

# Evaluation of the Prevalence of Different Types of Traumatic Injuries to Primary Anterior Teeth among Preschool Children in National Capital Region of Delhi, India: A Cross-sectional Study

Khyati Gupta<sup>1</sup>, Sameep Singh<sup>2</sup>

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## ABSTRACT

**Background/Aim:** The increasing worldwide prevalence of traumatic injury to primary teeth has raised concerns among dental practitioners and parents. This is due to the serious impact it has on children's dental as well as overall physical, emotional, and mental health. The aim of this study was to assess the prevalence of different types of traumatic injuries to the anterior teeth in preschool children.

**Materials and methods:** In this cross-sectional study, 1,800 preschool children, 2–6 years old, were selected from 17 primary schools in Delhi, the national capital region (NCR). The primary maxillary and mandibular anterior teeth of these children were examined by a single examiner, and a questionnaire was filled out by the parent/guardian. Andreasen's classification was used to classify the traumatic injuries. Statistical analysis was done by the Chi-square test, and the  $p$ -values  $\leq 0.05$  were considered to be statistically significant.

**Results:** The prevalence of hard tissue injuries was as follows: enamel infraction in 3.9%, enamel fracture in 84.4%, enamel–dentin fracture in 7.79%, and complicated crown fractures in 3.9%. Enamel fracture was the most common type of hard tissue injury, with more prevalence in 5-year-old children (37.6%) and affecting girls (51.9%) more than boys (32.46%). Distribution of children with TDI according to injury to periodontal tissues showed percentage of concussion (24.89%), subluxation (10.92%), extrusive luxation (7.86%), intrusive luxation (15.72%), lateral luxation (24.45%), and avulsion (16.6%) with concussion being the most common. Boys (58.5%) were more affected than girls (41.4%) with concussion, and it was more prevalent in 5-year-old children (51.09%).  $P$ -values were insignificant for both hard tissue and periodontal tissue injuries.

**Conclusions:** Due to the wide variation in the type of injuries and their prevalence, there is a need to spread awareness among parents through educational programs regarding the possible risks and preventive solutions for the same.

**Keywords:** Dental trauma, Hard tissue dental injury, Luxation, Primary anterior teeth, Periodontal injury, Preschool children.

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## INTRODUCTION

"Primary teeth are eventually replaced by permanent teeth" this notion has led to neglect in parents seeking for treatment of traumatic dental injuries (TDI) to their children's deciduous teeth. Parents are unaware that such injuries affect the emotional well-being of children, impacting esthetics and function. It has also been studied that TDI may affect the odontogenic process and hence the developing permanent successor.<sup>1</sup>

These injuries are caused by traumatic forces on the hard and soft tissues of the teeth. The extent of injury, i.e., involvement of dental structures, determines the severity of injury.<sup>2</sup> According to Ulf Glendor, one-third of all preschool children have suffered at least one TDI.<sup>3</sup>

The clinical presentation of dental injury is a result of multiple factors such as age, gender, location, and also surface of impact. According to the literature, boys and girls were equally impacted by TDIs.<sup>4–7</sup> Some studies reported that the highest frequency of TDIs was seen in the age-group of 12–36 months.<sup>8–10</sup> Most of the incidents were noted to be occurring due to falls.<sup>10–12</sup> As these children spend most of their time at home, most of these injuries occur at home.<sup>13,14</sup>

Hence, the present study aims at evaluating the prevalence of different types of TDI in preschool children and to increase

<sup>1</sup>Department of Prosthodontics, AIMST University, Kedah, Malaysia

<sup>2</sup>Department of Pedodontics, AIMST University, Kedah, Malaysia

**Corresponding Author:** Khyati Gupta, Department of Prosthodontics, AIMST University, Kedah, Malaysia, Phone: +60 1136159753, e-mail: khyati.doc.gupta@gmail.com

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awareness about the importance of seeking immediate treatment for the same.

## MATERIALS AND METHODS

This cross-sectional study was conducted after ethical clearance from the Ethics Committee, Santosh Dental College and Hospital, Ghaziabad, Delhi-NCR. Eighteen hundred children were enrolled in this study, aged 2–6 years, irrespective of gender. The participants

were selected from 17 preschools in Delhi NCR, India, according to ICMR (1994) and Helsinki declaration (modified 2000) guidelines. The exclusion criteria were mixed or permanent dentition, exfoliated deciduous anteriors, and injury to the tooth supporting hard and soft tissues. The participants' parents/guardians were asked to provide a written consent.

Only the anterior deciduous teeth were examined using basic diagnostic instruments by a solo examiner. The examiner had first practiced on 10 participants and studied the full range of traumatic injuries according to Anderson's classification. The diagnostic criteria were then applied to the preselected 25 subjects to determine consistency. The frequency of examination was 25 subjects twice on successive days. Finally, a comparison was drawn between the two observations, and if the variation was large, additional examination was conducted till consistent results were obtained.

The data recorded included different types of dental hard and soft tissue injuries according to age and gender.

All data were analyzed using an SPSS statistical program (version 16.0). Chi-square test was used to study the association between socio-demographic variables and oral factors and TDI. A  $p$ -value  $< 0.05$  was considered to be statistically significant.

The study spanned over 2 years. All the participants with evident TDI were sent to the Santosh Dental Clinic for treatment, and regular follow-ups were done.

## RESULTS

**Table 1** displays the distribution of participants with TDI according to hard tissue injury ( $n = 77$ ) with enamel infarction 3.9%, enamel fracture 84.4%, enamel-dentin fracture 7.79%, and complicated crown fractures 3.9%.

**Table 2** shows a correlation of hard dental tissue injury with age with an overall percentage of 25.16% with the highest number of enamel fractures in 5 years old ( $n = 24$ , 37.6%), followed by 4 years old ( $n = 14$ , 22.7%), 3 years old ( $n = 16$ , 20.7%), and 2 years old ( $n = 9$ , 15.5%).  $P$ -value was statistically insignificant.

**Table 3** shows a correlation of dental hard tissue injury with gender with higher number of hard tissue injuries in females. Enamel fractures were most commonly seen in 51.9% girls and 32.46% boys.  $P$ -values were insignificant (0.7%).

**Table 4** shows the distribution of participants with TDI according to type of injury to periodontal tissues ( $n = 229$ ) as concussion (24.89%), subluxation (10.92%), extrusive luxation (7.86%), intrusive luxation (15.72%), lateral luxation (24.45%), and avulsion (16.6%).

**Table 5** shows a correlation of periodontal injuries with age with highest number of concussion injuries in 5 years age-group (51.09%) followed by 3-year-old and 2-year-old (19.65% and 10.04%). The  $p$ -value was 0.5.

**Table 6** shows a correlation of periodontal injuries with gender with a higher percentage of injuries in males (58.5%) than in females (41.4%). The  $p = 0.5$  value was insignificant.

**Table 7** shows a comparison of types of TDI between hard and soft dental tissue injury with age. In the age-group of 2 years, the number of children with hard dental tissue injury was 12 and soft tissue injury was 23; in the age-group of 3 years, the number of children with hard dental tissue injury was 16 and soft tissue injury was 45; in the age-group of 4 years, the number of children with hard dental tissue injury was 17 and soft tissue injury was 23; in the age-group of 5 years, the number of children with hard dental tissue

**Table 1:** Distribution of children with TDI according to hard tissue injury ( $n = 77$ )

Hard tissue injury	Number (n)	Percentage (%)	95% Confidence limit
Enamel infarction	03	3.90	0.81–10.97%
Enamel fracture	65	84.42	74.36–91.68%
Enamel–dentin fracture	06	7.79	2.91–16.19%
Complicated crown fracture	03	3.90	0.81–10.97%
Uncomplicated crown root fracture	0	0	–
Complication crown root fracture	0	0	–
Root fracture	0	0	–
Total	77	100	

**Table 2:** Correlation of hard dental tissue injury with age

Age	Hard dental tissue injury				Total
	Enamel infarction	Enamel fracture	Enamel–dentin fracture	Complicated crown fracture	
2 years	0	9	2	1	12
3 years	0	16	0	0	16
4 years	1	14	0	0	17
5 years	1	24	2	2	29
6 years	1	2	0	0	3
Total	3	65	4	3	77

Chi-square = 14.4134; Df = 12; Probability = 0.2751

**Table 3:** Correlation of hard dental tissue injury with gender

Gender	Hard dental tissue injury				Total
	Enamel infarction	Enamel fracture	Enamel–dentin fracture	Complicated crown fracture	
Female	2	40	4	1	47
Male	1	25	2	2	30
Total	3	65	6	3	77

Chi-square = 1.0950; Df = 3; Probability = 0.7783

**Table 4:** Distribution of children with TDI according to injury to periodontal tissues ( $n = 229$ )

Injury to periodontal tissues	Number (n)	Percentage (%)	95% Confidence interval
Concussion	57	24.89	19.43–31.01%
Subluxation	25	10.92	7.19–15.69%
Extensive luxation	18	7.86	4.72–12.14%
Intrusive luxation	36	15.72	11.26–21.09%
Lateral luxation	56	24.45	19.03–30.55%
Avulsion	37	16.16	11.64–21.58%
Total	229	100	

injury was 29 and soft tissue injury was 117; and in the age-group of 6 years, the number of children with hard dental tissue injury was 3 and periodontal tissue injury was 21.

**Table 8** shows a comparison of types of TDI between hard dental tissue injury and periodontal tissue injury with gender. The total no. of males with hard dental tissue injury was 38.9% against

**Table 5:** Correlation of periodontal tissue injury with age

Age	Hard periodontal tissue injury						Total
	Concussion	Subluxation	Extrusion	Intrusion	Lateral luxation	Avulsion	
2	7	3	0	2	5	6	23
3	13	4	1	8	9	10	45
4	5	1	1	5	7	4	23
5	28	16	14	18	27	14	117
6	4	1	2	3	8	3	21
Total	57	25	18	36	56	37	229

Chi-square = 17.9217; Df = 20; Probability = 0.5926

**Table 6:** Correlation of periodontal tissue injury with gender

Gender	Hard periodontal tissue injury						Total
	Concussion	Subluxation	Extrusion	Intrusion	Lateral luxation	Avulsion	
Female	27	14	7	14	17	16	95
Male	30	11	11	22	39	21	134
Total	57	25	18	36	56	37	229

Chi-square = 3.7278; Df = 5; Probability = 0.5892

**Table 7:** Comparison of types of TDI between hard dental tissue injury and periodontal tissue injury with age

Age	Hard dental tissue injury		Periodontal tissue injury		Total	
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
2	12	15.6	23	10	35	11.43
3	16	20.8	45	19.7	61	19.94
4	17	22.1	23	10	40	13.07
5	29	37.6	117	51.1	146	47.72
6	3	3.9	21	9.2	24	7.84
Total	156	100	150	100	306	100.00

**Table 8:** Comparison of types of TDI between hard dental tissue injury and periodontal tissue injury with gender

Gender	Hard dental tissue injury		Periodontal tissue injury		Total	
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
Male	30	38.9	134	58.51	156	51
Female	47	61.03	95	41.48	150	49
Total	77	100	229	100	306	100

a total of 58.5% males with periodontal tissue injuries. The total no. of females with hard dental tissue injury was 61.03% against a total of 41.48% females with periodontal tissue injuries.

## DISCUSSION

Although many studies have been undertaken in different parts of India and the world, no data are available regarding the prevalence of types of TDI in Delhi, NCR region.<sup>15-24</sup> Hence, this research was conducted.

According to some studies, enamel fracture is the most frequent type of dental hard tissue injury.<sup>25-28</sup> These results are consistent with the findings of this study. The main reason for TDI is a lack of motor coordination in preschool children.<sup>12,29</sup>

Contrary to the findings of many studies regarding the higher prevalence of trauma among male patients, this study showed that higher rates of TDI were seen in girls than boys.<sup>30-34</sup> Since all children, irrespective of their gender age 1 month–6 years, are exposed to similar risk factors.<sup>35</sup> According to this study, traumatic

injuries to primary teeth were the highest in 2–6-year-old children, which is in agreement with other reviewed studies.<sup>36,37</sup>

Concussion was found to be the most prevalent type of periodontal injury in the present study. Second was lateral luxation, which is a unique finding since according to previous studies, subluxation has been documented to be the most prevalent.<sup>38</sup> Boys were more affected by periodontal injuries than girls.

Dental soft tissue injuries occurred 2–4 times more frequently (according to age-group) than hard dental tissue injuries, as reported by other studies.<sup>39-42</sup> This may be attributed to the elasticity of the periodontal ligament and alveolar bone resilience.

## CONCLUSION

This study was the first to report data on the types of dental hard and soft tissue injuries to the primary dentition in Delhi, NCR region. There is a need to conduct more such studies in different regions of India and the world. The data can help develop awareness programs

and educate parents and guardians regarding the prevalence of this very common occurrence and how they can effectively prevent its consequences.

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