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ANALYSIS OF TRAUMATIC DENTAL INJURIES IN CHILDREN AND ADOLESCENTS' PATIENTS WITH CEREBRAL PALSY IN TERESINA, PIAUÍ, BRAZIL

Oral Medicine

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ABSTRACT

Background: Cerebral Palsy (CP) is defined as a set of clinical abnormalities involving paralysis, incoordination, tremors and disability as a result of brain damage and the prevalence of dental injuries in children with CP is much higher than for non-syndromic populations.
Objective: The main objective this work was to measure the prevalence of traumatic dental injuries in children with cerebral palsy (CP) aged 7-17 years, and to assess the most prevalent type of trauma and treatment needs,
[Methods] via a cross-sectional study applied in patients.
Results: No statistically significant association was found between the type of CP and the occurrence of trauma, or between the last one and occlusion. However, among the victims of trauma, there was a predominance of Class II occlusion.
Conclusion: The occurrence of dental trauma in patients was high, which reinforces the importance of monitoring the dental condition of patients with special needs.

KEYWORDS

dental trauma, Cerebral Palsy, cross-sectional studies, caregivers, child, special education

INTRODUCTION

Cerebral Palsy (CP) is defined as a set of clinical abnormalities involving paralysis, incoordination, tremors and disability as a result of brain damage. The damaging process can occur in the pre, peri or postnatal period, when the nervous system is still maturing.[1] Several risk factors are currently known, such as perinatal hypoxia/ischemia, low birth weight, intrauterine infection, prematurity and genetic causes; these facts suggest that CP is a multifactorial disease.[2]

CP is traditionally classified by the degree of motor impairment and anatomical distribution. The classification based on motor impairment may include the words spastic, dyskinetic, ataxic, hypotonic and mixed. The most commonly used terms for the classification of anatomical distribution are hemiplegia (involvement of one side of the body), diplegia (involvement of both legs with minimal involvement of both arms), quadriplegia (involvement of four limbs) and monoplegia (involvement of only one member). The terms paraplegia (involvement of both legs), triplegia, double hemiplegia, and tetraplegia are also used.[3]

Traumas of teeth and their supporting structures can be described and classified according to their etiology, anatomy, pathology and therapy, and are graded as traumas of dental hard tissues and pulp, periodontal tissues, supporting bone and gingiva, or oral mucosa.[4] Among the most common causes of dento-alveolar trauma are car accidents and sport practice.

Children with CP develop a series of alterations in their musculoskeletal system. These alterations lead to a decreased mobility in the affected limbs and various degrees of motor impairment, ranging from difficulties in speech, swallowing, activities of daily living, walking, to total dependence. According to Côrrea[5] and McDonald and Avery[6], there are no specific oral alterations in children with cerebral palsy. However, as they do not follow the normal stages of psychomotor development, these children have difficulty in swallowing, chewing, speaking and produce excessive saliva. The imbalance between intra- and perioral muscles and their lack of muscle control also leads to an increased incidence of malocclusion, changes in the temporomandibular joint and bruxism.[5,6] According to Holan *et al*[7], the prevalence of dental injuries in children with CP was much higher than for non-syndromic populations considering the fact that individuals with cerebral palsy do not practice the violent sport activities that healthy children usually do.

Then, it is reasonable to hypothesize there isn't, or if there is that it is insufficient, prevention of dental injuries for children and adolescents with CP. Therefore, the aim of this study was to determine the prevalence of traumatic dental injuries in patients with CP in children and adolescents from 7 to 17 years old, to identify the causes and the most common sites of such injuries, and, according to the results, demonstrate the need of a plan to guide caregivers in order to avoid or minimize damage, improving the oral health of patients with CP.

MATERIAL AND METHOD

This study was approved by the Ethics and Research Committee of the Federal University of Piauí (UFPI) under protocol number 0153.0.045.000-08. It is an observational, cross-sectional descriptive study carried out at the institutions known as CIES (the Integrated Centre for Special Education) and CEIR (the Integrated Center for Rehabilitation) in Teresina/PI-Brazil, which are reference centers for rehabilitative care of special-needs patients in this state. The study included 52 patients (26 of each gender) with cerebral palsy, aged 7-17 years old, who regularly attend the institutions mentioned above.

Caregivers were given a questionnaire to provide information about the child's age, gender, medical history, mobility capability with or

without equipment, oral hygiene, time of brushing teeth, feeding patterns, frequency of dental visits and history of dental trauma. The previously trained examiner carried out a clinical examination, using an oral mirror, a number 5 dental probe, a WHO probe and tweezers, in order to identify dento-alveolar trauma, according to the classification of Andreasen[4] (Table 1). The examiner also recorded whether any treatment took place for the traumatized teeth and the patient's occlusion type.

Table 1. Simplified Classification and definition of types of the dental trauma (adapted from ANDREASEN, 1981).

Type of trauma	Characteristics
Crown fracture	Fracture with loss of dental substance restricted to the enamel and dentin
Concussion	Trauma to the supporting structures of the tooth without increased mobility or displacement of the tooth
Subluxation	Trauma to the supporting structures of teeth with increased mobility, but without displacement of the tooth
Luxation	Axial displacement of the tooth in a different direction from the axial direction
Avulsion	Complete displacement of tooth out of its socket

The data collected from the sample was recorded on forms and processed using SPSS (Statistics Package for Social Sciences, version 15.0, 2007). The chi-square test was used to assess the association between the type of CP and occurrence of trauma, and type of occlusion and trauma.[8] The level of significance was 5% ($p < 0.05$) and the study used a 95% confidence interval (CI).

RESULTS

This study was completed with 52 students who were examined at the institutions that were surveyed, 26 of each gender, aged 7-17 years old, of whom 46.2% were aged 7-9 years old and 53.8% were 10-17 years old.

Traumatic injury was present in 19 children, totaling 24 teeth with dental fractures; 13 children in 10-17 years old group and 6 children in 7-9 years old group. There was no significant statistic difference in ratio of injuries between both genders (chi-square test, $p > 0.05$).

Of the 19 patients with trauma in their anterior teeth, 29.4% had injuries to more than one tooth.

The most affected tooth was the permanent upper left maxillary central incisor (62.5%) (Table 2).

Table 2. Teeth most affected by traumatic injuries in children with CP.

Fractured tooth	Frequency [%]
Left maxillary central incisor	62.5
Right maxillary central incisor	33.3
Right maxillary lateral incisor	4.2

The house was the environment where trauma took place for the highest number of patients, accounting for 73.7%.

The most common types of injury were enamel fracture (52%), and fracture of enamel and dentin without pulp involvement (32%), followed by fracture of enamel and dentin with pulp involvement, concussion, extrusive luxation and luxation (4%) (Figure 1).

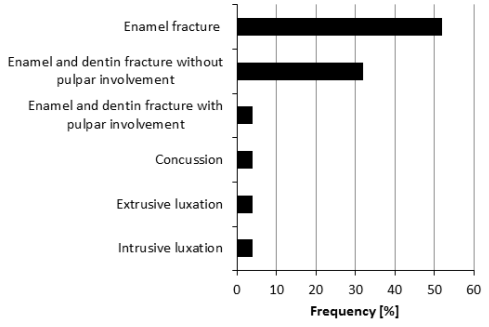

Figure 1 – Type of traumatic dental injuries in children and adolescents from 7 to 17 years old with CP.

There was no significant statistical difference in ratios of injuries ($p > 0.05$) among the three types of CP (Table 3).

Table 3. Association between the type of CP and the occurrence of dento-alveolar trauma.

Type of CP	Trauma [%]	
	Yes	No
Diplegia	36,8	30,1
Hemiplegia	26,3	18,2
Quadriplegia	36,8	51,6

$\chi^2 = 1,097; p < 0,05$

There was no significant statistical difference in ratio of the injuries between normal occlusion and malocclusion (chi-square test, $p > 0.05$) (data not shown). However, among the 19 children with the trauma, ratio of Class II malocclusion was significantly higher compared with the other types of occlusion (chi-square test, $p < 0.05$) (Table 4).

Table 4. Association between trauma and the occlusion´s type.

Type of occlusion	Trauma [%]
Normal	21,1
Class I	10,5
Class II	63,2
Class III	5,2

IC = 95%; $\chi^2 = 15.74; p < 0.05$

DISCUSSION

In order to adopt appropriate treatments in cases of emergency and to guide parents and caregivers for first aids, dentists should be aware of the factors associated with oral trauma such as the most common age of occurrence, causes of trauma, and places where they occur, the most common types of trauma and the most affected teeth.[8] Dentists, as an important source of information, could take an important role in preventive medicine for dental trauma, and in education of caregivers.

Traumatic regions and types

According to Firoozmand[12], patients with special needs have a higher prevalence of fractures in the permanent maxillary central incisors, consistent with Tapias *et al.*[13] and Altun *et al.*[14], who found, respectively, 83.7% and 80.3% of fractures in those teeth [12-14]. Jokic [11] reported that dental traumas were more frequent in the upper teeth, affecting the permanent dentition, and the most affected permanent teeth were the maxillary central incisors.[11] Similarly, in this study, 19 patients (36.5%) had trauma in their anterior teeth, 29.4% of which showed injuries in more than one tooth, and the most affected teeth were the permanent upper left central incisors (62.5%). Indeed, the anatomical position these teeth explains the prevalence of fractures.[3]

In the present study, the common types of injury were enamel fracture (52%), and fracture of enamel and dentin without pulp involvement (32%). These data corroborate previous reports in which the most frequent types of traumatic dental injury at permanent teeth were enamel fractures, fracture of enamel and dentin without pulp involvement[13] and fracture of enamel and dentin with pulp involvement.[19]

Ages of patients with dental trauma

This study indicates that incidence of injuries was higher in the 10-17 years old (68.4%) with no significant statistic difference between genders. A study using healthy children 9-14 years old[9] reported that the prevalence of dental trauma ranged from 8% in 9 years old to 16.1% in 14 years old. Foresberg and Tedestam[10] assessed 1,635 healthy children across the ages from 7 to 15 years and reported that 18% of them suffered from dental trauma in their permanent teeth[10], while Jokic *et al*[11] found a high frequency of traumatic dental injury (70.6%) in the age group of 10-14 years in healthy children. The present findings along with the data from the healthy children suggest that dental injuries increase with aging, probably because of physical development of the patients' body and less helps from the caregivers due to aging of patients (see below).

Places where traumatic injuries took place

Information of prevalent locations of trauma occurrence is of fundamental importance in prevention programs to minimize their

occurrence. In this study the house was the most prevalent environment where trauma took place, accounting for 73.7% of traumas. Other studies reported that the most common cause of trauma was falling[15], and 63.5%, and 60.3% of traumatic injuries occurred inside the house and in the neighborhood, respectively in children at preschool and school age[16]. Dos Santos[17] reported that 45% of dental injuries in patients with CP occurred at home due to falling from their wheelchair, consistent with Malikaew *et al*.[18] and Rajab[19]. Thus, according to these data, the main measures to avoid dental trauma in CP patients must be taken at home.

Causes of dental trauma

Although CP patients have motor disability, their body develops during puberty, which make CP patients more active. Falling from their wheelchair as causes of trauma (see above) suggest that children or adolescent might be left alone more often after a certain age. During puberty, face shapes of children change from rounded to more longitudinal ones due to anatomical development[20], which makes the children less cute[21]. Since baby-like features could evoke more caretaking behaviors from adults, older children could be provided with less helps from caregivers. Recent neuroimaging studies reported that baby-like characteristics modulated the activity of the brain reward system of women, which might induce motivational drive to caretaking behaviors, and the activity in the precuneus involved in attention[22]. These findings could explain the higher percentage of traumatic accidents in the 10-17 years old group, i.e., the older children/adolescents might be left alone more frequently or receive less attention. Further studies are required to determine whether or not older children with CP are left alone at home.

Types of occlusion and CP

The Malocclusion is the wrong organization of teeth in tridimensional planes of space [27], and this work the presence of occlusal interference did not affect prevalence of dental trauma. Therefore, it is reasonable to assume that occlusion is not the main cause for the increase in dental trauma in CP patients. However, among the patients with dental trauma, class II div 1 occlusion predominated. The occlusion type II was divided into div 1 and 2 being the div 2 a very rare occurrence[27]. This suggests that occlusion type could be one of the factors affecting dental trauma.

The types of CP did not affect the prevalence of trauma in this study. In fact, the inability of CP patients to control their movements[7], combined with the presence of dental overset and lack of lip protection, may be factors that predispose them to dental injuries[12]. CP is a disorder resulting from brain injuries, which induces motor impairments in body balance, posture and muscle tone, and also induces involuntary movements. These motor disturbances could result in falls and dental trauma.

Summary and conclusions

The results indicated that dental injuries occur more frequently in children between 10 and 17 years old, with the permanent central incisors being the most affected teeth. Fractures of enamel and dentin without pulp involvement are the most prevalent types of injuries. The prevalence of dental trauma is high in patients with CP. However, the types of CP were not associated with its occurrence. Among the patients with the dento-alveolar trauma, class II occlusion predominated.

Although this study did not focus on the caregivers' practices, higher prevalence of dental trauma at home suggest that more information and specific training are required as the main measures to prevent dental trauma in CP patients. Thus, it is important to develop prevention campaigns and provide training to caregivers of CP patients, assisted by dentists and psychologists. Further studies are required in order to investigate the prevalence of dento-alveolar trauma in individuals with special needs, taking behavioral aspects of patients and caregivers into consideration.

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