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A Comprehensive Approach for Prevention and Management of Surgical Wound Infections in Obs & Gynae Cases

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Abstract

Introduction: *Gynecological postoperative infections are a severe clinical issue that impacts patients' outcomes, healthcare costs, and overall quality of life. These infections cause longer hospital stays and higher medical costs, delayed recovery, and potential long-term issues. Modern healthcare depends on postoperative infection control because it promotes higher surgical success rates, improved patient safety, and resource efficiency. This study was done to implement a comprehensive strategy for the prevention and management of surgical wound infections in obstetrics and gynecology cases.*

Methods: *This retrospective study was conducted in the Department of Obstetrics and Gynecology of Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh, from January 2023 to January 2024. This study included 100 Obs & Gynae cases with surgical site infection.*

Result: *We found the mean age 35.74± 10.45 years. The most common comorbidities were hypertension, DM, and obesity. The majority (87%) of our patients had superficial incisional SSI, followed by 8% who had deep incisional SSI. The microbiological profile revealed Staphylococcus aureus (40%) as the most frequently isolated pathogens, followed by Acinetobacter spp. (25.26%), and Pseudomonas spp. isolated in 13.68%. Most of our patients (28.42%) were sensitive to Linezolid, followed by 17.89% were sensitive to Meropenem.*

Conclusion: *Our study's findings show a 95% SSI incidence rate, which emphasizes the necessity of giving SSI control top priority and creating accurate measures for SSI evaluation following discharge. Antimicrobial treatment lowered infection rates. Further lowering SSI rates can be achieved by managing patients with comorbidities and appropriate drug dosage.*

Keywords: *Surgical site infection, Cesarean delivery, Management*

1. INTRODUCTION

Gynecological postoperative infections are a severe clinical issue that impacts patients' outcomes, healthcare costs, and overall quality of life. These infections cause longer hospital stays and higher medical expenses, in addition to adding to patient misery, delayed recovery, and potential long-term issues.

Modern healthcare depends on postoperative infection control because it promotes higher surgical success rates, improved patient safety, and resource efficiency. [1] Gynecological

surgeries comprise a variety of procedures such as cesarean sections, hysterectomies, laparoscopic procedures, and treatments related to reproductive health. Each procedure carries a different risk of postoperative infections because of factors such as foreign materials, compromised immune responses, and surgical site contamination. Healthcare practitioners need to recognize and understand the nuances of postoperative infections in gynecology to develop effective management strategies and preventative measures. [2]

Postoperative infections include urinary tract infections (UTIs), surgical site infections (SSIs), and pelvic inflammatory disease (PID). [1] Surgical site infections (SSIs) are the most common nosocomial infections encountered during inpatient hospitalization. Of these infections, around two-thirds occur in superficial wounds, whereas the remainder infections occur in deeper tissues and organ spaces. [3-5] SSIs are caused by indigenous skin or vaginal bacteria contaminating the wound after surgery. The number of organisms required for the formation of SSI is reduced by a foreign body, such as a suture. [6] The most frequent organisms isolated from SSIs of abdominal incisions are Staphylococcus aureus, coagulase-negative staphylococci, Enterococcus spp, and Escherichia coli. During gynecologic procedures, potentially pathogenic microorganisms may come from the skin or ascend from the vagina and endocervix to the operative sites, which include abdominal incision, upper genital tract, and/or vaginal cuff. Gram-negative bacilli, enterococci, group B streptococci, and anaerobes are more prone to infect gynecologic SSIs due to vaginal and perineal incisions. [7, 8] Methicillin-resistant S aureus (MRSA) has been more prevalent in SSIs in recent years.[3] Diabetes, tobacco use, systemic steroid usage, radiation exposure at the surgical site, poor diet, obesity, extended perioperative stay, and blood product transfusions are risk factors for surgical site infections (SSIs). [3, 9] Preoperative vaginitis due to bacterial vaginosis or Trichomonas vaginalis is associated with an increased risk of post-hysterectomy cuff cellulitis. [4,10] Surgical factors associated with SSIs include prolonged surgery duration, excessive blood loss, hypothermia, hair removal by shaving, and the use of surgical drains. [3,11-13] Patients undergoing abdominal hysterectomy are more likely to experience febrile morbidity than those who undergo vaginal hysterectomy.[13]

Surgical practices that decrease the rates of infection include the use of antiseptic skin preparation, antimicrobial prophylaxis (AMP), thermoregulation, and following a sterile technique.1 Skin preparation with chlorhexidine-alcohol is preferred to povidone-iodine for preventing SSIs. [14] Antimicrobial agents should be administered intravenously no more than 1 hour before making the skin incision. [4, 12,13,15] If the duration of the procedure exceeds the expected duration of adequate tissue levels or 2 half-lives of the prophylactic antibiotic, an additional dose of the antibiotic should be administered. [3] For cefazolin, the most commonly used prophylactic antibiotic, a repeat dose should be given if the duration of surgery exceeds 3 hours. [4] An additional dose of the antibiotic should be administered in case the estimated blood loss is more than 1500 mL. [5] With current AMP practices, the rate of postoperative infections has decreased by approximately 50%. [15] AMP is recommended for all types of hysterectomies and induced abortion. For hysterectomy, cefazolin is the most commonly used AMP agent. [16]

This study was done to implement a comprehensive strategy for the prevention and management of surgical wound infections in obstetrics and gynecology cases.

2. METHODOLOGY & MATERIALS

This was a retrospective study conducted in the Department of Obstetrics and Gynecology of Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh during the period from January 2023 to January 2024. This study included 100 Obs & Gynae cases with surgical site infection.

These are the following criteria to be eligible for enrollment as our study participants:

Inclusion Criteria

a) Patients aged between 20 to 60 years old;
b) Patients who underwent abdominal hysterectomy, laparotomy & episiotomy;
c) Patients who needed emergency cesarean deliveries;
d) Patients who were willing to participate.

Exclusion Criteria

a) Patients under 18 or over 60 years old;
b) Patients with uncontrolled DM taking proper medication;
c) Patients with infections associated with minor procedures, like episiotomies.

List of obstetric and gynecological procedures: Lower segment cesarean section (LSCS) for cesarean deliveries (CD), abdominal hysterectomy for fibroids or dysfunctional uterine bleeding, episiotomy, and exploratory laparotomy for ectopic pregnancy and ovarian cancer were the obstetric surgical procedures carried out in this study.

Surgical preparation: All the processes followed the same methodology. Razor shaving was finished 24 hours before the procedure. The surgical site was prepared with alcohol, povidone, iodine, and alcohol. The first dressing inspection was carried out 72 hours after the procedure.

Data Analysis: All data were recorded systematically from the case record form. Quantitative data were expressed as mean and standard deviation and qualitative data were expressed as frequency distribution and percentage. Data was analyzed by using the SPSS 22 (Statistical Package for the Social Sciences) version.

3. RESULTS

Table 1. *Baseline characteristics of our patients*

Baseline characteristics	N	P(%)
Mean Age (years) (Min-Max)	35.74± 10.45 (22-55)	
Parity		
1-4	62	62
4-7	38	38
Gestational age		
< 37 weeks	48	48
≥ 37 weeks	52	52
Pregestational BMI		
≤ 25 kg/m2	28	28
25.1-29.9 kg/m2	42	42
≥ 30 kg/m2	30	30
Type of the surgeries		
CS	45	45
Abdominal hysterectomy	30	30
Laparotomy	15	15
Episiotomy	10	10
Bleeding (>1000 ml)	62	62
Chorioamnionitis	43	43
Premature rupture of membranes (PROM)	37	37
Common Symptoms for SSI Diagnosis		
Pain, tenderness, erythema, and edema for superficial incisional SSI	82	82
Purulent drainage, Spontaneous dehiscence of a deep incision, and high fever for deep incisional SSI	8	8
Purulent drainage from the wound site, and culture isolation of an organism from the wound site	5	5
Co-morbidities		
Obesity	52	52
Diabetes	64	64
Hypertension	73	73
Anemia	56	56

Table 1 shows the baseline characteristics of our patients. We found the mean Age 35.74± 10.45 years. The majority (58%) of patients had a gestational age of more than 37 weeks. Most of our patients (45%) had CS, followed by abdominal hysterectomy (30%), laparotomy (15%) & episiotomy (10%). Among the patients, 43% had chorioamnionitis and 37% had premature rupture of membranes (PROM). The most common comorbidities were hypertension and DM.

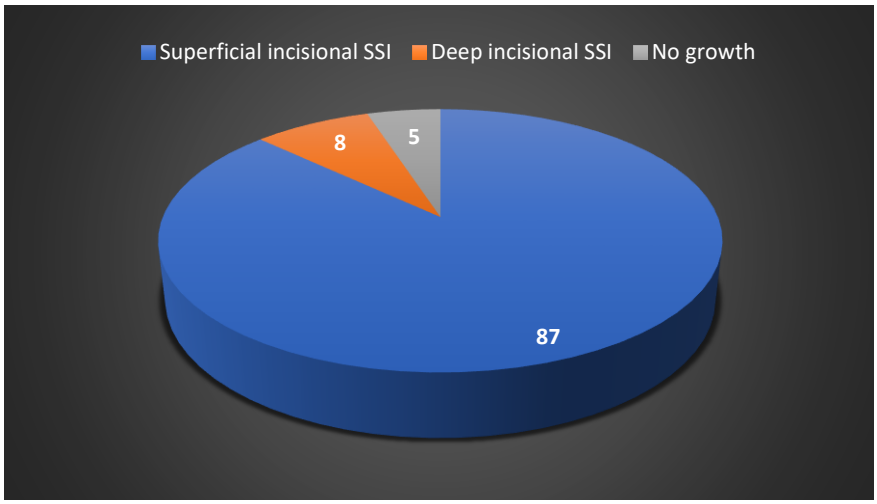

Figure 1. *Distribution of our study patients by surgical site infections*

Figure 1 shows that the majority (87%) of our patients had superficial incisional SSI, followed by 8% had deep incisional SSI, and 5% had no growth of bacteria.

Table 2. *Risk factors for surgical site infections after cesarean delivery*

Risk factors	N	P(%)
Age (>35 years)	22	22
Poor nutrition	27	27
Non-use of prophylactic antibiotics before surgery	31	31
Bleeding of (> 1500 ml)	30	30
Prolonged surgery duration (≥45 min)	31	31
Diabetes Mellitus	38	38
Obesity	34	34
Anemia	33	33
Hyperthermia	19	19
Use of unsterile surgical materials	27	27

Table 2 shows the risk factors for surgical site infections after cesarean delivery. The most common risk factors were DM, obesity, anemia, prolonged surgery duration (≥45 min), bleeding of (>1500 ml), non-use of prophylactic antibiotics before surgery, and using unsterile surgical materials. Other minor risk factors included patients over 35, poor nutrition, and hyperthermia.

Table 3. *Distribution of our study patients by microorganisms & antibiotics (n=95)*

Microorganisms	N	P(%)
Staphylococcus aureus	38	40.00
Acinetobacter spp.	24	25.26
Pseudomonas spp.	13	13.68
Escherichia coli	6	6.32
Enterococcus spp.	5	5.26
Enterobacter spp.	5	5.26
Klebsiella pneumoniae	4	4.21
Total	95	100.0
Antibiotics		
Linezolid	27	28.42
Meropenem	17	17.89
Amikacin	14	14.74
Clindamycin	13	13.68
Gentamicin	11	11.58
Doxycycline	8	8.42
Tigecycline	5	5.26
Total	95	100.0

In Table 3, the microbiological profile revealed *Staphylococcus aureus* (40%) as the most frequently isolated pathogen, followed by *Acinetobacter spp.* (25.26%), and *Pseudomonas spp.* isolated in 13.68%. There were 6 cases of clinical infection with *Escherichia coli, 5 cases of Enterococcus spp*., and *Enterobacter spp*. Most of our patients (28.42%) were sensitive to Linezolid, followed by 17.89% were sensitive to Meropenem, and 14.74% & 13.68% were sensitive to amikacin & clindamycin respectively. Only 5.26% of patients were sensitive to Gentamicin.

4. DISCUSSION

The CDC NNIS system has characterized SSIs into three categories: superficial incisional, deep incisional, and involving organ/space. [16] Within 30 days following surgery, a superficial incisional SSI, also known as a wound infection, affects only the skin or subcutaneous tissue. [16] Deep incisional SSI affects the deep soft tissues, including muscle layers and fascia, and occurs within 30 days following surgery. [16]

In this study, the mean age of our study patients was 35.74± 10.45 years with a minimum and maximum age of 22 & 55 years respectively. Olsen et al found a mean age of 26.5 years with a minimum and maximum years of 15 & 43 years respectively. [17] Wloch et al. found the median age of women included in the study was 31 years (range 14–56). [18] Vallejo et al. found the mean age was 28.6 ± 6.2 years. [19]

In the current study, the majority (87%) of our patients had superficial incisional SSI, followed by 8% had deep incisional SSI, and 5% had no growth of bacteria. Wloch et al found that among all their patients, 348 (88.3%) were superficial incisional, 19 (4.8%) were deep incisional and 27 (6.9%) were organ/space infections, 25 of which were classed as endometritis. [18] Vallejo et al. found the incidence of SSI after CD in their study was 7.0 %, consistent with other studies' estimates. [17,19,20] Globally, there is a large variation in the reported rate of SSI following C-sections; it ranges from 2.7% in a retrospective study done in Nova Scotia to 5.5% in the USA, with a high incidence rate of SSI up to 48% in Tanzania, 23.5% in Brazil, 18.8% in Malaysia, and 14.4% in Jordan. [21-26] A cross-sectional survey at the Estonian University Hospital revealed an SSI rate of 6.2% following a C-section. In contrast, a study from Saudi Arabia found an SSI rate of 9.5% following a cesarean delivery. [27,28]

Risk factors include medical conditions such as diabetes, obesity, smoking, respiratory infections, poor nutrition, longer duration of operation, absence of antibiotic prophylaxis, management by teaching service, use of staples for skin closure, and wound length, which have been linked to SSI studies. [19,29] Of all the risk factors mentioned above, this study found the most common risk factors were DM (38%), obesity (34%), anemia (33%), prolonged surgery duration (31%), and the use of unsterile surgery materials (27%). Diabetes has a strong correlation with SSI resulting from gynecological procedures. [30] There is an association between obesity and SSI including the relative avascularity of adipose tissue, the increase in the wound area, and the poor penetration of prophylactic antibiotics in adipose tissue. [17] A systematic review demonstrated that prolonged surgery duration was associated with a statistically significant increased incidence of SSI in the majority of studies. [31] Many studies reported that operative time was one of only a few independent predictors of SSI. [32,33]

In the present study, the microbiological profile revealed *Staphylococcus aureus*(40%) as the most frequently isolated pathogen, followed by *Acinetobacter spp.* (25.26%), and *Pseudomonas spp.* isolated in 13.68%. There were 6 cases of clinical infection with *Escherichia coli, 5 cases of Enterococcus spp*., and *Enterobacter spp*. Of all patients, 5% of them did not grow any microorganisms. Wloch et al found that 24.2% (38/ 157) were reported to be polymicrobial. The most commonly reported pathogen was Staphylococcus aureus (40.4%), followed by anaerobic cocci (23.2%), Enterobacteriaceae (13.3%), and streptococci (7.4%).[18] According to Vallejo et al., 35% of wound cultures developed polymicrobial, 18% had methicillin-resistant Staphylococcus aureus, 18% contained methicillin-sensitive Staphylococcus aureus, 18% included anaerobic organisms, and 11% did not produce any organisms. [19]

In this study, 28.42% were sensitive to Linezolid, followed by 17.89% were sensitive to Meropenem, and 14.74% & 13.68% were sensitive to amikacin & clindamycin respectively. Only 5.26% of patients were sensitive to Gentamicin. Wloch et al reported that 17.1% of patients were methicillin-resistant. [18]

Antimicrobial treatment needs to target the common microbiological pathogens linked to gynecologic infections following surgery. Antibiotic treatment for incisional cellulitis should address gram-positive cocci. Infection of a localized wound needs incision and drainage. [16] Furthermore, there is evidence that a strikingly low incidence of SSI occurs in patients who receive antibiotics before surgery, providing compelling evidence of the preventive effect of antibiotic prophylaxis in lowering the SSI rate. [34]

5. Limitations of the Study

This study was a single-center study with a short study period. The sample size was small so it does not represent the whole community.

6. Conclusion and Recommendations

The findings of our study show that we had a 95% SSI incidence rate and therefore this study emphasizes the necessity of giving SSI control top priority and creating accurate measures for SSI evaluation following discharge. Concerning obstetric and gynecological operations, the study found several risk factors for SSI that should be managed to mitigate the SSI incidence rate. Infection rates were lowered with antimicrobial treatment in the proper time in appropriate doses. Further lowering SSI rates can be achieved by managing patients with appropriate drug dosage, shortening surgical times, and using sterile surgical materials. Anemia, DM with other medical diseases of patients should be treated before surgery. A crucial component of preventing microbial resistance is implementing fresh, evidence-based policies on preoperative and postoperative antibiotic use.

Further study with a prospective and longitudinal study design including a larger sample size needs to be done to validate our research findings.

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