

Prevalence of Splenic Injury in Blunt Abdominal Trauma: A Cross-Sectional Study at Al Nasiriya Teaching Hospital, Thi-Qar, Iraq

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ABSTRACT

Background: Blunt abdominal trauma (BAT) is a common cause of intra-abdominal injury, with the spleen being the most frequently affected organ. In resource-limited settings, understanding injury patterns and management strategies is crucial for improving outcomes. **Objective:** To assess the prevalence, injury patterns, and clinical management of splenic injuries in patients with BAT.

Methods: A cross-sectional study was conducted at Al Nasiriya Teaching Hospital between April 1, 2024, and April 1, 2025. A total of 93 patients with splenic injury confirmed by imaging or surgical findings were included. Data on demographics, trauma mechanism, imaging findings, injury grade (AAST), associated injuries, and treatment approach were analyzed using SPSS version 26.

Results: The majority of patients were males (62.4%), with the highest prevalence observed in the 20-29 age group. Ultrasound was used in 60.2% of cases and CT in 35.5%. Grade 3 injuries were most frequent (38%), followed by Grade 2 (28%). Associated abdominal injuries occurred in 38.7%, mainly liver injuries (55.9%), while 40.9% had extra-abdominal injuries. Surgical intervention was performed in 92.5% of cases, and conservative management in 15%, primarily in low-grade injuries.

Conclusion: Splenic injury following BAT predominantly affects young males and often necessitates surgical intervention in low-resource settings. Broader adoption of non-operative management requires enhanced radiological and monitoring capacities.

Keywords: Blunt abdominal trauma, splenic injury, AAST grading, trauma surgery, non-operative management.

INTRODUCTION

Blunt abdominal trauma (BAT) is a major contributor to trauma-related morbidity and mortality worldwide. It often results from motor vehicle collisions, falls, or assaults, and accounts for approximately 75% of abdominal injuries (1). Among intra-abdominal organs, the spleen is the most frequently injured due to its high vascularity and anatomical location in the left upper quadrant (2). The spleen plays vital hematologic and immunologic roles and is protected by splenic ligaments, including the gastrosplenic and splenorenal

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ligaments, although its friable parenchyma makes it susceptible to trauma (3). Splenic injury risk varies with age, trauma mechanism, and the degree of impact. Studies report a prevalence of splenic injuries ranging from 25% to 50% in patients with BAT (4,5), with a higher incidence in younger individuals due to increased exposure to high-energy trauma and reduced thoracic protection (6).

Splenic trauma may result from direct compression, such as seatbelt injuries, or from deceleration forces leading to vascular avulsion or parenchymal laceration (7). Clinical presentation may include abdominal pain, signs of hypovolemia, or referred shoulder pain (Kehr's sign), indicating diaphragmatic irritation due to hemoperitoneum (8). Diagnosis often involves a physical examination alongside imaging, particularly Focused Assessment with Sonography for Trauma (FAST), which is a rapid and non-invasive technique, and contrast-enhanced computed tomography (CT), which remains the gold standard for grading injuries (9). CT allows classification based on the American Association for the Surgery of Trauma (AAST) system, ranging from Grade I (minor lacerations) to Grade V (shattered spleen or hilar vascular injury), which helps determine the optimal treatment approach (10,11).

Management has evolved from splenectomy to a preference for nonoperative management (NOM) in hemodynamically stable patients, with success rates exceeding 90% in selected case (12).

However, in resource-limited settings, surgical intervention is still common due to lack of radiologic support and intensive care infrastructure. When surgery is necessary, splenic preservation techniques, such as partial splenectomy or splenic artery embolisation, are increasingly used to preserve immune function (13). Complications of splenic trauma include delayed rupture and overwhelming post-splenectomy infection (OPSI), emphasizing the importance of follow-up care and immunization against encapsulated organisms like *Streptococcus pneumoniae* and *Haemophilus influenzae* (14-16).

Epidemiological studies of splenic injuries are vital to guide resource allocation, improve management protocols, and support preventive strategies. This study was conducted to evaluate the prevalence, clinical characteristics, and outcomes of splenic injuries due to BAT in a tertiary care setting in southern Iraq.

METHODOLOGY

This prospective cross-sectional study was conducted at Al Nasiriya Teaching Hospital, a major referral center

in southern Iraq, over one year from April 1, 2024, to April 1, 2025. The study included all patients presenting with blunt abdominal trauma who were diagnosed with splenic injury based on imaging (FAST or CT scan) or confirmed intraoperatively. Patients with penetrating injuries, pre-existing splenic pathology, or incomplete records were excluded.

A total of 93 patients were enrolled using convenience sampling based on trauma registry data and prior literature regarding the prevalence of splenic injuries. Data were collected from medical charts, imaging reports, operative notes, and follow-up records. Recorded variables included demographics, mechanism of injury, clinical findings, imaging modality, AAST injury grade, associated injuries, and management approach. Patient assessment followed Advanced Trauma Life Support (ATLS) protocols. Hemodynamically stable patients underwent CT scanning, while unstable patients were assessed by FAST and taken to surgery if necessary.

Operative procedures included splenectomy or spleen-preserving techniques depending on injury grade and patient condition. Conservative management was applied in stable cases with low-grade injuries and included ICU monitoring, bed rest, serial hemoglobin testing, and follow-up imaging.

Data were anonymized and entered into a secure electronic database. Ethical approval was obtained from the College of Medicine, University of Thi-Qar, and the Thi-Qar Health Directorate. Statistical analysis was conducted using SPSS version 26. Descriptive statistics were used for frequency distribution, while chi-square and t-tests were applied to compare categorical and continuous variables, respectively, with a significance level set at $p < 0.05$.

RESULTS

The study included a total of 93 patients with splenic injury.

Fig. 1 shows the age distribution of the patients. The majority of cases occurred in the age group of 20-29 years, followed by those aged 10-19 years and 30 to 39 years. Fewer cases were reported in the age groups above 40 years, with the lowest frequency in patients older than 50 years.

Fig. 2 presents the gender distribution of the patients. Males constituted the majority of cases, accounting for 58 (62.4%) of the patients, while females represented 35 (37.6%).

Fig. 3 illustrates the imaging modalities used for diagnosing splenic injuries. The US was the most

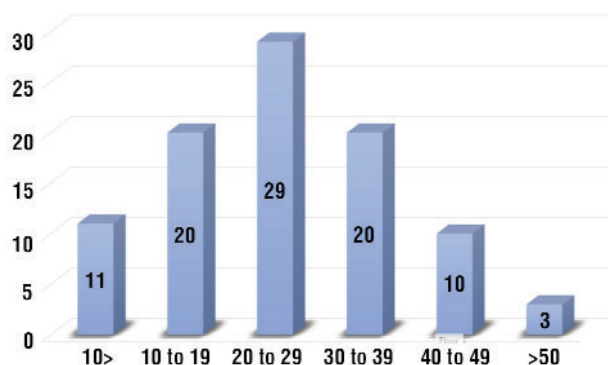


Figure 1 - Age (in years) distribution of splenic injury patients

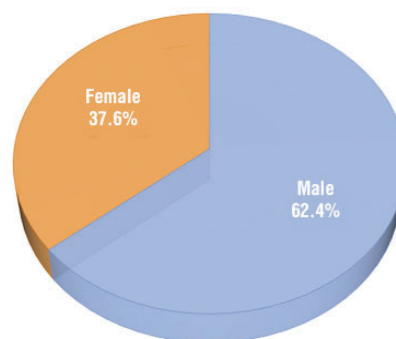


Figure 2 - Gender distribution of splenic injury patients

frequently used modality, applied in 56 (60.2%) of the cases. A CT scan was used in 33 (35.5%) of the patients, while Explorative laparotomy was used in 4 (4.2%).

Fig. 4 demonstrates the grades of splenic injury based on CT findings according to the AAST grading system. Grade 3 injuries were the most frequent overall, 30 (38%), followed by Grade 2, 26 (28%), Grade 4 18 (19.4%), Grade 1, 11 (11.85%), and Grade 5, 8 (8.6%).

In a cohort of splenic-injured patients, 38.7% had associated abdominal injuries, with liver injuries being the most common (55.9%), followed by left kidney hematomas (29%), bowel injuries (20.4%), vascular injuries (11.8%), bladder injuries (10.8%), and urethral injuries (2.1%). Extra-abdominal injuries were present in 40.9% of patients, most frequently hemothorax and pneumothorax (33.4%), rib fractures (24.7%), and diaphragmatic injuries (6.5%). Notably, 25.8% of patients had no associated injuries. These findings highlight the high incidence of concomitant injuries in splenic trauma, emphasizing the need for thorough evaluation in such cases (table 1).

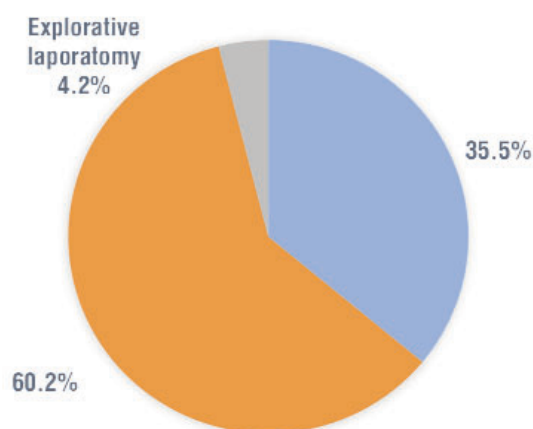


Figure 3 - Modalities used to diagnose the splenic injury

Table 2 presents the treatment modalities according to splenic injury grade. In a total of 93 patients with splenic injury, conservative treatment was employed in 15% of cases (n = 14), while surgical treatment was used in the remaining 85% (n = 79). Conservative

Table 1 - Associated injuries in splenic-injured patients

Associated Injuries	Frequency	Percent %
Abdominal 36 (38.7%)		
Bowel injury	19	20.4%
Liver injury	52	55.9%
Vascular injury	11	11.82%
Bladder injury	10	10.75%
Left kidney hematoma	27	29%
Urethral injury	2	2.1%
Extra abdominal 38 (40.9%)		
Hemothorax and pneumothorax	31	33.4%
Diaphragmatic injury	6	6.5%
Rib fractures	23	24.7%
No associated injuries	24	25.8%

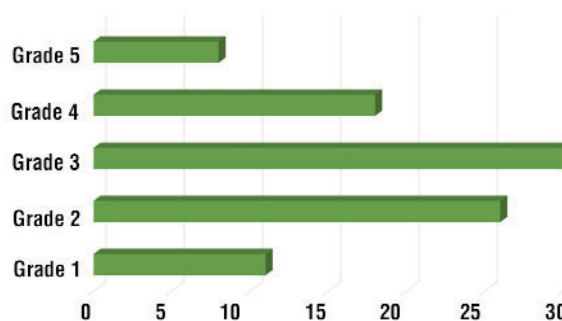


Figure 4 - Grades of splenic injury based on CT scan findings according to the AAST grading system

Table 2 - Type of treatment used for splenic injury by injury grade

Splenic injury grade	Conservative treatment (15%)	Surgical treatment (85%)	Total
Grade 1	6 (42.9%)	5 (6.3%)	11 (11.8%)
Grade 2	8 (57.1%)	18 (22.8%)	26 (28.0%)
Grade 3	0 (0.0%)	30 (38.0%)	30 (32.3%)
Grade 4	0 (0.0%)	18 (22.8%)	18 (19.4%)
Grade 5	0 (0.0%)	8 (10.1%)	8 (8.6%)
Total	14 (100.0%)	79 (100.0%)	93 (100.0%)

management was limited to lower-grade injuries, with 42.9% of Grade 1 and 57.1% of Grade 2 injuries managed non-operatively. In contrast, all Grade 3, 4, and 5 injuries were treated surgically, comprising 38.0%, 22.8%, and 10.1% of the surgical cases, respectively. This distribution indicates a clear trend toward surgical intervention with increasing injury severity.

DISCUSSION

Trauma remains a leading cause of both mortality and morbidity worldwide and is increasingly recognized as a global health epidemic. Among the various anatomical regions affected, the abdomen is one of the most commonly involved in traumatic injuries (17). Blunt abdominal trauma (BAT) and penetrating abdominal trauma together account for approximately 7–10% of trauma-related deaths, with splenic and hepatic injuries being major contributors due to their high risk of intra-abdominal hemorrhage and associated mortality rates reaching up to 42% (18). This study aimed to evaluate the demographic distribution, diagnostic approaches, injury severity, associated injuries, and management strategies in patients with splenic injuries secondary to BAT.

A strong male predominance (62.4%) was observed, with the highest incidence occurring in the 20-29-year age group. This finding aligns with previous studies, including a large series by Peitzman et al. (19), which reported a similar demographic trend - males aged 20-40 years - likely reflecting increased exposure to high-energy trauma mechanisms such as road traffic accidents and interpersonal violence.

Ultrasound was the most frequently utilized diagnostic modality (60.2%), followed by computed tomography (CT) at 35.5%, and laparotomy in a minority of cases (4.2%). This distribution is typical of resource-limited settings, where ultrasonography is often prioritized due to its accessibility, cost-effectiveness, and utility at the bedside-particularly in hemodynamically unstable patients (20). In contrast, in high-

resource environments, CT imaging is employed in over 90% of trauma evaluations, as demonstrated in a large multicenter U.S. study (21), reflecting its widespread availability and the value of detailed injury characterization.

Grade 3 splenic injuries were the most commonly observed (38%), followed by Grades 2 and 4. This injury distribution is consistent with findings from the Eastern Association for the Surgery of Trauma (EAST) multi-institutional trial, which reported Grades 2 and 3 as the most prevalent (22). Notably, Grade 3 injuries often represent a clinical decision-making threshold, where the choice between operative and non-operative management becomes particularly complex-especially in settings with limited resources for continuous monitoring and advanced imaging.

Associated injuries were identified in 38.7% of blunt abdominal trauma (BAT) cases, with the liver being the most frequently involved organ (55.9%). This aligns with prior studies identifying the liver and spleen as the most commonly injured solid organs in BAT (23,24). Extra-abdominal injuries - such as rib fractures, hemothorax, and pneumothorax - were also commonly observed, reflecting the high-energy mechanisms typically involved. Similarly, Haan et al. (25) reported thoracic injuries in approximately one-third of patients with splenic trauma, emphasizing the importance of a comprehensive evaluation to detect concurrent injuries.

Surgical intervention was performed in 92.5% of cases, while conservative management was employed in only 15%, primarily in patients with low-grade injuries. All Grade 3 and higher injuries were managed operatively. These findings contrast with practices in high-resource settings, where non-operative management (NOM) is widely adopted for Grades 1-3, and even selectively for Grades 4-5. For example, Stassen et al. (26) reported NOM success rates exceeding 80% for Grades 1-3 in centers equipped with interventional radiology and intensive monitoring capabilities. The high rate of operative management in this study likely reflects local constraints, including limited access to CT imaging, blood products, and continuous observation facilities.

Comparable trends have been reported in other Iraqi studies. Hatam et al. (27), for instance, documented surgical management in 81% of patients with splenic injuries, attributing the limited use of NOM to inadequate imaging infrastructure and ICU availability. These findings highlight the necessity of tailoring trauma care protocols to the capabilities and limitations of the local healthcare system.

Our findings underscore the importance of developing context-specific management protocols that consider both the severity of injury and the resources available within each institution. While high-resource centers are able to safely implement non-operative management (NOM) in up to 60–70% of splenic injury cases (28), operative intervention remains the standard approach in settings lacking the infrastructure for close hemodynamic monitoring, repeat imaging, and interventional radiology. Adapting management strategies to local capabilities is essential to optimize patient outcomes and ensure safe, effective trauma care.

CONCLUSION

This study confirms that splenic injuries resulting from blunt abdominal trauma (BAT) predominantly affect young adult males and are most frequently managed surgically in resource-limited settings. Grade 3 injuries were the most common and often required operative intervention. While global trends increasingly support non-operative management (NOM), its success is highly dependent on institutional resources, including access to advanced imaging, intensive care facilities, and trained clinical personnel. Expanding the use of NOM in such settings will require parallel investments in healthcare infrastructure, workforce development, and the implementation of standardized clinical protocols to ensure patient safety and optimize outcomes.

Author's Contributions

All authors contributed to the study design, data analysis, and manuscript preparation. All approved the final version.

Competing Interests

The authors declare that there are no conflicts of interest related to this work.

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Ethics Approval and Consent to Participate

Ethical approval was granted by Ethical approval was obtained from the College of Medicine, University

of Thi-Qar, and the Thi-Qar Health Directorate. Informed consent from the participants was waived due to the retrospective nature of the study.

Availability of Data and Materials

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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