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Original Research Article

Intraoperative complications in major gynecological surgeries: a prospective observational study

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ABSTRACT

Background: Major gynaecological surgery carries a risk of intraoperative events, including haemorrhage, injury to adjacent organs and anaesthesia-related complications, which may affect perioperative outcomes and recovery. This study aimed to describe the pattern of intraoperative complications in major gynaecological surgery and to examine the relationship between intraoperative blood loss and duration of hospital stay.
Methods: This prospective observational study included 120 women who underwent major gynaecological surgery at a tertiary care teaching hospital between April 2024 and March 2026. Demographic and clinical characteristics, surgical details, intraoperative complications, perioperative blood transfusion, estimated blood loss and duration of hospital stay were recorded. Pearson's correlation was used to assess the association between blood loss and hospital stay.
Results: Most women were aged 40-49 years (35.0%). Total abdominal hysterectomy was the most frequent procedure (40.0%), and 70.0% of operations were performed through an abdominal approach. Intraoperative complications occurred in 18 women (15.0%): haemorrhage (5.8%), anaesthesia-related complications (3.3%), bladder injury (2.5%), and ureteric and bowel injury (1.7% each). Blood transfusion was required in 28.3% of women during the perioperative period. Estimated blood loss correlated positively with hospital stay ($r = 0.397$, $p < 0.001$).
Conclusions: Intraoperative complications occurred in 15.0% of women, haemorrhage being the commonest. Greater blood loss was associated with a longer hospital stay, suggesting that meticulous haemostasis, careful surgical technique and preoperative optimization of modifiable risk factors merit attention. Larger multicentre studies are needed to confirm these findings.

Keywords: Major gynaecological surgery, Intraoperative complications, Haemorrhage, Visceral injury, Blood loss, Hospital stay

INTRODUCTION

Major gynaecological surgery is central to the management of a wide range of benign and malignant conditions of the female genital tract, including fibroids, abnormal uterine bleeding, endometriosis, pelvic organ prolapse and gynaecological malignancy. Hysterectomy is among the most frequently performed major non-obstetric gynaecological operations and may be undertaken by the abdominal, vaginal, laparoscopic or robotic route. Despite advances in minimally invasive techniques and perioperative care, these operations remain associated with intraoperative and postoperative complications.[1-3] Overall complication rates of approximately 20-30% have been reported in major gynaecological surgery.[4]

Intraoperative complications include haemorrhage, anaesthetic events and injury to adjacent organs, particularly the bladder, ureters and bowel. Urinary tract injury is estimated to occur in approximately 0.5-2% of major pelvic operations, and its risk depends on the

underlying pathology, distorted pelvic anatomy, surgical complexity and surgeon experience. Identifying patient- and procedure-related risk factors is therefore important for improving surgical outcomes.[1-3] Compared with open surgery, minimally invasive approaches are generally associated with less blood loss, less postoperative pain, a shorter hospital stay and fewer wound infections, although trocar-related and thermal injuries remain possible.[2] Advanced age, anaemia, obesity, diabetes, hypertension and previous pelvic surgery have been linked to a higher risk of complications.[5]

In India, hospital-based studies have reported overall complication rates of approximately 19-25%, but prospective data describing the pattern of complications in public tertiary care hospitals are limited.[6,7] This study was therefore undertaken to describe the pattern of intraoperative complications in major gynaecological surgery and to examine the relationship between intraoperative blood loss and duration of hospital stay.

METHODS

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology of a tertiary care teaching hospital over two years, from April 2024 to March 2026, after approval by the institutional ethics committee. Written informed consent was obtained from all participants. Women undergoing elective or emergency major gynaecological surgery during the study period were enrolled by consecutive sampling, and 120 women were included. Minor procedures such as diagnostic hysteroscopy, dilatation and curettage, cervical biopsy and polypectomy were excluded, as were combined procedures involving other surgical specialties, women who declined to participate, and those with incomplete perioperative records.

All eligible women underwent preoperative assessment, including a detailed history and clinical examination. Age, residence and socioeconomic status were recorded, together with body mass index (BMI), parity, menopausal status, comorbidities (including diabetes mellitus and hypertension), previous surgical history and the indication for surgery. Results of routine preoperative investigations were extracted from medical records: complete blood count and haemoglobin, blood group and Rh type, blood glucose, renal function tests, urine routine and microscopy, and screening for human immunodeficiency virus (HIV), hepatitis B surface antigen (HBsAg) and venereal disease research laboratory (VDRL). Bleeding time, clotting time and liver function tests were recorded where clinically indicated. Operative data comprised the type of surgery, surgical approach (abdominal, vaginal or laparoscopic), duration of surgery, estimated blood loss and requirement for perioperative blood transfusion. Intraoperative complications (haemorrhage, bladder, ureteric, bowel and vascular injury, and anaesthesia-related complications) were identified from operative and anaesthesia records. The duration of hospital stay was recorded for each woman.

Statistical methods

Data were entered into Microsoft Excel and analysed using the statistical package for the social sciences (SPSS) version 26.0. Categorical variables are presented as frequencies and percentages, and continuous variables as mean±standard deviation. The association between estimated blood loss and duration of hospital stay was assessed using Pearson's correlation coefficient. A p value <0.05 was considered statistically significant.

RESULTS

Most participants were aged 40-49 years (35.0%) and belonged to the middle socioeconomic class (36.7%). Most had a normal BMI (55.8%). Anaemia was the commonest comorbidity (45.8%), followed by hypertension (26.7%), previous surgery (25.0%), diabetes mellitus (23.3%) and thyroid disorders (15.0%) (Table 1).

Table 1: Distribution of study participants according to sociodemographic data and comorbidities.

Socio-demographic data	Category	Frequency	Percentage (%)
Age group (years)	30-39	31	25.8
	40-49	42	35.0
	50-59	30	25.0
	60-69	17	14.2
Socioeconomic status	Low	34	28.3
	Middle	44	36.7
	High	42	35.0
BMI category (kg/m²)	Normal (18.5-24.9)	67	55.8
	Overweight (25-29.9)	24	20.0
	Obese (≥30)	15	12.5
	Underweight (<18.5)	14	11.7
Comorbidities	Anaemia	55	45.8
	Hypertension	32	26.7
	Previous surgery history	30	25.0
	Diabetes mellitus	28	23.3
	Hypo/ hyperthyroidism	18	15.0

Total abdominal hysterectomy was the commonest procedure (40.0%), followed by vaginal hysterectomy (16.7%) and laparoscopic hysterectomy (13.3%). The leading indications for surgery were ovarian cyst (23.3%), abnormal uterine bleeding (20.8%) and fibroid uterus (19.2%). An abdominal approach was used in 70.0% of

operations, followed by vaginal (16.7%) and laparoscopic (13.3%) approaches (Table 2).

Table 2: Surgical details of the study participants.

Surgical details	Category	Frequency	Percentage (%)
Type of surgery	Total abdominal hysterectomy	48	40.0
	Vaginal hysterectomy	20	16.7
	Laparoscopic hysterectomy	16	13.3
	Myomectomy	14	11.7
	Salpingo-oophorectomy	12	10.0
	Tubectomy	10	8.3
Indication for surgery	Ovarian cyst	28	23.3
	Abnormal uterine bleeding	25	20.8
	Fibroid uterus	23	19.2
	Endometriosis	17	14.2
	Pelvic organ prolapse	17	14.2
	Tubectomy (family planning)	10	8.3
Surgical approach	Abdominal	84	70.0
	Vaginal	20	16.7
	Laparoscopic	16	13.3

Intraoperative complications occurred in 18 women (15.0%). Haemorrhage was the commonest, affecting 7 women (5.8%), followed by anaesthesia-related complications in 4 (3.3%), bladder injury in 3 (2.5%), and ureteric and bowel injury in 2 each (1.7%) (Figure 1).

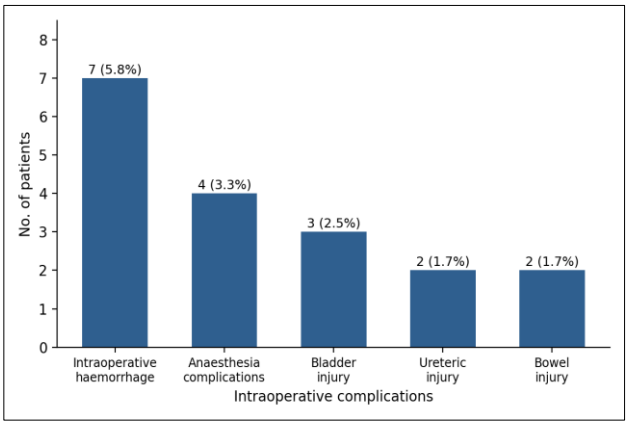


Figure 1: Intraoperative complications.

Of the 120 women, 34 (28.3%) required blood transfusion during the perioperative period, whereas 86 (71.7%) did not. Just over half (52.5%) were hospitalized for 5 days or fewer, 42.5% stayed for 6-10 days, and 5.0% stayed for more than 10 days.

Estimated intraoperative blood loss showed a weak-to-moderate positive correlation with the duration of hospital stay ($r = 0.397$, $p<0.001$); that is, greater blood loss was associated with longer hospitalization (Figure 2).

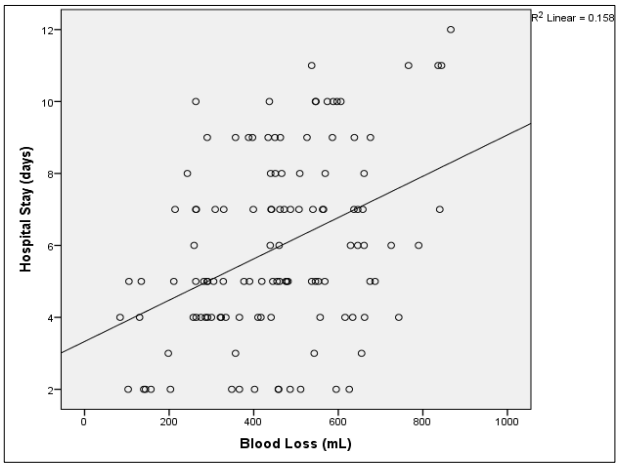


Figure 2: Correlation between intraoperative blood loss and hospital stay.

DISCUSSION

Most women in this series were aged 40-49 years (35.0%), and 60.0% were aged 40-59 years, which suggests that the need for major gynaecological surgery is greatest in the perimenopausal and early postmenopausal years. A similar age distribution has been reported by Mäkinen et al and Pandey et al.[8,9] The predominance of women from the middle socioeconomic class (36.7%) is in keeping with the findings of Sharma et al and Gupta et al.[10,11] More than half of the women had a normal BMI (55.8%), and 32.5% were overweight or obese, which is similar to the observations of Uccella et al and Siedhoff et al.[12,13] Anaemia was the commonest comorbidity (45.8%), followed by hypertension, previous surgery, diabetes mellitus and thyroid disorders, a pattern comparable with that reported by Gupta et al.[11]

Total abdominal hysterectomy (TAH) was the commonest procedure (40.0%), followed by vaginal (16.7%) and laparoscopic (13.3%) hysterectomy, and the abdominal route was used in 70.0% of all operations.

The predominance of the abdominal route may reflect case complexity, large uterine size, previous surgery, adhesions, associated pelvic pathology and institutional resources, similar to the findings of Mäkinen et al and Pickett et al.[2,8] Ovarian cyst (23.3%), abnormal uterine bleeding (20.8%) and fibroid uterus (19.2%) were the leading indications and together accounted for more than 60% of operations. The comparatively low use of laparoscopy may be related to case complexity, availability of equipment, workload and surgeon expertise. The distribution of surgical approaches was comparable with that reported by Pickett et al, Mäkinen et al and Tunitsky-Bitton et al.[2,8,14]

Intraoperative complications occurred in 15.0% of women in this study, with haemorrhage the most frequent (5.8%), followed by anaesthesia-related complications (3.3%), bladder injury (2.5%), and ureteric and bowel injury (1.7% each). These findings are comparable with those of Härkki-Sirén et al and Mäkinen et al, and support the pattern of intraoperative morbidity described in major gynaecological surgery.[3,8]

Perioperative blood transfusion was required in 28.3% of women. This may be related to the high prevalence of preoperative anaemia (45.8%) and the blood loss inherent in major gynaecological surgery; the association between preoperative anaemia and adverse perioperative outcomes, including transfusion, has been described by Muñoz et al, Musallam et al and Shander et al.[15-17] Just over half of the women (52.5%) were discharged within 5 days, 42.5% stayed for 6-10 days and 5.0% stayed for more than 10 days, a distribution broadly comparable with that reported by Pickett et al and Uccella et al.[2,12]

Estimated intraoperative blood loss showed a weak-to-moderate positive correlation with the duration of hospital stay ($r = 0.397$, $p<0.001$); that is, greater blood loss was associated with longer hospitalization. This is consistent with Mäkinen et al and Uccella et al, who reported that greater operative blood loss was associated with delayed recovery and a longer stay.[8,12] Because this is an unadjusted association in an observational study, it does not establish that blood loss causes a prolonged stay; nevertheless, it suggests that effective haemostasis, careful surgical technique and preoperative haemoglobin optimization may help to reduce morbidity and facilitate earlier recovery.

This study has several limitations. It was conducted at a single centre with a relatively small sample, which limits generalizability and the ability to detect uncommon complications such as ureteric and bowel injury. The heterogeneity of the procedures performed, and unmeasured factors such as surgeon experience, nutritional status and perioperative practices, may have influenced the findings. Risk factors for intraoperative complications were not analysed, and the correlation between blood loss and hospital stay was not adjusted for confounders such as the type of procedure or surgical approach. Finally, the observational design precludes causal inference.

CONCLUSION

In this prospective study of 120 women, intraoperative complications occurred in 15.0% of major gynaecological operations; haemorrhage was the commonest, followed by anaesthesia-related complications and bladder, ureteric and bowel injury. Greater intraoperative blood loss was associated with a longer hospital stay. These findings suggest that meticulous haemostasis, careful surgical technique and preoperative optimization of modifiable risk factors, particularly anaemia, merit attention in order to reduce intraoperative morbidity and promote recovery. Larger multicentre studies that also analyse risk factors are needed to confirm these observations.

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