Injury 53 (2022) 1987–1993

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Are home environment injuries more fatal in children and the elderly?

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ARTICLE INFO

Article history:
Accepted 22 March 2022

Keywords:
Home injury
Injury at home
Trauma outcome
Trauma mortality
Unintentional injuries at home

ABSTRACT

Introduction: 'In-home injuries' are those that occur within the house or its immediate surroundings. The literature on the prevalence and magnitude of home injuries is sparse. This study was designed to characterize the mechanisms of 'in-home' injuries and compare their outcomes with 'outside home injuries'.
Materials and Methods: The Australia-India Trauma Systems Collaboration (AITSC) Project created a multicentric registry consisting of trauma patients admitted at four urban tertiary care hospitals in India from April 2016 to March 2018. This registry data was analysed for this study. All admitted patients except for dead on arrival were included. Patients were categorised into 'in-home' and 'outside home' cohorts based on the place where the trauma occurred. The outcome measures were 30 day in-hospital mortality and the length of hospital stay. Two subgroup analyses were performed, the first comprised pediatric patients (<15 years) and the second elderly patients >64 years).
Results: Among 9354 patients in the AITSC data registry, 8398 patients were included in the study. Out of these, 29 percent were in-home injuries, whereas the rest occurred outside home. The 30 day in-hospital mortality was 10.6 percent in the 'in-home' cohort, as compared to 13.7 percent in the 'outside home' cohort. This difference although significant on univariable analysis (p <0.01), there was no significant difference on multivariable regression analysis, after adjusting for age and injury severity score (OR = 0.88, 95% CI = 0.73–1.04; p = 0.15). The length of hospital stay was shorter in the home injuries group (median = 5 days; IQR = 3–12 days) compared to the outside-home group (median = 7 days; IQR = 4–14 days) (p < 0.01). In the pediatric and the elderly, on multivariable regression analysis, in-home injuries were associated with higher mortality than outside home injuries.
Conclusion: There was no significant difference in the 30 day in-hospital mortality amongst admitted trauma patients sustaining injuries at home or outside the home. However, in pediatric and elderly patients the chances of mortality was significantly higher when injured at home.

Abbreviations: AIDS, Acquired Immunodeficiency Syndrome; AIIMS, All India Institute of Medical Sciences; AITSC, Australia-India Trauma Systems Collaboration; CI, Confidence interval; ED, Emergency Department; GCS, Glasgow Coma Scale; GTBH, Guru Teg Bahadur Hospital; HIC, High Income Country; HIV, Human Immunodeficiency Virus; HR, Heart Rate; ICU, Intensive Care Unit; ISS, Injury Severity Score; JPNATC, Jai Prakash Narayan Apex Trauma center; LMIC, Lower and Middle-Income Country; LOS, Length of stay; LTMGH, Lokmanya Tilak Municipal General Hospital; NCRB, National Crime Records Bureau; NISS, New Injury Severity Score; NTRI, National Trauma Research Institute; OR, Odds ratio; RR, Respiratory Rate; RTS, Revised Trauma Score; SBP, Systolic Blood Pressure; US, United States of America; VSH, Sheth Vadilal Sarabhai General Hospital.

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https://doi.org/10.1016/j.injury.2022.03.050

Introduction

Globally, injuries claim more lives than HIV/AIDS, tuberculosis, malaria, and maternal conditions combined [1]. Though considered safe, the home environment is an important and often neglected setting for injuries around the world. In the US, 12 million unintentional home injuries requiring some form of medical attention were reported in 1998 [2]. In Israel, home injuries accounted for one-third of total hospital admissions [3]. In Italy, home injuries have been associated with a higher number of visits to the emergency department compared to traffic-related injuries [4,5].

Home injuries are the injuries that happen in the house or its immediate surroundings and are not associated with traffic, vehicles, or sports [6]. The most common mechanisms are falls, burns, drowning, poisoning, and injuries from sharp objects. Specific characteristics of the home environment may increase the risk of injuries, for example, the absence of railings and the presence of unsecured poisonous substances [7]. Most home injuries are considered minor in severity and not requiring significant medical intervention. However, because of the predominant involvement of the vulnerable population groups (elderly and children), home injuries have been associated with significant mortality [3,7,8]. In the US, home injuries account for 20% of all injury-related deaths [7]. Moreover, deaths represent a minor proportion of the injury burden, with non-fatal outcomes due to home injuries representing a larger component. Home injuries are responsible for 2 million years of potential life years lost along with an estimated $216 billion cost to the society each year [9,10]. In countries like India, especially in rural areas and informal dwellings, the impact of home injuries is expected to be grave but is under-reported. The National Crime Research Bureau (NCRB) report from India does not identify injuries sustained at home as a separate category. The literature on the prevalence and magnitude of home injuries also remains sparse. Therefore, to fill this gap, this study was designed to assess the outcomes following in-home injuries.

In this study, we investigate the 30 day in-hospital mortality of patients sustaining injuries within the home environment compared to outside the home environment, across an Indian multicenter trauma registry. We hypothesize that patients injured in the home environment may have less mortality after accounting for differences in injury severity and age.

Materials and methods

Study setting and design

The present study is an analysis of the prospectively collected AITSC trauma database. The AITSC registry involved four major Indian trauma hospitals - the JPNATC, New Delhi; the lokmanya tilak municipal general hospital (LTMGH), Mumbai; the Sheth Vadilal Sarabhai General Hospital (VSH), Ahmedabad; and the guru teg bahadur hospital (GTBH), New Delhi. Each participating hospital is a referral center for tertiary trauma care for neighboring peripheral hospitals and states.

JPNATC is a standalone trauma center at AIIMS, New Delhi. There are 2362 beds at AIIMS, of which 180 trauma dedicated beds function at JPNATC with advanced trauma care facilities. LTMGH is a 1416-bedded general hospital in Mumbai with 25 trauma intensive care beds. GTBH is a 2500-bedded hospital in New Delhi, with seven main ICU and seven Neuro ICU beds. In comparison, VSH is an 1115-bedded hospital in Ahmedabad with 15 ICU beds.

Data sources

The australia-india trauma systems collaboration (AITSC) Project resulted from the joint efforts between the national trauma research institute (NTRI), a department of Monash University and Alfred Health, Melbourne, and the jai prakash narayan apex trauma center (JPNATC), all india institute of medical sciences (AIIMS), New Delhi. It created a registry using a prospective multi-center observational cohort at four urban public tertiary care hospitals across three Indian cities. The data for this study was extracted from the registry for patients that presented between April 2016 and March 2018.

Two independent data collectors were posted in the emergency department (ED) of each of these centres. Information was recorded as per the AITSC Trauma Registry Data Dictionary (Versions 1:04, January 2018) under the supervision of the trauma project managers. At each study site, the trained data collectors coded injuries using the Abbreviated Injury Scale (AIS) (2005, updated 2008). The data which was collected on paper forms, were then transferred onto Microsoft Excel spreadsheet, which was uploaded onto a dedicated server located at JPNATC via a secure file transfer protocol (SFTP). The uploaded data did not include data regarding the any patients' identity.

The data collectors then reviewed and cross-checked inconsistencies between the electronic and the paper record. Additional data cleaning was performed by a qualified biostatistician at the principal lead site in Australia – the national trauma research institute (NTRI) in Australia, part of Alfred Health and Monash University. All data were stored on a limited access, password-protected server, backed up at three sites. Individual site data was viewable by site staff and investigators via a secure login for that site. Aggregate data was only accessible to the principal leads site – JPNATC and the NTRI. The aggregate data remains the property of the AITSC and is managed by the AITSC Registry Steering Committee. Participating hospitals were coded in a non-identifiable format for this study.

Participants

All patients presenting to the emergency department with a history of injury and admitted to the hospital for the first time were considered for inclusion. Patients included in the data analysis were those who met either of three primary endpoints since admission within 30 days - (1) in-hospital death, (2) discharge, or (3) 30-day in-hospital stay. Those who could not be observed for 30 days before the study ended were excluded. Patients with missing admission records or hospital disposition dates were excluded. Patients were categorized into the "In-home" cohort if they had a history of injury sustained in the home environment. Any injuries sustained outside this home environment were categorized into the "Outside home" cohort.

The details regarding mechanism and place of injury were recorded according to the information conveyed to the health care providers at the hospitals, and many a time it might not have reflected what exactly had happened at the scene of the injury. The registry includes patients who had potentially life-threatening injuries and excludes patients who were dead on arrival. Patients with low energy falls resulting in fragility fractures or single bone fractures were not included as they were not considered potentially life threatening.

Definition of the home environment

The home environment comprised areas inside the house and the areas outside that are a part of the house (such as a balcony, rooftop, garden, or driveway). Farms, pasture, fields, stables, or other farm buildings were not considered a part of the home environment. There is no distinction between people getting injured within their own or someone else's home environment.

Variables

Our outcome measure was 30 days in-hospital mortality, defined as death occurring during the hospital stay. We also measured the length of in-hospital stay, defined as the total number of days a patient was admitted to the hospital. Study parameters included age, gender, mechanism of injuries, vital parameters recorded on arrival (systolic blood pressure (SBP), heart rate (HR), respiratory rate (RR) peripheral capillary oxygen saturation (SpO2); Glasgow Coma Scores (GCS); injury severity score (ISS) and revised trauma score (RTS). The injury scores were calculated from measured variables using standard methods.

Subgroup analysis

Previous studies reported that most patients presenting with home injuries were children and the elderly [2,3,8]. Hence, two subgroup analyses were done. The first comprised only pediatric patients, in which patients aged less than fifteen years were analyzed for the outcomes of interest. Similarly, another subgroup comprised elderly patients (aged 65 years or older). These age cutoffs were in line with international age classification guidelines [11].

Statistical analysis

R for Statistical Computing, version 3.6.1, was used for statistical analysis. [12] Normally distributed variables were summarized with mean and standard deviation, whereas skewed and ordinal variables were described using the median and interquartile range. The difference in-hospital mortality between the outside home and home groups was assessed using the chi-square test and the difference in length of stay was assessed using the Mann Whitney-U test as the data was skewed. Multivariable regression models were used to estimate the association between the place of injury ("Outside home" and "In-Home") and in-hospital mortality adjusting for severity of injury (determined by the ISS) and age. A p-value less than 0.05 was considered to be statistically significant. We did the power calculation for the sample satisfying the inclusion-exclusion criteria of the study and power was 96.9% was recorded for the selected sample.

Approval from ethical committee

Ethics approval for these studies was granted by each hospital's human research ethics committee - AIIMS-IEC/NP-327/2013; LTMG-IEC/83/14; VS-approved 13/11/2013; GTB-approved 12/2/2015); and the individual trauma patient on-admission consent process was waived for observational data. In Australia, the AITSC program of work was approved by the Alfred Hospital Ethics Committee (Project 245/17) and the Monash University Human Research Ethics Committee (CF16/1814 – 2016,000,929).

Results

Among 9354 patients in the AITSC data registry, 956 patients were excluded because of missing admission data, leaving 8398 patients eligible for the study (Fig. 1). Among the eligible study population, the total hospital mortality was 1055 (12.6%). 2442 (29.1%) patients sustained injuries at home, and among these, 259 patients (10.6%) died during their hospital stay.

Characteristics of the in-home injuries group

The distribution of baseline characteristics in the study population and between the in-home and outside home injuries groups is shown in Table 1. The median age of the patients in the in-home injuries group was 29 (20–43). 67.2% of patients were male. Fig. 2 depicts the mechanisms of injury which patients in both the cohorts presented with. Fall at home was the most common mechanism of injury (85.5%), followed by sharp (3.5%) or blunt (3.2%) objects. Overall, most injuries (84.5%) were due to blunt force. 48.3% of patients were referred from another hospital to the centers taking part in this study. 32.3% of patients required operative intervention.

Comparison between the in-home and outside home injuries groups

Patients in the in-home injuries group were younger (median age = 22 years) than the outside home injuries group (median age = 30) (p =<0.01). The sex distribution was significantly different, with a higher proportion of females in the in-home injuries group ($p < 0.01$). Falls were the predominant mechanism of injury at home (81.5%) but were infrequent outside the home (7.35%) ($p < 0.01$). Fig. 2 depicts the various mechanisms of injury among the two cohorts. More patients injured outside their homes required operative intervention (41.4%) than patients injured in their homes (32.3%) ($p < 0.01$).

Outcomes

The in-hospital mortality was 10.6% in patients in the in-home injuries group versus 13.7% in the outside home injuries group. This difference was statistically significant on univariable analysis (95% CI - 0.66 to 0.89, p-value <0.001) (Table 2). However, on multivariable regression analysis, after adjusting for age and injury severity score, there was no significant difference in the mortality between the two groups (Table 2). Hospital length of stay (LOS) was significantly less in the home-injury group compared to the outside home injury group (5 vs 7 days, p-value <0.01).

Subgroup analysis

In the pediatric subgroup, comprising 1379 children under 15 years of age, 71% (984/1379) were injured at home. The median age of the pediatric home injuries group was four years, compared to eight years in the outside home injuries group (p <0.01). The median ISS was less for the pediatric home injuries (8) compared to outside-home injuries (9) (p <0.01), and fewer operative procedures were required in the pediatric home injuries group (21.85% vs 42.5%) (p<0.01). On univariable analysis, there was no significant difference in mortality, but after adjusting for age and ISS, pediatric home injuries had significantly higher in-hospital mortality compared to outside home injuries (OR 0.494, 95% CI - 0.2877–0.847, $p = 0.01$). Also, pediatric home injuries were associated with a shorter duration of median hospital stay (4 days) than outside the home injuries group (6 days) (p <0.001) (Table 3).

The elderly subgroup comprised 521 patients, of which around 52% (242/521) were injured at home. In this subgroup, the patients injured at home had a greater median age (72 years versus 70 years) and a lower median ISS (9 versus 10) compared to patients injured outside the home. Again, on multivariable analysis, the in-hospital mortality significantly more in elderly persons injured at home compared to those injured outside the home (OR 0.5021, 95% CI - 0.284–0.888, $p = 0.018$). However, the length of hospital stay was more in the elderly injured at home (Table 3).

Discussion

According to this study, the contribution of home injuries (29% in hospital admissions) to the overall trauma burden of tertiary care hospitals is substantial and needs to be looked upon seriously.

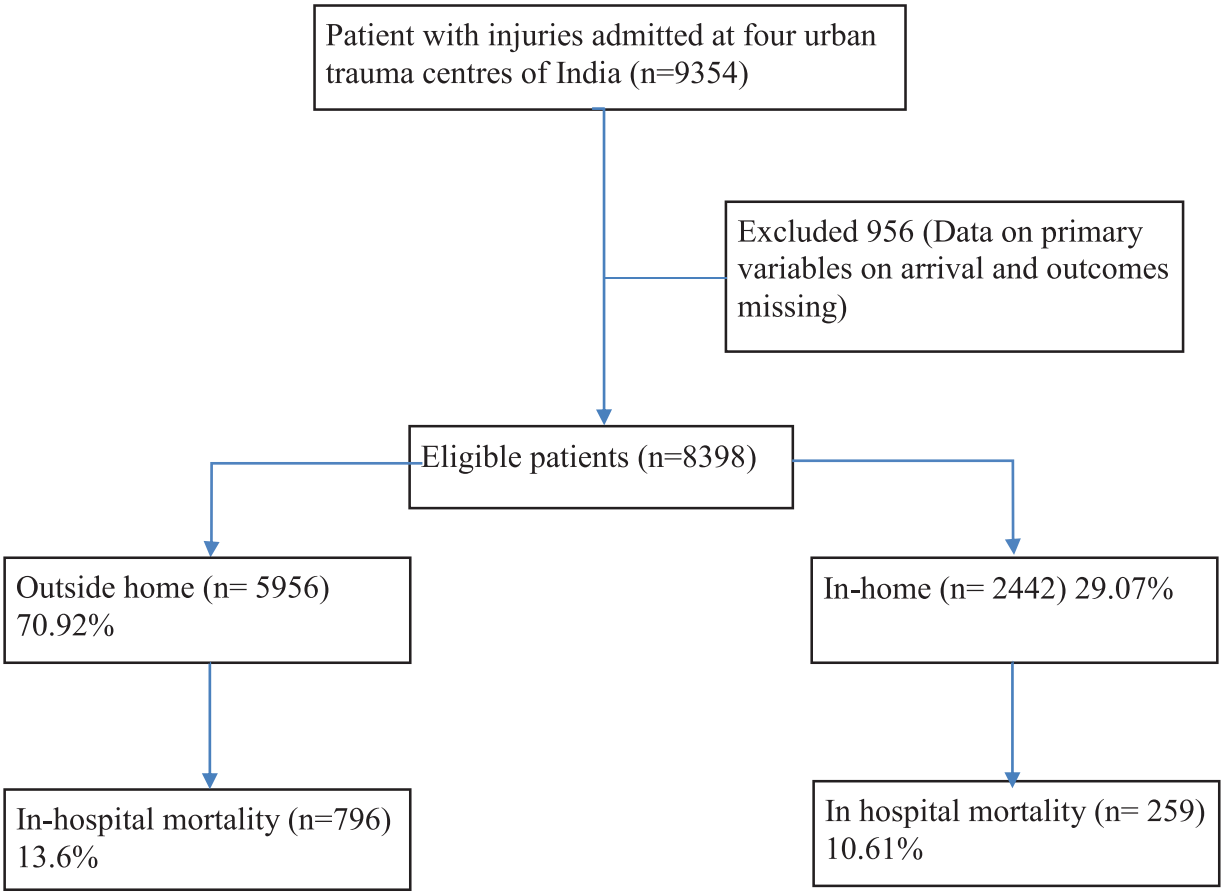


Fig. 1. Recruitment algorithm for trauma patients with injuries sustained "Outside home" vs "In-home".

Table 1
Demographics, injury severity and interventions done in the overall patient population.

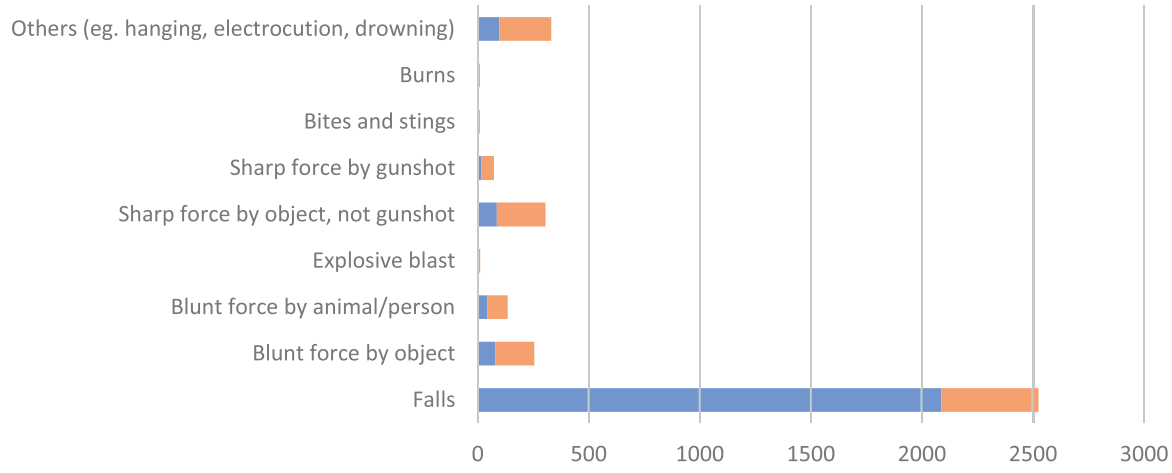
Parameter	Overall (n = 8398)	In-home (n = 2442)	Outside home (n = 5956)	Missing data
Age (Median, IQR)	29 (20–43)	22 (5–45)	30 (22–42)	18
Sex (n,%)				
Male	6849 (81.5)	1643 (67.2)	5206 (87.4)	2
Female	1549 (18.5)	799 (32.8)	750 (12.6)	
Referred patient (n,%)	4060 (48.3)	1057 (43.3%)	3003 (50.4)	146
ISS (Median, IQR)	9 (4–13)	9 (4–13)	9 (4–14)	751
RTS (Median, IQR)	7.84 (7.55–7.84)	7.84 (7.84–7.84)	7.84 (6.97–7.84)	1767
GCS (Median, IQR)	15 (13–15)	15 (14–15)	15 (11–15)	208
Triage on arrival (n)				
Red	4582	1201	3381	180
Yellow	3619	1185	2434	
Green	17	8	9	
Operative procedures done (n,%)	3258 (38.79)	790 (32.3)	2468 (41.4)	611

Table 2
Outcome parameters in the "Outside home" and "In-home" groups.

Parameter	Outside home (n = 5956)	In- home (n = 2442)	Trend (p)	Trend after adjustment (p)*
In hospital mortality (n,%)	796 (13.36)	259 (10.61)	<0.001	OR 0.8756 (CI 0.7319–1.0475) (p = 0.146)
Hospital LOS (Median, IQR)	7 (4–14)	5 (3–12)	<0.001	–

* Results of multivariable regression for mortality in "Outside home" and "In-home" groups (Supplementary Table 1).

In our previously published Trauma registry work, we have demonstrated that physiological scoring systems outperform anatomical scoring systems [13]. There are multiple similar papers about scoring systems like Kampala Trauma Score, performing well in LMIC settings. The median ISS of 9 and median RTS of 7.84 correlates with a relatively low severity of injury in the overall patient population. The severity of home injuries and the initial vitals (arrival heart rate, systolic blood pressure, and respiratory rate) were similar to outside home injuries. A large proportion of the home injuries were because of falls in the extremes of age. Young children are vulnerable because they are yet to achieve developmental maturity, and their ability to judge hazards is still



	Falls	Blunt force by object	Blunt force by animal/person	Explosive blast	Sharp force by object, not gunshot	Sharp force by gunshot	Bites and stings	Burns	Others (eg. hanging, electrocution, drowning)
in-home	2088	80	43	5	86	16	3	2	98
Outside home	438	175	93	6	220	57	7	8	233

Fig. 2. Various mechanisms of injury among patients injured in-home versus outside home.

Table 3
Outcome parameters in the pediatric and elderly subgroups.

Parameter	Outside home (n = 395)	In-Home (n = 984)	Trend (p)	Adjusted trend (p)*
Pediatric subgroup (< 15 years)				
In hospital mortality (n,%)	34 (8.6)	59 (5.9)	0.080	OR 0.494 (0.2877–0.847) (p = 0.010)
Hospital LOS (Median, IQR)	6 (3–11)	4 (2–7)	<0.01	–
Elderly subgroup (> 65 years)				
In hospital mortality (n,%)	57 (8.6)	47 (5.9)	0.109	OR 0.5021 (CI 0.284–0.888) p = 0.018
Hospital LOS (Median, IQR)	7 (4–19)	9 (4.5–16)	<0.01	–

(Key: LOS- length of stay; OR- Odds ratio; IQR- Interquartile range).
* Results of multivariable regression for mortality in "Outside home" and "Home" groups within the pediatric subgroup (Supplementary Table 2) and elderly subgroup (Supplementary Table 3).

redundant [14]. In the elderly, even a fall at ground level, which is generally considered a low-impact mechanism of injury, can result in multiple injuries, leading to high morbidity and mortality [15]. Elderly patients also commonly have co-morbidities requiring the use of anticoagulation or neurological medications, which increase this group's susceptibility to injury-related mortality and morbidity [16–19].

These observations are in concordance with other studies on falls in the pediatric population and the elderly [3,5,7,20,21]. Falls comprised 36.2% to 45.7% of the non-fatal unintentional home injuries which required a visit to healthcare providers in the US [2]. In an Italian database study, falls were the most common mechanism of home injuries followed by bumps, cuts, and burns. Falls were most frequent in the age classes >65 years and 0–5 years. The reason cited was that the children and the elderly spend more time at home, making them vulnerable to these injuries [5]. Data from the Emergency Department (ED) at trauma centers in the US revealed that at least 5% of the patients had domestic violence-related injuries [22]. In our study, after falls, blunt and penetrating injuries by an object were the second and third most frequent mechanism of injury. Domestic violence appeared to be the most logical explanation for such kinds of injuries since most assaults in LMICs are with low-velocity blunt (rods, clubs, hand) or penetrating (knives, ice picks) objects. When comparing other mechanisms, it is important to note that burns did not emerge as a leading cause of home injuries. This trend differs from other studies where burns in the home environment are amongst the leading causes of mortality, especially in children and the elderly [7]. It may be because all trauma centers participating in the study are not involved in caring for burn victims, as they are referred to dedicated burn care units.

The overall mortality due to unintentional injuries at home in the US has been reported as 6.83 per 10,000 population, compared to total injury-related mortality of 54.90 per 100,000 population [7]. Our analysis reveals a home injury mortality of 10.61% compared to a 13.36% mortality in the patients injured outside their homes, the difference not being significant on multivariable analysis. There are no similar comparative studies, but an Israeli study documented that 80% of the home injury-related mortality occurred in the age group of > 64 years [23]. Similarly, in the US,

elderly patients over 80 years of age, followed by infants, had the highest death rates (65.3/100,000 and 17.7 per 100,000) because of unintentional injuries in the home environment [24].

This study reflects the magnitude and damage in-home injuries can inflict on the well-being of the community. These injuries cause significant morbidity, many requiring prolonged hospitalization and loss of workdays/schooldays [2]. However, home injuries have not attracted adequate attention from policymakers and researchers compared to injuries in other settings, such as road traffic injuries. Very few studies have characterized in-home injuries, especially in lower and middle-income countries (LMICs), where their impact is grossly underestimated. Hence, preventive and therapeutic strategies towards home injuries need to be implemented to reduce their burden.

Most unintentional in-home injuries can be prevented by increasing awareness about them and promoting environmental modifications at home. Amongst infants, falls from beds other than cribs contribute significantly to pediatric in-home injuries. In older children, falls during running and playing are common. During adolescence, as sports and recreational activities decrease, assaults and falls from ladders become more prominent. Among the elderly, structures at home (slippery floors, stairs/steps, bathtubs/showers) and home furnishings (mainly beds, chairs, and rugs/carpets/doormats) increase the likelihood of falls when not designed carefully [10]. Environmental modifications like installation of grab bars and anti-skid mats in bathrooms (for the elderly), installation of stair gates and bed rails (for children) and general fire safety interventions like smoke alarms and sprinklers can help to prevent these injuries. Some home injury prevention programs such as home assessment and modification to reduce falls in the elderly or home visits regarding safety measures to prevent childhood injury have been conducted and are cost-effective [25,26]. An efficient public health policy needs to be designed to promote and disseminate information on home safety.

Conclusion

Among trauma patients presenting to large urban tertiary care hospitals, there is no significant difference in the 30 day in-hospital mortality between those injured at home and outside the home. However, the odds of mortality in pediatric (<15 years) and the elderly (>64 years) patients are significantly higher if they are injured at home compared with outside the home.

Limitations

Unfortunately, in our large (by LMIC standards) trauma dataset, the details regarding high and low velocity injuries are not captured. The reason is that with the lack of pre-hospital Emergency Medical Service (EMS) and care, the mechanism of injury is inadequately recorded, as it occurred on the injury site. Secondly, low-energy falls, such as fragility fractures or single bone fractures do not qualify/meet the inclusion criteria for admission to the trauma ICUs of large tertiary care hospitals. Polytrauma with an average ISS>15 is the usual admission criteria, for want of ICU beds. Thirdly, since we have considered only tertiary care hospital admissions, we have missed out on the large cohort of less severe/minor home injuries presenting to primary and secondary care centers. Again, since this is not a population-based study, we cannot assess minor injuries occurring at home for which patients do not seek medical help. Thus, the comparison between home and outside home injuries in this study likely involves severely injured patients in each cohort, which are expected to have high morbidity and mortality irrespective of the setting in which the injury occurred. Therefore, our results are valid only for patients with potentially fife threatening home injuries admitted to hospital.

Funding

Open access funding provided by Karolinska Institute. The AITSC was funded by the Indian Government (Department of Science and Technology) and the Australian Government (Department of Industry, Innovation and Science), through the Australia-India Strategic Research Fund (AISRF), Grand Challenge Round 2, AISRFGA12, Grants Number GCF0200130.

Compliance with ethical standards

Yes.

Declaration of Competing Interest

The authors declare that no conflict of interest exists.

Acknowledgement

The following are members of the AITSC (Australia-India Trauma System Collaboration): Fitzgerald MC, Mishra MC, Gupta A, Mathew J, Kumar S, O'Reilly G, Patel P, Biswadev M, Kumar S, Ivers R, Roy N, Cameron P, Dharap S, Gruen RL, Vyas S, Soni KD, Thakor AV, Sharma N, Joshipura M, Mock C, Bhoi S, Sagar S, Jarwani B, Howard TS, Kaushik G, Fahey MA, Farrow N, Mok MT, Singhal M, Joubert L, Kumar V, Stephenson M, Calthorpe S, Kumar V, Kimmel L, Walker T, Smolenears F, Rana LS, Varma D, Agrawal D, Shah N, Naik R, Hussain A, Gupta D, Makwana H, Misra P, Rai S, Lil N, Sinha S, Kumar A, Farooque K, Lalwani S, Sharma V, Mishra B, Trikha V, Jhakal A, Yadev L.

Data collectors: Sharma A, Sheth S, Aroke A, Dungdung A, Mahindrakar S, Vamik S, Gupta K, Shrivastava NP, Mhaske P, Patil S, Sawji S, Mohan K. Special thanks to Zoe Cheung for data cleaning and finalizing the dataset.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.injury.2022.03.050.

References

[1] GBD2017 Causes of death collaborators. Global, regional, and national age–sex-specific mortality for 282 causes of death in 195 countries and territories, 1980-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 2018;392(10159):1736–88 Epub 2018 Nov 8. Erratum in: Lancet. 2019 Jun 22;393(10190):e44. Erratum in: Lancet. 2018 Nov 17;392(10160):2170. PMID: 30496103; PMCID: PMC6227606.

[2] Runyan CW, Perkis D, Marshall SW, Johnson RM, Coyne-Beasley T, Waller AE, Black C, Baccaglini L. Unintentional injuries in the home in the United States Part II: morbidity. Am J Prev Med 2005;28(1):80–7 PMID: 15626561.

[3] Sikron F, Giveon A, Aharonson-Daniel L, Peleg K. My home is my castle! Or is it? Hospitalizations following home injury in Israel, 1997-2001. Isr Med Assoc J 2004;6(6):332–5.

[4] Environmental health inequalities in Europe. Assessment report [Internet]. Available from: https://www.euro.who.int/en/publications/abstracts/environmental-health-inequalities-in-europe.-assessment-report.

[5] Ferrante P, Marinaccio A, Iavicoli S. Home injuries in Italy: patterns of injury and the most exposed people. Int J Inj Contr Saf Promot 2013;20(1):36–41 Epub 2012 Mar 2. PMID: 22385149.

[6] Park K. Textbook of preventive and social medicine. Jabalpur India: Banarasi Das Bhanot; 2009. p. 427–8.

[7] Runyan CW, Casteel C, Perkis D, Black C, Marshall SW, Johnson RM, Coyne-Beasley T, Waller AE, Viswanathan S. Unintentional injuries in the home in the United States Part I: mortality. Am J Prev Med 2005;28(1):73–9 PMID: 15626560.

[8] Farchi S, Rossi PG, Chini F, Camilloni L, di Giorgio M, Guasticchi G, et al. Unintentional home injuries reported by an emergency-based surveillance system: incidence, hospitalisation rate and mortality. Accident Analy Prev 2006;38(5):843–53.

[9] Ballesteros MF, Webb K, McClure RJ. A review of CDC's web-based injury statistics query and reporting system (WISQARS™): planning for the future of injury surveillance. J Safety Res 2017;61:211–15 Epub 2017 Jan 18. PMID: 28454867; PMCID: PMC5605760.
[10] Zaloshnja E, Miller TR, Lawrence BA, Romano E. The costs of unintentional home injuries. Am J Prev Med 2005;28(1):88–94 PMID: 15626562.
[11] Provisional guidelines on standard international age classifications. United Nations New York, 1982. https://unstats.un.org/unsd/publication/SeriesM/SeriesM_74e.pdf.
[12] Core Team R. R: a language and environment for statistical computing, Vienna, Austria: R Foundation for Statistical Computing; 2020. URL https://www.R-project.org/.
[13] Roy N, Gerdin M, Schneider E, Veetil DK, Khajanchi M, Kumar V, Saha ML, Dharap S, Gupta A, Tomson G, von Schreeb J. Validation of international trauma scoring systems in urban trauma centres in India. Injury 2016;47(11):2459–64.
[14] Parmeswaran GG, Kalaivani M, Gupta SK, Goswami AK, Nongkynrih B. Assessment of home hazards for childhood injuries in an urban population in New Delhi. Child Care Health Dev. 2016;42(4):473–7 Epub 2016 Feb 19. PMID: 26892878.
[15] Ayoung-Chee P, McIntyre L, Ebel BE, Mack CD, McCormick W, Maier RV. Long-term outcomes of ground-level falls in the elderly. J Trauma Acute Care Surg 2014;76(2):498–503 discussion 503PMID: 24458057.
[16] Hollis S, Lecky F, Yates DW, Woodford M. The effect of pre-existing medical conditions and age on mortality after injury. J Trauma 2006;61(5):1255–60 PMID: 17099538.
[17] Kirshenbom D, Ben-Zaken Z, Albilya N, Niyibizi E, Bala M. Older age, Comorbid illnesses, and injury severity affect immediate outcome in elderly trauma patients. J Emerg Trauma Shock 2017;10(3):146–50 PMID: 28855778; PMCID: PMC5566026.
[18] McGwin G, MacLennan PA, Fife JB, Davis GG. Rue LW 3rd. Preexisting conditions and mortality in older trauma patients. J Trauma 2004;56(6):1291–6 PMID: 15211139.
[19] Niven DJ, Kirkpatrick AW, Ball CG, Laupland KB. Effect of comorbid illness on the long-term outcome of adults suffering major traumatic injury: a population-based cohort study. Am J Surg 2012;204(2):151–6 Epub 2012 May 18. PMID: 22608670.
[20] Gioffrè-Florio M, Murabito LM, Visalli C, Pergolizzi FP, Famà F. Trauma in elderly patients: a study of prevalence, comorbidities and gender differences. G Chir 2018;39(1):35–40 PMID: 29549679; PMCID: PMC5902142.
[21] Shields WC, Gielen AC, Frattaroli S, Musci RJ, McDonald EM, Van Beeck EF, et al. Child housing assessment for a safe environment (CHASE): a new tool for injury prevention inside the home. Injury Prevent 2020;26(3):215–20.
[22] Tennakoon L, Hakes NA, Knowlton LM, Spain DA. Traumatic injuries due to interpersonal and domestic violence in the United States. J Surg Res 2020;254:206–16 Epub 2020 May 26. PMID: 32470653.
[23] Madhivanan A, Venugopal V, Dongre AR. Physical violence against doctors: a content analysis from online indian newspapers. Indian J Community Med 2020;45(1):108–9 PMID: 32029997; PMCID: PMC6985956.
[24] Mack KA, Rudd RA, Mickalide AD, Ballesteros MF. Fatal unintentional injuries in the home in the U.S., 2000-2008. Am J Prev Med 2013;44(3):239–46 PMID: 23415120; PMCID: PMC4607019.
[25] King WJ, Klassen TP, LeBlanc J, Bernard-Bonnin AC, Robitaille Y, Pham B, Coyle D, Tenenbein M, Pless IB. The effectiveness of a home visit to prevent childhood injury. Pediatrics 2001;108(2):382–8 PMID: 11483803.
[26] Smith RD, Widiatmoko D. The cost-effectiveness of home assessment and modification to reduce falls in the elderly. Aust N Z J Public Health 1998;22(4):436–40 PMID: 9659769.