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Original Article

Comparison of injury patterns in road traffic accidents for elderly and very elderly trauma patients in Malaysia

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ABSTRACT

Objectives: To examine the difference in injury patterns between elderly (aged 60-74 years) and very elderly (aged 75 years and above) groups from road traffic accidents.

Methods: A total of 362 geriatric patients (aged 60 years and above) with major trauma following road traffic accidents in Malaysia extracted from the National Trauma Database (NTrD) from 2007 to 2011 were included in this study.

Results: Median age of the geriatric patients was found to be 67 years, with majority male patients (85%), of Malay ethnicity (48%) and sustained blunt injury (99.7%). Most of them had low injury severity, hemodynamically stable and more than half sustained injuries to head and neck region (54.7%). Very elderly group had significantly higher mortality rate than elderly group (P <0.001) with the increase in odds of mortality persisted even after adjustment for physiological status and injury severity (Odds Ratio, OR: 2.75, 95% Confidence Interval, CI: 1.51-5.05, P=0.001).

Conclusions: Injury patterns from road traffic accidents and its associated fatalities involving older people had emerged to be public safety concerns in Malaysia. Findings suggested extra attention was recommended especially in the care of very elderly patients.

Author contributions: WSC and SWHL conducted literature search, designed the study, seek permission from the National Trauma Database (NTrD) in Malaysia to utilise data for this study and obtained approval from the Monash University Human Research Ethic Committee (MUHREC) to proceed with the study. BHA conducted additional literature search and performed statistical analysis for the study. BHA, WSC, SWHL and SJ interpreted analysis results and finalised the manuscript. All authors commented on drafts of the manuscript. All authors read and approved the final manuscript.

INTRODUCTION

Trauma has emerged to become an important field which had triggered great awareness, as it has now been regarded as one of the major causes of death worldwide.[1] Injuries from road traffic accidents claim approximately 3,500 lives each day, and have been steadily increasing over the past decade. Malaysia, situated in the Association of Southeast Asian Nations (ASEAN), has the highest road traffic accident fatalities per 100,000 population.[2] According to Malaysian Institute of Road Safety Research (MIROS), total number of road accidents had increased approximately 15% from 2010 to 2013.[3]

While trauma has been traditionally associated with the younger and more active population, trauma care was overlooked as an important issue in geriatric population. Advancement in medical and health care sector and current trends toward healthier living had led to longevity gain, which predisposed the geriatric population to an increased risk of trauma. Therefore, this geriatric population was more likely to face adverse outcomes than the younger population.[4] It was projected by the World Health Organization that the number of older people (aged 60 years and above) will double from 11% in year 2006 to 22% in year 2050. By year 2050, more than 80% of older people in the world will reside in the developing countries, with most of them in Asian countries.[5] Malaysia, a developing country, is expected to achieve an aging nation status by year 2030 with approximately 15% geriatric population.[6]

The rapid greying of populations had raised two major concerns including, the increasing number of older drivers and the associated post-trauma fatalities. Headlines about road accidents involving elderly drivers had raised public safety concerns and high mortality rate reported for very elderly group revealed many older drivers continued to drive despite knowing the risk that they may not only pose to themselves but also others.[7-9] Currently, trauma has been regarded as the fifth leading cause of mortality in the elderly. Elderly aged 60 years and above represented approximately 16% of global RTA deaths with the highest

death rate per 100,000 population.[10] A recent published road safety annual report revealed the road fatalities for Malaysian drivers aged at least 65 years old was 11%, 8%, 9%, 10% and 9% respectively from 2010 to 2014.[11]

Descriptions of injuries and recovery characteristics among geriatric trauma patients were limited, resulting in the lack of targeted preventive measures and interventions.[12] Despite myriad of awareness programmes and safety measures had been implemented over the years, drop in overall trauma cases was observed for younger patients compared to geriatric patients. This has clearly indicated the current preventive measures had little impact on geriatric patients.[13,14] This could be potentially due to lack of understanding of injury mechanism involving geriatric patients.[15]

Past studies conducted in Malaysia concentrated on facial trauma involving younger patients to elderly patients.[16,17,18,19,20] Unfortunately, none of these studies had provided a full picture of road traffic accident involving geriatric patients. Inconsistent terminologies such as “very elderly”, “oldest old”, “old-old” and “super elderly” were found in literatures to represent very elderly population.[21,22,23,24,25,26,27] Past studies revealed very elderly patients to be significantly different from elderly patients and these two groups should be treated independently.[21,22,26] Older patients aged 75 years and above had shown significantly worst outcomes as compared to those younger in age.[9,25,28,29,30]

Hence, the aim of this study was to examine the difference in injury patterns between elderly (aged 60-74 years) and very elderly (aged 75 years and above) groups in Malaysia.

METHODS

Dataset

This study utilized de-identified data from the National Trauma Database (NTrD) during the period of 2007 to 2011. The registry was initiated and funded by the Ministry of Health (MOH) Malaysia in 2006 to collect information on trauma outcome in Malaysia. The database has been actively collecting information regarding trauma nationwide to assist in planning and evaluation of trauma prevention and control. Demographic and clinical baseline data were collected from all trauma patients (irrespective of severity) who were presented to the thirteen participating centers located across Peninsular Malaysia, covering approximately 62% of the nation’s major emergency and trauma centers. Data were recorded by the attending team including emergency physicians and/or neurosurgeons. This study was approved by the Monash University Human Research Ethics Committee (CF14/1869 - 2014000962).

Study Population

Patients included into this study were (1) geriatrics (defined as those aged 60 years and above, which is equivalent to the current retirement age in Malaysia;[31,32] (2) suffered from major trauma and (3) involved in a road traffic accident. Thus, all major trauma patients aged 60 years and above involved in road traffic accidents were included in this study. Major trauma patients were defined as those who satisfy one or more of the following criteria:

i. Patients who were placed in Intensive Care Unit (ICU) or High Dependence Ward (HDW) for more than 24 hours
ii. Patients with Injury Severity Score (ISS) >15
iii. Patients who required urgent surgery within 24 hours (intracranial/intrathoracic/intraabdominal/spinal/surgery/pelvic fixation)

The geriatric population was subsequently stratified into elderly patients (aged 60 – 74 years) and very elderly patients (aged 75 years and above). This stratification was consistent with past studies. [25,27,33,34]

Injury Severity Scales and Scores

The Abbreviated Injury Scale (AIS), Glasgow Coma Scale (GCS) and subscores were collected from patients. However, the AIS only provided score for one of the six body regions (AIS-Code of 6) and did not provide an overall score. In effort to simplify AIS, Maximum Abbreviated Injury Scale (maxAIS) was determined as a replacement by obtaining the highest AIS from each patient regardless of body region.[35] Besides maxAIS, ISS was also a derivative of AIS computed using the formula suggested by Baker et al. (1974) through addition of squared AIS scores of three most severely injured body regions.[36] The New Injury Severity (NISS), with some improvements over ISS, was later proposed by Osler and Long in 1997.[37] GCS was a physiological injury scoring tool introduced in an attempt to quantify head injury severity based on best motor, verbal and eye responses.[38] The Revised Trauma Scores (RTS) was another physiological score calculated by summing up the GCS, systolic blood pressure and respiratory rate.[38]

Statistical Analyses

Continuous variables were expressed as sample medians with ranges from minimum and maximum, and categorical variables were expressed as frequencies and percentages. In view of heavily skewed data, non-parametric test was performed for comparison analysis. Mann-Whitney test was performed for continuous variables, and Fisher’s Exact test or Pearson’s Chi-squared test was conducted for categorical variables. Logistic regression analysis was subsequently performed to compare the unadjusted and adjusted mortality rates using the significant level of 0.05. All statistical analyses were performed using Stata version 13.0 software (Stata Corp., College Station., Texas, USA).

RESULTS

Demographic and Clinical Characteristics

As of 11 July 2011, a total of 1,623 geriatrics patients were identified from the database, and 362 (22.3%) were

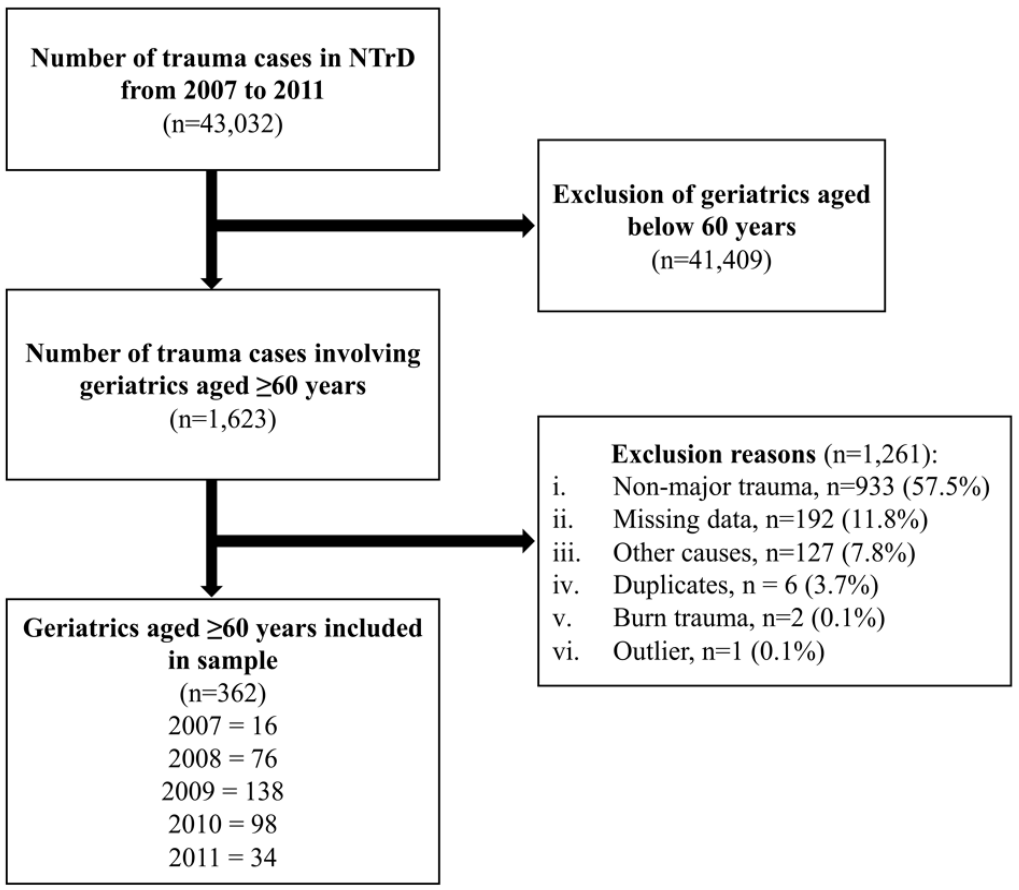

Figure 1. Flow diagram of sample selection (n=362) from National Trauma Database (NTrD) from 2007 to 2011 of major trauma patients aged 60 years and above involved in road traffic accidents.

included in this study. Reasons for exclusions include: (1) non-major trauma (57.5%); (2) missing data (11.8%) and (3) admission due to other causes of trauma (eg. fall, assault and burn) (7.8%) (Figure 1). The median age of the patients was 67 years (range from 60 years to 94 years) and mostly males (85.1%, n=308). The majority were Malays (48.3%, n=175), sustained blunt injury (99.7%, n=361) and hemodynamically stable at presentation to hospital. Regardless of age groups, more than half sustained injuries to head and neck regions (54.7%, n=198) and almost all the accidents occurred along a road, street or highway (98.6%, n=357). In term of outcome, the percentages of death (43.7%, n=158) and alive (56.3%, n=204) in the dataset were almost equally split.

In term of clinical characteristics, low scores for ISS and NISS indicative of minor injury severity. Considering the large number of patients sustained low injury severity and did not show any sign of severe physiologic derangement, most of the RTS values were skewed to higher values indicating higher chance of survival. GCS were scores measured from injured victim twice; at the scene and at presentation to measure the level of consciousness and it was highly likely influenced by any potential collision that may have impacted head region internally and externally. In this study, most patients suffered mild head injuries (35.6%, n=129) followed by critical head injuries (28.2%, n=102) as defined by GCS.

Comparison between Elderly and Very Elderly Groups

Most of the trauma characteristics and patterns were found to be quite similar between elderly and very elderly patients. It was interestingly to note very elderly patients (62.9%, n=44/70) had a significantly higher mortality rate compared to elderly patients (39%, n=114/292) (*P* <0.001, Table 1). No significantly different in other variables was observed when comparing the groups. Other demographics and clinical characteristics were presented in Table 1. Table 2 compared the injury severity distributions between elderly and very elderly groups. No significantly difference in maxAIS, ISS, NISS, GCS and RTS was observed between the two groups (Table 2). Consistent with past findings, AIS, ISS, GCS and RTS scores were more or less similar between these two groups.[21,22,39]

Unadjusted and adjusted mortality rates

Since there was difference observed in mortality between elderly and very elderly groups, further analysis was conducted using logistic regression to determine odds of mortality. Table 3 compared the in-hospital mortality rates between elderly and very elderly patients before and after adjustment for physiological status and injury severity. The result revealed it was 2.64 times (95% CI: 1.54 – 4.53, *P*-value <0.001) more likely for the very elderly to die compared to elderly group. This finding persisted even after the adjustment for injury severity (MaxAIS, ISS, NISS, GCS and RTS) and physiologic status of patients (Systolic Blood Pressure, Diastolic blood pressure, Heart rate, Respiratory rate, Shock index and Shock index X Age) (OR: 2.75, 95% CI: 1.51 – 5.05, *P*-value=0.001).

DISCUSSION

In Malaysia, the median age of population has been steadily increased over the past ten years. It was projected almost 10% of the total population will be older than 65

Table 1. Demographics and injury characteristics distribution and comparison between elderly and very elderly groups

Characteristics	Overall (n=362)	Elderly (n=292)	Very Elderly (n=70)	*P*-value
Age, *years**	67 (60-94)	66 (60-74)	77.5 (75-94)	**< 0.001****
Gender, *n (%)*				0.869†
Male	308 (85.1)	248 (84.9)	60 (85.7)	
Female	54 (14.9)	44 (15.1)	10 (14.3)	
Race, *n (%)*				0.073∞
Malay	175 (48.3)	139 (47.6)	36 (51.4)	
Chinese	149 (41.2)	118 (40.4)	31 (44.3)	
Indian	24 (6.6)	23 (7.9)	1 (1.4)	
Others	5 (1.4)	3 (1.0)	2 (2.9)	
Missing/NA/NK	9 (2.5)	9 (3.1)	0 (0.0)	
Injury Type, *n (%)*				9.999∞
Blunt	361 (99.7)	291 (99.7)	70 (100.0)	
Penetrating	1 (0.3)	1 (0.3)	0 (0.0)	
Injured Body Region, *n (%)*				0.067∞
External[+]	63 (17.4)	51 (17.5)	12 (17.2)	
Head and Neck	198 (54.7)	158 (54.0)	40 (57.1)	
Extremity and pelvic	52 (14.4)	37 (12.7)	15 (21.4)	
Chest	22 (6.1)	19 (6.5)	3 (4.3)	
Abdomen	16 (4.4)	16 (5.5)	0 (0.0)	
Face	11 (3.0)	11 (3.8)	0 (0.0)	
Physiological Status*				
SBP, *mmHg*	139 (64-250)	138 (64-250)	142 (69-242)	0.191**
DBP, *mmHg*	80 (30-176)	80 (30-176)	82 (36-129)	0.770**
Heart Rate, *bpm*	85.5 (22-156)	86 (22-149)	83 (42-156)	0.628**
Respiratory Rate, *bpm*	20 (8-40)	20 (8-40)	18 (10-40)	0.323**
Shock Index	0.61 (0.15–1.66)	0.62 (0.15-1.61)	0.57 (0.27-1.66)	0.165**
Modified Shock Index	0.85 (0.13 -2.40)	0.87 (0.13-2.40)	0.82 (0.47-2.15)	0.258**
Vehicle Type, *n (%)*				0.077∞
Motorcycle	64 (17.7)	55 (18.8)	9 (12.9)	
Car	10 (2.8)	9 (3.1)	1 (1.4)	
Bicycle	8 (2.2)	4 (1.4)	4 (5.7)	
Others	1 (0.3)	1 (0.3)	0 (0.0)	
Missing/NA/NK	279 (77.0)	223 (76.4)	56 (80.0)	
Road User Type, *n (%)*				0.827∞
Rider	66 (18.2)	55 (18.8)	11 (15.7)	
Pedestrian	17 (4.7)	14 (4.8)	3 (4.3)	
Driver	8 (2.2)	8 (2.7)	0 (0.0)	
Others	6 (1.7)	6 (2.1)	0 (0.0)	
Missing/NA/NK	265 (73.2)	209 (71.6)	56 (80.0)	
Injury Place, n (%)				0.496∞
Road, Street, Highway	357 (98.5)	288 (98.6)	69 (98.6)	
Home	2 (0.6)	2 (0.7)	0 (0.0)	
Others	2 (0.6)	2 (0.7)	0 (0.0)	
Missing/NA/NK	1 (0.3)	0 (0.0)	1 (1.4)	
Mortality, *n (%)*	158 (43.7)	114 (39.0)	44 (62.9)	**<0.001†**

*Median (Range), **Mann-Whitney test, †Pearson's Chi-squared test, ∞Fisher's Exact test.
n, number of trauma cases; bpm, beats per minute; bpm, breaths per minute; mmHg, millimetre of mercury; NA, not available; NK, not known; SBP, systolic blood pressure; DBP, diastolic blood pressure.
[+]External body region includes lacerations, contusions, abrasions and burns, independent of their location on the body surface, except amputation burns that are assigned to the appropriate body region. Other traumatic events assigned to this body region include electrical injury, frostbite, hypothermia and whole body (explosion-type) injury.

years by 2020.[40] As the number of senior citizens increased, geriatric trauma has emerged as a growing concern. In the past, age, injury region, co-morbidity and severe injuries measured by injury scoring tool, ISS are among the common potential causes of mortality reported for RTA geriatric trauma patients.[33,41,42,43,44,45,46,47,48,49] Odds of dying in geriatric patients increased with advancing age; increased ISS score; in the presence of head and neck injuries and in the presence of comorbidities, especially cardiovascular diseases.

In this study, Malays were more commonly involved in RTA than other ethnic groups in Malaysia. This finding was consistent with the ethnic distributions in Malaysia, where the Malays (61.8%), account for the majority of the population, followed by Chinese (21.4%), Indian (10.4%) and

Table 2. Injury severity distribution and comparison between elderly and very elderly groups

Injury Scoring Tools	Overall (n=362)	Elderly (n=292)	Very Elderly (n=70)	*P*-value
maxAIS*	**3 (1-6)**	**3 (1-6)**	**3 (1-6)**	0.995**
Minor (1), *n (%)*	87 (24.0)	69 (23.6)	18 (25.7)	
Moderate (2), *n (%)*	52 (14.4)	45 (15.4)	7 (10)	
Serious (3), *n (%)*	73 (20.2)	60 (20.6)	13 (18.6)	
Severe (4), *n (%)*	102 (28.2)	75 (25.7)	27 (38.6)	
Critical (5), *n (%)*	46 (12.7)	42 (14.4)	4 (5.7)	
Maximal/Untreatable (6), *n (%)*	2 (0.5)	1 (0.3)	1 (1.4)	
ISS*	**13 (1-43)**	**13 (1-43)**	**13 (1-37)**	0.897**
Minor (0-8), *n (%)*	137 (37.9)	113 (38.7)	24 (34.3)	
Moderate (9-15), *n (%)*	61 (16.8)	48 (16.5)	13 (18.6)	
Severe (16-24), *n (%)*	98 (27.1)	76 (26)	22 (31.4)	
Extremely Severe (25-75), *n (%)*	66 (18.2)	55 (18.8)	11 (15.7)	
NISS*	**16 (1-68)**	**16 (1-68)**	**16 (1-48)**	0.737**
Minor (0-8), *n (%)*	126 (34.8)	103 (35.3)	23 (32.9)	
Moderate (9-15), *n (%)*	51 (14.1)	41 (14)	10 (14.3)	
Severe (16-24), *n (%)*	63 (17.4)	51 (17.5)	12 (17.1)	
Extremely Severe (25-75), *n (%)*	122 (33.7)	97 (33.2)	25 (35.7)	
GCS*	**9 (3-15)**	**10 (3-15)**	**8 (3-15)**	0.132**
Mild (13-15), *n (%)*	129 (35.6)	109 (37.3)	20 (28.6)	
Moderate (9-12), *n (%)*	67 (18.5)	54 (18.5)	13 (18.6)	
Severe (6-8), *n (%)*	64 (17.7)	49 (16.8)	15 (21.4)	
Critical (3-5), *n (%)*	102 (28.2)	80 (27.4)	22 (31.4)	
RTS*	**6.61 (2.34-7.84)**	**6.61 (2.33-7.84)**	**5.68 (3.80-7.55)**	0.270**

*Median (Range), **Mann-Whitney test.
maxAIS, Maximum Abbreviated Injury Scale; ISS, Injury Severity Score; NISS, New Injury Severity Score; GCS, Glasgow Coma Scale; RTS, Revised Trauma Score; n, number of trauma cases; OR, Odds Ratio; CI, Confidence Interval.

others (0.9%) ethnic population.[40] We also revealed that very elderly patients were different from elderly patients in terms of post-injury outcomes. Specifically, it was demonstrated that very elderly patients were almost three times more likely to die during post-injury period compared to elderly patients. This finding persisted even after adjustment of potential confounding variables. In terms of injury pattern, head and neck injuries were predominant in current sample. These findings raised several important discussions.

Firstly, the comparison between elderly and very elderly groups in terms of mortality suggested these two age groups should be treated independently. Indeed, several past studies deduced that very elderly patients faced worst outcomes than elderly patients. For example, a retrospective review of registry data from a United States level 1 trauma center reported that very elderly recorded a mortality rate of 13.4% while elderly had a mortality rate of 7.7% (*P*=0.001). The increase in odds of dying remained twice higher for very elderly group even after adjustment for physiological status and injury severity.[22] Knudson et al. (1994) conducted a retrospective analyses based on geriatric blunt trauma patients from three different trauma centers. It was found that mortality rates were significantly higher in patients aged 75 years and older.[9] A very closely-related study on road traffic accidents by Siram et al. (2011) examined pedestrian injuries also reported similar finding. Interestingly, it was revealed that very elderly patients (≥75 years) were six to eight times more likely to die that those in younger age groups (*P* <0.001).[33] Results of this study also concur with a systematic review and meta-analysis conducted in geriatric patients with trauma, which found a 1.67-fold increase in mortality rate among very elderly patients aged 75 years and older compared to those aged 65 to 74 years old.[15] In another recent systematic review and meta-analysis conducted to better understand the increased in risk of mortality from major trauma among elderly patients, a sharp increase in mortality was reported in the very elderly group aged 75 years and above.[27] The most likely explanations for higher mortality in very elderly group were decreased in physiologic reserve and high incidence of comorbidity resulting from aging.[49,50] In relation to this, several past studies had also justified the need for aggressive treatment for older patients which was proven to improve their survival rate after injury.[51,52] The findings from this study were consistent with past studies and it has been justified that very elderly patients deserve special attention on

Table 3. In-hospital mortality by age groups

	Unadjusted Odds Ratio	**95% CI**	***P*-value**	**Adjusted Odds Ratio****	**95% CI**	***P*-value**
In-hospital mortality*	2.64	1.51 - 4.53	**<0.001**	2.75	1.50 - 5.05	**0.001**

*Elderly (60-74) years as reference group.
**MaxAIS, ISS, NISS, GCS, RTS, Systolic Blood Pressure, Diastolic blood pressure, Heart rate, Respiratory rate, Shock index and Shock index X Age.
CI, Confidence Interval.

trauma prevention, triaging and management.[21,22,26] This findings had suggested future studies should emphasize on older geriatric trauma patients.

Secondly, a majority of patients had head and neck injuries and half of non-survivors died due to head and neck injuries (n=81/158, 51.2%). Consistent with past findings,[34,53,54,55,56] head trauma remained as a strong indicator of adverse outcome for injured geriatric trauma patients. While injury to extremity region was reported as the most common part of injured region following road traffic accidents in general population,[57,58,59,60,61] a substantial number of head injury cases were reported among geriatric trauma patients in this study. This implied that the mandatory road safety practices such as wearing safety or crash helmet, wearing seatbelt and presence of functional airbag were not sufficiently being emphasized among elderly road users.

While fall was the most common cause of geriatric trauma in past literatures particularly in developed countries,[53,58,62,63] where home was reported as the most frequent site of injury,[58] our study was relatively unique in revealing road traffic accident was the most common cause of major trauma (74.0%, n=362/489) and mortality (32.3%, n=158) in geriatric trauma patients. Fall only accounted for 22.5% (n=110/489) from the overall major trauma cases involving geriatric trauma patients with a mortality rate of less than 10.0% (n=47/489). Apparent disparity observed in trauma cause and mortality distributions had driven us to narrow down the study sample to focus only on geriatric trauma patients involved in road traffic accidents. Despite the contradictory findings, most literatures agreed that majority of trauma cases involving geriatric trauma patients were unintentional, blunt, involved minor injury severity which in most cases, not detrimental for younger patients.[16,18,53,58,62,63]

Due to overwhelming younger populations, older population tend to receive less attention. Our very elderly patients were clearly at increased risk for mortality after trauma. Although, older people are considered to be cautious and safe road users, compared to younger middle-aged drivers, older drivers were at increased risk of fatal accident and severe injury.[64] This was mainly due to the fact that they were frailer than younger adults and therefore sustained more severe injuries in a crash and took longer to recover from their injuries. This study underpinned the need for early preparations to the possible demographic change. Information deduced from the current trauma research can serve as a reference to guide clinicians and policy makers in making informed decision to optimise health opportunities and enhance quality of life as people aged for the benefit of the society and country. With adequate knowledge on geriatric trauma, appropriate enhancements to the relevant policies, programmes and supporting initiatives such as mandatory license renewal or impairment screening to assist them in sustaining safe mobility [62,63] and also interventions to improve triage system by designing prognostic model sensitive to the need in geriatric trauma patients [65] can be facilitated which will be rewarding in the long-run to achieve reduction in mortality rate.

One of the major limitations of this study was the study design. Data reported to the NTrD were only from thirteen participating trauma centers located throughout Malaysia, which was equivalent to a coverage rate of 62%. Since NTrD was a self-reported database, therefore, it was very challenging to verify and rectify missing data. High rate of missing data for type of vehicle and road user were primarily involving geriatric trauma patients admitted to trauma centers between 2007 and 2009 with major trauma as these data were not collected during these period. While beginning year 2010 onwards, trauma data contributed by MIROS included all type of road traffic accident trauma cases covering wide range of injury severity from minor to severe with a more comprehensive details on type of road users and vehicles involved in accidents. While we attempted to further explore potential reasons for differences in mortality rates, this could not be performed due to limited data available for the necessary analysis.

In spite of limitations influencing generalizability and validity of study findings, to our knowledge, this study represented the single largest cohort study of geriatric trauma patients with trauma recruited to date in Malaysia. Considering there was no trend analysis from NTrD on major trauma cases, this study served as a reference in providing the updates and overview of geriatric trauma in Malaysia from 2007 to 2011. Although the burden of geriatric trauma was relatively small compared to younger patients, the potential risk of geriatric trauma was overlooked. Due to limited data capabilities, geriatric trauma has frequently been understudied and to some extent being neglected.[54] Therefore, this study took the initiative to utilize existing Malaysian database and reveal findings related to geriatric trauma patients over a period of time which serves as a good head start by setting a platform to encourage future research to emphasize on geriatric trauma patients.

CONCLUSIONS

Global aging can be regarded as one of the major challenges in this 21st century and expansion of the aging population in Malaysia is inevitable. Road traffic accidents in the elderly are becoming public safety concern, with a tendency to progressive worsening with increasing number of elderly drivers. This study had shown that geriatric trauma patients especially those in very elderly group were clearly at heightened risk of mortality despite sustaining low injury severity. Therefore, continuing efforts should be undertaken to initiate national awareness about global aging and impact of trauma. Understanding association between trauma epidemiology and consequences is important to improve healthcare services and also to propose new strategies. The overwhelming incidence of road traffic accidents in this population underscored the importance of directive prevention strategies targeting older road users in the streets. Furthermore, a new comprehensive trauma management guidelines tailored to geriatric trauma patients should be established especially in low and middle-countries where such guidelines are still lacking.

CONFLICT OF INTEREST STATEMENT

No conflict of interest was declared among authors.

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