

## The patterns of abdominal trauma and factors associated with ICU admission in a major trauma center in Medina

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### RESEARCH

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### ABSTRACT

#### Background

Trauma is a significant health problem in Saudi Arabia. In polytrauma victims, the abdomen is the second most affected body region following the head. In the Middle East, abdominal trauma prevalence ranges from 15 per cent to 82 per cent.

#### Aims

This study aims to assess the patterns of blunt and penetrating abdominal traumas and to assess the factors associated with ICU admission.

#### Methods

This is a retrospective analytical study conducted at a major trauma centre in Medina, Saudi Arabia. Admitted abdominal trauma patients from 2015 to 2018 were included. Paediatric and isolated extra-abdominal traumas were excluded. Descriptive analysis was used to identify patterns of abdominal trauma. Chi-squared test and independent t-

test were applied to evaluate the association of the mechanism of injury, solid abdominal organs, associated extra-abdominal injuries, and type of injury. Multiple regression analysis was conducted to assess factors associated with ICU admission in abdominal trauma.

#### Results

We included a total of 218 patients with a mean age of  $32.7 \pm 13.9$  years. Males (78.4 per cent) were predominantly greater in number than females (21.6 per cent). The primary mechanisms of injury were motor vehicle collisions (MVCs) (76.6 per cent), followed by stab wounds (12.4 per cent) and falls (7 per cent). The liver and spleen were the most injured organs (31 per cent and 30 per cent, respectively). Chest injuries were the most associated extra-abdominal trauma (47.2 per cent). The majority of MVC patients (88.6 per cent) had BTA, while stab wound was the main mechanism of injury in penetrating trauma (12 per cent) ( $P < 0.001$ ). Penetrating trauma patients required laparotomy more than BTA patients (52.9 per cent and 8 per cent;  $P < 0.05$ ). Eighteen percent of patients needed ICU admission. Factors positively associated with ICU admission ( $P < 0.05$ ) were head and neck, musculoskeletal, and thoracic injuries and a moderate Revised Trauma Score (RTS).

#### Conclusion

Blunt abdominal trauma was the dominant type of abdominal injury in this study. The majority of patients were young adult males. MVCs and stab wounds were the predominant mechanisms of injury. The most affected organs were the liver and spleen. Chest injuries were the most associated extra-abdominal trauma. Factors positively associated with ICU admission were head and neck, chest, and musculoskeletal injuries and a moderate RTS.

#### Key Words

Abdominal trauma, blunt trauma, penetrating trauma, ICU admission

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## What this study adds:

### 1. What is known about this subject?

Trauma is a major cause of high morbidity and mortality in Saudi Arabia. Blunt trauma is the primary type of abdominal injury followed by penetrating trauma.

### 2. What new information is offered in this study?

Abdominal trauma Patients with moderate revised trauma score, associated head, chest or musculoskeletal trauma are positively associated with ICU admission.

### 3. What are the implications for research, policy, or practice?

Abdominal trauma is poorly studied in Saudi Arabia and this study assess the pattern of abdominal trauma will add to the future investigations.

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## Background

Trauma is a significant health problem in Saudi Arabia, and traffic accidents have been estimated to be responsible for killing one person and injuring another four persons every hour.<sup>1</sup> The literature has reported that this increase in trauma is more prominent in young adult males and related to the significant changes in the Saudi economy and the possession of cars.<sup>2,3</sup> In polytrauma victims, the abdomen is the second most affected body region following the head.<sup>4</sup> Abdominal trauma prevalence is significantly high worldwide.<sup>4,5</sup> In the Middle East, abdominal trauma prevalence ranges from 15 per cent to 82 per cent.<sup>6-8</sup> Blunt and penetrating traumas are the main patterns of abdominal injuries.<sup>6,7</sup> However, the majority of abdominal injuries occur due to blunt trauma. Blunt trauma accounted for 95 per cent of all abdominal injuries.<sup>6</sup> Motor vehicle collisions (MVCs) are the most frequent mechanism of injury in blunt trauma, while penetrating trauma stab wounds are the primary mechanism of injury (61 per cent and 62.8 per cent, respectively).<sup>6,7</sup> The liver and spleen are the most commonly affected organs in abdominal trauma.<sup>6-8</sup> The most common associated extra-abdominal trauma is chest injuries ranging from 35 per cent to 55 per cent.<sup>6,8,9</sup> The management of abdominal trauma is mainly conservative and requires observation in an intensive care unit or general surgical ward, while surgical intervention is needed in the minority of patients.<sup>6,7,10</sup> Furthermore, in terms of survival, conservative management is superior to operative management, and surgery should be performed only when indicated.<sup>11</sup>

This study aimed to assess the pattern of blunt and penetrating abdominal traumas and the factors associated

with ICU admission following abdominal trauma at King Fahad Hospital in Medina, Saudi Arabia.

## Method

### Study design and sample

This study is a retrospective analytical study conducted at King Fahad Hospital (KFH) during 2018 in the city of Medina. King Fahad Hospital is the only major trauma centre covering this area with approximately 1500 admission /year. In KFH there is two surgical wards with 25 beds in each and Surgical ICU with a 20 bed. Approval of the study was obtained from the hospital ethics committee. We included all admitted abdominal trauma patients between 2015 and 2018 in this study. Allocation of the abdominal trauma based on the ICD code system with the help of the information technology department. Paediatric and isolated extra-abdominal trauma patients were excluded. We collected data from the emergency department and the medical records of the general surgery department at King Fahad Hospital. For each patient, demographic and trauma-related data such as age, gender, nationality, mechanism of injury, abdominal organ injuries, associated extra-abdominal injuries, hospital complications, length of hospital stay and the clinical parameters were reviewed. In this study, the Glasgow Coma Scale (GCS) and Revised Trauma Score (RTS) were also calculated. RTS is a physiological score that depends on the Glasgow Coma Score (GCS), respiratory rate (RR) and systolic blood pressure (SBP) parameters; RTS used to assess the prognosis of the trauma. The variables are converted to coded values (0, 1, 2, 3 and 4) assigned by specified ranges. A weighted coefficient is multiplied to each value before it is added. Low RTS is <3.4 points, moderate RTS is from 3.4 to 7.2 points and high RTS is >7.2 points.<sup>12</sup>

### Statistical analysis and data management

The data analysis was performed by using Statistical Packages for Social Sciences (SPSS) version 21, in which both descriptive and inferential statistics were conducted. A P-value of  $\leq 0.05$  was accepted as significant for all statistical tests. Categorical variables were summarized as numbers with percentages (per cent), and numerical variables were presented as the mean  $\pm$  standard deviation. Chi-squared test and independent t-test were applied to evaluate the association of demographics date, trauma-related data, and type of injury. Multiple regression analysis was conducted, where the odds ratio with significance level and 95 per cent confidence interval (CI) were also reported to assess ICU admission risk factors.

## Results

### Abdominal blunt trauma versus penetrating trauma

We included a total of 218 patients. Abdominal injuries were categorized into two groups: blunt abdominal trauma (BTA) (n=184) and penetrating trauma (n=34). The mean age in both groups was similar at 32.8 (SD 14.3) and 32.2 (SD 12.3), respectively. Males were predominantly greater in number than females, with the BTA group being 75.5 per cent male and 24.5 per cent female, while in the penetrating trauma group, 94.1 per cent was male, and 5.9 per cent was female. In the blunt group, 63.6 per cent of patients were Saudi, and 36.4 per cent of patients were non-Saudi; in the penetrating trauma group, 44.1 per cent was Saudi, and 55.9 per cent was non-Saudi. Regarding the mechanisms of injury, the majority of patients had motor vehicle collisions (MVCs), and 88.6 per cent of those patients were in the BTA group. In the penetrating trauma group, the majority of patients had stab wounds (79.4 per cent). Table 1 shows the other mechanisms of injury. Regarding liver injury, which is categorized into contusion and laceration based on CT scan report. BTA patients exhibited more contusions (21.2 per cent) compared to lacerations (14.1 per cent), while only 4 penetrating trauma patients had lacerations, and none had contusions (P=0.008). Regarding splenic injury, slightly more BTA patients had contusions (17.4 per cent) in comparison to lacerations (15.2 per cent), while only 6 penetrating trauma patients had lacerations, and none had contusions (P=0.031). Regarding intestinal injury, a significantly greater number of patients (12 patients) had BTA compared to penetrating traumas (10 patients, P<0.001). Anterior abdominal wall injuries in form of hematoma and laceration was observed in 16 patients in the BTA group compared to 12 patients in the penetrating trauma group (P<0.001). Other abdominal organs that were injured are listed in Table 2. Regarding the association of extra-abdominal trauma and type of injury, more than half of patients (51.6 per cent) in the BTA group had chest injuries compared to only 8 patients in the penetrating trauma group (P<0.003). Musculoskeletal injuries occurred in 41.8 per cent of patients in the BTA group compared to only 3 patients in the penetrating trauma group (P<0.001). Head and neck injuries was observed in 45 patients in the BTA group compared to 3 patients in the penetrating trauma group (P=0.043) (Table 3). The correlations between the clinical evaluation and the type of injury are presented in Table 4. The Glasgow Coma Scale (GCS) of 13-15 was predominant in other categories, with 89.7 per cent in the BTA group and 100 per cent in the penetrating trauma group. However, there was no significant association between GCS and the type of injury (P=0.146). The mean heart rate in the BTA

group was slightly greater than 93.5 (SD 18.9) compared to the mean in the penetrating trauma group (91.6 (SD 12.1), P=0.003). Table 5 shows the association between the clinical profile and the type of injury. Approximately 38 per cent of patients had a positive FAST, and more than half of patients (53.3 per cent) had a positive CT scan, (P=0.116 and P=0.506, respectively). Regarding blood transfusion units, the mean units in BTA patients were slightly greater compared to those in penetrating trauma patients at 3.2 (SD 1.9) and 2.2 (SD 1.1), respectively (P=0.077). Regarding surgical intervention, 52.9 per cent of patients in the penetrating trauma group underwent laparotomy, and 8.8 per cent underwent other surgeries. In addition, 8 per cent of the BTA group underwent laparotomy, while 5.4 per cent underwent other surgeries. We found that surgical intervention had a marginally significant association with the type of injury (P=0.054). The overall hospital stay was 9.1±11.9 days. The BTA group had a longer hospital stay (mean 9.3 days (SD 11.9)) compared to the penetrating trauma group (mean 7.5 days (SD 12.3)) (p=0.404). Regarding hospital complications, such as infections, cardiovascular, pulmonary embolism (PE) and bedsores, only PE showed a significant association with the type of injury (P=0.045).

### Risk factors associated with ICU admission

Forty patients (18 per cent) required ICU admission. The penetrating trauma group showed a longer ICU stay (mean 14.4 days (SD 13.0)) compared to the BTA group, with a mean stay of 9.7 days (SD 9.4). The majority of patients needed admission for close monitoring/severe trauma (65 per cent). Half of patients required intubation (52.5 per cent). For ICU complications, respiratory complications were predominant (12.5 per cent). Cardiovascular complications and pulmonary embolism were found in two patients each Table 6. Table 7 shows a multiple regression analysis of possible factors for ICU admission in abdominal trauma patients. Factors controlled in the model were the type of injury (thoracic, head and neck and musculoskeletal injuries), GCS, moderate RTS, mean haemoglobin, mean platelet count, and laparotomy. The analysis revealed that musculoskeletal injury (OR: 5.654, P=0.001), head and neck injury (OR: 3.505, P=0.001), thoracic injury (OR: 2.436, P=0.015) and moderate RTS (OR: 2.431, P=0.001) were significantly positively associated with ICU admission.

## Discussion

Abdominal trauma incidence is globally increasing in all nations and all socioeconomic strata.<sup>7,8</sup> This study presents the patterns and factors associated with ICU admission in abdominal trauma at King Fahad Hospital in Medina, Saudi

Arabia. There are only a few reports that describe the pattern of abdominal trauma in this region. Of the 218 studied patients with abdominal injuries, 184 patients (84.4 per cent) had blunt abdominal trauma. Consistent with our results, previous studies have found that blunt trauma is the cause of most abdominal injuries,<sup>6</sup> followed by penetrating trauma.<sup>13</sup> The male to female ratio was 3.6:1 for overall abdominal trauma. Afawupeet et al.<sup>14</sup> presented a similar ratio of trauma among males compared to females with a ratio of 3.4:1.<sup>14</sup> The patients in this study were young, with a mean age of approximately 32 years. A similar mean age of 36.53±14.43 years was reported in thoracic trauma by Saaq and Shah.<sup>15</sup> Motor vehicle collisions were the most frequent cause of blunt injuries (88.6 per cent), followed by falling from a height and falling of a heavy object. Vehicle motor collisions were the first cause of blunt injury in regional and international reports.<sup>5,6</sup> Stabbing was the most common cause of penetrating abdominal trauma in our study and previous studies.<sup>8</sup> Liver injuries have been reported to be the most common injured solid organ in blunt injuries.<sup>5,6,8,16,17</sup> In our study, the liver was the most frequently injured abdominal organ, followed by the spleen, intestine, and kidneys. However, other studies reported the spleen to be the most commonly injured abdominal organ.<sup>18-20</sup> In the present study, intestinal injuries represented 10.1 per cent of injured organs. This finding was consistent with Costa et al.<sup>5</sup> whom reported a 10 per cent incidence of small bowel injury in abdominal trauma patients.<sup>5</sup> Arumugam et al.<sup>6</sup> also reported a 12 per cent incidence of small bowel injuries in abdominal trauma injuries.<sup>6</sup> In terms of penetrating trauma, small intestine injuries were more frequent than other organs.<sup>21</sup> Similarly, our study found intestinal injuries to be the second most frequent injury (29.4 per cent) after anterior abdominal wall injuries (35.5 per cent). Chest injuries were the most frequently associated extra-abdominal injuries in multiple trauma patients in our study. Chest injuries occurred in 47.2 per cent of all patients and more than half of the blunt trauma patients; similar to these findings, multiple studies reported chest injuries to be the most commonly associated injury in patients with abdominal trauma.<sup>6,8</sup> The clinical parameters of both types of trauma was almost the same in the present study in regard to blood pressure, HR, RR, and RTSs. However, the GCS of 13–15 (score) was predominant in the penetrating trauma group and blunt trauma group (100 per cent vs. 89.7 per cent), and GCS of 8-3 was presented only in the blunt trauma group (5.4 per cent) of our studied sample. This difference might be attributed to the significant high frequency of head injuries associated with blunt trauma compared to penetrating trauma in our study (24.5 per cent vs. 8.8 per cent).<sup>22</sup> The surgical

intervention in our sample showed a significant difference, where laparotomy was performed in 52.9 per cent of penetrating trauma patients and in only 8 per cent of blunt trauma patients. Compared with this finding, laparotomy was reported in 13 per cent and 27 per cent of blunt trauma and penetrating trauma patients, respectively.<sup>6,23</sup> Penetrating abdominal trauma is traditionally explored by laparotomy, and this may have exposed patients to several postoperative complications, including pulmonary embolism.<sup>24,25</sup> In our study, the incidence of pulmonary embolism was significantly greater in penetrating trauma patients than in blunt trauma patients (5 per cent vs. 0.5 per cent). Trauma victims require ICU admission; a study showed that 33 per cent of abdominopelvic trauma patients were admitted to the ICU,<sup>8</sup> but in our study, 18 per cent of abdominal trauma patients are admitted to the ICU. Most of the studied factors of ICU admission did not show a significant difference by type of injury. However, the admission rate was greater in blunt trauma patients (37/40; 92.5 per cent) than penetrating trauma patients. In regard to risk factors associated with an increased risk of ICU admission in abdominal trauma, musculoskeletal injuries increased the risk by five times, and head and neck increased the risk by three times, while thoracic and moderate RTS increased the risk by two times. Although not significant, laparotomy increased the risk of ICU admission by three times. Similar to these findings, associated head injury was identified as a risk factor for ICU admission in thoracic trauma.<sup>26</sup> Most of the previous studies present the predictors of mortality in abdominal trauma.<sup>6-8</sup> However, the data obtained from the medical files have the potential risk of missing data concerning mortality, which was the main reason for not calculating the mortality rate among the studied patients.

## Conclusion

The prevalence of abdominal trauma is greatest in young adult males. Blunt trauma is predominant compared to penetrating trauma. The main mechanism of injury is motor vehicle accidents in blunt trauma, while that of penetrating trauma is stabbing. The liver and spleen are the most affected abdominal organs. However, chest injuries are the most prevalent extra-abdominal trauma. The associated musculoskeletal, head and neck, and thoracic injuries and a moderate revised trauma score were positively associated with ICU admission in this study.

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#### PEER REVIEW

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#### CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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None

#### ETHICS COMMITTEE APPROVAL

Institutional Review Board King Fahad Hospital – Medina. Departure research committee King Fahd Hospital. Ref: 109.



**Table 1: Socio-demographic characteristics and type of injury\***

Study Variables	Overall (n=218)	BTA (n=184)	Penetrating Trauma (n=34)	P-value <sup>§</sup>
Age in years	32.7 ± 13.9	32.8 ± 14.3	32.2 ± 12.3	0.832
Gender:				
• Male	171 (78.4%)	139 (75.5%)	32 (94.1%)	<b>0.016 **</b>
• Female	47 (21.6%)	45 (24.5%)	2 (5.9%)	
Nationality:				
• Saudi	132 (60.6%)	117 (63.6%)	15 (44.1%)	<b>0.033 **</b>
• Non-Saudi	86 (39.4%)	67 (36.4%)	19 (55.9%)	
History of Chronic Disease:				
• Yes	23 (10.6%)	20 (10.9%)	3 (8.8%)	0.721
• No	195 (89.4%)	164 (89.1%)	31 (91.2%)	
Mechanism of injury:				
• MVA	167 (76.6%)	163 (88.6%)	4 (11.8%)	<b>&lt;0.001 **</b>
• Fall from height	16 (7.3%)	13 (7.1%)	3 (8.8%)	
• Stab wound	27 (12.4%)	0	27 (79.4%)	
• Heavy object falls	5 (2.3%)	5 (2.7%)	0	
• Physical assault	3 (1.4%)	3 (1.6%)	0	

\*Results are expressed as the mean ± standard deviation, number and percentage (%). BTA – Blunt Abdominal Trauma; MVA – Motor Vehicle Accident. <sup>§</sup>P-value was calculated using chi-squared test and independent t-test. \*\*Significant at the  $p \leq 0.05$  level.

**Table 2: Abdominal organ injuries and type of injury\***

Factor	Overall <sup>(n=218)</sup> N (%)	BTA <sup>(n=184)</sup> N (%)	Penetrating Trauma <sup>(n=34)</sup> N (%)	P-value <sup>§</sup>
Liver Injury				
• Contusion	39 (17.9%)	39 (21.2%)	0	<b>0.008 **</b>
• Laceration	30 (13.8%)	26 (14.1%)	4 (11.8%)	
Spleen Injury				
• Contusion	32 (14.7%)	32 (17.4%)	0	<b>0.031 **</b>
• Laceration	34 (15.6%)	28 (15.2%)	6 (17.6%)	
Stomach Injury	7 (3.2%)	3 (1.6%)	4 (11.8%)	<b>0.002 **</b>
Intestine Injury	22 (10.1%)	12 (6.5%)	10 (29.4%)	<b>&lt;0.001 **</b>
Pancreas Injury	7 (3.2%)	6 (3.3%)	1 (2.9%)	0.923
Kidney Injury	20 (9.2%)	18 (9.8%)	2 (5.9%)	0.469
Anterior Abdominal Wall Injury	28 (12.8%)	16 (8.7%)	12 (35.3%)	<b>&lt;0.001 **</b>

\* Normal group patients were excluded from this table. BTA – Blunt Abdominal Trauma. <sup>§</sup>P-value was calculated using the chi-squared test. \*\*Significant at the  $p \leq 0.05$  level.

**Table 3: Associated extra-abdominal trauma and type of injury**

Factor	Overall <sup>(n=218)</sup> N (%)	BTA <sup>(n=184)</sup> N (%)	Penetrating Trauma <sup>(n=34)</sup> N (%)	P-value <sup>§</sup>
Head and Neck Injury	48 (22.0%)	45 (24.5%)	3 (8.8%)	<b>0.043 **</b>
Spinal Injury	30 (13.8%)	30 (16.3%)	0	<b>0.011 **</b>
Chest Injury	103 (47.2%)	95 (51.6%)	8 (23.5%)	<b>0.003 **</b>
Musculoskeletal	80 (36.7%)	77 (41.8%)	3 (8.8%)	<b>&lt;0.001 **</b>
Pelvic Injury	32 (14.7%)	32 (17.4%)	0	<b>0.008 **</b>
Maxillofacial	19 (8.7%)	19 (10.3%)	0	<b>0.050 **</b>

BTA – Blunt Abdominal Trauma. <sup>§</sup>P-value was calculated using the chi-square test. \*\*Significant at the  $p \leq 0.05$  level.

**Table 4: Correlation between clinical evaluation and type of injury\***

Factor	Overall <sup>(n=218)</sup>	BTA <sup>(n=184)</sup>	Penetrating Trauma <sup>(n=34)</sup>	P-value <sup>§</sup>
GCS (%)				
• 3 - 8	10 (4.6%)	10 (5.4%)	0	0.146
• 9 - 12	9 (4.1%)	9 (4.9%)	0	
• 13 - 15	199 (91.3%)	165 (89.7%)	34 (100%)	
HR (bpm)	93.2±18.1	93.5±18.9	91.6±12.1	<b>0.003 **</b>
RR (bpm)	21.2±6.4	20.6±3.3	24.1±14.0	0.757
SBP (mmHg)	118.0±18.8	117.9±19.7	118.9±12.5	0.668
DBP (mmHg)	69.2±13.3	69.1±13.8	70.1±10.3	0.113
RTS	7.7±0.6	7.7±0.7	7.9±0.1	0.585
HGB (g/dL)	14.2±14.1	14.3±15.4	13.4±1.9	0.718
Platelet (cmm)	270.7±226.4	274.9±245.2	247.6±52.9	0.519

\* Results are expressed as the mean ± standard deviation, number and percentage (%). BTA – Blunt Abdominal Trauma Abdomen; GCS – Glasgow Coma Score; HR – Heart rate; RR – Respiratory Rate; SBP – Systolic Blood Pressure; DBP – Diastolic Blood Pressure; RTS – Revised trauma score; HGB – Hemoglobin. <sup>§</sup>P-value was calculated using an independent t-test. **\*\*Significant at the p≤0.05 level.**

**Table 5: Clinical profile and type of injury\***

Factor	Overall <sup>(n=218)</sup>	BTA <sup>(n=184)</sup>	Penetrating Trauma <sup>(n=34)</sup>	P-value <sup>§</sup>
Positive Fast	84 (38.5%)	75 (40.8%)	9 (26.5%)	0.116
Positive CT scan	114 (52.3%)	98 (53.3%)	16 (47.1%)	0.506
Blood Transfusion	75 (34.4%)	60 (32.6%)	15 (44.1%)	0.194
Blood Transfusion in units	3.1±1.9	3.2±1.9	2.2±1.1	0.077
Surgical Intervention <sup>a</sup>				
• Laparotomy	33 (15.1%)	15 (8.0%)	18 (52.9%)	<b>0.054 **</b>
• Other surgeries	13 (5.9%)	10 (5.4%)	3 (8.8%)	
Hospital Stay in days	9.1±11.9	9.3±11.9	7.5±12.3	0.404
Hospital Complication				
• Wound infection	6 (3.2%)	4 (2.6%)	2 (6.9%)	0.227
• Cardiovascular	2 (0.9%)	1 (0.6%)	1 (3.3%)	0.195
• Respiratory	8 (4.3%)	6 (3.9%)	2 (6.5%)	0.523



• PE	3 (1.4%)	1 (0.5%)	2 (5.9%)	<b>0.045 **</b>
• Bedsores	2 (0.9%)	1 (0.5%)	1 (2.9%)	0.178

\* Results are expressed as the mean ± standard deviation, number and percentage (%). BTA – Blunt Abdominal Trauma Abdomen; CT – Computer Topography; PE – Pulmonary Embolism. <sup>§</sup>P-value was calculated using the chi-squared test.

\*\*Significant at the p≤0.05 level. <sup>a</sup> Only 46 patients underwent surgical intervention.

**Table 6: ICU admission and type of injury\***

Factor	Overall <sup>(n=40)</sup> <sup>a</sup>	BTA <sup>(n=37)</sup>	Penetrating Trauma <sup>(n=3)</sup>	P-value <sup>§</sup>
ICU stay in days	10.1±9.6	9.7±9.4	14.4±13.0	0.425
ICU admission cause				
• Close monitoring and/or severe trauma	26 (65%)	25 (67.6%)	1 (33.3%)	0.232
• Postsurgery	14 (35%)	12 (32.4%)	2 (66.7%)	
Intubation	21 (52.5%)	19 (51.4%)	2 (66.7%)	0.609
Infection	1 (2.5%)	1 (2.7%)	0	0.773
Cardiovascular complication	2 (5.0%)	1 (2.7%)	1 (33.3%)	<b>0.019 **</b>
Respiratory complication	5 (12.5%)	5 (13.5%)	0	0.496
PE	2 (5.0%)	1 (2.7%)	1 (33.3%)	<b>0.019 **</b>

\* Results are expressed as the mean ± standard deviation, number and percentage (%). BTA – Blunt Abdominal Trauma Abdomen; ICU – Intensive Care Unit; CVA – Cardiovascular; PE – Pulmonary Embolism. <sup>§</sup>P-value was calculated using chi-squared test and independent t-test. \*\*Significant at the p≤0.05 level. <sup>a</sup> Only 40 patients were admitted to the ICU.

**Table 7: Regression analysis of possible risk factors for ICU admission in abdominal trauma**

Factor	Odds ratio	95% CI	P-value
Type of Injury:			
• BTA vs Penetrating trauma	0.384	0.111–1.327	0.130
Head and Neck Injury	3.505	1.677–7.323	<b>0.001 **</b>
Thoracic Injury	2.436	1.193–4.976	<b>0.015 **</b>
Musculoskeletal Injury	5.654	2.672–11.963	<b>&lt;0.001 **</b>
GCS (%)			
• 3 - 8	Reference		
• 9 - 12	0.050	0.001–2.382	0.129
• 13 - 15	0.366	0.045–2.981	0.348

Moderate RTS	2.431	1.463–4.041	<b>0.001 **</b>
Mean Hemoglobin	0.991	0.972–1.011	0.384
Mean Platelet count	0.999	0.997–1.001	0.208
Laparotomy	3.646	0.945–14.065	0.060

CI – Confidence Interval; GCS – Glasgow Coma Score; RTS – Revised trauma score; HGB – Hemoglobin. \*\*Significant at the  $p \leq 0.05$  level.