Original Article

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Injury Survey at Chris Hani Baragwanath Academic Hospital, Soweto, South Africa

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Abstract

Introduction: Globally injuries constitute a major public health problem. In 2007, South Africa was listed as one of the most violent countries in the world, with more than 30 000 trauma-related deaths recorded annually.

Objective: Analysis of 5 371 trauma patients seen over a three-month period at Chris Hani Baragwanath Academic Hospital's trauma unit was conducted. Objectives of the survey were to: Describe the patients socio-demographic profile ; Assess the frequency, distribution and types of injuries sustained; Determine the severity of injuries; Determine patient outcomes after initial treatment; and Determine factors related to traumatic injuries.

Methods: A cross-sectional study. Patients were admitted assessed and records were reviewed.

Results: A male to female ratio of 2:1 was recorded. Only 22.69% of the patients reported been employed. The median age was 28 years (interquartile range 14-40 years). The predominant mechanism of injury was due to falls (32.37%), followed by assault (27.44%). Transport-related injuries accounted 22.52%, while burn injuries accounted for 8.01%. Males were more likely to suffer any form of injury compared to females ($p<0.05$). Assault injuries were 4.23 times more likely to result in head and neck injuries compared to any other mechanism of injury (OR:4.23, CI 3.52-5.08, $p<0.00$). Upon initial admission to the unit, 43.04% of patients were discharged home after initial treatment, while 41.54% were transferred to the orthopedic unit.

Conclusion: Sex, employment status, age and area of residence influenced the pattern of traumatic injuries. Falls injuries and assault were the predominant mechanisms of injury. Males were more likely to suffer from any form of injury than females. Assault injuries were more than four times more likely to result in head and neck injuries than any other mechanism of injury. Therefore, ongoing surveillance and education campaigns are recommended.

Keywords: Surveillance; Trauma; Injuries.

Introduction

Injuries constitute a major public health problem and are a leading cause of years of potential life loss in both developed and developing countries [1]. According to the World Health Organisation (WHO), individuals die every five seconds due to injuries [2]. Daily the lives of more than 154 000 people are lost as a result of injuries. Traumatic injuries may be intentional such as those resulting from blunt, penetrating objects used in interpersonal conflicts or even acts of self-harm. Alternatively, they may be unintentional, such as those sustained in motor vehicle accidents [2]. Among the causes of injury are acts of violence (either against others or oneself), road traffic accidents, burns, drowning, falls and poisonings. More than 5 million people of all ages and economic groups die every year from unintentional injuries and violence [3]. Injury is a disease; it has a host (the patient) and a vector of transmission (e.g. motor vehicle, firearm etc.), and the environment where it occurs [3]. In 2007, South Africa (SA) was listed as one of the most violent countries in the world. The homicide rate was nine times more than the global rate in males aged 15-29. The trauma burden in SA is significant as the country experiences over 30 000 trauma related deaths annually [4]. This figure is almost two-thirds of the 46000 annual trauma fatalities recorded for the whole of Europe [5]. Surveillance refers to on-going systematic collection analysis interpretation and dissemination' according to the World Health Organisation (WHO), whilst survey is defined as a once-off event [2]. Surveillance systems are monitoring tools that provide policy makers and public health practitioners with the necessary information for injury control. Internationally, ongoing established electronic injury surveillance systems include the National Electronic Injury Surveillance System (NEISS) and the Denmark Trauma Registry (DTR) [6, 7]. Surveillance is held as a key element in developing effective injury surveillance programs [8]. Conducting such research in emergency rooms provides better estimates of the magnitude of the injury problem than mortality data alone. Furthermore, surveillance provides early warning of new hazards useful for program evaluation [8]. The first 60 minutes after the occurrence of a major multisystem trauma, commonly known as the "Golden Hour", are critical [2]. Many changes regarding training and Advanced Trauma and Life Support (ATLS) have improved care and outcomes for injured patients [9]. Most traumatic injuries are referred to trauma units or hospitals where resuscitation and other forms of surgical and non-

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surgical emergency treatment are provided [9].

More severe and multiple traumatic injuries should be immediately transported to regional level one trauma centers as they provide the required comprehensive multi-disciplinary care with optimal resources and capabilities [10].

Therefore, the aim of the study was to determine the profile and nature of injuries sustained by patients attending the trauma unit at Chris Hani Baragwanath Academic Hospital (CHBAH), over a three-month period from 1st August till 31st October 2017.

Methods

A cross-sectional study was performed where patients were admitted, assessed and records were reviewed. CHBAH is the largest hospital in Africa as well as a tertiary-level academic institution. The catchment population of the hospital is around 3 million people. It has more than 3200 beds and 6760 staff. Its facilities are housed in 429 buildings. Approximately 70% of all admissions are emergencies. Accident, emergency and ambulance are the busiest services, counting more than 350 patients daily [11]. The hospital serves not only townships in the South of Johannesburg and the nearest districts but also serves as a referral for a large part of the country, including surrounding African states. Furthermore, although the majority of patients seen at the hospital are not on any form of health insurance, a minority whose health insurance is unable to cover specialised costs are referred to CHBAH.

Process of admission to CHBAH trauma unit: Before patients are admitted to the trauma unit at CHBAH, they have to be triaged. The South African Triage Score system is used at CHBAH. Patient prioritisation is of utmost importance so that only patients with serious and life-threatening injuries are attended to. Patients presenting to the trauma unit at CHBAH after referral by their local clinic count as Priority 1 (P1) or Priority 2 (P2) category patients. Community health centers and local primary health care facilities should be well equipped to manage less seriously injured, Priority 3 (P3) category patients.

Quantifying injury severity is integral to the epidemiology of trauma and serves as a critical guide to appropriate resource allocation in trauma care [4]. The survival of injured patients can be further improved by means of the objective calculation of patients' injury severity [12]. The Injury Severity Score (ISS) is the most used measure world-wide in trauma patients. It is a simple numeric method summarising multiple injuries by means of anatomical categorisation [28]. Currently, it remains the gold standard of injury severity scoring [13]. The scoring of ISS implies the following: 1-15 is minor injury; 16-24 is a serious injury; 25-40 is a severe injury and 41-75 signifies a critical injury. The Trauma Revised Injury Surveillance Score (TRISS) is used to assess the severity of injuries as it gives a physiological and anatomical index of injury severity based on the Injury Severity Score (ISS), the revised trauma score (RTS), patient age and nature of injury i.e. blunt or penetrating. Combining these four parameters, the TRISS method is useful in quantifying probability of survival and evaluating the outcomes of trauma care [14].

Study sample and data collection: The total number of patient records accessed for the study was n=5371. The data collection process occurred over a three-month period. During weekdays, all records of patients seen were included in the sample. Over weekends and public holidays, due to the large amount of patients attending, random patient reference numbers were selected. Using computer randomly generated numbers. The Random Integer Generator was used to sample the patients. The randomly selected numbers were then recorded and only those entries were added to the study sample. Assuming a daily attendance of 130 patients over the weekend, 60% incidence of traumatic injuries in the population with power of 80% and 5% of precision, 47 sample size for records were calculated. Thus, a minimum of 50 computer-generated numbers was selected over each weekend and each public holiday. A data capture sheet was created specifically for the study and used to collect socio-demographic data such as age, sex, residence, and employment status, and injury-related variables like injury diagnosis, type of injury, location of injury and cause of injury. Patient outcome was also recorded.

Data analysis

All information from the data capture sheets was entered into Microsoft Excel and later exported to Stata version 13 for statistical analysis. Data was analyzed for measures of central tendencies such as means, median and standard deviation where necessary. Association between independent exposure variables such as sex, and dependent outcome variables such as mechanism of injury, was calculated using chi-squared tests, and the level of statistical significance was set at 5%. Results for odds ratios were also calculated using logistic regression.

To determine the injury severity score/index (ISS), a random sample of n=116 triaged patients was selected. Further analysis using the TRISS calculator was later done with these patients.

Ethical considerations: Ethics approval to conduct this study was obtained from the WITS Human Research Ethics committee (HREC) prior to commencement and the clearance certificate number M170506 was issued. Additional authorization to conduct research in the trauma unit as part of CHBAH was obtained from the head of the trauma unit, the acting CEO at the time as well as from the Medical Advisory Committee of CHBAH.

Results

A total of 5371 patients were admitted to the trauma unit between July and October 2017. Male to female ratio of 2:1 was recorded. Majority of patients admitted to the trauma unit 3 168 (67.39%) were from the Soweto residential area. Stretford Clinic in the Johannesburg South area accounted for 1 295 (27.55%) admissions. Of the total patients, only 22.69% reported that they were employed. The median age was 28 years (interquartile range 14-40 years). Approximately quarter (24.15%) of the patients seen were in the 25-34 age group, followed by the 6-18 age group (Fig. 1). The anatomical distribution of injury sites (Table1), reveled upper limbs 41.06 % (n=1 652) to be predominantly injured, followed by the lower limbs 29.38% (n=1 182) and then head and neck injuries 19.54% (n=786). Generalised soft tissue injury accounted for fewer than 3% (n=114). Patients generally report this type of injury when they are in shock following the trauma traumatic incident they had experienced. The predominant mechanism of injury was due to falls 32.37%, followed by assault 27.44%. Transport-related injuries (combined MVA and PVA) accounted for 22.52% of injuries; and burns at 8.01% (Fig. 2). Assessment of the frequency of assault injury among all participants reveled that 62.26% of traumatic assault injuries occurred in patients who were unemployed and 27.03% of the participants who were employed (Table 2). Usuing chi [2] association tests, a significant difference in all forms of injuries sustained between male and female patients ($p<0.00$) was noted. Injury severity calculations showed that the majority (58%) of patients from the sample sustained severe injuries with ISS between 25-40, and only

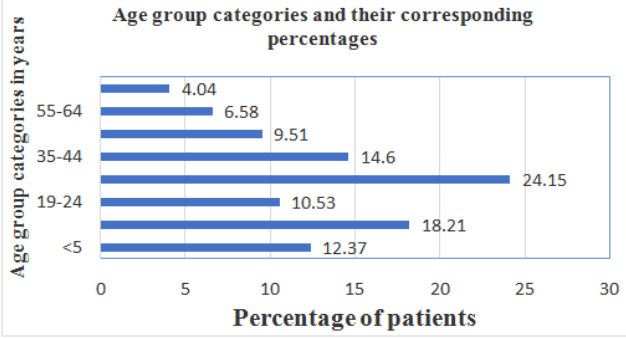
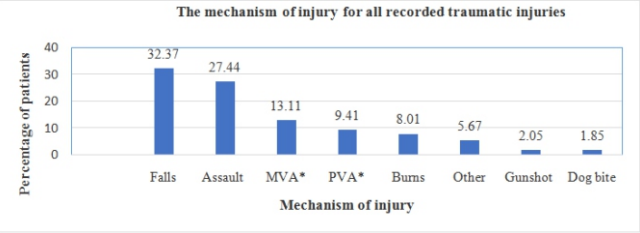


Figure 1: Bar graph representing age categories and their corresponding percentages



*MVA-Motor Vehicle Accident; * PVA-Pedestrian Vehicle Accidents

Figure 2: Bar graph depicting the mechanism of injury for all recorded traumatic injuries.

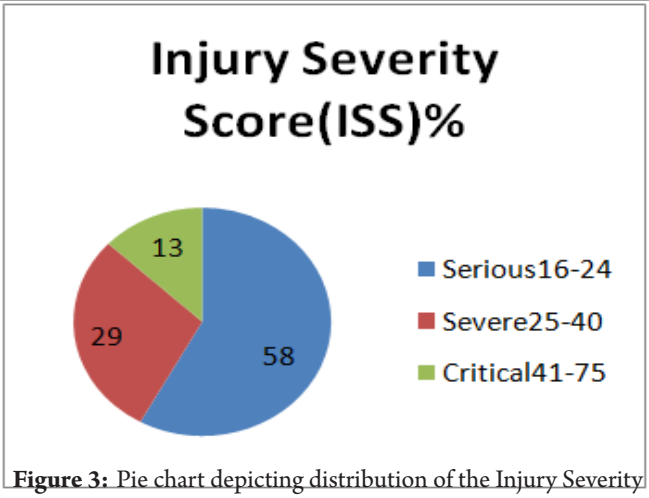


Figure 3: Pie chart depicting distribution of the Injury Severity score amongst traumatic injuries

(13%) were scored as critical. None of the patients in the study sample presented with a minor injury severity score of 0-16. (Fig. 3). The survival probability results between blunt and penetrating trauma using TRISS indicated that nearly all patients who sustained blunt trauma had a high survival rate score of 80-99%, accounting for n=71(97.26%), compared to n=39 (90.70 %) of patients who sustained penetrating traumatic injuries. Regardless of the type of trauma, a survival probability was good at the range of 80-99% score (Table 3).

Upon initial admission to the trauma unit, 43.04% of patients were discharged home after initial treatment, while 41.54% were transferred to the orthopedic unit (Table 4). Using logistic regression, calculations showed assault injuries were 4.23 times more likely to result in head and neck injuries compared to any other mechanism of injury (OR:4.23, CI 3.52-5.08, p <0.00).

Table 1: Anatomical distribution of injury sites

Injury type	Frequency	Percentage (%)
Upper limb	1 652	41.06
Lower limb	1 182	29.38
Head and neck	786	19.54
Thorax	227	5.64
Abdomen	62	2.83
Generalised soft tissue injury	114	2.83
Total	4 023	100

Table 2: The frequency of the traumatic assault injuries sustained amongst all participants

Employment or Scholar status	Frequency	Percentage (%)
Unemployed	698	62.26
Employed	303	27.03
Scholar	103	9.19
Pre scholar	17	1.52
Total	1121	100

Table 3: The Trauma Revised Injury Severity Score (TRISS)

	BLUNT TRAUMA (n=73)		PENETRATING TRAUMA (n=43)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
0-19	0	0	0	0
20-39	0	0	1	2.32
40-59	1	1.37	1	2.32
60-79	1	1.37	2	4.65
80-99	71	97.26	39	90.7
TOTAL	73	100	43	100

Table 4: Destination/ Referral of patients after initial treatment at the trauma unit

Destination after initial treatment	Frequency	Percentage (%)
Home	2 064	43.04
Orthopedic	1993	41.54
Ward(any)	390	8.14
Other	188	3.93
Resuscitation	161	3.36
Total	4 795	100

Discussion

The median age of the participants was 28 years (Interquartile range 14-40 years). The results are similar to other South African cohorts that showed the young and active of our society to be most commonly injured [14,15,16,17,18,19].

The current study indicated a 2:1 male to female ratio of injuries. Comparing this ratio to the other South African studies of this nature, it indicates more females are involved in trauma than previously reported. Reasons for change in gender distribution of injuries ratios may be as a result of urbanization, resulting in immigration of females from rural to urban areas [20, 21]. Furthermore, recent SA crime statistics show that increase in interpersonal violence where females are

the victims [22]. Male behaviors is more aggressive in nature thus, further exposing them to injury [23].

Patients in the sample who were unemployed and presented with assault related injuries accounted for almost two thirds (62.26%) of all assault admissions. This is similar to the study in Mthatha that found more than half of their injured patients were also unemployed. Social dynamics supporting violence include unemployment [24]. However, studies in Tehran [13] and Tanzania [25] showed contrary results regarding occupation status. Both studies showed that employed patients were more likely to sustain injuries especially at work.

About one in every 3 patients are referred to Stretford Community Health Centre (CHC) which is about 45 minutes away from, CHBAH. Thus, upgrading Stretford CHC to a level 1 trauma a center will assist patients to be attended to in the "Golden Hour".

TRISS results of the current study are similar to other studies in South Africa and internationally. Collectively, the majority of patients triaged had a greater than 50% survival probability [14,17,26]. In contrast another study done in India resulted in a larger unexpected death range, despite their calculated survival probability. The above mentioned difference was attributed to a lack of resources in their trauma centre [27]. Regardless of the slight differences reported, in both developing and developed countries, the TRISS methodology has proven to be an acceptable method for evaluating the difference between predicted and observed mortality [26]. The study showed 48.03% of patients were discharged home on the day that they presented with their relevant trauma related injury. This figure is comparable to the 61.2% that were discharged to home in the study done at Johannesburg General Hospital [14]. This similarity could be attributed to the fact that both CMJAH and CHBAH both are tertiary learning institutes and have very specialized consultants at their disposal, who also train doctors internationally on traumatology.

Upon analyzing upper and lower limb injuries, results reveal falls as statistically significant (p value<0.05). The odds of sustaining an upper or lower limb injury due to falling are twice as great (OR: 1.91, CI 1.70-2.28, p<0.00) and (OR:2.10,CI 1.79-2.46,p<0.00) respectively. The current study reveled that 70.44% of injures involved limbs/extremities. The results might explain the high number of falls related injuries in the study. The next anatomical area injured was the head and neck region with 19.54% of injuries. This finding was in accordance with other national and international studies of this nature [14,28,29]. Assault also is shown to be statistically significant to upper and lower limb injury; however, the odds are less than 1. On the other hand, the odds of sustaining a head and neck injury after being assaulted are four times higher than falling resulting in a head and neck injury (OR: 4.23, CI 3.52-5.08, p <0.00).

Conclusion

Sex, employment status, age and area of residence influence the pattern of traumatic injuries. Falls injuries followed by assault were the predominant mechanisms of injury affecting the limbs followed with the head and neck injuries respectively. Males were more likely to suffer from any form of injury than females. Assault injuries were four times greater to result in head and neck injuries than any other mechanism of injury.

References

1. *Rahman F, Andersson R, Svanström L. Potential of using existing injury information for injury surveillance at the local level in developing countries: experiences from Bangladesh. Public Health. 2000 Mar 1;114(2):133-6.*
2. *Holder Y, World Health Organisation Staff. Injury surveillance guidelines. Geneva: World Health Organization; 2002.*
3. *World Health Organization. Injuries and violence: the facts 2014*
4. *Africa, S. (2019). 2011 Census products | Statistics South Africa. [online] Statssa.gov.za. Available at: http://www.statssa.gov.za/?page_id=3955 [Accessed 28 Mar. 2017].*
5. *MRC/UNISA Crime, Violence and Injury Lead Programme. A profile of fatal injuries in South Africa 2008 - Annual Report for South Africa based on National Injury Mortality Surveillance System. www.mrc.ac.za/crime/nimss07.PDF [Accessed 28 March 2017]*
6. *De Vries R, Reininga IH, Pieske O, Lefering R, El Moumni M, Wendt K. Injury mechanisms, patterns and outcomes of older polytrauma patients—An analysis of the Dutch Trauma Registry. PloS one. 2018 Jan 5;13(1):e0190587.*
7. *Mackenzie SG, Pless IB. CHIRPP: Canada's principal injury surveillance program. Injury prevention. 1999 Sep 1;5(3):208-13.*
8. *Bradshaw D, Norman R, Lewin S, Joubert J, Schneider M, Nannan N, Groenewald P, Laubscher R, Matzopoulos R, Nojilana B, Pieterse D. Strengthening public health inSouth Africa: building a stronger evidence base for improving the health of the nation. South African Medical Journal. 2007;97(8):643-51.*
9. *Cardona VD. Trauma nursing: from resuscitation through rehabilitation. WB Saunders Company; 1994.*
10. *UF Health, University of Florida Health. (2019). Traumatic Injury. [online] Available at: https://m.ufhealth.org/traumatic-injury [Accessed 17 Mar. 2018].*
11. *Goosen J, Bowley DM, Degiannis E, Plani F. Trauma care systems in South Africa. Injury. 2003 Sep 1;34(9):704-8.*
12. *Gottschalk S. Triage—A South African perspective. Continuing Medical Education. 2004;22(6).*
13. *Hoyt DB, Coimbra R. Trauma systems. The Surgical Clinics of North America. 2007 Feb;87(1):21-35.*
14. *Bruce JC, Schmollgruber S, Eales J, Gassiep J, Doubell V. Injury surveillance at a level I trauma centre in Johannesburg, South Africa. Health SA gesondheid. 2003;8(3):3-12.*
15. *Chowdhury AH. A retrospective audit of trauma surgery at a level 1 trauma centre in South Africa (Doctoral dissertation, University of Cape Town 2012).*
16. *Nicol A, Knowlton LM, Schuurman N, Matzopoulos R, Zargaran E, Cinnamon J, Fawcett V, Taulu T, Hameed SM. Trauma surveillance in Cape Town, South Africa: an analysis of 9236 consecutive trauma center admissions. Jama Surgery. 2014 Jun 1;149(6):549-56.*
17. *Dhaffala A, Longo-Mbenza B, Kingu JH, Peden M, Kafuko-Bwoye A, Clarke M, Mazwai EL. Demographic profile and epidemiology of injury in Mthatha, South Africa. African health sciences. 2013;13(4):1144-8.*
18. *Jayaram A, Gururaj G, Rajanna MS, Venkatesh P. Findings of a injury surveillance programme done in a rural district setup in India. Injury*

Prevention. 2010 Sep 1;16(Suppl 1): A262-.
19. *Donovan MM, Kong VY, Bruce JL, Laing GL, Bekker W, Manchev V, Smith M, Clarke DL. The Hybrid Electronic Medical Registry Allows Benchmarking of Quality of Trauma Care: A Five-Year Temporal Overview of the Trauma Burden at a Major Trauma Centre in South Africa. World journal of surgery. 2019 Apr 15;43(4):1014-21.*
20. *Mogajane BM, Mabongo M. Epidemiology of maxillofacial fractures at two maxillofacial units in South Africa. South African Dental Journal. 2018 Apr;73(3):132-6.*
21. *Goosen J, Bowley DM, Degiannis E, Plani F. Trauma care systems in South Africa. Injury. 2003 Sep 1;34(9):704-8.*
22. *The South African. (2019). Crime stats: More women, children are victims of murder. [online] Available at: https://www.thesouthafrican.com/crime-stats-women-children-victims-murder/ [Accessed 22 Feb. 2019].*
23. *Udry JR. Why are males injured more than females? Injury Prevention. 1998 Jun 1;4(2):94-5.*
24. *Kynoch G. Apartheid nostalgia: Personal security concerns in South African townships. South African Crime Quarterly. 2003(5).*
25. *Nantulya VM, Muli-Musiime F. Kenya: Uncovering the social determinants of road traffic accidents. Challenging inequities in health: from ethics to action. 2001 Jul:211-5.*
26. *Chardoli M, Rahimi-Movaghar V. Analysis of trauma outcome at a university hospital in Zahedan, Iran using the TRISS method. East African medical journal. 2006;83(8):440 2.*
27. *Goel AP, Kumar SA, Bagga MK. Epidemiological and Trauma Injury and Severity Score (TRISS) analysis of trauma patients at a tertiary care centre in India. Nat Med J India. 2004 Jan 1;17:186-9.*
28. *Galano GJ, Vitale MA, Kessler MW, Hyman JE, Vitale MG. The most frequent traumatic orthopaedic injuries from a national pediatric inpatient population. Journal of Pediatric Orthopaedics. 2005 Jan 1;25(1):39-44.*
29. *Chalya PL, Mabula JB, Dass RM, Mbelenge N, Ngayomela IH, Chandika AB, Gilyoma JM. Injury characteristics and outcome of road traffic crash victims at Bugando Medical Centre in Northwestern Tanzania. Journal of trauma management & outcomes. 2012 Dec;6(1):1-8*

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