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SURGICAL SITE INFECTIONS AMONG PATIENTS UNDERGOING GYNECOLOGICAL SURGERIES: PREVALENCE, RISK FACTORS, MICROBIOLOGICAL PROFILE, AND ANTIMICROBIAL RESISTANCE PATTERN – A HOSPITAL-BASED CROSS-SECTIONAL STUDY

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ABSTRACT
Background: Surgical site infection (SSI) is one of the most common healthcare-associated infections following gynecological surgery and is associated with increased postoperative morbidity, prolonged hospitalization, antimicrobial use, and healthcare costs. Identification of risk factors, causative microorganisms, and antimicrobial susceptibility patterns is essential for implementing effective infection prevention and antimicrobial stewardship strategies.
Methods: A hospital-based cross-sectional study was conducted among 45 women undergoing elective or emergency gynecological surgeries at a tertiary care teaching hospital in Chennai, India. Consecutive sampling was employed over a six-month period. Demographic, clinical, surgical, and microbiological data were collected using a structured proforma. Surgical site infections were diagnosed according to the Centers for Disease Control and Prevention (CDC) criteria. Wound swabs obtained from infected patients underwent culture and antimicrobial susceptibility testing. Data were analyzed using SPSS version 25.0. Logistic regression analysis was performed to identify independent predictors of SSI, and a p-value <0.05 was considered statistically significant.
Results: The overall prevalence of SSI was 20.0% (9/45). Diabetes mellitus (adjusted OR=12.84, 95% CI: 1.31–125.92; p=0.028), anemia (adjusted OR=5.62, 95% CI: 1.03–30.62; p=0.046), and intraoperative blood loss ≥500 mL (adjusted OR=9.31, 95% CI: 1.45–59.63; p=0.019) were identified as independent predictors of SSI. Staphylococcus aureus was the most frequently isolated pathogen (33.3%), followed by Escherichia coli and Klebsiella pneumoniae (22.2% each). Amikacin demonstrated the highest antimicrobial susceptibility (88.9%), followed by gentamicin and piperacillin-tazobactam (77.8% each), whereas ceftriaxone and amoxicillin-clavulanate showed the highest resistance (55.6%).
Conclusion: Surgical site infection remains a significant postoperative complication following gynecological surgery. Diabetes mellitus, anemia, and intraoperative blood loss ≥500 mL were the major independent risk factors for SSI. Routine perioperative risk assessment, optimization of patient comorbidities, meticulous intraoperative blood loss control, adherence to evidence-based infection prevention practices, and culture-guided antimicrobial therapy are essential to reduce SSI incidence and improve postoperative outcomes.

KEYWORDS: Surgical Site Infection; Gynecologic Surgery; Hysterectomy; Risk Factors; Antimicrobial Resistance

INTRODUCTION
Surgical site infections (SSIs) are among the most common healthcare-associated infections and remain a major cause of postoperative morbidity, prolonged hospitalization, increased healthcare expenditure, and mortality worldwide. They are defined as infections occurring within 30 days after surgery or within one year following implant placement, involving the superficial incision, deep tissues or organ space manipulated during the surgical procedure.[1] Surgical infections continue to compromise patient safety despite substantial advances in operative techniques, perioperative care, sterilization practices, and antimicrobial therapy.[2] In gynecological practice, procedures such as abdominal hysterectomy, vaginal hysterectomy, myomectomy, staging laparotomy, and other major pelvic surgeries expose patients to varying degrees of tissue trauma and microbial contamination, making postoperative wound infections an important clinical concern.[3]
The World Health Organization (WHO) recognizes surgical site infection as one of the leading preventable healthcare-associated infections worldwide and has identified SSI prevention as an essential component of safe surgical care.[4] According to the Centers for Disease Control and Prevention (CDC), standardized surveillance based on uniform diagnostic criteria is fundamental for monitoring infection rates, evaluating hospital performance, and implementing effective infection prevention strategies.[5] Similarly, the National Institute for Health and Care Excellence (NICE) recommends comprehensive perioperative measures including appropriate antibiotic prophylaxis, skin antisepsis,

maintenance of normothermia, strict aseptic techniques, and standardized postoperative wound care to minimize SSI occurrence.[6]
Antimicrobial resistance (AMR) has emerged as an additional challenge in the management of postoperative infections. The WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS) has demonstrated increasing resistance among common surgical pathogens including Staphylococcus aureus, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, and Enterococcus species, thereby limiting treatment options and increasing healthcare costs.[7] The WHO has further identified antimicrobial resistance as one of the top global public health threats requiring coordinated surveillance, antimicrobial stewardship and infection prevention measures across healthcare facilities.[8] Complementing these recommendations, the CDC emphasizes judicious antibiotic prescribing practices to reduce unnecessary antimicrobial exposure while preserving the effectiveness of currently available antibiotics.[9] Effective infection prevention and control (IPC) programmes integrating surveillance, environmental hygiene, sterilization, hand hygiene and antimicrobial stewardship therefore remain indispensable for reducing postoperative infections and preventing the spread of resistant organisms.[10]
Gynecological surgeries constitute a significant proportion of elective and emergency surgical procedures performed in tertiary care hospitals. Although advances in minimally invasive surgery and perioperative management have substantially improved surgical outcomes, surgical site infections continue to occur following abdominal hysterectomy, vaginal hysterectomy, myomectomy, staging laparotomy, and other major gynecological procedures. The occurrence of SSI is influenced by multiple patient-related factors including advanced age, obesity, diabetes mellitus, anemia, malnutrition, immunosuppression, and smoking as well as surgery-related factors such as emergency procedures, prolonged operative duration, excessive blood loss, contaminated wounds, inappropriate antibiotic prophylaxis and prolonged hospital stay. These factors impair wound healing, facilitate bacterial colonization, and increase susceptibility to postoperative infections.
The burden of surgical site infections is particularly high in low- and middle-income countries because of limited healthcare resources, overcrowded hospitals, variability in infection control practices, and increasing antimicrobial resistance. In addition, the microbiological spectrum and antimicrobial susceptibility patterns differ across hospitals and geographical regions, emphasizing the need for continuous institutional surveillance to guide empirical antibiotic therapy and antimicrobial stewardship programmes. Region specific epidemiological data are therefore essential for developing effective infection prevention policies and optimizing perioperative management.
Despite growing emphasis on infection prevention, limited evidence is available regarding the prevalence, risk factors, microbiological profile, and antimicrobial resistance patterns of surgical site infections among patients undergoing gynecological surgeries in South Indian tertiary care hospitals. Therefore, the present study was undertaken to determine the prevalence of surgical site infections among women undergoing gynecological surgeries, identify associated patient- and surgery-related risk factors, evaluate the causative microorganisms, and determine their antimicrobial resistance patterns to provide evidence for improving infection control practices and postoperative patient outcomes.

METHODOLOGY

Study Design and Setting

A hospital-based cross-sectional study was conducted in the Department of Obstetrics and Gynaecology, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India. The study was carried out over a period of six months after obtaining approval from the Institutional Ethics Committee. The department serves as a tertiary referral center and performs a wide range of elective and emergency gynecological surgical procedures, providing an appropriate setting for evaluating the prevalence of surgical site infections (SSIs).

Study Population

The study population comprised women who underwent elective or emergency gynecological surgeries during the study period. Surgical procedures included abdominal hysterectomy, vaginal hysterectomy, myomectomy, laparotomy, and other major gynecological operations performed in the department.

Sample Size and Sampling Technique

The sample size was calculated using the standard formula for estimating a single proportion based on an expected SSI prevalence of 10%, with a 95% confidence level and an allowable error of 9%. The calculated sample size was 43, which was rounded to 45 participants after considering feasibility and possible non-response. Consecutive sampling was employed, and all eligible patients meeting the inclusion criteria during the study period were recruited until the required sample size was achieved.

Eligibility Criteria

Inclusion criteria-

- Women who underwent gynecological surgery during the study period
- Women who provided written informed consent

Exclusion criteria-

- Patients with pre-existing infection at or near the operative site
- Patients unwilling to participate
- Patients with incomplete clinical records or inadequate postoperative follow-up

Data Collection Procedure

Data were collected using a predesigned and pretested structured proforma. Demographic characteristics including age, socioeconomic status, parity, and body mass index were recorded. Clinical information such as diabetes mellitus, hypertension, anemia, and other relevant comorbidities was obtained from patient interviews and medical records. Surgical variables including type of surgery, nature of procedure (elective or emergency), duration of surgery, type of incision, wound classification, and intraoperative blood loss were documented from operative records. Perioperative variables including timing and type of antibiotic prophylaxis, duration of antibiotic administration, preoperative preparation, and adherence to aseptic precautions were also recorded. During the postoperative period, patients were examined for fever, wound discharge, redness, swelling, wound induration, delayed wound healing and other clinical features suggestive of surgical site infection.

Diagnosis of Surgical Site Infection

Surgical site infections were diagnosed according to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network criteria. Infections were classified as superficial incisional, deep incisional, or organ/space SSIs. Patients with clinically suspected infection underwent wound swab collection under aseptic precautions for microbiological culture and antimicrobial susceptibility testing. The isolated microorganisms and their antimicrobial resistance patterns were documented and analyzed.

Outcome Measures

Primary outcome -

- To measure the prevalence of surgical site infections among patients undergoing gynecological surgeries.
- Secondary outcomes -
- To identify patient-related and surgery-related risk factors associated with SSI.
- To characterize the microbiological profile of infected wounds and determine the antimicrobial susceptibility and resistance patterns.
- To evaluate the postoperative outcomes among patients who developed SSI.

Statistical Analysis

All collected data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Continuous variables were summarized using mean and standard deviation, whereas categorical variables were expressed as frequencies and percentages. Associations between categorical variables and the occurrence of surgical site infection were assessed using the Chi-square test or Fisher's exact test, as appropriate. Odds ratios with 95% confidence intervals were calculated to determine the strength of association between potential risk factors and SSI. A two-tailed p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1. Baseline Characteristics of the Study Participants and Prevalence of Surgical Site Infection (N=45)

Characteristic	Total N (%)
Age (years)	
<30	9 (20.0)
30–39	17 (37.8)
40–49	13 (28.9)
≥50	6 (13.3)
Mean age (years)	39.8 ± 9.7
BMI (kg/m²)	
<25	8 (17.8)
25–29.9	12 (26.7)
≥30	25 (55.6)
Mean BMI	27.3 ± 4.8
Diabetes mellitus	
No	27 (60.0)
Yes	18 (40.0)
Hypertension	
No	37 (82.2)
Yes	8 (17.8)
Anemia	
No	26 (57.8)
Yes	19 (42.2)

Type of surgery	
Abdominal hysterectomy	25 (55.6)
Staging laparotomy	11 (24.4)
Open myomectomy	6 (13.3)
Vaginal hysterectomy	3 (6.7)
Nature of surgery	
Elective	40 (88.9)
Emergency	5 (11.1)
Duration of surgery	
<2 hours	27 (60.0)
≥2 hours	18 (40.0)
Wound classification	
Clean	17 (37.8)
Clean-contaminated	28 (62.2)
Surgical Site Infection	
Absent	36 (80.0)
Present	9 (20.0)

Table 1 presents the baseline demographic, clinical, and surgical characteristics of the 45 women included in the study, along with the prevalence of surgical site infection (SSI). The mean age of the participants was 39.8 ± 9.7 years, with the largest proportion belonging to the 30–39 years age group (37.8%), followed by 40–49 years (28.9%), while participants aged <30 years and ≥50 years constituted 20.0% and 13.3%, respectively. The mean body mass index (BMI) of the participants was 27.3 ± 4.8 kg/m². More than half of the women (55.6%) had a BMI of ≥30 kg/m², indicating obesity, whereas 26.7% were overweight (BMI 25–29.9 kg/m²) and 17.8% had a BMI of <25 kg/m².

Regarding clinical characteristics, 27 (60.0%) participants did not have diabetes mellitus, while 18 (40.0%) had diabetes. Similarly, hypertension was present in 8 (17.8%) participants and absent in 37 (82.2%). Anemia was observed in 19 (42.2%) participants, whereas 26 (57.8%) had normal hemoglobin levels. Among the surgical procedures, abdominal hysterectomy was the most commonly performed operation, accounting for 25 (55.6%) cases, followed by staging laparotomy in 11 (24.4%), open myomectomy in 6 (13.3%), and vaginal hysterectomy in 3 (6.7%) patients.

Most surgeries were elective (40, 88.9%), while 5 (11.1%) were performed on an emergency basis. The duration of surgery was less than 2 hours in 27 (60.0%) patients and 2 hours or longer in 18 (40.0%) patients. Regarding wound classification, 28 (62.2%) surgical wounds were classified as clean-contaminated, whereas 17 (37.8%) were classified as clean wounds. Overall, 9 of the 45 participants (20.0%) developed surgical site infection during the postoperative period, while 36 (80.0%) had no evidence of SSI. This indicates that one in five women undergoing gynecological surgery experienced postoperative surgical site infection, highlighting the need to identify patient- and surgery-related risk factors associated with SSI.

Table 2. Univariate Analysis of Factors Associated with Surgical Site Infection (N = 45)

Variable name	SSI Present n (%)	SSI Absent n (%)	OR (95% CI)	p value
Age (years)				
<40	2 (25.0)	6 (75.0)	Ref	0.651
≥40	7 (18.9)	30 (81.1)	0.70 (0.12–4.23)	
BMI (kg/m²)				
<30	3 (15.0)	17 (85.0)	Ref	0.71
≥30	6 (24.0)	19 (76.0)	1.79 (0.39–8.29)	
Diabetes mellitus				
No	1 (3.7)	26 (96.3)	Ref	0.001
Yes	8 (44.4)	10 (55.6)	20.80 (2.30–188.31)	
Hypertension				
No	6 (16.2)	31 (83.8)	Ref	0.326
Yes	3 (37.5)	5 (62.5)	3.10 (0.58–16.59)	
Anemia				
No	2 (7.7)	24 (92.3)	Ref	0.024
Yes	7 (36.8)	12 (63.2)	7.00 (1.26–38.99)	

Nature of surgery				
Elective	7 (17.5)	33 (82.5)	Ref	0.258
Emergency	2 (40.0)	3 (60.0)	3.14 (0.44–22.45)	
Duration of surgery				
<2 hours	3 (11.1)	24 (88.9)	Ref	0.126
≥2 hours	6 (33.3)	12 (66.7)	4.00 (0.85–18.84)	
Blood loss				
<500 mL	3 (8.6)	32 (91.4)	Ref	0.002
≥500 mL	6 (60.0)	4 (40.0)	16.00 (2.83–90.47)	
Wound classification				
Clean	2 (11.8)	15 (88.2)	Ref	0.447
Clean-contaminated	7 (25.0)	21 (75.0)	2.50 (0.45–13.76)	

Table 2 presents the univariate analysis of factors associated with surgical site infection (SSI) among women undergoing gynecological surgeries. Patients aged ≥40 years had a lower proportion of SSI (18.9%) compared with those aged <40 years (25.0%); however, the association was not statistically significant (OR = 0.70, 95% CI: 0.12–4.23; p = 0.651). Likewise, patients with a BMI ≥30 kg/m² had 1.79 times higher odds of developing SSI than those with a BMI <30 kg/m², but this association was not statistically significant (OR = 1.79, 95% CI: 0.39–8.29; p = 0.710).

Among the clinical characteristics, diabetes mellitus showed a strong and statistically significant association with SSI. Eight of the 18 diabetic patients (44.4%) developed SSI compared with only 1 of the 27 non-diabetic patients (3.7%). Diabetic patients had 20.80 times higher odds of developing SSI than non-diabetic patients (OR = 20.80, 95% CI: 2.30–188.31; p = 0.001).

Although patients with hypertension had a higher incidence of SSI (37.5%) than those without hypertension (16.2%), the association was not statistically significant (OR = 3.10, 95% CI: 0.58–16.59; p = 0.326).

Anemia was significantly associated with SSI. The incidence of SSI was 36.8% among anemic patients compared with 7.7% among non-anemic patients. Patients with anemia had 7.00 times higher odds of developing SSI than those without anemia (OR = 7.00, 95% CI: 1.26–38.99; p = 0.024).

Regarding surgical factors, emergency surgeries showed higher odds of SSI than elective procedures (OR = 3.14, 95% CI: 0.44–22.45), although the association was not statistically significant (p = 0.258). Similarly, procedures lasting 2 hours or longer were associated with 4.00 times higher odds of SSI compared with surgeries lasting less than 2 hours; however, this relationship did not reach statistical significance (OR = 4.00, 95% CI: 0.85–18.84; p = 0.126).

Patients with intraoperative blood loss of ≥500 mL had the highest risk of developing SSI. The incidence of SSI was 60.0% among these patients compared with 8.6% among those with blood loss <500 mL. Blood loss ≥500 mL increased the odds of SSI by 16-fold, and this association was statistically significant (OR = 16.00, 95% CI: 2.83–90.47; p = 0.002).

Although clean-contaminated wounds demonstrated higher odds of SSI than clean wounds (OR = 2.50, 95% CI: 0.45–13.76), the association was not statistically significant (p = 0.447).

Overall, the univariate analysis identified diabetes mellitus, anemia, and intraoperative blood loss ≥500 mL as significant risk factors for surgical site infection among women undergoing gynecological surgeries. In contrast, age, body mass index, hypertension, nature of surgery, duration of surgery, and wound classification were not significantly associated with SSI in this study.

Table 3. Multivariable Logistic Regression Analysis for Independent Predictors of Surgical Site Infection (N = 45)

Variable name	Adjusted OR (95% CI)	p value
Diabetes mellitus		
No	Ref	0.028
Yes	12.84 (1.31–125.92)	
Anemia		
No	Ref	0.046
Yes	5.62 (1.03–30.62)	
Nature of Surgery		
Elective	Ref	0.437
Emergency	2.21 (0.30-16.45)	

Duration of surgery		
<2 hours	Ref	0.247
≥2 hours	2.64 (0.51–13.72)	
Blood loss		
<500 mL	Ref	0.019
≥500 mL	9.31 (1.45–59.63)	

Table 3 presents the results of the multivariable logistic regression analysis performed to identify the independent predictors of surgical site infection (SSI) after adjusting for potential confounding factors. Diabetes mellitus, anemia, nature of surgery, duration of surgery, and intraoperative blood loss were included in the final regression model.

After adjustment, diabetes mellitus remained a significant independent predictor of SSI. Patients with diabetes had 12.84 times higher odds of developing surgical site infection compared with non-diabetic patients (Adjusted OR = 12.84; 95% CI: 1.31–125.92; $p = 0.028$).

Similarly, anemia was independently associated with postoperative SSI. Anemic patients had 5.62 times higher odds of developing SSI than those without anemia (Adjusted OR = 5.62; 95% CI: 1.03–30.62; $p = 0.046$), indicating that preoperative anemia is an important patient-related risk factor.

Patients undergoing emergency surgery had 2.21 times higher odds of developing SSI compared with those undergoing elective surgery. However, this association was not statistically significant after adjustment (Adjusted OR = 2.21; 95% CI: 0.30–16.45; $p = 0.437$).

Although surgeries lasting 2 hours or longer were associated with 2.64-fold higher odds of SSI compared with procedures lasting less than 2 hours, this association did not remain statistically significant after adjusting for other variables (Adjusted OR = 2.64; 95% CI: 0.51–13.72; $p = 0.247$).

Intraoperative blood loss of ≥500 mL remained a significant independent predictor of SSI. Patients with blood loss of ≥500 mL had 9.31 times higher odds of developing postoperative surgical site infection than those with blood loss <500 mL (Adjusted OR = 9.31; 95% CI: 1.45–59.63; $p = 0.019$).

Overall, the multivariable logistic regression analysis identified diabetes mellitus, anemia, and intraoperative blood loss ≥500 mL as significant independent predictors of surgical site infection among women undergoing gynecological surgeries, whereas nature of surgery and duration of surgery were not independently associated with SSI after adjustment.

Table 4. Microbiological Profile Among Patients with Surgical Site Infection (n=9)

Microorganism	**n**	**%**
Staphylococcus aureus	3	33.3
Escherichia coli	2	22.2
Klebsiella pneumoniae	2	22.2
Pseudomonas aeruginosa	1	11.1
Enterococcus faecalis	1	11.1

Table 4 summarizes the microbiological profile of organisms isolated from the 9 patients who developed surgical site infection (SSI). Staphylococcus aureus was the most frequently isolated pathogen, accounting for 3 isolates (33.3%), indicating that it was the predominant causative organism of postoperative wound infections in the study population. This was followed by Escherichia coli and Klebsiella pneumoniae, each isolated in 2 patients (22.2%), suggesting that gram-negative bacilli also contributed substantially to the burden of SSI.

Less commonly isolated organisms included Pseudomonas aeruginosa and Enterococcus faecalis, each identified in 1 patient (11.1%). The isolation of both gram-positive and gram-negative organisms highlights the polymicrobial nature of surgical site infections encountered in gynecological surgeries.

Overall, Staphylococcus aureus emerged as the leading pathogen, followed by Escherichia coli and Klebsiella pneumoniae, emphasizing the importance of considering both gram-positive cocci and gram-negative bacilli when selecting empirical antimicrobial therapy for suspected surgical site infections until culture and sensitivity reports become available.

Table 5. Antimicrobial Susceptibility Pattern of Isolated Organisms (n=9)

Antibiotic	**Sensitive n (%)**	**Resistant n (%)**
Amikacin	8 (88.9)	1 (11.1)

Gentamicin	7 (77.8)	2 (22.2)
Piperacillin–Tazobactam	7 (77.8)	2 (22.2)
Ceftriaxone	4 (44.4)	5 (55.6)
Ciprofloxacin	5 (55.6)	4 (44.4)
Amoxicillin–Clavulanate	4 (44.4)	5 (55.6)

Table 5 presents the antimicrobial susceptibility pattern of the microorganisms isolated from the 9 patients with surgical site infection. Among the antibiotics tested, Amikacin demonstrated the highest effectiveness, with 8 isolates (88.9%) being sensitive and only 1 isolate (11.1%) showing resistance. High sensitivity was also observed for Gentamicin and Piperacillin–Tazobactam, with 7 isolates (77.8%) susceptible to each antibiotic, while resistance was noted in 22.2% of isolates.

In contrast, relatively lower susceptibility was observed for Ciprofloxacin, with 5 isolates (55.6%) sensitive and 4 isolates (44.4%) resistant. Ceftriaxone and Amoxicillin–Clavulanate exhibited the least favorable susceptibility profiles, with only 4 isolates (44.4%) sensitive and 5 isolates (55.6%) resistant to each antibiotic, indicating comparatively higher levels of antimicrobial resistance against these commonly used agents.

Overall, the findings suggest that Amikacin, Gentamicin, and Piperacillin–Tazobactam were the most effective antibiotics against the isolated pathogens, whereas Ceftriaxone and Amoxicillin–Clavulanate demonstrated the highest resistance rates.

DISCUSSION

In the present study, the overall prevalence of surgical site infection (SSI) among women undergoing gynecological surgeries was 20.0% (9/45). Diabetes mellitus (adjusted OR 12.84, 95% CI: 1.31–125.92; p=0.028), anemia (adjusted OR 5.62, 95% CI: 1.03–30.62; p=0.046), and intraoperative blood loss of ≥500 mL (adjusted OR 9.31, 95% CI: 1.45–59.63; p=0.019) emerged as independent predictors of SSI. Staphylococcus aureus was the most frequently isolated organism (33.3%), followed by Escherichia coli and Klebsiella pneumoniae (22.2% each). Amikacin demonstrated the highest antimicrobial susceptibility (88.9%), whereas ceftriaxone and amoxicillin-clavulanate exhibited the greatest resistance (55.6%).

The present study found an SSI prevalence of 20.0%. Badia et al. reported that SSI was associated with prolonged hospital stay, readmission, additional surgical procedures, and increased healthcare costs, highlighting the clinical importance of SSI and the need for effective prevention and early management.[11]

In the present study, 40.0% of patients had diabetes mellitus, which independently increased SSI risk (AOR 12.84; p=0.028). Allegranzi et al. emphasized evidence-based measures such as appropriate antibiotic prophylaxis, skin antisepsis, perioperative glycemic control, normothermia, and sterile surgical techniques to reduce SSI.[12]

SSI occurred in 44.4% of diabetic patients versus 3.7% of non-diabetic patients, with diabetes increasing the odds nearly 13-fold. Martin et al. similarly demonstrated significantly increased SSI risk among diabetic patients across surgical procedures. The stronger association in the present study may reflect its small sample and gynecological population.[13]

The present study identified Staphylococcus aureus as the predominant isolate (33.3%). Astagneau et al. demonstrated that SSI contributes substantially to postoperative morbidity and mortality, supporting the need for continuous SSI surveillance and preventive interventions.[14]

Intraoperative blood loss ≥500 mL independently increased SSI risk by 9.31-fold. de Jonge et al. demonstrated that evidence-based intraoperative wound irrigation can reduce SSI. These findings emphasize the importance of meticulous hemostasis and strict intraoperative infection-control practices.[15]

Diabetes, anemia, and blood loss ≥500 mL were independent predictors of SSI, whereas emergency surgery and operative duration ≥2 hours were not significant after adjustment. Ban et al. emphasized antimicrobial prophylaxis, glycemic optimization, normothermia, meticulous surgical technique, and postoperative surveillance as important SSI-prevention measures.[16]

Staphylococcus aureus was the predominant pathogen (33.3%), followed by E. coli and K. pneumoniae (22.2% each). Amikacin showed the highest susceptibility (88.9%), whereas ceftriaxone and amoxicillin-clavulanate showed the highest resistance (55.6%). Cassini et al. highlighted antimicrobial resistance as a major public health challenge, supporting culture-directed therapy and antimicrobial stewardship.[17]

Patients with anemia had 5.62-fold higher adjusted odds of SSI, while blood loss ≥500 mL increased the odds 9.31-fold. Isik et al. similarly identified diabetes, obesity, prolonged surgery, and wound contamination as important SSI determinants. Although obesity was not significant in the present study, both studies emphasize the importance of patient and operative risk factors.[18]

The present study reported a 20.0% SSI prevalence despite standard perioperative care. WHO SSI prevention guidelines recommend standardized antibiotic prophylaxis, sterile surgical practices, surveillance, and infection-prevention bundles to reduce SSI. Strengthening these measures may reduce SSI in gynecological units.[19]

Diabetes, anemia, and increased blood loss were major SSI predictors. Wang et al., studying abdominal hysterectomy patients, similarly identified blood loss, obesity, diabetes, prolonged surgery, and perioperative transfusion as important risk factors. Their findings support optimization of comorbidities and meticulous blood conservation during gynecological surgery.[20]

The present study identified diabetes and excessive blood loss as independent SSI predictors. Shi et al. reported similar associations among women undergoing hysterectomy for endometrial carcinoma, identifying obesity, diabetes, prolonged surgery, excessive blood loss, and lymph node dissection as significant risk factors.[21]

The present study observed a 20.0% SSI prevalence, with S. aureus accounting for 33.3% of isolates. Magill et al. reported that although healthcare-associated infections have declined in US hospitals, SSI remains an important healthcare-associated infection, supporting the continued need for effective prevention strategies.[22]

Diabetes, anemia, and blood loss were independent predictors, while emergency surgery and prolonged operative duration showed increased but non-significant odds. A recent study evaluating SSI after abdominal hysterectomy similarly identified prolonged surgery, obesity, diabetes, and perioperative blood loss as important risk factors and demonstrated reduced SSI following structured quality-improvement measures.[23]

The present findings are also consistent with a recent meta-analysis showing that obesity, diabetes, prolonged operative duration, emergency surgery, contaminated wounds, and perioperative blood loss increase SSI risk following obstetric and gynecological procedures. These findings reinforce the importance of comprehensive perioperative risk assessment.[24]

Liu et al. reported in a systematic review and meta-analysis of hysterectomy patients that obesity, diabetes, prolonged surgery, wound contamination, and perioperative blood loss significantly increased SSI risk. The consistent association of diabetes and blood loss with SSI supports the present findings and the need for perioperative optimization.[25]

The present study found a 20.0% SSI prevalence, with diabetes and excessive blood loss independently predicting infection. A recent nine-year study from a large safety-net hospital network similarly identified obesity, diabetes, prolonged operative duration, wound classification, and perioperative blood loss as important predictors of hysterectomy-associated SSI. These findings emphasize continuous surveillance, infection-prevention protocols, and antimicrobial stewardship.[26]

CONCLUSION

The study demonstrated that surgical site infection (SSI) remains a significant postoperative complication among women undergoing gynecological surgeries, with an overall prevalence of 20.0%. Diabetes mellitus, anemia, and intraoperative blood loss of ≥500 mL were identified as independent predictors of SSI, highlighting the importance of comprehensive preoperative risk assessment, optimization of patient comorbidities, and meticulous intraoperative blood loss control. Staphylococcus aureus was the predominant causative organism, followed by Escherichia coli and Klebsiella pneumoniae. Antimicrobial susceptibility testing revealed high sensitivity to amikacin, gentamicin, and piperacillin-tazobactam, whereas ceftriaxone and amoxicillin-clavulanate exhibited relatively higher resistance rates. These findings emphasize the need for strict adherence to evidence-based infection prevention practices, timely administration of prophylactic antibiotics, meticulous surgical technique, effective intraoperative hemostasis, and continuous antimicrobial stewardship guided by local microbiological surveillance. Early identification and targeted management of high-risk patients may substantially reduce the incidence of surgical site infections, improve postoperative outcomes, decrease healthcare burden, and enhance the overall quality and safety of gynecological surgical care.

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