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Dental Trauma in the Northern Region of the State of Ceará: An Observational Study

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Authors' contributions

This work was carried out in collaboration among all authors. Author MJM designed the study, carried out the analysis and wrote the first version of the manuscript. Authors YNV, LDCSR and FSRC wrote the manuscript, interpreted and tabulated the results. Authors GEDRDM and YNV translated the article. Author CDAADO placed the study within the magazine's standards. Author AKDSSB guided the study and revised the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Oral and dental trauma (ODT) results from sudden forces acting on the teeth and/or adjacent tissues. The etiology is complex and often multifactorial, along with cultural and social aspects that can favor the occurrence of these traumas. Epidemiological studies on dental injuries help to plan education and prevention actions.
Aim: The aim of this study was to determine the epidemiological pattern of patients affected by ODT over a 7-year period, treated at the Center for the Study of Patients Victims of Oral and Dental Trauma in Sobral, a project of the Federal University of Ceará.
Methodology: A descriptive, epidemiological and cross-sectional study was carried out by analyzing the medical records of all patients treated between 2016 and 2023. The data collected included gender, age, date and place of injury, diagnosis, teeth affected and time since trauma.
Results: The study included 99 patients with 169 affected teeth. Males were predominantly affected (73.3%), with the upper right central incisor being the most frequently injured tooth (21.9%). In addition, 18.18% of patients had a history of previous injuries. The most affected age group was children aged 0-12 (60.6%), with falls from a height being the main cause (29.29%), followed by bicycle accidents (12.12%). Most injuries occurred at home (35.35%).
Clinical Significance: ODTs represent an important public health problem. This study corroborates the existing literature, highlighting that dental trauma predominantly affects young males and impacts the anterior maxillary region. Understanding the risk factors is crucial for developing effective preventive and educational strategies, ensuring timely and appropriate emergency care.

Keywords: Trauma; epidemiology; tooth fractures; luxation injuries.

1. INTRODUCTION

Dental trauma is a common injury among children and adults. Of all injuries, covering all age groups, 5% are traumatic dental injury (TDI) [1]. In addition, 25% of school-age children and 33% of adults have suffered some kind of dental trauma. As oral dental trauma (ODTs) are frequent injuries, initial care after this type of accident should be common knowledge among parents, teachers, other childcare professionals, as well as first responders and medical staff [2].

Traumatic dental injury (TDI) is a public health problem and its prevalence has been studied all over the world [3]. The panorama of oral diseases has been changing over time, with a decline in the incidence of caries and periodontal diseases and an increase in TDIs [4]. Around 180 million children are thought to have suffered traumatic injuries to their primary teeth and around one billion to their permanent teeth, and it was concluded that the prevalence of ODTs in primary teeth was 22.7%, while in permanent teeth it was 15.2% [5].

In terms of development, the eruption of the anterior deciduous teeth starts at 6 months and continues until around 2 years of age. During this period, the individual also learns to walk/run and play. It is therefore not uncommon for TDIs to occur in the anterior deciduous dentition due to falls in early childhood [6]. Several systematic reviews have reported anatomical aspects and biological factors associated with a high prevalence of TDI; these include obesity, marked overjet, anterior open bite and inadequate lip seal. Certain behavioral habits and a previous history of dental trauma (DT) have also shown notable associations [7,8].

Inadequate management of dental treatment after trauma can aggravate certain conditions such as: color change, tooth mobility, altered position in the dental arch, painful symptoms, root and/or bone resorption, pulp necrosis and even loss of the tooth [9]. In adolescents, the consequences have a greater impact, since this phase is characterized as a period of great physical, psychological and social vulnerability [10].

In Brazil, the number of studies on the prevalence of ODT has been concentrated mainly in the South and Southeast regions, more precisely in the states of Rio Grande do Sul, Santa Catarina, Minas Gerais and São Paulo [11]. With regard to epidemiology, the publication of data in Brazil is considered to be recent, with the first records in permanent dentition being made in 2000 [12].

Given this scenario, in 2016 the Dentistry Course at the Federal University of Ceará - Sobral

Campus (UFC-Sobral) approved the implementation in the Center for Studies of Patients Victims of Oral and Dental Trauma in Sobral (NEPTRAUMA), within the institution itself, which treats patients who are victims of oral and dental trauma on demand or on referral from hospitals, emergency care units, basic health units, private dental clinics, among others. The extension project treats patients in emergency situations who have not received immediate care. In addition, the correct treatment and follow-up is carried out, preventing the progression of problems and consequently improving the prognosis.

Even with the understanding and knowledge of the risk factors associated with TDIs, there is still no real prevention strategy, since they are commonly the result of accidents [13]. Epidemiological data on dento-alveolar trauma provides a basis for expanding and evolving specific treatment concepts. Therefore, in order to implement prevention strategies, it is of fundamental importance to deepen knowledge and observe the panorama of the affected population. The aim of this study was to characterize and outline the epidemiological profile of patients affected by traumatic dental injuries who were treated at the UFC-Sobral Dental Clinic through NEPTRAUMA.

2. METHODOLOGY

This is a descriptive, epidemiological and cross-sectional study, based on the analysis of data from the medical records of patients seen at the UFC Sobral Dental Clinic through the NEPTRAUMA Extension Project, between August 2016 and August 2023. The study subjects were all patients who sought care at the Center for Studies of Patients Victims of Oral and Dental Trauma in Sobral (NEPTRAUMA) and who had a history of ODT. All the medical records of patients who were victims of ODT, with no age restriction and who sought the service between August 2016 and August 2023, were included for analysis by the researchers. It is important to note that in the period between 2019 and 2021, there was no record of care due to the global COVID-19 pandemic.

In addition, only patients who signed an informed consent form were included. The medical records of patients with incomplete/missing data and who did not sign the informed consent form were excluded. The individual information of the patients treated in the project, as well as their clinical and radiographic data, was obtained by consulting the dental records developed specifically for this purpose. The data was protected by an informed consent form signed by the patient or guardian in the case of children and adolescents. The type of trauma was recorded according to the adapted classification [14].

The medical records of patients who suffered oral and dental trauma were retrospectively analyzed in search of the following variables: Date and place of trauma, sex, age, etiology of the trauma, traumatized tooth and diagnosis. Data collection was carried out by two master's students from the Health Sciences Program and two students from the dentistry course at UFC, Sobral campus, under the supervision of the NEPTRAUMA coordinator. The variables extracted from the medical records were processed and tabulated in Office Excel 2016®

Table 1. Classification of oral and dental trauma, adapted from Andreasen et al., 2001. IADT guidelines [14]

Injuries to dental hard tissue, pulp and alveolar bone
Enamel crack
Enamel fracture
Coronal fracture without pulp involvement
Coronal fracture with pulp involvement
Coronal fracture
Root fracture
Injury to periodontal tissues
Concussion
Subluxation
Extrusion
Lateral dislocation
Intrusion
Avulsion

spreadsheets. Using the JAMOVI software, version 2.3, the information was sent for descriptive statistical analysis, based on absolute and relative proportions and frequencies. To compare sexes and age groups according to the etiology of the facial trauma and the location of the facial trauma, the Chi-square test or Fisher's exact test were used, considering a significance level of 5.0% (p<0 .05).

3. RESULTS

Between August 2016 and August 2023, 105 patients were seen. Following the exclusion criteria, 6 medical records were discarded from the study due to incomplete or missing information. Thus, the sample consisted of 99 medical records, represented by 71 (71.72%) male patients and 28 (28.28%) female patients. The average age for males was 13.1 with a standard deviation of 10.2, while for females the average was 11.3 with a standard deviation of 9.95. The minimum age recorded was 1 year in both sexes, while the oldest patient was 42 years old in males and 38 years old in females.

The results revealed the age range of patients treated by NEPTRAUMA, following the division proposed by the Statute of the Child and Adolescent (SCA), considering children to be those up to 12 years of age and adolescents to be those between 12 and 18 years of age, as well as adults to be those over 18 years of age. The project therefore treated 60 children, 37 of whom were in early childhood and 23 in early childhood, as well as 11 adolescents and 28 adults (Table 2). Of the 99 patients, 18 individuals (18.18%) had suffered trauma previously, taking into account both deciduous and permanent dentition, 80 individuals (80.8%) had no history of trauma and 1 patient (1.01%) was unable to provide information (Table 2).

The data showed that most of the patients seen by NEPTRAUMA are from the municipality of Sobral (Table 3). However, the information shows that there is a wide distribution throughout the Metropolitan Region of Sobral, extending to and encompassing municipalities in the Northern Macroregion of the state of Ceará (Fig. 2).

Table 2. Sociodemographic aspects of the patients seen by NEPTRAUMA with age range and history of previous injuries

Age group	**n**
Child	60
Adult	28
Adolescent	11
Previous injuries	**n**
Yes	80
Subluxation	18
Not info	1

Table 3. Distribution of care among the municipalities of Ceará

City	**n**
Sobral	81
Coreaú	3
Santana do Acaraú	2
Reriutaba	2
Senador Sá	2
Varjota	2
Cariré	1
Santa Quitéria	1
São Benedito	1
Groaíras	1
Massapê	1
Pacujá	1
Ibiapina	1

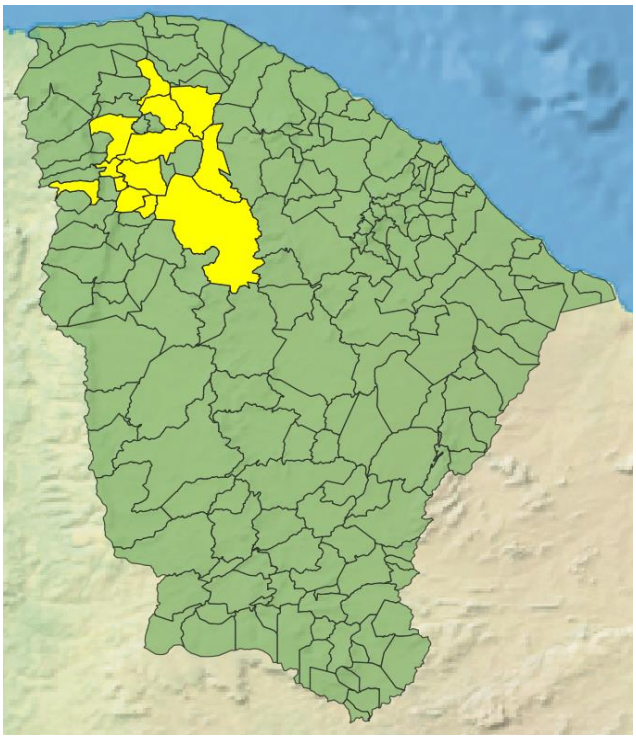

Fig. 1. Geographical map highlighting the municipalities where NEPTRAUMA treats patients
Source: Prepared by the authors using QGIS software (2023)

Table 4. Locations where dental trauma occurred

Place of occurrence	n
House	35
Street	30
School	11
Not info	7
Rom	3
Square	2
Field	2
Work	2
Swimming pool	1
Dentist	1
Amusement park	1
Bar	1
River	1
Jiu-jitsu	1

Table 5. Etiological factors related to trauma

How did it happen?	Counts	% of total
Falling From Own Height	29	29,29%
Falling From A Bicycle	12	12,12%
Motorcycle Accident	8	8,08%
Playing Soccer	7	7,07%
Did Not Know	5	5,05%
Physical Aggression	3	3,03%
Automobile Accident	3	3,03%
Other	32	32,32%

The most frequent places where trauma occurred were at home (N=35), followed by the street (N=30) and school (N=11) (Table 4).

The causes of oral and dental trauma varied. The main factor related to trauma was falling from a height (29.29%), followed by falling from a bicycle (12.12%) and a motorcycle accident (8.08%) (Table 5).

When we relate the three main etiological factors to the three main places where ODT occurred, we see that in 29 of the cases in which there was a fall from their own height, 16 occurred in the home environment. In the case of falls from a bicycle, the street was the place where this situation was most often repeated, as well as in the case of motorcycle accidents (Table 6).

A total of 169 dental injuries were recorded, with teeth 21 (N=36) and 11 (N=37) being the most traumatized in the permanent dentition and teeth 51 (N=25) and 61 (N=18) the most traumatized in the deciduous dentition, showing that the upper central incisors are the most injured teeth in both dentitions (Table 7).

September and October were the months with the highest number of visits to the extension project, but this does not necessarily mean that they are the months with the highest rates of trauma, since most of the patients were treated late, as shown in Table 8.

Table 6. Relationship between etiological factor and site of trauma

Etiological factor	Local	n
Falling From Own Height	House	16
	Street	4
	School	9
Falling From A Bicycle	House	1
	Street	11
	School	0
Motorcycle Accident	House	0
	Street	8
	School	0

Table 7. Frequency of traumatized teeth

Traumatized teeth	Counting	% of total
11	37	21,9%
21	36	21,3%
51	25	14,8%
61	18	10,7%
12	10	5,9%
22	8	4,7%
41	6	3,6%
31	4	2,4%
32	4	2,4%
52	4	2,4%
62	2	1,2

Table 8. Frequency of diagnoses in dental trauma

Elapsed time	Counts	% of total
Crown fracture without pulp exposure	38	22.6 %
Subluxation	10	6.0 %
Concussion	8	4.8 %
Intrusion	17	10.1 %
Lateral displacement	21	12.5 %
Coronary fracture with exposure pulp	17	10.1 %
Avulsion	24	14.3 %
Coronoradicular Fracture	8	4.8 %
No info	12	7.1 %
Extrusion	6	3.6 %
Root Fracture	2	1.2 %

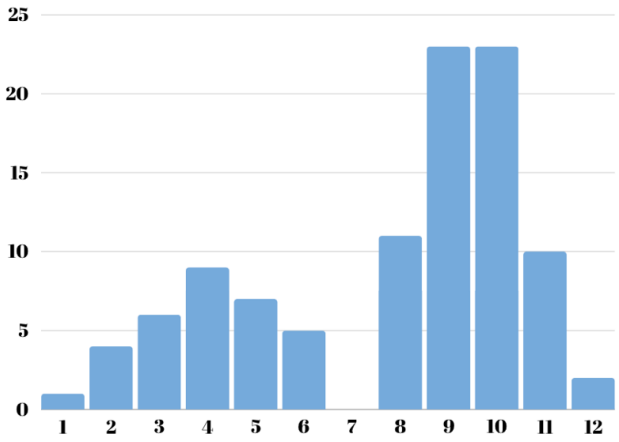

Fig. 2. Graph showing the frequency of visits by month

Table 9. Frequency of traumatized patients in relation to the time elapsed after the injury

Elapsed time	Counts
Same day	14
Between 2 and 10 days	22
Between 10 and 30 days	23
Between 2 months and 1 year	7
Not informed	9
Over 1 year	24

ODT = Oral and dental trauma; TDI = traumatic dental injury*; DT* = dental trauma*; SCA = Statute of the Child and Adolescent*

Of the 169 traumatized teeth, there were 38 cases of crown fracture without pulp exposure (22.6%), followed by 24 cases of avulsion (14.3%) and 21 cases of lateral displacement (12.5%) (Table 8).

Of the 99 patients seen, only 14 were seen on the same day, in order to resolve the traumatic emergency. Most of the consultations took place between 2 and 30 days (N=45). The number of patients (N=24) who were seen over a period of more than a year is noteworthy. It is worth pointing out that the data referring to the time elapsed, which was not informed, often reflects a previous trauma, but the patient does not remember exactly when it happened (Table 9).

4. DISCUSSION

The Brazilian studies corroborate the majority of international studies which indicate that the predisposing factors that increase the risk of ODT occurring are: male gender, presence of malocclusions, inadequate lip coverage, as well as a previous history of ODT [15,16,17]. The findings of this study revealed that males are more frequently involved in dento-alveolar trauma, which corroborates the findings in the literature.

The predilection for males is due to their greater participation in sports, resulting in greater exposure. A study carried out in Bern, Switzerland, showed a 1.6x higher prevalence for males compared to females, however, in the present study this proportion was 2.53x higher for males [18].

Most studies of dento-alveolar trauma have been limited to children, a narrow age group or participants in specific sports groups [19]. In this study, 99 patients suffered oral and dental trauma. The minimum age recorded was 1 year in both sexes, while the oldest patient was 42 years old in males and 38 years old in females.

In all, 169 teeth suffered some kind of trauma. In the sample, the age group with the highest prevalence was 1 to 12 years old, therefore children. Accidental trauma is related to the child's stage of development and behavior [20]. Although the etiology of facial and dental trauma is multifactorial, falls are generally identified as an important cause in different ranges ages,

corroborating the results found in this study, in which falls from their own height were responsible for oral and dental trauma in 29.29% of patients [21].

As for the type of traumatic injury, the study data showed that there were 38 cases of crown fracture without pulp exposure (22.6%), followed by 24 cases of avulsion (14.3%) and 21 cases of lateral displacement (12.5%). The higher prevalence of low-severity injuries was also observed in previous studies [22]. The present study revealed that the upper central incisors are the teeth most frequently involved in dental trauma, both in the permanent and deciduous dentition, with the single elements 11, 21, 51 and 61 being the most affected, respectively.

The time elapsed between dental trauma and dental care significantly influences the prognosis of the treatment to be carried out [23]. In the present study, it was observed that only 14 patients (14.14%) underwent treatment on the day of ODT, 22 patients (22.22%) underwent treatment between 2 and 10 days and 23 patients (23.23%) between 10 and 30 days. In the study by Altay & Güngör, carried out in Turkey, 48% of patients and in the study by Lam, et al., carried out in Australia, 36% of patients were examined within 24 hours of the trauma. Factors such as the distance to the college's outpatient clinic, as well as weekly and nightly appointments, may be related to the low rates of emergency trauma care [24,25].

One condition related to ODT that needs to be taken into consideration is the degree of knowledge and dissemination of ODT in the social environment. This study assessed the knowledge of parents/guardians about dental trauma and emergency procedures for preschoolers. Of the 100 individuals assessed, 75% did not know what dental trauma was and 44% reported not knowing what to do if their child suffered trauma. In the case of more serious fractures, such as tooth avulsion, 27% would pack the tooth without any liquid and only 2% would store it in milk [26].

Some of the information obtained from the patient and guardian about how the injuries occurred, which is important for making an accurate diagnosis, may be inaccurate. This is possible because the person responsible for the child or adolescent often doesn't remember or doesn't know exactly how the trauma occurred [27,28].

The promotion of university extension open to the participation of the population, the curricularization of extension and its actions applied to the various sectors of the community aim to promote a great and positive social impact. In turn, the scientific research that comes out of these actions, with the involvement of higher education students and teachers, results in the desired teaching-research-extension tripod for the promoting institution.

According to the literature studied, it can be seen that dento-alveolar trauma is a public order problem due to its high occurrence. In this context, NEPTRAUMA's work focuses on diagnosing, treating and documenting cases of ODT in patients seen at the dental clinic at UFC, Sobral campus. Thus, as a consequence of this extension work, there is also scientific production aimed at characterizing this population that seeks emergency care as a result of oral and dental trauma.

In view of the above, it is of the utmost importance to carry out educational activities about accidents and situations that can lead to oral and dental trauma in schools and communities so that teachers, caregivers, parents and guardians are instructed in the methods of preventing this injury and in the first care after trauma, as they play a fundamental role in a good prognosis of the injury.

5. CONCLUSION

In agreement with the literature, this study shows that the highest frequency of dental trauma occurred in predominantly male children, affecting the anterior maxillary region. The analysis showed that 18.18% of the patients had a history of anterior dental trauma, with the upper central incisors being the most frequently injured teeth. The most common place of injury was the patient's own home, with falling from a height being the main etiological factor (29.29%). The geographical distribution of patients highlighted the predominance of care in Sobral. In addition, the majority of patients were treated late, highlighting the need for improvements in the immediate treatment of dental trauma. Clinically, the role of the dental surgeon in the early diagnosis and treatment of dental trauma is evident, given that most patients were seen late, worsening their prognosis and restricting treatment measures. Finally, this study aims to map and highlight the epidemiological profile of patients affected by dental trauma, guiding future

measures for more targeted treatment and diagnosis.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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