

DISCUSSION

The demand of studying characteristics of elderly patients is dominated by the rapid growth in the aging population and the limited studies applied on them. ⁽¹¹⁾

Conventionally, “elderly” has been defined as a chronological age of 65 years old or older. ⁽¹²⁾

Elderly people are less likely to be injured than younger people. However, elderly people are different in that they more likely to have more complications, higher mortality, longer lengths of hospital stay and poorer outcomes because they often have pre-existing chronic medical conditions and decreased physical reserves. ⁽¹⁸⁾

Falls remain the leading cause of trauma in the elderly. They are responsible for the majority of accidental deaths in persons 75 years of age and older; followed by traffic accidents. Other forms of injuries, such as burns and scalds are also important. ^(39, 40) Although accidental injuries have been known to take the upper hand among all traumatic injuries experienced by elderly populations, yet non accidental injuries have become quite common in the last few years. ⁽⁸²⁾

The present study aimed to study the characteristics, incidence, pattern, risk factors, severity, prognosis and outcome of injuries among elderly patients aged 65 years and more who were admitted to the Emergency Department of Alexandria Main University Hospital during the period from the first of July till the end of December 2013.

A total number of 104 elderly patients were admitted to the ED representing 1.96 % of the total admissions of trauma patients from all age groups. This number was representative only for elderly trauma admissions to the ED of Alexandria Main University Hospital during a 6th month period, so this prospective study couldn't evaluate elderly trauma admissions to all Alexandria governmental hospitals, and thus excluding an important hospital like El-Hadra Orthopedic Hospital which, in a retrospective study by Salem et al., (1994) ⁽¹⁴¹⁾, received about 50.2% of elderly trauma patients (2101 patients) admitted to all governmental hospitals in Alexandria during a one year period.

I. Demographic data:

Age:

Age of the studied patients ranged from 65 to 90 years old with a mean age of 72.15 $\pm$ 7.0 years.

The accepted starting age in the current study was 65 years old, and this is quite similar to the majority of recent studies on elderly populations that is based on the international accepted definition of an elderly person as any person who is 65 years old and more. ^(142, 143)

The situation in Egypt was a little bit different before. Salem et al., (1994) ⁽¹⁴¹⁾ studied injuries in Egyptian elderly patients aged 60 years old and more as they considered the age of retirement is the accepted cut off value for defining an elder person.

Life expectancy at age 65 years is a better reflection of the success of a nation in the aging process. In the developed world, life expectancy is relatively increased for both genders (above 75 years for the United States and close to 80 years for Japan). The Arab countries show wide variations in their life expectancy ranging from as high as 75 years in Kuwait to 63.9 years in Egypt and as low as 50.4 years in Yemen. ⁽¹⁴⁴⁾

The highest percentage of elderly patients in the present study was in the age group 65-70 years (53.8%). This can be explained by the fact that this age group is more physically active when compared to the other older age groups.

Sex:

There was male predominance (53.8%) while females represented (46.2%) with a ratio 1.67:1. This might reflect the fact that elderly men are engaging in a more risky behavior and sustain more severe injuries that require ED visits and subsequent hospitalization. This coincides with the results reported by Adam et al., (2008) ⁽⁴⁰⁾ who studied the epidemiology of geriatric injuries in United Arab Emirates (UAE) where there were 121 patients of whom 70 patients were males and the other 51 were females.

Marital status:

The present study showed that 56.7% of patients were married, while 40.4% of them were widows. Being a widow, especially elderly people who had to live alone, may predispose them to increasing risk of accidental injuries at home.

Smoking:

The majority of patients (65.4%) were non-smokers and only 34.6% were smokers. Smoking till these old ages may indirectly affect the outcome of elderly injuries as it badly affects the general health and well-being of those patients by further reducing their physiological respiratory reserve.

Residency:

58 patients (55.8%) were from urban residency, while 46 (44.2%) of them were from rural areas. The number of patients from urban areas is a little bit closer to those patients coming from rural areas and this may be due to the fact that Alexandria main university hospitals receive and provide medical care for patients from Alexandria governorate and many rural areas around it.

History of chronic illness:

In the present study, nearly one third of the patients (32.7%) have diabetes mellitus (DM), history of hypertension in 33.7% of patients, 12.5% have cardiac disease, while nearly one third of patients (32.7%) had no history of chronic illness. In a study in Los Angeles, United States; Gelbard et al., (2014) ⁽¹⁴⁵⁾ reported that 72.5% of patients who were admitted with fall-related injuries, had one or more co-morbidities, with hypertension and diabetes mellitus being the most common.

The presence of one or more chronic illness with the subsequent recommended medications in an elder definitely adversely affects his or her reliability for injury and also

the final outcome of their injuries. Chang et al., (2008) ⁽¹⁴⁶⁾ reviewed pre-existing medical conditions (PMC) as important predictive factors for mortality and reported that elderly trauma patients with PMC showed increased mortality when compared with those without PMC. On the contrary, Chiang et al., (2012) ⁽¹⁴⁷⁾ noted that the effect of PMC becomes less important in patients above 65 years old, perhaps, because at this age, chronological age becomes the predominant predictor of mortality.

History of previous injury:

In the current study, the majority of elderly patients (82.7%) had no previous injuries, 11 patients (10.6%) had previous accidents, six patients (5.8%) were previously assaulted, and only one victim (1%) attempted suicide.

Disability for daily activities:

In the present study, 91 patients (87.5%) had no disability for daily activities while only 13 patients (12.5%) had some degree of disability before getting injured. This finding was in agreement with a study done by Oreskovich et al., (1984) ⁽¹⁴⁸⁾ who noted that 96% of the patients were independent at time of injury and they managed their daily activities without professional assistance and the other 4% of patients required nursing assistance. In another study about determinants of disability among elderly population in rural Minia, Egypt, Mahfouz et al., (2007) ⁽¹⁴⁹⁾ reported that nearly 10% of the studied participants suffered from disability with variable levels of severity and that the most common causes of disability were diabetes mellitus (22%), osteoarthritis and fracture (20%), followed by chronic obstructive pulmonary diseases (16%), eye problems (8%) and cardiovascular diseases (6%).

II. Data related to the injury:

The highest percentage of admission (21.2 %) was during October followed by September and December (18.3% each).

As regards the place of injury, 60.6% of the studied patients were injured outdoors, while 39.4% were injured indoors. The majority of Outdoor injuries were attributed to accidental falls during walking, road traffic accidents, and a minority following interpersonal violence. Indoor injuries probably involve accidental falls, burns and scalds or may be attributed to domestic violence. The same results were reported by Salem et al (1994). ⁽¹⁴¹⁾

More than two thirds of studied cases (80.8%) were injured accidentally, while the remaining (19.2%) were intentionally injured (assaulted except for only one patient who attempted suicide). The accidental injury was mainly either due to falls, motor vehicle accidents or even burn and scalds while serious assaults were caused by firearms and stabs (not to forget that this was in the era of riots and political conflicts). Salem et al ⁽¹⁴¹⁾ (1994) also reported that the majority of injuries (77.0%) were accidental while assaults represented 21.0% and attempted suicide was found in 2 female patients only. Physical elder abuse may be a hidden form of assaults among elderly people. In a study by Rahman et al., (2012) ⁽¹⁵⁰⁾ about elder mistreatment in a rural area in Egypt, it was reported physical abuse was detected in 5.7% of 1106 elderly participants.

Falls (either falling down or downstairs or from height) definitely took the upper hand (46.8%) in causing elderly injuries followed by motor vehicle accidents (30.8%). Several studies reported results nearer to those of the current study. ^(38, 40, 141, 146, 147)

The overwhelming incidence of falls the elderly population suggests that it is this area that should be the primary focus of preventive strategies for the reduction of traumatic injuries in this population. Recent guidance on falls prevention suggests multi-factorial fall risk assessment for elderly patients with unsteady gait or history of fall including evaluation for muscle weakness, balance problems and postural changes in blood pressure. The use of adaptive equipment or mobility aids, rationalization of medications, cataract treatment, vitamin D supplementation and environmental evaluation of home circumstances can be helpful. ^(38, 48)

Other causes of injuries were hitting by a blunt instrument (8.3%) as a result of an assault, scalds (4.8%), firearms and dry flame (3.8% for each), stabs and cuts (1.9% each).

The most commonly injured sites were lower limbs (50%), upper limbs (42.3%) and head (41.3%) respectively. The least frequently injured sites were pelvis (4.8%) and neck (1.9%) respectively. This is probably related to the underlying cause of injury as falls were the major cause of lower and upper limb injuries, while head and chest injuries were commonly encountered among motor vehicle accidents' victims.

These results were in agreement with the results reported by Adam et al., (2008) ⁽⁴⁰⁾. On the contrary, Salem et al., (1994) ⁽¹⁴¹⁾ reported that the main site of injury was the head, followed by the extremities, chest and abdomen.

Different injuries were encountered in the studied patients; contusions occurred in 48.1% of patients, followed by fractures and contused wounds (40.4% and 38.5% respectively), internal injury (34.8%) and the least observed type of injury was stab and cut wounds (1.9% each).

Salem et al., (1994) ⁽¹⁴¹⁾ reported that fractures were the main type of injury among elderly (63.0%) and osteoporosis was one of the main predisposing factors for fractures. The second type of injury encountered in their study was abrasions and contusions (17.0%). Also, Adam et al., (2008) ⁽⁴⁰⁾ stated also that fractured neck of femur was the most common injury after falling down in their study and this could be attributed to osteoporotic changes in old age.

III. The Trauma score-Injury Severity Score (TRISS):

The TRISS method offers a standard approach for evaluating outcome of trauma care. Anatomic, physiologic, and age characteristics are used to quantify probability of survival as related to severity of injury. ^(121, 140)

TRISS determines the probability of survival (Ps) of a patient from the given values of; Injury Severity Score (ISS), Revised Trauma Score (RTS), patient's age and, type of injury (blunt or penetrating). ^(137, 139)

In the present study, the probability of survival (Ps) calculated with TRISS ranged from 0.3% to 99.7% with a mean value of 89.41 ± 25.71 .

Patients in the age group (65 - 70 years) had the highest mean value of Ps calculated with TRISS (94.27±16.12) and advanced age groups in the present study showed lower mean values of Ps. However, there was no statistically significant relation between the Ps calculated with TRISS and age. This can be explained by the physiological deterioration of the brain functions with aging giving lower GCS scores which will decrease eventually the values of Ps calculated with TRISS. O'Neill et al., (2012) ⁽³⁸⁾ gave the same explanation in a population based study in Scotland about the mortality associated with traumatic injuries in the elderly.

The highest mean value of the Ps calculated with TRISS was noticed with injuries of upper limbs (91.06%), followed by lower limbs and back injuries (83.76% and 83.79% respectively) while the lowest mean values were noticed with neck and pelvis injuries (51.5% and 45.84% respectively). There was no statistically significant relation between Ps measured by TRISS values and the site of injury. Pelvic injuries are commonly associated with tremendous morbidity and mortality in polytrauma elderly patients as pelvic fractures are more likely to cause hemorrhage.

The highest mean values of the Ps calculated with TRISS were associated with cut wounds, scalds, and stab wounds (99.55%, 99.5%, and 99.4% respectively) while the lowest mean value was encountered with victims of burns (41.5%). There was a statistically significant relation between TRISS values and the type of injury. Burns are usually associated with high morbidity and mortality based on many factors and the most important are total body surface area (TBSA) burned, percent full-thickness burn, and smoke inhalation injury.

IV. Investigations:

Laboratory investigations that were routinely applied to these patients included; complete blood count, arterial blood gases, renal function tests, liver function tests and random blood sugar. Some deterioration in kidney and liver functions was noticed in the majority of patients as a normal finding in the aged people.

Radiological investigations (X-ray, CT, ultrasound, etc.) were applied depending on the injured site. Findings were helpful in accurate assessment of injuries especially fractures, hemorrhages and internal organ involvement.

V. Treatment received:

As regards the treatment offered to those patients after admission; 57 patients (54.8%) were treated conservatively while 45 of patients (43.3%) were undergone operative treatment. Only 2 patients (1.9%) didn't complete their treatment as they escaped against medical advice.

O'Neill et al., (2012) ⁽³⁸⁾ also gave quite similar results as elderly patients were more often managed non-operatively (53.9%). If an operation was required in the elderly population, it was most commonly an orthopedic procedure (43.6% of all operations in the elderly) and less commonly a neurosurgical intervention (0.4%) or laparotomy (0.4%).

VI. Duration of hospital stay:

The duration of hospital stay in the present study ranged from one day to 10 days with a mean of 1.68 ± 1.48 days. There was negative statistical correlation between Ps measured by TRISS and duration of hospital stay. This short duration of hospital stay can be due to the high rate of referral to other hospitals (El-hadara Orthopedic Hospital) or rapid improvement in patients with trivial injuries.

According to Chiang et al., (2012) ⁽¹⁴⁷⁾ the duration of hospitalization was significantly higher among elderly patients (12.7 ± 13.6 days) and the reason behind that is the development of complications in those patients with ultimately low value of Ps. Similar results were given by Adam et al., (2008).⁽⁴⁰⁾

In the present study, there was no statistically significant relation between the duration of hospital stay and either the age of the patient or even the site of injury.

A significant relation between the duration of hospital stay and the type of injury was found as the longest mean duration of hospital stay was noticed with crush wounds (5.33 ± 4.51 days). This can be attributed to the needed long term medical care and interventions for treatment of complications.

VII. Outcome:

About half of the studied patients improved (49%), 26% were referred to other hospitals (El-hadara), 10.6% developed complications, 12.5% died, and 1.9% with unknown outcome (didn't complete their treatment).

Chiang et al., (2012) ⁽¹⁴⁶⁾ reported an overall mortality rate 4.0% among elderly patients while O'Neil et al., (2012) ⁽³⁸⁾ found that the absolute mortality in elderly trauma patients was (9.9%). The in-hospital mortality in United Arab Emirates (UAE) was 6% as given by Adam et al., (2008) ⁽⁴⁰⁾.

In the current study, the highest percentage of improved patients (58.8%) were in the age group 65 – 70 years similar to the patients who were referred to other hospitals (51.9%), and patients who developed complications (63.6%). On the other hand, the highest percentage of patients who died (46.2%) was in an older age group 71 – 75 years. This may be due to the dramatic effect of aging on the response to traumatic injuries. There was no statistically significant relation between the age of the patient and outcome of trauma.

In a systematic review and meta-analysis study about the predictors of mortality in geriatric trauma patients, Hashmi et al., (2014) ⁽¹³⁴⁾ reported that trauma patients older than 74 years had twice the risk of mortality, as compared with those 65 years to 74 years old.

In the present study, 69.2% of patients who died and 81.8% of patients who developed complications were suffering from an internal injury (intracranial hemorrhage, pelvic hematoma, spinal cord injury, etc.), while fractures were found in the highest percentage of patients referred to other hospitals (El-Hadara Orthopedic Hospital) (92.6%) to perform the recommended orthopedic surgical operations for their fractures. Contused wounds were found in a high percentage of improved patients (47.1%) who were simply sutured and discharged.

In the present study, Head was the main site of injury in about 72.7% of patients who developed complications and in 69.2% of patients who died. Meanwhile, lower limbs were the main site of injury in 85.2% of patients who were referred to other hospitals (El-Hadara Orthopedic Hospital) for management of their fractures. 52.9% of improved patients were predominantly injured in the Upper limbs.

A number of anatomical changes occur to the brain with aging, namely a decrease in weight and size, stretch bridging vessels over the surface of the brain, which when combined with the significant age related decline in cerebrovascular autoregulation, results in a much worse prognosis in the elderly following head injury. ⁽³⁸⁾

There was a statistically significant relation between Ps measured by TRISS and outcome of trauma as patients who died had the lowest mean value of Ps measured by TRISS (29.95%), while improved patients, patients who were referred either to other hospitals, and those who developed complications had the highest mean values of Ps (99.56%, 95.0%, and 97.04% respectively). So, TRISS represented a valuable tool for prediction of mortality of elderly trauma patients.

Duration of hospital stay in elderly trauma patients in the current study was largely dependent on the outcome. In the current study, there was a statistically significant relation between the duration of hospital stay and outcome of trauma. Similar to the results encountered by Chiang et al., (2012) ⁽¹⁴⁶⁾, patients who developed complications had the highest mean value of duration of hospital stay (3.82 days) followed by patients who died (2.31 days), then patients referred to the other hospitals (1.37 days) and improved patients (1.25 days).

SUMMARY

Elderly injuries have become nowadays the scope of many studies worldwide. The demand of studying characteristics of elderly patients is dominated by the rapid growth in the aging population and the limited studies applied on them.

Conventionally, “elderly” has been defined as a chronological age of 65 years old or older.

Trauma is the fifth leading cause of death in persons more than 65 years of age. The elderly suffer the same types of injury as younger patients but with more complications, higher mortality, longer lengths of hospital stay and poorer outcomes.

The present study aimed to study the characteristics, incidence, pattern, risk factors, severity, prognosis and outcome of injuries among elderly trauma patients aged 65 years and more who were admitted to the Emergency Department of Alexandria Main University Hospital during the period from the first of July till the end of December 2013.

A total number of 104 elderly patients were admitted to the ED representing 1.96 % of the total admissions of trauma patients from all age groups.

This study revealed the following results:

Age of the patients ranged from 65 to 90 years old with a mean age of 72.15 ± 7.0 years. The highest percentage of patients was in the age group 65-70 (53.8%). There was male predominance (53.8%) while females represented (46.2%) with a ratio 1.67:1.

Nearly one third of the patients (32.7%) have diabetes mellitus (DM). History of hypertension was given by another one third of patients (33.7%), 12.5% have cardiac disease, while nearly one third of patients (32.7%) had no history of chronic illness.

The majority of patients (82.7%) had no previous injuries, 11 patients (10.6%) had previous accidents, six patients (5.8%) were previously assaulted, and only one victim (1%) attempted suicide.

Ninety one elderly patients (87.5%) had no disability for daily activities while only 13 patients (12.5%) had some degree of disability before getting injured.

The highest percentage of admission (21.2 %) was on October followed by September and December (18.3% each). Outdoor injuries were encountered in 60.6% of patients, while 39.4% of them were injured indoors.

More than two thirds of studied cases (80.8%) were injured accidentally, while the remaining (19.2%) were non-accidentally injured (assaulted except for only one patient who attempted suicide).

Falls took the upper hand (46.8%) in causing elderly injuries followed by motor vehicle accidents (30.8%). Other causes were hitting by a blunt instrument (8.3%), scalds (4.8%), firearms and dry flame (3.8% for each), stabs and cuts (1.9% each).

Summary

The most commonly injured sites were lower limbs (50%), upper limbs (42.3%) and head (41.3%). The least frequently injured sites were pelvis (4.8%) and neck (1.9%).

Contusions encountered in 48.1% of patients, followed by fractures and contused wounds (40.4% and 38.5% respectively), internal injury (34.8%) and the least observed type of injury was stab and cut wounds (1.9% each).

The probability of survival (Ps) calculated with TRISS in those patients ranged from 0.3% to 99.7% with a mean value of 89.41 ± 25.71 .

Patients in the age group (65 - 70 years) had the highest mean value of Ps calculated with TRISS (94.27 ± 16.12). However, there was no statistically significant relation between Ps calculated with TRISS and age.

The highest mean value of Ps calculated with TRISS was noticed with injuries of upper limbs (91.06%), followed by lower limbs and back injuries (83.76% and 83.79% respectively) while the lowest mean values were noticed with neck and pelvis injuries (51.5% and 45.84% respectively). Yet, there was no statistically significant relation between Ps calculated by TRISS and site of injury.

The highest mean value of Ps calculated with TRISS was associated with cut wounds, scalds, and stab wounds (99.55%, 99.5%, and 99.4% respectively) while victims of burns had the lowest mean value (41.5%). There was a statistically significant relation between TRISS values and the type of injury.

Laboratory investigations that were routinely applied to these patients included; complete blood count, arterial blood gases, renal function tests, liver function tests and random blood sugar. Radiological investigations (X-ray, CT, and ultrasound) were applied depending on the injured site.

As regards the treatment offered to those patients after admission; 57 patients (54.8%) were treated conservatively while 45 of patients (43.3%) were undergone operative treatment. Only 2 patients (1.9%) didn't complete their treatment as they escaped against medical advice.

The duration of hospital stay ranged from one day to 10 days with a mean of 1.68 ± 1.48 . There was no statistically significant relation between the duration of hospital stay and either the age of the patient or even the site of injury. Yet, there was negative statistical correlation between measured by TRISS and duration of hospital stay.

A significant relation between the duration of hospital stay and the type of injury was found and the longest mean duration of hospital stay was noticed with crush wounds (5.33 ± 4.51 days).

About half of the studied patients improved (49%), 26% were referred to other hospitals, 10.6% developed complications, 12.5% died, and 1.9% with unknown outcome (didn't complete their treatment as they escaped against medical advice).

The highest percentage of improved patients (58.8%) were in the age group 65 – 70 years similar to the patients who were referred to the ICU and other hospitals (51.9%), and patients who developed complications (63.6%). On the other hand, the highest percentage

of patients who died (46.2%) was in the age group 71 – 75 years. There was no statistically significant relation between the age of the patient and outcome of trauma.

About 69.2% of patients who died and 81.8% of patients who developed complications were suffering from an internal injury, while fractures were found in 92.6% of patients who were referred to other hospitals. Contused wounds and contusions were found in a high percentage of improved patients (47.1% and 33.3% respectively).

Head was the main site of injury in patients who developed complications (72.7%). Patients who died were mainly injured in the lower limbs followed by the head (76.9% and 69.2% respectively). Also, lower limbs were the main site of injury in patients who were referred to other hospitals (85.2%), while the upper limbs were the main site of injury in 52.9% of improved patients.

There was a statistically significant relation between Ps measured by TRISS and outcome of trauma. Patients who died had the lowest mean value of Ps measured by TRISS (29.95%), while improved patients, patients who were referred to other hospitals, and those who developed complications had the highest mean values of Ps (99.56%, 95.0%, and 97.04% respectively).

There was also a statistically significant relation between the duration of hospital stay and outcome. Patients who developed complications had the highest mean value of duration of hospital stay (3.82 days) followed by patients who died, then patients referred to the other hospitals (1.37 days) and improved patients (1.25 days).

CONCLUSIONS

From the results of the present study, it was concluded that:

- The highest percentage of elderly injured patients was in the age group 65-70 years 'early elderly' (53.8%) and males outnumbered females with a ratio 1.67:1.
- Most of the injured elderly patients suffered from pre-existing medical conditions (PMCs).
- The presence of disability for daily activities in the elderly may be considered an important risk factor for occurrence of injury.
- Less than two thirds of elderly patients (60.6%) sustained outdoor injuries.
- Accidental injuries were found to take the upper hand (80.8%) among all traumatic injuries experienced by elderly patients.
- Falls remain the leading cause of trauma in the elderly followed by motor vehicle accidents.
- The most commonly injured sites were the extremities and the head.
- Blunt injuries in the form of contusions, fractures and contused wounds were the most commonly encountered types of injury in the elderly.
- The highest mean value of Ps calculated with TRISS was encountered in the age group (65-70 years) i.e in the early elderly.
- The Ps of victims of burns was the lowest when compared with victims with other types of injury.
- Death was the outcome in 12.5% of the patients, of whom 69.2% suffered from internal injury.
- TRISS represented a valuable tool for prediction of mortality of elderly trauma patients.
- The longest duration of hospital stay was highly detected with patients who developed complications.
- Risk factors for the occurrence of elderly injuries were found to be:
 1. Age, especially those who were early elderly.
 2. The presence of pre-existing medical conditions (PMCs) together with the use of recommended medications for treatment.
 3. The presence of disability for daily activities before the onset of injury.