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PROFILE OF NON FATAL SKELETAL INJURIES DUE TO UNINTENTIONAL FALL FROM HEIGHT IN AN URBAN CENTRE IN WESTERN INDIA

Forensic Medicine

Dr Ishita Manral* Assistant professor, Department of Forensic Medicine and Toxicology, Command Hospital, Kolkata *Corresponding Author

Col (Dr) Abhijit Rudra Professor, Military Hospital, Jalandhar, Punjab, Department of Forensic Medicine and Toxicology, Armed Forces Medical College, Pune.

ABSTRACT

This study is based on an effort to address the deficiency of literature on non-fatal fall from height. Unintentional fall from height represents a significant cause of injury in urban populations. While fatal injuries due to a fall from height are showing an upward trend due to increase in high rise buildings in an urban setting, a significant number of non – fatal cases occur due to unintentional fall from height. There is a need to study the demographic profile of injured persons, assess the severity of their injuries and identify certain risk factors associated with such non fatal injuries due to fall from height. In this retrospective study, data pertaining to cases which were examined and treated at a tertiary care centre in Western India was analysed.

KEYWORDS

Non -fatal fall from height, skeletal injuries, unintentional

INTRODUCTION

Falls from height are one of the leading causes of death from unintentional injuries, which disproportionately affects the very young and very old. Falls from height are the most common cause of non-fatal childhood injuries but are often fatal in the elderly1.

While fall as a cause of injury is extensively documented in the west 1, very little data is available about the morbidity associated with non-fatal fall from height in India.

In the current study we retrospectively studied and evaluated the demographic data in relation to age group and sex of victims. We studied the severity of injuries in various parts of the body and assessed the severity by recording the Injury Severity Score (ISS). We recorded details regarding the circumstances and height of fall, in order to identify factors that had a definitive role to play in the causation of these injuries. Finally we tried to assess the maximum severity of injury that eventually proved to be non – fatal.

MATERIAL AND METHODS

The study was conducted in a tertiary care hospital affiliated with a Medical College in Western India. We carried out a Retrospective study. We reviewed cases of musculoskeletal trauma as a result of fall from height over two years (Jan 2014 to Feb 2016).

Patients who sustained musculoskeletal injury due to fall from height and were admitted in the Orthopedic Department for observation/intervention were included in the study. The trauma records of the Emergency room were reviewed to ascertain patient details. Patients for whom record of the height and circumstances of the fall were not available in the case record were excluded from the study. We also excluded from the study patients who were not admitted but were sent back home after primary management, falls that were a result of suicide attempts or homicide (intentional injuries may have different patterns of fall and sustained injury), and cases brought after death.

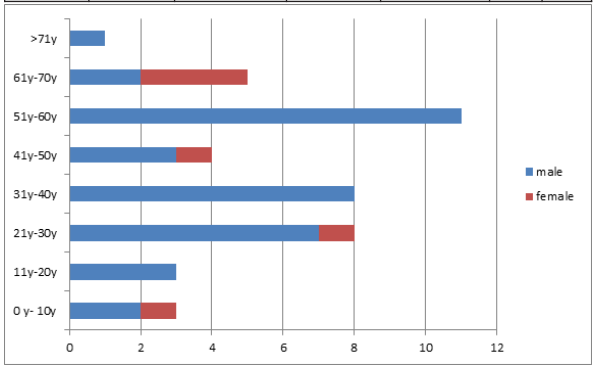
All available records and documented the age and sex of the patient, site of accident, circumstances and location of the fall, approximate height of the fall, season, landing surface, details of musculoskeletal and other injuries, and duration of hospital stay. The patients were divided into age groups according to age: 0-10, 11-20, 21-30, 31-40 ,41-50, 51-60, 61-70 studied for injuries. All fractures were tabulated as injuries to upper limbs, lower limbs, spine, and pelvis in each age group. The number of fractures sustained to upper and lower limbs, the spine and pelvis were compared between children, adolescents, adults, and the elderly for any significant differences.

RESULTS

Age and sex distribution of total cases

Table No 1: Age And Sex Distribution Of Total Number Of Patients Studied Is As Tabulated:

Age Group In Years	Male		Female		Total	%
	Number	Percentage	Number	Percentage		
0-10	2	6%	1	14%	3	7%
11-20	3	6%	0	-	3	7%
21-30	7	20%	1	14%	8	18%
31-40	8	22%	0	-	8	18%
41-50	3	9%	1	14%	4	9%
51-60	11	28%	0	-	11	25%
61-70	2	6%	3	44%	5	11%
>71	1	3%	1	14%	2	5%
Total	**37**	**100**	**7**	**100**	**44**	**100**



GRAPH 1: Age wise distribution amongst Males

As seen in table 1 and graph 1, Age wise distribution of the sex of the cases of non-fatal fall from height, table showing 0-10 years of age with 7%(3) of the population size. 11-20 years showing 7% (3) of the population size, 21-30 years with 18%(8) of the population size, 31-40 years showing 18%(8) of the population size. 41-50 years showing 9%(4) of the population size. 41-50 years showing 9%(4) of the population size. 51-60 years showing 25%(11) of the size, 61-70 years showing 11%(5) of the study size and >71 years showing 5%(2) of the study size as shown in graph 1.

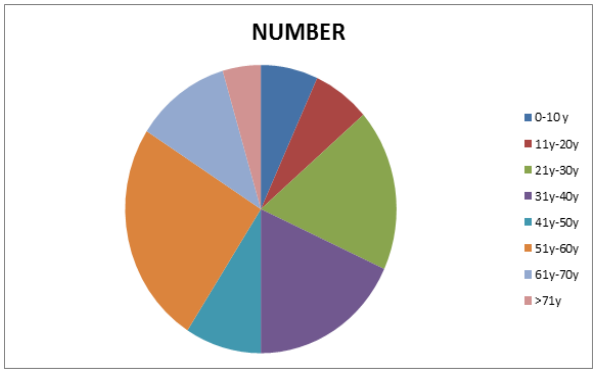
Age wise distribution amongst Females

Age wise distribution of the sex of the cases of non-fatal fall from height, table showing 0-10 years of age with 7%(3) of the population size. 11-20 years showing 7% (3) of the population size, 21-30 years with 18%(8) of the population size, 31-40 years showing 18%(8) of the population size. 41-50 years showing 9%(4) of the population size. 41-50 years showing 9%(4) of the population size. 51-60 years showing 25%(11) of the size, 61-70 years showing 11%(5) of the study size and >71 years showing 5%(2) of the study size.

Age wise distribution of the patients in both sexes combined
Table No2 : Age Wise Distribution Of The Sample Size

AGE GROUP IN YEARS	NUMBER	PERCENTAGE
0-10	3	7%
11-20	3	7%
21-30	8	18%
31-40	8	18%
41-50	4	9%
51-60	11	25%
61-70	5	11%
>71	2	5%
Total	44	100

Age wise distribution of the cases of non-fatal fall from height, please see Table 2 , table showing 0-10 years of age with 7%(3) of the population size. 11-20 years showing 7% (3) of the population size, 21-30 years with 18%(8) of the population size, 31-40 years showing 18%(8) of the population size. 41-50 years showing 9%(4) of the population size. 41-50 years showing 9%(4) of the population size. 51-60 years showing 25%(11) of the size, 61-70 years showing 11%(5) of the study size and >71 years showing 5%(2) of the study size as in graph 2 .

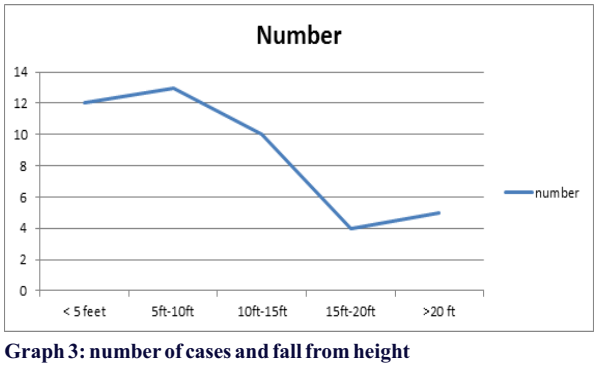


Graph 2: Graph showing the age distribution of the sex in the sample size.

Table no 3: Number of patients in relation to the height of fall

Height(feet)	Number	Percentage
< 5 feet	12	27%
5-10 feet	13	29%
10-15 feet	10	22%
15-20 feet	4	10%
>20 feet	5	12%
Total	44	100

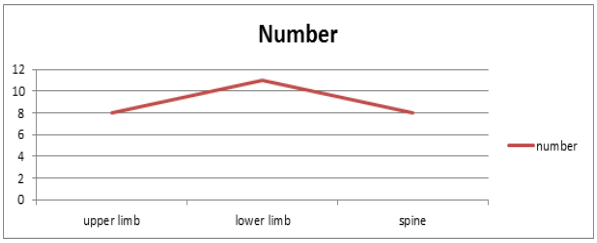
Table 3 showing the distribution of the cases according to the height of the fall of the patients. 27%(12) of cases had fall from less than 5 feet. 30%(13) had fall from 5-10 feet.23%(10) of the cases had fall from 10-15 feet. 9%(4) of the cases had fall from 15-20 feet and > 20 feet height of fall was seen in 11%(5) cases illustrated in graph 3.



Graph 3: number of cases and fall from height

Table no 4: Number of patients in relation to the region of the body injured due to fall

Table 4 showing upper limb fractures 30%(8) of the cases. Spine fractures constitute 30%(8) of the cases. Lower limb fractures 40% (11) of the cases as shown in graph 4.



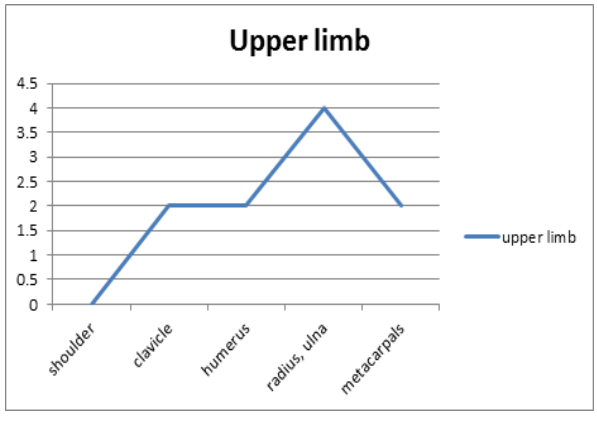
Graph 4: Number of patients in relation to the region of the body injured due to fall

Table no 5 : Distribution of cases of fracture in regions of the body.

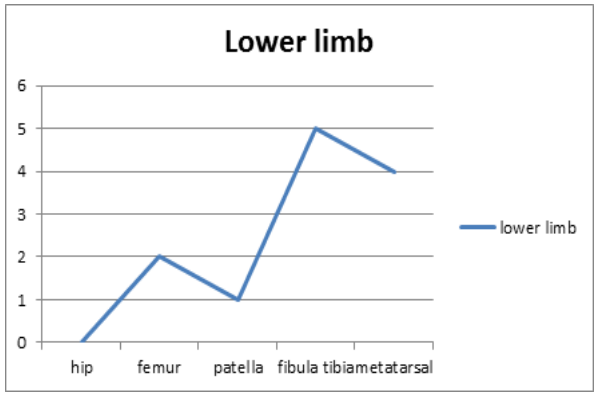
Region	Fracture	Number	Percentage
Upper limb	Radius and ulna	4	15%
	Humerus	2	8%
	Shoulder dislocation	-	-
	Metacarpal	2	8%
	Clavicle	2	8%
Lower limb	Tibia and Fibula	5	18%
	Femur	2	8%
	Hip dislocation	-	-
	Metatarsal	4	15%
	Patella	1	4%
Spine	Cervical	1	4%
	Thoracic	1	4%
	Lumbar	2	8%
Total		26	100%

Table no 5 shows In upper limb, radius and ulna were 15%(4) of the total fracture, humerus was 8%(2) of the fracture and metacarpal had 8%(2) and clavicle had 8% (2)of the fracture as in graph 5. Lower limb had 18%(5) tibia, fibula fracture, 8 %(2) femur fracture. 15%(4) metatarsal fracture and 1 %(1) fracture of patella as in graph 6. in spine, 4%(1) cervical. 4%(1) thoracic and 8%(2) lumbar fracture as in graph 7. Please see table 6.

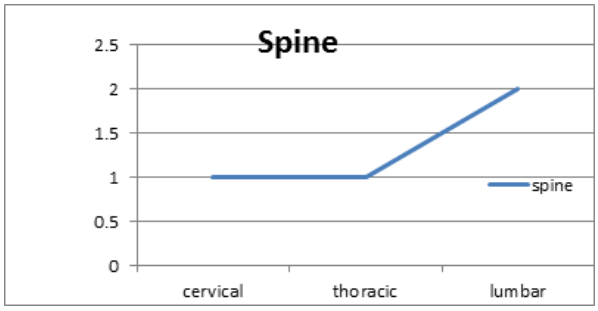
Table 5 showing age distribution of the fractures. Total number of cases with fracture in the upper limb being 5, number of cases with fracture in lower limb being 10, and spine fracture 5.



Graph 5: Distribution Of Injuries In Upper Limb



Graph 6: Distribution Of Injuries In Lower Limb

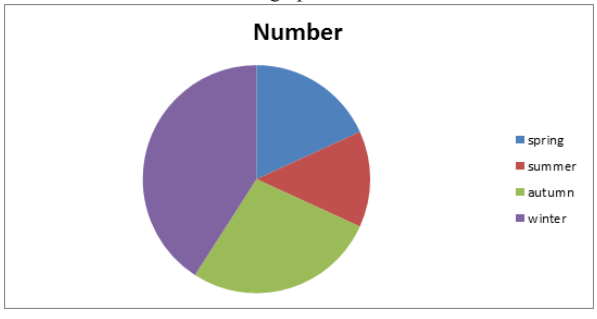


Graph 7: Distribution Of Injuries In Spine

Table 6 : Seasonal Variation in occurrence of cases of unintentional fall

Major season	Number of cases	Percentage
Spring (april to june)	8	18
Summer (june to September)	6	13
Autumn (October to December)	12	27
Winter(January to march)	18	42
Total	44	100

Seasonal distribution of injuries, maximum cases occurred in winter 42%(18), 27% (12) in autumn, 18%(8) in spring and 13% (6) in summer season as in table 6 and graph 8.

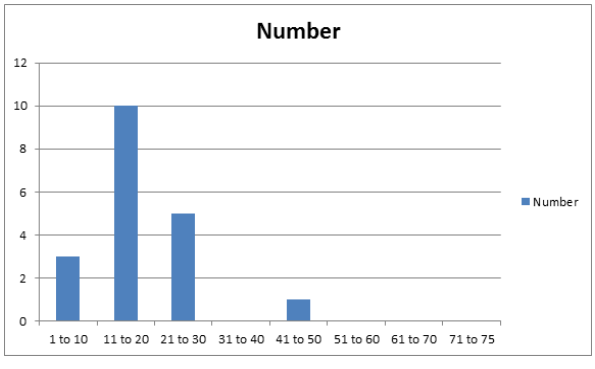


Graph 8: Seasonal Distribution Of Injuries

Table 7 :Distribution of ISS score

SCORE	MALE	FEMALE	TOTAL
	TOTAL	TOTAL	
1-10	3	-	3
11-20	10	-	10
21-30	3	2	5
31-40	-	-	-
41-50	1	-	1
51-60	-	-	-
61-70	-	-	-
71-75	-	-	-
TOTAL	17	2	19

Injury Severity Scale of 1-10 were seen in 3 cases, 11-20 in 10 cases, 21-30 in 5 cases and 41-50 in 1 case as in table 7, graph 9.



Graph 9: Distribution Of Iss Scoring Of Injuries

DISCUSSION

Fall from height is a common mode of trauma in western world(1,2) and in the developing countries(3), where injuries are not documented. In our country, adequate data is not found in the topic of non fatal fall from height. The unintentional fall from height which is major cause of morbidity in pour country can be prevented by few remedial measures. However, the number and patterns of injuries due to falls need to be studied first to ascertain the specific corrective action that is needed.

The above series of 44 cases were collected over a period of one year from the casualty of tertiary care hospital in Western India. The admission rate in various studies ranges from 6-42% (4), with our admission rate being on the lower side. The male preponderance (84%) was consistent with other studies (5, 6). The peak age of fall was seen between 51 and 60 years. Musculoskeletal injuries to this age group have the propensity to lead to disability, affecting the most productive section of society in addition to being a burden on the healthcare resources.(3) A case similar to Goren et al(7) was a fall sustained while going to urinate late at night or in the early morning in a state of decreased attention similar phenomenon was also observerd. Monsoon season July are “kite flying months” in India (13). An increase in the number of falls from height, especially in children, was observed in these months (13). The Committee on Injury and Poison Prevention reported radius, ulna and femur as the most frequent sites of fracture in pediatric falls in the United States (8). Our findings matched their observations, but we also found high rates of spinal injuries and fractures of the tibiae and fibulae (11.1%) in our study.

Injury sustained due to fall from height depend upon age, height of fall, nature of impact surface, and the body part first hitting the ground (9). Children, due to their larger head to body ratio, are more susceptible to head injuries, whereas adults are more prone to limb injuries (10) . Height of fall and age were significant factors in determining the severity of trauma(11). Goodacre et al. 12 opined that height of fall is a poor predictor of major injury. Study conducted by Gulati et al had similar findings (13).

In our study Injury Severity Scale of 1-10 were seen in 3 cases, 11-20 in 10 cases, 21-30 in 5 cases and 41-50 in 1 case. Previous studies have reported little mortality due to fall from heights (14, 15).

The study has its limitations, as the height of fall was considered as told by the patient or attendant in the case record. No site visits were conducted to determine the exact height of the fall. There is a need accumulate more data on non- fatal falls from height, in order to plan specific interventions that can help reduce their incidence.

Ethical clearance : a prior approval was obtained from the institutional ethical committee : IEC/2016/ Feb/AFMC/FM&T

Conflict of interest: none to declare
Source of funding: none to declare

REFERENCES

1. Allshouse MJ, Rouse T, Eichelberger MR. Childhood injury: a current perspective. Pediatr Emerg Care 1993;9:159-64.
2. Rivara FP, Calonge N, Thompson RS. Population-based study of unintentional injury incidence and impact during childhood. Am J Public Health 1989;79:990-4.
3. Kohli A, Banerjee KK. Pattern of injuries in fatal falls from buildings. Med Sci Law 2006;46:335-41.
4. Payne SR, Waller JA, Skelly JM, Gamelli RL. Injuries during woodworking, home repairs, and construction. J Trauma 1990;30:276-80.
5. Mosenthal AC, Livingston DH, Elcavage J, Merritt S, Stucker S. Falls: epidemiology and strategies for prevention. J Trauma 1995;38:753-6.
6. Garrettson LK, Gallagher SS. Falls in children and youth. Pediatr Clin North Am 1985;32:153-62
7. Goren S, Subasi M, Týrasci Y, Gurkan F. Fatal falls from heights in and around Diyarbakir, Turkey. Forensic Sci Int 2003;137:37-40.
8. Committee on Injury and Poison Prevention. American Academy of Pediatrics: Falls from heights: windows, roofs, and balconies. Pediatrics 2001;107:1188-91.
9. Lapostolle F, Borron SW, Gere C, Dallemagne F, Beruben A, Lapandry C, et al. Victims of fall from height. Study of 287 patients and determination of clinical prognostic factors. [Article in French] Ann Fr Anesth Reanim 2004;23:689-93
10. Sawyer JR, Flynn JM, Dormans JP, Catalano J, Drummond DS. Fracture patterns in children and young adults who fall from significant heights. J Pediatr Orthop 2000;20:197-202.
11. Agalar F, Cakmakci M, Sayek I. Factors effecting mortality in urban vertical free falls: evaluation of 180 cases. Int Surg 1999;84:271-4.
12. Goodacre S, Than M, Goyder EC, Joseph AP. Can the distance fallen predict serious injury after a fall from a height? J Trauma 1999;46:1055-8.
13. Gulati D, Aggarwal AN, Kumar S, Agarwal A. Skeletal injuries following unintentional fall from height. Ulus Travma Acil Cerrahi Derg. 2012 Mar 1;18(2):141-6.
14. Faergemann C, Larsen LB. Non-occupational ladder and scaffold fall injuries. Accid Anal Prev 2000;32:745-50.
15. Partridge RA, Virk AS, Antosia RE. Causes and patterns of injury from ladder falls. Acad Emerg Med 1998;5:31-4.