

The epidemiological characteristics of major trauma in Pietersburg and Mankweng hospitals, Limpopo province

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Background: Data on trauma burden and outcome varies amongst the nine South African Provinces. In Limpopo Province there is a paucity of data which this study aimed to quantify and characterise the severe trauma burden in the province.

Methods: A retrospective chart review for all patients with injury severity score (ISS) > 16 over a 6-year period (Jan 2015–Dec 2020) at two central hospitals in Limpopo province. Descriptive analysis was undertaken of the following variables: patient demographics, injury patterns and outcomes.

Results: The review identified 355 patients whose mean age was 31 years (Range 0.25–74 years). Eighty four per cent were males. Forty nine per cent were unemployed. The most common mechanisms of injury were interpersonal violence 49% and motor vehicle crashes (MVCs) 34.9%. Head (41%), torso (25%) and limbs (15.2%) were the body-regions most frequently involved. The median ISS was 16 with IQR (16–16) (0). The median length of stay was 7 days with IQR (5–15) (10). Of the ICU admissions 50% were MVCs and 56% due to head injury. Of the 50 deaths 50% were due to MVC and pedestrian vehicle crashes (PVCs), and head injuries were present in 54% of those who died.

Conclusion: Young males were the most predominantly affected. Assault and MVC were the most common mechanisms of injury. The unemployment rate also seems to be a key factor in trauma epidemiology in the province. Further study of the wider trauma burden is required.

Keywords: Limpopo, trauma, injury severity score, death

Introduction

The burden of injuries is increasing in low- to middle-income countries (LMICs). The mortality of major trauma is six times higher than in higher-income countries.¹ Trauma injury significantly contributes to societal morbidity. It is the leading cause of death among people 1–44 years old and the leading cause of death in all age groups.² In LMIC countries, the challenges are numerous from lack of emergency medical services (EMS) with prehospital training to inadequate emergency department and non-specialist staff. Also, there may be shortages of specialist surgeons or orthopaedic surgeons.³

In LMIC countries such as Botswana, several studies have been conducted. Mwandri et al. reported that the knowledge of essential trauma care (by both nurses and doctors), district hospital capability to provide essential surgery and the organisation of trauma care were found to be lacking.⁴

In another LMIC country, Tanzania, the Mwandri et al. study found males to be most commonly affected at 84%, and the most common mechanism of injury was motor vehicle crash (MVC) at 69%, followed by violence at 20% and then falls at 9%.⁵

South Africa is included in the list of LMIC countries, and the injury burden is heavily influenced by two major factors – MVC and interpersonal violence.⁶ KwaZulu-Natal (KZN) is the second most populous province and faces a

high burden of trauma.⁷ A study by Tefera et al. showed that intentional exceeds unintentional trauma by a ratio of 2:1.⁸

Limpopo province remains one of the most under-resourced and under-researched of the South African provinces. Fewer studies were carried out there. A study by Mavhungu et al. reported males to be most commonly affected at 70%, and 40% of general surgery emergencies were trauma related.⁹ Interpersonal violence contributed 55%, followed by MVC at 22.9%.¹⁰ Another study by Mphekgwana et al. demonstrated that a larger number of crashes occur during weekends (Saturday and Sunday) when compared to weekdays.¹¹ Factors which were more likely associated with crash occurrence are poor or defective road surface, time interval between 6 am and 11 pm and provincial roads. In Limpopo province there is a paucity of trauma burden studies. "The aim of this study was to determine the patient characteristics, patterns and outcomes of major trauma in the province for patients requiring transfer to a central hospital, and discuss how these findings compare to the rest of South Africa and other similar resource settings.

Methods

Design

This was a retrospective cohort study of patients who sustained major trauma between 1 January 2015 and 31 December 2020.

Setting

The study was conducted at Pietersburg and Mankweng hospitals, the two central hospitals in Limpopo province serving a population of about 6 million.

Participants

Patients of all ages who sustained significant injury and who had an injury severity score (ISS) > 16. These include cases referred to general surgery, neurosurgery, urology, cardiothoracic, maxillo-facial surgery and orthopaedic surgery.

Variables

Data were collected on demographics, admission and discharge data, mechanism of injury, types of injury, admission blood pressure (BP), admission Glasgow Coma Scale (GCS), ISS, operative intervention, length of hospital stay and outcome.

Results

The study identified 355 patients over the 6-year period. Males contributed 297 (83.7%) with a male to female ratio of 5:1 with a mean age of 31 years. Ninety-eight per cent of patients were Black, followed by Whites at 1% and Asians 1%. The registered unemployment rate was 48.5%, while those under 18 years were 12.1% and the unspecified group was 24.5%; this included patients who were not in formal employment and could not pay hospital fees (Table I).

The most common mechanism of injury was interpersonal violence (assault) at 175 (49.2%), followed by MVC at 124 (34.9%) falls at 35 (0.98%) and others at 21 (0.06%) (Figure 1). Alcohol levels were only noted for 11% of the entire population from entirely self-reporting.

Seventy-one per cent of patients had mild traumatic brain injury (TBI), followed by severe TBI at 20.3% (Table II). Seventy-eight per cent of patients had an ISS of 16–24, while 21.7% had an ISS of 25–49 (Table III). The median ISS was 16 with interquartile range (IQR) of 16–20, while the average length of hospital stay was 14 days. Overall, 41.7% of patients in the study were admitted to ICU. Pre-hospital intubation was done in 14.7% of patients.

Concerning the day of the week and seasonal variation, most of the trauma admissions occurred on a Sunday (19.70%), followed by Monday (15%). Trauma occurred mostly in spring season (35.2%), followed by summer (29.8%) (Table IV). Almost 98% of patients were transported to the hospital by ground EMS, followed by private and air

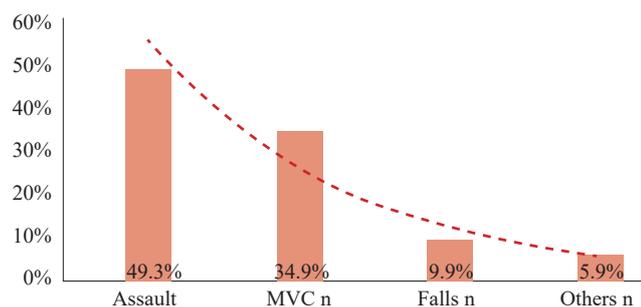


Figure 1: Mechanism of injury in Limpopo central hospitals

Table I: Demographic characteristics of patients (n = 355)

Variable	n (%)
Sex	
Male	297 (83)
Female	58 (16.3)
Age (years)	
	Mean (range) 30.6 (0.25–74) years
0–10	22 (6.2)
11–20	50 (14.1)
21–30	129 (36.2)
31–40	89 (25.1)
41–50	34 (9.6)
51–60	15 (4.2)
> 60	16 (4.6)
Place of residence	
Rural	335 (94.4)
Urban	20 (5.6)
Occupation	
Employed	53 (14.9)
Unemployed	172 (48.5)
Under 18 years	43 (12.1)
Unspecified	87 (24.5)
Alcohol use	
	39 (11.1)

Table II: Clinical characteristics of patients

Variable	n (%)
Pre-hospital intubation	52 (14.7)
ICU admission	148 (41.7)
GCS	
13–15 (mild head injury)	253 (71.3)
9–12 (moderate head injury)	30 (8.4)
3–8 (severe head injury)	72 (20.3)
ISS (median) (IQR)	16 (0)
Length of stay (mean)(days)	14.32 (1–332)

Table III: ISS of the patients

ISS	n (%)
1–8 (minor)	0 (0)
9–15 (moderate)	0 (0)
16–24 (serious)	278 (78.3)
25–49 (severe)	77 (21.7)
50–74 (critical)	0 (0)
75 (maximum)	0 (0)
Total	355 (100)

ambulance. Eighty-eight per cent of patients were inter-hospital transfers, while 12% were direct referrals.

In terms of body region with most to least injury presentation, head injury contributed 180 (53%), followed by abdominal injuries at 81 (22.8%), orthopaedic injuries at 57 (16.0%) and chest injuries at 13 (3.6%) cases (Figure 2).

Regarding the need for surgical intervention, out of a total of 355 patients, 317 required a surgical procedure. Craniotomies were the lead procedure at these referral hospitals and contributed 131 of the required operations

Table IV: Temporal variations of trauma

Variable	n (%)
Season	
Summer	106 (29.8)
Autumn	68 (19.1)
Winter	56 (15.7)
Spring	125 (35.2)
Day of the week	
Sunday	70 (19.7)
Monday	54 (15.2)
Tuesday	48 (13.5)
Wednesday	40 (11.2)
Thursday	45 (12.6)
Friday	45 (12.6)
Saturday	50 (14)

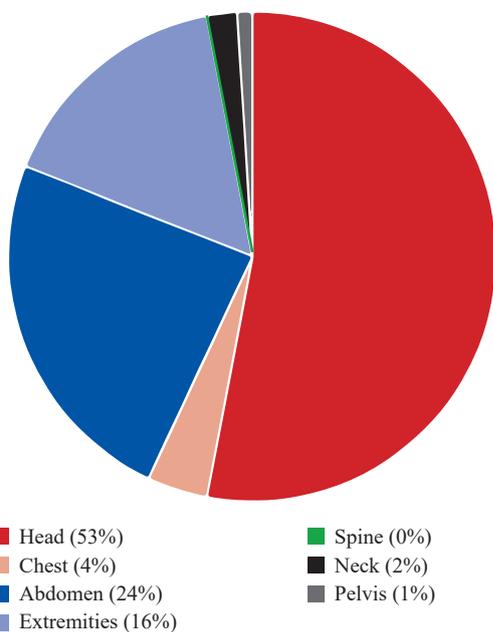


Figure 2: Body regions injured

Table V: ICU admissions according to mechanism of injury and body region involved (n = 148)

Variable	n (%)
Mechanism of injury	
MVC	73 (49.3)
Assault	71 (47.7)
Fall	4 (2.7)
Body region involved	
Head	83 (56)
Neck	6 (4)
Torso	23 (15.5)
Arm	1 (0.67)
Leg	5 (3.4)
Abdomen/leg	2 (1.35)
Head/chest/leg	1 (0.67)
Head/chest/arm	2 (1.35)
Head/leg	1 (0.67)
Neck/abdomen	1 (0.67)

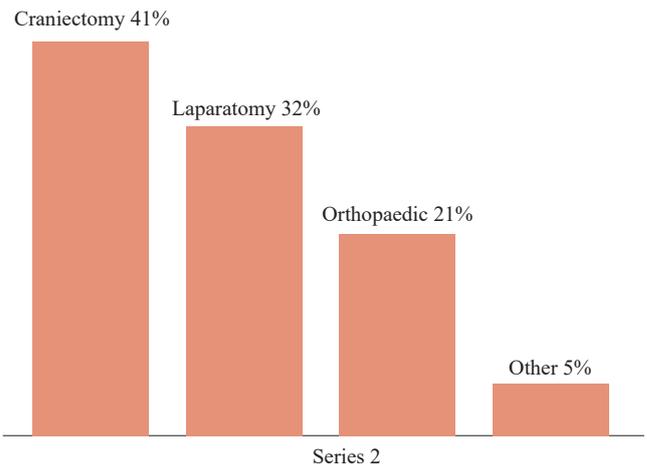


Figure 3: Types and proportion of surgical procedures

(41.3%), followed by laparotomies, constituting 102 (32.2%) and orthopaedic operations 67 (21.1%). Other procedures performed included neck exploration (for visceral injuries) (5), arm exploration for vascular injuries (5), mandibular operations (3), exploration of the thigh for vascular injuries (3) and amputation of the leg (1) (Figure 3).

In total, 41.7% of trauma admissions were admitted to ICU. Regarding ICU admissions, MVCs accounted for 49.3% of cases, followed by assault at 47.7% and then 2.7% for falls. The most commonly admitted body injury in ICU was the head at 56%, followed by torso injuries at 15.5% (Table V).

The mortality rate in the study was 14%, with 50 deaths recorded. Almost 36% of the deaths were caused by MVC, followed by PVC at 24% and then assault with a blunt object. TBI contributed to almost 54% of all deaths (Table VI).

Discussion

The study highlights the trauma burden encountered in an under-resourced setting. Quality data on trauma is limited, therefore making it difficult to influence governments on public health policies and provision of appropriate amenities and clinical resources.¹²

The study shows a high male preponderance. This is consistent with a study by Marle et al. with 69% and a mean age of 27.8 years.¹³ This could very likely be due to the fact that males are the ones involved in more risky behaviour.

The registered unemployment rate in the study was 48.5%. This is consistent with the national unemployment rate among the youth of 45.5%, while the national rate is at 32.9%. Young black males seem to be the most affected group in trauma, combined with factors such as unemployment. Unemployment itself seemed to be a major contributing factor in the epidemiology of trauma in this study, associated with the use of alcohol and outdoor activities, for example, being on the streets at night, increasing the rate of trauma.¹⁰ Although the recorded alcohol use is very low, it seems that the problem was under-estimated since no formal testing was done and the recordings were solely dependent on self-reporting. These are people who are still very active and supposed to be economically productive and this has serious economic implications, especially if they are unable to go back to work, as many of them are supposed to be breadwinners.

Table VI: Mortality according to mechanism of injury (n = 50)

Aetiology	TBI	Torso	Multiple	Extremity	Total
MVC	7	0	9	3	19
PVC	8	0	3	0	11
Assault (blunt object)	10	2	0	0	12
Assault (sharp object)	1	0	0	0	1
Gunshot	0	5	1	0	6
Fall from a height	1	0	0	0	1
Total	27	7	13	3	50
Percentage of total per group	(54)	(14)	(26)	(6)	(100)

About 94% of patients in the study reside in rural areas. Fleet et al. reported that the mortality in patients treated in the rural setting was 5% more than in an urban setting.¹⁴ The cause of these could be due to particular activities, such as farming, mining and industrial work and delayed hospital treatment.¹⁴

The most common mechanism of injury in the study was interpersonal violence at 49.2%. Worldwide it is estimated that intentional injury accounts for about 33% of all trauma. This agrees with study by Hunter et al. in the 19–30 years age group in Cape Town, that reported that this constituted 51%.¹⁵ Also, Tefera et al. in a recent study in KZN over 10 years showed that intentional trauma exceeded non-intentional trauma with a ratio of 2:1.⁸ The differences could be due to different study populations and study periods, although it is well known that interpersonal violence is higher in South Africa.¹⁶

The most common cause of TBI in the study was interpersonal violence, which contributed about 62.6%. This is higher than a previous study by Jerome et al. which reported interpersonal violence to be accountable for 39.6% of TBI.¹⁷ Overall, 41% of patients were admitted to ICU in the study. About 56% of ICU admissions were TBI and 76% were a result of MVC. This demonstrates that MVC results in more severe TBI. Mamo et al. reported in their publication that 82.5% of ICU admissions were TBIs and 59% were as a result of MVC.¹⁸

In the current study, trauma occurred most commonly in spring (35.2%), followed by summer (29.8%) and on a Sunday (19.7%), followed by a Monday (15.2%). These findings are consistent with the Bhana et al. study from Johannesburg which reported that the trauma incidence was higher on Sundays (24.4%) and occurred mainly in Spring (33%).¹⁹ This could be caused by warmer weather conditions.

Alcohol presence was recorded in only 11% of the patients in the current study population. This is lower than the Hirvikangas study which reported 55% with self-reporting of patients.²⁰ The low percentage could be due to underestimation of the problem and the infrequent use of blood alcohol levels.

The overall mortality is 14%. MVC accounted for 60% of the deaths and 54% died of TBI.

The results, despite a small sample size, seem to highlight two things, namely, the difficulty in obtaining data in an under-resourced environment suggesting the need for a trauma registry to be established in this (and all the other) provinces, and the need to have a dedicated trauma care unit in the province to coordinate the care of severely injured patients.

Limitations

By being retrospective, the study had some limitations. Incomplete documentation and inability to retrieve almost half of the potentially includable files was a problem, resulting in the smaller than expected sample-size. There could be selection bias since patients who died before admission were not included, as well as the fact that these were all referred patients to a central facility and therefore the study does not reflect the trauma cases managed at regional or district hospitals in Limpopo. These figures may represent the tip of the iceberg.

Conclusion

Assault and MVC are the most common mechanisms of injury. Young economically active males are the most predominantly affected. The issue of young male unemployment and involvement in outdoor activities seem to be a key factor in the epidemiology of trauma in the province. Unemployment seems to increase the number of trauma admissions especially in interpersonal violence. This seems to suggest that there is a need for general behaviour modification. There is also a need for road safety awareness strategies. The need for electronic patient records and development of a trauma registry would improve data reliability.

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Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

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