

Original article

Emergency Surgical Management of Trauma Patients: Pattern and Outcomes

Rihab Absaat^{1*}, Nourah Alharam²¹Department of General Surgery, Faculty of Medicine, University of Tobruk, Tobruk, Libya²Department of ENT, Faculty of Medicine, University of Tobruk, Tobruk, LibyaEmail: rihab.absaat@tu.edu.ly**Keywords.**

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Abstract

Trauma remains a major global health problem and an important cause of death and disability. The incidence of trauma-related injury and mortality remains a significant public health challenge worldwide. Unintentional injuries account for over 110,000 deaths annually, with road traffic collisions contributing to more than 40% of these cases. Despite the high burden of trauma, information about the outcomes of polytrauma patients in resource-limited settings. This retrospective observational study aimed to evaluate the pattern and clinical outcomes of trauma and polytrauma patients managed at Tobruk Medical Centre during the study period. The overall mean age was 40.8 ±16.5. Trauma patients accounted for 85.57% (n=599), while polytrauma accounted for 14.42% (n=101) of cases. Regarding the distribution of injury mechanisms among the study population (Total N=700). (RTAs) inside the car were the most frequent mechanism, accounting for 46.1%. Extremity injuries were the most frequent anatomical site affected, accounting for 31.2%. The morbidity rate was 25.8%, and the overall mortality rate was 2.6%. Mortality was also higher in polytrauma patients (77.77%) compared to trauma patients. Recovery rates were higher in trauma patients 88.46%, while polytrauma patients had relatively poorer outcomes 11.53%. In conclusion, trauma represents a high-risk clinical entity requiring prompt management, and enhancing multidisciplinary collaboration is an essential strategy to reduce morbidity and mortality in this patient population.

Introduction

Trauma remains a major global health problem and an important cause of death and disability. The incidence of trauma-related injury and mortality remains a significant public health challenge worldwide. Unintentional injuries account for over 110,000 deaths annually, with road traffic collisions contributing to more than 40% of these cases [1]. Initial resuscitation of trauma and polytrauma patients focuses on airway management, spinal stabilisation, control of haemorrhage, and rapid evaluation for associated injuries [2]. The Golden Hour concept emphasises that definitive intervention within the first 60 minutes post-injury significantly improves outcomes and reduces mortality [1].

The outcomes of trauma and polytrauma patients vary widely depending on injury severity, patient-related factors, anatomical location, and the timing of interventions. Mortality is highest within the first 24 hours, primarily due to haemorrhage or severe traumatic brain injury (TBI), while late mortality is often associated with multi-organ failure (MOF), sepsis, or complications from prolonged ICU admission [2,3]. Mortality has decreased over the past decades due to improved pre-hospital care, appropriate and rapid resuscitation, and multidisciplinary management; however, severe TBI and major thoracoabdominal trauma remain leading causes of death [2,4]. Despite the high burden of trauma, information about the outcomes of trauma and polytrauma patients is still limited in many resource-limited settings. This study aimed to evaluate the pattern and clinical outcomes of trauma and polytrauma patients managed at Tobruk Medical Centre.

Methods

A retrospective observational study was conducted at Tobruk Medical Centre during the period from 01 January to 30 October 2025. Data of 700 patients were retrieved from medical records. The study included patients of all age groups and both sexes. Patients with incomplete medical records or missing data were excluded. Data analysis was conducted using SPSS Statistics version 25.0. Categorical variables were presented as frequencies and percentages. Fisher exact test was used to assess associations between categorical variables. A p-value<0.05 was considered statistically significant.

Results

(Table 1) The mean age of patients with trauma was 38.6 ±15.2, compared with 42.9 ±17.4 among patients with polytrauma, while the overall mean age was 40.8 ±16.5. Trauma patients accounted for 85.57% (n=599), while polytrauma accounted for 14.42% (n=101) of cases. There was a statistically significant difference in mean age between trauma and polytrauma groups (p-value < 0.001).

Table 1. Age distribution and number of trauma and polytrauma Patients

Variable	Trauma (n, %)	Polytrauma (n, %)	Total (n=700)	p-value
Age (Mean $\pm$ SD)	38.6 $\pm$ 15.2	42.9 $\pm$ 17.4	40.8 $\pm$ 16.5	<0.001
No. of patients	599 (85.57%)	101 (14.42%)	700 (100%)	

Table 2 shows the distribution of injury mechanisms among the study population (Total N = 700). Road traffic accidents (RTAs) inside the car were the most frequent mechanism, accounting for 46% (n = 322). Within the subset of inside-car RTAs, trauma was recorded in 90.37% (n = 291), while polytrauma accounted for 9.62% (n = 31). Falls represented the second most common cause of injury, accounting for 25.2% (n = 177); among these, trauma occurred in 88.70% (n = 157), and polytrauma was observed in 20% (n = 11.29). Penetrating injuries, including gunshot accounting for 10.5% (n=74); among these, trauma was recorded in 78.3% (n=58), and polytrauma was occurred in 21.62% (n=16), but stab wounds contributed a smaller proportion of the study population, accounting for 9.85% (n=69). The table also demonstrates a statistically significant difference between trauma and polytrauma groups according to the mechanism of injury (p < 0.001).

Table 2. Mechanism of Injury among trauma and polytrauma patients

Variable	Trauma (n, %)	Polytrauma (n, %)	Total (n=700)	p-value
RTA (overall)	315 (88.2 %)	42(11.7%)	357(51%)	<0.001
Pedestrian RTA	24 (68.5%)	11(31.42%)	35(5%)	
RTA – Inside car	291 (90.37 %)	31(9.62%)	322(46.1%)	
Fall	157(88.70 %)	20(11.29%)	177(25.2%)	
Gunshot injury	58(78.3 %)	16(21.62 %)	74(10.5%)	
Stab wound	53(76.8 %)	16(23.18 %)	69(9.85%)	
Burn	9(75%)	3(25%)	12(1.7%)	<0.001
Explosive injury	7 (63.63 %)	4(36.36 %)	11 (1.6%)	

Table 3 displays the distribution of the study population based on the mechanism of trauma (Total N = 700). Blunt trauma was identified as the predominant mechanism of injury, accounting for more than half of the total cohort, 85.2% (n = 597). Penetrating trauma was observed in 14.8% (n = 103) of the cases.

Table 3. Types of traumas

Variable	Trauma (n, %)	Polytrauma (n, %)	Total (n=700)	p-value
Blunt trauma	528 (88.4 %)	69 (11.55 %)	597 (85.2%)	<0.001
Penetrating trauma	71 (68.93%)	32 (31.7%)	103 (14.8%)	

Table 4 shows the anatomical distribution of injuries among the study population (Total N = 700). Extremity injuries were the most frequent anatomical site affected, accounting for 31.2% (n = 219). Within this group, trauma was recorded in 57.53% (n = 126), while polytrauma accounted for 42.46% (n = 93). Abdominal injuries represented the second most common site, accounting for 29.4% (n = 206); among these, trauma occurred in 57.28% (n = 118), and polytrauma was observed in 42.71% (n = 88).

Note. Patients may have sustained multiple injuries; therefore, totals may exceed 700 and percentages may exceed 100%.

Table 4. Injury Pattern and Anatomical Distribution

Injury Site	Trauma (n, %)	Polytrauma (n, %)	Total (n, %)	p-value
Head injury	98 (53.26 %)	86 (46.73%)	184 (26.3%)	<0.001
Neck injury	21 (36.20 %)	37 (63.79%)	58 (8.3%)	<0.001
Chest injury	112 (58.63 %)	79 (41.36%)	191 (27.2%)	<0.001
Abdominal injury	118 (57.28 %)	88 (42.71%)	206 (29.4%)	<0.001
Pelvic injury	47 (35.87 %)	84 (64.12%)	131 (18.7%)	<0.001
Extremities injury	126 (57.53%)	93 (42.46%)	219 (31.2%)	<0.001
Spine injury	34 (30.90 %)	76 (69.09%)	110 (15.7%)	<0.001

Tables 5 & 6 outline the clinical outcomes and healthcare utilisation among the study population (Total N = 700). Intensive Care Unit (ICU) admission was required for (n=309) patients, accounting for 44.1%. Among those admitted to the ICU, trauma was recorded in 70.87% (n = 219), while polytrauma was recorded in 29.12% (n = 90). Surgical intervention was performed in 12.6% (n = 88) of the cases. Regarding overall patient outcomes, morbidity was observed in 25.8% (n = 181), with a higher rate among trauma cases (60.77%). Whereas the overall mortality rate was 2.6% (n = 18), Mortality was

higher in polytrauma patients (77.77%) compared to trauma patients. Finally, the mean duration of hospital stay was significantly greater among polytrauma patients. 14.8 ± 9.2 days (Mean $\pm$ SD). Recovery rates were higher in trauma patients (88.46%), comparable to polytrauma patients (11.35%). The table also demonstrates a statistically significant difference between trauma and polytrauma groups according to the clinical outcome ($p < 0.001$).

Table 5. Clinical outcomes and hospital stay of trauma and polytrauma patients (n= 700)

Variable	Trauma (n, %)	Polytrauma (n, %)	Total (n, %)	p-value
Morbidity rate	110 (60.77 %)	71 (39.2 %)	181 (25.8%)	<0.001
Mortality rate	4 (22.22 %)	14 (77.77%)	18 (2.6%)	<0.001
Surgery	49 (55.68 %)	39 (44.3 %)	88 (12.6%)	0.03
ICU admission	219 (70.87 %)	90 (29.12%)	309 (44.1%)	<0.001
Length of hospital stay (Mean $\pm$ SD)	6.4 $\pm$ 4.9	14.8 $\pm$ 9.2	9.1 $\pm$ 7.3	<0.001

Table 6. Outcomes at discharge

Variable	Trauma (n, %)	Polytrauma (n, %)	Total (n, %)	p-value
Recovery	460 (88.46 %)	60 (11.53%)	520 (74.3%)	<0.001
Death	4 (22.22 %)	14 (77.77%)	18 (2.6%)	
LAMA	126 (96.9%)	4 (3.07%)	130 (18.6%)	
Transfer	10 (31.25 %)	22 (68.75%)	32 (4.6%)	

Discussion

Trauma is the leading cause of death and disability worldwide. Over five million people are killed annually due to injury caused by road traffic accidents, falls, burns, (self-inflicted) violence, or acts of war. These deaths account for 9% of global mortality [5]. The present study included (700) patients: (599) with trauma and (101) with polytrauma. The mean age (Mean $\pm$ SD) was (38.6 $\pm$ 15.2) years among patients with trauma and (42.9 $\pm$ 17.4) years among those with polytrauma. Road traffic accidents involving vehicle occupants were the most frequent mechanism, accounting for 46.1% (n=322). Of these, (90.37%, n= 291) patients had trauma, while (9.62%, n=31) had polytrauma.

Falls were the second most common mechanism (n= 25.2%). These findings are generally consistent with those of a hospital-based study conducted in Nepal, which included 87 patients and reported that road traffic accidents (51.7%) were the leading cause of injury, followed by fall injury, which accounted for 20.9% [6]. The present study demonstrated a significant association between the mechanism of injury, trauma type, and patient outcomes. Road traffic accidents were the most common mechanism of injury, and blunt trauma accounted for the majority of cases (85.2%). These findings are consistent with a previous study that analyzed data from a large trauma population to evaluate the relationships among injury mechanism, injury severity, and outcomes. They reported that blunt trauma accounted for approximately 80% of major trauma cases, while road traffic collisions were the predominant mechanism of injury. Their study also found that high-energy mechanisms were associated with greater ICU utilization and a higher risk of mortality [7].

In the current study, road traffic accidents were associated with multiple anatomical injuries, particularly extremities, head, and chest injuries. Similarly, a previous study demonstrated that road traffic collisions frequently result in multisystem trauma, making mechanism of injury an important predictor during the initial trauma assessment [7], and according to Huber-Wagner et al., multitrauma cases constitute nearly a quarter (23.5%) of total tertiary centre admissions. The thorax is more commonly affected in blunt trauma patients, manifested as thoracic polytrauma in up to 60% of these high-energy presentations [8]. The present study demonstrated that extremity injuries were the most common anatomical injury pattern (31.2%), followed by abdominal injuries (29.4%), chest injuries (27.2%), and head injuries (26.3%). Moreover, polytrauma patients had significantly higher frequencies of injuries involving all anatomical regions compared with patients with isolated trauma, indicating the multisystem nature of severe trauma. These findings are comparable with the Libyan systematic review of 13 studies (n= 4665 patients), which reported that extremities accounted for 54.5% (n=2248) of all injuries, while abdominal and pelvic injuries accounted for 16.6% and head and neck injuries accounted for 9% [9]. Similarly, a retrospective study at Benghazi Medical Centre during the war reported that injuries of the upper extremities represented (35%) and lower extremities represented (29.3%) as a primary site, with a combined rate of about (64.3%) [9].

Regarding clinical outcomes and healthcare utilization of study population, among the study population, admission to the Intensive Care Unit was required for (44.1%, n=309) patients. Among those admitted to the ICU, trauma was recorded in (70.87%, n = 219), while polytrauma was recorded in (29.12%, n = 90). Surgical intervention was performed in (12.6%, n = 88) of the cases. Regarding overall patient outcomes, morbidity was observed in a considerable proportion of patients, accounting for 25.8% (n = 181), with a markedly higher rate among trauma cases. (60.77%). Whereas the overall mortality rate was 2.6% (n = 18), Mortality was higher in polytrauma patients, representing 77.77%, compared to trauma patients. Finally, the mean duration of hospital stay was significantly greater among polytrauma patients (14.8 $\pm$ 9.2) days (Mean $\pm$

SD).

Recovery rates were higher in trauma patients 88.46%, while polytrauma patients had relatively poorer outcomes 11.35%. The table also demonstrates a statistically significant difference between trauma and polytrauma groups according to the clinical outcome ($p < 0.001$). In summary, polytrauma patients had significantly higher morbidity, mortality, ICU admission, and longer hospital stay than patients with isolated trauma. In comparison with a retrospective single-centre study of adults admitted to the ICU of the Level I trauma centre in Germany, from 2010 to 2014. The included (383) Patients had severe multiple trauma, demonstrating that the morbidity rate was 47.5% and the mortality rate was 27.4%, with the largest mortality peak occurring 6–72 hours after admission. Our study showed a substantially lower morbidity and mortality rate. This difference may be explained by the previous study including patients with an Injury Severity Score ≥ 1 , representing a population with severe and critical injuries, while our study included trauma patients across a broader range of severity. In addition, the referral pattern for serious patients with neurosurgical trauma may have contributed to an underestimation of morbidity and mortality in our hospital-based study [10]. In comparison, another Prospective observational study was conducted at Tanta University Hospitals, Tanta, Egypt, from April 2022 to April 2023. Included (3,000) polytrauma patients and reported findings that were broadly comparable to those of our study. The mortality rate was reported as (13%), and the morbidity rate was (12%). These differences may be related to variation in the severity and characteristics of cases. The reported length of hospital stay (mean $\pm$ SD) was relatively shorter in the Egyptian study (5.07 ± 3.2 days), range 1–15 days, compared with our study (14.8 ± 9.2). This difference may reflect variation in injury severity and differences in hospital discharges and referral practices [11].

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Ethical approval

was obtained from the Research Ethics Committee (REC), Faculty of Medicine, Tobruk University, under approval number NBC:009.H.25.45 (16/10/2025).

Conflicts of Interest

The authors declare no conflicts of interest.

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