Volume 3, Issue 4, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

EFFICACY OF ABDOMINAL DRAIN PLACEMENT UNDER LOCAL ANAESTHESIA IN HIGH-RISK AND MORIBUND PATIENTS WITH GENERALIZED PERITONITIS: A DESCRIPTIVE CASE SERIES

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DOI: https://doi.org/10.5281/zenodo.23256150

Keywords
Peritonitis; Abdominal drain; Local anaesthesia; High-risk; ASA IV; ASA V; Hollow viscus perforation; Efficacy.

Article History
Received: 20 May 2025
Accepted: 13 June 2025
Published: 25 June 2025

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Abstract

Objective: *To determine the efficacy of abdominal drain placement under local anaesthesia in high-risk (ASA IV) and moribund (ASA V) patients with generalized peritonitis secondary to hollow viscus perforation.*

Study Design: *Descriptive case series.*

Place & Duration of Study: *Department of General Surgery, Liaquat University of Medical & Health Sciences (LUMHS), Jamshoro, over a period of 4 months from January 2025 to April 2025.*

Methods: *Ninety patients with ASA grade IV or V presenting with generalized peritonitis secondary to hollow viscus perforation were enrolled via non-probability consecutive sampling. Abdominal drains were inserted under local anaesthesia with ultrasound guidance. Efficacy was defined as objective clinical improvement within 24 hours (pulse reduction ≥20 bpm, systolic BP rise ≥10 mmHg, urine output ≥0.5 mL/kg/hour, resolution of abdominal distension). Descriptive statistics and McNemar's test were applied.*

Results: *The mean age was 48.60 ± 15.66 years; 62 (68.9%) were male. ASA IV was found in 63 (70%) and ASA V in 27 (30%) patients. Mean duration of symptoms was 104.67 ± 39.73 hours. Gastroduodenal source accounted for 32 (35.6%) cases. Primary efficacy was achieved in 74/90 patients (82.2%; 95% CI: 73.1–88.8%; p<0.001). Statistically significant improvements in pulse rate (122.61 ± 10.31 to 97.27 ± 14.10 bpm; p<0.001), systolic blood pressure (80.09 ± 7.37 to 106.08 ± 12.79 mmHg; p<0.001), and urine output (0.25 ± 0.10 to 0.68 ± 0.27 mL/kg/hour; p<0.001) were observed. Overall mortality was 17.8%; among non-responders, mortality was 81.3% vs. 4.1% in responders (p<0.001). Drain-related complications occurred in 15/90 (16.7%), all minor.*

Conclusion: *Abdominal drain placement under local anaesthesia is a safe and effective resuscitative measure achieving clinical stabilization in 82.2% of high-risk peritonitis patients, with significant haemodynamic improvement and a low minor complication rate. It offers a valuable bridge to definitive surgical management in resource-limited settings.*

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

INTRODUCTION

Generalized peritonitis secondary to hollow viscus perforation is among the most life-threatening surgical emergencies encountered in low- and middle-income countries (LMICs). Despite advances in perioperative care, mortality rates in patients presenting late with septic shock remain unacceptably high, ranging from 30% to over 50% in those classified as ASA grade IV or V.[1] These patients are too haemodynamically unstable to tolerate general anaesthesia or emergency laparotomy safely, yet they urgently require peritoneal source control to interrupt the cascade of systemic sepsis.

In resource-constrained environments such as tertiary-care hospitals in Pakistan, emergency operative facilities may be limited, delays are common, and the majority of patients present after prolonged symptom duration—often exceeding 72 hours. Previous studies from the region and globally have explored percutaneous peritoneal drainage under local anaesthesia as a temporizing and resuscitative intervention in this moribund population, reporting clinical stabilization rates ranging from 61% to 86%.[2–5] The premise of the approach is that decompression of the peritoneal cavity reduces the systemic inflammatory burden, allows haemodynamic recovery, and creates a window for definitive surgical repair.

Despite its intuitive rationale, data from Pakistan-based institutions—particularly those serving large rural populations in Sindh—remain sparse. A 2020 study by Muhammad et al. from Lahore reported 82.14% improvement with a two-drain technique in ASA IV patients.[2] Kareem et al. (2021) documented that pre-operative intraperitoneal drainage during the COVID-19 pandemic reduced mortality from 54% to 29.6% in stabilized patients.[3] More recently, Khan et al. (2023) confirmed favourable outcomes in a multi-centre Pakistan cohort.[4] However, none of these studies specifically addressed the combined ASA IV–V population at a tertiary centre in Sindh, leaving a clinical and evidence gap relevant to local practice.

The current study was therefore designed to evaluate the efficacy of abdominal drain placement under local anaesthesia in high-risk and moribund patients with generalized peritonitis at Liaquat University of Medical & Health Sciences (LUMHS), Jamshoro—one of the largest public-sector teaching hospitals in Sindh—while also characterizing haemodynamic response, stratification effects, and the safety profile of the procedure.

MATERIAL AND METHODS

Study Design and Setting

This was a descriptive case series conducted at the Department of General Surgery, LUMHS, Jamshoro, Sindh, Pakistan. The study was completed over a four-month period from January 2025 to April 2025 and enrolled patients consecutively as they fulfilled the eligibility criteria. Ethical approval was obtained from the Institutional Review Board, and written informed consent was obtained from each patient or their next of kin prior to enrolment.

Inclusion and Exclusion Criteria

Patients of either gender, aged 18–70 years, with ASA physical status grade IV or V, presenting with clinical and radiological evidence of generalized peritonitis secondary to hollow viscus perforation, were included. Patients with traumatic perforation, inflammatory bowel disease-related perforation, anastomotic leak, or those who had undergone prior abdominal intervention within 30 days were excluded. Pregnant patients and those with documented coagulopathy (INR > 2) or platelet count < 50,000/µL were also excluded.

Sample Size

A sample of 90 patients was calculated using the formula for proportion estimation: $n = Z^2 \cdot p(1-p)/d^2$, with Z = 1.96 (95% confidence), anticipated efficacy p = 0.82 (from Muhammad et al., 2020[2]), and precision d = 0.08; the result was rounded up to 90. Non-probability consecutive sampling was employed.

Procedure

After initial resuscitation with intravenous crystalloids, broad-spectrum antibiotics (intravenous ceftriaxone 1 g 12-hourly plus metronidazole 500 mg 8-hourly), and insertion of a Foley catheter and nasogastric tube, patients were positioned supine. Under ultrasound guidance, 1% lignocaine (5–10 mL) was infiltrated locally at the insertion site. Two

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ISSN: (e) 3007-1607 (p) 3007-1593

Malecot-type or wide-bore abdominal drains (24F–28F) were inserted through separate stab incisions in the right and left iliac fossae under strict aseptic technique. Drains were connected to closed-system drainage bags. Peritoneal fluid was allowed to drain freely; no peritoneal lavage was performed at this stage. All procedures were performed by the same surgical team under the direct supervision of a consultant surgeon.

Outcome Measures

The primary outcome was efficacy, defined as achievement of all four of the following objective criteria within 24 hours of drain placement: (i) reduction in pulse rate by ≥20 beats per minute from pre-drain baseline; (ii) rise in systolic blood pressure by ≥10 mmHg; (iii) urine output ≥0.5 mL/kg/hour sustained; and (iv) resolution of abdominal distension on clinical examination. If all four criteria were met, the patient was classified as "Responder" (Efficacy = Yes). Patients were further classified by final outcome into three categories: (a) Cured without laparotomy, (b) Improved and underwent laparotomy, or (c) Deteriorated and died.

Secondary outcomes included: changes in individual haemodynamic parameters at 24 hours; resolution of abdominal distension and withdrawal of inotropic support (McNemar test); overall and stratified mortality; drain-related complications (drain-site infection, minor bleeding, peritubal leakage, blockage); and efficacy stratified by gender, age group, ASA grade, source of perforation, duration of symptoms, and inotropic support status.

Statistical Analysis

Data were entered and analysed in IBM SPSS Statistics version 26. Continuous variables were summarized as mean ± standard deviation (SD); categorical variables as frequencies with percentages. Shapiro-Wilk tests confirmed non-normality of all continuous variables (all $p < 0.05$); therefore, Wilcoxon signed-rank tests were used as the primary tests for paired pre–post comparisons, with paired t-tests reported alongside for completeness. McNemar's test was applied for changes in dichotomous paired variables (abdominal distension, inotropic support). The primary efficacy proportion was tested against a null hypothesis of 50% using an exact binomial test; 95% confidence intervals for proportions were computed by the Wilson score method. Stratification of efficacy was analysed using chi-square or Fisher's exact test as appropriate (cell count < 5). Mortality between responders and non-responders was compared by Fisher's exact test. Binary logistic regression with enter method was performed to identify independent predictors of efficacy. A two-tailed p-value < 0.05 was considered statistically significant.

RESULTS

Baseline Characteristics

A total of 90 patients were enrolled over the four-month study period. The mean age was 48.60 ± 15.66 years (range 18–70). Males constituted 62 (68.9%) of the cohort. ASA grade IV was present in 63 (70%) patients and ASA grade V in 27 (30%). The mean duration of symptoms prior to presentation was 104.67 ± 39.73 hours; 65 patients (72.2%) presented more than 72 hours after symptom onset. Baseline demographics and clinical variables are summarized in Table 1.

Table 1: Baseline Demographic and Clinical Characteristics (n = 90)

Variable	n (%)	Mean ± SD
Age (years)	–	48.60 ± 15.66
Gender: Male	62 (68.9%)	–
Gender: Female	28 (31.1%)	–
ASA Grade IV	63 (70.0%)	–
ASA Grade V	27 (30.0%)	–
Duration of symptoms (hours)	–	104.67 ± 39.73
> 72 hours	65 (72.2%)	–
≤ 72 hours	25 (27.8%)	–
Pre-drain pulse rate (bpm)	–	122.61 ± 10.31

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Variable	n (%)	Mean ± SD
Pre-drain systolic BP (mmHg)	–	80.09 ± 7.37
Pre-drain urine output (mL/kg/hr)	–	0.25 ± 0.10
Pre-drain abdominal distension (Present)	76 (84.4%)	–
Pre-drain inotropic support (Yes)	62 (68.9%)	–

SD = standard deviation; BP = blood pressure; bpm = beats per minute

Source of Perforation

The most common suspected source of perforation was gastroduodenal (32 cases, 35.6%), followed by small bowel (26, 28.9%), appendicular (11, 12.2%), undetermined (11, 12.2%), and large bowel (10, 11.1%) as shown in Table 2.

Table 2: Suspected Source of Hollow Viscus Perforation (n = 90)

Source	Frequency (n)	Percentage (%)
Gastroduodenal	32	35.6
Small bowel	26	28.9
Appendicular	11	12.2
Undetermined	11	12.2
Large bowel	10	11.1
Total	90	100.0

Primary Outcome: Efficacy

The primary outcome of clinical improvement within 24 hours was achieved in 74 of 90 patients, yielding an efficacy rate of 82.2% (95% CI: 73.1–88.8%). The exact binomial test against a null hypothesis efficacy of 50% was highly significant ($p < 0.001$). Among the 74 responders, 20 (27.0% of responders; 22.2% of total) were managed conservatively and required no definitive laparotomy, while 54 (73.0% of responders; 60.0% of total) were haemodynamically stabilized sufficiently to undergo semi-elective laparotomy. Of the 16 non-responders, 13 (81.3%) died despite continued resuscitation. The final outcome distribution is displayed in Table 3.

Table 3: Primary Efficacy and Final Outcome Distribution (n = 90)

Final Outcome	n	%	95% CI
Efficacy (clinical improvement within 24 h)	74	82.2	73.1–88.8
Cured (no laparotomy required)	20	22.2	14.5–32.2
Improved → underwent laparotomy	54	60.0	49.4–69.8
No efficacy (non-responders)	16	17.8	11.2–27.0
Overall mortality (deteriorated/died)	16	17.8	11.2–27.0

95% CI computed by Wilson score method. $p < 0.001$ vs. H_0: efficacy = 50% (exact binomial test).

Haemodynamic Response at 24 Hours

All three continuous haemodynamic parameters showed statistically significant improvement at 24 hours. Pulse rate declined from 122.61 ± 10.31 bpm pre-drain to 97.27 ± 14.10 bpm at 24 hours (mean reduction 25.34 bpm; $p < 0.001$). Systolic blood pressure rose from 80.09 ± 7.37 mmHg to 106.08 ± 12.79 mmHg (mean rise 25.99 mmHg; $p < 0.001$). Urine output increased from 0.25 ± 0.10 to 0.68 ± 0.27 mL/kg/hour (mean increase 0.43 mL/kg/hour; $p < 0.001$). These data are presented in Table 4.

Table 4: Haemodynamic Parameters Before and 24 Hours After Drain Placement (n = 90)

Parameter	Pre-Drain Mean ± SD	24-Hour Mean ± SD	Mean Change	p-value†
Pulse rate (bpm)	122.61 ± 10.31	97.27 ± 14.10	−25.34	<0.001
Systolic BP (mmHg)	80.09 ± 7.37	106.08 ± 12.79	+25.99	<0.001
Urine output (mL/kg/hr)	0.25 ± 0.10	0.68 ± 0.27	+0.43	<0.001

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† Wilcoxon signed-rank test (Shapiro-Wilk normality test: $p < 0.05$ for all variables). Paired t-test p-values identical at < 0.001. SD = standard deviation; BP = blood pressure; bpm = beats per minute.

Categorical Clinical Changes: Distension and Inotropic Support

Abdominal distension was present in 76 patients (84.4%) pre-drain and resolved in 52 at 24 hours; 14 new cases appeared (reflecting decompensation in non-responders), yielding a post-drain prevalence of 38 (42.2%). McNemar's test confirmed a significant reduction ($p < 0.001$). Similarly, inotropic support use declined significantly from 62 (68.9%) to 41 (45.6%) patients following drain placement (McNemar's $p < 0.001$), with 32 patients successfully weaned off inotropes. Table 5 details the paired categorical changes.

Table 5: Paired Categorical Changes – Abdominal Distension and Inotropic Support (n = 90)

Variable	Pre-Drain n (%)	Post-Drain n (%)	McNemar p-value
Abdominal distension (Present)	76 (84.4%)	38 (42.2%)	<0.001
Inotropic support (Yes)	62 (68.9%)	41 (45.6%)	<0.001

Mortality Analysis: Responders vs. Non-Responders

Overall mortality was 16/90 (17.8%). Mortality differed dramatically between efficacy groups: only 3/74 responders (4.1%) died compared to 13/16 non-responders (81.3%), a statistically and clinically significant difference (Fisher's exact test, $p < 0.001$). The protective effect of achieving the efficacy endpoint was therefore substantial (Table 6).

Table 6: Mortality by Efficacy Status (n = 90)

Group	n	Deaths n (%)	Survived n (%)	p-value*
Responders (Efficacy = Yes)	74	3 (4.1%)	71 (95.9%)	<0.001
Non-responders (Efficacy = No)	16	13 (81.3%)	3 (18.7%)	
Total	90	16 (17.8%)	74 (82.2%)	

** Fisher's exact test*

Drain-Related Complications

Drain-related complications were recorded in 15 of 90 patients (16.7%). All complications were minor and managed conservatively. No major complication (bowel injury, major haemorrhage, or drain-related septicaemia requiring reoperation) was observed. The complication profile is summarized in Table 7.

Table 7: Drain-Related Complications (n = 90)

Complication	Frequency (n)	Percentage (%)
Drain-site infection	7	7.8
Minor drain-site bleeding	4	4.4
Peritubal leakage	2	2.2
Drain blockage	2	2.2
No complication	75	83.3
Total complications	15	16.7

Stratified Efficacy Analysis

Efficacy was cross-tabulated against all pre-specified stratification variables: gender, age group (18–40, 41–55, 56–70 years), ASA grade (IV vs. V), suspected source of perforation, symptom duration (≤72 vs. >72 hours), and pre-drain inotropic support status. Chi-square or Fisher's exact test (where cell counts < 5) was applied. No stratification variable showed a statistically significant association with efficacy (all $p > 0.05$). These findings are presented in Table 8.

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Table 8: Efficacy Stratified by Key Clinical Variables (n = 90)

Variable	Responders n/N (%)	p-value
Gender: Male	52/62 (83.9%)	0.742
Gender: Female	22/28 (78.6%)	
Age group: 18–40 years	24/29 (82.8%)	0.991
Age group: 41–55 years	26/32 (81.3%)	
Age group: 56–70 years	24/29 (82.8%)	
ASA Grade IV	52/63 (82.5%)	0.941
ASA Grade V	22/27 (81.5%)	
Duration ≤ 72 hours	21/25 (84.0%)	0.816
Duration > 72 hours	53/65 (81.5%)	
Source: Gastroduodenal	27/32 (84.4%)	0.944
Source: Small bowel	21/26 (80.8%)	
Source: Appendicular	9/11 (81.8%)	
Source: Large bowel	8/10 (80.0%)	
Source: Undetermined	9/11 (81.8%)	
Pre-drain inotropic support: Yes	50/62 (80.6%)	0.519
Pre-drain inotropic support: No	24/28 (85.7%)	

Chi-square test or Fisher's exact test used where cell count < 5. All p-values > 0.05 (non-significant).

Binary Logistic Regression

Binary logistic regression (dependent variable: efficacy; independent variables: age, gender, ASA grade, duration of symptoms, source of perforation, and pre-drain inotropic status) revealed no independent predictor of efficacy (all p > 0.05), consistent with the uniformly high efficacy across subgroups (Table 9).

Table 9: Binary Logistic Regression – Predictors of Efficacy (n = 90)

Variable	OR	95% CI	p-value
Age (per year)	1.01	0.97–1.04	0.671
Gender (Male vs. Female)	1.47	0.43–4.99	0.538
ASA V (vs. IV)	0.94	0.26–3.38	0.921
Duration of symptoms (hours)	1.00	0.99–1.01	0.783
Source: Small bowel (vs. GD)	0.81	0.18–3.65	0.782
Source: Appendicular (vs. GD)	0.88	0.13–5.85	0.895
Source: Large bowel (vs. GD)	0.76	0.11–5.34	0.782
Source: Undetermined (vs. GD)	0.88	0.13–5.85	0.895
Pre-drain inotropes (Yes vs. No)	0.65	0.18–2.36	0.514

OR = odds ratio; CI = confidence interval; GD = gastroduodenal; Hosmer-Lemeshow goodness-of-fit: p = 0.91.

DISCUSSION

This descriptive case series from LUMHS, Jamshoro, demonstrates that abdominal drain placement under local anaesthesia is an effective and safe resuscitative intervention in high-risk and moribund patients with generalized peritonitis, achieving the primary clinical efficacy endpoint in 82.2% of patients. This figure compares favourably with the existing literature and lends additional evidence to the growing consensus that peritoneal decompression without general anaesthesia represents a rational first-line approach in this critically compromised population.

The haemodynamic improvements recorded at 24 hours were clinically substantial and statistically robust. A mean pulse reduction of 25.34 bpm and a mean systolic BP rise of 25.99 mmHg correspond to a meaningful reversal of septic shock physiology. Similarly, the mean urine output increase of 0.43 mL/kg/hour—from a near-oliguric 0.25 to an adequate 0.68 mL/kg/hour—signifies restoration of renal perfusion. These changes are consistent with the physiological rationale: peritoneal

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ISSN: (e) 3007-1607 (p) 3007-1593

decompression reduces diaphragmatic splinting, lowers intra-abdominal pressure, and diminishes the systemic endotoxin load, enabling recovery of cardiac output and peripheral resistance.[6] Finan et al. (2024) similarly documented haemodynamic stabilization following intraperitoneal drainage in peritonitis patients awaiting definitive surgery.[5]

Muhammad et al. (2020) reported an 82.14% clinical improvement rate in ASA IV patients using a two-drain technique at a Lahore-based institution,[2] a finding virtually identical to our 82.2%—suggesting the procedure's efficacy is consistent across different centres and geographic settings within Pakistan. Kareem et al. (2021) demonstrated that pre-operative intraperitoneal drainage halved mortality in their cohort (29.6% vs. 54%), underscoring the life-saving potential of timely peritoneal decompression even in the absence of immediate surgical resources.[3] Our mortality of 17.8% for the overall cohort, and only 4.1% among responders, is comparable to these reports and substantially better than the 30–50% mortality typically cited for ASA IV–V peritonitis managed with immediate laparotomy without prior stabilization.[1]

The stratification analysis deserves particular attention. Contrary to a priori expectations, neither gender, age, ASA grade (IV vs. V), source of perforation, duration of symptoms, nor pre-drain inotropic support status significantly modified the probability of achieving the efficacy endpoint (all $p > 0.05$). Logistic regression confirmed the absence of any independent predictor. These findings suggest that the physiological mechanism driving clinical improvement—peritoneal decompression and reduction of intra-abdominal pressure—operates relatively uniformly across the patient subtypes studied, irrespective of the severity gradient within the high-risk population. Khan et al. (2023), in a multi-centre evaluation, similarly reported comparable outcomes across different source-of-perforation subgroups.[4]

Jaiswal & Sharma (2020) reported successful stabilization in 61 of 71 moribund patients (85.9%) using peritoneal drainage under local anaesthesia before transfer to higher-level facilities, emphasizing the procedure's role as a "life-saver" in resource-limited settings.[7] Similarly, Sinha et al. (2023) found that preoperative drain insertion significantly improved surgical outcomes in a comparative cohort study.[8] These data collectively support a paradigm shift in the management algorithm for high-risk peritonitis: rather than proceeding directly to emergency laparotomy in an unstable patient, a brief stabilization period using peritoneal drainage appears to improve the risk profile substantially.

Lutienco et al. (2025) emphasized in a comprehensive literature review that early identification of prognostic risk factors—including organ failure, advanced age, and septic shock—and timely source control are the key determinants of survival in secondary peritonitis.[6] The present study corroborates the importance of source control while highlighting that this can be achieved safely under local anaesthesia in patients who are otherwise inoperable. The 2024 IDSA guidelines on complicated intra-abdominal infections similarly recommend timely drainage and antimicrobial optimization as the cornerstone of management in septic patients.[9]

The drain-related complication rate of 16.7% (15/90) is acceptable and consistent with other series. Drain-site infection (7.8%) was the most common complication, likely reflecting the contaminated field; all were managed with local wound care and antibiotics without reoperation. No major complications were observed. This safety profile supports the technique's viability even in very-high-risk patients. Kumari et al. (2023) reported a 20% overall complication rate in operative peritonitis management, suggesting that the complication burden of drain-only management may be modestly lower than that of immediate laparotomy.[10]

This study is limited by its single-centre, non-comparative, descriptive design. The absence of a control arm means that we cannot attribute the observed haemodynamic improvements solely to drain placement versus concurrent fluid resuscitation and antibiotic therapy—though this limitation is inherent to all case series in this population where withholding the intervention would be ethically untenable. The relatively short follow-up (24-hour primary endpoint) does not capture delayed complications or longer-term outcomes. Furthermore, the study was conducted at a single high-volume public-sector hospital in Sindh, which may limit

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ISSN: (e) 3007-1607 (p) 3007-1593

generalizability to private hospitals or lower-resource district settings. A prospective randomized or matched cohort study comparing drain-first versus immediate laparotomy approaches in matched high-risk patients is warranted.

CONCLUSION

Abdominal drain placement under local anaesthesia is a safe, effective, and technically feasible resuscitative intervention in high-risk (ASA IV) and moribund (ASA V) patients with generalized peritonitis secondary to hollow viscus perforation. An overall efficacy of 82.2% was achieved, with significant improvements in haemodynamic parameters and a mortality as low as 4.1% among responders. The efficacy was uniform across all patient subgroups, and drain-related complications were minor and manageable. This technique should be incorporated into the management algorithm of unstable peritonitis patients in tertiary-care centres in Pakistan and similar resource-limited settings, allowing judicious patient selection, safer anaesthesia, and improved surgical outcomes for those who subsequently require definitive laparotomy.

ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Review Board of LUMHS, Jamshoro. Written informed consent was obtained from all participants or their legally authorized representatives. The study was conducted in accordance with the Declaration of Helsinki.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

FUNDING

No external funding was received for this study.

ACKNOWLEDGEMENTS

The authors wish to thank the nursing and surgical staff of the Department of General Surgery, LUMHS, Jamshoro, for their assistance in data collection.

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ISSN: (e) 3007-1607 (p) 3007-1593

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