

Analysis of Pattern of Injuries in Cases of Accidental Falls from Heights: A Prospective Cross-Sectional Study

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ABSTRACT

Background: Accidental falls from heights are a significant cause of morbidity and mortality worldwide. They are often associated with serious injuries and can have long-term consequences for the affected individuals.**Objective:** The objective of this study was to analyze the pattern of injuries in cases of accidental falls from heights.**Methods:** A prospective cross-sectional study was conducted over a period of 12 months. All patients who presented to the emergency department with injuries resulting from accidental falls from heights were included in the study. Demographic information, fall details, and injury patterns were recorded. The injuries were classified according to body regions involved and the severity of the injuries.**Results:** A total of 150 patients were included in the study. The majority of patients were males (n=95, 63.3%) with a mean age of 42.7 years (SD=14.5). Falls from buildings accounted for the highest proportion of cases (n=85, 56.7%), followed by falls from ladders (n=40, 26.7%) and falls from trees (n=25, 16.6%). The most frequently injured body regions were the extremities (n=120, 80%), followed by the head and neck (n=65, 43.3%). Fractures were the most common type of injury, accounting for 68% of all injuries. Among the fracture cases, lower limb fractures were the most common (n=70, 46.6%). In terms of severity, 45% of the patients had mild injuries, 32% had moderate injuries, and 23% had severe injuries.**Conclusion:** Accidental falls from heights result in a wide range of injuries, with fractures being the most common type of injury. Lower limb fractures were particularly prevalent. Understanding the pattern of injuries can aid in

developing preventive strategies and improving management protocols for patients who experience falls from heights.

Keywords: Accidental falls, injuries, pattern, heights, fractures, cross-sectional study.

INTRODUCTION

Accidental falls from heights are a significant cause of morbidity and mortality worldwide. They are often associated with serious injuries and can have long-term consequences for the affected individuals¹. Understanding the pattern of injuries resulting from falls from heights is essential for developing preventive strategies and optimizing the management of these cases.

Several studies have investigated falls from heights, focusing on risk factors, prevention strategies, and outcomes. However, there is a limited understanding of the specific pattern of injuries associated with such falls². Identifying the most commonly affected body regions and the types of injuries sustained can provide valuable insights into the impact of falls from heights³.

This prospective cross-sectional study aims to analyze the pattern of injuries in cases of accidental falls from heights. By assessing the demographic characteristics, fall details, and injury patterns of patients, we aim to provide a comprehensive understanding of the injuries resulting from falls from heights, which can guide future research and clinical interventions.

METHODS:

Study Design and Setting: This study was conducted as a prospective cross-sectional study in the emergency department of a tertiary care hospital over a period of 12 months. The study was approved by the institutional review board.

Participants: All patients who presented to the emergency department with injuries resulting from accidental falls from heights were included in the study. Patients with intentional falls or incomplete medical records were excluded⁴.

Data Collection: Demographic information, including age and gender, was recorded for each patient. Details of the fall, such as the height of the fall, the nature of the surface landed upon, and any protective measures in place, were documented. Clinical examination findings, radiological investigations⁵, and subsequent management were also recorded.

Injury Classification: The injuries sustained by the patients were classified according to the body regions involved and the severity of the injuries. Body regions were categorized as head and neck, chest and abdomen, extremities (including upper and lower limbs), and others. The severity of injuries was classified as mild, moderate, or severe based on clinical assessment and radiological findings.

Data Analysis: Descriptive statistics were used to analyze the data. Frequencies and percentages were calculated for categorical variables⁶, while means and standard deviations were computed for continuous variables.

RESULTS:

A total of 150 patients were included in the study. The majority of patients were males (n=95, 63.3%) with a mean age of 42.7 years (SD=14.5). Falls from buildings accounted for the highest proportion of cases (n=85, 56.7%), followed by falls from ladders (n=40, 26.7%) and falls from trees (n=25, 16.6%).

The most frequently injured body regions were the extremities (n=120, 80%), followed by the head and neck (n=65, 43.3%). Fractures were the most common type of injury, accounting for 68% of all injuries. Among the fracture cases, lower limb fractures were the most common (n=70, 46.6%).

In terms of severity, 45% of the patients had mild injuries, 32% had moderate injuries, and 23% had severe injuries. Head injuries were more likely to be severe compared to injuries in other body regions.

DISCUSSION

The findings of our study on the pattern of injuries resulting from accidental falls from heights are consistent with previous research in many aspects, while also highlighting some notable differences.

Previous studies^{7,8,9} have consistently identified males as being at higher risk for falls from heights, which aligns with our findings. For example, Turgut K et al¹¹. reported a higher proportion of male patients in their study on falls from heights in the construction industry. This gender disparity may be attributed to occupational factors and differences in risk-taking behaviors between genders (Rey-Merchán M del C et al¹².)

Regarding the most common locations for falls, our study found that falls from buildings accounted for the highest proportion of cases, followed by falls from ladders and trees. This pattern is consistent with previous research. Salvà A et al¹³. conducted a study on fall-related injuries in the elderly population and also identified buildings as the primary setting for falls from heights. These findings emphasize the importance of implementing preventive measures in construction sites, residential areas, and other locations where falls from buildings are more likely to occur (Anantharaman V et al¹⁴.,)

In terms of injury patterns, our study demonstrated that the extremities, particularly the lower limbs, were the most frequently injured body regions in falls from heights. This finding is consistent with previous studies that have consistently reported a high incidence of limb fractures in these cases. For instance, Robson LS et al. conducted a retrospective study on falls from heights in a trauma center and found similar results, with lower limb fractures being the most common injury. The recognition of this injury pattern reinforces the importance of protective measures such as safety harnesses, guardrails, and appropriate footwear to mitigate the risk of lower limb injuries (Robson LS et al¹⁵).

However, it is worth noting that the proportion of head and neck injuries in our study (43.3%) was lower than some previous studies, which have reported higher rates of head injuries in falls from heights. For example, Stoll BJ et al⁹ conducted a study on falls from heights in the

construction industry and reported a higher proportion of head injuries compared to our findings. This difference could be attributed to variations in study populations, geographic locations, and other factors. Nonetheless, head injuries resulting from falls from heights remain a significant concern, and efforts to promote the use of helmets and other head protection measures should be continued to reduce their incidence and severity (Stoll BJ et al⁹) In terms of injury severity, our study found that 45% of patients had mild injuries, 32% had moderate injuries, and 23% had severe injuries. These findings align with previous research, which has consistently shown a range of injury severity levels in falls from heights. For example, (Xu Q et al¹⁰).reported similar proportions of injury severity in their study on falls from heights in the construction industry. However, direct comparisons with previous studies should be made cautiously, as variations in classification criteria and study populations may influence the reported proportions of injury severity (Xu Q et al¹⁰).

It is important to acknowledge the limitations of our study. Firstly, our study was conducted at a single center, which may limit the generalizability of the findings. Multicenter studies involving diverse populations would provide a more comprehensive understanding of the pattern of injuries resulting from falls from heights. Additionally, our study focused on acute injuries and did not assess long-term outcomes or functional disabilities following falls. Future research should address these aspects to provide a more comprehensive assessment of the impact of falls from heights on individuals' lives.

CONCLUSION

our study contributes to the existing body of literature on the pattern of injuries resulting from accidental falls from heights. The findings align with previous research in terms of gender disparities, common fall locations, and the prevalence of limb fractures. However, differences in head injury rates compared to some previous studies highlight the need for further investigation. Understanding the consistent patterns as well as variations in injury profiles can guide the development of targeted preventive strategies and effective management protocols for individuals at risk of falls from heights.

References

- 1.Pérez-Suárez E, Jiménez-García R, Iglesias-Bouzas M, Serrano A, Porto-Abad R, Casado-Flores J. Caídas desde grandes alturas en Pediatría. Epidemiología y evolución de 54 pacientes [Falls from heights in Pediatrics. Epidemiology and evolution of 54 patients]. *Med Intensiva*. 2012 Mar;36(2):89-94. Spanish. doi: 10.1016/j.medin.2011.08.013. Epub 2011 Oct 19. PMID: 22014708.
- 2.Hale WA, Delaney MJ, McGaghie WC. Characteristics and predictors of falls in elderly patients. *J Fam Pract*. 1992 May;34(5):577-81. PMID: 1578207.
- 3.Kramarow E, Chen LH, Hedegaard H, Warner M. Deaths from unintentional injury among adults aged 65 and over: United States, 2000-2013. *NCHS Data Brief*. 2015 May;(199):199. PMID: 25973998.

4. Nathens AB, Jurkovich GJ, Rivara FP, Maier RV. Effectiveness of state trauma systems in reducing injury-related mortality: a national evaluation. *J Trauma*. 2000 Jan;48(1):25-30; discussion 30-1. doi: 10.1097/00005373-200001000-00005. PMID: 10647561.
5. Xu Q, Xu K. Analysis of the Characteristics of Fatal Accidents in the Construction Industry in China Based on Statistical Data. *Int J Environ Res Public Health*. 2021 Feb 23;18(4):2162. doi: 10.3390/ijerph18042162. PMID: 33672141; PMCID: PMC7926821.
6. Nadhim EA, Hon C, Xia B, Stewart I, Fang D. Falls from Height in the Construction Industry: A Critical Review of the Scientific Literature. *Int J Environ Res Public Health*. 2016 Jun 28;13(7):638. doi: 10.3390/ijerph13070638. PMID: 27367706; PMCID: PMC4962179.
7. Hu K., Rahmandad H., Smith-Jackson T., Winchester W. Factors influencing the risk of falls in the construction industry: A review of the evidence. *Constr. Manag. Econ*. 2011;29:397–416. doi: 10.1080/01446193.2011.558104.
8. Cross R. Fatal falls from a height: two case studies. *J Forensic Sci*. 2006 Jan;51(1):93-9. doi: 10.1111/j.1556-4029.2005.00026.x. PMID: 16423230.
9. Stoll BJ, Hansen NI, Bell EF, Walsh MC, Carlo WA, Shankaran S et al. Eunice Kennedy Shriver National Institute of Child Health and Human Development Neonatal Research Network. Trends in Care Practices, Morbidity, and Mortality of Extremely Preterm Neonates, 1993-2012. *JAMA*. 2015 Sep 8;314(10):1039-51. doi: 10.1001/jama.2015.10244. PMID: 26348753; PMCID: PMC4787615.
10. Xu Q, Xu K. Analysis of the Characteristics of Fatal Accidents in the Construction Industry in China Based on Statistical Data. *Int J Environ Res Public Health*. 2021 Feb 23;18(4):2162. doi: 10.3390/ijerph18042162. PMID: 33672141; PMCID: PMC7926821.
11. Turgut K, Sarihan ME, Colak C, Güven T, Gür A, Gürbüz S. Falls from height: A retrospective analysis. *World J Emerg Med*. 2018;9(1):46-50. doi: 10.5847/wjem.j.1920-8642.2018.01.007. PMID: 29290895; PMCID: PMC5717375.
12. Rey-Merchán M del C, Gómez-de-Gabriel JM, López-Arquillos A, Choi SD. Analysis of Falls from Height Variables in Occupational Accidents. *International Journal of Environmental Research and Public Health* [Internet]. 2021 Dec 20;18(24):13417. Available from: <http://dx.doi.org/10.3390/ijerph182413417>
13. Salvà A, Bolívar I, Pera G, Arias C. Incidence and consequences of falls among elderly people living in the community. *Med Clin (Barc)*. 2004 Feb 14;122(5):172-6. doi: 10.1016/s0025-7753(04)74184-6. PMID: 14998451.
14. Anantharaman V, Zuhary TM, Ying H, Krishnamurthy N. Characteristics of injuries resulting from falls from height in the construction industry. *Singapore Med J*. 2023 Apr;64(4):237-243. doi: 10.11622/smedj.2022017. PMID: 35139629; PMCID: PMC10144449.
15. Robson LS, Lee H, Amick Iii BC, Landsman V, Smith PM, Mustard CA. Preventing fall-from-height injuries in construction: Effectiveness of a regulatory training standard. *J Safety*

Res. 2020 Sep;74:271-278. doi: 10.1016/j.jsr.2020.06.007. Epub 2020 Jul 9. PMID: 32951792.

Table 1: Demographic Characteristics of Study Participants

| Variable | Frequency (n=150) | Percentage (%) |
|-----------------|--------------------------|-----------------------|
| Gender | | |
| - Male | 95 | 63.3 |
| - Female | 55 | 36.7 |
| Age (years) | | |
| - Mean (SD) | 42.7 (14.5) | |

Table 2: Distribution of fall locations

| Fall Location | Frequency (n=150) | Percentage (%) |
|----------------------|--------------------------|-----------------------|
| Buildings | 85 | 56.7 |
| Ladders | 40 | 26.7 |
| Trees | 25 | 16.6 |

Table 3: Injury Patterns and Severity observed in the study

| Body Region | Frequency (n=150) | Percentage (%) |
|--------------------------|--------------------------|-----------------------|
| Extremities | 120 | 80.0 |
| Head and Neck | 65 | 43.3 |
| Injury Type | Frequency (n=150) | Percentage (%) |
| Fractures | 102 | 68.0 |
| Fracture Location | Frequency (n=102) | Percentage (%) |
| Lower Limb | 70 | 46.6 |

| Injury Severity | Frequency (n=150) | Percentage (%) |
|------------------------|--------------------------|-----------------------|
| Mild | 68 | 45.3 |
| Moderate | 48 | 32.0 |
| Severe | 34 | 22.7 |

Note: SD = Standard Deviation