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ORIGINAL RESEARCH

Investigation of surgical site infection after gynecological procedures at ANMMCH Gaya

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ABSTRACT
Background: Surgical site infections (SSIs) are a major postoperative complication following gynecological surgeries, leading to increased morbidity and healthcare burden. Identifying risk factors and microbiological patterns can help improve infection prevention strategies. **Methods:** A prospective observational study was conducted at ANMMCH, Gaya, Bihar, from August 2023 to December 2024, including 100 patients undergoing gynecological surgeries. Patient demographics, surgical details, risk factors, and microbiological analysis of SSIs were recorded and analyzed. **Results:** The overall SSI incidence was 18%. Significant risk factors included obesity (55.6%), diabetes mellitus (27.8%), prolonged surgical time (>90 min, 24.4%), and surgical drains (30.8%). Abdominal hysterectomy had the highest infection rate (23.8%), while laparoscopic procedures had the lowest (10.7%). Escherichia coli (40%) was the most common pathogen, followed by Staphylococcus aureus (26.7%). **Conclusion:** SSIs remain a significant concern in gynecological surgeries. Strict infection control measures, optimized preoperative management, and minimally invasive techniques can help reduce infection rates. Future studies should focus on larger populations and long-term outcomes.
Keywords: Surgical site infection, gynecological surgery, risk factors, microbiological profile

INTRODUCTION

After gynecological procedures, surgical site infections (SSI) are a serious consequence that raises morbidity, lengthens hospital stays, and adds to medical expenses. SSIs are among the most frequent postoperative complications and arise from microbial infection of the surgical incision [1]. SSIs are still a concern even with improvements in surgical methods, aseptic measures, and antibiotic prophylaxis. This is especially true for gynecological procedures, as the operative field is frequently close to the vaginal and perineal flora. The kind of operation, patient comorbidities, surgical technique, and perioperative care are some of the variables that affect the incidence of SSIs [2]. There are various infection risks associated with gynecological surgery, ranging from major abdominal and vaginal surgeries to minimally invasive laparoscopic treatments. The development of SSIs is significantly influenced by factors like obesity, diabetes, extended surgical duration, intraoperative blood loss, and insufficient use of preventive antibiotics [3,4].

To avoid serious consequences including sepsis, pelvic abscess, and wound dehiscence, SSIs must be identified early and managed appropriately. The incidence of SSIs can be considerably decreased by surveillance and adherence to infection control protocols, including as rigorous aseptic procedures, postoperative wound care, and preoperative patient optimization. to analyze the microbiological profile, incidence, risk factors, and results of surgical site infections after gynecological procedures, as well as the effect of preventive measures on lowering the rates of SSIs.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted at Anugrah Narayan Magadh Medical College and Hospital (ANMMCH), Gaya, Bihar. The study aimed to assess the incidence, risk factors, and microbiological profile of surgical site infections (SSIs) following gynecological surgeries.

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Study Duration
The study was conducted over a period of one year, from August 2023 to December 2024.

Study Population
A total of approximately 100 patients who underwent gynecological surgeries at ANMMCH were included in the study.

Inclusion and Exclusion Criteria
Informed permission and 30 days of postoperative follow-up were required for elective or emergency gynecological procedures. Exclusion criteria included pre-existing surgical site infections, non-surgical gynecological procedures, immunocompromised patients (such as HIV-positive or immunosuppressed patients), and those lost to follow-up before 30 days postoperatively.

Data Collection
Preoperative, intraoperative, and postoperative data collecting occurred. Preoperative data included patient demographics, comorbidities (such as diabetes, hypertension, and obesity), operation indication, type, and prophylactic antibiotic use. Surgery type, duration, blood loss, drain use, and complications were intraoperative data. CDC criteria were used to monitor patients for SSIs including redness, edema, discomfort, discharge, fever, and wound dehiscence after surgery.

Microbiological Analysis
Wound swabs were collected from infected surgical sites and sent for **culture and sensitivity testing** to identify the causative organisms and determine their antibiotic susceptibility patterns.

Follow-up and Outcome Assessment
All patients were followed for **30 days postoperatively** to monitor the occurrence of SSIs and related complications.

Statistical Analysis
Appropriate statistical techniques were used to analyse the data. Using logistic regression analysis and chi-square testing, the incidence of SSIs was determined, and correlations between risk factors and infection rates were assessed; a p-value of less than 0.05 was deemed statistically significant.

RESULTS
18 of 100 gynecological surgery patients (18%) had surgical site infections (SSIs), whereas 82 (82%) recovered normally. In the study population, the mean age was 42.6 ± 8.3 years, with the highest prevalence of SSIs in the 40-50 age range (66.7%, n=12). Obesity (BMI >30 kg/m²) was linked to SSIs in 55.6% (n=10) of infected patients, compared to 21.9% (n=18) in the non-infected group (p=0.003). Other comorbidities, including diabetes (27.8%, n=5, p=0.021), hypertension (38.9%, n=7, p=0.041), and anaemia (Hb <10 g/dL) (44.4%, n=8, p=0.008), also significantly correlated with SSIs. SSI rates varied by surgical type. SSIs occurred in 23.8% (n=10) of 42 abdominal hysterectomy patients. 16.7% (n=5) of 30 vaginal hysterectomy patients and 10.7% (n=3) of 28 laparoscopic patients acquired SSIs, demonstrating a considerably higher infection rate in abdominal surgery (p=0.027). SSI rates were 24.4% (n=13/55) for surgeries lasting more than 90 minutes and 11.1% (n=5/45) for those lasting less than 90 minutes (p=0.019). Surgical drains increased the probability of SSIs by 30.8% (n=8) compared to 13.2% (n=10) of patients without drains (p=0.011).
A positive bacterial culture was found in 83.3% (n=15) of SSI cases. Escherichia coli (40%, n=6), Staphylococcus aureus (26.7%, n=4), Klebsiella pneumoniae (20%, n=3), and Pseudomonas aeruginosa (13.3%, n=2) were the most prevalent pathogens Gram-negative bacteria were more responsive to piperacillin-tazobactam and meropenem, while Gram-positive bacteria were most sensitive to vancomycin and linezolid. Among the 18 SSI patients, 61.1% (n=11) needed hospitalisation for more than 7 days and 38.9% (n=7) needed wound debridement due to severe infection. Additionally, 11.1% (n=2) of infected patients needed wound management readmission. The study population had no deaths.
Gynaecological surgeries had an 18% SSI rate, with open abdominal procedures having a greater rate. Obesity, diabetes, anaemia, extended surgery, and drainage increased SSI risk. E. coli caused the most cases, followed by Staphylococcus aureus. The findings emphasise the need for preoperative patient optimisation, aseptic surgery, and antibiotic prophylaxis in SSI prevention.

Table 1: Incidence of Surgical Site Infections (SSIs)

Total Patients (N=100)	Patients with SSI (N=18)	Patients without SSI (N=82)	SSI Rate (%)
100	18	82	18%

Table 2: Demographic and Clinical Characteristics of Patients

Characteristic	Patients with SSI (N=18)	Patients without SSI (N=82)	p-value
Mean Age (years)	42.6 ± 8.3	40.2 ± 7.9	0.068
Age Group (years)			
20–30	2 (11.1%)	15 (18.3%)	0.152
31–40	4 (22.2%)	25 (30.5%)	0.097

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41–50	12 (66.7%)	42 (51.2%)	0.041*
Obesity (BMI >30 kg/m²)	10 (55.6%)	18 (21.9%)	0.003*
Diabetes Mellitus	5 (27.8%)	8 (9.8%)	0.021*
Hypertension	7 (38.9%)	17 (20.7%)	0.041*
Anemia (Hb<10 g/dL)	8 (44.4%)	16 (19.5%)	0.008*

(*$p < 0.05$ considered significant*)

Table 3: Incidence of SSIs Based on Type of Surgery

Type of Surgery	Total Cases (N=100)	Patients with SSI (N=18)	SSI Rate (%)	p-value
Abdominal Hysterectomy	42	10	23.8%	0.027*
Vaginal Hysterectomy	30	5	16.7%	
Laparoscopic Procedures	28	3	10.7%	

Table 4: Surgical Factors and SSI Incidence

Factor	Total Cases (N=100)	Patients with SSI (N=18)	SSI Rate (%)	p-value
Surgical Duration				
< 90 minutes	45	5	11.1%	0.019*
> 90 minutes	55	13	24.4%	
Use of Drains				
Yes	26	8	30.8%	0.011*
No	74	10	13.2%	

Table 5: Microbiological Profile of SSI Cases

Pathogen Identified	Number of Cases (N=15/18 Positive Cultures)	Percentage (%)
Escherichia coli	6	40%
Staphylococcus aureus	4	26.7%
Klebsiella pneumoniae	3	20%
Pseudomonas aeruginosa	2	13.3%

Table 6: Postoperative Complications and Outcomes

Complication	Patients with SSI (N=18)	Percentage (%)
Prolonged Hospital Stay (>7 days)	11	61.1%
Wound Debridement	7	38.9%
Readmission Due to Infection	2	11.1%
Mortality	0	0%

DISCUSSION

Surgical site infections (SSIs) after gynecological procedures increase morbidity, hospital stays, and medical costs. This study had an 18% SSI rate, which is typical. The kind of operation, patient risk factors, and perioperative care can affect SSI rates from 10% to 25%. SSI causes must be identified to improve patient outcomes and avoid them. Obesity (BMI >30 kg/m2) was associated with 55.6% of SSIs (p=0.003). Obesity delays wound healing and increases infection risk due to increased wound tension, poor tissue perfusion, and reduced immune response. This is consistent with Ghuman et al. (2017), who identified 21.4% SSI in obese women undergoing gynecological procedures [6]. Diabetes mellitus was found in 27.8% of SSI patients, according to Cheng et al. (2018) [7]. Reduced wound healing and poor leukocyte function increased the likelihood of postoperative infections. SSIs are associated with other concomitant disorders such anaemia (44.4%) and hypertension (38.9%), suggesting that people in poor health are more susceptible to infectious consequences.

Surgery type greatly affected SSI rates. This study found that abdominal hysterectomy (23.8%) caused the most SSI, followed by laparoscopic (10.7%) and vaginal (16.7%). Abdominal surgery infections increase due to larger incisions, tissue manipulation, and longer operating times. These findings support the use of minimally invasive procedures to reduce infection risks since Kiran et al. (2019) [8] found an SSI rate of 20.5% in open hysterectomies and 8.9% in laparoscopic surgeries. SSIs were also affected by operation duration. Procedures over 90 minutes showed 24.4% infection rate, compared to 11.1% for shorter ones (p=0.019). Long surgical times cause tissue damage and bacterial contamination, slowing wound healing. Owens and Stoessel (2016) [9] found that SSI risk increased with operating time, underlining the necessity for efficient surgery and time management to reduce infection risks. Additionally, surgical drainage increased SSI (30.8%, p=0.011). Continuous drain uses increases SSI rates due to microbial invasion, according to a 2017 meta-analysis by Leaper et al. [10]

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Escherichia coli (40%) was the most often isolated pathogen, followed by *Staphylococcus aureus* (26.7%), *Klebsiella pneumoniae* (20%), and Pseudomonas aeruginosa (13.3%). According to Maheshwari et al. (2020) [11], E. coli caused 38% of SSIs after gynaecological surgeries. This study showed that Gram-negative bacteria were most responsive to piperacillin-tazobactam and meropenem, whereas Gram-positive bacteria were most sensitive to vancomycin and linezolid, underlining the importance of targeted antibiotic therapy The frequency of SSIs increased hospital stays and surgical complications. Infected patients spent 61.1% longer in the hospital than non-infected ones. In addition, 38.9% of SSI patients needed wound debridement and 11.1% needed serious infection readmission. These findings underline the economic and clinical burden of SSIs and the need for infection management. Though interesting, this study has major disadvantages. A 100-patient sample restricts generalisability. Future research must be larger and multicentric to corroborate results. 2) The study was conducted at ANMMCH, Gaya, Bihar, and surgical techniques, infection control practices, and patient demographics may differ elsewhere, affecting its external validity. Late-onset SSIs may have been missed due to the 30-day follow-up. Antiseptic skin preparation, intraoperative temperature regulation, and surgeon factors may affect SSI rates but were not investigated. A complete antibiotic resistance profile, needed for empirical therapy and antibiotic stewardship, was not explored. Expand this research with multicenter, long-term late-onset SSI studies. Studying preoperative antiseptics, intraoperative sterilisation, and postoperative wound care could avoid infections. Minimally invasive procedures may lower SSIs. Complete antibiotic resistance analysis may improve hospital antibiograms and empirical treatment. Finally, cost-effectiveness studies on SSIs' economic effects and infection control improvements could inform healthcare policy. This study emphasises early risk factor identification, infection prevention, and appropriate surgical procedures to minimise SSIs after gynaecological surgery. Improve postoperative results, healthcare expenditures, and patient safety.

CONCLUSION

Gynaecological surgeries often induce SSIs, which occurred 18% of the time in our study. Risk factors include obesity, diabetes, anaemia, prolonged surgery, and drainage. Less invasive laparoscopic operations showed lower infection rates than abdominal hysterectomy, which had the highest. Escherichia coli was the most prevalent pathogen, followed by Staphylococcus aureus and Klebsiella pneumoniae, stressing targeted antibiotics. SSIs increased hospital stays, wound care, and readmissions, highlighting their clinical and economic burden. Infection prevention needs better preoperative patient management, aseptic techniques, and antibiotics. More samples and longer follow-ups are needed to understand long-term infection risks and prevention. Improved infection control improves gynaecological surgery outcomes and patient safety.

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