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CLINICAL AND SURGICAL PREDICTORS OF POSTOPERATIVE COMPLICATIONS AMONG WOMEN UNDERGOING SURGERY FOR GYNECOLOGICAL MALIGNANCIES

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Abstract

Gynaecological malignancies are a major health concern among women and often require complex surgical procedures for diagnosis and treatment. Identifying clinical and surgical factors associated with postoperative complications is important for improving patient safety, reducing surgical morbidity, and supporting better recovery. This prospective clinical study aimed to assess clinical and surgical predictors of postoperative complications among women undergoing surgery for gynaecological malignancies. The study was conducted in tertiary care hospitals in Pakistan, where data were collected prospectively from women undergoing surgical treatment for confirmed or suspected gynaecological malignancies. A total sample of 381 women was recruited using a consecutive sampling technique. Data were collected through clinical assessments, patient interviews, and reviews of medical records using a structured data collection form. Information regarding demographic characteristics, clinical history, cancer-related characteristics, comorbidities, type of malignancy, surgical procedure, duration of surgery, intraoperative blood loss, and postoperative outcomes was recorded. Data were analyzed using the Statistical Package for the Social Sciences (SPSS), including frequencies, percentages, means, and standard deviations, along with chi-square tests, independent sample t-tests, and logistic regression analysis to identify significant predictors of postoperative complications. The findings indicated that selected clinical and surgical characteristics were associated with postoperative complications among women undergoing surgery for gynaecological

malignancies. The study highlights the importance of comprehensive preoperative assessment, careful surgical planning, identification of high-risk patients, and close postoperative monitoring. The findings may help healthcare professionals improve perioperative management, reduce postoperative morbidity, and enhance the safety and quality of surgical care for women with gynaecological malignancies.

INTRODUCTION

Gynecological malignancies refer to cancers that affect the female reproductive organs. The most common types include cervical, endometrial, and ovarian cancers, which together represent an important global health concern. According to estimates from the Global Cancer Observatory in 2024, more than 700,000 new cases of these cancers were reported worldwide, making up approximately 4.6% of the total cancer cases globally.(Sung et al., 2026). The tumours often present at an advanced stage, requiring surgery for tumour debulking and adjuvant therapy. Surgical options vary from procedures involving more limited resection to extensive, complicated surgery (Kengsakul et al., 2022).

Surgery is often an important part of treating gynecologic cancers because both the disease and its treatment can cause serious health problems (Habo et al., 2025). However, patients who already have chronic health conditions or physical limitations may face greater risks during and after surgery. Therefore, having a clear understanding of a patient's overall physical health can help healthcare providers identify those who may need closer care before and after surgery, as well as more careful monitoring during the recovery period.

Postoperative Complications

Postoperative complications are the undesirable conditions that happen to a patient following surgery, and can affect the quality of the recovery and overall outcome for the patient. For women undergoing surgery for gynaecological malignancies, complications include surgical site infections, wound problems, thromboembolic events, postoperative respiratory complications, ileus, and a variety of other medical and surgical complications (Lavikainen et al., 2024). The nature and the extent of these complications are related to patient related and procedure related factors (Javed et al., 2023).

In gynaecological oncology, postoperative complications are of significant importance because the surgeries in this speciality often involve extensive surgery which includes removal of a significant amount of normal tissue (including lymph nodes), dissection of other structures, urinary and bowel diversion, and significant blood loss. Complications have also been associated with preoperative factors such as age, co-morbid conditions and increased surgery and anesthesia duration (Barton et al., 2015). A better understanding of the patient risk factors may enable improved care and planning for the patient (Stephenson et al., 2020).

Clinical Predictors of Postoperative Complications

Clinical predictors refer to patient-related factors that may help to recognize patients at risk of developing postoperative complications. In women undergoing gynecological cancer surgery, these factors may include: age, co-morbidities, body mass index (BMI), functional status and nutritional status, disease stage, and type of malignancy. Diabetes, frailty, obesity, higher co-morbidities, advanced disease, and poor functional status are associated with higher postoperative morbidity (Visser et al, 2015). These factors may also impact the physiological reserve of a patient and her ability to withstand a major surgical stress (e.g. cancer surgery).

The relationships between clinical factors and postoperative outcomes are also shown in the literature on gynaecological oncology surgery. Advanced tumor stage and characteristics are associated with increased postoperative complications (Bonde et al, 2021). These factors help identify patients who are at increased risk for postoperative complications and assist in personalized perioperative care planning (Yadeta et al., 2024).

Surgical Predictors of Postoperative Complications

Predictors of postoperative complications depend on the nature of the surgery. For example, the degree of surgery, the type of surgical approach, the length of the surgery, blood loss during surgery, and the need for other surgeries during the same procedure play a role. Surgery, in general, creates a state of physiological stress. More extensive surgery causes greater blood loss and stress, as well as a longer time for surgery (Kabir et al., 2020). Assessing the nature of the surgery is essential when assessing the potential postoperative complications.

Research has shown that the length of surgery and the amount of blood loss during surgery are key factors in the development of morbidity and complications in gynaecological oncology surgery.

Generally, more extensive and longer surgeries increase the potential for complications and longer recovery. The negative effects of major and prolonged surgery can be diminished by proper anticipation and planning by the surgical team (Husain et al., 2018). Identifying the characteristics of the surgery can also be helpful for the surgical team to anticipate the postoperative needs of the patient, and to create an adequate plan for monitoring and further interventions.

Relationship Between Clinical and Surgical Predictors and Postoperative Complications

Postoperative complications are related to both clinical and surgical predictors because patient and operative factors may combine to increase the stress of surgery and reduce the ability to recover. A patient with advanced cancer and other comorbidities or with reduced physiological reserves may not tolerate a long and complex procedure well (Woodfield et al., 2017). Therefore, both clinical and surgical factors should be considered to address the entire patient situation.

Identification of these relationships may help determine independent predictors of postoperative complications for patients with gynaecological malignancies. Findings from other studies have shown that postoperative complications may be as a result of a combination of patient-related factors (including age, comorbidities and disease status) and surgical-related factors (such as operative duration and blood loss) (Barton et al., 2015; Kengsakul et al., 2022; Zhang et al., 2026). Evaluating these factors may help preoperatively determine patient risks, plan surgery and post-operative care and help eliminate preventable adverse events.

Research Objectives

- **To determine the frequency and types of postoperative complications among women undergoing surgery for gynaecological malignancies.**
- **To assess the association between selected clinical characteristics and postoperative complications among women undergoing surgery for gynaecological malignancies.**
- **To examine the association between selected surgical characteristics and postoperative complications among women undergoing surgery for gynaecological malignancies.**
- **To identify the independent clinical and surgical predictors of postoperative complications among women undergoing surgery for gynaecological malignancies.**

Research Questions

1. **What are the frequency and types of postoperative complications among women undergoing surgery for gynaecological malignancies?**
2. **Is there a significant association between selected clinical characteristics and postoperative complications among women undergoing surgery for gynaecological malignancies?**
3. **Is there a significant association between selected surgical characteristics and postoperative complications among women undergoing surgery for gynaecological malignancies?**
4. **Which clinical and surgical characteristics independently predict postoperative complications among women undergoing surgery for gynaecological malignancies?**

Problem Statement

Gynaecological cancers cause significant morbidity and may require large and complex surgeries. Following major surgery, there may be a number of complications including wound infection, bleeding,

urinary and respiratory complications, thromboembolic events, and other medical and surgical complications. The likelihood of complications is dependent on a patient's clinical status, nature and extent of the disease, and the type of surgery and complexity of the procedure as well as the duration and volume of blood loss during the procedure. Prior studies have considered many of these factors. However, there is still a need to identify which factors are most associated with postoperative complications in the local healthcare environment (Abuye et al., 2025). This is particularly the case for women who undergo surgery for gynaecological cancers. Identifying high-risk patients is important to provide adequate planning and management. The primary objective of the study is to assess the clinical and surgical factors associated with postoperative complications in women who undergo surgery for gynaecological malignancies at tertiary care hospitals in Pakistan (Sehouli et al., 2021).

Significance of the Study

This study is significant because it may provide clinically relevant evidence about the factors associated with postoperative complications among women undergoing surgery for gynaecological malignancies. Identifying important clinical and surgical predictors can help surgeons, oncologists, anesthetists, and nursing staff recognize patients at higher risk and improve preoperative assessment, surgical planning, and postoperative monitoring. The findings may also support timely management of complications, reduce preventable postoperative morbidity, and contribute to safer surgical care. Furthermore, the study may provide useful evidence for tertiary-care hospitals in Pakistan to strengthen perioperative practices and guide future research on surgical outcomes among women with gynaecological malignancies.

Literature Review

Predictors of Complications in Gynaecological Oncology Surgery

Iyer et al. (2015) conducted the UK Gynaecological Oncology Surgical Outcomes and Complications study, a prospective, multicenter study of surgical outcomes from 10 gynaecological cancer centres. The study included 2,948 major surgical procedures and assessed post-operative complications using the Clavien-Dindo classification. The authors documented significant post-operative morbidity and highlighted that, in addition to wound complications and infections, the other post-operative morbidities remain the most prominent clinical findings in gynaecological oncology. They also noted that post-operative complications also increase the demand on the healthcare system and prolong the recovery process.

In the same study, Inci et al. (2020) further highlighted that various patient characteristics were related to post-operative morbidity. Univariable analysis showed age, comorbidity, diabetes, body mass index and ASA grade were related to post-operative morbidity; however, in the multivariable analysis, only comorbidity and diabetes remained related to post-operative morbidity. The authors noted that the presence of comorbidities and diabetes may also compromise the ability to tolerate major oncological surgery. Similar clinical predictors have been reported in other systematic reviews pertaining to surgery for endometrial cancer (Gaba et al., 2024).

The study also showed the importance of operative characteristics in the development of post-operative complications. Factors such as the duration of the operation, estimated blood loss and the approach used also affected post-operative morbidity. The authors showed that the duration of the surgery remained an independent predictor. This suggests that an operation may have challenges related to the surgical technique, post-operative complications, and clinical demand, in addition to patient factors. This is in agreement with the present study, which also explores both clinical and surgical factors related to patients undergoing surgery for gynaecological malignancies.

Patient and Surgical Factors in Ovarian Cancer Surgery

In their review, Rooth, (2013) researched factors related to postoperative morbidity for epithelial ovarian cancers and their associations with cytoreductive surgery. They analyzed 15 studies and 15,325 patients and showed that postoperative complications were significant and concerning in the field of oncology. The authors identified patient factors such as old age, poor performance status (PS), hypoalbuminemia, ascites, advanced stage of the disease, and more extensive surgical intervention as factors related to

increased postoperative morbidity. Surgical factors related to increased postoperative morbidity included peritonectomy, splenectomy and surgery involving the colon.

A major contribution of Nick et al. (2015) was identifying clinical factors that can be modified. Specifically, PS and albumin were shown to be clinical factors that can be modified and predicted postoperative complications. These findings demonstrate that additional factors outside of the typical assessment for ovarian cancer, such as the patient's nutritional and functional status, should be assessed. Findings in the study are corroborated with Habo et al. (2025) which assessed women undergoing hysterectomy for endometrial cancer, showing frailty, diabetes, and obesity as additional relevant factors in the study, in addition to ASA classification, the stage of cancer, and other clinical factors.

Günakan et al. (2020) also demonstrated the importance of the extent of surgical intervention in postoperative morbidity. More extensive surgical interventions (including peritonectomy, splenectomy, and colon surgery) showed an increase in post-operative complications. Other clinical and demographic factors in the study corroborate the authors' focus on surgical factors and the types of surgical interventions performed on the patient.

Risk Factors Following Hysterectomy for Endometrial Cancer

The study by Winn, (2019) systematically reviewed evidence on the postoperative complications of hysterectomy for the treatment of endometrial cancer. They included studies from major biomedical and multidisciplinary databases and assessed both preoperative and intraoperative risk factors. They reported that the stage of the cancer, diabetes, frailty, obesity, ASA classification, medications, and smoking were among the preoperative factors associated with postoperative complications. These findings highlight the need for a comprehensive evaluation of a patient to determine preoperative risk factors.

Additionally, Desai et al. (2019) reported that postoperative complications could not be attributed to a single clinical outcome. Across the studies reviewed, there were surgical site infections, urinary tract infections, wound disruption and dehiscence, respiratory complications, ileus, thrombophlebitis, lymphocele and other lymphatic complications, and wound fluid collection. Length of stay was also extended. As noted above, postoperative morbidity in gynecologic oncology can involve a number of organ systems and have varying clinical presentations. Along with other factors, Vetter et al. (2020) reported the length of hospital stay, operative time, and surgical blood loss as important perioperative factors. The authors also stated that the use of a risk assessment tool and individualized evaluation prior to surgery could help to minimize postoperative complications. The authors stated that postoperative complications are due to patient vulnerability combined with surgical burden and not due to a single predictor.

Risk Factors Following Staging Surgery for Endometrial Cancer

Matsuo et al. (2016) examined the risk factors for complications following surgery to stage endometrial cancer. The authors noted that surgical complications impact patient recovery and increase the demand and costs on the health care system. Because surgery involves many risks, complications, and variables, staging surgery can help evaluate how the elements of a surgical procedure contribute to postoperative outcomes.

More recently published studies on endometrial cancer note how the outcome of a surgery can be influenced by the characteristics of the patient and the characteristics of the procedure. Other studies and the evidence of Gasparri et al. (2019), indicate that such risks can be influenced by factors such as the patient's physiologic burden (e.g. age, obesity, diabetes, cardiopulmonary status, disease severity, surgical complexity, procedure duration, and volume).

Nwachukwu et al. (2021) indicate that from a clinical and surgical point of view, postoperative complications should be viewed together, and therefore the authors of the present paper believe the same can be said for preoperative evaluation. Instead of assessing the simple presence of complications, the authors of the present paper aim to evaluate which factors determine postoperative complications and which factors are independent predictors of postoperative complications. This approach is consistent with the aforementioned study of Iyer et al. (2015), who also performed multivariate analysis to identify which factors were independent predictors of complications.

Relationship Between Clinical and Surgical Predictors and Postoperative Complications

The reviewed evidence shows the factors relating to a patient's clinical condition and their surgery are inter-related in influencing postoperative outcome. Examples of patient factors that could lead to a reduced physiologic reserve and increase vulnerability to stress of surgery include; frailty, diabetes, advanced disease, co-morbidities, nutrition deficiencies and age. Long or complex surgery further increased the patient's stress. Patient factors associated with increased postoperative complications include advanced disease, high malignancy, low serum albumin, poorer performance status and long surgery.

Integrated assessment of risk factor for postoperative complications is further endorsed by recently published research. Kanda, (2020) showed that patient factors (diabetes, obesity, frailty, cancer stage and ASA score) and operative factors (blood loss, surgical duration and complexity, lymph node dissection) were related in explaining postoperative complications. Existing studies provide an adequate understanding of individual risk factors, but the impact of the factors may be dependent on the type of malignancy, healthcare setting and the surgery. There is inadequate understanding of the contribution of clinical and surgical factors jointly in predicting postoperative complications. This study addresses this gap by focusing on women with gynaecologic malignancies (Willingham et al., 2020).

Research Gap

Although some risk factors for postoperative complications in gynaecological oncology have been described, they tend to be specific to certain types of malignancy or to particular types of surgery (Goins et al., 2022). There are multiple reasons for the lack of concordance in the existing literature, including variations in patient populations, the diversity in surgical practices, the differences in healthcare systems, and variations in the circumstances under which the surgery was performed. In light of the above, the aim of the present study is to identify both clinical and surgical risk factors associated with the occurrence of postoperative complications for patients with gynaecological malignancies, including patient conditions, comorbidities, the characteristics of the malignancy, type and extent of surgery, duration of surgery and blood loss during surgery.

Methodology

Research Design

The study used a quantitative, prospective, clinical study design to examine clinical and surgical predictors of postoperative complications of women undergoing surgery for gynecological malignancies. The design was used to capture data before surgery, pertinent operative information and to identify postoperative complications.

Study Setting

The study was performed at selected tertiary care teaching hospitals in Pakistan providing surgical and gynecological oncology services. The participating centers were chosen to represent a varied clinical case mix and adequate access to women undergoing surgical treatment for gynecological malignancies.

Study Population

The study population was women of child bearing age undergoing surgical treatment for confirmed or clinically suspected gynecological malignancies. Women undergoing surgical treatment for malignancies of the cervix, uterus, ovary, vagina and vulva were included in the study.

Sample Size and Sampling Technique

A total of 381 women were included in the study. Participants were selected using the consecutive sampling technique. Women who were diagnosed to have gynecological malignancies and who underwent surgical treatment during the study period were approached for participation and data collection until the sample size was achieved.

Table 1: Distribution of Study Participants by Institution (N = 381)

Institution	Sample Size (n)	Percentage (%)
Nishtar Medical University	70	18.4
King Edward Medical University	65	17.1
Jinnah Postgraduate Medical Centre	65	17.1
Dow University of Health Sciences	65	17.1
Khyber Medical University	60	15.7
Bolan Medical College	56	14.7
Total	**381**	**100.0**

Inclusion Criteria
Women aged 18 years or older undergoing major surgery for a confirmed or clinically suspected gynaecological malignancy were included. Those providing informed consent and having available clinical and operative information were also included. Women needed to be available for post-operative assessment to capture and classify complications.

Exclusion Criteria
Women undergoing surgery for benign gynaecological conditions were excluded. Likewise, women undergoing surgery for non-gynaecologic conditions were also excluded. Women with substantially incomplete clinical or operative records, or who could not be assessed for post-operative outcomes, were also excluded from the study.

Data Collection Procedures
Data were collected in a prospective manner by means of a structured clinical research form. Information was obtained from patient interviews, clinical and operative examinations and reviews of medical records. Information captured included patient, disease and treatment factors. Assessments of complications and postoperative events were performed to capture the occurrence and type of complications.

Study Variables
The outcome variable was the occurrence of postoperative complications, and was based on clinical documents postoperative events. Wound infection, wound complications, postoperative bleeding, urinary and respiratory complications, thromboembolic complications and gastrointestinal complications were among the postoperative complications captured.

Measurement and Documentation of Clinical Outcomes
Standardized sections of the study data collection form were used to capture clinical and surgical information. Preoperative characteristics were recorded before surgery. Variables were recorded during surgery based on the operative records and postoperative complications were documented during the postoperative period. Each complication was documented based on the medical diagnosis recorded by the treating medical team.

Ethical Considerations
Prior to the commencement of data collection, ethical approval was obtained from the concerned institutional authorities. Written informed consent was obtained from all participants after a full explanation of the study and its procedures. Participants were free to withdraw at any stage. Information of participants was kept confidential. No personal identifiers were included in the dataset. Information collected was for research purposes only.

Results
In all, 381 women with gynaecological malignancies who underwent surgery were included in the study. Results were presented in the following format: demographic and clinical characteristics; characteristics of malignancy; characteristics of surgery; postoperative complications; and association between potential predictors and postoperative complications; and the independent predictors of postoperative complications determined by logistic regression analysis.

Demographic Characteristics of Study Participants
Table 2: Demographic Characteristics of Study Participants (N = 381)

Demographic Characteristic	Category	n	%
Age	40 years or younger	78	20.5
	41–50 years	112	29.4

Demographic Characteristic	Category	n	%
	51–60 years	119	31.2
	More than 60 years	72	18.9
Body Mass Index	Less than 18.5 kg/m²	31	8.1
	18.5–24.9 kg/m²	151	39.6
	25.0–29.9 kg/m²	129	33.9
	30 kg/m² or higher	70	18.4
Residence	Rural	205	53.8
	Urban	176	46.2

The average age of the participants was approximately 52 years, with the largest proportion in the 51–60-year age group. Most participants had a BMI in the normal or overweight range, while a smaller proportion was under- or overweight. More than half of the participants was from rural areas. Diabetes and hypertension were among other comorbidities present in a proportion of the study participants. Most women had good functional status prior to surgery. About a third of the women had reduced functional status prior to surgery.

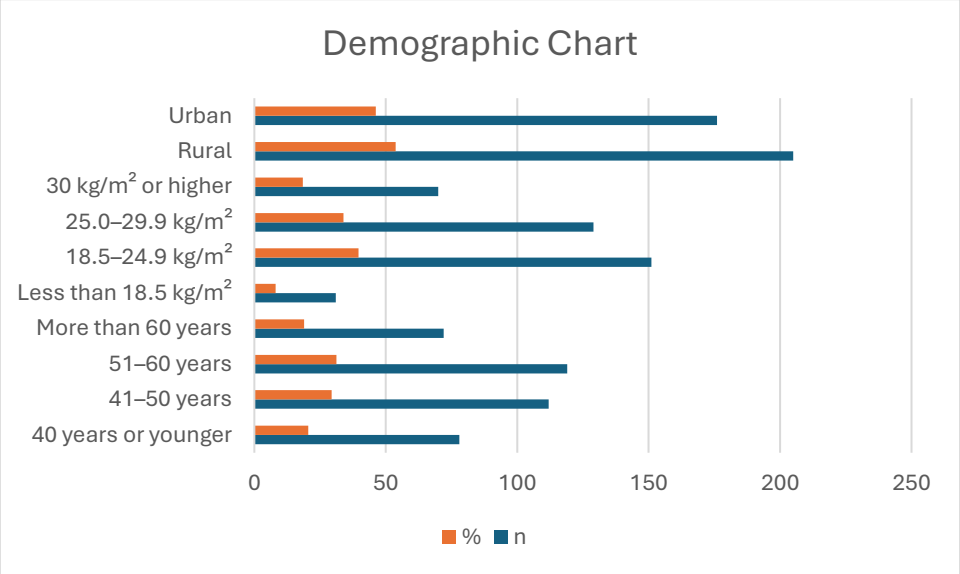


Fig 1: Demographic Characteristics of Study Participants (N = 381)

Table 3: Clinical Characteristics of Study Participants (N = 381)

Clinical Characteristic	Category	n	%
Diabetes Mellitus	Yes	82	21.5
	No	299	78.5
Hypertension	Yes	116	30.4
	No	265	69.6
Other Comorbidities	Yes	94	24.7
	No	287	75.3

Clinical Characteristic	Category	n	%
Preoperative Anaemia	Yes	137	36.0
	No	244	64.0
Functional Status	Good	268	70.3
	Reduced	113	29.7

Participants had diabetes, hypertension and other comorbidities. Preoperative anaemia was also present in a proportion of the participants. Most study participants had good functional status before the surgery, however, about one-third of study participants had reduced functional status before the surgery.

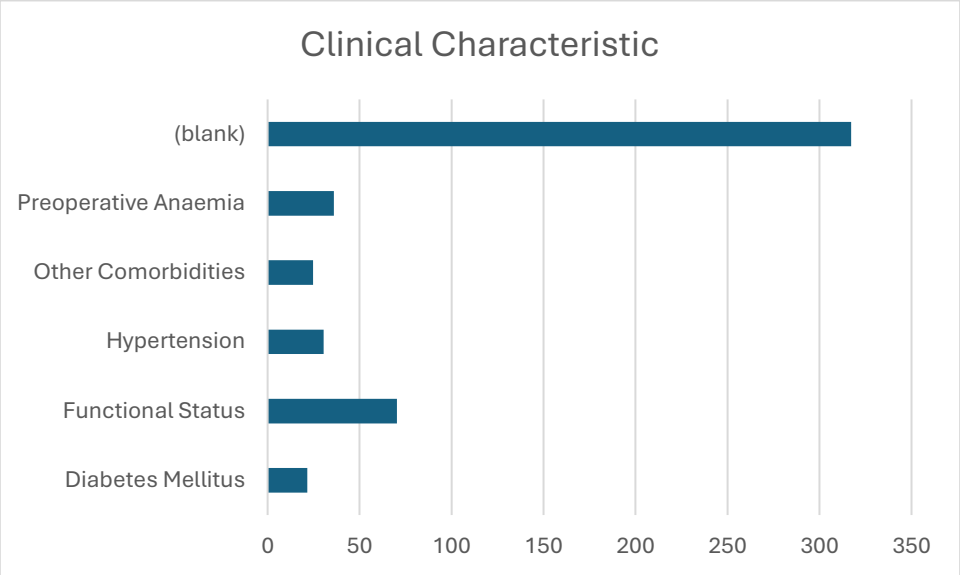


Fig 2: Clinical Characteristics of Study Participants (N = 381)

Table 4: Malignancy-Related Characteristics of Study Participants (N = 381)

Characteristic	Category	n	%
Type of Malignancy	Cervical	126	33.1
	Ovarian	108	28.3
	Endometrial/Uterine	113	29.7
	Other Gynaecological	34	8.9
Disease Stage	Early	173	45.4
	Locally Advanced	126	33.1
	Advanced	82	21.5

Cervical cancer was the most prevalent cancer, followed by endometrial/uterine and ovarian cancers. Nearly half of the study participants had their cancer classified as early stage. The rest had their cancers classified as locally advanced or more.

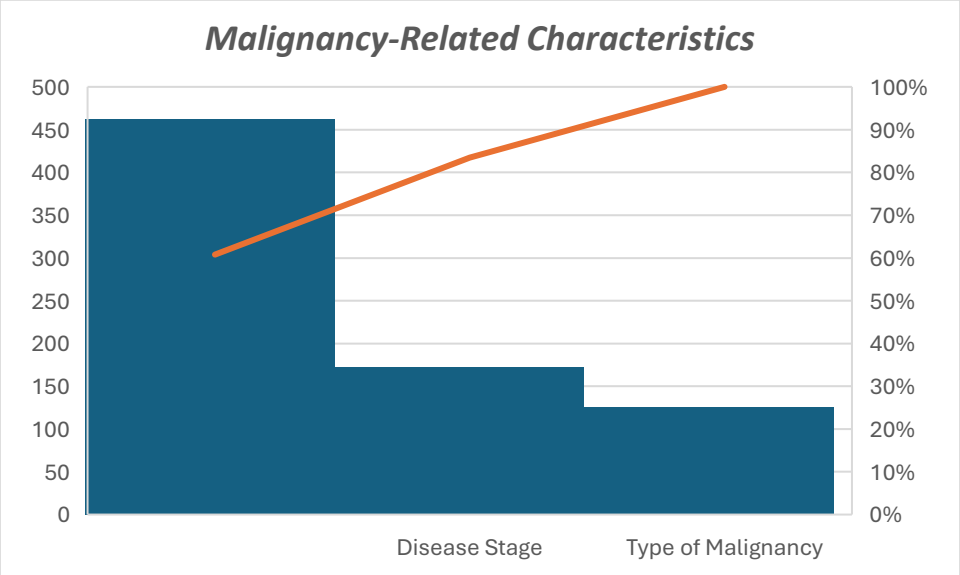


Fig 3: Malignancy-Related Characteristics of Study Participants (N = 381)

Table 5: Surgical Characteristics of Study Participants (N = 381)

Surgical Characteristic	Category	n	%
Surgical Procedure	Hysterectomy	138	36.2
	Ovarian/Cytoreductive Surgery	101	26.5
	Radical Surgery	89	23.4
	Other Oncological Procedures	53	13.9
Operative Duration	Three hours or less	145	38.1
	More than three hours	236	61.9
Intraoperative Blood Loss	500 mL or less	247	64.8
	More than 500 mL	134	35.2
Surgical Complexity	Moderate	211	55.4
	High	170	44.6

Nearly 62% of the participants had surgery lasting more than 3 hours. More than a third of the participants had blood loss of more than 500 mL during surgery. More than 44% of the procedures were considered surgically complex.

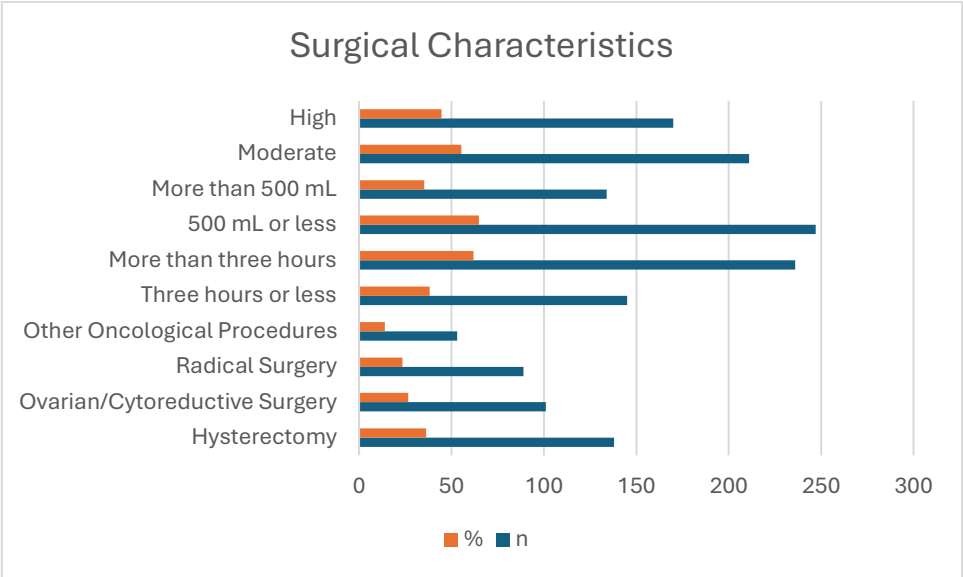


Fig 4: Surgical Characteristics

Table 6: Postoperative Complications among Study Participants (N = 381)

Postoperative Outcome	n	%
No complication	267	70.1
At least one complication	114	29.9
Surgical-site/wound infection	38	10.0
Postoperative bleeding	25	6.6
Urinary complications	21	5.5
Gastrointestinal complications	18	4.7
Respiratory complications	15	3.9
Thromboembolic complications	10	2.6

Post-operative complications occurred in 29.9% of the participants, and the remaining 70.1% had no complications. Surgical site or wound infection was the most common complication, followed by post-operative bleeding, urinary, gastrointestinal, and respiratory complications, and thromboembolic events.

Table 7: Association of Clinical Characteristics with Postoperative Complications (N = 381)

Clinical Characteristic	No Complication n (%)	Complication n (%)	χ^2	p
Age: More than 60 years	41 (15.4)	31 (27.2)	8.42	.004
Diabetes	47 (17.6)	35 (30.7)	8.64	.003
Hypertension	70 (26.2)	46 (40.4)	8.17	.004
Preoperative anaemia	82 (30.7)	55 (48.2)	11.10	.001
Reduced functional status	62 (23.2)	51 (44.7)	18.08	< .001

Clinical Characteristic	No Complication n (%)	Complication n (%)	χ^2	p
BMI: 30 kg/m² or higher	42 (15.7)	28 (24.6)	4.42	.036

Postoperative complications were significantly associated with older age, diabetes, hypertension, preoperative anemia, reduced functional status, and obesity. More postoperative complications were seen in women with these clinical characteristics.

Table 8: Association of Surgical Characteristics with Postoperative Complications (N = 381)

Surgical Characteristic	No Complication n (%)	Complication n (%)	χ^2	p
Operative duration: More than 3 hours	147 (55.1)	89 (78.1)	19.70	Less than .001
Blood loss: More than 500 mL	74 (27.7)	60 (52.6)	22.49	Less than .001
High surgical complexity	99 (37.1)	71 (62.3)	20.76	Less than .001
Radical surgery	53 (19.9)	36 (31.6)	6.88	.009
Additional surgical procedure	61 (22.8)	42 (36.8)	8.18	.004

Longer operating times, more blood loss during surgery, surgical complexity, radical surgery, and the performance of other surgeries were associated with postoperative complications. Complications were more frequent in women with these features.

Table 9: Binary Logistic Regression Analysis of Independent Predictors of Postoperative Complications (N = 381)

Predictor	Adjusted OR	95% CI	p
Age: More than 60 years	1.86	1.08–3.21	.026
Diabetes mellitus	1.91	1.10–3.32	.022
Preoperative anaemia	1.78	1.09–2.91	.021
Reduced functional status	2.31	1.40–3.81	.001
Advanced disease stage	2.08	1.20–3.61	.009
Operative duration: More than 3 hours	2.47	1.48–4.12	Less than .001
Blood loss: More than 500 mL	2.63	1.59–4.35	Less than .001
High surgical complexity	2.21	1.34–3.65	.002

Independent predictors of postoperative complications were older age, diabetes, preoperative anemia, reduced functional status, advanced disease, increased operative duration, increased intraoperative blood loss, and surgical complexity. Intraoperative blood loss and operative duration showed the strongest relation with postoperative morbidity.

Discussion

This study investigated clinical and surgical risk factors for complications in 381 women with gynaecological malignancy, and analyzed types of complications that occurred post-surgery. There were complications in 29.9% of the participants, and wound or surgical site infection (SSI) was the most

frequent complication observed. It is acknowledged that morbidity occurs following surgery for gynaecological cancers, and the findings show that vigilant assessment before, during and after surgery is essential. It is also shown that the nature of surgery performed for gynaecological cancers is complex, and patient factors also affect the risk of post-surgical complications (Giannini et al., 2020).

There were also significant clinical associations with post-operative complications. Older age, diabetes, hypertension, and preoperative anaemia, reduced functional status, and obesity were more common in patients who had complications. The frequencies of each of these variables were found to be directly associated with post-operative complications. Our results support the view that pre-existing health conditions, frailty and a reduced functional status limit the physiological reserve of the patient, and may negatively impact the ability to tolerate and recover from major surgery. Sevinyan et al. (2025) reported advanced age and poor performance status as important risk factors for postoperative morbidity. Silva et al. (2023) reported the clinical risk factors for frailty, obesity, diabetes and ASA classification as important risk factors for poor outcomes.

In the present study, there was also a significant association between preoperative anemia and the risk of postoperative complications. It has been demonstrated that anemia may reduce the physiological reserve of patients, and negatively impact tissue oxygenation, particularly when there is significant blood loss during the surgery. The findings further support the idea that the baseline, or preoperative, physiological status of patients plays an important role in determining the risk of postoperative complications. Whenever possible, clinically relevant modifiable risk factors for poor outcomes, should be addressed in order to improve outcomes for patients undergoing major surgery.

The study also analyzed relevant surgical characteristics and their association with postoperative complications. The results showed that women experiencing operations lasting more than three hours, or having blood loss of more than 500 mL, or undergoing very complex surgical procedures, had increased complication rates. This is in agreement with the findings of Chambers et al. (2023), where they identified the duration of surgery, blood loss and surgical complexity as key factors in postoperative complication rates. The results of Aquil et al. (2021) also support these findings, where increased surgical complexity, durations and blood loss of the operation were reported to increase postoperative morbidity of women having surgery for ovarian cancer.

The logistic regression also indicated that both clinical and surgical factors were independent contributors to postoperative morbidity. Longer operation time and blood loss and increased surgical complexity also had a direct impact on the postoperative morbidity. The results showed that increased morbidity was a consequence of the total burden of the disease and the surgical effort. This supports the findings of Kuroda et al. (2017), where they also support the importance of considering the total burden of the disease along with the surgical effort and the operation itself when assessing the risk for a patient in the postoperative period.

General Conclusion

Results indicate that postoperative complications are common for women who have surgery for gynaecological malignancies. Postoperative complications were related to a number of clinical factors including age, diabetes, preoperative anaemia, lower functional status and more advanced disease. Longer surgery time, more blood loss during surgery, and increased surgical complexity were related to increased postoperative complications. Risks related to surgical treatments of gynaecological malignancies emphasize the need for risk assessment of all patients prior to treatment. There is a need to identify ways to optimize clinical conditions, plan surgery, and improve intraoperative and postoperative management to better control morbidity and improve recovery. The study supports the need for a multidisciplinary team approach to provide the safest and highest level of care for women being treated for gynaecological malignancies.

Future Implications

Further investigation is required to identify potential clinical and surgical risk factors of postoperative complications in women having surgery for gynaecological malignancies in large multicenter studies with longer follow-up periods. Other aspects, for example nutritional status, anaesthetic risk, blood

transfusion, infection control and postoperative rehabilitation may also be usefully investigated. The results of these studies might enhance the development of risk assessment tools and standardized perioperative protocols to identify patients at high risk, to facilitate surgical planning and perioperative management to minimize preventable complications. Further research might evaluate outcomes for a range of gynaecological malignancies and surgical procedures.

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