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Pattern and outcomes of colonic injuries among a sample of Iraqi patients: A retrospective analysis

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Abstract

Background: Colon injuries are a major difficulty for trauma surgeons, particularly in conflict settings. The management and outcomes of colon injuries in Iraq have hardly been studied yet.

Objective: To investigate the incidence, management and outcomes of colon injuries in Iraqi patients presenting to a trauma center in Baghdad.

Methods: A retrospective study of 324 colon-injured patients treated at a Private Hospital in Baghdad between January 2019 and December 2023. Data was collected on demographics, mechanism of injury, injury severity scores, management, complications and outcomes. Established Protocols for Data Collection: * Initial instructions providing detailed information regarding the retrospective study were sent and on arrival in the hospital, the third author further guided the first two authors through the data formally recorded during the treatment of each individual patient. Our investigations reveal the following:

Results: The mean age of patients was 32.4 ± 14.2 years and 78.4% were male. Penetrating trauma was the cause of colon injury in 76.2% of presentations, with gunshot wounds the commonest mechanism (45.4%). The ascending colon was most commonly injured (28.7%). In overall treatment, 41.4% of patients had a primary repair, while 38.3% underwent resection and anastomosis. Overall mortality was 12.3% (n=40) with sepsis causing 67.5% of mortalities. Post-operative complications occurred in 34.6% of patients with surgical site infection being the most common (18.5%).

Conclusion: Colon injuries in Iraq were more predominant in young males from penetrating mechanisms. Early surgical intervention, and appropriate methods of colonic injury management were both shown to be important in clinical outcomes from colonic injuries. The high associated complication rates demonstrate that sustaining patient safety to most situations requires use of intervention protocols both in pre-operative and post-operative care, including infection control and prevention methods.

Keywords: Colonic injuries, trauma surgery, Iraq, penetrating trauma, outcomes, Baghdad

Introduction

Colonic injuries are one of the most difficult aspects of managing abdominal trauma and can lead to significant morbidity and mortality. Colon injuries require an immediate surgical response and strict postoperative vigilance [1]. These injuries are especially challenging to manage because of the unique anatomical and physiological characteristics of the colon, such as the volume of contents in the colon, the inconsistent blood supply, and the potential for peritoneal cavity contamination [2]. In the context of a population at war and experiencing violence, as in the case of Iraq, colon injuries show a variety of patterns and complication that are different from population with trauma experiences that are seen in civilian trauma centres in less risky environments.

Iraq's health care system has the historical context of decades of conflict, economic sanctions, and political instability have greatly impacted the healthcare system's infrastructure, resources, and capacity [3]. Since the 2003 invasion and years of inter-sectarian violence, Iraqi health facilities have had to adapt to the issues surrounding high numbers of trauma cases, especially high-velocity projectiles and explosive injuries [4]. This environment has created a vulnerable clinical environment whereby trauma surgeons have a large volume of experience with complex penetrating injuries, and are still dealing with the lack of resources, shortages of essential equipment, and limited infection control challenges.

The epidemiologically based profiles of colon injuries in Iraq reflect the violence and trauma that has been intrinsic to Iraq's culture and history. In contrast to developed countries, where blunt trauma from motor vehicle accidents predominates, the Iraqi experience is certainly weighted towards penetrating injuries caused by firearms, improvised explosive devices, and fragmentation-type weapons [5]. In essence, this means that surgery, management, and allocation of devising surgical intervention protocols, are different than what is found in usual Western trauma practice.

There is great variation in anatomical distribution of colonic injuries depending on the mechanism of trauma, and penetrating injuries demonstrate typically different patterns than blunt trauma [6]. In Iraq, high-velocity projectiles that produce damage, and not necessarily injury, are common. This may result in complicated injury modalities that create broad patterns of injury and may require multi-organ surgical intervention. Although there is loss of tissue through projectile trajectories, the energy loss and transfer to the surrounding tissue generates enough damage to cause loss of soft tissue integrity to the point where one cannot extrapolate the anatomy. Energy also creates blood loss, vessel compromise and contamination of the operated site that forces a reconsideration of the initial management and healing process.

Current literature regarding the management of colon trauma stresses the importance of rapid recognition, definite surgical intervention, and complete perioperative management, as being highly influential on patient outcomes [7]. Over the past several decades, there has been a significant shift in the approach to colonic injuries, whereby the necessity for colostomy creation has reduced to preference for primary repair if safe for the patient. The issue of whether resource constrained environments, like those often encountered in Iraq, maintain the validity of recent evidence based treatment recommendations continue to be a germane debate to the clinical perspective. The process of making decisions regarding the management of colonic injuries involves many considerations such as the location and extent of the injury, level of contamination, patient physiological condition and availability of resources necessary for postoperative care [8]. In the Iraqi healthcare context, these decisions are complicated by delays in presentation, multiple simultaneous injuries, limited access to blood banks and sterile surgical environments. Thus, clinicians have developed modified protocols that still adhere to damage control principles but potentially minimize future morbidity.

Control of infection represents an especially important factor in the management of colonic injuries within the Iraqi context, as the patterns of hospital-acquired infection and antibiotic resistant infection will vary greatly from what is outlined in western literature [9]. The unique setting is often defined by the presence of multi-drug resistant organisms, limited antibiotic availability and difficulty maintaining a sterile environment, creating a clinical scenario in which infection prevention and management considerations must be individualized to the contemporary situation and available resources.

Economic impacts associated with colonic injury are just as significant as the medical concerns; the associated long-term change in quality of life, functional ability and economic productivity are of concern for the affected individual as well as their families. In a country where public health resources are limited and social support systems have deteriorated, the consequences of traumatic injuries have serious implications for the affected individuals and their families [10]. Identifying these wider impacts is essential to developing more comprehensive treatment pathways that meet urgent, surgical needs and long-term rehabilitation and societal reintegration needs.

Documenting and collecting data on colonic injury patterns in Iraq has many benefits, including informing local treatment processes, supporting decisions about where to allocate scarce healthcare resources, and serving as data for global data on trauma care, particularly in areas of conflict. Countries such as Iraq provide unique insights into acute trauma, particularly in penetrating trauma, that can inform care in other similar or mass casualty scenarios worldwide**.**

Prior research studying colonic injuries sustained in an environmentally clasified as a conflict zone has demonstrated the importance of systematically collecting and analyzing data to identify trends, test treatment and evaluate protocols, and facilitate the development of evidence-based protocols that are relevant to specific clinical contexts [11]. While a lot of the data related to colonic injuries has been published regarding military trauma or civilian traumas occurring in stable civilian populations, there is a great need for published data describing the particular issues and outcomes related to colonic injuries within the Iraqi civilian healthcare system**.**

Recognizing a need to fill the gap in Iraqi data regarding colonic injuries, this study is intended to provide a comprehensive picture of colonic injury patterns, management, and outcomes to a group of Iraqi patients. By reporting data from a major trauma center in Baghdad, we hope to identify patterns, examine management practices, and highlight potential opportunities for improvements in clinical care delivery.

While it would be incorrect to state this study is purely for academic interest, the work may generate interest for policy decisions it could influence, training, and resources that could be allocated to improve outcomes for trauma patients throughout Iraq and in other similar situations. It is/was our hope that the identification of specific issues and successes related to colonic injury management in Iraq can provide insight to humanitarian agencies, international medical mission groups, and military service medical service providers operating in similar environments**.**

In addition to adding to an historic record of knowledge gained during one of the most challenging humanitarian medical crises experienced in the world, we sought to add to the knowledge also gained during the years caring for these types of complex trauma issues in Iraq. We have an obligation to record and report the challenges faced by those providing acute trauma care for patients in Iraq. The data we present is not only statistical data; it is the culmination of knowledge gained, in some cases from intestinal surgeons who managed the unmanageable, under conditions that should fully preclude caring for acutely injured patients.

Methodology

Study Design and Setting

This retrospective cross-sectional study was conducted at a Private Hospital in Baghdad, Iraq. This institution was selected based on its status as a primary referral center for trauma cases in Baghdad and its capacity to maintain comprehensive medical records. The hospital serves both private patients and those referred from public healthcare facilities, providing a representative sample of trauma cases in the Baghdad metropolitan area. The study period extended from January 1, 2019, to December 31, 2023, providing a five-year window for data collection and analysis.

A Private Hospital located in central Baghdad, equipped with modern trauma and surgical facilities including a dedicated trauma unit, intensive care capabilities, and 24-hour emergency surgical services. The hospital maintains electronic medical records and has established protocols for trauma management that align with international standards while adapting to local conditions and resource availability.

Study Population and Inclusion Criteria

The study population comprised all patients presenting with colonic injuries during the specified time period. Inclusion criteria were established to ensure comprehensive capture of relevant cases while maintaining data quality and clinical relevance. Patients were included if they: (1) presented with traumatic colonic injuries confirmed by operative findings, computed tomography, or autopsy; (2) underwent surgical intervention or died before surgery due to colonic injury complications; (3) had complete medical records available for review; and (4) were treated at a Private Hospital during the study period.

Exclusion criteria were applied to eliminate cases that might confound the analysis or lack sufficient data for meaningful interpretation. Patients were excluded if they: (1) had iatrogenic colonic injuries resulting from medical procedures; (2) presented with colonic injuries secondary to underlying pathological conditions such as inflammatory bowel disease or malignancy; (3) had incomplete medical records preventing adequate data extraction; (4) were transferred to other facilities before definitive treatment; or (5) had colonic injuries discovered incidentally during surgery for other conditions without contributing to the primary clinical presentation.

Data Collection and Variables

Data collection was performed using a standardized data extraction form developed specifically for this study. The form was pilot-tested on a sample of 50 cases to ensure completeness and reliability before full implementation. Data extraction was conducted by trained research assistants under the supervision of senior clinicians at the hospital. Regular quality control checks were performed to ensure consistency and accuracy throughout the data collection process.

Demographic variables collected included age, gender, occupation, place of residence, and socioeconomic status indicators. Clinical variables encompassed mechanism of injury, time from injury to presentation, initial vital signs, laboratory values, imaging findings, and injury severity scores. The Injury Severity Score (ISS) was calculated for all patients using standardized methodology, with particular attention to abdominal injuries and their contribution to overall severity assessment.

Anatomical injury characteristics were documented including specific colonic segments involved, number of perforations, size of defects, degree of contamination, and presence of associated injuries. The Colon Injury Scale developed by the American Association for the Surgery of Trauma was used to grade injury severity, providing standardized assessment criteria that facilitated comparison across cases.

Surgical management variables included time from presentation to surgery, type of anesthesia used, surgical approach, specific procedures performed, need for damage control surgery, blood product requirements, and operative complications. Postoperative care variables encompassed intensive care unit stay, total hospital length of stay, antibiotic regimens, nutritional support, and rehabilitation services provided.

Outcome Measures

Primary outcome measures were defined as mortality and major complications occurring within 30 days of initial treatment. Mortality was categorized as early (within 48 hours), intermediate (48 hours to 7 days), or late (7 to 30 days) to identify patterns and potential intervention points. Major complications were defined using standardized criteria including anastomotic leak, intra-abdominal abscess, wound infection, sepsis, multiple organ failure, and need for reoperation.

Secondary outcome measures included hospital length of stay, intensive care unit utilization, functional outcomes at discharge, and long-term complications when follow-up data were available. Functional outcomes were assessed using validated scales where applicable, with particular attention to bowel function, quality of life indicators, and return to normal activities.

Statistical Analysis

Statistical analysis was performed using SPSS version 28.0 (IBM Corporation, Armonk, NY). Descriptive statistics were used to characterize the study population and injury patterns. Continuous variables were expressed as means with standard deviations or medians with interquartile ranges, depending on data distribution. Categorical variables were presented as frequencies and percentages.

Univariate analysis was conducted to identify factors associated with mortality and complications. Chi-square tests were used for categorical variables, while Student's t-tests or Mann-Whitney U tests were employed for continuous variables as appropriate. Multivariable logistic regression analysis was performed to identify independent predictors of mortality and complications, with variables showing significance at $p < 0.20$ in univariate analysis included in the initial model.

Model building followed a forward selection approach with significance levels set at $p < 0.05$ for inclusion and $p > 0.10$ for removal. Goodness of fit was assessed using the Hosmer-Lemeshow test, and model discrimination was evaluated using the area under the receiver operating characteristic curve. All statistical tests were two-sided, with significance set at $p < 0.05$.

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki. Given the retrospective nature of the study, individual patient consent was waived by the ethics committee. However, strict confidentiality measures were implemented to protect patient privacy, with all data de-identified before analysis.

Data security protocols were established to ensure confidentiality throughout the study period. Electronic data were stored on password-protected servers with restricted access, and physical documents were maintained in locked filing systems. Research staff received training on ethical research conduct and data protection requirements before participating in the study.

Quality Assurance
Quality assurance measures were implemented at multiple levels to ensure data accuracy and reliability. Inter-rater reliability was assessed through duplicate data extraction on a random sample of 10% of cases, with kappa statistics calculated to measure agreement. Regular audits were conducted to verify data accuracy and completeness, with discrepancies resolved through discussion and chart review.
Standardized definitions were developed for all variables to ensure consistency among reviewers. Training sessions were conducted for all research staff to ensure uniform application of inclusion criteria, data extraction procedures, and outcome assessments. External validation was performed on a subset of cases by independent reviewers not involved in the primary data collection.

Results
Demographic Characteristics
A total of 324 patients with colonic injuries were included in this study at a Private Hospital, Baghdad. The demographic profile revealed a predominantly young male population, with a mean age of 32.4 ± 14.2 years (range: 14-78 years). Male patients comprised 78.4% (n=254) of the cohort, while female patients represented 21.6% (n=70). The age distribution showed that 68.2% of patients were between 20-45 years of age, representing the economically active population segment.

Table 1: Demographic Characteristics of Patients with Colonic Injuries (n=324)

Variable	n	%
Age Groups		
<20 years	34	10.5
20-30 years	118	36.4
31-45 years	103	31.8
46-60 years	52	16.0
>60 years	17	5.2
Gender		
Male	254	78.4
Female	70	21.6
Patient Type		
Private patients	189	58.3
Referred from public hospitals	135	41.7

Injury Mechanisms and Patterns
Penetrating trauma dominated the injury mechanisms, accounting for 76.2% (n=247) of all colonic injuries, while blunt trauma represented 23.8% (n=77) of cases. Among penetrating injuries, gunshot wounds were the most common mechanism, occurring in 45.4% (n=147) of all patients, followed by stab wounds in 18.5% (n=60) and shrapnel injuries in 12.3% (n=40). Motor vehicle accidents accounted for 15.4% (n=50) of cases, primarily resulting in blunt trauma patterns.

Table 2: Injury Mechanisms and Anatomical Distribution (n=324)

Variable	n	%
Mechanism of Injury		
Gunshot wound	147	45.4
Stab wound	60	18.5
Shrapnel	40	12.3
Motor vehicle accident	50	15.4
Fall from height	15	4.6
Other blunt trauma	12	3.7
Anatomical Location		
Ascending colon	93	28.7
Transverse colon	76	23.5
Descending colon	82	25.3
Sigmoid colon	73	22.5
Injury Severity Score		
<15	142	43.8
15-25	138	42.6
>25	44	13.6

Surgical Management and Outcomes
Primary repair was the most common surgical intervention, performed in 41.4% (n=134) of cases. Resection and anastomosis was required in 38.3% (n=124) of patients, while 20.3% (n=66) required colostomy formation. Damage control surgery was necessary in 8.6% (n=28) of cases, typically in patients with multiple injuries or hemodynamic instability.

Table 3: Surgical Management and Complications (n=324)

Variable	n	%
Surgical Procedure		
Primary repair	134	41.4
Resection and anastomosis	124	38.3
Colostomy	66	20.3
Complications		
Any complication	112	34.6
Surgical site infection	60	18.5
Anastomotic leak	28	8.6
Intra-abdominal abscess	35	10.8

Sepsis	42	13.0
Multiple organ failure	18	5.6
Mortality		
Overall mortality	40	12.3
Early mortality (<48 hours)	15	4.6
Intermediate mortality (2-7 days)	18	5.6
Late mortality (7-30 days)	7	2.2

The overall mortality rate was 12.3% (n=40), with early mortality (<48 hours) occurring in 4.6% of patients. Sepsis was the leading cause of death, responsible for 67.5% (n=27) of all mortalities. Complications occurred in 34.6% (n=112) of patients, with surgical site infection being the most common complication at 18.5% (n=60). The mean hospital length of stay was 12.8 ± 8.4 days, with patients requiring colostomy having significantly longer stays (18.2 ± 11.3 days) compared to those undergoing primary repair (9.4 ± 5.7 days).

Discussion

The results of this extensive study offer new insight into the frequency and effect of colonic injuries in Iraqi patients after being treated in a private hospital in Baghdad, which shown noteworthy patterns that differ based on the current health challenges and traumatic demands of this burdened location. The significant number (78.4% male) young patients with penetrating injuries (76.2%), clearly presents a traumatic picture that ties to a stressful time of unrelenting violence, conflict and war time health care for civilians that is distinctly different to health experiences seen in stable health atmospheres.

The average age of our cohort of 32.4 years, is a younger population than that seen in Western trauma settings where the psychology of colonic injuries is located in the older population exposed to road traffic accidents and blunt trauma mechanisms [12]. This age of this problem creates important societal effects when its the productive population that is being most affected and these subsequent effects may have implications on individuals, families and society over time. The younger population needing trauma care also suggests that violence-related trauma persists as a public health concern in Iraq, and there is a need for a coherent violence prevention strategy to be implemented, alongside building improved trauma capacity, and capability.

People were found to have a talent for getting shot, because in this cohort penetrating injury males were most common (45.4%) compared to blunt trauma. As a rule of thumb, we would expect to see a third who would have penetrating, with the remaining two-thirds being blunt trauma. This stark contrast can be attributed the security situation, for which guns remain ubiquitous in this part of the world. Comparatively, developed countries have limited penetrating injuries, and therefore have trained people in surgery for blunt trauma, making education of specialists to manage penetrating abdominal trauma a necessary part of transporting change into Iraq, as well as requiring systems to be developed to employ valuable and much-needed clinical skills in surgery [13]. Gunshot wounds, especially high-velocity injuries, tend to cause more tissue devastation and have greater complication rates than alternate mechanisms, making serum morbidity and mortality consistent with the trend observed in our study.

The injury mechanism is important for surgical choice and outcomes. The average cavitation effects of penetrating high-velocity projectiles extend further from the apparent wound track due to comparable injuries, tissue viability, and structures injured that are adjacent [14]. This could at least partly account for the higher complication rates noted in our series than studies conducted outside North America where blunt trauma is the predominant mechanism of injury. While considerable energy may be imparted to a target through many mechanisms, tissue, which may seem normal at first, when combined with imparted energy can also devitalize other tissue in the area, affecting the decisions regarding primary repair or diversionary methods.

Geographically, the anatomical distribution varied evenly between the colonic segments and the ascending colon had the highest incidence of injury at 28.7%. This injury distribution pattern may reflect the actual trajectory of penetrating implements and the anatomical location of the colon. The ascending colon lies retroperitoneal and injuries to this segment are very challenging to manage in respect to approach and this likely would contribute to a higher rate of complications and affect the need for complex surgical interventions [15].

Our surgical management in respect to decision making preferred primary repair-41.4%, secondary preferred resection and anastomosis-38.3%. This reflects the surgical decision making currently advised in trauma surgery, while factors allow- primary repair is preferred over colostomy, such as minimal contamination, hemodynamic stability, and absence of multiple organ failure [16]. The rate of colostomy formation (20.3%) in our series may be higher due to the nature of injuries sustained and the difficulties in performing complex reconstructive surgery in a low-resource trauma setting. The mortality rate of 12.3% in our series is comparable to trauma populations reported in similar studies, although it remains higher than populations reported typically in some developed countries with advanced trauma systems [17]. The high proportion of patients who died from sepsis (67.5% of patients died from sepsis) emphasizes the necessity to implement rigorous infection control practices and antibiotic stewardship in the management of patients who sustain colonic injuries. The relatively high rate of early mortality (4.6%) demonstrates that improvement in pre-hospital care and supported transport systems could reduce the number of preventable deaths. Overall, complications occurred in 34.6% of patients with surgical site infection being the highest percentage of complications (18.5%). This complication rate is higher compared to some published Western series [18], but may likely relate the difficulties and challenges sustained in trauma surgery in Iraq, including delays in presentation, access to resource limitations, and injury patterns [18]. The rate of sepsis (13.0%) and intra-abdominal abscess formation (10.8%) stress the importance of adequate perioperative prophylactic antibiotics and postoperative monitoring.

The rate of anastomotic leak rate of 8.6% in this series is consistent with the reported literature for trauma colon injuries; nevertheless, it is an awful complication that contributes to morbidity and mortality [19]. The issues of delayed presentation, presence of contamination, potential nutritional deficiencies, and possible dilapidation of postoperative monitoring regimes significantly influence the risk of anastomotic leakage necessitating further study in the Iraq context. The establishment of standardized protocols for patient selection for primary anastomosis may reduce the complication rates. The average hospital stay for patients requiring colostomy (18.2 days) was longer than the average hospital stay for the patients in the primary repair group (9.4 days) which reflects the greater complexity of the initial injury as well as the need for additional procedures for stoma reversal. This also has implications for healthcare resource utilization and patient quality of life and provides further support for primary repair when it is clinically advisable [20].

This study took place in the private hospital sector, which adds interesting perspectives on the delivery of trauma care within Iraq's mixed healthcare system. There were both private patients (58.3%) and those referred to the private hospital from public facilities (41.7%), meaning that the study patients may be a more representative trauma burden than studies that were exclusively conducted in public hospitals. The private hospital environment, the opportunities to enhance resources, and the ability to select staffing levels and infection control measures may have resulted in better outcomes compared to the overwhelmed public healthcare system.

There are several limitations to this study to be recognized. The single-center study design limits the applicability of these findings to other healthcare settings within Iraq or the conflict-affected regions. The retrospective nature of the study introduces bias in patient selection and has potential implications for data quality in some areas. Most important, however, is that long term follow-up data were not consistently available so that functional outcomes and quality of life measures, which are now being recognized more so as important outcomes in the trauma literature, could not be assessed. The results of this study have a number of significant implications for clinical practice and healthcare policy in Iraq. The high rates of penetrating injuries indicate a need for trauma surgeon and emergency physician training programs which emphasize managing complex abdominal trauma. The relatively high complication rates indicate that improved infection control measures, antibiotic stewardship, and postoperative monitoring systems would improve outcomes.

From a public health standpoint, the predominance of violence-related injuries in the young adult population suggests a necessity to develop comprehensive and effective injury prevention programs that take into account the underlying causes of violence and conflict. By investing in conflict resolution, community safety programs, and ways to foster economic opportunities for young people, the burden of traumatic injuries on the healthcare system could potentially be reduced.

The experience of care in Iraq from the management of a high volume of penetrating trauma may also offer valuable lessons for military medicine, humanitarian organizations and other healthcare systems affected by conflict. Evidence-based protocols, modified for low-resource settings, could improve outcomes in similar contexts across the world.

Future research priorities should focus on prospective studies with longer follow-up periods measuring functional outcomes and quality of life. The relative effectiveness of various antibiotic regimens for colonic trauma in Iraq, with respect to local resistance patterns, and the availability of medications, would be a useful investigation which could inform clinical practice guidelines. Research into the cost-effectiveness of different management protocols would be valuable towards healthcare policy. The record of clinical experiences and outcomes in Iraq's trauma centers serves to enhance local care but also to share this knowledge with future healthcare providers so we do not forget what we have learned during this difficult time and the way of providing trauma care in a resource-limited setting. The knowledge learned from delivering trauma care in a challenging environment can have an important impact on improving global trauma care capabilities and emergency preparedness.

In conclusion, this study presents detailed information on the pattern and outcomes of colonic injuries within the Iraqi healthcare context, and presents challenges and opportunities for trauma care in a conflict-affected, low-resource, area. The results highlight the important need for ongoing investment in trauma care infrastructure, training programs, and injury prevention practices to optimize outcomes for patients with these complicated injuries. Collectively, the experience here will contribute to the research and understanding of trauma care in adverse contexts, and hopefully contribute to improving clinical practice and policy development.

Conclusion

This extremely comprehensive retrospective study of 324 patients with colonic injuries was one Private Hospital in Baghdad, which represents by far, the largest single center study of its kind in Iraq, and provides important data on trauma patterns and outcomes in a multi-casualty, conflict-affected healthcare environment. While the study describes traumatic pathology and outcomes that are familiar to trauma care providers, it describes distinctly different aspects to this group of patients compared to face trauma in more stable healthcare systems, and more importantly, significant evidence of both harm (or suffering) and where trauma care providers were able to adapt their practice to deliver care. The epidemiological profile of our cohort, comprised mainly of young male patients (78.4%) with penetrating injuries (76.2%), is a clear indication of the on-going ramifications of conflict and violence on Iraq's civilian population. The mean age of 32.4 years, representing the most economically productive part of society, has implications that reach beyond health care to the economic and socially impact of individuals, families, and the community for years to come. The distribution of mechanism of injury, with gunshot wounds accounting for 45.4% of injuries, stab wounds accounting for 18.5%, and shrapnel injuries accounting for 12.3%, also serves as a reminder of the insecure environment Iraqis are living in. The pattern of penetrating injuries in Iraq also calls for tailored training and protocols specifically aimed at the management of penetrating abdominal trauma, and they present distinct differences from blunt trauma management protocols developed in stable environments.

The surgical management strategies utilized in our series illustrate a comprehensive approach, evaluating both evidence-based best practices and real-world local resource constraints. The use of primary repair (41.4% of the cases) when possible agrees with the basic principles of trauma surgery, while also noting that decision-making should be individually based on patient, injury factors, and capabilities of the institution.

In our series, the gross mortality rate of 12.3%, albeit higher than some rates reported in developed nations, is a reasonable outcome given the degree of injuries and the situations trauma is being managed in. The incidences of mortality caused by sepsis (67.5%) also demonstrates how critical infection control measures and antibiotic stewardship are to mortality and outcomes.

The complication profile of our study, an overall complication rate of 34.6%, indicates the nature of the injuries sustained and limitations of providing the optimal standard of care in a resource limited resourced environment. The values of surgical site infections (18.5%) and sepsis (13.0%) raises the evolve the standard of infection control protocols and antibiotics stewardship programs.

Global Considerations

The findings of this study when shared with the global knowledge of trauma care, low-resource limited environments and conflicts can only contribute positively, with the knowledge gained of caring for a large volume of penetrating trauma being of use to military medical services, humanitarian agencies, and health care in other difficult environments**.**

Documenting and preserving clinical experiences and outcomes not only assists with local health care improvements, but preserves the knowledge acquired in difficult times for those who follow in their footsteps. The experience gained managing complex trauma in adverse situational factors is a valuable resource that can be captured and shared in a systematic manner**.**

Fundamentally, the health system will not achieve improved outcome for patients sustaining colonic injuries resulting from conflict in Iraq without a systematic approach to improving clinical management, healthcare facilities and infrastructure, and trauma prevention, with embracing and understanding the findings from this study as a starting means of understanding trauma care in conflict. The relatively good outcomes achieved despite the challenges illustrates the capabilities and resilience of Iraqi health care providers and provides hope for consistent improvements with the management of trauma.

Conflict of Interest

Not available.

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Not available.

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