



The Etiology of Trauma in Geriatric Traumatic Patients Refer to an Academic Trauma Center: A Cross Sectional Study

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ABSTRACT

Objective: Geriatric trauma refers to injuries sustained by elderly individuals, typically those aged 65 years and older. The management of geriatric trauma in the Emergency Department requires a comprehensive approach that takes into account the physiological changes associated with aging, as well as the increased vulnerability and complexity of injuries in this population.

Methods: This is a cross-sectional study aimed at evaluating the etiology of trauma in geriatric patients referred to the ED of level-1 an academic center. All patients with complaints of trauma are evaluated and patients over 65 years enrolled in the study. Data were analyzed by SPSS 26.

Results: 319 patients were investigated, 49.8% male and 50.2% female. The most common underlying diseases are high blood pressure, diabetes type 2, and ischemic heart disease. The most common trauma cause was falling from the same level (48.9%), followed by a fall from a height (16.6%), accidents with cars (16%), and motorcycles (9.1%). The most common injury was extremities trauma (71.5%) following head trauma (13.2%) and chest trauma (6%). The severity of injury in extremities was higher in women, and chest trauma was more severe in men.

Conclusion: The fall and subsequent car accident had the highest frequency as a cause of trauma in elderly patients admitted to our academic trauma center. Hypertension and diabetes have also been the most common underlying diseases. Head and neck injuries are life-threatening and critical in a larger number of patients than other injuries, and protecting them can be effective in reducing mortality and serious injuries in elderly trauma patients.

Keywords: Geriatrics, Etiology, Trauma center, Fall, Emergencies.

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Introduction

Geriatric trauma refers to injuries sustained by elderly individuals, typically those aged 65 years and older [1]. As the population continues to age, the incidence of geriatric trauma has been on the rise, presenting unique challenges for emergency departments (EDs) worldwide [2]. The management of geriatric trauma in the ED requires a comprehensive approach that takes into account the physiological changes associated with aging, as well as the increased vulnerability and complexity of injuries in this population [3]. These injuries can have severe consequences for older individuals, leading to increased morbidity, mortality, and decreased quality of life [1, 4].

One of the key factors contributing to geriatric trauma is age-related physiological changes. This makes older adults more susceptible to fractures from falls or other traumatic events [5]. Additionally, aging can lead to a decrease in sensory perception and balance, increasing the risk of falls and subsequent injuries [6, 7].

The complexity of injuries in geriatric trauma patients is another significant consideration for ED. Older adults often have multiple comorbidities such as heart disease, diabetes, or cognitive impairments that can complicate their management [8]. These comorbidities may affect treatment decisions and increase the risk of adverse outcomes [9, 10]. The assessment and management of geriatric trauma in the ED require a multidisciplinary approach involving emergency physicians, nurses, surgeons, social workers, and rehabilitation specialists [11]. The initial evaluation should focus on identifying life-threatening injuries while considering potential age-related complications such as delayed healing or impaired immune response [12]. Diagnostic imaging plays a crucial role in evaluating geriatric trauma patients [13, 14].

Therefore, understanding the etiology or causes of geriatric trauma is crucial in developing effective preventive strategies. Miyoshi ET al. studied geriatric trauma patients as a major socio-economic problem in Japan. They found that falls are the leading cause of trauma in this age group [8]. Jiang ET al. also conducted a study on the incidence of geriatric trauma in the USA from 2005 to 2015; they concluded that the incidence of trauma in this age group increased significantly [10].

The elderly population is increasing all over the world, trauma is one of the leading causes of exacerbation of disability in this age group. So far, several studies have been conducted to investigate the causes and ways to prevent trauma in this age group. This study aims to explore the etiologic investigation of geriatric trauma and highlight the importance of prevention in this vulnerable population.

Materials and Methods

This is a cross-sectional study aimed at evaluating

the etiology of trauma in geriatric patients referred to the ED of level-1 an academic center. The study was conducted on trauma patients admitted to the ED of Shahid Hasheminejad Hospital during 2021.

All patients with complaints of trauma are evaluated, patients over 65-years enrolled in the study and evaluated in terms of age and sex, severity of trauma, underlying diseases, type of trauma, and finally the outcome of the patients including discharge from the ED, hospitalization in the ward or the intensive care unit (ICU) and deceased.

In this study, the trauma registry system of the hospital was used. Demographic and trauma information including the triage level, the level of consciousness upon arrival, the mechanism of injury, the organ involved, and the treatment and outcome, were extracted for one year (Figure 1).

Descriptive and inferential statistics in SPSS software version 26 were performed for data analysis. Charts and statistical tables were used to describe the data; in the case of type and severity of trauma descriptive statistics such as mean, median, and standard deviation were used.

The severity of trauma was measured using the Injury Severity Scale (AIS). To check the severity of injury in different parts of the body, the AIS criterion is used. Student's t-test or Wilcoxon test was used to compare the severity of trauma.

The cause of trauma, underlying diseases, type of trauma, etc. were reported using descriptive statistics such as frequency and percentage; Chi-square tests were used to compare and describe the severity of injuries and injuries.

The patient's data was coded and entered with the name removed to remain confidential. All steps of this study followed the ethical principles of Helsinki and were approved by the Ethics Committee of Mashhad University of Medical Sciences.

Results

In general, during the 1-year of the study, 319 people were eligible for the study, of which 49.8% were men and the rest were women. The average age of the patients was 75.18 ± 18.39 . Table 1 shows the distribution of demographic variables, variables related to vital signs, and history of underlying diseases in all patients by gender.

Based on this data, the most common underlying diseases were high blood pressure, type 2 diabetes, and ischemic heart disease, respectively. The prevalence of all three mentioned diseases in women is significantly higher than in male patients, so the prevalence of high blood pressure and ischemic heart disease in female referring patients was 53.10% and 21.9%, respectively, while the frequency of these in male patients was 35.80% and 13.21% respectively (Table 1).

The frequency of trauma caused in men and women is somewhat different (Table 1). The main and most

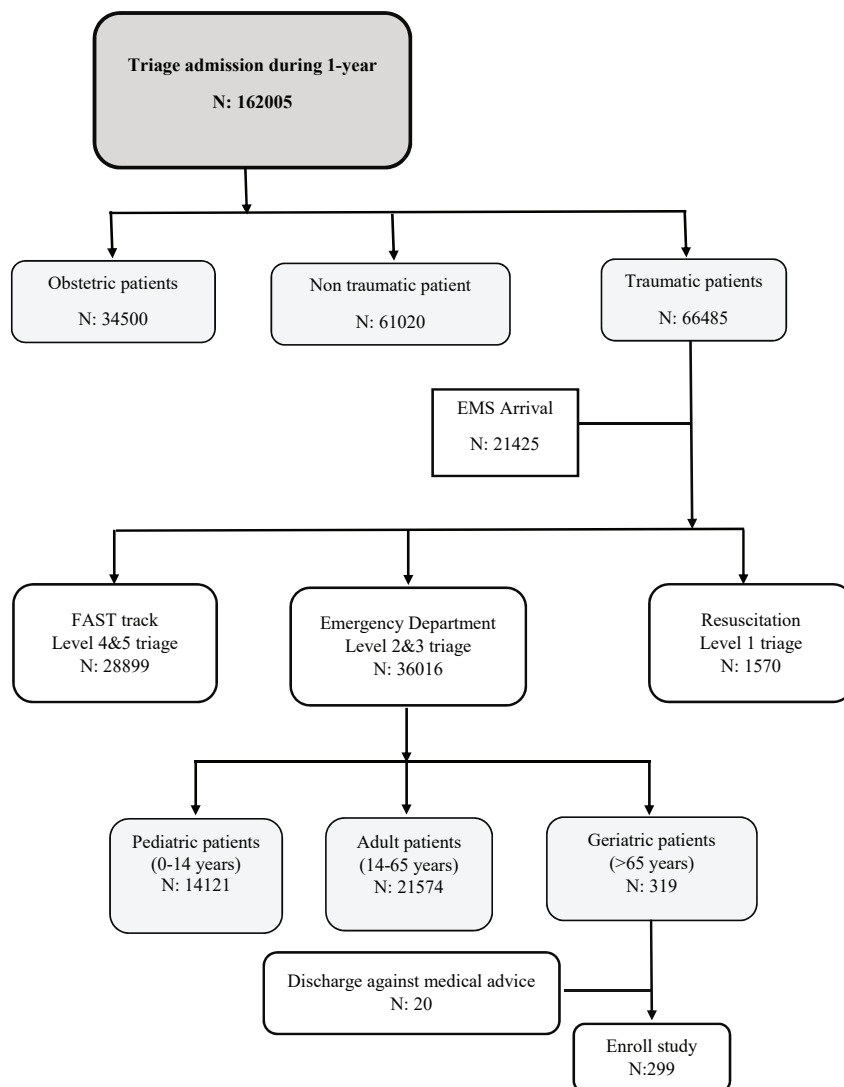


Figure 1. The flow chart of traumatic patients admitted to the hospital

Table 1. Distribution of demographic variables and history of underlying diseases

Variables	Total N=319		Men N=159		Women N=160	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Age	75.18	18.39	74.26	8.20	76.10	8.50
SBP (mmhg)	146.35	27.8	146.45	18.29	146.26	26.47
DBP(mmhg)	87.11	15.79	88.04	16.29	86.18	15.27
HR (per minutes)	83.71	14.70	82.00	14.52	85.41	14.72
RR (per minutes)	17.22	2.19	17.17	2.38	17.26	1.99
GCS	14.85	0.93	14.86	0.87	14.84	1.06
Underlying Disease						
Disease	N	%	N	%	N	%
IHD	56	17.60	21	13.21	35	21.90
DM	75	23.50	32	20.10	43	26.90
HTN	142	44.5	57	35.80	85	53.10
CVA	14	4.40	6	3.80	8	5.00
HLP	22	6.90	5	3.10	17	10.60
CRF	6	1.90	1	0.60	5	3.10
COPD	7	2.20	1	0.60	6	3.80
CHF	3	0.94	-	-	3	1.60
Malignancy	1	0.30	-	-	1	0.60

SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; HR: Heart Rate; RR: Respiratory Rate; GCS: Glasgow Coma Scale; IHD: Ischemic Heart Disease; DM: Diabetic Mellitus; HTN: Hypertension; CVA: Cerebra Vascular Accident; HLP: Hyperlipidemia; CRF: Chronic Renal Failure; COPD: Chronic Obstructive pulmonary Disease; CHF: Chronic Heart Failure

common causes of trauma in the male patients were falling on the same level (35.80%), car accidents, fall from a height, and motorcycle accidents, respectively. the most common cause of trauma in females was falling on the same level (61.90%), but falling from a height was second (15%) and the other causes were car accident (8.10%) and motorcycle (5.60%) (Table 2).

92.8% (296 people) of these patients were admitted to the hospital ward. Ten patients (1.03%) were discharged in good general condition, 5 patients were admitted to the ICU, and death occurred in only 2.5% of patients.

The prevalence of discharge outcomes and admission to the ward in male and female patients were similar. However, it seems that the outcome of death and hospitalization in the intensive care unit (ICU) was higher in males than in females. The distribution of injury severity in different parts is based on the AIS scale were shown in Table 3.

The Chi-square showed that the frequency of severe trauma (AIS score 3 and greater than 3) of

the head, spine, abdomen, and pelvis was similar in males and females and there was no significant difference (Table 4). The frequency of severe trauma to the chest and upper and lower extremities was different in men and women and this difference was statistically significant. Severe trauma of the upper and lower extremities was more common in women compared to men. However, cases of severe chest trauma were more common in men than in women ($P=0.008$).

Discussion

According to the information obtained from 319 trauma patients over 65-years, the most common cause of trauma in people over 65 years of age is fall on the same level (48.9% of all cases). The results of other studies show that in most medical centers, falls are the main cause of trauma in elderly people, according to the frequency of the causes of trauma,

Table 2. Trauma type and mechanism

Variables	Total N=319		Men N=159		Women N=160	
	N	%	N	%	N	%
Trauma						
Blunt	305	95.60%	154	96.90%	151	94.40%
Stab	14	4.40%	5	3.10%	9	5.60%
Mechanism						
Falling on the same level	156	48.90%	57	35.80%	99	61.90%
Falling from a height	53	16.60%	29	18.20%	24	15%
Motor vehicle car accident	51	16%	38	23.90%	13	8.10%
Motorcycle accident	29	9.10%	20	12.60%	9	5.60%
Interpersonal assault	8	2.5%	2	1.3%	6	3.8%
Others	22	6.90%	13	8.20%	9	5.60%

Table 3. Distribution of injury severity based on the AIS scale

Injury site	No Injury	Minor	Moderate	Severe, not Life-Treating	Severe, Life-Treating	Critical
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Head	277 (86.6)	1(0.3)	11(3.4)	9 (2.8)	11 (3.4)	10 (3.1)
Spine	291 (91.2)	8 (2.5)	20 (6.3)	-	-	-
Chest	200 (94)	1 (0.3)	1 (1.90)	11 (3.4)	1 (0.3)	-
Abdominal-pelvic	296 (92.8)	2 (0.6)	11 (3.4)	-	-	-
Extremities	91 (28.5)	11 (3.4)	49 (15.4)	168 (52.7)	-	-

Table 4. The frequency of severity of injury based on AIS scale in male and female

Site of Injury	AIS	Men		Female		P value
		N	%	N	%	
Head	<3	140	48.4	149	51.6	0.12
	≥3	19	19.00	11	36.7	
Spine	<3	0	00.00	0	00.00	-
	≥3	0	00.00	0	00.00	
Chest	<3	149	48.5	158	51.50	0.02
	≥3	10	83.30	2	16.70	
Abdominal-pelvic	<3	152	49.20	157	50.80	0.19
	≥3	7	70	3	30	
Extremities	<3	87	57.60	64	42.40	0.008
	≥3	72	42.90	96	57.10	

it is appropriate to take consideration to reduce this occurrence in each area [11, 12]. Paying attention to the underlying diseases, drugs and neurological disorders related to aging in these patients can prevent the occurrence of trauma in this age group to some extent [13]. Also, dangerous surrounding areas that may cause them to fall, such as stairs with non-standard design, the presence of obstacles in the path, etc., should be according to the standard conditions of their age [14].

Accidents with automobiles (16%) and motorcycles (9%) are other important causes of trauma in the elderly, especially in men. Increasing age is generally effective in reducing the ability and accuracy of a person's driving. Vision, hearing, the ability to react to the stimulus, and overall mental cognitive function that is necessary for driving accurately and correctly, may undergo changes and weaknesses with the aging process and cause road accidents. Considering that in our country, men drive more than women, and in general, women spend more time at home than men, the frequency of accidents in elderly men has been higher than in women.

Interpersonal assault injury is one of the other factors that lead to trauma at different ages. In the present study, only 2.5% of the cases were traumatized due to interpersonal assault; which was more in women.

Gioffre-Florio and his colleagues in Rome, investigated the prevalence, related risk factors, the injured organs, and the difference in prevalence between men and women in patients with trauma. In this study, 4554 patients over 65 years of age (61% women and 39% men) were examined and divided into three age groups, 65 to 75 years, 75 to 85 years, and over 85 years. The most age group involved were people between 75 and 85 years old; in this study, women are more affected in 75-85 years and men in 65-75 years [15].

The most common type of trauma was head injury and fracture of the upper and lower limb, respectively. They found an increase in the prevalence of head injuries in the age group over 85 years old (42% of all injuries in this age group). The most common related underlying diseases in this study were hypertension and ischemic heart disease respectively (diabetes in this study was much less prevalent than in our study) [15]. Compared to our study, M. GIOFFRÈ-FLORIO's study divided the patients by their age group into three separate groups, and the prevalence of underlying diseases, frequency of affected areas, and different injuries in all 3 groups were separately checked and compared at the end. In this study, the frequency of injuries to lower and upper limbs was mentioned along with the type of injury [15].

Ricardo Naraynsingh and his colleagues conducted a study on trauma patients aged 18 years and above; 1052 patients were examined, of which 941 were aged between 18 and 65, and 111 people were over 65 years old. This study aimed to compare the cause

and type of injuries caused by trauma in young and elderly. In this study, the most common cause of trauma in the elderly was falling (71%), among which (94%) fall from the same level and (6%) fall from height. Also, following a fall in the elderly and trauma to the lower limb (35%), head and neck (26%), and upper limb (19%) were common. About 14% of elderly patients have suffered more than one injury after a fall [11].

In this study, as in our study, extremities were the most common (upper and lower limbs), which included about 50% of the cases, followed by head injuries, which were seen in about 30% of the cases [11]. In this study, as in our study, the AIS was used to check the severity of organ damage, but unlike our study, lower limb injuries in this study had the most cases of severe to critical damage (in 31% of cases, they had AIS>2), then head injuries, the most cases were severe to critical injuries (in 19% of cases, AIS>2) [11]. Compared to our study, Ricardo Naraynsingh's study investigated more closely the injuries that occurred following falls in the elderly. Also, in this study, young and old people were compared in terms of various things such as the cause of trauma and injuries, whereas, we just evaluated the geriatric patient.

Trauma in geriatrics patients is a complex and multifactorial problem that requires a comprehensive approach to prevention and treatment. By understanding the various causes of trauma in older adults, healthcare providers can work to reduce the incidence of injuries and improve outcomes for geriatric patients. According to the results of our research, the main cause of trauma in elderly people is falls from the same level and then motor-vehicle car accidents. Also, HTN and diabetes were the most common underlying and related diseases in the occurrence of trauma in the elderly under our investigation. Extremity injury (upper and lower limbs) and then head and neck are the most common injuries in elderly trauma patients. Head and neck injuries are life-threatening and critical in a larger number of patients than other injuries, and protecting them can be effective in reducing mortality and serious injuries in elderly trauma patients.

Declaration

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Conflict of interest: None

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Authors' Contribution: EVM and EP Conceptualization, Methodology; HZ, BRK and HGH Data curation; MS Software and analysis;

EVM Writing- Original draft preparation. SMS and EVM Visualization, Investigation; EVM, EP and HZ, Supervision; BRK Validation, all authors finalized the manuscript.

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