Prevalence, Etiology, and Risk Factors of Traumatic Dental Injuries in Children with Special Needs of Puducherry

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Abstract
Background/aim: Dental trauma draws attention in special children due to its risks and consequences. The aim of this study was to estimate the prevalence, etiology, and risk factors of traumatic dental injuries in children with special healthcare needs of Puducherry.

Materials and methods: A cross-sectional survey among 121 special children aged 4–18 years was carried out in Puducherry. The children were examined for the presence of traumatic dental injuries (TDI) and associated risk factors for the occurrence of trauma and classified according to the WHO epidemiological field survey classification.

Results: Prevalence of TDI was 40.5%. The majority of them were restricted to enamel fractures and the most commonly affected were permanent maxillary central incisors. The most common cause of injury was ‘falling over’ and home was the frequent place of injury to occur. The risk factors associated with TDI were mesosporadic facial form, convex facial profile, increased overjet, Angles Class II molar relationship, posterior facial divergence, and incompetent lips which were statistically significant.

Conclusion: The study concludes the prevalence of TDI is more prevalent in CSHCN, thereby it is necessary to create awareness, health education, and periodic screening for efficient treatment.

Keywords: Children, Prevalence, Special healthcare needs, Traumatic dental injuries (TDI).

Introduction
Children with special needs constitute a considerable sector of the community, accounting for an estimated 10% of the worldwide population. Lately, the phrase “disability” has been defined as “an impairment that restricts or limits daily activity in some manner.”¹ In India, as per the 2011 census report, approximately 26.8 million people are classified as disabled.² Compared to the healthy population, children with special needs are at a higher risk of developing oral diseases throughout their lives.³ These children have the equal right to health care as their able-bodied counterparts.⁴ Multiple studies examined the oral health of special needs children reporting worldwide prevalence ranging between 9.2%⁵ and 45.2%.⁶ Despite the in-depth review of literature only three studies were documented from India and are available as a database regarding the prevalence of traumatic dental incident (TDI) in adolescents and children with special needs.

Traumatic dental incidents (TDIs) in children and young adults are a serious public health issue.⁷ Traumatic dental injuries (TDI) and orofacial injuries are extremely common around the world, affecting an estimated 20–30% of the permanent teeth and frequently leading to compromised esthetics and function.⁸ In addition, recent studies showed that dental trauma experience had a negative impact on children’s and parents’ quality of life.⁹ Dental trauma in special healthcare needs people occurs both at a young age, during which growth and development take place, and also in adulthood. The nature of their health condition, as well as their neurodevelopmental, intellectual, behavioral, and functional limitations, increase susceptibility to unintentional injury, which causes facial and dental tissue damage.¹⁰ Dental trauma may also lead to dental injuries, impacting both maxillofacial structures and bone, resulting in functional, aesthetic, mental, and social aspects.

While there are very few studies on TDI in the diverse sample of children with special needs, the prevalence and the associated etiological/risk factors of traumatic dental injuries remain unexplored in Indian statistics, especially in the South Indian population. In view of the above findings as aims and objectives, this study was conducted in children with SHCN attending special schools.

Materials and Methods
Ethical Approval
The study was approved for ethical clearance from the Institutional Review Board and the Institutional Ethical Committee. Permissions were also obtained from the school institution to screen the children. For their children’s participation, the parents/legal guardians provided their written consent.

Conflict of interest
None

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Nil

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Sample Selection
A cross-sectional investigation was conducted in special schools among children and young adults ranging in the age group from 4–18 years. The minimum sample size needed to estimate significance was determined using a power calculation. With a confidence level of 90% and a margin of error of 5%, the minimum sample size needed was 121. The inclusion criteria were children with at least one or more disabilities and who were present at school on the day of examination. Exclusion criteria included children undergoing orthodontic treatment, teeth with developmental defects, and teeth that are lost due to reasons other than traumatic dental injuries. Prior to the children’s clinical examination, a case template was used to gather data on demographic characteristics such as name, age at last birthday, gender, socioeconomic status of the parents, and residential address of parents/guardians. Medical records were used to determine the child’s clinical diagnosis and condition.

Clinical examinations were conducted in daylight-filled classrooms using the ADA type III technique. Participants sat in chairs in the presence of a caretaker from the school/center staff who assisted with children’s behavior for optimal assessment methods. A single investigator conducted the oral examination, and data was collected by a calibrated assistant. The clinical examination consisted of the presence/absence of TDI determined by direct orofacial and dental examination.

• Details about trauma were recorded as remembered by their parents/caretakers
• Previous and present TDI history, which includes location, time, and cause.
• TDI treatment sought:
  • If treatment was done, the parent was asked to specify whether it was restorative, endodontic, or invasive.
  • If treatment for the trauma was not done, the parent was questioned about the reasons for not seeking treatment.

TDIs were recorded based upon the field screening for Epidemiological classification of Traumatic Dental Injuries (TDIs) including codes of the WHO International Classification of Diseases to Dentistry and Stomatology which is as follows:10

| Code | Injury | Criteria |
|------|--------|----------|
| Code 0 | No injury | No evidence of treated or untreated dental injury |
| Code 1 | Treated dental injury | Composite restoration, bonding of the tooth fragment, crown, denture or bridge pontics replacing missing teeth due to TDI, restoration located in the palatal/lingual surface of the crown suggesting endodontic treatment and no evidence of decay, or any other treatment provided due to TDI Note: Composite restorations may be difficult to recognize |
| Code 2 (N 502.50) | Enamel fracture only | Loss of a small portion of the crown, including only the enamel |

(Contd...)
In the primary dentition, three primary lateral incisors had enamel fracture and one had enamel dentin fracture (Table 3).

Both convex facial profile, Angles class II molar relationship were significantly associated with increased prevalence of trauma. A significant relationship was revealed between trauma incidence and anterior teeth protrusion and lip coverage adequacy (p<0.05) using Chi-square analysis.

Table 1: Distribution of children based upon demographic characteristics and medical condition

| Factors          | Categories          | Special needs children n (%) |
|------------------|---------------------|-----------------------------|
| Gender           | Boys                | 67 (55.4)                  |
|                  | Girls               | 54 (44.6)                  |
| Age              | 4–6 years           | 6 (5)                      |
|                  | 7–9 years           | 17 (14)                    |
|                  | 10–13 years         | 38 (31.4)                  |
|                  | 14–18 years         | 60 (49.6)                  |
| Socioeconomic status | Upper class         | 6 (5)                      |
|                  | Upper-middle class  | 25 (20.7)                  |
|                  | Lower-middle class  | 20 (16.5)                  |
|                  | Upper-lower class   | 69 (57)                    |
|                  | Lower class         | 1 (0.8)                    |
| Medical condition | Mental retardation  | 71 (58.7)                  |
|                  | Cerebral palsy with mental retardation | 28 (23.1) |
|                  | Autism              | 10 (8.3)                   |
|                  | Downs syndrome      | 9 (7.4)                    |
|                  | ADHD                | 3 (2.5)                    |

Table 2A: Genderwise distribution of traumatic dental injuries

| Prevalence by gender | Male  | Females |
|----------------------|-------|---------|
|                      | 41.8% | 38.9%   |

Table 2B: Agewise distribution of traumatic dental injuries

| Prevalence by age          | 4–6 years | 7–9 years | 10–13 years | 14–18 years |
|----------------------------|-----------|-----------|-------------|-------------|
|                            | 16.7%     | 35.3%     | 42.1%       | 43.3%       |

Table 2C: Distribution of traumatic dental injuries based upon the medical condition

| Prevalence based on medical condition          | Intellectual disability | Cerebral palsy with intellectual disability | Autism | Downs syndrome | ADHD |
|------------------------------------------------|-------------------------|--------------------------------------------|--------|----------------|------|
|                                               | 39.4%                   | 39.3%                                      | 40%    | 44.4%          | 66.7%|
which might be one reason for the lower prevalence of trauma in small children. Physical activities increase as they grow older or engage in leisure activities which might have increased the probability of trauma in the older age group of children.

The present study findings have shown that children with ADHD had a higher incidence of TDI followed by children with Down’s syndrome and Autism. Though the findings were not statistically significant (p = 0.915), a recent meta-analysis by Alnmes S et al., 11 in 2020 stated that patients with ADHD are more likely to experience dental trauma. The fact that children with ADHD sustained more dental trauma in the present study could be because of the hyperactive nature of the ADHD condition which caused falls. The study by Al-Sarheed et al., 15 investigated the prevalence of trauma, malocclusion, and dental caries among children with Down’s syndrome and found a higher incidence of trauma among them. In the present study, the second-highest prevalence of TDI was seen in Down’s syndrome, which could be because these children had a higher predisposition to malocclusion, macroglossia, and an accident-prone profile which could have caused trauma. In the present study, TDI in children with Autism could be due to cognitive impairment. The study done by Al-Sehaibany FS et al., 4 had evaluated the prevalence of trauma in children with Autism and found it to be 25.7%. On the contrary, the studies done by Nayak et al., 4 Murthy et al., 12 have observed a higher incidence of trauma in children with mental retardation. The prevalence of TDI in permanent maxillary central incisors was statistically high as reported in the literature. 3,4,15–17 The studies conducted by Avsar et al., 16 Murthy et al., 12 Al-Sarheed et al., 15 Al-Batayneh et al., 18 and Franca et al., 6 showed a higher prevalence of uncomplicated crown fractures. The present study also showed a higher extent of enamel fracture among traumatic dental injuries. In accordance with the previous study, by Al-Batayneh et al., 18 who observed that the treatment-seeking behavior was less among special needs children. The present study also found that there is a lesser percentage of children who had undergone treatment for the traumatized teeth due to unawareness. The present results showed that fall injury due to slipping and tripping over a staircase was the most common cause followed by the collision with an object, which was due to the lack of motor coordination and self-injury. Similar results were found in studies conducted by Kumar and Dixit et al., 7 Nayak et al., 4 Bagattoni S et al., 11 and Ferreira et al. In the present study, the traumatic episodes which had commonly occurred at home and school were entitled to the sudden activity of the children when they were left unsupervised. Similar findings were observed by Nayak et al., 4 Al-Batayneh et al., 18 and dos Santos et al.19

An important finding in this study was that nearly 98% of the patients were examined by a dental surgeon for the first time. Concerning dental treatment for people with special needs, a questionnaire was used to elicit information about the possible reasons for not seeking dental care. The various reasons which were given for not taking treatment were unawareness/negligence regarding the importance of dental treatment of the traumatized tooth, fear of uncooperation from their child, and lack of time/transport. Additionally, communication with the special needs population is a challenge and an impediment to dental care. Hence social workers should play a major role in helping these parents or caregivers to seek treatment.

In the present study, risk factors such as facial form, facial profile, facial divergence, lip competence, lip coverage, molar relationship, overjet, overbite, presence of diastema, and open bite were examined for all children, and all these factors are related to traumatic dental injuries. Thus, there is a positive correlation in the presence of convex facial profile and it was shown that children with Angle’s Class II molar relationship had a positive association with traumatic dental injury due to the fact of proclined incisors. Anterior open bite could be a possible risk factor but in the present study, no significant correlation with TDI was found. It was assessed that the amount of lip coverage and incompetent lips is a risk factor since the lip is an important soft tissue characteristic and it is crucial in the prevention of traumatic dental injury. When compared to those with normal overjet, those with increased overjet and inadequate lip coverage had a high incidence of TDIs. Similar results were discovered in prior studies by Kumar and Dixit et al., 7 Nayak et al., 4 Shyama et al., 15 Altun et al., 17 Al-Batayneh et al., 18 and Munot et al. 20 On the contrary, no significant positive correlation was found with overjet and trauma in the study conducted by Holan G et al. 21

The present study’s findings would contribute to the literature on the prevalence of TDI in the special needs population in the Union Territory of Puducherry in the Southern part of India. This study could create awareness about dental traumatic injuries and help in preventive and therapeutic treatment needs for those affected children. Effective policies for injury prevention, treatment, and malocclusion correction must be developed in these children to prevent TDIs. Policies regarding Health Education on TDI, its management, and prevention programs should be fundamental by the government. Social workers, medical practitioners, healthcare workers, caregivers should be trained on identification, diagnosis, and timely referral to a dentist. Regular motivational programs with preventive professional care should be made mandatory. Disable-friendly environment with
insufficient accessibility is lacking in India which is a must and thus could reduce the incidence of trauma in these individuals. The importance of incorporating oral health care into these everyday living must be emphasized.

**Limitations**

The present investigation only included children with special care needs; whereas including healthy children would have provided more opportunities for comparison, not only among CHSN groups but also with their able-bodied cohorts. Another constraint is that the correlation of TDI in the individual type of medical condition could have been focused on for a better assessment of the condition and to add on to the data.

**Conclusion**

This study concluded that:

- Seventy-four traumatized teeth were found in 40.5% of the children with special needs.
- There was no significant difference between genders, ages, or medical conditions.
- All teeth that had been traumatized were maxillary teeth.
- Only 1.7% of children received treatment for traumatized teeth.
- Most prevalent type of trauma was enamel fracture, followed by enamel-dentin fracture.
- According to these findings, traumatic dental injuries are a common issue in children with special healthcare needs.

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