

Original Article

Prevalence of Dental Traumatic Injuries in a Group of Egyptian Children with Special Healthcare Needs Aging 6-14 Years: A Cross-Sectional Study

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Abstract

Aim: This study aimed to identify the prevalence of traumatic dental injuries in a group of Egyptian children with special health care needs aging 6-14 years, investigating types, causes, and possible risk factors associated with dental trauma, as well as factors related to treatment.

Subjects and Methods: This study was conducted through questionnaires for parents and clinical examinations for 763 children with special health care needs in fourteen different places in three Egyptian governorates.

Results: The prevalence of traumatic dental injuries in children with special health care needs was 12.8% (98 children). The prevalence was highest among children with intellectual disability (49%), followed by epilepsy (18.4%). Males are more prone to traumatic dental injuries than females. The upper central incisors had the highest frequency of injury (89.7%), and enamel fracture was the most frequent type (51.8%). Falling was the most common cause of dental injuries (69.4%), and the most frequent place of trauma was at home (48.0%).

Conclusion: Inadequate lip coverage, increased overbite, anterior open bite, and increased overjet were significant risk factors associated with traumatic dental injuries. The main reasons for not receiving dental treatment were poor parental attitude and lack of dental awareness.

Keywords: Traumatic, Dental injuries, Healthcare needs, Overjet, Disability.

I. INTRODUCTION

Traumatic dental injuries (TDIs) are emergency dental health problems that may cause aesthetic, functional, social, psychological, and therapeutic issues, affecting

the quality of life of children [1]. Children with special health care needs (CSHCN) are more likely to have TDIs due to many factors; some of these factors are associated with their disability, such as physical, neurological,

intellectual, and behavioral problems, making them more likely to have an accidental injury. The characteristics of TDIs in CSHCN are different from those of healthy children [2, 3].

There are few studies on TDIs in CSHCN, and most of them are concerned with the relationships between TDIs and the type of disability. Studies have demonstrated a higher risk of TDIs among children with autism (30-39%), sensory impairment (10.8%), cerebral palsy (10.6-57%), and visual impairment (32.5%) [1, 2].

In Egypt, the rate of CSHCN aged (5-17) years has reached (4.94%) of the total population (5.14% for males vs. 4.71% for females) [4]. There is a gap in knowledge regarding the prevalence of TDIs in Egyptian CSHCN, and there is an obvious need to study TDIs among those children. Therefore, this study aimed to identify the prevalence of TDIs, investigating types, causes, risk factors associated with dental trauma, and factors related to treatment.

II. SUBJECTS AND METHODS

A. Study design:

This study is a cross-sectional descriptive study based on interviewer-administrated validated questionnaires for parents **Al-Batayneh et al., 2017** [5], and clinical examinations for a group of Egyptian CSHCN, to identify the prevalence of TDIs, investigating types, causes, risk factors associated with dental trauma, and factors related to treatment.

B. Sample size calculation:

The sample size was revised and approved by the Medical Biostatistics Unit (MBU), Faculty of Dentistry, Cairo University, Egypt, in 2019. The required sample size was estimated based on a previous study by **Al-Batayneh et al., 2017** [5] which reported the prevalence of TDIs among CSHCN in Jordan was 8.7%. By setting the confidence interval level at (95%) and using a margin of error of (2%), the required sample was 763 CSHCN.

C. Ethical approval:

The Ethical Committee, Faculty of Dentistry, Cairo University, reviewed the protocol and approved it regarding its scientific content and adherence research and human subject regulation on 25/6/2019.

D. Study registration:

The study was entered on clinicaltrials.gov under the name "Prevalence of Dental Traumatic Injuries in A Group of Egyptian Children with Special Health Care Needs Aging 6-14 years" with the identifier NCT03874182.

E. Informed consent:

Before the beginning of the questionnaire and the clinical examination, the aim of the research was clarified to the parents, and written informed consent was obtained.

F. Setting and locations:

The study took place in fourteen different places from the period of September 2019 to March 2021; the study included: the treatment unit for CSHCN in the Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University; a school; an autism clinic in the National Research Centre; a physiotherapy center; three-sport youth centers; and seven different charity organizations in three different governorates (Cairo, Giza, and Al Qalyubia). The study was enrolled in both rural and urban sectors.

G. Eligibility criteria and selection method:

Inclusion criteria involved: a group of Egyptian CSHCN between 6 to 14 years old, who had at least one or more of the following condition: cerebral palsy (CP), motor difficulty, neurobehavioral disorders such as: autism spectrum disorder (ASD), and attention deficit hyperactivity disorder (ADHD), Down syndrome, intellectual disability (ID), learning difficulties, visual impairment (VI), hearing impairment (HI), multiple disabilities (patients with more than one medical condition), epilepsy and developmental Delay. Both genders were included in the study. Exclusion criteria

included parents who refused to join the study, and patients with an unspecified condition.

H. Interviewer-administered questionnaire:

The data of the study were obtained with the use of a validated interviewer-administered questionnaire for parents. The questionnaire was in the Arabic language; it was translated from the original article. The questionnaire was adopted from **Al-Batayneh et al., 2017**. The questionnaire consisted of two sections: the first section was for personal data and medical history, and the second section consisted of seven questions, three of which were close-ended, binary (Yes/No), and four questions were multiple-choice questions. The questionnaire included the following: the history of dental injuries (time, place, and cause); previous dental trauma; type of treatment provided; and reasons for not seeking treatment.

I. Clinical examination:

It was done under the artificial light using a graduated periodontal probe and a dental mirror. All examinations were carried out by a single examiner. The examination was conducted using a custom-made dental chart, which was formulated based on the Assessment of Acute Traumatic Injuries chart (adapted from the American Academy of Pediatric Dentistry, *Pediatr Dent* 24 (7suppl): 95-96, 2002) [6]. The presence of TDIs was recorded according to the Andreasen & Andreasen, (1994) [7] classification as follows:

- a) Injuries to the hard dental tissues, and the pulp: enamel infraction, enamel fracture, enamel dentin fracture, and complicated crown fracture (enamel dentin pulp fracture).
- b) Injuries to the hard dental tissues, the pulp and alveolar process: crown root fracture, root fracture, alveolar fracture.
- c) Injuries to the periodontal and supporting tissues: concussion, subluxation, extrusion, intrusion, lateral laxation, avulsion.

The possible associated oral predisposing risk factors of TDIs included:

- i. Overjet was measured using a graduated periodontal probe as the horizontal distance from the incisal edge of the maxillary central incisor to the labial surface of the corresponding mandibular incisor when both jaws were closed. In the present study, overjet was recorded as increased when the measurement was more than 3 ml.
- ii. Overbite was measured using the graduated periodontal probe as the amount of vertical overlap of the upper anterior teeth (incisal edge) over the lower anterior teeth when the jaws are closed. In the present study, overbite was recorded as increased overbite when it was more than 3 ml.
- iii. Lip competence was recorded (adequate or inadequate), where an inadequate lip is a term used to describe lips that are separated by more than 3-4 ml and are unable to close adequately at rest.
- iv. The type of dental occlusion was recorded using Angle's classification.

The condition of the affected tooth and surrounding soft tissue was assessed using mobility test, percussion test, presence or absence of dental caries of traumatized tooth, and soft tissue examination of the surrounding gingiva, mucosa, and lips to detect gingivitis, soft tissue injuries, swelling, and fistulous tract, and recorded in the dental chart as binary (Yes/No).

Statistical methods:

Qualitative data were presented as frequencies and percentages. Chi-square test and Fisher's Exact test were used for comparisons regarding qualitative data. Quantitative data were presented as mean and standard deviation (SD) values. The significance level was set at $P \leq 0.05$. Statistical analysis was performed with IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

III. RESULTS

The present study was conducted on 763 CSHCN, 499 males (65.4%) and 264 females (34.6%). The mean (SD) values for age were 9.96 (\pm 2.27) years old, with a minimum of 6 and a maximum of 14 years old. The prevalence of TDIs was found to be (98 of 763) CSHCN giving a prevalence of 12.8% (**Figure 1**). The prevalence of TDIs was significantly higher in boys (74.5%) than in girls (25.5%) ($p=0.043$), males were (1.545) fold more prone to TDIs than females. The participants were distributed into three age groups, the results revealed that children aged from $9 \leq 11$ years old showed the highest prevalence of TDIs (49%), followed by children aged $12 \leq 14$ years old (40.8%), and the lowest prevalence of TDIs was found in children aged $6 \leq 8$ years old (10.2%), with a statistically significant association ($p<0.001$). 55.2% of the participants were from urban areas (**Table 1**).

The most prevalent type of disability among study group was intellectual disability (35%),

followed by autism (18.1%). The least prevalent type of disability was motor difficulty (0.8%) (**Table 2**). TDIs were more frequent among children having ID (49%), followed by epilepsy (18.4%), with a statistically significant relationship with ID ($p=0.003$), epilepsy ($p=0.003$). The most common cause of TDIs was falling (69.4%) (**Table 3**), and these injuries occurred mainly at home (48%) (**Table 4**). The total number of traumatized teeth was 136 permanent anterior teeth from 98 CSHCN, and maxillary central incisors were the most common injured teeth (89.7%) (**Table 5**). 65.3% of CSHCN with TDIs had one tooth affected, and enamel fracture was the most frequent type of TDIs (51.8%), followed by enamel-dentin fracture (23.0%) (**Table 6**). Of all examined injured teeth, 11.8% were tender to percussion, 8.8% were discolored, 5.1% showed signs of decay, and 3.7% were mobile.

Table (1): Frequencies (n) and percentages (%) for demographic data of the study participants (n = 763)

Demographic data	n
Gender [n, (%)]	
Male	499 (65.4%)
Female	264 (34.6%)
Age [Mean, (SD)]	
	9.96 (\pm 2.27)
Age groups [n, (%)]	
$6 \leq 8$ years	253 (33.2%)
$9 \leq 11$ years	295 (38.7%)
$12 \leq 14$ years	215 (28.2%)
Residence [n, (%)]	
Urban	421 (55.2%)
Rural	342 (44.8%)

Table (2): Frequencies (n) and percentages (%) for types of disabilities among study participants (n = 763)

Types of disability	n	%
Intellectual disability	267	35
Autism	138	18.1
Down Syndrome	125	16.4
Cerebral palsy	122	16
Epilepsy	76	10
Hearing impairment	60	7.9
ADHD	59	7.7
Visual impairment	30	3.9
Motor difficulty	6	0.8

Note: Some CSHCN had multiple disabilities

Table (3): Frequencies (n) and percentages (%) for causes of TDIs among study participants (n = 98)

Causes of TDIs	n	%
Fall	68	69.4
Collision with a hard object	10	10.2
Parents don't know	4	4.1
Traffic accident	3	3.1
Self-inflicted injury	8	8.1
Violence	2	2
Sports activity	2	2
Child abuse	1	1

Table (4): Frequencies (n) and percentages (%) for places of TDIs among study participants (n = 98)

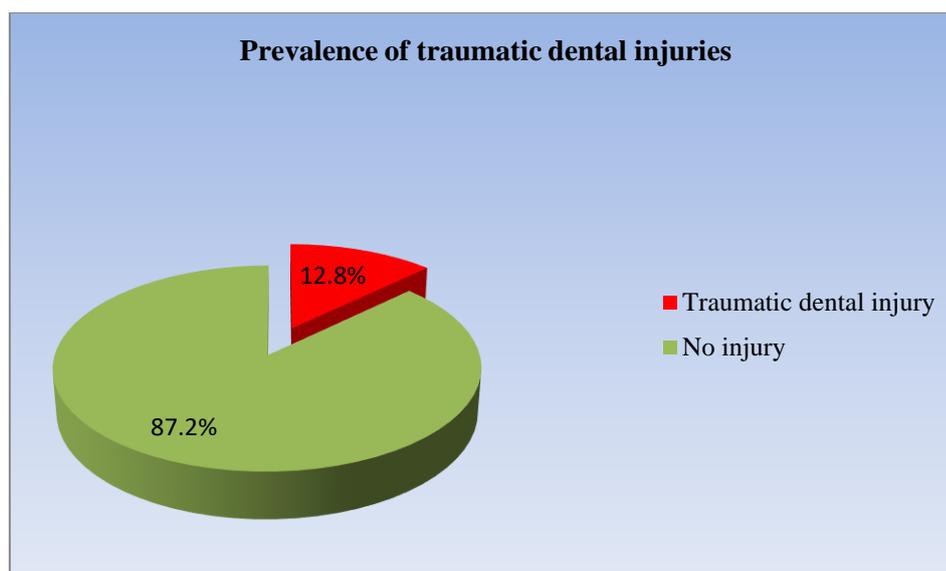
Places of TDIs	n	%
Home	47	48
Street	29	29.6
School	12	12.2
Parents don't know	4	4.1
Skills development center	3	3.1
Sports club	3	3.1

Table (5): Frequencies (n) and percentages (%) for teeth involved in trauma (n = 136)

Involved teeth	n	%
Upper central incisor	122	89.7
Upper lateral incisor	8	5.9
Lower central incisor	6	4.4

Table (6): Frequencies (n) and percentages (%) for types of TDIs (n = 136)

Type of traumatic dental injury	n	%
Enamel fracture	72	51.8
Enamel-dentin-fracture	32	23
Enamel-dentin-pulp-fracture	20	14.4
Intrusion	3	2.2
Subluxation	3	2.2
Avulsion	2	1.4
Concussion	2	1.4
Lateral Luxation	2	1.4
Root fracture	2	1.4
Infraction	1	0.7

**Figure (1):** Pie chart representing prevalence of TDIs among study participants.

IV. DISCUSSION

This study was carried out to address the prevalence of TDIs among a group of Egyptian CSHCN and the relevant factors associated with these injuries. The prevalence of TDIs in this study was evaluated as 12.8%, which was nearly the same as the prevalence reported in a study done in India 12.1% [8], more than the result reported in Brazil 9.2% [9], and Jordan 8.7% [5], and less than the result reported in Italy 20.3% [10], and Saudi Arabia 23.1% [1].

In the present study, males were more prone to TDIs than females, and the result is in agreement with other studies [5, 11]. The higher prevalence of TDIs in boys may be due to more aggressive behavior, cultural factors, and more participation in sports activities than in girls. However, other studies showed a similar prevalence between both genders as TDIs in CSHCN are more related to other risk factors like muscular hypotonia, poor coordination, and ID, predisposing equally to accidental falls for both genders [8–10].

In the present study, the most frequent age group for TDIs to occur was between $9 \leq 11$ years (49%), the finding may be due to increasing physical activity in this age range. Other published studies reported that the frequency peaks of TDIs in CSHCN were between 11-15 years old [8, 12].

The types of disabilities were calculated in this study based on their numbers, not the number of children, as many children had more than one type of disability, which may be a risk factor in the occurrence of TDIs. TDIs were more frequent among children with ID (49%), followed by epilepsy (18.4%) with a statistically significant relationship with ID ($p=0.003$), and epilepsy ($p=0.003$). The results may be since ID and epilepsy are common findings that decrease motor coordination and movement safety, increasing the risk of accidental falls during daily activities. **Al-Batayneh et al., 2017** [5] found that prevalence was highest in children with

multiple disabilities (14.0%), followed by ID (13.1%), and CP (12.2%). **Basha et al., 2021** [1] found that children with CP presented with a higher prevalence of TDIs (47.5%), followed by ID (40%), then deafness or blindness, or both (23.3%).

Falling was the most prevalent cause of TDIs (69.4%); the result may be due to loss of stability, poor motor coordination, and uncontrolled movement, falling during play, or accidentally falling from a high object or faulty carriage. The result is similar to the results of other studies [5, 11, 13].

Regarding the place of TDIs, 48.0% of children had their injuries at home. The results may be due to those children staying more at home than outside; the result is similar to other studies [5, 11]. On the other hand, **Basha et al., 2021** [1] found in their study that the majority of CSHCN were exposed to trauma at school (42.0%), followed by residence (35.8%).

From the results of clinical examination, there were 136 injured permanent anterior teeth from 98 CSHCN; maxillary central incisors were the most commonly injured teeth (89.7%), the finding may be related to the position of the upper central incisors in the oral cavity and the lower bone density of the alveolar process in children and the result is in agreement with other studies [5, 8, 13].

Enamel fracture was the most frequent type of TDIs (51.8%). The results may be due to the fact that most of the injuries being mild to moderate in intensity. The results were similar to the results reported in other studies [1, 5, 13]. However, other studies demonstrated that enamel-dentin fracture was the most frequent type of TDIs in CSHCN [10, 14].

In the present study, increased overjet more than 3 mm and inadequate lip coverage have been shown to be important risk factors in TDIs, with a statistically significant association ($p < 0.001$). The increased risk of TDIs is due to inadequate soft tissue

protection; the force is applied directly to the teeth, causing dislocation and fracture. This result is in agreement with several studies [1, 5, 13]. **Basha et al., 2021** [1] found that CSHCN with an overjet bigger than 3 mm were 4.82 times more likely to have TDIs than children with an overjet of equal or less than 3 mm. However, **Miamoto et al., 2011** [15] reported in their study on children with CP that overjet is not associated with a greater prevalence of TDIs. **Bhat et al., 2011** [16] reported in their comparative study between VI and sighted children that TDIs were independent of lip coverage.

In the present study regarding the anterior open bite, there was a statistically significant association between the prevalence of TDIs and the anterior open bite ($p=0.020$). The odds ratio value indicated that CSHCN with an anterior open bite were 1.733 more prone to TDIs than those with no anterior open bite the result is in agreement to study done by **Shyama et al., 2001** [17]. In contrast, **Cardoso et al., 2015** [18] reported that open bite was not a risk factor for TDIs in their study of children with CP.

In the present study regarding overbite, there was a statistically significant association between increased overbite and the prevalence of TDIs ($p=0.012$). **Shyama et al., 2001** [17] reported that children and adolescents with SHCN who had severe malocclusion (including an overbite greater or equal to full tooth depth) had a significant risk for TDIs occurrence.

In the present study, regarding the type of occlusion, there was a statistically significant association between class II malocclusion and the prevalence of TDIs ($p=0.023$). The finding may be due to accentuated overjet in children with Class II malocclusion. **Patel et al., 2012** [19] reported that the maximum number of dental injuries were in Class II Division 1 malocclusion, then Class I occlusion, Class III occlusion, while the least number of dental injuries were in Class II Division 2

malocclusion due to retroclination of maxillary incisors

Regarding seeking dental treatment, 73.5% of parents didn't seek any dental advice in the case of TDIs. The pooled results of the questionnaire indicate that the most common reason for not seeking dental advice in the case of TDIs was the lack of dental awareness and poor parental attitude (73.3%), followed by financial problems (13.9%) and difficulties getting dental care (5.8%). **Al-Batayneh et al., 2017** [5] found that lack of dental awareness and poor parental attitude were (68.1%) of the reasons for not seeking dental care, followed by difficulties getting dental care (36.2%).

From CSHCN patients who had received supportive dental treatment, pharmacological treatment in the form of painkillers or antibiotics was the most common treatment received (46.2%). The result was close to that done by **Al-Batayneh et al., 2017** [5], as they found that only 27.7% of CSHCN had received treatment for TDIs, and pharmacological treatment was the most common treatment (48.2%). On the other hand, **Nayak et al., 2015** [11] reported that all CSHCN in their study group had not undergone any type of treatment for TDIs.

Limitation of the study:

The study has some limitations due to a lack of socioeconomic data, especially about income and parents' education, because such questions are sensitive and can lead to misunderstandings among parents. Another limitation was the difficulty in detecting child abuse cases by taking the histories of parents. There was more than one suspected case, and in the only case that was confirmed to have been abused, the history was gained from the child's teacher, who reported what happened, and the child's mother was afraid to mention the fact. Also, the late dental presentation may decrease the true prevalence value as some injuries may be healed at the time of examination.

V. CONCLUSION

From the results of this study, the following can be concluded:

- ✓ The prevalence of TDIs in Egyptian CSHCN was found to be (12.8%).
- ✓ Males were more prone to TDIs than females.
- ✓ TDIs were more frequent in the age group of 9-11 years old.
- ✓ TDIs were more prevalent in children with intellectual disabilities, followed by epilepsy.
- ✓ The prevalence of TDIs was significantly associated with increased overjet, anterior open bite, inadequate lip coverage, and increased overbite.
- ✓ The main reasons for not receiving dental treatment were poor parental attitudes, and a lack of dental awareness.

VI. RECOMMENDATIONS

Awareness programs need to be carried out for parents, schools and centers caring for CSHCN regarding the accidents that may cause dental injuries and the importance of early dental check-ups after trauma. A safe environment without overcrowding should be made available at homes, schools, and specialized centers caring for CSHCN by ensuring the design meets safety standards specialized for different types of disabilities. More dental specialized services should be easy and available to CSHCN in multiple places in Egypt.

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Conflict of interest

The authors declare that they have no conflict of interests.

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