

# Frequency and Patterns of Unintentional Injuries among Children Aged Less than 14 Years in Chengalpattu, Tamil Nadu, India: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Unintentional injuries occur very frequently in the paediatric age group. The major causes leading to unintentional injuries, such as poisoning, fires, drowning, and accidents, can vary according to age. Most of these injuries are preventable by modifying the child's environment or providing adult supervision.

**Aim:** To study the frequency and patterns of unintentional injuries in the paediatric age group under 14 years in Chengalpattu, Tamil Nadu.

**Materials and Methods:** A hospital-based, cross-sectional study was conducted in the paediatric Outpatient Department (OPD) and emergency Department of Karpaga Vinayaga Institute of Medical Sciences, Chengalpattu, Tamil Nadu, India from June to November 2019. A total of 220 paediatric patients aged less than 14 years, who were admitted to the emergency Department with a history of unintentional injury, were included in the study. Data were collected using a semi-structured proforma containing details of age, education of the mother and father, type and place of injury, and

other socio-demographic parameters. The nature of the injury was considered as the primary outcome variable. Statistical analysis was performed using coGuide.

**Results:** In the present study, 220 children were included with a mean age of 6.12±3.74 years. The majority were male children 130 (59.09). The majority of the children (93.64%) were taken care of by their parents, and falls were the most commonly reported injury (55.00%), followed by falls of objects, poisoning, and Road Traffic Accidents (RTA). There was a statistically significant difference in mean age across the groups classified by the nature of their injury ( $p < 0.05$ ).

**Conclusion:** In the present study, the prevalence of falls was 55%. Other common unintentional injuries among children under 14 years of age included falls of objects, poisoning, RTAs, bites/stings, foreign bodies, burns, and drowning or near drowning. These injuries can be prevented by adult supervision and providing a safe, child-friendly environment for play.

**Keywords:** Accidental falls, Accidental injuries, Parents, Poisoning

## INTRODUCTION

Unintentional childhood injuries, including road traffic injuries, burns, drowning, poisonings, and falls, are a growing problem worldwide. Over 95% of unintentional injury-related deaths occur in low and middle-income countries, leading to physical, psychological, and economic consequences for these communities [1].

Paediatric age groups are at risk of injuries due to their physical and psychological characteristics. Their small body size and soft tissues make them more susceptible to injuries. Children have limited risk perception, which makes them prone to road accidents, drownings, burns, and poisonings [2]. Psychological factors such as impulsiveness, curiosity, and experimentation also contribute to their vulnerability to injuries. Adolescents, in particular, tend to engage in risk-taking behaviour and often neglect safety measures, increasing their chances of getting injured [3].

Injury and violence are major causes of childhood deaths worldwide, resulting in approximately 950,000 deaths in children and youth under 18 years each year [4]. The majority of these deaths are caused by unintentional injuries, making them the leading cause of death for children aged 10-19 years. Road traffic injuries and drowning are the most common causes of injury deaths among children globally, followed by burns and falls [5]. According to a World Health Organisation (WHO) report on childhood injuries, they account for 9% of the world's deaths and 12% of the burden of diseases [6]. Unintentional injury is defined as any disability that occurs due to accidental circumstances [6]. Unintentional injuries are responsible for 30% of mortality in children aged 1-3 years, 40% in 4-year-old

children, and 50-60% in children aged 5-18 years [6,7]. Southeast Asia (SEA) accounts for 31% of the world's burden and 27% of injury-related mortality [8]. In India, which has a population of over a billion people, children aged 0-14 years constitute approximately 31.4% [9].

Despite recent efforts to understand the burden of injuries, the magnitude of morbidity and mortality remains unknown for many individual countries, including India. Therefore, the present study aimed to determine the frequency and pattern of unintentional injuries among children under 14 years of age in rural areas.

## MATERIALS AND METHODS

A hospital-based cross-sectional study was conducted in the paediatric OPD and emergency Department of Karpaga Vinayaga Institute of Medical Sciences, Chengalpattu, Tamil Nadu, India, from June to November 2019. The study received approval from the Institutional Ethical Committee (Reference Number: KIMS/F/2019/09), and informed written consent was obtained from the parents or guardians who were available during the hospital visit.

**Inclusion criteria:** All 220 children under 14 years of age from rural areas who were brought to the paediatric department OPD and emergency department with a history of unintentional injury within the study duration were included in the study.

**Exclusion criteria:** Children with intentional injuries, such as interpersonal violence, self-harm, suicide, injuries due to child abuse, children with significant developmental delay, children with a seizure disorder, and children with physical and sensory disabilities, were excluded from the study.

## Study Procedure

A semi-structured proforma was used to collect data. The proforma included sections on the sociodemographic profile, such as age and gender of the child, mother's age, educational status, and occupation, father's educational qualification and profession, and socio-economic status based on the modified Prasad score [10]. It also included information on the type of injury, frequency of injury per child, place of injury, type of activity the child was involved in, caretaker of the child, and whether the injury was witnessed or unwitnessed. These factors were selected based on the studies obtained during the literature review [7-9,11].

## STATISTICAL ANALYSIS

The nature of the injury was considered as the primary outcome variable, while the demographic parameters were considered as the primary explanatory variable. Descriptive analysis was performed using mean and standard deviation for quantitative variables, and frequency and proportion for categorical variables. Data were also represented using appropriate diagrams, such as cluster bar diagrams. Normal distribution was checked for all quantitative variables within each category of the explanatory variable. For non normally distributed quantitative variables, medians and Interquartile Range (IQR) were compared between study groups using the Kruskal-Wallis test for more than two groups. Categorical outcomes were compared between study groups using the Chi-square test. A p-value <0.05 was considered statistically significant. Statistical analysis was conducted using CoGuide [12].

## RESULTS

In the present study, out of 220 children, the majority were male and the mean age was  $6.12 \pm 3.74$  years. Unemployed mothers and semiskilled fathers were in a higher proportion. The majority of family income (in rupees) fell within the range of 1972-3286. Families with four members were more common in the study population. The majority of the population belonged to Class III socio-economic status. The majority of the participants were first in birth order [Table/Fig-1].

Parameters	n (%)
Mean age (years)	6.12±3.74 (ranged 1 to 13)
Gender	Male 130 (59.09%) Female 90 (40.91%)
Mother age (years)	29.65±4.74 (ranged 21 to 40)
Mother occupation	Semiskilled 14 (6.36%) Skilled 10 (4.55%) Unemployed 128 (58.18%) Unemployed (pregnant) 10 (4.55%) Unemployed (Taking care of the younger child) 42 (19.09%) Unskilled 16 (7.27%)
Father age (years)	33.3±5.71 (ranged 24 to 49)
Father occupation	Unskilled 32 (14.55%) Semiskilled 90 (40.91%) Skilled 84 (38.18%) Semiprofessional 12 (5.45%) Professional 2 (0.91%)
Per capita income (in rupees)	>6574 16 (7.27%) 3287-6573 64 (29.09%) 1972-3286 96 (43.64%) 986-1971 38 (17.27%) <985 6 (2.73%)

No. of people in the family	3	38 (17.27%)
	4	88 (40.00%)
	5	62 (28.18%)
	6	28 (12.73%)
	7	4 (1.82%)
Socio-economic status	Class-I	16 (7.27%)
	Class-II	66 (30.00%)
	Class-III	96 (43.64%)
	Class-IV	36 (16.36%)
	Class-V	6 (2.73%)
Order of birth	1	142 (64.55%)
	2	64 (29.09%)
	3	14 (6.36%)

[Table/Fig-1]: Demographic parameter of the study population (N=220).

In the present study, parents were the caretakers for the majority of the children. Regarding the nature of the injury, the majority (121, 55.00%) were injured due to falls. In the majority of cases (124, 56.36%), the caretakers witnessed the injury. The majority (166, 75.45%) of children were engaged in leisure/play activities at the time of injury, and all study participants reported morbidity [Table/Fig-2,3].

Parameters	n (%)
Caretaker of the child at home	Parents 206 (93.64%) Grandparents 12 (5.45%) Other family members 2 (0.91%)
Nature of injury	Fall 121 (55.00%) Fall of object 30 (13.64%) Poisoning 17 (7.73%) RTA 14 (6.36%) Bite/sting 14 (6.36%) Foreign body 12 (5.45%) Burns 8 (3.64%) Drowning/near-drowning 2 (0.91%) Not clearly defined 2 (0.91%)
Frequency of injury*	Once 184 (83.64%) Twice 30 (13.64%) Three 4 (1.82%) Four times 2 (0.91%)
Witnessed injury	By caretaker 148 (67.27%) By passers 30 (13.64%) Other family members 29 (13.18%) Friends 13 (5.91%)
Place of injury	Inside home 96 (43.64%) Outside home 124 (56.36%)
Child's activity at the time of injury	Leisure/play 166 (75.45%) The activity of daily living 44 (20.00%) Sports 10 (4.55%)
Outcome	Admitted, cured and discharged 220 (100.00%) Adverse outcome -

[Table/Fig-2]: Summary of nature of injury and other relevant parameters (N=220). \*Represents the number of times the child was injured

Nature of injury	n (%)
Fall	121 (55.00%)
Fall of object	30 (13.64%)
Bite/sting	14 (6.36%)
First degree burns	8 (3.64%)

<b>Poisoning</b>	17 (7.73%)
• Ala ingestion	1 (5.88%)
• Camphor ingestion with seizure	1 (5.88%)
• Distilled water ingestion, used for inverter batteries	1 (5.88%)
• Kerosene ingestion	7 (41.18%)
• Paracetamol tablet/syrup ingestion	2 (11.76%)
• Potassium permanganate ingestion	1 (5.88%)
• Thyroxin tablet ingestion	1 (5.88%)
• Turpentine oil ingestion	2 (11.76%)
• Unknown plant ingestion with allergic reaction of mouth	1 (5.88%)
<b>RTA</b>	14 (6.36%)
• RTA with abrasion	4 (28.57%)
• Femur fracture	2 (14.29%)
• Pulled elbow	2 (14.29%)
• RTA with head trauma/injury	2 (14.29%)
• RTA with displaced fracture of right frontal bone	2 (14.29%)
• RTA with loss of conscious	2 (14.29%)
<b>Foreign body</b>	12 (5.45%)
• Button battery ingestion	1 (7.14%)
• Coin ingestion	1 (7.14%)
• Foreign body causing blunt, abrasive, or penetrating trauma.	5 (35.71%)
• Stick injury (by tree stem, plant stem causing injuries)	1 (7.14%)
• Thorn prick	4 (28.57%)

[Table/Fig-3]: Type of each injury.

Different factors were compared for their association with the nature of the injury. There was a statistically significant difference in mean age across the groups classified by the nature of their injury ( $p < 0.05$ ). There was no statistically significant difference in the nature of the injury based on gender (in years) ( $p > 0.05$ ), with the majority (57.78%) of female participants experiencing fall injuries and other relevant parameters [Table/Fig-4].

Regarding educational status, secondary school education was most common for both mothers and fathers. There was no significant association between the nature of the injury and either the mother's education or occupation. Among participants with secondary school education for the mother, the majority 35 (46.05%) had fall injuries. Among participants with unemployed mothers, the majority 68 (53.13%) had fall injuries [Table/Fig-5].

Among participants with secondary school education for the father, the majority (24, 41.38%) had fall injuries. Among participants with semiskilled fathers, the majority 39 (43.33%) had fall injuries [Table/Fig-6].

## DISCUSSION

The present study aimed to determine the frequency and pattern of unintentional injuries among children under 14 years of age in rural areas. The findings of the study showed that the most common type of unintentional injury in this age group was falls (55%). The majority of these injuries occurred outdoors (56.36%) while the child was engaged in play activities (75.45%). The types of unintentional injuries reported in the study included falls, falling objects, poisoning, RTA, bites/stings, foreign bodies, burns, and drowning or near-

Parameters	Nature of injury						p-value
	Fall	Fall object	Poisoning	RTA	Bite/sting	Foreign body and others	
Child age (in years) median (IQR, 25 <sup>th</sup> -75 <sup>th</sup> )	5 (2.5, 8)	8 (3, 12)	3 (1.5, 3.62)	6 (5, 10)	7 (3.5, 9)	9 (2, 11.75)	<0.001*
<b>Gender</b>							
Male (n=130)	69 (53.08%)	20 (15.38%)	9 (6.92%)	10 (7.69%)	10 (7.69%)	12 (9.23%)	0.582 <sup>†</sup>
Female (n=90)	52 (57.78%)	10 (11.11%)	8 (8.89%)	4 (4.44%)	4 (4.44%)	12 (13.33%)	
<b>No. of people in family</b>							
3 (n=38)	20 (52.63%)	6 (15.79%)	2 (5.26%)	6 (15.79%)	2 (5.26%)	2 (5.26%)	‡
4 (n=88)	40 (45.45%)	14 (15.79%)	4 (4.55%)	6 (6.82%)	8 (9.09%)	16 (18.18%)	
5 (n=62)	37 (59.68%)	8 (12.9%)	7 (11.29%)	2 (3.23%)	2 (3.23%)	6 (9.68%)	
6 (n=28)	20 (71.43%)	2 (7.14%)	4 (14.29%)	0 (0%)	2 (7.14%)	0	
7 (n=4)	4 (100%)	0	0	0	0	0	
<b>Order of birth</b>							
1 (n=142)	74 (52.11%)	22 (15.49%)	10 (7.04%)	10 (7.04%)	10 (7.04%)	16 (11.27%)	‡
2 (n=64)	41 (64.06%)	6 (9.38%)	3 (4.69%)	4 (6.25%)	4 (6.25%)	6 (9.38%)	
3 (n=14)	6 (42.86%)	2 (14.29%)	4 (28.57%)	0	0	2 (14.29%)	
<b>Socio-economic status</b>							
Class-I (n=16)	7 (43.75%)	2 (12.5%)	2 (12.5%)	0 (0%)	4 (25%)	1 (6.25%)	‡
Class-II (n=66)	40 (60.61%)	8 (12.12%)	4 (6.06%)	12 (18.18%)	0 (0%)	2 (3.03%)	
Class-III (n=96)	49 (51.04%)	12 (12.5%)	8 (8.33%)	2 (2.08%)	6 (6.25%)	19 (19.79%)	
Class-IV (n=36)	25 (69.44%)	4 (11.11%)	3 (8.33%)	0 (0%)	4 (11.11%)	0	
Class-V (n=6)	0	4 (66.67%)	0	0	0	2 (33.33%)	

[Table/Fig-4]: Comparison of the demographic parameter across the nature of injury (N=220).

\*Kruskal Wallis test; †Chi-square test ‡No statistical test was applied- due to 0 subjects in the cells

Parameters	Nature of injury					
	Fall	Fall object	Poisoning	RTA	Bit/sting	Foreign body and others
<b>Education</b>						
Illiterate (n=20)	10 (50%)	4 (20%)	0	0	2 (10%)	4 (20%)
Primary school (n=12)	8 (66.67%)	2 (16.67%)	0	2 (16.67%)	0	0
Middle school (n=32)	18 (56.25%)	0	6 (18.75%)	2 (6.25%)	2 (6.25%)	4 (12.5%)
Secondary school (n=76)	35 (46.05%)	16 (21.05%)	4 (5.26%)	4 (5.26%)	6 (7.89%)	11 (14.47%)

Higher secondary (n=50)	27 (54%)	8 (16%)	5 (10%)	6 (12%)	0	4 (8%)
Diploma (n=14)	11 (78.57%)	0	0	0	2 (14.29%)	1 (7.14%)
Ug (n=16)	12 (75%)	0	2 (12.5%)	0	2 (12.5%)	0
<b>Occupation</b>						
Semiskilled (n=14)	6 (42.86%)	8 (57.14%)	0	0	0	0
Skilled (n=10)	6 (60%)	0	2 (20%)	0	2 (20%)	0
Unemployed (n=128)	68 (53.13%)	14 (10.94%)	10 (7.81%)	10 (7.81%)	8 (6.25%)	18 (14.06%)
Unemployed (Pregnant) (n=10)	6 (60%)	0	4 (40%)	0	0	0
Unemployed (taking care of younger child) (n=42)	25 (59.52%)	6 (14.29%)	1 (2.38%)	4 (9.52%)	4 (9.52%)	2 (4.76%)
Unskilled (n=16)	10 (62.5%)	2 (12.5%)	0	0	0	4 (25%)

**[Table/Fig-5]:** Comparison of mother education and occupation across the nature of injury (N=220).

\*No statistical test was applied- due to 0 subjects in the cells

Parameter	Nature of injury					
	Fall	Fall object	Poisoning	RTA	Bit/sting	Foreign body and others
<b>Education</b>						
Illiterate (N=10)	4 (40%)	2 (20%)	0	0	0	4 (40%)
Primary school (N=4)	2 (50%)	0	0	2 (50%)	0	0
Middle school (N=26)	14 (53.85%)	2 (7.69%)	6 (23.08%)	2 (7.69%)	2 (7.69%)	0
Secondary school (N=58)	24 (41.38%)	14 (24.14%)	1 (1.72%)	6 (10.34%)	6 (10.34%)	7 (12.07%)
Higher secondary (N=38)	26 (68.42%)	4 (10.53%)	2 (5.26%)	0	0	6 (15.79%)
Diploma (N=46)	23 (50%)	8 (17.39%)	2 (4.35%)	2 (4.35%)	4 (8.7%)	7 (15.22%)
UG (N=36)	26 (72.22%)	0	6 (16.67%)	2 (5.56%)	2 (5.56%)	0
PG (N=2)	2 (100%)	0	0	0	0	0
<b>Occupation</b>						
Unskilled (N=32)	16 (50%)	4 (12.5%)	2 (6.25%)	0	2 (6.25%)	8 (25%)
Semiskilled (N=90)	39 (43.33%)	18 (20%)	6 (6.67%)	10 (11.11%)	4 (4.44%)	13 (14.44%)
Skilled (N=84)	55 (65.48%)	8 (9.52%)	9 (10.71%)	2 (2.38%)	8 (9.52%)	2 (2.38%)
Semiprofessional (N=12)	9 (75%)	0	0	2 (16.67%)	0	1 (8.33%)
Professional (N=2)	2 (100%)	0	0	0	0	0

**[Table/Fig-6]:** Comparison of father education and occupation across the nature of injury (N=220).

\*No statistical test was applied- due to 0 subjects in the cells

drowning. A multicentric community-based study conducted in India, supported by Indian Council of Medical Research (ICMR), reported a total proportion of unintentional injuries of 7.62%. They found significant associations between unintentional injuries and factors such as "area of residence" and "gender". No fatalities were observed due to unintentional injuries [13].

Similar findings were observed in previous studies where falls were the most common type of injury, while burns and drowning or near-drowning were relatively rare, consistent with the present study [14,15]. These similarities among the studies could be attributed to similar environmental and geographic conditions in the study settings. Importantly, all the studies highlight the high prevalence of unintentional injuries. The frequency of injury among the study participants was mostly a single occurrence (83.64%). Similar frequencies were observed in previous studies conducted by Tiruneh BT et al., Liyange IK et al., and Scherrif A et al., [11,16,17]. This single occurrence could be attributed to increased awareness and implementation of safety measures by parents after the first incident, thus preventing subsequent injuries.

A hospital-based study conducted by Varkey S et al., showed that the major reasons for admission were mechanical trauma (44.2%), burns (37.9%), and foreign bodies (17.1%). They observed that the most common age group affected was the preschool age group, and the majority (85.6%) of the affected children were from lower socio-economic status. Falls from height and head injuries were commonly reported in their study [18]. Lack of parental supervision and the outdoor environment were identified as contributing factors to many injuries. In the current study, most of the injuries occurred outdoors (56.36%) while the child was engaged in play activities (75.45%).

Other studies by Liyanage IK et al., and Scherrif A et al., also showed that injuries were more common among children of younger parents due to a lack of knowledge about child-rearing [16,17].

The majority of parents in the present study had at least secondary school education. Secondary school education was the most common level of education for both mothers and fathers. There was no significant association between the nature of the injury and either the mother's education or occupation in the present study. However, a survey conducted by Sutcliffe AG et al., highlighted that increasing maternal age and education were associated with better health and development outcomes for children [19].

In the present study, there was a statistically significant difference in mean age across the groups classified by the nature of the injury ( $p < 0.05$ ). This suggests that age may play a role in the type of injury sustained by children. A study by Dave VR et al., reported falls as the most common type of injury among 36% of children in the age group of 5 to 9 years [13]. Another previous study reported falls among 8.6% of patients in the age group of less than 18 years. These findings indicate that falls are more prevalent among younger age groups and may decrease as the child gets older.

Most of the injuries in the present study occurred outside the house while the child was playing, which is consistent with a previous study by Sharma M et al., [9]. Creating child-friendly environments and ensuring adult supervision during play can help reduce the incidence of unintentional injuries. Drowning, burns, and bites were less common compared to falls, which is consistent with previous studies [11]. Therefore, implementing safety measures such as fall-proof play areas with safety nets and soft floors is recommended to reduce the severity of injuries caused by falls. Falls have been

consistently reported as one of the most common types of injuries among children in many studies.

### Limitation(s)

Active interventions to mitigate the factors resulting in unintentional injury were not carried out; only the identification of the magnitude of injuries was studied.

### CONCLUSION(S)

The most common unintentional injury found was falls, followed by falling objects, poisoning, RTA, bites/stings, foreign bodies, burns, and drowning or near-drowning. Creating a child-friendly environment and ensuring adult supervision during playtime are recommended to reduce the incidence of unintentional injuries. Conducting further large-scale studies with an environmental survey component will help identify the factors contributing to unintentional injuries in children and develop strategies for mitigation.

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#### PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Dec 31, 2022
- Manual Googling: Feb 16, 2023
- iThenticate Software: Sep 16, 2023 (10%)

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