

## Original Research Article

# Post-relaparotomy morbidity and mortality patterns following gynecological and obstetrical surgeries: a tertiary care hospital experience

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**Received:** 31 August 2026

**Accepted:** 15 September 2026

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### ABSTRACT

**Background:** Relaparotomy following obstetrical and gynecological surgery is an uncommon but serious event associated with substantial maternal morbidity and mortality. Early identification of postoperative complications and timely surgical intervention are essential to improve outcomes. This study aimed to evaluate the morbidity and mortality pattern among patients undergoing relaparotomy following gynecological and obstetrical surgeries.

**Methods:** This hospital-based prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Rajshahi Medical College Hospital, over six months (November 2018 to April 2019). A total of 48 patients who required relaparotomy after obstetrical or gynecological abdominal surgery were included by consecutive sampling. Demographic characteristics, primary surgery, indications and timing of relaparotomy, operative findings, postoperative complications, treatment requirements and final outcomes were recorded and analyzed.

**Results:** Among 48 patients, 39 (81.3%) underwent relaparotomy following obstetrical surgery and 9 (18.8%) following gynecological surgery. Caesarean section was the commonest primary procedure (64.6%). Hemoperitoneum or ongoing intra-abdominal hemorrhage was the leading indication for relaparotomy (33.3%), followed by sepsis/peritonitis (16.7%) and hematoma (14.6%). Overall, 60.4% of relaparotomies were performed within 24 hours. Major post-relaparotomy morbidities included sepsis (25.0%), hemorrhagic shock (20.8%), wound infection (18.8%) and acute kidney injury (14.6%). Blood transfusion was required in 81.3% and ICU/HDU admission in 31.3% of patients. Six patients died, giving an overall mortality rate of 12.5%.

**Conclusions:** Relaparotomy was associated with considerable morbidity and mortality, predominantly due to hemorrhage and sepsis. Vigilant postoperative monitoring, early recognition of complications, prompt re-exploration and adequate critical-care support are essential to improve patient outcomes.

**Keywords:** Caesarean section, Hemorrhage, Morbidity, Mortality, Relaparotomy, Sepsis

### INTRODUCTION

Relaparotomy refers to reopening of the abdominal cavity following a primary abdominal operation because of postoperative complications that cannot be adequately managed by conservative measures. Although relatively uncommon, relaparotomy following obstetric and gynecological surgery represents a serious adverse surgical event and is associated with substantial morbidity,

prolonged hospitalization, intensive care requirement, blood transfusion and maternal mortality. Caesarean section is the most frequent primary operation preceding relaparotomy in obstetric practice, while hysterectomy and other major gynecological procedures also contribute to the burden.<sup>1,2</sup>

The reported incidence of relaparotomy following caesarean delivery varies between institutions and

populations. Hemorrhage and hematoma are consistently reported as the leading indications, followed by wound infection or dehiscence, intra-abdominal sepsis, abscess formation and occasionally visceral injury.<sup>3,4</sup> Several maternal and operative factors have been associated with increased risk, including previous caesarean section, placenta previa or accreta, placental abruption, hypertensive disorders, cervical tears, emergency surgery, excessive intraoperative blood loss and difficult primary surgery.<sup>5-7</sup>

Relaparotomy is particularly important in low-resource settings, where delayed referral, severe hemorrhage, infection and limitations in critical-care facilities may worsen outcomes. A recent systematic review estimated an overall mortality of approximately 7% following relaparotomy after caesarean section, with substantially higher mortality in resource-limited settings.<sup>8</sup> Studies from Bangladesh have similarly identified postpartum hemorrhage, hemoperitoneum, sepsis, subrectus hematoma and wound disruption as important indications, with considerable associated mortality.<sup>9,10</sup> Understanding the local pattern of indications, complications and outcomes is therefore essential for improving perioperative care. The present study was undertaken in the Department of Obstetrics and Gynaecology, Rajshahi Medical College Hospital, over a six-month period to evaluate the morbidity and mortality pattern among patients undergoing relaparotomy following gynecological and obstetrical surgeries.

## METHODS

### *Study design and setting*

This hospital-based prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Rajshahi Medical College Hospital (RMCH), Rajshahi, Bangladesh, over a period of six months from November 2018 to April 2019. Rajshahi Medical College Hospital is a major tertiary referral center in northern Bangladesh, catering to a large patient population referred from primary and secondary healthcare facilities across the region.

### *Study population and eligibility criteria*

All patients who underwent relaparotomy following an obstetrical or gynecological abdominal surgical procedure during the study period were considered eligible. Patients undergoing relaparotomy for non-obstetric or non-gynecological conditions and those with incomplete clinical information were excluded. A consecutive sampling technique was applied, and all eligible patients (n=48) during the study period were enrolled.

### *Data collection and clinical assessment*

Data were collected using a predesigned structured case-record form from patients' medical records, operative

notes, investigation reports and postoperative monitoring charts. Information regarding age, parity, residence, referral status, primary diagnosis, type and indication of initial surgery, timing and indication of relaparotomy, intraoperative findings, procedures performed during relaparotomy, blood transfusion requirement, intensive care unit admission, duration of hospital stay and postoperative complications was recorded. Major morbidities including hemorrhage, sepsis, wound dehiscence, organ injury, renal impairment and need for repeat surgical intervention were documented. Final patient outcomes were categorized as recovery or mortality.

### *Operational definitions*

**Relaparotomy:** Reopening of the abdominal cavity after a previous obstetrical or gynecological abdominal operation during the same hospital admission or postoperative period because of a complication requiring surgical intervention.

**Post-relaparotomy morbidity:** Any complication occurring following relaparotomy that required additional treatment, prolonged hospitalization, blood transfusion, intensive care, repeat surgery or other therapeutic intervention.

**Post-relaparotomy mortality:** Death of a patient following relaparotomy during the same hospital admission, irrespective of the immediate cause of death.

**Postoperative hemorrhage:** Clinically significant bleeding following the primary surgery, including hemoperitoneum or persistent operative-site bleeding, requiring blood transfusion, surgical exploration or active intervention.

**Postoperative sepsis:** Suspected or confirmed infection occurring after surgery accompanied by systemic manifestations and requiring antimicrobial treatment, drainage, relaparotomy and/or intensive supportive care.

### *Statistical analysis*

Collected data were checked for completeness, coded and entered into SPSS software (IBM Corp., Armonk, NY, USA) for statistical analysis. Categorical variables were expressed as frequencies and percentages, while continuous variables such as age, interval between primary surgery and relaparotomy, and duration of hospital stay were summarized using mean with standard deviation. Morbidity patterns, indications for relaparotomy, surgical procedures performed and mortality rates were presented in tables and figures. Associations between selected clinical factors and mortality were assessed using the Chi-square test or Fisher's exact test, where appropriate. A p-value of <0.05 was considered statistically significant.

### *Ethical considerations*

Ethical approval was obtained from the Institutional Ethics Committee, Rajshahi Medical College Hospital, before

commencement of the study. Informed consent was obtained from eligible participants or their legal attendants. Participation did not interfere with standard clinical management, and no additional invasive procedure was performed solely for research purposes. Confidentiality and anonymity of patient information were strictly maintained by using coded data without personal identifiers. All collected information was used exclusively for research purposes, and the ethical principles of the Declaration of Helsinki were followed throughout the study.

## RESULTS

During the six-month study period, a total of 48 patients underwent relaparotomy following obstetrical or gynecological surgery and were included in the analysis. Of these, 39 (81.3%) relaparotomies followed obstetrical procedures and 9 (18.8%) followed gynecological procedures. The demographic characteristics, initial surgical procedures, indications and timing of relaparotomy, operative findings, postoperative morbidity and final outcomes are presented below.

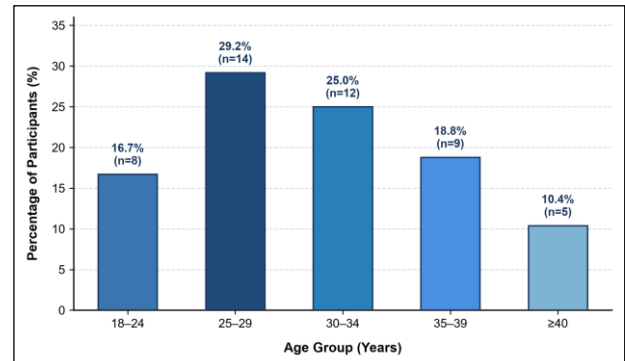
The mean age of the study participants was  $30.8 \pm 6.7$  years. Nearly two-thirds of the patients (64.6%,  $n=31$ ) were from rural areas, reflecting the referral pattern of the hospital. More than half of the women were para 1-2 (52.1%,  $n=25$ ), while approximately one-third (33.3%,  $n=16$ ) were multiparous (para  $\geq 3$ ). A considerable proportion of patients (60.4%,  $n=29$ ) were referred from other health facilities after their primary surgery. Nearly half of the patients (47.9%,  $n=23$ ) were anemic (hemoglobin  $<10$  g/dL) at the time of assessment for relaparotomy (Table 1).

**Table 1: Demographic and baseline characteristics of the study patients (n=48).**

| Characteristics                        | Frequency (N)  | Percentage (%) |
|----------------------------------------|----------------|----------------|
| Age (Mean $\pm$ SD) in years           | 30.8 $\pm$ 6.7 | -              |
| <b>Residence</b>                       |                |                |
| Rural                                  | 31             | 64.6           |
| Urban                                  | 17             | 35.4           |
| <b>Parity</b>                          |                |                |
| Nulliparous                            | 7              | 14.6           |
| Para 1-2                               | 25             | 52.1           |
| Para $\geq 3$                          | 16             | 33.3           |
| <b>Patient source</b>                  |                |                |
| Referred from another facility         | 29             | 60.4           |
| Primary treatment at study hospital    | 19             | 39.6           |
| Anemia at presentation (Hb $<10$ g/dL) | 23             | 47.9           |

The largest proportion of participants belonged to the 25-29 years age group (29.2%,  $n=14$ ), followed by those aged 30-34 years (25.0%,  $n=12$ ). Participants aged 35-39 years

and 18-24 years accounted for 18.8% ( $n=9$ ) and 16.7% ( $n=8$ ), respectively. The lowest proportion was observed among women aged  $\geq 40$  years (10.4%,  $n=5$ ), indicating that most relaparotomy cases occurred in the younger reproductive age groups (Figure 1).



**Figure 1: Age group distribution of the study participants (n=48).**

Obstetrical surgery constituted the majority of primary procedures preceding relaparotomy. Caesarean section was the single most common initial operation, accounting for almost two-thirds of all cases (64.6%,  $n=31$ ). Caesarean hysterectomy (8.3%,  $n=4$ ), laparotomy for ruptured uterus (4.2%,  $n=2$ ) and ectopic pregnancy (4.2%,  $n=2$ ) constituted smaller proportions of obstetric procedures. Among gynecological procedures, abdominal hysterectomy was the most frequently encountered operation (10.4%,  $n=5$ ), followed by ovarian tumour surgery (4.2%,  $n=2$ ), myomectomy (2.1%,  $n=1$ ) and other major pelvic surgery (2.1%,  $n=1$ ). Overall, 81.3% ( $n=39$ ) of relaparotomies occurred following obstetrical surgery compared with 18.8% ( $n=9$ ) following gynecological surgery (Table 2).

**Table 2: Distribution of patients according to primary surgical procedure (n=48).**

| Primary surgical procedures      | Frequency (N) | Percentage (%) |
|----------------------------------|---------------|----------------|
| <b>Obstetrical surgery</b>       | 39            | 81.3           |
| Caesarean section                | 31            | 64.6           |
| Caesarean hysterectomy           | 4             | 8.3            |
| Laparotomy for ruptured uterus   | 2             | 4.2            |
| Laparotomy for ectopic pregnancy | 2             | 4.2            |
| Gynecological surgery            | 9             | 18.8           |
| Abdominal hysterectomy           | 5             | 10.4           |
| Ovarian tumour surgery           | 2             | 4.2            |
| Myomectomy                       | 1             | 2.1            |
| Other major pelvic surgery       | 1             | 2.1            |
| <b>Total</b>                     | 48            | 100.0          |

Postoperative hemorrhagic complications were the predominant reasons for relaparotomy. Hemoperitoneum

or continuing intra-abdominal hemorrhage was the commonest individual indication, occurring in one-third of patients (33.3%, n=16). Sepsis or peritonitis was the next important indication (16.7%, n=8), followed by rectus sheath or subfascial hematoma (14.6%, n=7). Persistent or recurrent postpartum hemorrhage (10.4%, n=5) and wound

dehiscence/burst abdomen (10.4%, n=5) were also clinically important causes. Intra-abdominal or pelvic collections accounted for 8.3% (n=4). Suspected bowel or bladder injury (4.2%, n=2) and retained surgical material (2.1%, n=1) constituted relatively uncommon indications for repeat abdominal exploration (Table 3).

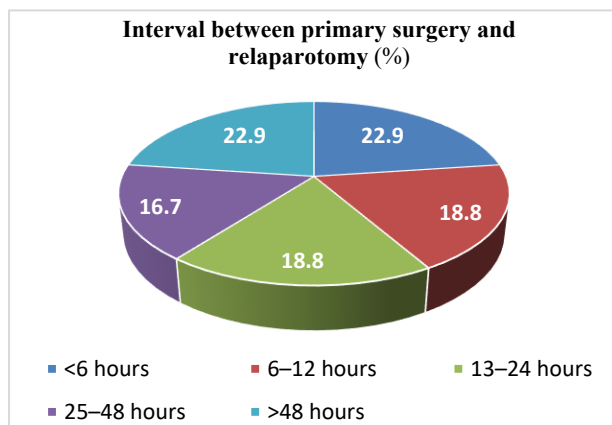
**Table 3: Principal indications for relaparotomy (n=48).**

| Principal indication for relaparotomy             | Frequency (N) | Percentage (%) |
|---------------------------------------------------|---------------|----------------|
| Hemoperitoneum/ongoing intra-abdominal hemorrhage | 16            | 33.3           |
| Sepsis/generalized peritonitis                    | 8             | 16.7           |
| Rectus sheath/subfascial hematoma                 | 7             | 14.6           |
| Persistent/recurrent postpartum hemorrhage        | 5             | 10.4           |
| Wound dehiscence/burst abdomen                    | 5             | 10.4           |
| Intra-abdominal/pelvic collection                 | 4             | 8.3            |
| Suspected bowel/bladder injury                    | 2             | 4.2            |
| Retained surgical material                        | 1             | 2.1            |
| Total                                             | 48            | 100.0          |

**Table 4: Intraoperative findings and procedures performed during relaparotomy (n=48).\***

| Operative findings and procedures     | Frequency (N) | Percentage (%) |
|---------------------------------------|---------------|----------------|
| <b>Intraoperative findings*</b>       |               |                |
| Active bleeding site                  | 21            | 43.8           |
| Hemoperitoneum                        | 20            | 41.7           |
| Hematoma                              | 9             | 18.8           |
| Pus/peritoneal contamination          | 8             | 16.7           |
| Uterine scar bleeding/dehiscence      | 6             | 12.5           |
| Fascial disruption                    | 5             | 10.4           |
| Bowel/bladder injury                  | 2             | 4.2            |
| <b>Procedures performed*</b>          |               |                |
| Evacuation of hemoperitoneum/hematoma | 20            | 41.7           |
| Hemostatic suturing/ vessel ligation  | 18            | 37.5           |
| Peritoneal lavage and drainage        | 11            | 22.9           |
| Hysterectomy                          | 9             | 18.8           |
| Abdominal wall resuturing             | 6             | 12.5           |
| Repair of bowel/bladder injury        | 2             | 4.2            |

\*Multiple findings and procedures were possible in an individual patient; percentages do not total 100%



**Figure 2: Distribution of interval between primary surgery and relaparotomy (n=48).**

The interval between the primary surgical procedure and relaparotomy varied considerably according to the underlying complication. Eleven patients (22.9%) underwent repeat surgery within six hours, predominantly because of acute postoperative bleeding. A further 18 patients (37.5%) underwent relaparotomy between 6 and 24 hours after the primary procedure. Nineteen patients (39.6%) required relaparotomy more than 24 hours after the initial surgery, generally due to infection, hematoma, collection or wound-related complications. Thus, 60.4% (n=29) of relaparotomies were performed within the first 24 hours, whereas 39.6% (n=19) were performed after 24 hours (Figure 2).

Active bleeding and hemoperitoneum were the most frequently encountered operative findings during relaparotomy, observed in 43.8% (n=21) and 41.7%

(n=20) of patients, respectively. Hematoma (18.8%, n=9), peritoneal contamination/pus (16.7%, n=8), and uterine scar-related bleeding or disruption (12.5%, n=6) were also observed in substantial proportions. Fascial disruption was noted in 10.4% (n=5) and visceral injury in 4.2% (n=2). Evacuation of hemoperitoneum or hematoma (41.7%, n=20) and achievement of surgical hemostasis by suturing or vessel ligation (37.5%, n=18) were the most frequently performed interventions. Peritoneal lavage and drainage were performed in 22.9% (n=11). Nine patients (18.8%) ultimately required hysterectomy to control life-threatening hemorrhage or irreversible uterine pathology. Abdominal wall resuturing was required in 12.5% (n=6) and repair of visceral injury in 4.2% (n=2). Because some patients had more than one operative finding and required multiple procedures, cumulative percentages exceed 100% (Table 4).

Post-relaparotomy morbidity remained substantial despite definitive surgical intervention. Sepsis was the most frequent major postoperative complication (25.0%, n=12), followed by hemorrhagic/hypovolemic shock (20.8%, n=10) and surgical-site/wound infection (18.8%, n=9). Acute kidney injury developed in seven patients (14.6%), reflecting the severity of hemorrhage, sepsis and hemodynamic instability in this population. Pulmonary complications (10.4%, n=5) and disseminated intravascular coagulation (8.3%, n=4) were less frequent but were associated with severe clinical illness. Three patients (6.3%) required another operative intervention (repeat relaparotomy) because of persistent or recurrent postoperative complications, while urinary tract complications occurred in 4.2% (n=2) (Table 5).

**Table 5: Morbidity pattern following relaparotomy (n=48).\***

| Post-relaparotomy morbidity*           | Frequency (N) | Percentage (%) |
|----------------------------------------|---------------|----------------|
| Sepsis                                 | 12            | 25.0           |
| Hemorrhagic/hypovolemic shock          | 10            | 20.8           |
| Surgical-site/wound infection          | 9             | 18.8           |
| Acute kidney injury                    | 7             | 14.6           |
| Pulmonary complications                | 5             | 10.4           |
| Disseminated intravascular coagulation | 4             | 8.3            |
| Repeat relaparotomy/reoperation        | 3             | 6.3            |
| Urinary tract complication             | 2             | 4.2            |

\*More than one morbidity could occur in the same patient; percentages do not total 100%

A large proportion of patients required substantial supportive treatment following relaparotomy. Blood transfusion was required in 39 (81.3%) patients, while 18 (37.5%) required massive transfusion of four or more units of blood or blood components. Fifteen patients (31.3%) required admission to an intensive care unit (ICU) or high-dependency unit (HDU), and eight (16.7%) required mechanical ventilatory support. Post-relaparotomy hospital stay was  $\leq 7$  days in 13 (27.1%), 8-14 days in 21 (43.8%), and  $>14$  days in 14 (29.2%) patients, indicating considerable postoperative healthcare utilization. Overall, 42 (87.5%) patients recovered and were discharged, while six patients died, giving a post-relaparotomy mortality rate of 12.5% (Table 6).

**Table 6: Treatment requirements and final outcome following relaparotomy (n=48).**

|                                                  | Frequency (N) | Percentage (%) |
|--------------------------------------------------|---------------|----------------|
| <b>Treatment requirements/outcomes</b>           |               |                |
| Blood transfusion required                       | 39            | 81.3           |
| Massive transfusion ( $\geq 4$ units/components) | 18            | 37.5           |
| ICU / HDU admission                              | 15            | 31.3           |
| Mechanical ventilatory support                   | 8             | 16.7           |
| <b>Post-relaparotomy hospital stay</b>           |               |                |
| $\leq 7$ days                                    | 13            | 27.1           |
| 8-14 days                                        | 21            | 43.8           |
| $>14$ days                                       | 14            | 29.2           |
| <b>Final outcome</b>                             |               |                |
| Recovered and discharged                         | 42            | 87.5           |
| Death                                            | 6             | 12.5           |

Mortality was analyzed in relation to selected demographic, operative and postoperative clinical factors. Mortality was comparatively higher among women aged  $\geq 35$  years (28.6% vs 5.9%), although the difference narrowly failed to reach statistical significance ( $p=0.052$ ). Delayed relaparotomy beyond 24 hours after the primary surgery was significantly associated with mortality (26.3% vs 3.4%,  $p=0.030$ ). Development of sepsis (33.3% vs 5.6%,  $p=0.028$ ), hemorrhagic shock (40.0% vs 5.3%,  $p=0.013$ ), acute kidney injury (42.9% vs 7.3%,  $p=0.033$ ), and massive blood transfusion (27.8% vs 3.3%,  $p=0.022$ ) were all significantly associated with increased mortality. Furthermore, ICU/HDU admission showed a strong significant association with mortality (40.0% vs 0.0%,  $p<0.001$ ), reflecting the greater severity of illness among critically ill patients. These findings suggest that delayed recognition of complications and development of major systemic complications were critical determinants of fatal outcomes (Table 7).

**Table 7: Association of selected clinical factors with post-relaparotomy mortality (n=48).\***

| Clinical factors                             | Total | Death, N (%) | Survived, N (%) | P value* |
|----------------------------------------------|-------|--------------|-----------------|----------|
| Age ≥35 years                                | 14    | 4 (28.6)     | 10 (71.4)       | 0.052    |
| Age <35 years                                | 34    | 2 (5.9)      | 32 (94.1)       |          |
| Relaparotomy >24 hours after primary surgery | 19    | 5 (26.3)     | 14 (73.7)       | 0.030    |
| Relaparotomy ≤24 hours                       | 29    | 1 (3.4)      | 28 (96.6)       |          |
| Sepsis                                       | 12    | 4 (33.3)     | 8 (66.7)        | 0.028    |
| No sepsis                                    | 36    | 2 (5.6)      | 34 (94.4)       |          |
| Hemorrhagic shock                            | 10    | 4 (40.0)     | 6 (60.0)        | 0.013    |
| No hemorrhagic shock                         | 38    | 2 (5.3)      | 36 (94.7)       |          |
| Acute kidney injury                          | 7     | 3 (42.9)     | 4 (57.1)        | 0.033    |
| No acute kidney injury                       | 41    | 3 (7.3)      | 38 (92.7)       |          |
| Massive transfusion                          | 18    | 5 (27.8)     | 13 (72.2)       | 0.022    |
| No massive transfusion                       | 30    | 1 (3.3)      | 29 (96.7)       |          |
| ICU/HDU admission                            | 15    | 6 (40.0)     | 9 (60.0)        | <0.001   |
| No ICU/HDU admission                         | 33    | 0 (0.0)      | 33 (100.0)      |          |

\*Fisher's exact test was applied; p<0.05 considered statistically significant

## DISCUSSION

The present study demonstrated that relaparotomy following obstetrical and gynecological surgery was associated with considerable postoperative morbidity and mortality. Most relaparotomies followed obstetric procedures (81.3%), particularly caesarean section (64.6%). This pattern is consistent with previous reports in which caesarean delivery constituted the predominant primary operation before relaparotomy.<sup>1,2,10</sup> The predominance of obstetric cases may reflect the high volume of emergency caesarean deliveries in tertiary referral hospitals.

Hemoperitoneum or ongoing intra-abdominal hemorrhage was the leading indication for relaparotomy, followed by sepsis, hematoma, postpartum hemorrhage and wound dehiscence. Similar findings were reported by Seal et al, Gedikbasi et al, Kessous et al and Levin et al with hemorrhage and hematoma being major reasons for re-exploration.<sup>11,12,5,6</sup> Bangladeshi studies have likewise identified postpartum hemorrhage, hemoperitoneum, subrectus hematoma and sepsis as important indications.<sup>9,10,13</sup> These findings emphasize meticulous hemostasis during primary surgery.

In the present study, 60.4% of relaparotomies were performed within 24 hours. Early re-exploration is generally related to hemorrhage, whereas later intervention is more frequently associated with infection, abscess formation and wound complications.<sup>3,4,14</sup> Sepsis, hemorrhagic shock and acute kidney injury were prominent morbidities. The high requirement for blood transfusion and ICU/HDU admission further illustrates the severity of these complications and is consistent with findings reported by Weissmann-Brenner et al and Huras et al.<sup>15,16</sup>

The observed mortality rate of 12.5% indicates the potentially life-threatening nature of relaparotomy. Shan et

al, in a systematic review and meta-analysis, reported a pooled mortality of 7.24%, increasing to 16.90% in low-resource settings.<sup>8</sup> Bangladeshi studies have reported substantial variation in case fatality, including 4.17% at Mymensingh Medical College Hospital, 18% at Rajshahi Medical College Hospital and 25% in an earlier Dhaka study.<sup>9,10,13</sup> The associations of delayed relaparotomy, sepsis, hemorrhagic shock, acute kidney injury and massive transfusion with mortality highlight the need for vigilant postoperative monitoring, timely referral, rapid surgical intervention, adequate blood-bank support and accessible critical care services.

## CONCLUSION

Relaparotomy following obstetrical and gynecological surgery was associated with considerable morbidity and mortality. Hemorrhage, sepsis and wound-related complications were the major indications for repeat surgery. Delayed relaparotomy, hemorrhagic shock, sepsis, acute kidney injury and massive transfusion were associated with poorer outcomes. Early recognition of postoperative complications, timely surgical intervention and adequate critical-care support are essential to reduce adverse outcomes.

## ACKNOWLEDGEMENTS

The authors express their sincere gratitude to the faculty, resident doctors, nursing personnel, and administrative staff of the Department of Obstetrics and Gynaecology, Rajshahi Medical College Hospital, for their invaluable cooperation and clinical assistance during the study.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee, Rajshahi Medical College Hospital, Rajshahi, Bangladesh*

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**Cite this article as:** Nazme N, Ferdous MJ. Post-relaparotomy morbidity and mortality patterns following gynecological and obstetrical surgeries: a tertiary care hospital experience. *Int J Res Med Sci* 2026;14:4249-55.