Hospitalization Due to Traffic Accidents among the Elderly, Shiraz, 2018; Mortality, Severity, and Injury Pattern

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Abstract

Background: Aging results in declined function, which leads to loss of capacity and respond to injury. Hence, the duration of treatment after traffic accident increases in these patients. The present study aimed to identify the factors affecting the elderly hospitalization. **Study Design:** This was a cross-sectional study. **Materials and Methods:** This cross-sectional study was conducted on 768 trauma patients aged 65 years and more due to traffic injuries, referred to Rajaee (Emtiaz) hospital trauma referral center, Shiraz, Iran, in 2018. Data were collected through the hospital's health information system, as well as readings and encoding patient's clinical records. Poisson regression was performed to evaluate the partial effects of each covariate on geriatric trauma patients. **Results:** The mean age of injured patients was 73.27 ± 6.88 years, of which 7.29% expired. Extremities and externals (58.20%) and head and neck (18.36%) were the most commonly injured regions of the body. Each year after 65 led to 0.03 times increase in the length of hospitalization. The male's hospital stay was 1.15 times more than females. **Conclusion:** According to the results, length of hospitalization had a direct correlation with aging among elderly trauma patients. Since the elderly population is on the rise, it is necessary for the policymakers to come up with preventive measures to reduce the number of accidents and casualties.

Keywords: Elderly, hospitalizations, traffic accidents

INTRODUCTION

In the past two decades, Iran's population pyramid shows a significant increase in the elderly population and in years to come, which can lead to an increase in the number of illness and disability.[1] According to the Iranian census of 2016, out of the 79 million people, 7.4 million (9.28%) of the population are the elderly.[2] It is projected that the percentage of the elderly in Iran will reach 10% by 2025 and go as high as 30% by 2050.[3] According to this prediction, by 2050, the percentage of the elderly in Iran will be higher than the average of the world and Asia, and one out of every three will be elderly.[2] Due to physiological changes that occur when age increases, the elderly suffer from various diseases more than the other age groups. Older patients are more likely to suffer from trauma than young people. In fact, trauma in the elderly is a special and important challenge due to physiological changes, such as reduced physical strength associated with age, previous diseases, mental stress, inability to repair tissue, the use of drugs, as well as economic and social problems, which can all affect the recovery and health outcomes.[4] The effect of aging, gender, nosocomial infection, injury severity score (ISS), and head injury on mortality in elderly was investigated in many studies,[5] but as far as we know, no study has evaluated the effect of these factors on the length of hospitalization.

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Several studies have declared that a longer length of stay (LOS) among trauma patients leads to hospital mortality by controlling other demographic and other hospital intervention factors.[6] In another study, it was shown that there is no relation between mortality and LOS and stated that other factors expect LOS affect hospital mortality.[7]

Considering that the traumatic factors in elderly people are different from young people, the pattern of hospitalization seems to be higher among these individuals than the young patients. Hence, it seems to be necessary to allocate specific care for this group of patient to reduce pain and disability as well as cost by determining factors that can affect the length of hospitalization. Considering the fact that Rajaee Trauma Center is a major hub for trauma in Southern Iran, the aim of this study was to identify a typology of trauma due to traffic accidents as well as other factors affecting the length of hospitalization among the elderly in 2018.

MATERIALS AND METHODS

The present study was a cross-sectional study among the elderly who were referred to Rajaee Trauma Center (Emtiaz) from October to March 2018 due to traffic injuries *via* census.

The inclusion criteria are as follows: being 65 years old or higher and alive at the time of admission by the emergency medical services.

Death on arrival and causes of trauma other than motor vehicle, pedestrian accidents, or those whose Abbreviated Injury Scale (AIS) values were not measurable, and patients with unclear type of trauma and those with very mild injuries, such as soft tissue damage and fractures, were excluded from the study.

Data gathering

Demographic data including age, gender, length of hospitalization, mechanism of injury (motor vehicle, pedestrian accidents), injured body region, patients' status at the time of discharge, severity of injury, and infection were collected. These information were collected through the hospital's health information system (HIS), as well as readings and encoding patient's clinical records. Patients' information from admission to discharge is collected in their medical documents unit by experts, based on specific code in HIS.

Each ICD-10 injury code was assigned to one of the 6 ISS body regions. According to the AIS severity scale, each patient's injured body regions have to correspond with the injured body region with the highest ISS. In this regard, all injuries received an AIS code ranging from 1 (minor injury) to 6 (an injury considered "incompatible with life"). Patients with multiple injuries were scored by adding the squares of the three highest AIS scores in three predetermined body regions. This process could range from 1 to 75.[8] ISS has been evaluated in the previous studies.[9]

Ethical consideration

This study was approved by the Local Ethics Committee of

Shiraz University of Medical Sciences, number of IR.SUMS. REC.1397.875.

Data analysis

Data were analyzed using Stata 14 software (StataCorp- 4905 Lakeway Drive, College Station, Texas 77845 USA) and figures were prepared using R 3 -.4.3 software The R software foundation for statistical computing (https://cran.r-project. org/) for Windows. Poisson regression was performed to evaluate the partial effects of each covariate on geriatric trauma hospitalization. Gender was considered as a covariate factor to adjust for bias. Two-sided $P < 0.05$ was considered to be statistically significant.

RESULTS

There were a total of 768 records with a mean age of 73.27 ± 6.88, collected from October to March 2018, of which 712 patients (92.71%) survived and 56 (7.2 9%) expired with gender distribution by a male-to-female ratio of 1.78:1. Extremities and externals (58.20%) and head and neck (18.36%) were the most commonly injured regions. The most common injury mechanisms were as follows: car and pedestrian injuries with 47.52% and 37.89%, respectively. There was a statistically significant difference in injury mechanism between survival and nonsurvival trauma patients [Table 1].

A poisson regression was performed on 65-years-old and older patients to determine the risk factors for a hospital stay in this age-group. Age, gender, ISS, injured body region, injury mechanism, and infection status are the considered variables. The most important risk factors for geriatric hospitalization are shown in Table 2. Increasing age led to 0.03 times increase in the length of hospital stay. Males were 1.15 times more prone to stay in the hospital for an extra day compared to females. All ISS categories were significantly caused by a hospital stay for an extra day. Patients with head and neck injuries were more prone to stay in the hospital for an extra day in comparison to extremities and external injuries. Pedestrian trauma patients had the highest hospital stay rate compared to car and motorcycle trauma patients.

As shown in Figure 1, the frequency of death in males increased at night and midnight. Percentage of death at 20–24 p.m. was about four times higher than at 0–8 a.m., and also the percentage of death at 16–20 p.m. in females was higher than males.
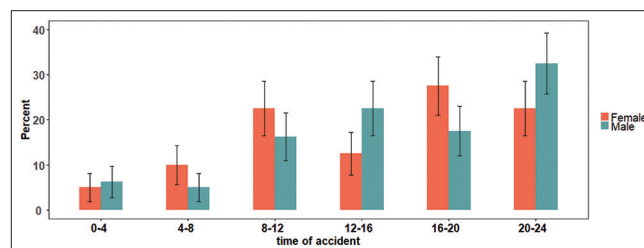

Figure 1: Frequency of death by the time of accident according to the gender

Table 1: Population characteristics (stratified by survival and nonsurvival)

Variable	Survival (712)	Nonsurvival (56)	Total	P
Gender, frequency (%)				
Male	451 (63.34)	39 (69.64)	490 (63.80)	<0.001
Female	261 (36.66)	17 (30.36)	278 (36.20)	
Injury severity score, frequency (%)				
1-3	347 (48.74)	11 (19.64)	358 (46.61)	<0.001
4-8	208 (29.21)	12 (21.43)	220 (28.64)	
9-15	74 (10.39)	9 (16.07)	83 (10.81)	
16-24	36 (5.06)	11 (19.64)	47 (6.12)	
>25	47 (6.6)	13 (23.21)	60 (7.81)	
Injured area, frequency (%)				
Head and neck	122 (17.3)	19 (33.93)	141 (18.36)	0.004
Face	67 (9.41)	0	67 (8.72)	
Chest	60 (8.43)	2 (3.57)	62 (8.07)	
Abdomen	49 (6.88)	2 (3.57)	51 (6.64)	
Extremities and external	414 (58.15)	33 (58.93)	447 (58.20)	
Injury mechanism, frequency (%)				
Car accident	340 (47.75)	25 (44.64)	365 (47.52)	<0.001
Pedestrian accident	265 (37.22)	26 (46.43)	291 (37.89)	
Motorcycle accident	107 (15.03)	5 (8.93)	112 (14.58)	
Long of hospital stay, mean±SD	3.14±4.51	7.32±7.65	3.45±4.93	<0.001
Long of hospital stay (days), frequency (%)				
1	441 (61.94)	27 (48.21)	468 (60.94)	<0.001
2-6	177 (24.86)	10 (17.86)	187 (24.35)	
7-30	83 (11.66)	11 (19.64)	94 (12.24)	
>30	11 (1.54)	8 (14.29)	19 (2.47)	

SD: Standard deviation

**Table 2: Multivariate poisson regression between the covariates and length of hospitalization**

Duration of hospitalization	Categories	Exp(β)	P	95% CI for exp(β)	
				Lower	Upper
Age	-	1.03	0.03	1	1.05
Gender	Male	1.15	0.001	1.06	1.26
ISS	1-3	Baseline			
	4-8	2.84	<0.001	2.53	3.19
	9-15	4.41	<0.001	3.89	5.01
	16-24	4.33	<0.001	3.67	5.11
	25 and more	2.00	<0.001	1.64	2.43
Injured area	Extremities and external	Baseline			
	Head and neck	1.81	<0.001	1.72	1.91
	Face	0.99	0.95	0.82	1.21
	Chest	0.96	0.63	0.81	1.13
	Abdomen	1.17	0.07	0.98	1.40
Injury mechanism	Pedestrian	baseline			
	Motor accident	0.93	0.20	0.83	1.03
	Car accident	0.80	<0.001	0.72	0.89
Infection	Yes	3.89	0.001	3.51	4.32

CI: Confidence interval, ISS: Injury severity score

Patients with head and neck and extremities and external injuries with 4.69 and 3.49, respectively, had higher hospital stay compared to patients with other types of injuries. Furthermore, face injuries had led to lower hospitalization time amongst the elderly [Figure 2].

DISCUSSION

Data analysis showed that the mean age of the elderly with trauma was 73.27 ± 6.88. The mean and standard deviation of elderly age in Jalalvandi *et al.*[10] was 70.06 ± 9.1. Moreover, our results were consistent with the results of
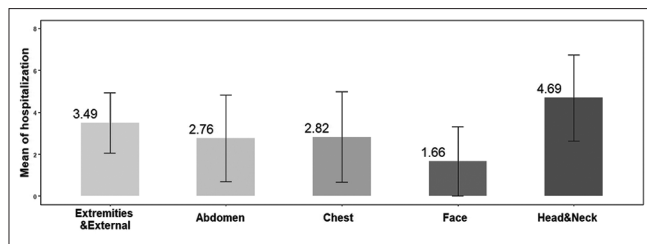
Figure 2: Mean of hospitalization based on the injured area

Tavakoli *et al.*, Hatamabadi *et al.*[11] and Hadinejad *et al.*[12] studies.

In the present study, the male-to-female ratio was not significantly different at 1.78:1. In the study by Jalalvandi *et al.*, the male-to-female ratio was 1.29.[10] In the Tavakoli *et al.*,[13] study, this ratio was 1.8. The greater the number of men can be attributed to their greater usage of motorcycle drivers.

Head injury is one of the leading causes of fatality in geriatric trauma patients.[14] Based on our results, the most common injured body regions were extremities (58.20%) and head injuries (18.36%). In Jalalvandi *et al.*,[10] upper extremities with 25.1%, and in the study by Hatamabadi *et al.*,[11] hips with 28% were the most common injured body regions among the elderly.

The average and standard deviation of hospitalization time among the elderly was 3.45 ± 4.93. The results of a study also showed that the maximum length of hospitalization was from 3 days to 1 week.[15] The length of hospitalization for about 60% of patients was <1 day, whereas <2.47% of hospitalized patients had more than 30 days of hospitalization. Meanwhile, 14.29% of the elderly patients had expired after 30 days of hospitalization. Hospitalization among adults patients by Abbasi *et al.*[9] followed a similar trend; however, the number of death after 30 days of hospitalization in geriatrics was more adult trauma patients.

Wee *et al.* in their study showed that the elderly victims had a higher rate of chest injuries and as a result higher hospitalization, which is not similar to our study. In this study, the mean duration of hospitalization for chest injuries was 2.82 days, whereas head and neck injuries had the highest length of hospital stay with more than 4 days. Patients with head and neck injuries required surgery. Moreover, this type of injury is usually associated with a decreased level of consciousness since reaching full consciousness might increase the length of hospital stay. Hence, patients with this type of injury needed more care and attention.[16]

The result of this study showed that the ISS score of about 20% is more than 9, which is similar to a study by Bull who showed that ISS among the elderly is significantly higher than under 65-year-old patients.[17]

Andersen *et al.*[18] showed that increased severity of injury contributed to excessive LOS in acute care settings, which was consistent with another survey,[19] showing a strong positive correlation between higher ISS and prolonged LOS. Moreover,

a study conducted by Böhmer *et al.* revealed that patients spent one additional day in intensive care units for every five additional points on the ISS.[20] As expected, the current study results also proved that the patients with prolonged LOS have significantly higher ISS compared to those with shorter LOS.

In the study by Hsieh *et al.*, the elderly patients with motorcycle-related trauma had higher injury severity compared to those with car-related trauma,[21] and for this reason, the rate of hospitalization duration in this group was higher than the elderly with car-related trauma. The present study found that LOS was higher in pedestrian and motorcycle accidents compared to car accident injuries. In line, a previous study conducted in Iran indicated that longer LOS was associated with being a pedestrian or motorcyclist.[22] By considering that the rate of accident in motorcycle is about 14%, it seems that awareness of geriatrics about the dangers of using a motor vehicle can help to reduce the risk of injury among them.

According to the results, most death due to accidents occurred between men at 20–24 p.m., while the peak of death was at 8–12 a.m. interval for females.

In our study, the effects of aging on hospitalization duration were evaluated. As far as we know, there has not been a study in Iran on trauma and the risk factors of hospitalization duration among the elderly. Short posttrauma follow-up period was the limitation in our study. Data might not be as accurate as a prospective study due to incomplete data, such as past medical history, not comparing the rank of trauma hospitalization considering other illnesses, and the retrospective nature of the present study. Further research should consider the quality of life and years of life lost due to death or disability when evaluating elderly trauma patients. As the Iranian population is aging, it is necessary to reduce the number of accidents and casualties among this population. In addition, using preventive measures, the country's treatment structure should also provide more facilities to treat these people. In addition, this age group requires more nursing care in hospitals.

Conclusion

The results of this study showed that age, gender, mechanism of injury (car accident), infection, type of injury (head and neck), and ISS could lead to the prolongation of LOS. Considering the site of injury, the patients with head and neck injuries had the highest mean of hospitalization. The most common cause of trauma accident among the elderly was a car accident. According to the results of this study, the increase in hospitalization was associated with increased age and ISS. It seems that due to the vulnerability of the elderly in comparison with other age groups and taking a longer time to treat patients, it seems necessary to establish a unit that can provide special care for them.

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Conflicts of interest
There are no conflicts of interest.

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