e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2025; 17(1); 109-116

Original Research Article

To Study the Risk Factors Affecting Patients Undergoing Emergency Laparotomy for Perforation Peritonitis

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Received: 28-12-2024 / Revised: 01-01-2025 / Accepted: 06-01-2025

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Conflict of interest: Nil

Abstract:

Introduction: Emergency laparotomy for perforation peritonitis is a critical surgical procedure requiring swift diagnosis and management due to its significant morbidity and mortality risks. Peritonitis, a severe inflammation of the abdominal cavity, arises from various causes, including gastrointestinal perforations. Despite advancements in medical care, managing this condition remains challenging, particularly in resource-constrained settings.

Objective: To evaluate risk factors influencing outcomes in patients undergoing emergency laparotomy for perforation peritonitis, focusing on clinical, biochemical, and intraoperative parameters to improve prognosis and management strategies.

Methods: This hospital-based observational cohort study, conducted over 18 months, included 60 patients diagnosed with perforation peritonitis and treated with emergency laparotomy. Clinical presentations, biochemical markers, and intraoperative findings were analyzed. Exclusion criteria encompassed patients aged below 18 or above 65 years, those with postoperative anastomotic leaks, and those who declined consent. Outcomes were compared based on ICU admissions, mortality, and hospital stays.

Results: Middle-aged adults (51–60 years, 43.3%) were most affected, with a higher prevalence in females (61.7%). Common operative findings included duodenal ulcers (53.3%) and typhoid ulcers (26.7%). Elevated TLC, hypoalbuminemia, and raised CRP levels were significantly associated with poorer outcomes. ICU patients exhibited higher temperatures and pulse rates but lower systolic blood pressure. Non-survivors had significantly prolonged hospital stays, hypoalbuminemia (100%), and higher inflammatory markers.

Conclusion: Perforation peritonitis predominantly affects middle-aged adults, presenting with abdominal pain, tenderness, and systemic signs of sepsis. Key prognostic markers include elevated TLC, hypoalbuminemia, and raised CRP, emphasizing the importance of early intervention and tailored care. Improved strategies for timely diagnosis and management are crucial to reducing morbidity and mortality.

Keywords: Perforation peritonitis; emergency laparotomy; risk factors; prognostic markers; hypoalbuminemia; inflammatory markers.

Introduction

Emergency laparotomy is a critical surgical procedure performed to address a wide range of acute abdominal conditions, such as trauma, undiagnosed abdominal pain, bowel obstruction, or perforated viscus. This life-saving intervention requires meticulous assessment and preparation, including essential investigations to establish a preliminary diagnosis and ensure the patient's clinical stability.

The procedure involves opening the abdominal cavity to identify and treat the underlying pathology. Due to the urgency of the situations, it addresses, laparotomy demands swift clinical judgment, precise surgical techniques, and coordinated perioperative management to stabilize the patient, administer antibiotics, and address complications [1]. The success of this intervention often relies on a multidisciplinary approach to optimize outcomes.

One of the most common presentations in patients requiring emergency laparotomy is peritonitis, an inflammation of the abdominal cavity's lining. This condition can arise from various causes and is classified into three types. Primary peritonitis occurs without a breach in gut integrity, often in patients with ascites, and is typically monomicrobial.

Secondary peritonitis, on the other hand, results from gastrointestinal tract disruption, causing leakage of intestinal contents into the abdominal cavity and triggering an inflammatory response. Tertiary peritonitis is a more persistent or recurrent form, usually seen in critically ill patients. Recognizing the type and cause of peritonitis is vital for guiding treatment [2]. Perforation peritonitis is one of the most frequent and serious surgical emergencies encountered in clinical practice. It carries a high mortality risk, which can reach up to 20%, and ranks as a significant health concern. The condition is the third most common cause of an acute surgical abdomen after appendicitis and intestinal obstruction [3]. The underlying causes of perforation peritonitis are varied and include peptic ulcers, appendicitis, typhoid fever, intestinal tuberculosis, gallbladder perforations due to stones, and trauma, as well as malignancies, diverticulitis, foreign body ingestion, and iatrogenic injuries. Thorough patient history, including previous illnesses, medication use, recent surgeries, and potential trauma or ingestion of foreign objects, provides valuable insights into the cause of peritonitis. Identifying the underlying pathology is crucial for timely and effective intervention [4].

Patients with peritonitis typically present with severe, sudden-onset abdominal pain and characteristic local findings such as abdominal tenderness, guarding or rigidity, distension, and diminished bowel sounds [5]. These signs indicate inflammation and the presence of fluid or gas in the abdominal cavity. Systemic manifestations often accompany the local symptoms and include fever, tachycardia, sweating, restlessness, dehydration, and, in severe cases, signs of septic shock such as hypotension, organ dysfunction, and altered mental status. The clinical picture necessitates a high degree of suspicion and urgency in diagnosis [6].

The diagnosis of peritonitis largely relies on clinical assessment, but imaging studies like plain X-rays, ultrasounds, and CT scans are invaluable in confirming the diagnosis and delineating the pathology. Plain X-rays can reveal free air under the diaphragm, suggestive of perforation, while CT scans and ultrasound offer more detailed visualization [7]. Once diagnosed, the treatment of peritonitis is multifaceted, combining resuscitation, antibiotic therapy, and surgical intervention. The primary goals are to stabilize the patient, control infection, and address the source of peritoneal contamination. Surgery involves repairing perforations, removing necrotic tissue, or draining abscesses as required. Postoperative care focuses on monitoring and managing potential complications such as sepsis, ileus, and organ dysfunction [8].

Despite remarkable advancements in surgical techniques, antibiotic therapies, and perioperative care, peritonitis continues to pose significant challenges, particularly in resource-constrained settings where access to timely interventions and critical care may be limited. The morbidity and mortality rates remain high due to multiple contributing factors. Advanced age often comes with reduced physiological resilience and the presence of comorbidities, complicating recovery [9]. Pre-existing health conditions such as diabetes, cardiovascular diseases, or chronic kidney disease can further weaken the body's response to infection. Delayed surgical intervention, often due to late presentation or diagnostic hurdles, allows the infection to progress, leading to systemic complications. Physiological derangements like anemia, hypoalbuminemia, leukocytosis, and renal impairment reflect the severity of the underlying pathology, while the presence of shock, coagulopathy, and multi-organ dysfunction exacerbates the condition. These predictors underscore the critical need for early diagnosis, aggressive resuscitation, and precise perioperative management to mitigate risks, optimize outcomes, and save lives [10].

Globally, the causes of perforation peritonitis vary. In developing countries, infectious diseases like typhoid and tuberculosis are prominent causes, whereas malignancies and diverticulitis are more common in developed nations. This variation underscores the need for region-specific strategies in diagnosis and treatment. In low-resource settings, challenges such as delayed presentation and limited access to advanced diagnostic tools significantly impact patient outcomes. Addressing these challenges requires investments in healthcare infrastructure, training, and public health initiatives to ensure timely and effective care for patients [11].

Understanding the factors influencing outcomes in emergency laparotomy for perforation peritonitis is essential for improving patient care. Identifying risk factors and predictors of complications helps healthcare providers anticipate issues, tailor treatments, and provide focused care for high-risk patients. This knowledge also aids in refining hospital protocols, guiding further research, and shaping healthcare policies. By enhancing preparedness and response to this challenging surgical emergency, healthcare systems can reduce mortality, improve outcomes, and ultimately provide better care for patients in critical conditions [12].

The study aims to evaluate the factors influencing outcomes in patients undergoing emergency laparotomy for perforation peritonitis. The objectives

include analyzing clinical and biochemical parameters, as well as intraoperative findings, to determine their impact on patient outcomes, and assessing the correlation of these factors with the prognosis of perforation peritonitis.

Materials and Methods

This hospital-based observational cohort study was conducted in the Department of General Surgery, AIMSR, Bathinda, over 18 months, following approval from the research and ethics committees of Adesh University. Patients presenting with perforation peritonitis, confirmed through radiological imaging (X-ray, CECT, or USG abdomen), and undergoing emergency laparotomy were included after meeting the inclusion criteria and providing informed consent. Clinical presentations, pathological reports, intraoperative findings, and outcomes were documented using a predesigned proforma. Exclusion criteria included patients under 18 or over 65 years, those with postoperative anastomotic leaks, and individuals who declined consent. Data were analysed to evaluate outcomes.

Results

In this study, the largest age group was 51–60 years, comprising 43.3% of participants, followed by 61–70 years at 20.0%. Patients under 40 made up 16.7%, while 41–50 years accounted for 11.7%.

The smallest group, over 70 years, represented 8.3%. Regarding gender, females were the majority at 61.7%, with males constituting 38.3% of the participants.

Table 1: Distribution of Patients with Presenting Complaint in Term of Pain Abdomen

Pain Abdomen (Days)	Number of Patients	Percentage
No pain	2	3.3%
≤5	34	56.7%
6-10	9	15.0%
>10	15	25.0%
Total	60	100.0%

In this study, 3.3% of patients reported no abdominal pain, while 56.7% experienced pain for 5 days or less. Pain lasting 6-10 days was reported by 15.0% of patients, and 25.0% experienced pain for more than 10 days.

Table 2: Distribution of Patients with Presenting Complaint in Term of Constipation

Constipation	Frequency	
enema	3	5.0%
No	25	41.7%
Yes	32	53.3%
Total	60	100.0%

Constipation was reported by 53.3% of patients, indicating it as a common issue. Meanwhile, 41.7% of patients did not experience constipation. A smaller proportion, 5.0%, required an enema for relief, highlighting the varying degrees of severity and management needs among affected individuals.

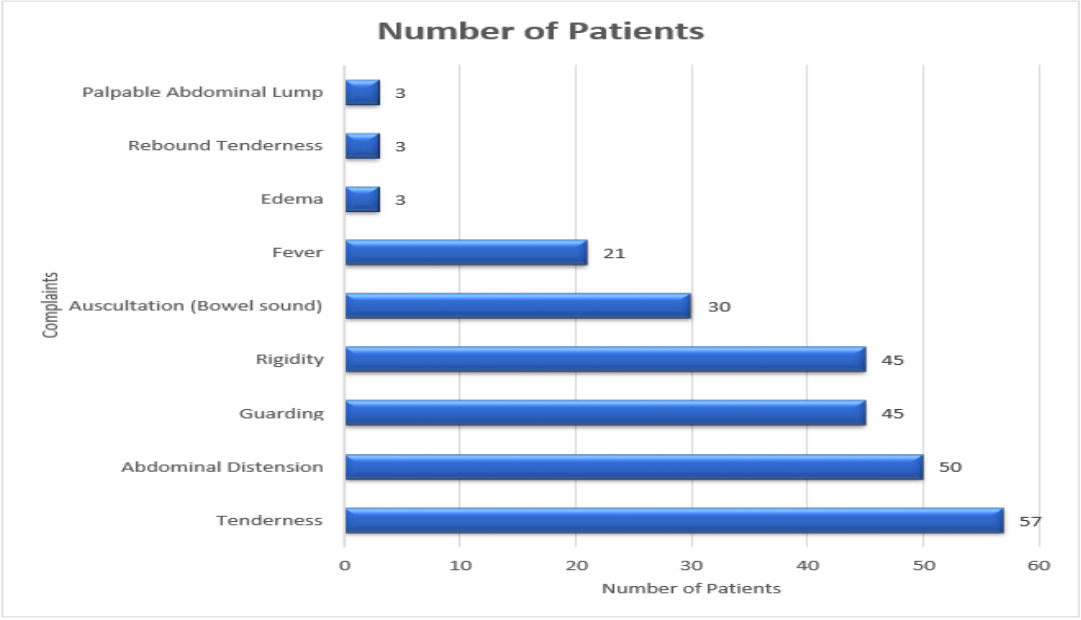

Figure 1: Distribution of Patients on the Basis of Clinical Presentation

In this study, the most common clinical presentation was tenderness (95.0%), followed by abdominal distension (83.3%), guarding (75.0%), and rigidity (75.0%). Fever was noted in 35.0%, with bowel sounds detected in 50.0%. Less frequent findings included edema, rebound tenderness, and palpable lumps, each observed in 5.0% of patients.

Table 3: Distribution of Patients on the Basis of Operative Pathology

Operative pathology	Number of Patients	Percentage
Duodenal ulcer	32	53.3%
Typhoid ulcer	16	26.7%
Gastric Perforation	6	10.0%
Traumatic Perforation	5	8.3%
Tubercular Perforation	1	1.7%
Total	60	100.0%

In this study on operative pathology, duodenal ulcer was the most common condition (53.3%), followed by typhoid ulcer (26.7%), gastric perforation (10.0%), traumatic perforation (8.3%), and tubercular perforation (1.7%).

Table 4: Distribution of Patients on the Basis of History Given by Patients Regarding Comorbidities

Comorbidity	Number of Patients	Percentage
NSAID ingestion	16	26.7%
Hypertension	13	21.7%
Pneumonia	11	18.3%
Diabetes mellitus	7	11.7%
Alcohol consumption	6	10.0%
Typhoid	5	8.3%
Hypotension	4	6.7%
Tuberculosis	1	1.7%

In this study on comorbidities, 26.7% of patients had a history of NSAID use, 18.3% had pneumonia, and 21.7% were diagnosed with hypertension. Additionally, 10.0% reported alcohol consumption, 8.3% had typhoid, 11.7% had diabetes mellitus, and 6.7% experienced hypotension. One patient (1.7%) was diagnosed with tuberculosis, highlighting the varied comorbidity profile among participants.

Table 5: Biochemical Parameters Affecting Intraabdominal Abcess

		Intraabdominal abcess(n=5)		No abcess(n=55)		p value
		Number	percent	Number	percent	
TLC	Normal(≤10000)	2	40%	27	49%	0.697
	Raised(>10000)	3	60%	28	51%	
Serum Albumin	Low(≤3.5)	3	60%	19	35%	0.258
	Normal(>3.5)	2	40%	36	65%	
Creatinine	Raised(>1.2)	1	20%	26	47%	0.241
	Normal(≤1.2)	4	80%	29	53%	
Urea	Elevated(<42)	1	20%	11	20%	0.686
	Normal(≥42)	4	80%	44	80%	
CRP	Normal(≤6)	3	60%	39	71%	0.610
	Raised(>6)	2	40%	16	29%	
Serum Lactate	Normal(<2.2)	5	100%	44	80%	0.268
	Raised(≥2.2)	0	0%	11	20%	
Age Group	<50 years	3	60%	14	25%	0.101
	≥50 years	2	40%	41	75%	
Norad	Required	1	20%	13	24%	0.853
	Not Required	4	80%	42	76%	

In this study, biochemical parameters such as raised TLC, low serum albumin, elevated creatinine, urea, CRP, serum lactate, age, and noradrenaline requirements showed no statistically significant differences between the groups. This suggests these factors are not significantly associated with the presence of intra-abdominal abscesses.

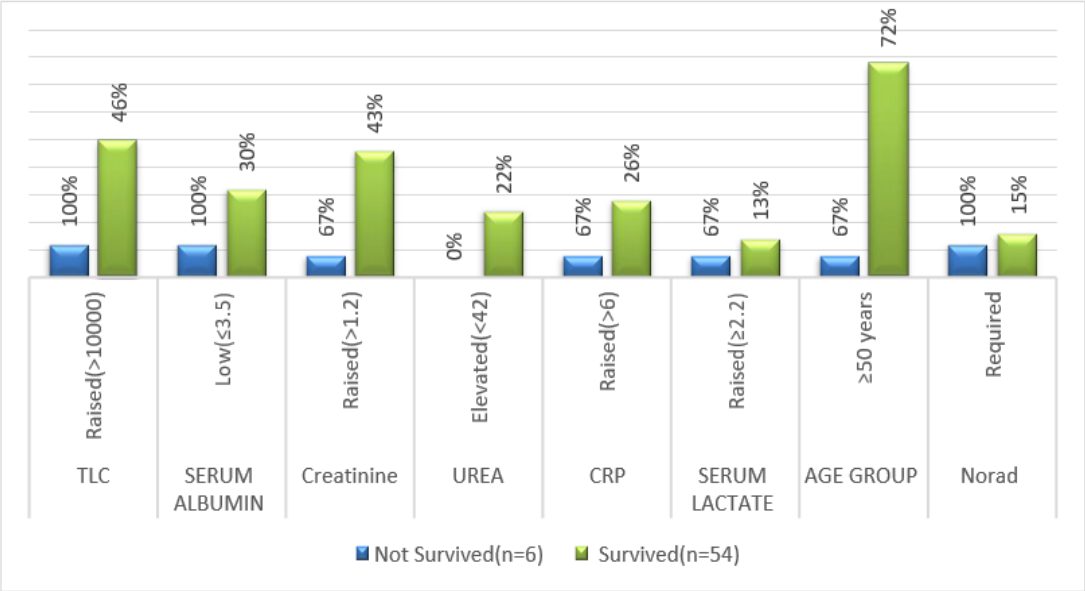

Figure 2: Parameters Affecting Outcome of Patients in Term of Survival

The analysis shows significant biochemical differences between survivors and non-survivors. Non-survivors had higher TLC (>10,000; p=0.024), low serum albumin (≤3.5; p=0.001), raised CRP (>6; p=0.039), elevated lactate (≥2.2; p=0.008), and noradrenaline use (p<0.001). Differences in creatinine, urea, and age distribution were not statistically significant.

Table 6: Comparison of Physiological Parameter of Patients Who Admitted to ICU

ICU admission	Required (n=8)	Not required	p value
Temperature (°F)	101.46±1.6	99.4±0.74	0.000
Respiratory Rate(bpm)	24.75±2.82	25.6±3.13	0.474
SBP(mmHg)	90.25±18.41	102.85±13.83	0.025
DBP(mmHg)	67.75±9.81	72.63±12.03	0.279
Pulse Rate(bpm)	107.63±13.36	90.56±10.69	0.000

The table compares clinical parameters in patients requiring ICU admission after emergency laparotomy for perforation peritonitis. ICU patients had higher temperatures (101.46°F vs. 99.4°F, p<0.001) and pulse rates (107.63 vs. 90.56 bpm, p<0.001) but lower systolic BP (90.25 vs. 102.85 mmHg, p=0.025). Respiratory rate and diastolic BP showed no significant differences.

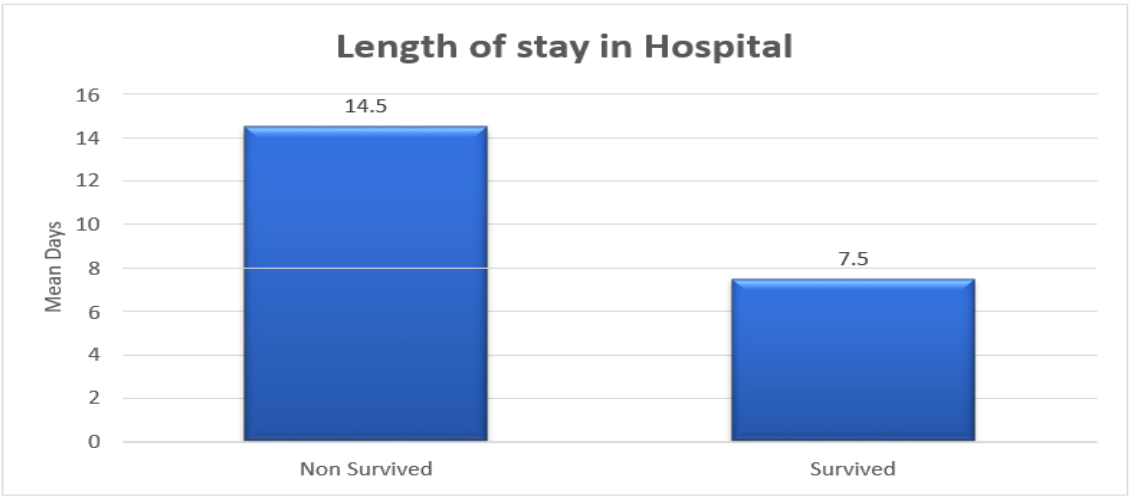

Figure 3: Duration of Hospital Stay of the Patients in Term of Survival

Non-surviving patients had a significantly longer hospital stay (14.5 ± 2.81 days) compared to survivors (7.5 ± 3.3 days), with a p-value of <0.001, indicating a statistically significant difference.

Discussion

This 18-month observational cohort study at AIMSR Bathinda investigated factors influencing outcomes after emergency laparotomy for perforation peritonitis. Approved by AIMSR's Research and Ethics Committees, it included 60 patients meeting predefined criteria. The study aimed to identify determinants affecting outcomes and improve clinical management and patient care in similar cases.

The study shows most patients (43.3%) were aged 51-60 years, followed by 61-70 years (20.0%). Patients under 40 constituted 16.7%, 41-50 years 11.7%, and over 70 years 8.3%. Consistent with studies by Jain et al. and Neupane et al., middle-aged adults predominated. Females accounted for 61.7%, and males 38.3% [13,14].

Abdominal pain was the primary complaint, with 56.7% experiencing pain for ≤5 days, 15.0% for 6-10 days, and 25.0% for >10 days. Only 3.3% reported no pain. Similar findings were noted by Hameed et al. and Bali et al. Constipation affected 53.3%, 41.7% had none, and 5.0% required enemas [15,16].

Clinically, the most common presentation was tenderness (95.0%), followed by abdominal distension (83.3%), guarding, and rigidity (75.0% each). Fever was noted in 35.0%, and bowel sounds were auscultated in 50.0%. Less common symptoms included edema, rebound tenderness, and palpable abdominal lumps (5.0% each), aligning with findings by Hameed et al. and Jain et al. Operative pathology revealed duodenal ulcer as the most frequent condition (53.3%), consistent with Bali et al.'s observations. Typhoid ulcer was noted in 26.7%, with gastric perforation (10.0%), traumatic ulcer (8.3%), and tubercular perforation (1.7%) also identified [13,15,16].

Common comorbidities included NSAID ingestion (26.7%), hypertension (21.7%), and diabetes mellitus (11.7%), reflecting the diverse clinical profiles of patients requiring emergency surgical intervention for perforation peritonitis. Complications occurred in 36.7% of patients, lower than the 72.4% reported by Manoj et al. Most complications (77.3%) were operation-related, underscoring surgical complexity [17]. Complications included wound infections (27.3%), intra-abdominal abscesses (22.7%), and anastomotic leaks (18.2%), with medical issues like pneumonia and renal failure accounting for 22.7%. Ylimartimo et al. found medical complications (50%) more common early postoperatively, while operation-related issues (30%) stemmed from the underlying disease. Elevated TLC (p=0.045), CRP (p=0.042), and serum lactate (p=0.017) significantly predicted anastomotic leakage, consistent with Jina et al. and Garcia-Granero et al. Norepinephrine use (p=0.011) and intraoperative hypotension, as Post et al. highlighted, also correlated with leaks [18,19,20,21].

Low serum albumin and raised creatinine were more common in anastomotic leakage patients but were not statistically significant (p=0.135, p=0.318). Jina et al. associated serum creatinine >1.2 mg/dL with leaks, while Choudhuri et al., Suding et al., and Parthasarathy et al. identified hypoalbuminemia as a significant risk factor. ICU admission occurred in 13.3%, with 10% mortality, reflecting severity. Neupane et al. reported perforation peritonitis as the leading surgical emergency with up to 20% mortality. ICU patients had higher temperatures, lower systolic pressure, and elevated pulse rates, indicating severity [14,19,21,23,24].

This study on emergency laparotomy for perforation peritonitis compared ICU and non-ICU patients. Hemoglobin levels showed no significant difference (ICU: 10.3 ± 2.67 g/dL vs. non-ICU: 11.33 ± 1.24 g/dL), consistent with Rai et al. Elevated TLC (87.5%) and hypoalbuminemia (ICU: 2.63 ± 0.82 g/dL vs. non-ICU: 4.14 ± 1.33 g/dL, p=0.003) correlated with ICU admission, reflecting severe inflammation. ICU patients had higher urea (82.63 ± 19.18 mg/dL, p=0.011) and CRP (66.5 ± 104.28 mg/dL, p=0.004), aligning with Rai et al. and Hacım et al., highlighting albumin and CRP as critical prognostic markers [25,26]. Patients requiring ICU admission after emergency laparotomy for perforation peritonitis had significantly longer hospital stays (16.25 ± 4.03 days vs. 6.96 ± 1.83 days, p<0.001), reflecting severe conditions. Mortality was 10.0%, higher than reported by Kallely et al. (3.3%) and Neupane et al. (5%). Non-survivors had higher temperatures (102.15°F ± 0.95), lower systolic blood pressure (82 ± 7.62 mmHg), and higher pulse rates (113.67 ± 7.92 bpm). Elevated TLC (19,400 cells/mm³) in non-survivors, consistent with Bansal et al., highlighted severe inflammation and septic burden [14,27,28].

Low serum albumin (≤3.5 g/dL) was observed in all non-survivors (100%) versus 30% of survivors (p=0.001), with significantly lower mean levels in non-survivors (2.33 ± 0.38 g/dL vs. 4.11 ± 1.32 g/dL, p=0.002). Singh et al. reported similar results. Elevated creatinine and urea levels were common in non-survivors, reflecting impaired renal function. Non-survivors also had longer hospital stays (14.5 ± 2.81 days, p<0.001). These findings

emphasize albumin, creatinine, and urea as prognostic markers, highlighting the need for early intervention and vigilant perioperative care [29].

Conclusion

This study on emergency laparotomy for perforation peritonitis highlights the complexity of managing this critical condition. Predominantly affecting middle-aged adults, with a higher prevalence in females, it presents with abdominal pain, tenderness, and distension. Common findings include duodenal and typhoid ulcers, while comorbidities such as NSAID use, hypertension, and diabetes add to complexity. Elevated TLC, hypoalbuminemia, and raised CRP are key prognostic markers of inflammation. High ICU admission and mortality rates, along with prolonged hospital stays, underline severity. Early recognition, prompt intervention, and tailored care are essential to optimize outcomes in this challenging surgical emergency.

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