



A prospective observational study on postoperative complications following urological, general surgical, and gynecological procedures in pelvic surgeries.

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Abstract

Background:

Pelvic surgeries involving urological, general surgical, and gynecological procedures are highly complex and associated with considerable postoperative morbidity. To evaluate the incidence, spectrum, and predictors of postoperative complications in patients undergoing pelvic surgeries involving urological, general surgical, and gynecological procedures.

Methods:

This prospective observational study included 100 consecutive patients. Surgical interventions comprised urological procedures (bladder repair, ureteric reimplantation, vesicovaginal fistula repair), general surgical operations (sigmoid volvulus, sigmoid perforation, acute intestinal obstruction, obstructed femoral hernia, pelvic trauma), and gynecological procedures (hysterectomy, ovarian torsion, ectopic pregnancy). Postoperative complications within 30 days were classified using the Clavien–Dindo system, and predictors were analyzed using multivariable logistic regression.

Results:

The median age was 56 years (IQR: 46–65), with 62% males and 41% ASA class $\geq$ III. Colorectal resection with urological reconstruction was most frequent (54%), followed by cystectomy with diversion (18%), complex fistula repairs (16%), pelvic exenterations (12%), and gynecological surgeries (10%). Open surgery was performed in 58% of cases, while 42% underwent minimally invasive approaches. The median operative time was 310 minutes (IQR: 250–380), with blood loss $\geq$ 500 mL in 35%. Overall, 38% developed complications, and 14% had major events (Clavien–Dindo III–V). The most common complications were surgical-site infection (16%), postoperative ileus (14%), and urinary leak (9%). Independent predictors included operative time $\geq$ 240 minutes (OR 2.62), blood loss $\geq$ 500 mL (OR 3.06), and ASA class $\geq$ III (OR 2.28).

Conclusions:

Pelvic surgeries involving multidisciplinary teams carry a high incidence of postoperative morbidity. Surgical-site infection, ileus, and urinary leak were the most frequent complications, and prolonged operative time, higher blood loss, and greater ASA class were significant predictors.

Recommendations:

Preoperative optimization of high-risk patients, multidisciplinary planning, meticulous hemostasis, preference for minimally invasive approaches, and integration of enhanced recovery after surgery protocols are essential to reduce complications and improve outcomes.

Keywords: pelvic surgery, urological surgery, general surgery, gynecological surgery, postoperative complications

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Introduction

Pelvic surgeries requiring the combined expertise of urological and general surgical teams are often indicated in complex oncological, reconstructive, and advanced benign conditions. Examples include pelvic exenteration, colorectal resection with urinary tract reconstruction, complex fistula repair, and combined oncological resections involving the bladder, ureters, rectum, or pelvic floor [1,2]. These procedures are inherently challenging due to the proximity of vital anatomical structures, shared operative fields, and the necessity for meticulous multidisciplinary coordination [3].

Despite advances in surgical techniques, minimally invasive approaches, and perioperative care protocols, combined pelvic operations remain associated with considerable morbidity. Large series have reported complication rates ranging from 25% to over 50%, with surgical-site infection, anastomotic leak, urinary leak, and postoperative ileus among the most common postoperative events [1–3]. Major complications not only prolong hospitalization and increase healthcare costs but also delay adjuvant oncological treatment, potentially compromising long-term survival [4]. Several perioperative factors, including surgical approach, operative duration, intraoperative blood loss, and patient comorbidities, have been identified as key determinants of adverse outcomes in complex pelvic surgeries [5]. However, there is a paucity of literature focusing specifically on the combined setting in which urological and general surgical procedures are performed concurrently during the same operative session. Furthermore, much of the existing evidence is derived from retrospective series with heterogeneous patient populations, limiting the applicability of results to contemporary practice.

This prospective observational study was designed to assess the incidence, spectrum, and severity of postoperative complications in patients undergoing combined urological and general surgical pelvic procedures, while also identifying perioperative predictors of adverse outcomes to support surgical planning, patient counseling, and perioperative optimization. Furthermore, gynecological interventions such as hysterectomy, management of ovarian torsion, and surgery for ectopic pregnancy carry distinct postoperative challenges; therefore, these were also incorporated into the present analysis.

Materials and Methods

Study Design

This was a prospective hospital-based observational cohort study conducted to evaluate postoperative complications and their predictors among patients undergoing pelvic

surgeries that involved urological, general surgical, and gynecological procedures. The cohort design allowed longitudinal assessment of postoperative outcomes up to 30 days after surgery, ensuring temporal association between perioperative factors and complications.

Study Setting

The study was carried out in the Departments of Urology and General Surgery, Government Medical College and General Hospital, Bhadrachari Kothagudem, Telangana, India, which functions as a tertiary-care referral centre catering to both urban and rural communities of Bhadrachari Kothagudem district and neighboring regions of Khammam. The hospital has fully functional general surgical, urological, obstetrics and gynecology, anesthesiology, and critical care units. It provides round-the-clock emergency, operative, and intensive care services, managing a wide range of elective and emergency surgical conditions. The study period extended over 18 months, from January 2024 to June 2025.

Study Population

All consecutive patients undergoing pelvic surgeries that required the involvement of urological, general surgical, or gynecological teams during the study period were considered eligible. Combined procedures were defined as those in which at least one urological, general surgical, or gynecological intervention was performed within the same operative session. The spectrum of procedures included:

Urological: bladder repair, ureteric reimplantation, vesicovaginal fistula repair.

General surgical: sigmoid volvulus, sigmoid perforation, acute intestinal obstruction involving the large bowel, obstructed femoral hernia, pelvic trauma.

Gynecological: hysterectomy, ovarian torsion, and ectopic pregnancy.

Sample Size Determination

A minimum sample size of **96** was estimated using the single-proportion formula:

$$n = (Z_{1-\alpha/2})^2 \times P \times (1 - P) / d^2$$

Where $Z = 1.96$ for 95% confidence, $P = 0.5$ (assumed prevalence of postoperative complications based on previous studies reporting 40–50% morbidity in major pelvic surgeries), and $d = 0.10$ (10% allowable error).

Substituting these values yielded $n = 96$; to compensate for potential dropouts and incomplete data, a total of 100 consecutive patients were finally enrolled.



Inclusion Criteria

Adult patients (≥ 18 years) undergoing urological, general surgical, or gynecological pelvic procedures, either individually or in combination.

Patients who provided informed written consent to participate.

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Exclusion Criteria

Patients with incomplete perioperative records or lost to follow-up within 30 days postoperatively.

Data Collection

Baseline demographic variables, comorbidities, ASA physical status, surgical details (type of procedure, surgical approach, operative duration, estimated blood loss [EBL], stoma creation, emergency/elective status), and intraoperative events were recorded prospectively.

Outcome Measures

The primary outcome was the occurrence of postoperative complications within 30 days, classified according to the Clavien–Dindo system. Secondary outcomes included length of hospital stay, reoperation rate, 30-day readmission, and mortality.

Bias and Its Management

To minimize selection bias, consecutive eligible patients meeting the inclusion criteria were enrolled prospectively without omission. Information bias was reduced by using a pre-validated structured data collection proforma and by maintaining uniform definitions of complications according to the Clavien–Dindo classification. Observer bias was limited by ensuring that postoperative complications were independently verified by two senior consultants blinded to intraoperative details. Regular data audits were performed to ensure completeness and consistency.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY). Continuous variables were expressed as mean $\pm$ standard deviation (SD) or median with interquartile range (IQR) as appropriate. Categorical variables were presented as frequencies and percentages. Associations between categorical variables were tested using Chi-square or Fisher's exact test, and continuous variables were compared using the independent t-test or Mann–Whitney U test. Multivariable logistic regression analysis was performed to identify independent predictors of postoperative complications. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of Government Medical College, Kothagudem, before initiation. Written informed consent was obtained from all participants.

Results

Participant Flow and Recruitment

During the 18-month study period, a total of 118 patients undergoing pelvic surgeries involving urological, general surgical, or gynecological procedures were screened for eligibility. Of these, 10 patients were excluded due to incomplete perioperative data, 4 were lost to 30-day follow-up, and 4 declined participation after preoperative counseling. Thus, 100 consecutive eligible participants fulfilling all inclusion criteria and providing written informed consent were finally enrolled and analyzed. All included participants completed postoperative follow-up for 30 days, and there were no dropouts or protocol deviations.

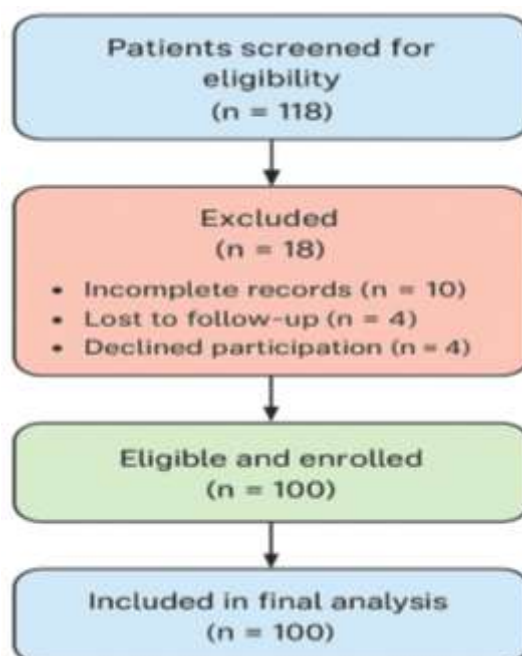


Figure 1. Participant Flow Diagram

A total of 100 patients who underwent combined urological and general surgical procedures for pelvic pathologies were included in the analysis. The median age was 56 years (IQR: 46–65), with a male predominance (62%). The mean body mass index was 26.1 ± 3.8 kg/m². Hypertension (34%),

diabetes mellitus (28%), and chronic kidney disease (8%) were the most common comorbidities. An ASA physical status classification of $\geq$ III was observed in 41% of the cohort (Table 1).

Table 1. Demographic Characteristics (n = 100)

Variable	Value
Age, years, median (IQR)	56 (46–65)
Male sex, n (%)	62 (62.0)
BMI, kg/m ² , mean $\pm$ SD	26.1 ± 3.8
Hypertension, n (%)	34 (34.0)
Diabetes mellitus, n (%)	28 (28.0)
Chronic kidney disease, n (%)	8 (8.0)
ASA class $\geq$ III, n (%)	41 (41.0)

Regarding the surgical profile, colorectal resection with concurrent urological reconstruction represented the largest subgroup (54%), followed by cystectomy with urinary diversion and an additional general surgical component (18%). Complex fistula repairs accounted for 16% of cases, pelvic exenterations for 12%, and gynecological procedures such as hysterectomy, ovarian torsion, and ectopic pregnancy formed 10% of the study population. An open

approach was performed in 58% of patients, whereas 42% underwent minimally invasive (laparoscopic or robotic) surgery. The median operative time was 310 minutes (IQR: 250–380), with 35% of patients experiencing an estimated blood loss $\geq$ 500 mL. Intraoperative transfusion was required in 22%, a temporary stoma was created in 31%, and 12% of cases presented as emergencies (Table 2).



Table 2. Surgical Profile of Patients Undergoing Urological, General Surgical, and Gynecological Procedures in Pelvic Surgeries (n = 100)

Variable	Value
Procedure category, n (%)	
Colorectal + Urological reconstruction	54 (54.0)
Cystectomy + Diversion (+GS component)	18 (18.0)
Complex fistula repair (combined)	16 (16.0)
Pelvic exenteration	12 (12.0)
Gynecological (hysterectomy, ovarian torsion, ectopic pregnancy)	10 (10.0)
Surgical approach, n (%)	
Open	58 (58.0)
Minimally invasive (laparoscopic/robotic)	42 (42.0)
Operative time, min, median (IQR)	310 (250–380)
EBL $\geq$ 500 mL, n (%)	35 (35.0)
Intraoperative transfusion, n (%)	22 (22.0)
Stoma creation, n (%)	31 (31.0)
Emergency presentation, n (%)	12 (12.0)

Within 30 postoperative days, 38 patients (38%) developed at least one complication, and 14 (14%) had major complications (Clavien–Dindo grade III–V). Reoperations

were required in 9% of patients, the 30-day readmission rate was 12%, and mortality was 2%. The median postoperative hospital stay was 7 days (IQR: 5–11) (Table 3).

Table 3. Thirty-Day Postoperative Outcomes

Outcome	n (%)
Any complication	38 (38.0)
Major complication (Clavien–Dindo III–V)	14 (14.0)
Reoperation	9 (9.0)
30-day readmission	12 (12.0)
Mortality (30-day)	2 (2.0)
Length of stay, days, median (IQR)	7 (5–11)

The most frequent complications were surgical-site infection (16%), postoperative ileus (14%), urinary leak (9%), and urinary tract infection or catheter-associated infection (12%). Less common events included anastomotic leak (6%), acute kidney injury (8%), wound dehiscence

(4%), postoperative hemorrhage requiring intervention (3%), venous thromboembolism (2%), and early ureteric stricture (3%). Multiple complications were recorded in some patients (Table 4).

Table 4. Specific Postoperative Complications*

Complication	n (%)
Surgical-site infection	16 (16.0)
Postoperative ileus	14 (14.0)
Urinary leak	9 (9.0)
Anastomotic leak	6 (6.0)
Acute kidney injury	8 (8.0)
UTI/catheter-associated infection	12 (12.0)
Wound dehiscence	4 (4.0)



Postoperative hemorrhage (intervention)	3 (3.0)
Venous thromboembolism	2 (2.0)
Early ureteric stricture	3 (3.0)

**Patients could have more than one event.*

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Subgroup analysis demonstrated that open surgery was associated with a significantly higher overall complication rate than minimally invasive surgery (46.6% vs 26.2%; χ^2 p = 0.030) and that emergency procedures tended to have more complications compared with elective operations (58.3% vs 35.2%; χ^2 p = 0.082) (Table 5).

Table 5. Complications by Surgical Approach and Urgency

Subgroup	Any complication, n/N (%)	Statistic
Open	27/58 (46.6)	χ^2 p =0.030 vs MIS
Minimally invasive	11/42 (26.2)	
Elective	31/88 (35.2)	χ^2 p =0.082 vs Emergency
Emergency	7/12 (58.3)	

On multivariable logistic regression, operative time ≥ 240 minutes (adjusted OR: 2.62; 95% CI: 1.12–6.13; p = 0.027), estimated blood loss ≥ 500 mL (adjusted OR: 3.06; 95% CI: 1.25–7.51; p = 0.014), and ASA class $\geq$ III (adjusted OR:

2.28; 95% CI: 1.00–5.20; p = 0.049) were identified as independent predictors of any postoperative complication. Open surgical approach and stoma creation showed a non-significant trend towards increased risk (Table 6).

Table 6. Multivariable Predictors of Any Complication

Variable	Adjusted OR (95% CI)	p-value
Operative time ≥ 240 min	2.62 (1.12–6.13)	0.027
EBL ≥ 500 mL	3.06 (1.25–7.51)	0.014
ASA class $\geq$ III	2.28 (1.00–5.20)	0.049
Open (vs MIS)	2.02 (0.88–4.67)	0.098
Stoma creation	1.58 (0.77–3.25)	0.210

Discussion

This prospective observational study conducted at a tertiary care center evaluated postoperative outcomes in 100 patients undergoing pelvic surgeries that included urological, general surgical, and gynecological procedures. The overall complication rate was 38%, with 14% of patients experiencing major complications (Clavien–Dindo grade III–V). Reoperation was required in 9%, and the 30-day mortality rate was 2%. The most frequent complications observed were surgical-site infection, postoperative ileus, and urinary leak. On multivariable analysis, operative time ≥ 240 minutes, estimated blood loss ≥ 500 mL, and ASA class $\geq$ III emerged as independent predictors of adverse outcomes.

These study findings are consistent with previously reported high morbidity rates in complex pelvic surgeries requiring multidisciplinary collaboration. Similar complication rates, ranging from 30% to 50%, have been described in combined colorectal–urological resections, where the technical complexity and prolonged operative times contribute

significantly to risk [6,11]. In this series, surgical-site infection occurred in 16%, which is comparable to published data on major pelvic oncological resections involving both urinary and gastrointestinal tract manipulation, where bacterial contamination is a recognized concern [12]. The incidence of postoperative ileus (14%) aligns with prior reports for extensive pelvic procedures (10–25%) and is likely related to prolonged operative duration and extensive bowel handling [8]. Urinary leaks were documented in 9%, slightly higher than the 5–8% reported in radical cystectomy cohorts [11], probably reflecting the inclusion of complex fistula repairs and emergency cases in our study population. In addition to urological and general surgical interventions, we also included gynecological procedures such as hysterectomy, ovarian torsion management, and surgery for ectopic pregnancy. These operations, while often lifesaving, carry distinct risks including hemorrhage, sepsis, and pelvic adhesions, and their inclusion underscores the importance of multidisciplinary preparedness when managing pelvic pathologies.



The observed association between prolonged operative time and higher complication rates is consistent with established evidence in both urological and colorectal oncological surgeries, where extended anesthesia, fluid shifts, and tissue trauma increase the physiological burden [6,12]. Similarly, excessive intraoperative blood loss has been linked with impaired immune responses and delayed wound healing, predisposing to infection and anastomotic failure [7,9]. Our finding that ASA class $\geq$ III independently predicted complications supports prior evidence that patients with significant baseline comorbidities face a higher risk of poor postoperative recovery [10].

While minimally invasive approaches are associated with reduced wound morbidity, their technical demands, particularly in complex pelvic oncological and reconstructive surgeries, can increase operative times and perioperative challenges [6,8]. Our data suggest that careful patient selection and surgical expertise remain critical in optimizing outcomes. Furthermore, adoption of enhanced recovery after surgery (ERAS) protocols has been shown to improve recovery in both urological and colorectal procedures [7], which may help mitigate morbidity in this diverse cohort.

This study adds prospective, systematically collected data from an Indian tertiary care center to a relatively underexplored field. Unlike retrospective reports, standardized complication grading and multivariable analysis strengthen the validity of our conclusions. However, the study is limited by its single-center design, modest sample size, and restriction to 30-day outcomes. Larger multicenter studies with longer follow-up and tailored ERAS integration are warranted to refine perioperative risk stratification and improve outcomes in patients undergoing pelvic surgeries involving urological, general surgical, and gynecological teams.

Generalizability

The findings of this study are most applicable to tertiary-care centers in similar low- and middle-income healthcare settings, where multidisciplinary collaboration between urology, general surgery, and gynecology departments is routinely required for complex pelvic pathologies. The inclusion of both elective and emergency procedures enhances the representativeness of real-world clinical practice. However, since all participants were recruited from a single tertiary institution in Telangana, external validity may be limited in community or primary-care hospitals with differing case mixes, resource availability, and perioperative infrastructure. Nevertheless, the demographic composition, spectrum of procedures, and complication rates observed in

this study align closely with international literature on combined pelvic surgeries, suggesting that the results are broadly generalizable to comparable multidisciplinary surgical settings.

Conclusion

Pelvic surgeries involving urological, general surgical, and gynecological procedures are associated with a substantial risk of postoperative morbidity, with more than one-third of patients in this study experiencing complications and 14% sustaining major adverse events. Surgical-site infection, postoperative ileus, and urinary leak were the most frequent complications observed. Longer operative time, excessive intraoperative blood loss, and higher ASA class independently predicted poorer outcomes, highlighting the importance of comprehensive preoperative optimization and meticulous intraoperative planning. Incorporating minimally invasive approaches where feasible, adopting multidisciplinary strategies, and implementing tailored enhanced recovery after surgery (ERAS) protocols may help improve perioperative outcomes in this high-complexity surgical cohort.

Limitations

Limitations include the single-center design, modest sample size, and short-term follow-up. Functional outcomes, quality of life, and long-term oncological results were beyond the scope of this analysis. Future multicenter studies with larger cohorts and extended follow-up could better delineate modifiable risk factors and refine patient selection criteria.

Recommendations

Preoperative optimization of patients with high ASA scores, including rigorous control of comorbidities, may help reduce postoperative morbidity in combined pelvic surgeries. Multidisciplinary preoperative planning between urological and general surgical teams should be routine to streamline operative workflow and minimize duration. Strategies to limit intraoperative blood loss—such as meticulous hemostasis, use of advanced energy devices, and cell salvage—should be implemented. Where feasible, minimally invasive approaches should be considered to reduce wound-related complications and shorten hospital stay. Enhanced recovery after surgery (ERAS) protocols tailored to combined pelvic procedures could further improve outcomes. Larger, multicenter studies are recommended to confirm and expand these findings.



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Abbreviations

ASA – American Society of Anesthesiologists
BMI – Body Mass Index
CD – Clavien–Dindo classification
CKD – Chronic Kidney Disease
EBL – Estimated Blood Loss
ERAS – Enhanced Recovery After Surgery
IQR – Interquartile Range
MIS – Minimally Invasive Surgery
OR – Odds Ratio
SD – Standard Deviation
UTI – Urinary Tract Infection

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The study had no funding.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

CPB-Concept and design of the study, results interpretation, review of literature, and preparation of the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. **NK**- Design of the study, results interpretation, review of literature and preparing first draft of manuscript, revision of manuscript.-Review of literature and preparing first draft of manuscript. Statistical analysis and interpretation. **YS**-results interpretation, review of literature and preparing first draft of manuscript, revision of manuscript.-Review of literature and preparing first draft of manuscript. Statistical analysis and interpretation.

Data availability

Data available on request

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Dr. Yerra Sudhakar is a dedicated academic surgeon with a strong foundation in clinical practice and surgical education. He obtained his MBBS degree from Kakatiya Medical College, Warangal (2002–2008) and completed his MS in General Surgery from Mamata Medical College, Khammam (2016–2019).

In 2019, Dr. Sudhakar commenced his academic career as an Assistant Professor in the Department of General Surgery at Government Medical College, Suryapet, Telangana. Over the next five years, until June 2024, he made significant contributions to undergraduate and postgraduate training, refining his expertise in surgical education, operative techniques, and clinical mentoring.

In mid-2024, he was appointed Associate Professor at Government Medical College & General Hospital, Bhadradi Kothagudem, where he continues to integrate evidence-based practice into both patient care and academic teaching. Known for his commitment to professional growth, Dr. Sudhakar combines scholarly rigor with compassionate care, fostering an environment that encourages innovation, research engagement, and high standards of surgical excellence. **ORCID ID:** <https://orcid.org/0009-0005-2330-241X>

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