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Original Research Article

Occurrence and Risk Factors for Complications Following Laparotomy for Benign Gynaecological Surgeries

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Abstract:

This prospective observational study was conducted in Gauhati Medical College and Hospital, Guwahati for a period of one year from October 2022 to September 2023 in the Department of Obstetrics and Gynaecology. 350 patients undergoing laparotomy for benign gynaecological conditions, aged between 15-65 years of age were studied for post-operative complications for a period of 30 days after surgery and the associated risk factors were evaluated. The post-operative complications which were most frequently observed were paralytic ileus, surgical site infection, urinary tract infection and organ injury. Significant association was found between certain risk factors and the complications developed. Positive correlation was found between the development of surgical site infection with diabetes mellitus, obesity, and anaemia. Significant association was also seen between the occurrence of post-operative paralytic ileus with diabetes mellitus and prolonged duration of surgery. Urinary tract infection was seen to be associated with diabetes mellitus. Peri operative blood loss was also found to be associated with post-operative complications. No association was found between the age of the patients, raised blood pressure and hypoalbuminemia with the post-operative complications. It was concluded that the risk factors associated with post- operative complications were anaemia, obesity, diabetes mellitus, peri operative blood transfusion and prolonged duration of surgery. Hence, pre optimisation of the patient's condition prior to surgery plays a vital role in prevention of these complications and will reduce the morbidity and health case expense associated with them.

Keywords: laparotomy, Surgical site infection (SSI), Paralytic ileus, Urinary tract infection (UTI), Organ injury.

Introduction

Laparotomy, a surgical incision into the abdominal wall, is used for various gynecological conditions like fibroids, endometriosis, and ovarian cysts. While minimally invasive techniques are advancing, laparotomy remains necessary for complex cases. However, it carries risks, ranging from minor wound infections and ileus to severe complications like hemorrhage, thromboembolism, and organ injury, increasing hospital stays, costs, and morbidity. Complication rates vary (8.9% to 30%) depending on the study. Common complications include wound issues, UTIs, and thromboembolism. Risk factors include obesity, advanced age, pre-existing conditions (diabetes, hypertension), previous abdominal surgeries, emergency surgery, blood loss, prolonged surgery, and contaminated wounds. Addressing these risk factors through weight reduction, glycemic control, prophylactic anticoagulation, and early mobilization can mitigate complications. Minimally invasive techniques (minilaparotomy, laparoscopic-assisted procedures) and Enhanced Recovery after Surgery (ERAS) protocols also show promise in reducing complications and improving recovery. Further research is needed to refine risk assessment, optimize surgical techniques, and improve perioperative care. Tertiary care centers like Gauhati Medical College and Hospital, with their high volume of gynecological laparotomies (350-500 annually), are ideal for such studies.

Material and Method

A cross-sectional prospective observational study was conducted at the Department of Obstetrics and Gynecology, Guwahati Medical College and Hospital (GMCH), Assam, India. The study was

carried out over a one-year period from October 2022 to September 2023. The study population consisted of females aged 15-65 years who underwent laparotomy for benign gynecological conditions at GMCH during the study period. A total of 350 patients were included in the study based on the inclusion and exclusion criteria.

Women aged 15 to 65 years undergoing laparotomy for benign gynecological conditions and elective gynecological surgeries were included in the study.

Patients aged less than 15 years or more than 65 years, laparotomy performed for malignant or suspicious malignant gynecological conditions, laparotomy performed for the correction of complications arising from previous surgeries, emergency laparotomies for any gynaecological condition and any pregnant patient undergoing gynaecological laparotomy were excluded from the study.

Data Collection: A structured data collection form was used to gather relevant information from the patients' medical records, including demographic data, clinical history, and indications for laparotomy, surgical details, and postoperative complications. The data collection process was carried out by me.

Outcome Measures: The primary outcome measure were the incidence of complications occurring in the postoperative period following laparotomy for benign gynecological surgeries. Complications were defined as any adverse events occurring within 30 days of the operation, including wound infection, hemorrhage, venous thromboembolism, urinary tract infection, ileus, and organ injuries.

Statistical Analysis: Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as means and standard deviations. The incidence of complications was calculated as the proportion of patients who experienced any complication during the postoperative period, with 95% confidence intervals. Subgroup analyses were performed to identify potential risk factors associated with the development of complications, using appropriate statistical tests such as chi-square or Student's t-test. Multivariable logistic regression analysis was employed to identify independent predictors of postoperative complications, adjusting for potential confounders. Odds ratios (ORs) with 95% confidence intervals were reported for significant predictors. A p-value of less than 0.05 was considered statistically significant. All statistical analyses were performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA).

Results and Discussion

Complications Following Laparotomy for Benign Gynecological Conditions Laparotomy remains a common procedure in gynecological surgery. Due to the high volume of cases, associated complications and their implications are substantial, ranging from superficial wound infections to severe complications like hemoperitoneum requiring re-laparotomy. These complications are influenced by patient-related factors (general condition, nutrition, hemoglobin, serum albumin, chronic illnesses like diabetes and autoimmune disorders requiring immunosuppressants), procedure-related factors (operative difficulty, previous surgeries, surgical pathology, and duration of surgery), and postoperative care (antibiotics, early mobilization, catheterization duration, diabetes control, and nutritional support).

The complications occurring after laparotomy were wound discharge (5.7%), urinary tract infection (2.8%), paralytic ileus (12%), organ injury (0.85%), others (0.57%).

The most common complication was paralytic ileus with an incidence of 12%. Each of the complication and their associated risk factors have been discussed in the following text.

1. Age Distribution of Patients Undergoing Laparotomy

The mean age of patients undergoing laparotomy for benign gynecological conditions in this study was 40.51 years (SD 10.85). No significant correlation between age and complications was found ($p = 0.74$). This may be due to the exclusion of patients over 65, uneven case distribution across age groups, and confounding factors like obesity and anemia.

2. Association of Hypertension with Complications

This study found no association between hypertension and complications ($p = 0.57$), consistent with findings by Crowther M et al. (2018) [1] ,who concluded that pre-operative hypertension (BP < 180/110 mmHg) does not independently predict intraoperative hemodynamic instability, suggesting elective procedures can be safely performed in these patients.

3. Surgical Site Infections (SSIs)

A) **Rate of Surgical Site Infection**: The SSI rate in this study was 5.71%, comparable to other studies. In this study, E. coli was the most common, followed by Klebsiella pneumoniae, Staphylococcus epidermidis, and Acinetobacter. Korol E et al. (2013) [2] reported a median SSI rate of 3.7% (range 0.1-50.4%). Agrawal A et al. (2014) [3] found a 15.7% overall SSI rate (5.7% for elective, 28.6% for emergency surgeries). Salahuddin M et

al. (2022) [4] reported a range of 2-17.8% with an average of 7.8%. The most common microorganisms were E. coli, Staphylococcus aureus, and Klebsiella pneumoniae.

B**) Association of Wound Discharge with Anemia**: Anemia was associated with a 1.9 times higher risk of SSI (p = 0.024), consistent with other studies. Weber WP et al. (2009) [5] found an OR of 1.32 (p = 0.037) for anemia and SSI. Ariza et al. (2020) [6] found associations with pre-surgical Hb levels, intraoperative transfusions and major blood loss.

C**) Association of Wound Discharge with BMI**: High BMI was associated with a 1.7 times higher risk of wound discharge (p = 0.0001), similar to other studies. Thelwall S et al. (2015) [7] found a 1.1 to 4.4 times increased AOR for SSI with high BMI. Abdelaziz A et al. (2021) [8] reported an OR of 1.59. Qiao Y et al. (2022) [9] reported an OR of 1.87.

D) **Association of Wound Discharge with Serum Albumin**: This study did not find a significant association between hypoalbuminemia and wound discharge (p=0.24), unlike other studies. Hennessey DB et al. (2010) [10] found hypoalbuminemia to be an independent risk factor (RR 5.68, p < 0.001). Sullivan SA et al. (2016) [11] found an OR of 2.9 (p = 0.02). The present study's lack of association may be due to smaller sample size.

E) **Association of Diabetes Mellitus with Wound Discharge**: Diabetes was associated with a 5.2 times higher risk of wound discharge, higher than reported in other studies. Ata A et al. (2010) [12] found an OR of 3.2 for serum glucose >140 mg/dL and SSI. Martin ET et al. (2016) [13] reported an OR of 1.53. He C et al. (2023) [14] found an OR of 1.63. The higher rate in this study may be due to other factors like anemia, malnutrition, difficult surgery, and prolonged surgeries, and a potentially skewed sample due to the hospital being a referral center.

F**) Association of Wound Discharge with Duration of Surgery**: This study found no significant association between surgery duration >2 hours and wound discharge (p = 0.23). This may be due to the small number of wound discharge cases and the use of higher-grade antibiotics in prolonged surgeries. Cheng H et al. (2017)[15] found increasing SSI risk with longer durations.

4) Urinary Tract Infection (UTI)

A**) Rate**: Symptomatic UTI occurred in 2.8% of patients (10/350), with only two cases microbiologically confirmed. This low confirmation rate may be attributed to empirical antibiotic use and potential collection errors. This rate is comparable to other studies reporting UTI rates of 1.1% (Alvarez AP et al., 2016) [16] and 3.7% (Sheka AC et al., 2016) [17].

B) **Association with Diabetes**: Diabetic patients had a 2.6 times higher risk of UTI (p = 0.001), consistent with other studies reporting odds ratios of 2.04 (Kumar R et al., 2019) [18], 2.3 (Ramrakhia S et al., 2020) [19], and 2.64 (Jagadeeshan S et al., 2022) [20].

C) **Association with Catheterization Duration**: While 15 patients had prolonged catheterization, none developed UTI symptoms. This absence of symptoms may be due to postoperative antibiotics, good perineal hygiene, and the absence of risk factors like diabetes or steroid use, although asymptomatic bacteriuria cannot be ruled out. This contrasts with Brusch L et al. (2021), who reported high rates of bacteriuria with both short and long-term catheterization.

5. Venous Thromboembolism (VTE) No VTE events were observed in this study, potentially due to early mobilization and the absence of predisposing factors like previous DVT or thrombophilia.

6. **Paralytic Ileus**

a. Rate: Paralytic ileus occurred in 12% of patients (42/350). Three patients required Ryle's tube insertion.

b. **Association with Diabetes**: Diabetic patients had a 1.3 times higher risk of ileus (p = 0.001). c. Association with Surgery Duration: A significant association was found between surgery duration and ileus (OR 1.08, p = 0.034). Mean surgery duration in patients with ileus was 2 hours. This is lower than Moghadamyeghaneh Z et al. (2016) [21] who found an AOR of 2.56

7. Organ Injury Organ injury occurred in 0.85% of cases (3/350): two bowel injuries (associated with adhesions) and one ureteric ligation (during hysterectomy for a large myoma).

8. Other Complications One case each of subrectal hematoma (0.28%) and hemoperitoneum requiring relaparotomy (0.28%) were observed.

9. Association of Blood Transfusion

1. **With Anemia**: A significant association was found (p = 0.01); 25% of anemic patients received transfusions compared to 4.3% of non-anemic patients, consistent with Khair S et al. (2019)[22].

2. **With Overall Complications**: A significant association was found (p < 0.01); 15.27% of all complications were associated with perioperative blood transfusion, comparable to Weber WP et al. (2009)[5] and Morris FJD et al. (2023)[23]

The type of complications and their associations based on P Value can be summarized as follows:

No Significant Association

Type of Complication P Value

- Age with Complications 0.74
- Hypertension with Complications 0.53
- Serum Albumin with Wound Discharge 0.243
- Duration of Surgery with Wound Discharge 0.23

Significant Association

Type of Complication P Value

- Anemia with Wound Discharge 0.024
- BMI with Wound Discharge 0.0001
- Diabetes with Wound Discharge 0.001
- Diabetes with UTI 0.001
- Paralytic Ileus with Diabetes 0.001
- Paralytic Ileus with Duration of Surgery 0.034
- Perioperative Blood Transfusion with Anemia 0.001
- Perioperative Blood Transfusion with Complications <0.01

Conclusion

This study shows that the complications following laparotomy following benign gynaecological conditions are significantly associated with patient related factors like anaemia, diabetes mellitus, BMI of the patient.

It is also significantly associated with the duration of surgery.

Diabetes is associated with surgical site infection, post-operative UTI and paralytic ileus. Hence control of blood sugar is extremely vital before performing surgeries which can help in reducing post-operative morbidity significantly.

Hence, to reduce these complications, pre optimisation of the patient's haemoglobin by blood transfusion, adequate control of blood sugar levels, pre-operative weight loss are necessary steps.

Limitations

While the results are promising, it is pertinent to note certain limitations, such as the study's modest sample size, single centered study and the lack of long-term follow-up after surgery, which would be critical for assessing the prolonged effects of the complications following laparotomy for benign gynaecological surgeries.

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