A Study on Epidemiology of Unintentional Childhood Injury at One of the Districts of Gujarat State: An Indian Council of Medical Research Task Force Study

Viral R. Dave, Bhavik Mukeshkumar Rana, Venu R. Shah, Kantibhai N. Sonaliya
Department of Community Medicine, GCS Medical College, Ahmedabad, Gujarat, India

Abstract

Context: Childhood injuries are a less explored area of public health. In the presence of public health problems such as communicable and noncommunicable diseases, childhood injury has gained less attention from the health system. Aims: The aim of the study was to assess the prevalence of various types of unintentional injuries (UI) amongst children and to assess the factors associated with same. Settings and Design: The study was conducted at Ahmedabad District of Gujarat State, and this is a cross-sectional study. Subjects and Methods: The current study was a part of a multicentric national level research supported by Indian Council of Medical Research. Total 11 sites were selected across India, which all followed a uniform methodology. One of the selected sites was Dholka taluka of Ahmedabad district, Gujarat. This cross-sectional study was conducted in 2341 households. The study participants were children aged from 6 months up to 18 years. A total of 3018 children and their caretakers were interviewed using software-based questionnaire. Statistical Analysis Used: Statistical analysis was performed by frequencies and Percentage, Chi-square Test, Z-Test. Results: The overall prevalence of injuries was 7.62%. Gender and area of residence were significantly associated with UI. Fall-related injuries had the highest prevalence (3.38%), followed by road traffic injuries (RTI) (1.62%). The prevalence of burn-related injuries and poisoning was higher among females compared to males. No mortality was observed due to UI. Conclusions: Majority of the injuries were of minor or trivial type. Fall-related injury and RTI were the most common types of UIs among children.

Keywords: Childhood injury, epidemiology, unintentional injury

Introduction

Developing countries like India are undergoing a major transition in terms of public health challenges. Despite making a major progress with regard to increase in life expectancy, decrease in mortality rates pertinent to maternal, infant, and under-five, the defiance of communicable diseases is still alarming. Along with that, noncommunicable diseases are on increasing trend and gradually becoming leading causes of morbidity and mortality. However, with these public health problems, there are a number of affairs needed to be addressed on priority, one of them is injuries.

A survey has revealed that annually around 5 million people die worldwide because of injuries, which is 9% of the total deaths. World Health Organization (WHO) reports that trend of mortality due to injuries is on the rise in low- and middle-income countries. The majority of the data available pertaining the burden of injuries is of mortality, and burden of morbidity is unknown as very few researches have been conducted for that. The information available on injuries is a “tip of an iceberg” in epidemiological context.

Childhood is a vulnerable age for injuries because of physical and mental limitations in comparison to older age groups. Globally, injury and violence are major killers of children.
As per the census 2011, the children of age 0–14 years constitute about 31% of the total population, which is a huge, vulnerable cohort to injuries. “Intentional injuries” refer to injuries resulting from purposeful human action, whether directed at oneself or others. Intentional injuries include self-inflicted and interpersonal acts of violence intended to cause harm. “Unintentional injuries (UI)” include road traffic accidents, falls, burns, animal bites, and drowning etc. Because of the legal aspect, intentional injuries are reported more commonly than UIs. Very few data are available about UIs amongst children in India. Current research is an attempt to measure the prevalence of various types of UIs among children and assess the factors associated with UIs.

**Subjects and Methods**

The present research was conducted in India between years 2018 and 2020 as a part of a multicentric study: an extramural project funded by Indian Council of Medical Research (ICMR). It included 11 sites from selected by the funding agency considering the representation of all the regions of India. One of these sites was Dholka taluka of Ahmedabad district, selected randomly from the list of all taluka of Ahmedabad, Gujarat. A common methodology was adopted by all the centers. It was a cross-sectional research with a study population comprising of children aged 6 months to <18 years. The sample of the study population was selected by 2 stage cluster sampling with probability proportionate to size (PPS). The clusters (village for rural areas and Census Enumeration Block (CEB) for urban) were selected randomly from the lists. From rural and urban areas, 98 and 48 clusters were selected, respectively. Each cluster consisted of 16 houses—both in urban and rural areas. The number of clusters to be surveyed to meet the required sample size was estimated separately for urban and rural areas. Ethical approval and permission from concerned authorities were obtained before commencing the research.

Considering the preceding research, prevalence rates of childhood injuries varied from 5.4% to 66.8%. One of such studies including both rural and urban areas revealed the prevalence of childhood injury was 11.0%. In the same context, sample size estimation with a relative precision of 13% and 95% confidence level, a standard formula for calculating the sample size was applied as below:

\[ n = \frac{4 \times [r \times (1-r) \times f \times (1.1)]}{(e^2 \times p \times nh)} \]

Based on the above formula, the calculated sample size came to 2341 households. Based on the rural-urban distribution of the population of Ahmedabad district, the households were distributed in the ratio of 47:53 (1573 from rural and 768 from urban areas). In rural area, all villages in the selected taluka were in the sampling frame. In the next stage, villages were selected based on PPS, while in urban area, all the towns in the selected taluka were in the sampling frame. Of these, one town was selected using simple random sampling technique. Later on, a map of localities in selected town was prepared, and houses were numbered.

Data Collection: To begin with all houses in the selected villages/CEBs were numbered serially. The field investigators visited each household and conducted interviews of the parent/primary caregiver. A written informed consent was taken from parents/caregivers. All children 6 months up to 18 years of age and who were permanent residents of the study area (≥6 months residence in the study areas) including visiting children and household help who had been living in that area for more than 6 months and all children 6 months up to 18 years who had died in the past 12 months due to any of the UIs were included for the study.

Birth injuries or injuries which occurred as a result of intranatal complications; disabilities due to other communicable diseases; and children who were not from the household e.g., visiting children or household help who had been living that area for <6 months were excluded.

The WHO child injury questionnaire, adapted to the Indian settings, was used after validation. Definitions for types (road traffic accidents, falls, burns, poisoning, drowning, and animal-related injuries) and severity of injuries was adapted from the WHO study. Injuries other than these types were categorized as miscellaneous. Cloud-based software was used for the storage of the data. Data were collected electronically on hand-held devices by field workers who were provided training for the same.

**Definitions**

- **Minor injury/trivial injury:** An injury requiring medical care on outpatient department (OPD) basis or where home remedies itself was sufficient
- **Moderate injury:** An injury requiring medical care on OPD basis and for which school or work was missed for a period of 1–3 day or child was unable to carry out activities of daily living for a period of one to 3 days
- **Major injury:** An injury requiring hospitalization for <10 days. This definition was designed to capture injuries that required significant care but did not necessarily require surgical intervention
- **Serious injury:** Injury requiring hospitalization for 10 days or more/requiring a major surgical procedure
- **Severe Injury:** Injury that resulted in permanent
disability – such as blindness, deafness, loss of an extremity, or the inability to walk, or the loss of mental abilities. Emotional and psychiatric causes will not be included because of the difficulty of diagnosis and classification.

**Results**

The current study was conducted in 2341 households with total 3018 children justifying the inclusion criteria. The overall prevalence of UIs was 7.62%. After excluding minor/trivial injuries, prevalence observed was 2.55%. No deaths were observed in selected sample due to UIs.

As evident from Table 1, the highest prevalence of UI was in the age group of 5–9 years (9.02%), followed by 10–14 years (7.62%). The prevalence of the UI was higher among male (8.90%) compared to females (5.98%). Statistical significant difference ($P < 0.05$) in context to prevalence of injuries was noted for genders (male: 8.90%) and place of residence (Rural: 8.51%). Type of family and religion did not reveal any statistical significant difference upon revealed prevalence of UI.

Table 2 compares prevalence of different types of injuries. The fall-related injuries constituted the highest number of injuries (44.3%), followed by road traffic Injuries (RTI) (21.3%). No drowning-related injuries were observed among the study participants. About 17% of UI were animal-related injuries, while miscellaneous, burns, and poisoning constituted 11.7%, 4.8%, and 0.9% of total UIs.

Table 1 suggests that no difference in the prevalence was observed between urban and rural areas in terms of RTI. Fall-related injuries were more common in rural areas (3.95%) compared to urban areas (2.30%). Similarly, animal-related injuries were more common in rural areas (1.29%) compared to urban areas (0.86%). Miscellaneous injuries were more common in urban areas (1.05%) compared to rural areas (0.81%). Poisoning-related injuries were observed only in rural areas. Fall-related injuries were having highest prevalence (3.38%).

As per Figure 1, it was found that the prevalence of most of the UI were higher among male children, except burns and poisoning. The highest prevalence was of fall-related injuries among males (3.83%) and females (2.79%).

Table 3 analyzes further the type of injuries in various age groups. It is revealed that RTIs are more common in the age group of more than 10 years. Falls were most common in the age group of 5–9 years (36.3%). Burn-related injuries were most common in the age groups of 1–4 years and 10–14 years (27.3%). The highest prevalence of animal-related injuries was seen in the age group of 10–14 years (41.0%).

Figure 2 Major proportion of the UIs consisted of mild/trivial (64.8%) injuries. Major, severe and serious injuries were 28.4% in total.

Table 4 demonstrates severity of different types of injuries.** compares prevalence of different types of injuries. Majority (51.9%) of the injuries were minor/trivial in nature. Overall, the severe injuries were 3.7%, and serious injuries were 11.1%. A maximum number of severe injuries (12, 11.8%) was observed in case of falls. However, the prevalence of severe injuries was highest in case of burns.

**Discussion**

Overall prevalence of the injuries in this study was 7.62%. The prevalence of injuries varies between 11% and 64% in India.[12-14] When minor/trivial injuries are excluded from the total injuries, the prevalence comes down to 2.55%. No deaths due to UI were observed in the current study. This finding also parallels the low prevalence of serious and severe injuries. However, previous studies have found mortality among children due to injuries.[15]

Male participants demonstrated significantly higher prevalence of UI compared to females, suggesting that gender can be a significant factor. Similar findings were also observed by studies conducted by Shriyan et al. and Parmeswaran et al.[13,16] Another study from WHO showed the double prevalence of injuries amongst males compared to females.[17]

The present study showed that the prevalence of UI was higher in rural areas. This may be due to the higher prevalence of fall-related, burn-related, and animal-related burns in rural areas. The presence of domestic animals in vicinity, unprotected ladders/steps, children climbing on the trees and use of chulha (mainly set up on the floor), and absence of caretaker at the time of injury can be the reasons for this

---

**Table 1: Prevalence rate of unintentional injuries**

| Sociodemo graphic factor | Number of subjects | Number of subjects with injuries | Prevalence rate (%) | Significance, $\chi^2 (P)$ |
|--------------------------|-------------------|--------------------------------|--------------------|--------------------------|
| Age group                |                   |                                |                    |                          |
| 6 months–<1 year         | 34                | 0                              | 0.0                | 6.01 (0.19)             |
| 1–4 years                | 641               | 46                             | 7.1                |                          |
| 5–9 years                | 809               | 73                             | 9.0                |                          |
| 10–14 years              | 879               | 67                             | 7.6                |                          |
| 15–18 years              | 655               | 44                             | 6.7                |                          |
| Gender                   |                   |                                |                    |                          |
| Male                     | 1696              | 151                            | 8.9                | 9.04 (0.002)            |
| Female                   | 1322              | 79                             | 5.9                |                          |
| Area of residence        |                   |                                |                    |                          |
| Urban                    | 1044              | 62                             | 5.9                | 6.41 (0.01)             |
| Rural                    | 1974              | 168                            | 8.5                |                          |
| Types of families        |                   |                                |                    |                          |
| Nuclear family           | 1549              | 122                            | 7.8                | 5.67 (0.06)             |
| Joint family             | 663               | 37                             | 5.5                |                          |
| Three generation family  | 806               | 71                             | 8.8                |                          |
| Religion                 |                   |                                |                    |                          |
| Hindu                    | 2694              | 211                            | 7.8                | 1.59 (0.21)             |
| Muslim                   | 324               | 19                             | 5.8                |                          |
finding. However, this result is in contrast with the findings of Mathur et al. who conducted a study at Ujjain, India.[18] When vulnerability of different age groups was explored for different types of injuries, it was found that RTIs were most common in the age group of more than 10 years. These are more likely to cross roads alone or ride the vehicle driven by self or other. Furthermore, there is no legal age limit for crossing the roads alone in India. There are evidences suggesting that younger age groups are more vulnerable to RTI.[19,20]

Burn-related injuries were higher in the age groups of 1–4 years. The children under 4 years of age spend most time in the domestic environment. Many of the houses in India do not have higher platforms for setting up stoves or chulha.[21] They are placed on the ground or floor. It makes them easily accessible to young children.

Animal-related injuries were also more common in rural areas. The vicinity of domestic animals such as dogs and cattle are major reason for higher exposure to animals and injuries among children. The current study showed only 1.29% prevalence of animal-related injuries, but the similar other researches has reported that 11% of injuries in children were due to animals.[22,23]

No similar study with such a representative sample size has been conducted in the past in the Ahmedabad district, so the current study could reveal findings which can lead to generation of new evidences. However, the current study did not have participants representing hilly or tribal areas, where the factors responsible for injuries may differ drastically from urban or rural areas.

**Conclusions**

Overall prevalence of the injuries was 7.62%; however, the prevalence of major/severe/serious injuries was less. Age group of 5–9 years showed the highest prevalence of UI. Fall-related injuries were the most common type of UI, followed by RTI. Gender and area of residence were significantly associated with UI. Animal-related injuries were more common in rural areas.

**Acknowledgment**

The authors acknowledge ICMR, New Delhi, for funding support; Principal Investigator and other team members from the coordinating agency (Ramaiah Medical College, Bangalore) and members of the Task Force for their guidance and inputs, all the participating institutions, Government health and administrative officials for facilitating the study, the study subjects for participating in the study.

**Financial support and sponsorship**

This study was financially supported by Extramural Research Grant, Indian Council for Medical Research, Government of India.

**Conflicts of interest**

There are no conflicts of interest.
Table 3: Comparison of prevalence of different unintentional injuries in different age groups

| Type of injury               | 6 months-1 year, n (%) | 1-4 years, n (%) | 5-9 years, n (%) | 10-14 years, n (%) | 15-<18 years, n (%) | Total, n (%) | Chi-Square test statistic (P) |
|------------------------------|------------------------|-----------------|-----------------|--------------------|---------------------|-------------|-----------------------------|
| Road traffic related         | 1 (2.0)                | 2 (4.1)         | 12 (24.5)       | 17 (34.7)          | 17 (34.7)           | 49 (100.0)  | 34.42 (0.02)                |
| Falls                        | 6 (5.9)                | 21 (20.6)       | 37 (36.3)       | 24 (23.5)          | 14 (13.7)           | 102 (100.0) |                             |
| Burns                        | 2 (18.2)               | 3 (27.3)        | 2 (18.2)        | 3 (27.3)           | 1 (9.1)             | 11 (100.0)  |                             |
| Poisoning                    | 0                      | 0               | 1 (50.0)        | 1 (50.0)           | 0                   | 2 (100.0)   |                             |
| Animal related injury        | 0                      | 5 (12.8)        | 13 (33.3)       | 16 (41.0)          | 5 (12.8)            | 39 (100.0)  |                             |
| Miscellaneous/others         | 0                      | 6 (22.2)        | 8 (29.6)        | 6 (22.2)           | 7 (25.9)            | 27 (100.0)  |                             |

Table 4: Severity of unintentional injuries in different types of injuries

| Type of injury               | Minor/trivial, n (%) | Major, n (%) | Moderate, n (%) | Serious, n (%) | Severe, n (%) |
|------------------------------|----------------------|-------------|----------------|----------------|---------------|
| Road traffic related         | 29 (59.2)            | 9 (18.4)    | 7 (14.3)       | 4 (8.2)        | 0             |
| Fall related                 | 68 (66.7)            | 15 (14.70)  | 5 (4.90)       | 2 (2.0)        | 12 (11.8)     |
| Burns related                | 8 (72.7)             | 0           | 0              | 0              | 3 (27.3)      |
| Poisoning related            | 2 (100)              | 0           | 0              | 0              | 0             |
| Animal related               | 32 (82.1)            | 4 (10.3)    | 2 (5.1)        | 0              | 1 (2.6)       |
| Miscellaneous                | 14 (51.9)            | 8 (29.6)    | 1 (3.7)        | 3 (11.1)       | 1 (3.7)       |

References

1. Narain JP. Public health challenges in India: Seizing the opportunities. Indian J Community Med 2016;41:85-8.
2. Gururaj G. Growing burden and impact of road crashes in India: Need for a safe systems approach. Int J Veh Saf 2014;7:282.
3. World Health Organization. Injuries and Violence: The Facts 2014. World Health Organization; 2014. p. 19. Available from: https://apps.who.int/iris/handle/10665/149798. [Last accessed on 2021 Aug 25].
4. Peden M, editor. World Report on Child Injury Prevention. Geneva: World Health Organization; 2008. p. 211.
5. Accidental Deaths & Suicides in India-2010 | National Crime Records Bureau. Available from: https://ncrb.gov.in/en/accidental-deaths-suicides-india-2010. [Last accessed on 2021 Aug 31].
6. Gururaj G. Injuries in India: A national perspective. NCMM Background Papers. Burden of Disease in India. Equitable development-Healthy future. National Commission on Macroeconomics and Health. Ministry of Health and Family Welfare, Government of India, New Delhi; September. 2005:325-47.
7. Peden M, Oyegbite K, Ozanne-Smith J, Hyde AA, Branche C, Rahman AF, et al., editors. World Report on Child Injury Prevention. Geneva: World Health Organization; 2008. (WHO Guidelines Approved by the Guidelines Review Committee). Available from: http://www.ncbi.nlm.nih.gov/books/NBK310641/. [Last accessed on 2021 Aug 25].
8. Hyder AA, Sugerman DE, Puvanachandra P, Razzak J, El-Sayed H, Isaza A, et al. Global childhood unintentional injury surveillance in four cities in developing countries: A pilot study. Bull World Health Organ 2009;87:345-52.
9. Census of India Website: Office of the Registrar General & Census Commissioner, India. Available from: https://censusindia.gov.in/2011-common/censusdata2011.html. [Last accessed on 2021 Aug 25].
10. Yin X, Li D, Zhu K, Liang X, Peng S, Tan A, et al. Comparison of intentional and unintentional injuries among Chinese children and adolescents. J Epidemiol 2020;30:529-36.
11. McGee K, Sethi D, Peden M, Habibu SL. Guidelines for conducting community surveys on injuries and violence. Inj Control Saf Promot 2004;11:303-6.
12. Banerjee S, Paul B, Bandyopadhyay K, Dasgupta A. Domestic unintentional injury of 1 to 5-year-old children in a rural area of West Bengal, India: a community-based study. Tanzan J Health Res [Internet]. 2016;18:1-8. Available from: https://www.ajol.info/index.php/thrb/article/view/138093 [Last accessed on 2021 Aug 31].
13. Shriyan P, Prabhu V, Aithal K, Yadav UN, Orgechakwku M. Profile of unintentional injury among under five children in coastal Karnataka, India: A cross-sectional study. Int J Med Sci Public Health 2014:3:1.
14. Zaidi SH, Khan Z, Khalique N. Injury pattern in children: A population-based study. Indian J Community Health 2013;25:45-51.
15. Fact Sheets WHO Collaborating Centre for Injury Prevention and Safety Promotion – Nimhans. Available from: https://nimhans.ac.in/who-collaborating-centre-for-injury-prevention-and-safety-promotion/fact-sheets-who-collaborating-centre-for-injury-prevention-and-safety-promotion. [Last accessed on 2021 Aug 31].
16. Parimeswaran GG, Kalavani M, Gupta SK, Goswami AK, Nongkynrih B. Unintentional childhood injuries in urban Delhi: A community-based study. Indian J Community Med 2017;42:8-12.
17. World Health Organization. Regional Office for South-East Asia. Research Framework for Road Safety in the South-East Asia Region. New Delhi: World Health Organization; 2015. Available from: https://apps.who.int/iris/handle/10665/160763. [Last accessed on 2021 Aug 31].
18. Mathur A, Mehra L, Diwan V, Pathak A. Unintentional childhood injuries in urban and rural Ujjain, India: A community-based survey. Children (Basel) 2018;5:E23.
19. Road Traffic Injuries. Available from: https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries. [Last accessed on 2021 Aug 31].
20. Anonymous. Age Groups Most Involved in Fatal Crashes. Mobility and Transport – European Commission; 2016. Available from: https://ec.europa.eu/transport/road_safety/specialist/knowledge/pedestrians/crash_characteristics_where_and_how/age_groups_most_involved_in_fatal_crashes_en. [Last accessed on 2021 Aug 31].
21. Peddi. The Persistent Paradigm of Pediatric Burns in India: An Epidemiological Review. Available from: https://www.ijburns.com/article/view/191 [Last accessed on 2021 Aug 31].
22. Injury Prevention and Care: An Important Public Health Agenda for Health, Survival and Safety of Children – PubMed. Available from: https://pubmed.ncbi.nlm.nih.gov/22718091/. [Last accessed on 2021 Aug 31].
23. Murray CJ, editor. The Global Burden of Disease: Summary; A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and risk Factors in 1990 and Projected to 2020. Geneva: World Health Organization; 1996. p. 43.