd quintile	1.02 (0.53-1.98)	0.948	1.04 (0.54-2.01)	0.907	1.11 (0.58-2.14)	0.752
4th quintile	1.10 (0.59-2.04)	0.761	1.14 (0.61-2.13)	0.677	1.16 (0.65-2.08)	0.620
Most deprived quintile	1.25 (0.67-2.30)	0.481	1.33 (0.69-2.55)	0.387	1.37 (0.75-2.52)	0.309
Child's sex						
Female					1	
Male					1.75 (1.25-2.44)	0.001
Child's age						
8-year-olds					1	
12-year-olds					2.55 (1.68-3.87)	<0.001
15-year-olds					1.83 (1.28-2.63)	0.001

Model 1: unadjusted (FSM and IMD entered separately)
Model 2: mutually adjusted (FSM and IMD entered together)
Model 3: fully adjusted (FSM and IMD entered together with covariates)

Table 3. Weighted prevalence of severe and non-severe dental trauma to permanent incisors by sex, age and markers of socio-economic position.

	Weighted prevalence		
	Severe trauma Percentage (95%CI)	Non-severe trauma Percentage (95%CI)	p-value
Child's sex			
Female	1.7 (1.16-2.46)	5.2 (3.46-7.69)	**0.005**
Male	2.1 (1.45-2.92)	9.1 (7.51-11.05)	
Child's age			
8-year-olds	0.8 (0.42-1.50)	4.6 (3.15-6.62)	**<0.001**
12-year-olds	2.6 (1.76-3.81)	9.9 (7.46-13.08)	
15-year-olds	2.3 (1.59-3.22)	7.1 (5.49-9.19)	
Free school meals eligibility			
No	1.9 (1.47-2.39)	7.3 (5.70-9.26)	0.838
Yes	1.9 (1.16-3.05)	6.7 (4.50-9.79)	
Index of Multiple Deprivation (IMD, quintiles)			
Least deprived quintile	2.0 (1.24-3.31)	6.7 (3.70-11.93)	0.385
2nd quintile	1.8 (1.07-3.14)	4.2 (2.64-6.72)	
3rd quintile	2.0 (0.91-4.29)	6.9 (4.70-10.15)	
4th quintile	1.8 (0.94-3.32)	7.8 (5.50-10.90)	
Most deprived quintile	1.8 (1.03-3.22)	8.8 (6.89-11.30)	