Profile of surgical complications in gynaecology at a teaching hospital in South Africa

T Gallant, MMed (O&G), FCOG (SA); **F H van der Merwe,** MMed (O&G), FCOG(SA)

Department of Obstetrics and Gynaecology, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa

Corresponding author: *T Gallant (tasneem.gallant@gmail.com)*

Background. Information about current gynaecological surgical practices and patient outcomes is integral to the provision of quality gynaecological care. An audit of surgical complications can provide important information needed for an assessment of current surgical practices and outcomes.
Objective. To describe the cohort of patients undergoing gynaecological surgical procedures at Tygerberg Hospital, their complication rates and identify associated risk factors.
Methods. We conducted a retrospective review of adult patients having emergency and elective gynaecological surgical procedures between 1 January and 31 December 2019. A total of 970 patients were included. We summarised categorical data as counts and percentages. We performed logistical regressions to assess factors associated with complications. Odds ratios (ORs) were reported as measures of association with the corresponding 95% confidence interval (CI). Statistical significance was set at a *p*-value <0.1 and *p*-value <0.05 in the bivariate and multivariate analysis, respectively.
Results. Overweight and obese patients accounted for 60% of patients. The most common indication for surgical intervention was benign gynaecological conditions (23.3%). Total abdominal hysterectomy was the single most common procedure performed (23.7%). Intraoperative or postoperative complications occurred in 12.7% of patients, while 1.2% sustained both intraoperative and postoperative complications. The most common complications were infection-related (7.5%) and bowel injury (1.8%). Oncological surgery did not increase the likelihood of complications compared with non-oncological surgery (OR 1.14; 95% CI 0.66 - 1.97; *p*=0.63).
Conclusion. The provision of quality gynaecological care requires information on gynaecological surgical practices and patient outcomes. The rates of surgical complications at our facility appear to be higher than local and international studies, with our main contributors being infection-related complications and bowel injuries. An extended course of prophylactic antibiotics could be considered, as well as auditing infection control measures. Patients who are at a higher risk of bowel injury should be identified preoperatively and the surgery approached with care.

Keywords. gynaecological surgery, complications, hysterectomy, infection.

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Information about current gynaecological surgical practices and patient outcomes is integral to the provision of quality gynaecological care. An audit of surgical complications can provide important information needed for an assessment of current surgical practices and outcomes.[1] This information can be utilised for surgical skill development, the provision of information to patients and, ultimately, to improve healthcare. Surgical complications have been shown to increase the cost burden on a health system and decrease the quality of life of patients.[2] Previous studies on surgical outcomes have focused on the outcomes of all surgical domains[2-4] or specific procedures and outcomes.

The reported complication rate of gynaecological surgery ranges between 7 and 10%.[2,4] The identification of risk factors associated with complications could assist with increased perioperative surveillance of high-risk patients and facilitate in the prevention and/or early detection of complications. In addition to the aforementioned factors, the provision of appropriate perioperative care aims to decrease the morbidity associated with surgical complications. There are limited data for South African hospitals. In the present study, we aimed to describe a cohort of patients having gynaecological surgical procedures, their complications and identify potential risk factors.

Methods

Study design

We conducted a retrospective audit of all women, 18 years and older, who underwent emergency or elective gynaecological surgical procedures at Tygerberg Hospital (TBH), Western Cape, South Africa between 01 January 2019 and 31 December 2019.

Study setting

TBH is a teaching hospital in the Western Cape Province of South Africa and is affiliated to Stellenbosch University. It serves the Eastern sub-district of the Cape Metropole and serves a heterogeneous population of low- to middle-income status. TBH receives referrals from level one and two healthcare facilities, reaching as far as George, Paarl and Worcester. Medical practitioners employed in the Gynaecology Department include interns, medical officers, registrars, and registered specialists. The service is run on a 24-hour basis, which includes access to theatre and intensive care units (ICUs). The service includes elective and emergency surgery in general gynaecology and subspecialties such as reproductive medicine, gynaecological oncology and urogynaecology.

Study population

We included female patients, 18 years or older, who presented to TBH for elective or emergency gynaecological surgery during the stipulated period. To be included, the patient must have had an anaesthetic administered by an anaesthetist and be admitted for at least one night. We excluded all outpatient surgical procedures and primary obstetric procedures. Obstetric patients requiring gynaecological surgical intervention more than 7 days after delivery were included.

Data collection

All theatre registers were reviewed to identify patients to be included. The folder numbers and patient names were used to obtain the patient records from the Electronic Content Management database (ECM) at TBH. These records were reviewed for study eligibility and study numbers were allocated to eligible to ensure their anonymity. The desired demographic and clinical data, and details regarding the surgery, hospital stay, as well as any readmission owing to a complication within 6 weeks of the surgery, were extracted into a pre-designed data dictionary on RedCap.

Data analysis

Statistical analysis was performed using Stata (version 17) (STATA Corp., USA). Numerical data were summarised as means with standard deviations (SDs). We summarised categorical data as counts and percentages. We performed bivariate and multivariate logistical regression to assess clinical and surgical factors associated with complications. We reported odds ratios (ORs) as a measure of association with the corresponding 95% confidence interval. *P*-values <0.1 and <0.05 were considered statistically significant in the bivariate and multivariate analyses, respectively.

Ethics

Ethics approval was obtained from the Human Research Ethics Committee of the Faculty of Medicine and Health Sciences at Stellenbosch University (ref. no. S19/10/264). We also obtained approval from the TBH management to conduct the study at the hospital. The study is registered with The National Health Research Database. We were granted a waiver for informed consent.

Results

A total of 1 068 patients were identified between 1 January 2019 and 31 December 2019. A total of and 970 (*N*=970) met the inclusion criteria. The mean (SD) age of the cohort was 41 (14.87) years (range 18 - 83).

Table 1 summarises the clinical and surgical characteristics of the cohort. A large percentage of patients were either overweight (*n*=172; 17.7%) or morbidly obese (*n*=414; 42.7%). Most patients were non-smokers (*n*=698; 72%). A total of 302 patients had one comorbidity (31.1%). The most common group of comorbidities was cardiovascular disease, of which hypertension was the most common (*n*=303; 31%2). This was followed by retroviral disease (*n*=145; 14.9%) and endocrine disorders, specifically diabetes mellitus (*n*=103; 10.6%). About a fifth of patients had more than one comorbidity (*n*=224; 23.1%).

Approximately a fifth of patients required surgical intervention for early pregnancy complications (*n*=215; 22.5%), with half of this group having ectopic pregnancies (11.3%). A similar proportion of patients had surgery for benign gynaecological conditions (*n*=226; 23.3%), the most common being leiomyomas (*n*=83; 8.6%). One hundred and eighty-six patients had surgery for gynaecological malignancies and the most common malignancies included endometrial cancer (*n*=52; 5.4%), ovarian cancer (*n*=46; 4.7%) and cervical cancer (*n*=45; 4.6%) Other indications for surgery included sepsis-related conditions (*n*=70; 7.2%), infertility (*n*=65; 6.7%) and pelvic organ prolapse (*n*=57; 5.9%).

Almost half of the patients had previous abdominal surgery (*n*=411; 45.5%). About two-thirds of the patients were classified as American Society of Anaesthesiologist (ASA) 2 (*n*=624; 64.3%).

Table 1. Clinical and surgical characteristics of patients undergoing gynaecological surgery (*N*=970)

Variable	*n* (%)
BMI, kg/m^2	
<18	26 (2.7)
18 - 25	322 (33.2)
26 - 30	172 (17.7)
>30	414 (42.7)
No BMI recorded	36 (3.7)
Smoking	
Yes	248 (25.6)
No	698 (72)
Smoking status unknown	24 (2.4)
Comorbidities	
HIV	145 (14.9)
Cardiovascular disease	358 (36.9)
Pulmonary conditions	75 (7.7)
Thromboembolic disease	12 (1.2)
Endocrine disorders	126 (12.9)
Other comorbidities	132 (13.6)
>1 comorbidity	224 (23.1)
Previous abdominal surgery	
Yes	411 (45.5)
No	551 (56.8)
Unknown	8 (0.8)
ASA	
1	210 (21.6)
2	624 (64.3)
3	105 (10.8)
4	2 (0.2)
No ASA status	29 (3.0)
Urgency of surgery	
Elective	677 (69.8)
Emergency	293 (30.2)
Duration of surgery	
<30 min	139 (14.3)
30 min - 2 hours	507 (52.3)
>2 hours	307 (31.6)
No duration noted	17 (1.8)
Surgical approach	
Open	703 (72.4)
Laparoscopic	264 (27.2)
Laparoscopic-assisted	3 (0.3)
Primary surgeon	
Specialist	565 (58.2)
Registrar	388 (40)
Intern	2 (0.2)
Primary surgeon not noted	15 (1.5)
Estimated blood loss, mL	
<500	814 (83.9)
500 - 1 000	89 (9.2)
>1 000	49 (5.0)
No recorded estimate	18 (1.9)

ASA = American Society of Anaesthesiology; BMI = body mass index.

A total of 677 patients (69.8%) had elective surgery. Open surgery was the most common surgical approach (*n*=703; 72.4%) and the primary surgeon was a specialist in more than half of the cases (58.2%). Total abdominal hysterectomies accounted for 230 (23.7%) of all surgical procedures performed. This was closely followed by salpingectomies or salpingostomies (*n*=141; 14.5%) for either ectopic pregnancies or fertility purposes. A total of 138 (14.2%) patients had an estimated blood loss of more than 500 mL.

During the study period, 123 (12.7%) surgical procedures were complicated by either intraoperative or postoperative complications and a further 12 patients (1.2%) had both intraoperative and postoperative complications (Table 2). Bowel injuries were the most common intraoperative complications and occurred in 17 surgical procedures (1.8%). Three patients sustained multiple intraoperative complications – two of which sustained both bowel and urinary tract injuries and one sustained a bladder injury and uterine perforation. Infective complications were the most common postoperative complications, occurring in 73 patients (7.5%). This was closely followed by medical complications (*n*=13; 1.3%) and postoperative haemorrhage (*n*=10; 1.0%). Eleven patients (1.1%) sustained multiple postoperative complications. Two (0.2%) patients demised postoperatively.

To assess the association between certain clinical and surgical characteristics and complications, a bivariate and multivariate analysis was conducted. The bivariate analysis as described in Table 3 showed that having more than one comorbidity, smoking, morbid obesity, previous abdominal surgery and an ASA classification of 2 or more had a higher likelihood of complications. However, after a multivariate analysis, only an ASA classification of 3 or more and previous abdominal surgery was associated with a higher likelihood of complications.

Laparoscopic surgery was associated with fewer complications compared with open surgery (OR 0.39; CI 0.22-0.72; *p*=0.002). Surgery performed by registrars as the primary surgeon, compared with specialists, were less likely to have complications (OR 0.43; 95% CI 0.21 - 0.89; *p*=0.02). Women having emergency surgery were less likely to experience complications compared with elective surgery (OR 0.16; 95% CI 0.08 - 0.33; *p*<0.001). Oncological surgery did not increase the likelihood of complications compared with non-oncological surgery (OR 1.14; 95% CI 0.66 - 1.97; *p*=0.63). Intraoperative blood loss of more than 500 mL was associated with more complications.

The relationship between two well-known risk factors for septic complications were analysed. RVD-reactive patients had a two-fold increase in septic complications (OR 2.26; 95% CI 1.23 - 4.12; *p*=0.008). Patients with diabetes mellitus also had a higher likelihood of septic complications but this was not statistically significant (OR 1.56; CI 0.75 - 3.28; *p*=0.24).

The association between an elevated BMI and wound complications were also analysed. An elevated BMI was associated with a 60% less likelihood of wound dehiscence (OR 0.47; 95% CI 0.13 - 1.77; *p*=0.265) and a 2-fold increase in superficial wound sepsis (OR 1.89; CI 0.84 - 4.25; *p*=0.121). However, both findings were not statistically significant.

Discussion

Surgical complications are known to increase the health burden in terms of cost and quality of life.[2] The aim of the present study was to describe the cohort of patients, their complication rates and the associations between various characteristics and complications in patients having gynaecological surgery at TBH.

Internationally, the surgical complication rate across all surgical disciplines was reported to be as high as 20%.[2] The International Surgical Outcome Study (ISOS) reported that gynaecological surgery had a complication rate of 9.8%, with no difference between high- and middle- or low-income countries. Low- and middle-income countries had a higher mortality rate (3.3%) compared with high-income countries (2.3%).[2] This finding was supported by the African Surgical Outcome Study (ASOS), where it was found that gynaecological surgery in African countries had a complication rate of about 8% and a mortality rate of 2.1%.[3] Our study found a complication rate of 13.9%, which is significantly higher than the international figures. In our study, infective complications were the most common contributors to the overall complication rate, and this was consistent with ISOS and ASOS findings. Interestingly,

Table 2. Intraoperative and postoperative complications(*n*=177)

Complications	Number of occurrences (%)
Intraoperative complications	
Urinary tract injury	12 (1.2)
Bladder	7 (0.7)
Ureteric	3 (0.3)
Urethral	2 (0.3)
Bowel injury	17 (1.8)
Uterine perforation	3 (0.3)
Medical conditions	1 (0.1)
Acute coronary syndrome	1 (0.1)
Multiple intraoperative complications	3 (0.3)
Postoperative complications	
Infectious complications	73 (7.5)
Blood stream infection	3 (0.3)
Deep surgical site sepsis	21 (2.2)
Superficial wound sepsis	37 (3.8)
Urinary tract infections	12 (1.2)
Haemorrhage	10 (1.0)
Acute postoperative bleed	5 (0.5)
Wound haematoma	2 (0.2)
Vault haematoma	3 (0.3)
Medical conditions	13 (1.3)
Pneumonia	5 (0.5)
MINS	1 (0.1)
Acute urinary retention	2 (0.2)
Symptomatic anaemia	1 (0.1)
Lateral cutaneous nerve of thigh injury	1 (0.1)
Acute kidney injury	2 (0.2)
Pulmonary oedema	1 (0.1)
Wound dehiscence	6 (0.6)
Bowel-related	7 (0.7)
Ileus	5 (0.5)
Bowel obstruction	2 (0.2)
Vesicovaginal fistula	2 (0.2)
Thromboembolic events	6 (0.6)
Pulmonary emboli	6 (0.6)
Multiple postoperative complications	12 (1.2)
Intraoperative and postoperative complications	12 (1.2)

MINS = myocardial injury after non-cardiac surgery.

our study found a significantly lower mortality rate of 0.2%. It was, however, difficult to compare our numbers with their finding, as the definitions (of complications) as well as study designs differed. ISOS, for example, only analysed elective surgery in high-, middle- and low-income countries. The inclusion criteria for ASOS were similar to those employed in our study. Nonetheless, a complication rate that is significantly higher than international standards is of clinical significance and should prompt further evaluation.

Intraoperatively, 14% of patients had an estimated blood loss of more than 500 mL and this was associated with a 2-fold increase in complications. It is known that blood loss >400 mL at hysterectomies for benign conditions is associated with prolonged hospital stay, increased associated complications and higher re-operation rates.[5] Despite the common use of blood products, blood transfusions are expensive and may be associated with their own set of complications.[6,7] Estimated blood loss is subjective and not easily standardised. To decrease the morbidity associated with significant blood loss and/or blood transfusions, it would be important to optimise preoperative haemoglobin levels and use surgical approaches to minimise blood loss.

Visceral injuries were the most common intraoperative complications. The rate of urinary tract injuries in our study was similar to previous studies, however, we had more bowel injuries in the present study – 1.8% of our patients sustained a bowel injury, which was almost three times higher than the rate reported in the literature, i.e. 0.3 - 0.5%.[8] Bowel injury, particularly when the diagnosis is delayed, is associated with significant postoperative morbidity and a mortality rate of 3.4%.[8] The majority of bowel injuries are to small bowel (75%) with well-known risk factors including previous abdominal surgery, pelvic infection and extensive adhesions.[8] Almost half of our study population had previous abdominal surgery and we found a 50% higher likelihood of complications in this group. However, we did not investigate the correlation between previous abdominal surgery and bowel injury alone, nor did we differentiate between large and small bowel injury. Prevention of visceral injury may not always be possible, but the recognition of risk factors should prompt a surgical approach with increased care to mitigate this risk. Additionally, these patients should have increased perioperative surveillance to identify delayed manifestations of such injuries – this would decrease the delay in diagnosis and its associated morbidity and mortality.

Infective complications were the most common and almost 80% occurred due to surgical site infection. Two known risk factors were explored, namely co-existing retroviral disease and diabetes mellitus, both of which are immunosuppressive conditions associated with sepsis.[9,10] RVD-reactive patients, particularly those with lower CD4 counts, tend to have higher rates of surgical-site sepsis.[9] Interestingly, the proportion of RVD-reactive individuals was higher in our study than ASOS (14.9% v. 11%). The relationship between infective complications and retroviral disease was not explored by the authors of ASOS but our study found that individuals with retroviral disease were more likely to have infective complications. An increase of about 50% in infective complications in those with diabetes mellitus, despite not being statistically significant, implies that both diabetes and retroviral disease should be regarded as risk factors requiring ongoing surveillance for infective complications.

Thromboembolic events are a leading cause of death in the developed world.[11] A systematic review in 2011 by Rahn *et al.*[12] found that up to 2% of surgical procedures for benign gynaecological procedures were complicated by venous thromboembolism. Other risk factors like surgery for gynaecological malignancy and being elderly significantly increased the rate of venous thromboembolism.[12] Our study found that 0.6% of patients had thromboembolic events following gynaecological surgical procedures. This is consistent with the findings by Rahn *et al.*,[12] but our study did not investigate the association between age or gynaecological malignancy and thromboembolic events.

Table 3. Association between clinical and surgical characteristics and complications

Risk factors	Crude OR	*p*-value	95% CI	aOR	*p*-value	95% CI
>1 comorbidity	2.37	<0.001	1.59 - 3.54	1.30	0.287	0.80 - 2.12
Smoking	1.47	0.07	0.97 - 2.22	1.09	0.72	0.69 - 1.70
BMI, kg/m^2						
<18	0.91	0.02	0.57 - 1.39	1.32	0.06	0.96 - 6.96
26 - 30	1.03	0.93	0.59 - 1.77	1.58	0.07	0.97 - 2.57
>30	2.95	0.02	1.21 - 7.22	2.58	0.06	0.74 - 2.34
Previous abdominal surgery	1.48	0.04	1.01 - 2.17	1.59	0.03	1.04 - 2.43
ASA						
2	1.94	0.03	1.07 - 3.50	1.49	0.21	0.79 - 2.80
3	5.43	<0.001	2.73 - 10.79	2.88	0.01	1.27 - 6.50
Laparoscopic surgery	0.18	<0.001	0.14 - 0.22	0.39	0.002	0.22 - 0.72
Primary surgeon						
Specialist	0.53	0.04	0.29 - 0.96	0.71	0.34	0.36 - 1.43
Registrar	0.37	<0.001	0.21 - 0.65	0.43	0.02	0.21 - 0.89
Urgency of surgery						
Elective	0.57	0.02	0.36 - 0.91	0.78	0.46	0.41 - 1.51
Emergency	0.16	<0.001	0.13 - 0.20	0.16	<0.001	0.08 - 0.33
Oncological surgery	2.77	<0.001	1.83 - 4.17	1.14	0.63	0.66 - 1.97
Estimated blood loss, mL						
500 - 1 000	2.65	<0.001	1.55 - 4.54	2.09	0.01	1.16 - 3.76
>1 000	3.10	0.01	1.58 - 6.06	2.18	0.04	1.04 - 4.56

ASA = American Association of Anaesthesiology; BMI = body mass index; CI = confidence interval; OR = odds ratio.

Two patients demised postoperatively. The first patient had complicated oncological surgery for ovarian cancer with severe intraoperative haemorrhage and a massive blood transfusion. She was admitted to ICU postoperatively, subsequently deteriorated and had a relook laparotomy for possible ongoing haemorrhage, which was excluded. She improved postoperatively but had a sudden cardiac arrest after extubation, with an unsuccessful resuscitation effort. The second patient was morbidly obese with diabetes mellitus and asthma. She developed a pulmonary embolism and puerperal sepsis following a caesarean section. She required a laparotomy secondary to intra-abdominal sepsis. At laparotomy, multiple bowel injuries and four-quadrant sepsis was diagnosed and a hysterectomy and bowel resection were done. She deteriorated postoperatively, with worsening multiorgan dysfunction, and demised in ICU.

Interestingly, morbid obesity, once adjusted for other factors, increased the risk of complications by close to 50%, however, this finding was not statistically significant. An American study[13] reported that an increased BMI was associated with certain complications like wound dehiscence and wound sepsis but had minimal association with other complications like thromboembolism. This finding was consistent with a local study in 2012 where the outcomes of hysterectomies for benign conditions at a public facility was investigated. This study demonstrated a 5-fold increase in wound sepsis in women with an increased BMI.[14] Despite a non-statistically significant association between elevated BMI and wound sepsis, a 90% increased risk of wound sepsis in those who were overweight or obese, is of clinical significance. Thus, morbid obesity should still be viewed as a significant risk factor for complications as nearly half of our patient population falls into this category.

Most surgical procedures were performed by specialists, but more complications also occurred in this group. This differs from the findings in the VALUE-study[15] where the complication rate in hysterectomies for benign indications had similar outcomes in both the specialist and non-specialist groups. The difference we found in this study may be due to specialists performing more challenging surgical procedures. Additionally, a variety of surgical procedures – including hysterectomies – were performed.

Lastly, oncological surgery, which accounted for a fifth of surgical procedures was not associated with a higher likelihood of complications. This is in keeping with the findings of an earlier study by Butt *et al*.[14] Oncological surgery is perceived to be more complex surgery and therefore the findings were surprising.

Study limitations

Our study was not without limitations – it was retrospective in nature of the study and therefore dependent on the record-keeping of others, as well as the ability of the investigator to interpret the records. The 6-week follow-up period was allocated to allow for inclusion of delayed complications; however, patients may not have followed up at TBH which may have led to under-reporting. A prospective study with similar outcomes could be considered in the future.

Conclusion

The delivery of quality gynaecological care requires information about current gynaecological surgical practices and patient outcomes. These outcomes should be comparable with both national and international standards. The rate of surgical complications at our facility appears to be higher than that reported in both national and international studies. Infective complications were the main contributors, which might be attributed to a higher rate of retroviral disease in our study population. The use of an extended course of prophylactic antibiotics in those at risk of infective complications should be explored in the future. Additionally, auditing of intra- and postoperative infection prevention and control measures should also be considered. Patients who are high-risk of bowel injury should be identified pre-operatively and the surgery should be approached with care. Surgical awareness and increased perioperative surveillance may not eliminate visceral injury, but it may decrease the associated morbidity, especially with delayed presentations.

Declaration. This study was done in the partial fulfilment of the requirements for TG's MMed (O&G) degree at the Faculty of Medicine and Health Science, Stellenbosch University.

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