ORIGINAL RESEARCH ARTICLE

Incidence and Risk Factor of Unintentional Fall Related Injuries Among Children in Tamil Nadu, India

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ABSTRACT

Introduction: Injuries are a major global public health problem. There are very few community-based studies on childhood injury from India in this study, we identified the distribution and risk factors for fall-related child injuries in the Chengalpattu district, Tamil Nādu community.

Methodology: A descriptive analysis was done among 710 children of age up to 14 years residing in the Kattankulathur region in Tamil Nādu. The appropriate number of samples were recruited using the cluster sampling method by dividing the subjects into separate clusters and from each cluster 40 samples were obtained. The information on fall-related injury was collected according to mechanism of 'injury'

Results: The annual incidence of fall-related injuries was 9.1 %. About 72.3% of children had injuries at home and 36% of the persons had fractures in the upper limb. 42% of children had disability in their hands. The age, gender, education and type of family was significant to injury.

Conclusion: Our study reported a higher incidence of Fall injuries in Tamil Nādu when compared other studies done in India. Male children are the most common victims of injury and also identified homes, roads/streets as the most common places for the occurrences of fall injury in children.

Key words: Unintentional Injury, Children, Socioeconomic status, fall, Disability

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INTRODUCTION

Injuries in general considered a major public health issue among younger children particularly unintentional injuries which cause a sudden damage to the body tissue due to the interaction of external agents and are responsible for the major cause of death among both adolescents and children throughout the world.[1,2]

Unintentional injuries are the second leading cause of death, after injuries. However, most injuries are preventable.[3-6] According WHO 12% of the global disease burden is due unintentional injuries and is largely responsible for 30% of the mortality rate among children aged 1-3 years, 40% among children aged 4 years, and 50%-60% among adolescents.[7] The severity of fall-related injuries ranges from minor to severe, necessitating a medical visit and possibly hospitalisation. However, establishing a global spectrum of unintentional fall-related injuries is difficult due to a lack of valid data from low- and middle-income countries (LMICs), particularly for nonfatal injuries. Unintentional injuries are a leading cause of death in developing countries such as India and it was common in both urban and rural areas.[6-8]

According to the studies done in India, 50 percent of children under the age of 12 who sustained an unintentional injury suffered from mild to moderate disability.[9] The serious complications of unintentional fall injury not only affect children's health education but also have a significant impact on the socioeconomic class of the children's family.[10] The majority of the literature on childhood injuries in Low a Middle-income countries has come from hospital-based studies or trauma centres. Hospital-based studies underestimate the true burden of injuries in Low- and Middle-income countries because many reportable injuries are not deemed serious enough to warrant a visit to a health-care facility. So, the present study aims to assess the Incidence and risk factors of Unintentional fall related injury among children residing in kattankulathur block, Chengalpattu district, Tamil Nadu.

METHODOLOGY

An Analytical cross-sectional study was conducted in Kattankulathur Block, Chengalpattu district, Tamil Nādu. The study included all children up to 14 years of age (i.e., A permanent residents of the house for a period of minimum one year) People who are not willing to participate, and disabilities due to other communicable diseases was excluded from the study. A pretested semi-structured questionnaire was used to collect data from the parents of the children with a one-on-one interview conducted by the interviewer. Taking a prevalence of 23 %[9], with the formula $N=Z^2PQ/L^2$ Where prevalence is 23%, relative precision 4.6, N= 321, assuming a design effect of 2, the sample size is 642, adding 10% to the sample size for the nonresponse rate, another 64 subjects was included in the study and the sample size was rounded off to 710.Two-stage cluster sampling was used to select the study population. Total no of clusters was selected using formula, square root of n divided by 2, a total of 18 cluster was obtained.18 cluster from 39 panchayat unions with a sampling frame of 40 from each cluster was taken. Two validated pre-structured questionnaires were used to collect data. A pilot study was conducted among 50 individuals of kattankulathur block, according to which the necessary changes were made in the questionnaire. Informed assent and consent were obtained from the students and the parents respectively before conducting the study. The children who met the requirements for the study were included. If the first one didn't meet the criteria the next house was utilized for the study, In-person interview was conducted among care givers of each participant. In order to avoid inter-observer bias, only one interviewer conducted the interview. Data collection was done after obtaining SRM Medical College Hospital & Research Centre - Institutional Ethics committee IEC No: 2819/IEC/2021.

The data collected was entered into Microsoft excel 360 and master chart was created. The master chart was then loaded onto SPSS version 26 (Statistical Package for Social Sciences). The data contained both qualitative and quantitative variables. Data were coded according to severity of injuries. Proportions of fall injuries were reported with corresponding 95% confidence intervals (CIs). The association between factors such as prevalence rate with age, gender, and other factors was tested for statistical significance by Chi-square test. Univariate analysis was done using Chi-square test to compare proportions of fall injuries by gender, age, family type, educational Status and socioeconomic class. Crude odds ratios (OR) were calculated from two-by-two tables. Adjusted odds ratios(aOR) of falls for various covariates having P value <0.05 were calculated with a multivariate logistic regression model.

RESULTS

In this study, among 710 children a total of 65 unintentional fall related injuries occurred indicating an overall incidence rate of 9.1%. A total of 22(33%) fall injuries received first aid and 34(50%) falls resulted in hospital admissions.

The commonest place of unintentional fall injuries occurred at Home 47(72.3%), followed by roads 12 (18.5%) and in schools 6 (9.2%). The victim was doing leisure/play 60% of during which fall injury occurs, followed by unpaid work (16.9%) (Table 1).

Nearly 55.4 % of the injury happened the in upper limb and 24.6 % of the fall injury was in the head (Table 2). Among the children, the physical nature of injury due to fall was almost 41.5% fracture and among 24.6% it was cut injuries (table 3).

Table 1: Distribution according to the place of injury, activity by the victim at the time of fall (n=65)

Variable	Children (%)
In which place did the injury occur	
Home	47 (72.3)
School	6 (9.2)
Road	12 (18.5)
What was the victim doing at time of injury	
Unpaid work	11 (16.9)
Sports	3 (4.6)
Leisure/play	39 (60)
Vital activity	6 (9.2)
Unspecified activity	6 (9.2)

Table: 2 Distribution according to the part of the body injured (n = 65)

Part of the body injured	Children (%)
Head	16 (24.6)
Upper limb	36 (55.4)
Abdomen	3 (4.6)
Lower limb	10 (15.4)

Table: 3 Distribution according to the physical nature of injury (n=65)

Physical nature of the injury	Children (%)
Fracture	27 (41.5)
Dislocation	13 (20)
Other open wounds	16 (24.6)
Bruise/superficial injury	9 (13.8)

Table 4: Distribution according to distance of fall and the object from which fall occurred.

Variable	Children (%)
Approximate distance the victim fell from	
Same level as one was standing	18 (27.7)
Height less than 2 meters	38 (58.8)
Height greater than 2 meters	9 (13.8)
Object from which the fall occurred	
Stairs	22 (33.8)
Tree	3 (4.6)
Bathroom	12 (18.5)
Arms of the person	19 (29.2)
Don't know	9 (13.8)

According to distance of fall, fall from height of less than 2 metres resulted in 58.8% of injury cases, and falling from same level as one was standing accounts for 27.7% of cases and fall from height of more than 2 metres resulted in 13.8 % of injuries in children. Fall from the stair's accounts for maximum number of fall injury cases which accounts for 33.8% and 29.25 from arms of the person. (Table:4)

The odds of getting unintentional fall injury are 1.8 times more in boys compared to girls and was statistically significant with p value <0.05, Children of age group >4 to 10 years are at increased odds (3.8) of getting injury than other age groups, and this association is statistically significant with p value <0.5. The children belonging to nuclear family are 2.7 times more odds of getting fall injury than other family types, and it is significant statistically. Compared to children not eligible for scholl, school going children are at increased odds of getting fall injury, primary school going children are at more risk of getting unintentional fall injury. Compared to children of upper socio-economic class, other class children are at slightly increased odds of getting injury, but this association was not statistically significant (Table 5)

Table 6 shows in Univariate logistic regression shows that falls were associated with Gender (more incidence in boys compared to girls), and primary school-going children.

DISCUSSION

There are very few studies to report the incidence and risk factors associated with unintentional falls in children of age group up to 14 years in South India.

Falls are the most common unintentional injuries that occur in a community.[11-13] This study reports 9.1% incidence of unintentional fall injuries in Tamil Nadu which is higher than the study done by Ashish Pathak[14] in Madhya Pradesh and Gupta S[15] in Nepal which showed 7.7% and 5.2% of incidence this might be due to geographical variation. In a study by Mohan et al[16] in Haryana revealed more incidence of unintentional fall injuries which might be due to the selection of participants boys were more than girls.

Of the total unintentional fall injuries 72% of fall injury occurred at home, followed by roads (18%) and schools (10%) which is similar to a study done by Chowdhary et al[17] in Bangladesh reported home (51%), roads (21 %) and school (3%) this might due to more hazards in the home more likely for the child to get injuries. Another done by Mathur M et al[18] in Madhya Pradesh revealed the most common place of injury was streets (53%) followed by home (33%). In various studies conducted in India, majority of the unintentional fall injuries occurred at home.[19-20]

Boys are more likely to sustain fall injuries, and it was more common among 5-10 years of age, A study conducted by Mathur A et al[18] also states that children of age group 5-10 years are more vulnerable to injuries 19% compared to other age group, which is similar to another study conducted by Pathak et al[14] in Madhya Pradesh, Ujjain. In our study, the incidence of injury was more in nuclear families, whereas in a study conducted by Parameswaran et al [11] the prevalence of injury is maximum among joint family.

Of the total of 65 injuries, the commonest injury was fracture (41%), followed by cuts (25 %) and sprains (20%), %), whereas in a study done by Pathak et al[14] in Madhya Pradesh, Ujjain abrasions and cuts are considered the commonest outcome of unintentional injury. In another study conducted by Fuglkjaer et al[21] ,a systematic review reported that the head is the most common anatomical site of injury after a fall

Table 5: Showing association between demographic factors and unintentional fall injury

Variable	Total (n = 710)	Fall injury		OR	95%CI	P value
		Yes (n =65) (%)	No (n =645) (%)			
Gender						
Girls	370	25(6)	345(93)	1	Reference	-
Boys	340	40(11)	300(88)	1.8	1.09 – 3.1	**0.02**
Age						
1 day-4years	234	11(5)	223(95)	1	Reference	-
>4 -10 years	213	34(16)	179(84)	3.8	1.8-7.8	**0.0002**
>10- 14 years	263	20(8)	243(92)	1.6	0.7-3.5	0.185
Type of family						
Nuclear family	110	21(19)	89(81)	2.7	1.4-5.2	**0.001**
Joint family	292	20(6)	272(93)	0.8	0.4-1.6	0.65
3 Generation	308	24(7)	284(93)	1	Reference	-
Educational Status						
Not eligible for school	212	10(5)	202(95)	1	Reference	-
Primary school	247	34(13)	213(87)	3.2	1.5-6.6	**<0.001**
Secondary school	251	21(8)	230(92)	1.8	0.84-4.0	0.12
Socioeconomic class						
Class I	76	5(6)	71(94)	1	Reference	-
Class II	292	21(7)	271(93)	1.1	0.4-3.0	0.85
Class III/Class IV	342	36(11)	316(89)	1.4	0.5-3.8	0.46

Table 6: Adjusted Odds Ratio of sociodemographic risk factors for 710 children with fall related injury in Chengalpattu, Tamilnadu

Variable	Adjusted Odd's ratio	95%CI		p-value
		Lower	Upper	
Age > 4-10 years	1.3	0.6	2.6	0.452
Male gender	1.7	1.2	2.5	**0.003**
Primary schooling	3.4	1.5	7.4	**0.002**
Joint/ 3-generation family	1.4	0.9	2.1	0.091
Socioeconomic class	1.1	0.6	2.1	0.698

The most common anatomical site of injury in this study was the upper limb (55%) followed by head (25%), whereas in a study done by Pathak et al[14] in Madhya Pradesh most common anatomical site of injury was the head (31%),followed by lower extremities (26%),another study done by Wadhwaniya et[22] al in Bangladesh head, shows , face, and chest injuries were frequent in younger children (<4 years); upper limb injuries were frequent in older children (5–9 years old); and lower limb injuries were frequent in young adults (10–24 years old).

The majority (n = 65, 58%) of falls occurred at the height less than 2 meters, whereas in a study reported by Pathak et al[14] in Madhya Pradesh shows injury at ground level accounts for majority of fall injuries, whereas in a study reported by Bhuvaneswari et al[23] from south Delhi and Gupta et al[15] in a study at Nepal shows, fall from heights as the most common cause of unintentional fall injuries.

The overall analysis of the study stated that the majority of the injuries occur while playing at home in which high-grade injuries occur at the upper limb with a prevalence of 55%.

In our study, there is a significant association between age, sex and educational status of participants and the occurrence of injury. Similarly in a study conducted by Inbaraj et al[24] Factors like age, gender, and educational status had a significant association with the occurrence of unintentional injury. In our study factor like type of family had a significant association between occurrence of injury. Another study conducted by Mahalakshmi et al[25] factors like type of family and socio-economic status were significantly associated with occurrence of injury

LIMITATIONS

This being a cross sectional study we cannot draw clear conclusions about causality. The limitation of the study is there might be an under-reporting due to recall bias might have occurred, as information on the incidence of injuries was collected retrospectively

CONCLUSION

This study highlights the importance of proper care in maintenance of injuries among children with earliest attention. Male children are the most common victims of injury. Our study identified homes and roads/streets as the most common places for the occurrences of injury in children. The educational status of mother type of family, gender and age of the children had a great influence on unintentional injuries. The lack of attention and proper care, transport

facilities and inaccessibility to health centres also makes the persons more prone to infections of injuries. This study suggests in modifying the home environment to reduce injuries, teaching people about home safety, and providing safe equipment to prevent injuries. Injury prevention should be a part of student curriculum to comprehend precise estimates of DALY and loss of productivity, it is necessary to develop state or national injury registries. The findings of the study add to the evidence that childhood nonfatal fall injuries are an important public health problem and should be incorporated in injury prevention programs

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