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Original Article

Assessment and Clinical Outcomes of Fall Related Injuries at Emergency

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ABSTRACT

Background and objectives: Falls are significant cause of mortality and morbidity with a considerable burden on societies, families and victims. The study aims to determine the interventions and outcomes of fall-related injuries, and the association between injury severity and fall height.
Methods: A descriptive cross-sectional study was conducted among 322 fall-related injured persons in West and East emergency hospitals in Erbil City from September 2020 to February 2021. Study sample demography, location of injury, place of affected body regions, outcome, and hospital stay were analyzed.
Results: Of the 322 patients studied, 68.9% were males, and 31.1% were female. Less than half of the samples (48.8%) were between the ages 18 to 36 years old. The most common location for fall-related injuries was residential facilities (44.1%) followed by the place of work (35.1%). According to the type of fall, fall from ground was 38.4%, and fall from a fall height of 1-3 meters was 48.8%. Finally, according to the injury classification, more than half (56.5%) of the study sample had a significant degree of severity. The discharged status of disposition at the emergency room had the highest percentage (64.9%) of the study sample. There was a significant difference between the scores of the items of fall consequences and outcomes regarding to type of ground (soft or hard). There was a significant relationship between injury severity and fall height (p-value = 0.00).
Conclusion: Fall-related injuries are the most common cases at emergency departments in Erbil city. Among ages 18 to 36, men are more frequently exposed to falls than women. The highest risk of fall is occupation with construction laborers at the greatest risk. Fall-related injury is a burden on the health care system, particularly on emergency services in developing countries like Iraq in relations cost of care and resources.
Key words: Fall, Unintentional fall, Injury severity, Fall height, Outcome.

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INTRODUCTION

Falls are a common cause of mortality in both sex and all age groups [1]. It is one of the common reasons for trauma care at emergency department (ED) visits among all age groups [2]. Fall-related injuries increase the cost on the health care system [3]. About half of falls result in injuries, and about 10% of those injuries are serious injuries such as head injuries and fractures or injuries to the joint [4]. Falls and resulting injuries are frequently need medical care [5].Globally, falls are a major public health problem. Each year about 646,000 fatal falls occur. It is the second leading cause of accidental injury death after road traffic injuries. In low- and middle-income countries, fatal falls occur over 80% [6]. It is one reason that leads to death and the

Third. leading cause of non-fatal injuries [7]. Although fall-related injuries are usually reported in older age groups, other studies have shown that younger people (15-49 years) have been recognized as the most vulnerable group affected by fall-related injuries. In addition, men are twice as likely to as women to be affected by falls [8]. Two of the three significant causes of injury deaths – fall and road traffic injuries– are expected to increase in rank compared to other causes of death, with falls increasing to become the 17th leading cause of death. [9].In Kurdistan, Iraq, there is no current study about falls in all circumstances, including settings and injury-prone environments. The environmental, personal, and equipment risk factors for falls change in different communities. It is essential to know the severity of injuries and outcome of patients who sustain injuries by falls to be better prepared to manage these emergencies and to provide appropriate recommendations for prevention. This study will have a fundamental role in refining knowledge and will be recognized as a source of nurses and emergency staff. The finding of this study may help nurses and other healthcare professionals expand their knowledge and improve their practice related to fall-related injuries. This study aimed to explore the socio demographic characteristics, severity, interventions, and health outcomes associated with fall-related injuries and determine the association between injury severity and fall height.

METHODS

A descriptive cross-sectional study of 322 fall-related injured persons in West and East emergency hospitals in Erbil City was conducted from September 2020 to February 2021. The sample size was determined by Z2 p q/d2, z = confident interval 95% (1.96), p= prevalence= (0.30), q = (1-p) = (0.70), d = sampling error (0.05) [10]. Patients who died upon injury or those who died in the emergency rooms (9) were omitted because there was no complete data regarding the circumstances of death and to avoid potential bias due to outcome measurement. The researcher obtained an approval letter from the Ethics Committee at Hawler Medical University/College of Nursing on September 2020 (number 833). The official approval was taken as well. The researcher prepared a questionnaire for collecting data based on the review literature. The questionnaire was reliable and accessible to the public. The questionnaire was checked by a panel of experts who have extensive experience from different specialties. Based on their comments, the questionnaire was corrected and modified for appropriate data collection. A pilot study was conducted on 30 fall-related injured persons selected purposively from East and West emergency hospitals in September 2020. The pilot study was beneficial to determine the reliability, clarity, acceptability and time estimation for each participant to give full data which was 20-30 minutes. Reliability was determined using the Spearman-Brown formula. The following procedures were used in data analysis: descriptive statistical data analysis (frequency and percentage) and inferential statistical data analysis (independent sample t-test and Chi-square test). Data were analyzed using SPSS version 21.

RESULTS

Table 1 shows the socio demographic characteristics of the sample. Nearly half of the sample (48.8%) were aged 18 – 36 years old, and a majority were male was (68.9%). 31.7% graduated from primary school, and 49.1% lived in urban areas. The majority of the sample (86%) were Iraqi, more than a third (37.9%) .

identified their occupation as a worker, and more than half (57.1%) reported a social income status of Sufficient daily needs.

Table 1: Distribution of socio demographic data of the study sample (n=322)

The Characteristics	Subgroups	*F.*	%
Age groups	1 – 18 Years	91	(28.3)
	18 -36 Years	157	(48.7)
	36-54 Years	44	(13.7)
	> 54 Years	30	(9.3)
Gender	Male	222	(68.9)
	Female	100	(31.1)
Education level	Illiterate	57	(17.7)
	Able to read and write	70	(21.7)
	Primary school	85	(26.4)
	Secondary school	33	(10.3)
	College or institute	22	(6.8)
	Post graduate	11	(3.4)
	Child (N. A.)	44	(13.7)
Residence	Urban	158	(49.1)
	Rural	95	(29.5)
	Suburban	69	(21.4)
Nationality	Iraqi	277	(86)
	Others	45	(14)
Occupation	Manual employee	9	(2.8)
	Office (Government) employee	14	(4.3)
	Unemployed (house wife)	75	(23.3)
	Retired	10	(3.1)
	Worker	122	(37.9)
	Student	48	(14.9)
	Child (N. A.)	44	(13.7)
Income	Exceeds daily needs	3	(0.9)
	Sufficient for daily needs	184	(57.1)
	Insufficient for daily needs	135	(42)

Table 2 shows information regarding fall-related injuries. The primary mode of arrival was by none-ambulance mode (87%). Nearly half of the samples (44.1%) were injured at a residential facility, followed by the workplace (35.1%). Almost all falls (92.5%) were unintentional, and 89.1% of falls were falls to a hard ground.

The most common mechanism of fall was fall from ground 38.4%, and the most common fall height was fall from 1-3 meters (48.8%). On the pain scale, 54.3% of the sample reported, and on the Glasgow Coma Scale, 91.3% reported no head injury, and 79.2% received radiological investigation.

Table 2: Distribution of information regarding fall of the study sample (n= 322)

The characteristics	Subgroups	*F.*	%
Mode of Arrival	Ambulance	41	(12.7)
	None-ambulance mode	281	(87.3)
Location of fall Occurrence	Residential facility	142	(44.1)
	Sports facility	26	(8.1)
	Work place	113	(35.1)
	Public / Commercial area	41	(12.7)
Intentionality of fall	Unintentional	298	(92.5)
	Intentional	24	(7.5)
Ground of fall	Soft	35	(10.9)
	Hard	287	(89.1)
Fall Height	< 1 Meter	109	(33.8)
	1 – 3 Meters	157	(48.8)
	3 – 6 Meters	51	(15.8)
	> 6 Meters	5	(1.6)
Level of Consciousness	Conscious	299	(92.9)
	Unconscious and or altered mental status	23	(7.1)
Pain Scale	Mild pain	7	(2.2)
	Moderate pain	132	(41)
	Severe pain	175	(54.3)
	Unconscious	8	(2.5)
Total of Glasgow Coma Scale	No head injury GCS 15/15	294	(91.3)
(GCS)	Severe head injury GCS 3-8	8	(2.5)
	Moderate head injury GCS 9--12	18	(5.6)
	Miner head injury GCS 13 -15	2	(0.6)
Radiology investigation	No	32	(9.9)
	X-Ray	255	(79.2)
	X-Ray with other radiology test	35	(10.9)

Mechanism of fall	F	%
Fall from ground	124	(38.4)
Fall from stairs and scaffold	111	(34.5)
Fall from building or structure	45	(14)
Sport activity	27	(8.4)
Others	15	(4.7)
Total	322	(100)

Table 3 shows the characteristics of injuries. Of the sample, 53.1% has no soft tissue injury, 41.3% had no fracture, 99.1% had no spinal cord injury, and 97.3% had no visceral injury. More than half (56.5%) of study sample had major degree of severity. Table 4 shows the frequencies and percentages of the treatment type and in terventions of the study sample, 27.3% was received back slab or cast for the affected area, 24.8% was received advice and giving medication, 22.4% was received open reduction and internal fixation, 15.6% was received wound dressing and suturing, 3.4% was received traction, others, craniotomy 2.8%, surgical debridement and external fixation2.5%, laparotomy 1.2%.

Table 3: Distribution of the injury characteristics among study sample (n= 322)

The Characteristics	Subgroups	*F.*	%
Soft tissue injury	None	171	(53.1)
	Yes	151	(46.9)
Site of fracture	None	133	(41.3)
	Skull and neck fracture	20	(6.2)
	Upper limb fracture	57	(17.7)
	Lower limb fracture	68	(21.1)
	Back fracture	11	(3.4)
	Chest fracture	5	(1.6)
	Pelvis fracture	15	(4.7)
	Multiple fracture	13	(4)
Spinal cord injury	None	319	(99.1)
SCI	Yes	3	(0.9)
Visceral Injury	No	313	(97.3)
	Yes	9	(2.7)
Injury Severity	None	0	(0.0)
Classification	Minor	104	(32.3)
	Moderate	29	(9)
	Major	183	(56.8)
	Death	6	(1.9)

Table 4: Distribution of interventions of fall among the study sample (n= 322)

The Outcomes	Sub-groups	*F.*	%
Open Reduction and Internal Fixation	No	250	(77.6)
	Yes	72	(22.4)
Laparotomy	No	318	(98.8)
	Yes	4	(1.2)
Surgical debridement and external fixation	No	314	(97.5)
	Yes	8	(2.5)
Craniotomy	No	313	(97.2)
	Yes	9	(2.8)
Wound dressing and suturing	No	285	(88.5)
	Yes	50	(15.6)
Back slab or cast for affected area	No	234	(72.7)
	Yes	88	(27.3)
Traction	No	311	(96.6)
	Yes	11	(3.4)
Advice and giving Medication	No	242	(75.2)
	Yes	80	(24.8)

Table 5 shows the differences between the fall consequences and outcomes regarding the ground of fall (soft or hard). There was a significant difference between the scores of the fall consequences and outcomes regarding ground of fall. A high significance was reported for open reduction and internal fixation (p=0.00), advice and giving medication (p=0.00), and disposition at emergency hospitals (p=0.00) with back slab or cast for the affected area (p=0.01), traction (p=0.01) and significant association for open reduction and external fixation (p=0.04). There was no significance at the $p \leq 0.05$ with craniotomy, laparotomy, wound dressing, and suturing. A significant relationship between injury severity and fall height was observed (p= 0.00).

Table 5: Distribution of the fall consequences and outcomes based on (Ground of fall) **of** the study sample (n=322)

Fall outcomes	Ground of fall (*f.*)	Sig. p value	Sig. Level at p. value ≤ 0.05
1- Open reduction and internal fixation	Soft (35) Hard (287)	0.000	H.S.
2- Laparotomy	Soft (35) Hard (287)	0.156	N.S.
3- Surgical debridement and external fixation	Soft (35) Hard (287)	0.041	S.
4- Craniotomy	Soft (35) Hard (287)	0.963	N.S.
5- Wound dressing and suturing	Soft (35) Hard (287)	0.289	N.S.
6- Back slab or cast for affected area	Soft (35) Hard (287)	0.019	S.
7- Traction	Soft (35) Hard (287)	0.015	S.
8- Advice and giving medication	Soft (35) Hard (287)	.0000	H.S.
9- Disposition at emergency room	Soft (35) Hard (287)	0.000	H.S.

Table 6: Association between injury severity and fall height among the study sample (n=322).

Injury severity classification	Fall height				Total	χ^2 value	Sig. value at p. value 0.05
	Less than one meter *f.* %	>1-3 m *F.* %	>3-6 m *F.* %	>6 m *F.* %			
None	0	0	0	0	0		
	0.0	0.0	0.0	0.0	0.0		
Minor	57	38	9	0	0		
	17.7	11.8	2.8	0.0	0.0		
Moderate	18	11	0	0	0		
	5.6	3.4	0.0	0.0	0.0		
Major	82	60	38	0	3		
	25.5	18.6	11.8	0.0	0.9		
Death	0	0	0	4	2		
	0.0	0.0	0.0	1.2	0.6		
Total	157	109	47	4	5		
	48.8	33.8	14.6	1.2	1.6	74.213	0.000

DISCUSSIONS

This study shows that majority of the sample as between 18 – 36 years old, which aligns with the Lohanathan et al. retrospective study in South India [11]. The sample had a larger proportion of males than females, which aligns with the Ahmad et al. study results of fatal falls [12]. Usually, men are exposed to falls more frequently than women because boys are more active at early ages than girls, and men are more physical workers than women. Based on the occupation, workers were more than a third of the study sample and aligns with Dong et al., Meena, and Punia, which reported that the highest risk of fall was occupation with construction laborers as the largest occupation at risk [13] [14]. The primary mode of arrival was by none-ambulance mode, consistent with earlier studies by Fayyaz et al. that demonstrated similar results [15]. Residential facility was the most common place of fall followed by the workplace as reported in the same study [16]. A higher proportion of falls were unintentional, and majority of fall ground was hard. Injuries from fall height of 1-3 meters were the highest which is similar to the results by İçer et al [17]. Falls from the ground were highest among the sample which agrees with the study done by Alfredsson [18]. The present study disagrees with the study by Grivna et al., which showed more patients had fallen from higher heights compared to ground level [19].Most of the sample population were conscious and had a Glasgow coma score of 15. Most of the patients were stabilized and after primary care discharged directly from the emergency department, similar to study results

done in South India done by Lohanathan et al [11]. X-Ray investigation was done for majority of the cases like the study by Dong et al [13]. Nearly half of sample population had soft tissue injuries similar to the retrospective study by Turgut et al. at the Emergency Department of Inonu University which reported the most common traumatic lesion of fall was soft tissue injury [1].Limbs were the commonly injured body part, similar to the study in India done by Kumar and Srivastava [20]. Nearly one percent of the study sample had spinal cord injuries, agreeing with the Oxley et al. study [21]. However, it disagrees with the Kennedy et al. study reporting nearly a quarter percent of falls had spinal cord injury which may be attributed to the long duration of the study and differences in the heights of fall [22]. More than half of the sample has a major degree of severity which disagreed with Luzia et al., which reported that most injuries were classified as mild. Fall-related injuries involved specific medical and nursing interventions such as sutures, dressings, casting, orthopedic and neurologic surgical procedures. The percentage of injuries resulting in death was 1.9% of cases similar to that reported by Luzia et al. [23]. In this study, nearly a quarter of the cases needed orthopedic surgery, which disagrees with the study by Alizo et al., which showed that more than half of the sample population needed orthopedic surgery [24]. Alizo et al. reported these findings among falls from height only and not all types of falls. The outcomes of patients falling on soft grounds compared to those falling on solid grounds were statistically significant, similar to a Turkish study done by İçer et al. [17]. The present study showed a significant relationship between injury severity and fall height, similar to a retrospective observational data-based study by Dickinson et al. which showed the same result [25].

Conclusion

Fall-related injuries are the most common cases at emergency departments in Erbil city. Men are exposed to falls more frequently than women among ages 18 to 36 years old. The highest risk of fall is occupation with laborers of construction at the highest risk. Fall-related injuries have serious implications on the burden of the health care system, particularly on emergency services in developing countries like Iraq in relation to cost of care and resources.

Recommendation

Falls at work can be prevented by safety instruction to different groups, and proper regulation and legislation. Environmental variation based on architectural design may prevent falls among susceptible risk groups.

Conflict of interest

The author reports no conflict of interests.

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