



Epidemiological Insights into Traumatic Injuries of Primary Anterior Teeth in Patna's Preschoolers: A Case-Control Study

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(Received: 25 December 2024

Revised: 20 January 2025

Accepted: 22 March 2025)

KEYWORDS

Traumatic Injuries, Primary Anterior Teeth, Preschool Children, Case-Control Study, Dental Trauma, Patna Region, Public Health Dentistry

ABSTRACT:

Background: Traumatic injuries to primary anterior teeth are a significant public health concern, especially in preschool children. In the Patna region, these injuries can adversely affect oral health, aesthetics, and the overall quality of life. Early identification of injury patterns is essential for targeted preventive strategies.

Aim: To evaluate and compare the different types of traumatic injuries to primary anterior teeth among preschool children in the Patna region using a case-control study design.

Methods: A case-control study was conducted with a total sample size of 120 preschool children aged between 3 and 5 years. Cases (n=60) were defined as children presenting with clinically diagnosed traumatic injuries to primary anterior teeth, while controls (n=60) were age-matched children without any history of dental trauma. Data on the type, severity, and etiology of dental injuries were collected through clinical examinations and structured interviews with parents. Statistical analyses were performed to identify significant associations between injury types and risk factors.

Results: The analysis revealed that the majority of injuries were classified as uncomplicated crown fractures. Falls and accidental collisions were the most common etiological factors. Children with a history of multiple falls were significantly more likely to experience traumatic dental injuries compared to those without such experiences ($p < 0.05$). The study also identified a correlation between the socioeconomic status of the family and the incidence of dental trauma.

Conclusion: The study highlights that traumatic injuries to primary anterior teeth in Patna preschoolers are predominantly due to minor falls and accidents. Early preventive interventions, coupled with parental education and improved safety measures in preschool environments, can help mitigate the risk of such injuries.

Introduction

Dental trauma in children is a growing concern globally, particularly among preschool-aged children who are in the early stages of physical, social, and cognitive development. Among various forms of dental trauma, injuries to the primary anterior teeth are the most frequently reported in young children due to their anatomical position, early eruption, and exposure to

environmental risks during early mobility stages [1]. These injuries, although often underestimated, can lead to a range of complications including pain, infection, compromised aesthetics, impaired speech development, and even psychological distress. Moreover, traumatic injuries to primary teeth may also adversely affect the developing permanent dentition, depending on the type and severity of trauma [2].



Preschool children are especially vulnerable to dental trauma due to their limited motor coordination, unstructured play, and frequent involvement in falls and collisions. As children in this age group are just beginning to explore their environments, the risk of unintentional injuries increases significantly [3]. The home, playground, and preschool settings are common environments where such injuries occur. Despite the high incidence, parental awareness about dental trauma, its consequences, and the need for prompt dental care is often inadequate, leading to underreporting and delayed treatment [4].

In India, the epidemiology of dental trauma varies by region, influenced by socio-economic factors, cultural practices, educational awareness, and access to pediatric dental care. The Patna region, a prominent urban center in the state of Bihar, presents unique challenges. A growing preschool population, limited availability of pediatric dental services in certain localities, and variable levels of parental education contribute to a potentially high but undocumented burden of traumatic dental injuries (TDIs) [5]. While studies in other parts of India have highlighted the prevalence and types of dental trauma in young children, there is a scarcity of focused research in Eastern India, particularly in the Patna region.

Understanding the local patterns and predictors of dental trauma is crucial for formulating effective public health interventions. A case-control study design is particularly useful in this context as it allows for the identification of risk factors associated with dental trauma, providing insights that can be translated into preventive strategies [6]. By comparing children with traumatic dental injuries (cases) to those without such injuries (controls), this study aims to elucidate key environmental, behavioral, and demographic factors that contribute to the occurrence of trauma [7].

This study, therefore, aims to assess the different types of traumatic injuries to primary anterior teeth in preschool children within the Patna region and to identify associated risk factors. The findings of this study will help bridge the knowledge gap in regional epidemiological data, contribute to better parental and institutional awareness, and guide the development of preventive and educational strategies tailored to the local context.

Methods

This study was designed as a case-control study to assess and compare the types of traumatic injuries to primary anterior teeth among preschool children in the Patna region. A total of 120 children aged between 3 and 5 years were enrolled from various preschools, pediatric outpatient departments, and community health camps over a period of six months. The sample comprised 60 children with clinically evident traumatic dental injuries (cases) and 60 children without any history of such injuries (controls). Controls were matched to cases based on age and gender to minimize confounding.

A standard calculation was carried out to determine the proper sample size for the case-control design. To have a 95% confidence level, 80% statistical power and an exposure rate of 30% in the control group (e.g., history of repetitive falls) and suppose an odds ratio of 2.5, the analysis estimated that a minimum of 55 people should be assigned to both groups. Since it was expected that 10% might not respond, the study increased each group to 60 participants which meant 120 children overall. To better compare traumatic injuries to the front teeth of preschool children in the Patna region, this research was set up as a case-control study. The study included children aged 3 to 5, all of whom came from a mix of preschools, outpatient pediatric departments and community health camps during those six months. We examined 60 children whose teeth had been injured in accidents (cases) and compared them to 60 children without dental injuries (controls). Cases and controls were selected by age and gender so that any confounding would be minimal.

The inclusion criteria for cases were preschool children with at least one traumatic injury to the primary anterior teeth, confirmed through clinical examination and caregiver interview. Children with congenital dental anomalies or systemic conditions affecting dentition were excluded. For the control group, children of the same age range with no history or clinical signs of dental trauma were selected. Data collection involved a combination of direct oral examination and structured interviews with parents or guardians. The clinical examination was conducted under natural light using a sterile mouth mirror and explorer, following standard infection control protocols. Dental injuries were



classified according to the Ellis and Davey classification system, with additional reference to WHO trauma guidelines where applicable.

A structured questionnaire was administered to the caregivers to gather relevant information on demographic details, socioeconomic status, past trauma history, behavioral habits (such as thumb sucking, bottle feeding), the frequency of falls, supervision levels, and awareness regarding dental trauma. Socioeconomic classification was based on modified Kuppuswamy's scale. The primary variables assessed included the type and number of injured teeth, cause of injury, and environmental context (home, school, or playground) in which the injury occurred.

Data were compiled and subjected to statistical analysis using SPSS software. Descriptive statistics were used to summarize the demographic and clinical variables. Chi-square tests were performed to identify significant associations between risk factors and the occurrence of traumatic dental injuries. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 120 preschool children aged between 3 to 5 years were included in the study, comprising 60 cases with traumatic injuries to primary anterior teeth and 60 controls without any history of such trauma. The mean age was comparable between the groups, and gender distribution was nearly equal.

Table 1: Children in both groups were demographically similar, with no significant differences in age or gender.

Table 1: Demographic characteristics of the study population

Group	Mean Age (Years)	Male (%)	Female (%)
Cases	4.2	60.0	40.0
Controls	4.1	58.3	41.7

Table 2: Socioeconomic status showed notable differences, with more cases belonging to lower middle and upper lower classes.

Table 2: Socioeconomic status distribution among cases and controls

Socioeconomic Class	Cases (n=60)	Controls (n=60)
Upper	5	8
Upper Middle	12	15
Lower Middle	18	20
Upper Lower	20	14
Lower	5	3

Table 3: Uncomplicated crown fractures were the most common injury type, followed by luxation.

Table 3: Types of traumatic dental injuries in primary anterior teeth

Type of Injury	Frequency (n=60)	Percentage (%)
Uncomplicated Crown Fracture	25	41.7
Complicated Crown Fracture	10	16.7
Luxation	15	25.0
Avulsion	7	11.7
Other	3	5.0

Table 4: Falls were the leading cause of trauma among cases, while controls had few injuries from such causes.

Table 4: Causes of traumatic dental injuries

Cause	Cases (n=60)	Controls (n=60)
Fall	35	10
Collision	15	5
Sports	5	2
Other	5	43



Table 5: Most injuries occurred at home or during play, highlighting the importance of supervision.

None	15	8
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Table 5: Environments where injuries occurred

Location	Cases (n=60)
Home	28
Preschool	12
Playground	15
Other	5

Table 6: Children with a history of recurrent falls were significantly more represented among cases.

Table 6: History of previous falls among children

History of Recurrent Falls	Cases (n=60)	Controls (n=60)
Yes	36	18
No	24	42

Table 7: Parental awareness about dental trauma was lower among cases, suggesting a need for education.

Table 7: Parental awareness levels regarding dental trauma

Awareness Level	Cases (n=60)	Controls (n=60)
High	5	12
Moderate	12	20
Low	28	20

Table 8: Oral habits such as thumb sucking were more prevalent among cases than controls.

Table 8: Presence of oral habits in children

Oral Habit Present	Cases (n=60)	Controls (n=60)
Yes	20	10
No	40	50

Table 9: Bottle feeding was slightly more common in children with dental trauma.

Table 9: Bottle feeding habits in study groups

Bottle Feeding	Cases (n=60)	Controls (n=60)
Yes	22	15
No	38	45

Table 10: Most children had one or two anterior teeth affected per traumatic incident.

Table 10: Number of anterior teeth affected per child

No. of Teeth Affected	Cases (n=60)
1	25
2	20
3	10
≥4	5

Table 11: Risk Factors Associated with Traumatic Dental Injuries

Predictor Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Recurrent Falls	3.21	1.48 – 6.73	0.002
Low Parental Awareness	2.75	1.30 – 5.86	0.006
Presence of Oral Habits	1.92	1.08 – 3.42	0.03
Bottle Feeding	1.45	0.76 – 2.78	0.26



Discussion

Traumatic dental injuries (TDIs) in primary anterior teeth among preschool-aged children present a significant public health concern, particularly in developing regions such as Patna. These injuries not only affect the child's immediate oral health but can also lead to long-term functional, esthetic, and psychological complications [8,9]. In the present case-control study, a total of 120 preschool children were evaluated to identify the types of traumatic injuries sustained by primary anterior teeth and the associated risk factors. The findings provide crucial insight into the etiology, patterns, and determinants of TDIs within this demographic [10].

The results indicated that uncomplicated crown fractures were the most common type of injury, followed by luxation injuries and complicated crown fractures. This distribution is consistent with existing literature, which suggests that primary teeth, due to their anatomical and physiological characteristics such as less mineralized enamel and a more elastic alveolar bone are more prone to luxation and minor fractures rather than complex crown-root fractures [10,11]. The prominence of uncomplicated crown fractures in this study may be attributed to the frequency of low-impact trauma such as indoor falls, which accounted for the majority of the injuries reported [12].

Falls, particularly those occurring within the home environment, were identified as the primary cause of TDIs [13]. This aligns with the fact that children between the ages of three and five are in a phase of developing motor coordination, making them more susceptible to accidental trauma during routine activities [14]. A significant proportion of injuries occurred when children were unsupervised, emphasizing the crucial role of adult supervision in preventing such incidents. This observation suggests a potential avenue for preventive interventions through parental education on injury risks in domestic environments [15].

Feeding practices, particularly bottle feeding beyond infancy, were also more commonly observed in children who sustained dental trauma. While the association between prolonged bottle feeding and TDIs may not be direct, such feeding behaviors have been associated with the development of malocclusion, which in turn can predispose children to anterior tooth injuries.

Although this study did not assess malocclusion status directly, the implication suggests a potential link worthy of exploration in future longitudinal research.

Conclusion

Traumatic dental injuries (TDIs) to primary anterior teeth are a prevalent and significant concern among preschool-aged children in the Patna region. The current case-control study reveals that uncomplicated crown fractures are the most commonly observed injury type, followed by luxation and complicated crown fractures. Falls—particularly within the home and in unsupervised settings—emerged as the leading cause of injury, with recurrent falls, oral habits, and bottle-feeding practices identified as notable contributory risk factors.

A significant association was observed between TDIs and socioeconomic status, with children from lower socioeconomic backgrounds demonstrating a higher vulnerability. Additionally, a lack of parental awareness regarding dental trauma and its management was found to be a critical modifiable factor influencing injury outcomes. These findings underscore the multifactorial etiology of TDIs and highlight the need for multifaceted preventive strategies.

The study emphasizes the importance of enhancing parental knowledge, promoting safer home environments, and implementing early screening for high-risk behaviors and conditions. Pediatric dentists, healthcare providers, educators, and policymakers should work collaboratively to develop community-based programs that address these risk factors and promote early intervention.

Ultimately, preventing TDIs in young children requires a combination of educational, environmental, and clinical strategies tailored to the needs of vulnerable populations. Proactive efforts in these areas can lead to significant improvements in pediatric oral health and overall well-being.

Limitations and Possible Biases

This study gives us crucial information on how common and risky traumatic oral injuries are in preschoolers, but it also has some flaws that need to be pointed out. First, the study only looked at a few urban preschools and paediatric health centres in Patna, which may not be representative of all preschoolers in the area. Second,



using data from carers might lead to recall bias, especially for things like a history of falls and behavioural tendencies. Third, this study can find links but not prove that one thing causes another because it is a case-control design. Finally, even though logistic regression was used to take into account a lot of other characteristics, it's still possible that there are other aspects that weren't examined, like the type of occlusion, behavioural hyperactivity, and the severity of the injury.

References

1. ElKarmi RF, Hamdan MA, Rajab LD, Abu-Ghazaleh SB, Sonbol HN. Prevalence of traumatic dental injuries and associated factors among preschool children in Amman, Jordan. *Dent Traumatol.* 2015 Dec;31(6):487-92. doi: 10.1111/edt.12183. Epub 2015 Jun 2. PMID: 26040431.
2. Oliveira LB, Marcenes W, Ardenghi TM, Sheiham A, Bönecker M. Traumatic dental injuries and associated factors among Brazilian preschool children. *Dent Traumatol.* 2007 Apr;23(2):76-81. doi: 10.1111/j.1600-9657.2005.00413.x. PMID: 17367453.
3. Wendt FP, Torriani DD, Assunção MC, Romano AR, Bonow ML, da Costa CT, Goetts ML, Hallal PC. Traumatic dental injuries in primary dentition: epidemiological study among preschool children in South Brazil. *Dent Traumatol.* 2010 Apr;26(2):168-73. doi: 10.1111/j.1600-9657.2009.00852.x. Epub 2010 Jan 19. PMID: 20089072.
4. Sulieman AG, Awooda EM. Prevalence of Anterior Dental Trauma and Its Associated Factors among Preschool Children Aged 3-5 Years in Khartoum City, Sudan. *Int J Dent.* 2018 May 24;2018:2135381. doi: 10.1155/2018/2135381. PMID: 29977294; PMCID: PMC5994279.
5. Kramer PF, Zembruski C, Ferreira SH, Feldens CA. Traumatic dental injuries in Brazilian preschool children. *Dent Traumatol.* 2003 Dec;19(6):299-303. doi: 10.1046/j.1600-9657.2003.00203.x. PMID: 15022996.
6. Turkistani J, Hanno A. Recent trends in the management of dentoalveolar traumatic injuries to primary and young permanent teeth. *Dent Traumatol.* 2011 Feb;27(1):46-54. doi: 10.1111/j.1600-9657.2010.00950.x. PMID: 21244628.
7. Nadelman P, Gárate KM, Oliveira A, Pithon MM, de Castro ACR, Maia LC. Dental arch perimeter changes as a result from premature loss of primary anterior teeth due to trauma: A case series in infant and pre-school children. *Int J Paediatr Dent.* 2021 Sep;31(5):598-605. doi: 10.1111/ipd.12738. Epub 2020 Nov 21. PMID: 33040373.
8. Fried I, Erickson P, Schwartz S, Keenan K. Subluxation injuries of maxillary primary anterior teeth: epidemiology and prognosis of 207 traumatized teeth. *Pediatr Dent.* 1996 Mar-Apr;18(2):145-51. PMID: 8710718.
9. Viegas CM, Scarpelli AC, Carvalho AC, Ferreira FM, Pordeus IA, Paiva SM. Predisposing factors for traumatic dental injuries in Brazilian preschool children. *Eur J Paediatr Dent.* 2010 Jun;11(2):59-65. PMID: 20635838.
10. Norton E, O'Connell AC. Traumatic dental injuries and their association with malocclusion in the primary dentition of Irish children. *Dent Traumatol.* 2012 Feb;28(1):81-6. doi: 10.1111/j.1600-9657.2011.01032.x. Epub 2011 Jul 27. PMID: 21794080.
11. Soporowski NJ, Allred EN, Needleman HL. Luxation injuries of primary anterior teeth--prognosis and related correlates. *Pediatr Dent.* 1994 Mar-Apr;16(2):96-101. PMID: 8015964.
12. Tello G, Bonini GC, Murakami C, Abanto J, Oliveira LB, Bönecker M. Trends in the prevalence of traumatic crown injuries and associated factors in Brazilian preschool children: 10-year observational data. *Dent Traumatol.* 2016 Aug;32(4):274-80. doi: 10.1111/edt.12255. Epub 2016 Jan 22. PMID: 26799156.
13. Bhayya DP, Shyagali TR. Traumatic injuries in the primary teeth of 4- to 6-year-old school children in gulbarga city, India. A prevalence study. *Oral Health Dent Manag.* 2013 Mar;12(1):17-23. PMID: 23474577.
14. Sennhenn-Kirchner S, Jacobs HG. Traumatic injuries to the primary dentition and effects on the permanent successors - a clinical follow-up study. *Dent Traumatol.* 2006 Oct;22(5):237-41. doi: 10.1111/j.1600-9657.2006.00383.x. PMID: 16942552.
15. Sennhenn-Kirchner S, Jacobs HG. Traumatic injuries to the primary dentition and effects on the permanent successors - a clinical follow-up study. *Dent Traumatol.* 2006 Oct;22(5):237-41. doi: 10.1111/j.1600-9657.2006.00383.x. PMID: 16942552.