

Original Research



Road injuries among older people in a tertiary care hospital in Sri Lanka – a comparative analysis

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Abstract

Introduction: With escalating incidence of road traffic crashes (RTCs), related injuries and deaths in Sri Lanka, understanding its burden on vulnerable road users such as older people and people with disability have important implications for traffic injury prevention and transport policy planning.

Objectives: To determine crash characteristics and patterns of injuries sustained by victims of RTCs admitted to a tertiary-care hospital and investigate if these differ for older people

Methods: Recorded data of all victims of RTCs admitted to the Colombo South Teaching Hospital from 1 January to 31 March 2017 were systematically extracted and analysed.

Results: Of the 573 victims, 70 (12.2%) were older people aged 60 years and above. Pedestrians (46%) were the most common road user type injured among older people. In contrast, among younger victims, the motorcyclists dominated (54%). Older people were involved in RTC between 9.01 am and 12.00 noon more often than those who were younger (22% vs. 9.5%), and had significantly higher incidence of severe head injuries (13% vs. 3%), fractures (54% vs. 40%) and deaths (10% vs. 2%), and referrals to rehabilitation services at discharge (60% vs. 39%).

Conclusions: Older road crash victims are at higher risk of head injuries, fractures, and deaths than younger people. Given the lack of documented data, the influence of pre-existing disability on road injury outcomes could not be investigated. Future injury surveillance, intervention and evaluative efforts should explicitly consider the needs of these vulnerable road users.

Key words: road traffic injuries, hospital-based, older-people, Sri Lanka

Introduction

Road traffic crashes (RTCs) and consequent injuries constitute a global public health problem disproportionately borne by low- and middle-income countries (LMICs) (1). In Sri Lanka, challenges to safe transportation are escalating with increased urbanisation and motorisation (2). These changes make older people and people with disabilities at any age particularly vulnerable to road traffic injuries (RTIs) (3). Road safety risks hinder meaningful social participation, leading to social exclusion with adverse impacts on well-being and quality of life of these population groups (4).

The limited availability of RTC data and related injuries in Sri Lanka makes it difficult for policy makers to advocate for targeted road safety interventions (5). The sources of primary RTCs and injury data available in Sri Lanka are National Police Statistics and hospital records (6). However, studies conducted in the districts of Colombo (7) and Kandy (6) found marked under reporting of RTI events in police records.

This study aimed to determine the crash characteristics and patterns of injuries sustained by the victims of RTCs admitted to a major tertiary hospital in the Colombo district (2.3 million accounting for 11.2% of the total population) of Sri Lanka, particularly considering relationships with older age.

Methods

This was a hospital-based study which retrospectively reviewed clinical records using a pre-designed data extraction form. The data extraction form was developed referring to previously used formats of hospital based RTI studies (8) to suit the research inquiry and the local settings. All acute injury admissions to the Colombo South Teaching Hospital (CSTH) between 1 January and 31 March 2017 following a RTC were included. Admissions encompassed: presentations to the 'accident service unit' and deaths on arrival. For the purpose of this study, people aged 60 years and above were

considered 'older people'. A minimum sample size of 384 was required to estimate an injury prevalence of 50% with a two-sided alpha error of 0.05 and a confidence interval ranging from 45% to 55%. All 576 road crash victims admitted to CSTH during the study period were theoretically eligible for analysis.

The information (where available) extracted from clinical records included: age and gender, presence of pre-injury disability, date and time of crash, type of road user and collision, contributory causative factors, details of on-site first-aid, mode of transportation to hospital, Glasgow Coma Scale (GCS) score on admission, site and type of injuries, duration of hospital stay, discharge status (e.g. death, home), and if rehabilitation was recommended for those who survived. The presence of a pre-injury disability was determined by the presence of any of the following: documentation of any impairment (sensory, physical, learning or cognitive) regardless of the cause, or use of assistive technology (e.g. wheel-chairs, walking aids, hearing aids) prior to the index RTI leading to hospitalisation. The clinical records of all admissions consistent with the case definition were retrieved and required data were extracted. This included autopsy reports of those who were dead on admission. Clinical records that were unavailable and information that was missing, unclear or poorly documented were systematically noted.

Data analysis

Descriptive statistics using Statistical Package for Social Sciences (SPSS) version 24 were generated and presented as frequencies, percentages, means and standard deviations. Associations between variables were tested using the chi square test, independent sample t-test and the Mann Whitney U test. P value less than 0.05 was considered statistically significant.

Results

Clinical records were retrieved for a total of 573 of the 576 (99.5%) RTC victims admitted during the 3-month study period. People aged 60 years and above constituted 12.2% (n=70) of all victims. Of note, no

information consistent with pre-existing disability or assistive device use was documented in the clinical records of any included cases.

Age and gender

There were 467 (81.5%) males and 106 (18.5%) females. Crash victims were aged from five months to 90 years with a mean age of 36.6 years (SD=17.2 years). The highest number (n=168) of RTC victims were in the 20-29 years age group while 60% (n=344) of all victims were between the ages of 20 and 49 years (Table 1).

Time of the RTC

Eighteen percent (n=105) of the clinical records did not have the time of crash recorded. From the information that was available (n=468), the highest proportion (22%) of victims aged 60 years and above were involved in crashes that occurred between 9.01 am and 12.00 noon (Table 2). Only 9.5% of the victims aged less than 60 years were involved in crashes during this time period. Overall, more injuries occurred between 12.01 pm and 3.00 pm (18.4%) and between 6.01 pm and 9.00 pm (18.8%) than in the other time periods.

Type of road user

The type of road user (victim) was not documented in 18 (3%) clinical records. From the information that was available (n=555), 87% were people less than 60 years and 13% were people 60 years or above (Table 3). Pedestrians accounted for almost half of the RTC victims aged 60 years and older and a much lower proportion of younger victims (46% vs. 17%). Motorcycle users and three-wheeled vehicle occupants accounted for 20% and 17% of the RTC victims in the older age group, while these road user groups accounted for 54% and 21% of victims in the younger age group.

Nature of the road traffic crash

The type of collision (head-on, rear-end, roll over etc.) was documented in only 10% (n=58) of clinical records, while information on possible contributory

human (alcohol, speeding, negligence, no licence etc.), vehicular or environmental (roads, adverse weather) factors was rarely documented in the clinical records.

Pre-admission circumstances

From the clinical records that documented both the time of the RTC and the time of admission to hospital (n=468; 82%), the average time taken to reach the hospital was 99 minutes after the crash (mode 30; median 55 (IQR 25, 120)). There was no significant difference observed (p=0.316) in the transfer time between older and younger victims. Mode of transport of the victim to the hospital was not indicated in 91% (n=568) of clinical records and only five clinical records (1%) reported that the victims were transported to hospital by ambulance. The provision and nature of first aid administered at the site of crash was not mentioned in any of the clinical records.

Pattern of injuries and their consequences

Upper and lower limbs were the commonest body regions injured in older and younger victims (Table 4). The next most commonly injured body region among the older people was head, the incidence of which was significantly higher (p= 0.048) than that of younger people. Severe head injuries (GCS 3-8 on admission) were higher among the older victims (13%) compared to younger victims (3%) (p<0.001). Half of the older victims (54%) sustained fractures compared to 40% of younger victims (p=0.02).

There was no difference in the mean length of hospital stay between the older (mean=2.6 days (SD=3.7); median=1) and young (mean=2.6 days (SD=3.6); median=1) RTC victims. The proportion of fatalities was 3%. This included five deaths on admission and twelve in-hospital deaths. A higher proportion of older victims (10%) died following RTC than that of younger victims (2%) (p=0.0002). At discharge, a significantly higher proportion of older victims were recommended on-going care through rehabilitation/physiotherapy compared to younger victims (60% vs. 39%).

Table 1. Distribution of road traffic injury victims by age and sex

Age category (years)	Male (n=467)	Female (n=106)	Total (n=573)
	No. (%)	No. (%)	No. (%)
0 – 9	9 (1.6)	10 (1.7)	19 (3.3)
10 – 19	43 (7.5)	18 (3.1)	61 (10.6)
20 – 29	150 (26.2)	18 (3.1)	168 (29.3)
30 – 39	85 (14.8)	18 (3.1)	103 (18.0)
40 – 49	59 (10.3)	14 (02.4)	73 (12.7)
50 – 59	68 (11.9)	11 (1.9)	79 (13.8)
≥ 60	53 (9.2)	17 (3.0)	70 (12.2)

Table 2. Distribution of road traffic injuries by time of day

Time of the day	< 60 years (n=409)	≥ 60 years (n=59)	Total (n=468)
	No. (%)	No. (%)	No. (%)
12.01 am – 3.00 am	30 (7.3)	2 (3.4)	32 (6.8)
3.01 am – 6.00 am	28 (6.8)	3 (5.1)	31 (6.6)
6.01 am – 9.00 am	54 (13.3)	8 (13.6)	62 (13.2)
9.01 am – 12.00 noon	39 (9.5)	13 (22.0)	52 (11.2)
12.01 pm – 3.00 pm	79 (19.3)	7 (11.9)	86 (18.4)
3.01 pm – 6.00 pm	55 (13.5)	11 (18.6)	66 (14.1)
6.01 pm – 9.00 pm	76 (18.6)	12 (20.3)	88 (18.8)
9.01 pm – 12.00 midnight	48 (11.7)	3 (5.1)	51 (10.9)

Table 3. Distribution of road traffic injuries by the type of road user

Road user type	< 60 years (n=485)	≥ 60 years (n=70)	Total (n=555)
	No. (%)	No. (%)	No. (%)
Pedestrian	84 (17.3)	32 (45.7)	116 (20.9)
Pedal cyclist	8 (1.7)	9 (12.9)	17 (3.1)
Motorcycle user	261 (53.8)	14 (20.0)	275 (49.5)
Three -wheeler occupant	104 (21.4)	12 (17.1)	116 (20.9)
Other vehicle occupant	28 (5.8)	3 (4.3)	31 (5.6)

Table 4. Presentation patterns and outcomes of road traffic injuries

Variable	< 60 years (n=503)	≥ 60 years (n=70)	Total (n=573)
	No. (%)	No. (%)	No. (%)
GCS			
3-8	13 (2.7)	9 (13.4)	22 (4.0)
9-12	7 (1.4)	2 (3.0)	9 (1.6)
13-15	465 (95.9)	56 (83.6)	521 (94.4)
Data not available	18 (3.6)	3 (4.3)	21 (3.7)
Body region¹			
Head	124 (24.7)	25 (35.7)	149 (26.0)
Face	139 (27.6)	17 (24.3)	156 (27.2)
Neck	6 (1.2)	1 (1.4)	7 (1.2)
Thorax	32 (6.4)	11 (15.7)	43 (7.5)
Abdo-pelvic	39 (7.8)	3 (4.3)	42 (7.3)
Spine	16 (3.2)	3 (4.3)	19 (3.3)
Upper limb	194 (38.6)	34 (48.6)	228 (39.8)
Lower limb	246 (48.9)	30 (42.9)	276 (48.2)
Type of injury²			
Superficial	394 (78.3)	50 (71.4)	444 (77.5)
Open wound	7 (1.4)	1 (1.4)	8 (1.4)
Dislocation/sprain	15 (3.0)	3 (4.3)	18 (3.1)
Fracture	200 (39.8)	38 (54.3)	238 (41.5)
Crush	4 (0.8)	0 (0.0)	4 (0.7)
Amputation	3 (0.6)	1 (1.4)	4 (0.7)
Burn	3 (0.6)	0 (0.0)	3 (0.5)
Other ³	6 (1.2)	3 (4.3)	9 (1.6)
Hospital stay (in days)			
1	293 (58.2)	37 (52.9)	330 (57.6)
2-3	127 (25.2)	23 (32.9)	150 (26.2)
4-7	39 (7.8)	6 (8.5)	45 (7.8)
>7	44 (8.8)	4 (5.7)	48 (8.4)
Outcome of RTI			
Death ⁴	10 (2.0)	7 (10.0)	17 (3.0)
Transferred	27 (5.4)	4 (5.7)	31 (5.4)
Discharged	466 (92.6)	59 (84.3)	525 (91.6)
Referred for rehabilitation ⁵	182 (39.1)	33 (55.9)	215 (41.0)

GCS – Glasgow Coma Scale; RTI – road traffic injuries¹ More than one body region may have been injured; ²In some cases multiple injury types were sustained; ³Includes avulsion, penetrating and de-gloving injuries; ⁴Includes both in-hospital and deaths on arrival; ⁵ Among those who survived and were discharged from hospital

Discussion

This study examined the profile of RTC victims in Colombo District as documented in the clinical records of a tertiary-care hospital and aimed to compare if the epidemiological characteristics varied by age group (60 years and above compared with younger). The findings revealed that older RTC victims were mostly pedestrians and often involved in crashes during off-peak morning hours. They sustained more severe head injuries, had higher incidence of fractures, and more commonly died or were referred to rehabilitation services following RTC than younger RTC victims.

Similar to previous studies in Sri Lanka (9) and elsewhere (10), most of the RTC victims were males. Twelve percent of RTC victims in this study were aged 60 years and above, which is lower than many other LMICs and high-income countries that report incidences ranging from 20% to 46% (11). Given the increase in the total number of older road users among ageing populations seen in other low-income settings, this number is likely to increase over the coming decades (12). Older men were involved in RTCs more than older women in this study consistent with reports of some studies (12) and contrary to findings of other studies (13).

Among people aged 60 years and above, pedestrians constituted the majority of RTC victims. Increased mortality and morbidity associated with transport related injuries in older adults as pedestrians have been well documented attributing to factors such as giving up driving, engaging more in walking, longer reaction times and reduced sensory/cognitive abilities in old age (12). Absence of safe-walkways and pedestrian crossings, unprotected nature of pedestrians, and their poor awareness were few of the identified factors that increase vulnerability of all pedestrians particularly in LMICs (14). Unlike older people, the highest proportion of younger people involved in RTCs was motorcyclists or pillion riders. Similar results have been observed in other studies in Sri Lanka (15) and in low-resourced settings elsewhere (16-17). The attributed reasons included non-helmet use, excessive speed, passenger overload, reckless driving, poor regulation and law

enforcement, low level of education and possible use of alcohol among motor cyclists and three-wheeled taxi drivers (18).

In this study, the majority of people aged 60 years and above sustained injuries between the hours of 9.01 am and 12.00 noon while road crashes in younger people peaked during 12.01 pm-3.00 pm and 6.01 am-9.00 am, similar to findings observed in other studies (19). Although we did not have access to travel exposure patterns, the findings of this study suggest that older adults avoid rush hours for their travel.

Delays in trauma patients getting to hospital is one of the most influential factors in determining the outcome of RTIs (20). There was no difference observed in the time taken for transport of victims from the crash site to hospital between the older and the younger group. The average transfer time was less than two hours with the majority (57.1%) reaching the hospital within an hour. This can be regarded as a relatively swift transfer of victims to medical care compared to many other LMICs that report an average transit time of 6-24 hours (16). However, in this study, there was limited information on mode of transfer of victims and no information was available on onsite-first aid provided to victims. An emergency ambulance service has been operational since 2016 within several districts in Sri Lanka including Colombo.

In this study, a higher proportion ($p=0.048$) of older people sustained head injuries than younger victims. The severity of head injury was significantly higher (GCS 3-8; $p<0.001$) in the older group compared to the younger group. High morbidity and mortality associated with old age compared to young people even after controlling for severity of crashes have been attributed to high risk of fragility, increased number of medical complications and differences in care management of older people (21).

Further, older victims reported a higher number of fracture injuries ($p=0.02$) than the younger victims. Bone fractures are a key type of injury seen in RTCs particularly among the elderly due to poor reflex times, poor eyesight, and fragility of bones (22). The

high death rates among older victims compared to the younger group in this study ($p=0.0002$) are consistent with other studies conducted in Sri Lanka (23) and elsewhere (12, 24). The high mortality of older people reflects their greater vulnerability to RTCs and to adverse outcomes following injury.

Long hospitalisations are associated with loss of productivity, consumption of health resources, economic burden, and risk of disabilities (25). The mean length of hospital stay in this study (2.6 days) was lower than that reported in other LMICs (16). Although there was no significant difference observed in the duration of hospital stay between the two groups, a higher proportion of older victims were recorded as having functional limitations at discharge and recommended for physiotherapy/rehabilitation compared to younger victims. These factors alongside their greater propensity for comorbidities, suggest RTCs may impose a higher risk for their post-crash quality of life.

This review of all RTC presentations (to 'accident service unit' including deaths on admission) to a major hospital in Colombo, Sri Lanka has provided the opportunity to describe the nature and patterns of hospital-attended road injuries and their outcomes. However, the findings must be considered in light of several limitations. The retrospective analysis of secondary data precluded the opportunity to obtain comprehensive data on some aspects of interest for RTC prevention. For example, data on RTC characteristics such as type of collision, contributory causative human errors or environmental factors, mode of transport of the victim etc., were not reliably documented in the clinical records. The lack of systematic recording of the presence of pre-existing disability in the clinical records reviewed in this study is of concern and has been noted by previous authors (26). These concerns relating to lack of completeness of routinely collected health data needs to be rectified so that it can be of use in informing road injury prevention and control strategies (27).

Conclusions and Recommendations

The results of this study indicate that older RTC victims are different from younger victims in terms of age, type of road user, times of crashes, incidence and severity of head injuries, incidence of fractures, and mortality and morbidity following RTCs. These findings highlight the fact that older people are a distinctive population that require attention in transport policy planning in Sri Lanka. Further research studies are recommended to assess inequalities in road safety among vulnerable road user groups such as older people; often viewed as socially and/ or economically- disadvantaged in Sri Lanka (28). The concept of age- and disability-friendly cities, also supported by the WHO Age-Friendly Cities Guide (29), which incorporates priorities of older people and people with disability in all policies and programmes, and the sustainable development goals of the United Nations (30), particularly Goal 3 under which the target is to halve the number of global deaths and injuries from road traffic crashes by 2030, are the ways forward in urban developments in Sri Lanka as inclusive and accessible systems benefit everyone.

The analysis of hospital-based data highlights the limitations of data such as crash characteristics. At present, an injury surveillance system is operational in some hospitals in Sri Lanka, however, the information gathered lacks the completeness of RTC epidemiology, injury severity/ ICD-10 codes or pre-injury disability. There is an imperative need for Sri Lanka to adopt a road traffic injury surveillance system to estimate the burden of road injuries and fatalities in order to effectively plan and implement inclusive road safety strategies. The current injury surveillance data collection form could be modified and upgraded for victims of RTCs to obtain standardised information. Incorporating this form in victims' clinical records will enhance the quality of routinely collected data and pave the way for a national RTC surveillance system that can inform road safety priorities for at-risk population groups in Sri Lanka and in similar settings globally.

Public Health Implications

- The findings revealed that older RTC victims were a distinctive group being mostly pedestrians, often involved in crashes during off-peak morning hours, and sustained significantly higher incidence of severe head injuries, fractures, mortalities, and morbidities than younger RTC victims.
- A greater emphasis should be placed on further research to identify road safety inequities, to implement national road traffic injury surveillance system to inform safety priorities of vulnerable road users, and to develop inclusive policies and sustainable strategies to minimise road injury burden in the country.

Author Declarations

Competing interests: The authors declare no competing interest

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