

ABSTRACT

The objective was to evaluate the history of traumatic dental injury (TDI) among children with and without autism spectrum disorders (ASD) at the Centro Integrado de Educação Especial (CIES), in Teresina, Brazil. The dental records of 228 children, 114 with ASD (SG = study group) and 114 without ASD (CG = control group), paired by age, gender and socioeconomic characteristics between January 2007 and September 2014 were reviewed. Data were analyzed using chi-square test and multivariate logistic regression ($\alpha = 5.0\%$). Dental trauma in SG was lower than in the CG (24.6% and 41.2%, respectively, $p = 0.007$). The risk of trauma was lower among males in SG (OR: 0.35; 95%CI: 0.18 to 0.67). The likelihood of TDI in SG was 3.17 higher in females than that of males ($p = 0.040$). The prevalence of TDI was lower in ASD individuals compared to controls. Dental trauma was higher among ASD girls than ASD boys.

KEY WORDS: dental trauma, prevalence, primary tooth, permanent tooth, autism spectrum disorders

Retrospective study of dental trauma in children with autism spectrum disorders: a paired study

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Introduction

Traumatic dental injuries (TDI) of the oral cavity are considered a public health problem in Brazil^{1,2} and correspond to 5% of all body lesions.³ TDI are most common during the first decade of life, and its prevalence is associated with the individual's activities, environment, age and gender.⁴

There is a high risk of dental injury in children with malocclusions, as a result of nonnutritive oral habits (NNOH), when compared with children with normal occlusion.^{1,5,6} Children with special needs of health are at higher risk of TDI than children without these conditions due to characteristics related to cognitive impairment, psychomotor and behavioral disorder.⁷⁻¹¹

Autism spectrum disorder (ASD) is a new DSM-5 term that reflects a scientific consensus that four previously separate disorders (autistic disorder, Asperger's disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified) are actually a single condition with different levels of symptom severity in two core

domains.¹² The prevalence of ASD has increased in past decades, with a 4:1 male to female ratio.¹³ ASD is characterized by deficits in social communication and social interaction and restricted repetitive behaviors, interests, and activities (RRBs).¹²

There is not sufficient evidence to qualify the ASD as a risk factor for dental trauma. The few studies assessing the oral health of children with ASD are limited and poorly comprehensive.^{7,8,10} According to the study by Altun *et al.*,⁷ the statistics of dental trauma relative to children with ASD are high. The maxillary upper incisors are the most affected teeth, and enamel fracture is the most common type of lesion. This type of injury might have clinical, aesthetic,

and psychological consequences, mainly as a function of the behavioral disorders exhibited by this particular population.⁷

The prognosis of TDI depends on early intervention and appropriate treatment.^{14–16} However, emergency treatment is often neglected due to the lack of knowledge of both laypeople and professionals.^{17,18}

As a function of the impact of the sequelae of TDI and the lack of data in the literature regarding that type of lesion in children with ASD, the aim of this retrospective study was to investigate the prevalence of TDI in children and adolescents with ASD who received care at a reference center for special patients and to compare with normal individuals treated at a public university dental clinic in Teresina, Piauí, Brazil. We hypothesized the ASD group would have a higher TDI prevalence than the control group.

Materials and methods

The research ethics committee of the Federal University of Piauí (CEP/UFPI) approved this retrospective cross-sectional study (Protocol N° 874.968), and it met the ethics recommendations dictated by the Declaration of Helsinki.

The dental and medical forms of all the patients with ASD ($n = 115$) were reviewed. The children were treated between 2007 and September 2014. These individuals were between three and 15 years old and were being treated at the Centro Integrado de Educação Especial (CIES), a public school and referral center that provides health care for children and adolescents with special needs in Teresina, Piauí, Brazil. When socioeconomic data or the history of dental trauma was incomplete, the children's caregivers were contacted by phone. The records lacking telephone contact data were excluded from the study. These individuals composed the study group (SG).

For the purpose of comparison, a control group (CG) was established including 114 registration forms of children without ASD who were treated at the Infant's Dental Clinic, at Federal University of Piauí (UFPI), Teresina,

Table 1. Sociodemographic profile of children in SG and CG.

	SG	CG	p^*
	n (%)	n (%)	
Gender			
Male	97 (85.1)	97 (85.1)	1.00
Female	17 (14.9)	17 (14.9)	
Age range			
3-6 years old	46 (40.4)	42 (36.8)	0.86
7-10 years old	44 (38.6)	47 (41.2)	
11-15 years old	24 (21.0)	25 (22.0)	
Family income			
≤2 MW**	77 (67.5)	82 (71.9)	0.47
>2 MW**	37 (32.5)	32 (28.1)	
Mothers' educational level			
<10 years	48 (42.1)	49 (43.0)	0.89
≥10 years	66 (57.9)	65 (57.0)	
Fathers' educational level			
<10 years	49 (43.0)	49 (43.0)	1.00
≥10 years	65 (57.0)	65 (57.0)	
Main caregiver			
Mother	85 (74.6)	91 (79.8)	0.34
Other	29 (25.4)	23 (20.2)	
Total	114 (100.0)	114 (100.0)	

*Chi-square test; **Minimum wage.

Piauí, Brazil. This is a public reference center for dental care of children and adolescents in the city. Children were matched per age, gender and socioeconomic characteristics on a 1:1 ratio.

There were 3,927 dental forms at the Children's Dental Clinic files, UFPI. A systematic sampling process (with a constant $k = 34$) was carried out to compose CG. Only registration forms of patients treated during the same period of time as the study group (2007 to 2014) were eligible.

The variables that were analyzed in the dental forms were: age, gender, parents' educational level, family income (categorized based on the Brazilian monthly minimum wage, the equivalent to \$252.56 USD at the time of data collection), main caregiver, report of TDI, affected teeth, presence of soft tissue

lesion, type of care due to TDI and presence of NNOH. Data collection was carried out during September and October 2014. TDI were considered as present when it had been reported by the caregiver and recorded in the dental form.

Pearson's chi-square test (χ^2) was used in bivariate analysis to investigate the association between history of TDI and ASD. The significance level was set at 5% ($p \leq 0.05$). Variables that showed $p \leq 0.20$ in the bivariate analysis were included in the multivariate model. A multivariate logistic regression model was created using the Enter method, which was fitted using the Hosmer-Lemeshow test model. The adjusted odds ratio (OR) and (95%) confidence interval (CI) were calculated. Associations were statistically significant when $p \leq 0.05$ (Wald test). The data were registered in a

Table 2. Distribution of variables relative to history of dental trauma and nonnutritive oral habits.

	SG	CG	<i>p</i>
	n (%)	n (%)	
Dental trauma			
Yes	28 (24.6)	47 (41.2)	0.007*
No	86 (75.4)	67 (58.8)	
Total	114 (100.0)	114 (100.0)	
Affected teeth			
Permanent maxillary incisors	13 (46.4)	02 (4.3)	<0.001**
Maxillary deciduous incisors	12 (42.9)	44 (93.6)	
Maxillary and mandibular incisors	03 (10.7)	01 (2.1)	
Soft tissue lesion			
Yes	14 (45.2)	27 (57.4)	0.288*
No	17 (54.8)	20 (42.6)	
Sought a dentist after trauma			
Yes	08 (28.6)	28 (59.6)	0.009*
No	20 (71.4)	19 (40.4)	
Nonnutritive oral habits			
Yes	44 (38.6)	15 (13.2)	<0.001*
No	70 (61.4)	99 (86.8)	
Total	114 (100.0)	114 (100.0)	

*Chi-square test; **Fisher's exact test.

Table 3. Logistic regression model corresponding to study group (SG).

Variable	Adj. OR (IC 95%CI)	<i>P</i>
History of dental injury		
Yes	0.42 (0.23-0.77)	0.005
No	1	
Nonnutritive oral habits		
Yes	4.45 (2.25-8.77)	<0.001
No	1	

Adj. OR = adjusted odds ratio; 95%CI = 95% confidence interval; *P* = probability on the Wald Test. Hosmer-Lemeshow test (final model) *p* = 0.99.

form and afterwards, analyzed using the *Statistical Package for Social Sciences* (SPSS®) version 18.0 for Windows® software.

Results

The sample consisted of 228 dental forms of children (SG = 114, CG = 114).

A total of 115 dental records of children with ASD were available at CIES, Teresina. One form was excluded due to incomplete data and lack of telephone contact data.

The sociodemographic characteristics of the sample are described in Table 1; the results show that the two groups were paired.

The prevalence of TDI in the study group was lower than in the CG (*p* = 0.007). Therefore, our hypothesis was rejected. In the SG group, the permanent maxillary incisor was the most affected tooth. Children in CG sought dental care motivated by trauma more frequently than children in SG (Table 2).

The frequency of NNOH was higher among the children in SG than in children in CG (*p* < 0.001). However, no association was found between the presence of NNOH and history of dental trauma (*p* = 0.917).

Multivariate logistic regression analysis showed that a diagnosis of ASD was protective regarding TDI (OR: 0.42, 95%CI: 0.23 to 0.77; *p* = 0.005), although the likelihood for the children with ASD to develop NNOH was 4.5 times higher than the controls (*p* < 0.001) (Table 3).

Regarding the history of TDI among girls only, no difference was found between groups (*p* = 0.486). There was statistically significant association between TDI and males (*p* = 0.001). The risk of trauma was lower among males of SG (OR: 0.35, 95%CI: 0.18 to 0.67) than males of CG (Table 4). In SG, the prevalence of TDI was higher among females than males (41.7% and 20.6%, respectively). The likelihood of ASD females to experience TDI was 3.17 higher than that of ASD males (*p* = 0.040).

Discussion

In this study, the majority of children with ASD were males (85.1%) and the prevalence of TDI was lower among the children with ASD. One similar study carried out in Brazil found a prevalence of dental trauma of 9.2% among individuals with special needs and 27.3% among ASD individuals,⁸ however that study had no control group. An incidence study conducted in Turkey⁷ found similar TDI incidence between autistic and nonautistic individuals (23.0% and 15.0%, respectively, *p* = 0.190). However, the sample's age ranged from 4 to 23 years old.

The behavior of individuals with ASD, characterized by difficulties in

Table 4. Prevalence of dental trauma in children with or without ASD by gender.

	Female			Male			
	SG	CG	* <i>p</i>	SG	CG	* <i>p</i>	Adj. OR (95%CI)
Dental trauma							
Yes	8 (57.1)	6 (42.9)	0.486	20 (32.8)	41 (67.2)	0.001	0.35 (0.18-0.67)
No	9 (45.0)	11 (55.0)		77 (57.9)	56 (42.1)		1
Total	114 (100.0)	114 (100.0)		114 (100.0)	114 (100.0)		
*Chi-square test. Adj OR = adjusted odds ratio; 95%CI = 95% confidence interval.							

*Chi-square test. Adj OR = adjusted odds ratio; 95%CI = 95% confidence interval.

reciprocal social interactions and impaired communication skills, leads to the isolation of patients.¹⁹ Those characteristics are the opposite of the most common causal factors of dental trauma, which is the participation in collective activities, in which falls and physical impacts are more frequent.²⁰ This fact might account for the lower prevalence rate among ASD children found in this study.

Generally, individuals with special needs, cognitive developmental delay or impaired motor coordination are more prone to TDI when compared with individuals without special needs, regardless of their gender.^{7-10,21} This was the reason for our hypothesis. However, there is controversy in the literature^{19,22} as to the association between TDI and gender among ASD individuals. Girls with ASD or developmental disorders tend to exhibit greater cognitive impairment but fewer behavioral and social problems compared with boys.²³ These facts may explain the higher percentage of girls than boys with history of TDI in the study group. Habibe *et al.*¹⁰ found that girls with ASD experienced more TDI than boys, a fact probably explained by the ASD condition itself, more severe in females.

Permanent maxillary incisors were most affected (46.4%) by dental trauma in SG. Another study reported similar results, in ASD individuals.¹⁰ This finding can be explained due the position of these teeth in the dental arch. Although TDI tends to affect a single tooth, multiple dental and soft tissue lesions might also occur.³ In our study, soft tissue lesions occurred in 46.2% of the cases of TDI.

The association between TDI and socioeconomic status also remains controversial. Marcenés *et al.*²⁴ found higher TDI prevalence among more affluent adolescents. However, another study²⁵ found an inverse correlation between trauma and the parents' educational level and socioeconomic status. For this reason in our study, the groups were paired according to their socioeconomic characteristics.

Little evidence exists suggesting that ASD individuals are at high risk for TDI. Therefore, and considering that TDI are very frequently found in clinical practice, the investigation of such lesions in ASD individuals is relevant to the implementation of preventive and interceptive strategies.³

Inadequate management of TDI might lead to complications such as pulp necrosis, partial or total obliteration of the root canal, (internal or external) root resorption, and dental ankylosis.²⁶ In 71.4% of the cases analyzed in this study, the children's caregivers did not seek a dentist after TDI. Such omission hampers the diagnosis and the assessment of the severity of the injury and, therefore, worsens the prognosis of the affected tissues. The odds for a favorable prognosis are inversely related to the time period between the occurrence of trauma and the onset of adequate care.²⁷

The likelihood that ASD children would develop NNOH was higher than for the controls. However, the presence of such habits was not associated with a history of TDI ($p = 0.150$). NNOH might be associated with anterior open bite and crossbite, which are forms of

malocclusion that are significantly associated with an increased prevalence of TDI in the primary dentition.⁵ However, our study did not assess the presence of malocclusion, which was one limitation.

Another limitations of this study lie in the fact that the sample data were collected from dental records, and the children were not actually examined. Furthermore, there was no information on the type of TDI that resulted from the trauma, only the record of a dental trauma event and the involvement of soft tissues. Nevertheless, the individuals were contacted by phone to verify the accuracy of the events.

In conclusion, the prevalence of TDI was lower among the children with ASD than the controls. The permanent teeth were the most affected by traumatic injury in the group of children with ASD. The prevalence of TDI was higher among ASD girls than boys. Together with the inclusion of ASD individuals in regular schools and consequent greater socialization, the frequency of TDI might exhibit a tendency to increase. Further studies on the impact of TDI on dental and perioral tissues and in the quality of life of children with ASD are encouraged.

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