

Severe or not so severe? The gravity of geriatric trauma

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ABSTRACT

Background: Due to associated comorbidities, the elderly population is more vulnerable to injuries with complications. This study was done to assess the severity of trauma and outcome of injuries among these patients presenting to the Emergency Department (ED). **Materials and Methods:** This was a retrospective cohort study. We included all patients aged more than 60 years, who presented to the ED with trauma in the year 2018. Details of the mode of trauma, severity of injuries and outcome were analysed. **Results:** During the study period a total of 7666 trauma patients presented to ED, among which 879 (879/7666: 11.4%) were in the geriatric age group. The mean age was 68.9 (SD: 7) years with 90.8% being young-old (60–79 years) and 9.2% being old-old (>80 years). Common modes of injuries were road traffic accidents (RTA) (64%) fall on level ground (FLG) (20%) and fall from height (FFH) (8%). Most of them had Injury Severity Score (ISS) and New Injury Severity Score (NISS) score of 0–7, i.e.: 62% and 51%, respectively. On multivariate logistic regression analysis RTA, FFH FLG and triage priority 1 patients were associated with trauma in the old-old as compared to the young-old age groups significantly. Independent risk factors associated with severe trauma were seen RTA, FLG and priority 1 patients. Forty-four per cent patients were managed by the ED team alone. Trauma speciality departments referred to included orthopaedics (47%), neurosurgery (22%), trauma surgery (14%), plastic surgery (8%) and hand reconstruction surgery (6%). About half of the population under study was discharged stable (44%), of which the majority belonged to the young-old category (44.1%). The in-hospital mortality rate was 0.5% (4/879). **Conclusion:** This study shows the gravity of multiple injuries sustained by the geriatric age group with RTA, FLG and FFH being the predominant causes of trauma. The NISS highlights the severity of injuries in the old and the frail.

Keywords: Accidents, emergency department, geriatric, injury patterns, ISS, NISS, trauma

Introduction

Elderly trauma is associated with significant morbidity and mortality in developing countries and in the developed world. Emergency departments (ED) and trauma centres in the country should be prepared to cope with the ever-increasing numbers of trauma victims. After any injury, physiological response changes overtime depending on the severity of injury, but the first recorded vital signs at ED arrival are conventionally taken to describe the severity of injury.

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The geriatric age group is particularly vulnerable to the impact caused by trauma. A previous study done on the Indian geriatric population shows a prevalence of 4.9% associated with trauma. They are prone to injuries easily because of their weakened physical architecture and their inability to mount an adequate physiological response in cases of trauma. The social conditions also play a role in deciding the course of their treatment. The need for help with transport, mobility and finances is seen as one of the major factors in their prognosis.^[1,2] Therefore, knowing the profile of trauma in geriatric patients will help us to be better equipped to provide better care to this section of the population. This study aims to assess retrospectively, the profile of geriatric trauma that present to the ED. Furthermore, in this study we assessed the severity of the injuries using an internationally standardized system such as Injury Severity Score (ISS) and the New Injury Severity Score (NISS).

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We also looked at the proportion of patients requiring hospital admission and subsequent major surgical interventions.

Materials and Methods

Design

The study was a retrospective study conducted in the ED.

Setting

Our ED has 50 beds with annual case load of 75000 patients per year.

Participants

All geriatric (age > 60 years) patients with history of trauma (road traffic accidents (RTA), workplace incidents, electrical injuries, fall from height (FFH) or fall on level ground (FLG), or trauma related to assault, sports and animals), who presented to the ED between January and December 2018 were included in the study. Those between the ages of 60-79 years were considered as young old and those >80 years were considered old-old.

Exclusion criteria

Trauma patients not in the geriatric age group (<60 years), patients with missing charts or documentation and those who were brought dead to ED were excluded.

Variables

We reviewed the medical records to collect relevant details of ED triaging, history, clinical examination findings, laboratory, and radiological investigations. Further, the severity of injury in based on the anatomical scoring system and the hospital outcome of each patient were noted. Based on the patient's physiological status triaging of victims was done using standard Canadian triaging system. Triage Priority I patients included victims with compromised airway, breathing or circulation and/or with Glasgow Coma Scale (GCS) \leq 8. Victims with a stable airway, breathing and circulation were triaged as priority 2. These included patients with extremity injuries, stable thoracoabdominal injuries, and mild to moderate head injury. Victims with minor injuries without any hemodynamic instability were triaged as priority 3.

Outcome variable

The following outcome variables were documented; hospital admission, and in hospital mortality.

Laboratory test

After performing primary and secondary survey relevant blood investigations and radiological tests were done at the discretion of the treating physician.

Study size

Since we wanted to study the seasonal variation concerning the modes of injuries, all patients >60 years, presenting to ED, with trauma from January to December 2018 were included in the study.

Bias

This was a retrospective study, and, therefore, we could not control exposure or outcome assessment, and instead relied on others for accurate record keeping. History, physical examination, and decision to send investigations completely depended on the ED registrar.

Statistical analysis

The data were analysed using Statistical Package for Social Sciences (SPSS). Continuous variables were shown as mean with standard deviation (SD) and categorical variables were shown as percentages. Bivariate and multivariate logistic regression analysis were performed for factors predicting severe trauma as determined by NISS >8.

Ethical considerations

Approval was obtained from the Institution Review Board (IRB) prior to commencement of study (IRB Min no: 12222 dated 22nd August 2019).

Results

During the 1-year study period, our ED attended to 74,252 patients with 7666 (10.3%) of them presenting with trauma, of which 11.4% (879) were in the geriatric age group (>60 years). [Figure 1] The mean age was 68.9 (SD: 7) years. About 90% of our geriatric population belonged to the young-old category (60-79 years). Our study population had a male predominance (79.40%: $n = 698$). The majority (60%: $n = 530$) were priority 2 patients. About half of them (48%: $n = 423$) presented to the ED between 8 am and 5 pm.

Common modes of injuries were RTA's (64%: $n = 565$) fall on level ground (20%: $n = 183$) and fall from a height (8%: $n = 72$). [Figure 2] The severity of the injury was assessed by using internationally accredited systems such as the ISS and the NISS. The distribution of the ISS scores are as follows: ISS <4: 51.3% ($n = 451$), ISS 5-8: 12.7% ($n = 112$), ISS 9-14: 29.7% ($n = 261$) and ISS >14: 6.3% ($n = 55$). In the similar manner, the NISS scores are as follows: NISS < 4: 42.5% ($n = 374$), NISS 5-8: 12.6% ($n = 111$), NISS 9-14: 31.8% ($n = 279$) and NISS >14: 13.1% ($n = 115$).

On multivariate logistic regression analysis, RTA (adjusted OR 0.94, 95% confidence interval (CI) 0.32-2.76), $P < 0.001$), falls from height (adjusted OR 4.27, 95% CI: 1.32-13.79), $P = 0.015$), falls on level ground (adjusted OR 4.37, 95% CI: 1.49-12.78), $P = 0.007$) and triage priority 1 (adjusted OR 1.07, 95% CI: 0.59-1.94, $P < 0.05$), were associated with trauma in the old-old as compared to the young old age groups significantly. [Table 1] Similarly independent risk factors associated with severe trauma (NISS >8) were RTA (adjusted OR 0.58, 95% CI: 0.42-0.79), $P = 0.001$ and fall on level ground (adjusted OR 0.31, 95% CI: 0.19-0.47), $P < 0.001$ [Table 2].

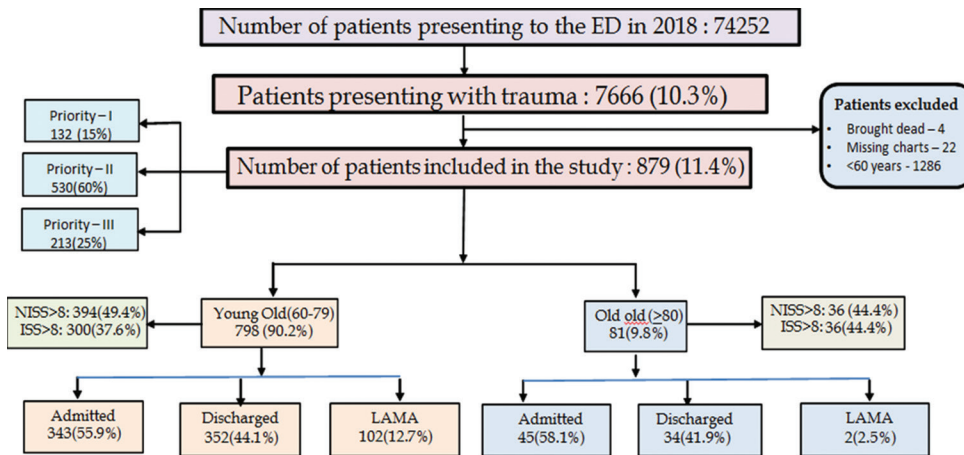


Figure 1: STROBE diagram

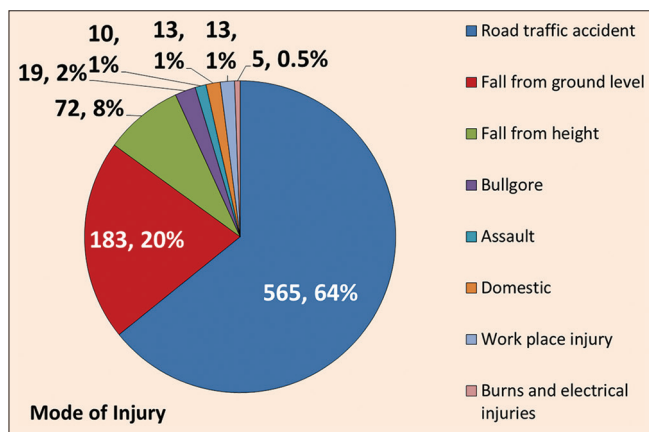


Figure 2: Modes of injury

Given the pattern of injuries seen in this set of people, we expected a significant rise in the trend during the rainy season. With this in mind, a plot of the annual rainfall (in cm) and the pattern of injuries was drawn. This did not show an increase in the number of injuries, both in the categories of falls or RTAs during the rainy season. [Figure 3]

Almost half (44%: $n = 387$) the patients were managed by the ED team alone. After initial stabilization, patients were referred to the necessary surgical specialities for further management when required. Orthopaedics (47%), Neurosurgery (22%), Plastic Surgery (8%) and Hand Surgery (6%) were the main departments involved. [Figure 4]

Patients with minor trauma were managed and discharged by the ED team after a short observation period. Patients requiring surgery or conservative management were admitted as in patients. About half of the population under study was discharged stable (44%: $n = 386$), of which the majority belonged to the young-old category (91.2%: $n = 352$). The in-hospital mortality rate was 0.5% ($n = 4$).

Discussion

Trauma is seen as an emerging problem in a developing country like India with severe, sometimes life-threatening consequences

for individuals and societies as a whole. In India, where there is still a paucity of safe medical facilities for everyone, situations like trauma pose a huge challenge for the direction of resources where a primary care physician and trained ED physicians plays a major role. This is more so realized in the context of the geriatric population, as this sector seems to be hugely impacted by the lack of knowledge for their special needs. Medical facilities are definitely on the rise and with the advent of newer technologies; the quality of life of the elderly is bound to improve. With the rising trend of the geriatric population, it was important for us to study their injury severity profile, which is different from the normal adult or the pediatric population.

Our study has a similar prevalence of trauma to that of a Chinese study done on the geriatric population in 2012 which showed that in a population aged above 60 years, which is about 14.3% of the population, they had an 8.5% prevalence of trauma.^[3] This study is also consistent with studies done in India with a trauma prevalence of 11% in the geriatric population thereby alarming the primary care physicians.^[2,4] Our study also shows a similar prevalence of road traffic accidents as compared to a study done in Ontario, with the prevalence of road traffic accidents being 65% in men and 34% in women.^[5] As expected, in this study more women had suffered from falls either from the level ground or from height while more men were involved in RTA. This prevalence is consistent with the fact that in the Indian context, the elderly women tend to stay mostly at home and suffer from multiple comorbidities resulting in poly-pharmacy and its various side effects, whereas most men in the young-old age group seem to be quite independent for their transport needs. According to the literature, most of these trivial falls associated with long bone injuries are seen in women in the post-menopausal age group, suffering from osteoporosis, bony resorption due to malignancies and general debility of the physical architecture. In our study, more than half of the cases of trauma was due to road traffic injuries followed by a fifth of them with fall on level ground and a small percentage of them falling from a height. This could be explained by the fact that the majority of the population that was studied belonged to the young-old category and males, who were

Table 1: Bivariate and multivariate logistic regression analysis of the young old (60-79 years) and the old old (>80 years) age groups

Mode of injury	Old old (n- 81)	Young old (n-798)	P	Unadjusted OR (95%CI)	P	Adjusted OR (95%CI)
RTA*	27 (33.3%)	521 (65.3%)	<0.001	0.27 (0.16-0.43)	0.91	0.94 (0.32-2.76)
Fall from height	14 (17.3%)	58 (7.3%)	<0.05	2.67 (1.41-5.03)	0.015	4.27 (1.32-13.79)
Fall on level ground	36 (44%)	147 (18.4%)	<0.05	3.54 (2.20-5.68)	0.007	4.37 (1.49-12.78)
Priority 1	19 (23.5%)	112 (14%)	<0.05	1.88 (1.08-3.26)	0.81	1.07 (0.59-1.94)
Fracture	38 (46.9%)	350 (45.2%)	0.76	1.07 (0.67-1.69)	-	-
Head injury	20 (24.7%)	131 (16.4%)	0.06	1.67 (0.97-2.86)	-	-
Face injury	19 (23.5%)	156 (19.5%)	0.40	1.26 (0.73-2.17)	-	-
Extremity injury	43 (53.1%)	482 (60.6%)	0.19	0.74 (0.47-1.17)	-	-
ISS >8	36 (44.4%)	300 (37.6%)	0.23	1.33 (0.84-2.11)	-	-
NISS >8	36 (44.4%)	394 (49.4%)	0.40	0.82 (0.52-1.30)	-	-

RTA* - Road traffic accidents

Table 2: Bivariate and multivariate logistic regression analysis to identify the factors associated with severe trauma (NISS >8)

Variable	NISS >8 (n- 430)	NISS <8 (n- 449)	P	Unadjusted OR (95%CI)	P	Adjusted OR (95%CI)
Old old	36 (8.4%)	45 (10%)	0.398	0.82 (0.52-1.3)	-	-
RTA*	246 (57.2%)	302 (67.3%)	<0.05	0.65 (0.50-0.86)	0.001	0.58 (0.42-0.79)
Fall from height	46 (10.7%)	26 (5.8%)	<0.05	1.95 (1.18-3.21)	0.02	1.97 (1.11-3.48)
Fall on level ground	94 (21.9%)	89 (19.8%)	0.457	1.13 (0.82-1.57)	<0.001	0.31 (0.19-0.47)
Pedestrian	45 (10.5%)	61 (13.6%)	0.156	0.74 (0.49-1.12)	-	-
Two-wheeler	265 (61.6%)	261 (58.1%)	0.290	1.16 (0.88-1.51)	-	-
Auto	5 (1.2%)	11 (2.4%)	0.154	0.47 (0.16-1.36)	-	-
Priority 1	32 (9.8%)	89 (19.8%)	<0.05	0.44 (0.30-0.65)	-	-
Blood alcohol content positive	22 (5.1%)	14 (3.1%)	0.135	1.68 (0.85-3.32)	-	-
Male sex	283 (47.5%)	313 (69.7%)	0.21	0.84 (0.63-1.11)	-	-

RTA* - Road Traffic Accident

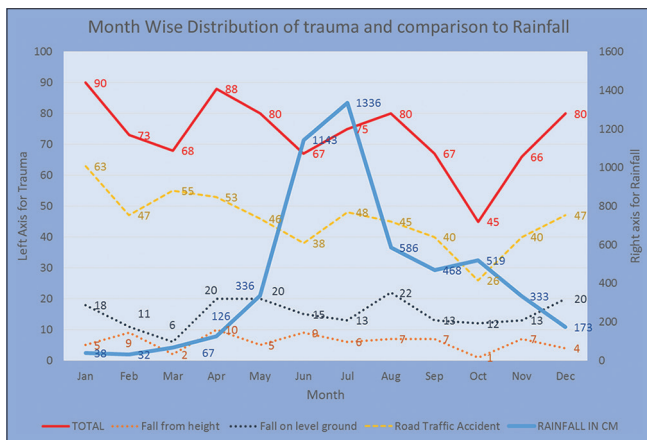


Figure 3: Seasonal variation concerning rainfall and mode of injury

able to move around using vehicles. Failing vision and postural difficulties could be a suitable explanation for the road traffic accidents among the men in this age group. Increasing crowds on the roads with absolute disregard to traffic regulations such as safety measures or following the traffic lights provide a recipe for disaster in the case of RTAs. Usage of glaring, high-intensity headlights while travelling also contributes to this woe.

We postulated an increase in the trend of falls and RTAs during the rainy seasons knowing that the roads are covered with potholes and skidding of vehicles is a common occurrence during

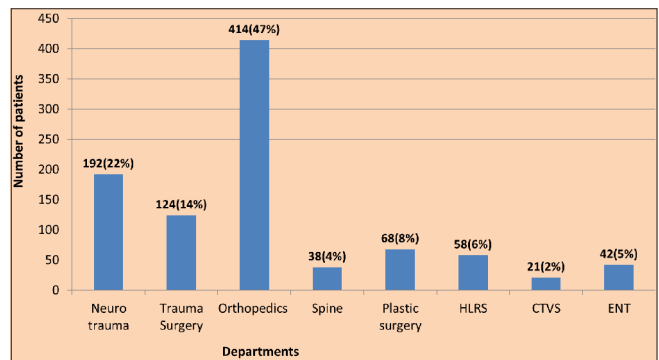


Figure 4: Departments involved in the management of patients in ED and admission

this season. But, we could not find any significant increase in the rate of falls or RTAs during this season. This could either be due to extreme precautions taken by this age group during this season or due to under-reporting of cases due to social limitations.

Studies from the developed countries showed hypothermia, falls, cardiovascular emergencies to be major causes of geriatric trauma.^[5,6] These are consistent with the description of the geriatric giants namely instability, incontinence, immobility and impaired memory/intellect. These conditions are the harbingers of falls leading to hip fractures, depression and delirium followed by periods of inactivity leading to high morbidity situations.^[7] About half of the population in this study had ISS and NISS scores of <8 (non-severe

injuries), which shows that despite being in the lower end on the severity scores, the patients did suffer complications of the injury, which reiterates the fact that their needs are different and they require special care even for low impact injuries.

The analysis was done using the ISS and the NISS system which is based on an anatomical grading system known as the AIS.^[8,9] Consistent with a study from our centre, only a few patients presented with an ISS score of >8, which is considered severe. In comparison with the NISS scores, about half of them were seen to have a score >8 considered as severe injury in cases of RTA and falls either from height or on level ground. This was probably because of multiple long bone injuries seen usually in the geriatric population. This states the fact that the NISS has a better probability of identifying multiple severe injuries.^[10-12]

In large tertiary centres like ours, triaging were done by trained ED nurse aide by a ED physician and after initial stabilization were referred to the concerned specialities for specific care. Almost half the cases were managed by ED the physicians, with orthopedics been the second most involved department. This was closely followed by neurosurgery since traumatic brain injuries and head injuries were the most common presentations which were similar to other studies.

Conclusion

Our study shows the gravity of multiple injuries sustained by the geriatric age group with RTAs and falls on the level ground being the predominant causes of trauma. The NISS highlights the anatomical severity of injuries in the old and the frail presenting with trauma to the ED. Increasing awareness, adequate training of the first responders and physicians about prevention and early management of geriatric trauma is the need of the hour.

Key points

- Road traffic accidents and fall on the level ground are predominant mode of injuries in the geriatric population
- Statistical analysis showed road traffic accidents, falls from height or on level ground and triage priority 1 patients were associated with trauma in the old-old as compared to the young-old age groups.
- Risk factors associated with severe trauma (NISS >8) includes fall from height and road traffic accidents
- Our study showed no significant seasonal variation associated with these traumas.

Research quality and ethics statement

The authors of this manuscript declare that this scientific work complies with reporting quality, formatting and reproducibility

guidelines set forth by the EQUATOR Network. The authors also attest that this clinical investigation was determined to require Institutional Review Board/Ethics Committee review, and the corresponding protocol/approval number is IRB Min no: 12222 dated 22 August 2019. We also certify that we have not plagiarized the contents in this submission and have done a Plagiarism Check.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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