International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622
© Gynaecology Journal
www.gynaecologyjournal.com
2024; 8(6): 110-117
Received: 03-11-2024
Accepted: 02-12-2024

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Study of surgical site infection among patients undergoing obstetrics and gynaecological operation in a teaching institute

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DOI: https://doi.org/10.33545/gynae.2024.v8.i6b.1549

Abstract
Introduction: Surgical site infection is a type of healthcare-associated infection, in which a wound infection occurs after an invasive (surgical) procedure. Incidence varies from 0.5 to 15% depending on the type of operation and underlying patient status. This study was carried out to find risk factors of surgical site infection, most common causative organism and their antibiotic susceptibility.
Materials and Methods: This study was carried out by the Department of Obstetrics and Gynaecology in collaboration with the Department of Microbiology of Agartala Government Medical College among 300 patients undergoing different surgeries. The patient was followed up till the 30th postoperative day for the development of infection.
Result: The likelihood of developing surgical site infection was 9.3% and among which all had superficial infection. The most common organism isolated was *E. coli* (21%), followed by *Staphylococcus aureus* and Pseudomonas aeruginosa. *E. coli* is highest susceptible to Amikacin & highest resistance is observed with Ciprofloxacin.
Most of the patients had Anaemia (3.6%), Prolonged PROM (7.1%), and Diabetes (10.7%), Gestational DM (3.6%) gest. HTN, 2 (7.1) Obstructed labour and (17.9%), PROM, etc. Most of the patients had emergency surgery (P=0.0425). In patients with infection, 53.6% had Transverse incision and 46.4%patients had Vertical incision. In patients with infection, the mean duration of hospital stay before Surgery was 2.60±4.79 days. In our study 32.2%patients had requirement of secondary suturing. The mean Postoperative day of developing SSI of patients was 7.92±2.05 days. The mean Post-operative day of hospital stay due to infection was 0.64±2.37days.
Conclusion: In our observation, we concluded that the incidence of SSI was higher for Obstetric surgeries compared to Gynecological surgeries. Multiple risk factors identified in the present study can be helpful for SSI risk stratification in our institution. Practitioners and hospitals may use this information as they develop strategies for SSI prevention in their own practice.

Keywords: Surgical site infection, patients, obstetrics, gynaecological operation, teaching institute

Introduction
Skin is a natural barrier against infection. So, any surgery that causes a break in the skin can lead to postoperative infection. Any purulent discharge from a closed surgical incision, together with signs of inflammation of the surrounding tissue is considered as wound infection.

Surgical site infections are defined as infections occurring within 30 days after a surgical operation or within one year if an implant is left in place after the procedure and affecting either the incision or deep tissue at the operation site [1].

Surgical site infections are the third most frequently reported nosocomial infections, accounting for 14% to 16% of all nosocomial infections among hospitalized patients [2].

It is responsible for increasing the length of stay of patients which result in social and economic loss to patients and family.

The manifestation of postoperative wound infection has tri factorial basis: The overall systemic trauma, local host damage, and bacterial contamination of the wound. The progression of a wound to an infected state involves a multitude of microbial and host factors such as type, site, size, and depth of the wound, the extent of nonviable exogenous contamination, level of blood perfusion to wound, general health, and immune status of the host. The caesarean section now a days is a commonly performed surgical procedure. It is a clean category surgery according to classification. Post caesarean section surgical site infection is frequently occurring.

It poses a substantial health risk with regards to prolonged hospital stay, morbidity, mortality, cost, and inappropriate use of broad-spectrum antibiotics leading to antimicrobial resistance [3].
Surgical site infections are an indicator of the quality of health care. Analysis of the reliable hospital data will help to determine the factors responsible for it and thereby will help in preventing them.
Most of the studies on surgical site infections in Lower Segmental Caesarean Section (LSCS) patients and patient undergoing gynaecological operations have been conducted outside India. As a result, not much data is available on the incidence rates of surgical site infections among patients undergoing LSCS and gynaecological operations in Indian hospitals. The data is also lacking knowledge of common pathogens causing it. There exists a need to investigate intraoperative and postoperative risk factors for surgical site infection after caesarean section and gynaecological operations. In spite of the availability of antibiotics surgical site infections are still responsible for much morbidity and for reaching socioeconomic consequences for both patients as well as health care systems.
Reduction in surgical site infections while minimizing antibiotic resistance still remains a challenge for operations in Indian hospitals. The data is also lacking knowledge of common pathogens causing it. There exists a need to investigate intraoperative and postoperative risk factors for surgical site infection after LSCS and gynaecological operations.
Surgical site infection (SSI) is a type of healthcare-associated infection, in which a wound infection occurs after an invasive (surgical) procedure. Surgical site infections are frequent; the incidence varies from 0.5 to 15% depending on the type of operation and underlying patient status [4, 5]. It limits the potential benefits of surgical procedures. The impact of SSI on hospital costs and postoperative length of stay (between 3 and 20 additional days) is considerable [6-8]. Infection of abdominal wound following surgery is due to its contamination from the air, from organisms on patients' skin, or from infectious foci in abdominal cavity. It can also be the result of inadequate aseptic technique by the theatre staff (including the surgeon) or of the secondary infection of a hematoma. Fever without apparent cause should always awaken suspicion of infection in the wound. The common causes of wound dehiscence are infection at the wound, pressure on sutures, sutures too tight, injury to the wound area, weak tissue or muscle at the wound area, incorrect suture technique used to close operative area, use of high-dose or long-term corticosteroids, severe vitamin C deficiency (scurvy). There are some known risk factors associated with the surgical wound infection and disruption. Important among them are overweight, increasing age, poor nutrition, diabetes, jaundice, smoking, malignant growth, presence of prior scar or radiation at the incision site, non-compliance with post-operative instructions (such as early excessive exercise or lifting heavy objects), surgical error, increased pressure within the abdomen due to: fluid accumulation (ascites); inflamed bowel; severe coughing; straining; or vomiting, long-term use of corticosteroid medication, other medical conditions such as diabetes, kidney disease, cancer, immune problems, chemotherapy, radiation therapy [4, 5].

Materials and Methods

Study Design: Prospective study.

Type of study: Observational study.

Setting: The study was conducted in the Department of Obstetrics and Gynecology in collaboration with the Department of Microbiology, AGMC & GBP Hospital.

Study duration: One and a half years.

Study population: Patients underwent different obstetric and gynaecological operations like Elective caesarean section, Emergency caesarean section, vaginal hysterectomy, Total abdominal hysterectomy, and laparotomy for different reasons, etc. at AGMC &GBP hospital target population.

Sample size calculation

$$N = Z_{\propto}^{2}PQ / D^{2}$$

N = No of patients
P = Prevalence = 24.2 (ref 56)
Q = (100_ 24.2) = 75.8
Z = 1.96 at 95% confidence interval
D = 5% (absolute precision)
So by this formula N=282
~ 300

Sampling technique: A simple random sampling technique was used to choose the study sample from different patients undergoing obstetrics and Gynaecological surgeries at AGMC.

Study tools
1. A pre-designed and pre-tested interview
2. Swab stick to collect wound swabs for culture and sensitivity testing.

Inclusion criteria
1. Surgery done in this hospital.
2. Occur after the operation till the 30th postoperative day.

Exclusion criteria
1. Patients who already suffered from cutaneous or soft tissue infections before the study.
2. All the cases operated outside the hospital.

Data collection method
According to data available in their department, the proportion of Obstetrics and Gynaecological surgeries is 2:1, and accordingly, my sample size was divided, 200 for Obstetrics cases and 100 for Gynaecological cases. Considering one and half years for data collection; 1 year has 52 weeks and 6 days of OT per year. Hence, 1 patient was selected per day from the OT list to be included in the study. Since the proportion of Obst. Surgeries to Gynae surgeries is 2:1, hence 4 days were randomly selected in a week and 1 Obst. Patient per day was selected by simple random sampling by lottery method from the OT list of that particular day and 2 remaining selected days in a week, 1 gynaecological patient per day undergoing surgery was selected by simple random sampling by lottery method from the gynaecological OT list of the particular day.
All registered women were first counseled regarding the aim of the study and written consent was taken from them in language understandable to them in prescribed preformat. A detailed history had been taken from all patients followed by general and systemic examination along with necessary investigations to rule out any local and systemic infections. Blood and serological

investigations were performed as a prerequisite for anesthesia. The patients were being prepared for abdominal or vaginal approach, either elective or emergency as per the need of patients. These patients were monitored for evidence of infection after surgeries.

The following clinical parameter was used to diagnose surgical site infection: 1. Erythema and or induration, serous oozing, the presence of pus.2. Separation of edges of suture line and lab parameters: wound swab culture and sensitivity.

Operated patients were followed up regularly, during the post-operative period. The wound was checked on the 3rd postoperative day routinely and later according to the complaints of the patients and on the day of discharge, then follow-up of those patients used to be done till the 30^{th} postoperative day.

Plan for statistical analysis

Data-related outcome variables like age, body mass index, associated risk factors like diabetes, anemia, nature of surgery whether emergency or elective, route of surgery, intraoperative complications, preoperative hospital stay, and use of antimicrobial before operation, patients developing surgical site infection, frequency of various pathogens causing surgical site infection, morbidity related to surgical site infection like duration of hospital stay, sensitivity pattern of microorganisms, a requirement of secondary suture etc. were entered in the master chart and analyzed using Microsoft Excel software.

Statistical Analysis

For statistical analysis, data were entered into a Microsoft Excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. A chi-squared test ($\chi 2$ test) is any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualifications, 'the chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer’s exact test, as appropriate.

Explicit expressions that can be used to carry out various *t*-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a *t*-distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test.

Once a *t* value is determined, a *p*-value can be found using a table of values from Student's t-distribution. If the calculated *p*-value is below the threshold chosen for statistical significance (usually the 0.10, 0.05, or 0.01 level), then the null hypothesis is rejected in favor of the alternative hypothesis.

P-Value ≤ 0.05 was considered statistically significant

Result and Analysis

In our study, 28 (9.3%) patients had developed SSI, and all patients [300 (100.0%)] had Superficial SSI.

Table 1: Distribution of pathogens isolated

Organism distribution		
Name of isolated organism	**Number of found**	**% of organism**
Escherichia coli	10	36%
Staphylococcus aureus	6	21%
Acinetobacter Spp.	3	11%
Klebsiella pneumoniae	3	11%
Proteus vulgaris	1	3%
Pseudomonas aeruginosa	5	18%

E. coli is highest susceptible to Amikacin & highest resistance is observed with Ciprofloxacin. Pseudomonas is highly susceptible to Amikacin and the highest resistance is observed with Levofloxacin.

Highest susceptibility of Acinetobacter seen with Levofloxacin and Imipenem, highest resistance is observed with Ceftriaxone.

The highest susceptibility of Klebsiella pneumoniae is observed with Imipenem.

Staphylococcus aureus is highly susceptible to Doxycycline & the highest resistance is observed with Ceftriaxone.

In our study, 19 (6.3%) patients were ≤ 20 years of age, 133 (44.3%) patients were 21 to 30 years of age, 65 (21.7%) patients were 31 to 40 years of age, 60 (20.0%) patients were 41 to 50 years of age, 20 (6.7%) patients were 51 to 60 years of age and 3 (1.0%) patients were >60 years of age.

With SSI, 3 (10.7%) patients were ≤ 20 years of age, 14 (50.0%) patients were 21 to 30 years of age, 7 (25.0%) patients were 31 to 40 years of age, 2 (7.1%) patients were 41 to 50 years of age and 2 (7.1%) patient were 51 to 60 years of age. Association of Age in a group with SSI was not statistically significant (P=0.5224).

The mean Age (Mean ± S.D) of patients was 33.55±11.03 years.

Without SSI, the mean Age (Mean ± S.D) of patients was 33.79±11.10 years.

With SSI, the mean Age (Mean ± S.D) of patients was 31.21±10.19 years.

The association of mean Age with SSI was not statistically significant (P=0.2400).

The mean BMI (Mean ± S.D) of patients was 26.04±3.01 Kg/mt^2. In Without SSI, the mean BMI (Mean ± S.D) of patients was 26.04±2.92 kg/mt^2.In With SSI, the mean BMI (Mean ± S.D) of patients was 26.07±3.84 kg/mt^2.

The association of mean BMI with SSI was not statistically significant (P=0.9637).

In our study, 91 (30.3%) patients were from the Lower class, 100 (33.3%) patients were from the Lower Middle class, 20 (6.7%) patients were from the Upper class and 89 (29.7%) patients were from Upper Middle class according to kuppuswamy scale.

Table 2: Distribution of risk factors of SSI

Risk factors of SSI	Frequency	Percent
Anaemia	33	11.0%
Anaemia, Diabetes mellitus, hypertension	1	0.3%
Anaemia, Prolonged Premature rupture of membranes	1	0.3%
Diabetes mellitus	7	2.3%
Gestational Diabetes mellitus	8	2.7%
Gestational Diabetes mellitus, Gestational hypertension	1	0.3%
Gestational hypertension	19	6.3%
Hypertension	20	6.7%
NIL	152	50.7%
Obesity	6	2.0%
Obesity, Gestational Diabetes mellitus	4	1.3%
Obesity, Gestational hypertension	5	1.7%
Obstructed labour	12	4.0%
Prolonged labour	4	1.3%
Premature rupture of membranes	27	9.0%
Total	300	100.0%

In our study, 99(33.0%) patients had Gynaecological Surgery, and 201 (67.0%) patients had Obstetrics Surgery.

Table 3: Distribution of pattern of surgical procedures

Name of Surgical procedures	Frequency	Percent
Laparotomy	32	10.7%
Lower segment Cesarean section (LSCS)	199	66.3%
Myomectomy	2	0.7%
Total abdominal hysterectomy and bilateral salpingo-oophorectomy (TAH+BSO)	58	19.3%
Vaginal hysterectomy and pelvic floor repair (VH+PFR)	9	3.0%
Total	300	100.0%

In our study, 32 (10.7%) patients had Laparotomy Surgery, 199 (66.3%) patients had LSCS Surgery, 2 (0.7%) patients had Myomectomy Surgery, 58 (19.3%) patients had TAH+BSO Surgery and 9 (3.0%) patients had VH+PFR Surgery.

Table 4: Association between the categories of surgery with SSI

	SSI		
Category of surgery	**No**	**Yes**	**Total**
Elective	161	11	172
Emergency	111	17	128
Total	272	28	300

Chi-square value: 4.1120, **P-Value:** 0.0425
Odds ratio: 2.2416 (1.0112, 4.9691)

In our study, 172 (57.3%) patients had Elective and 128 (42.7%) patients had Emergency surgery. In with SSI, 11 (39.3%) patients had Elective and 17 (60.7%) patients had Emergency. Emergency procedures had more frequency of SSI than elective surgery.
The association of Category of surgery with SSI was statistically significant (P=0.0425).
In our study, 214 (71.3%) patients had Transverse incisions and 77 (25.7%) patients had Vertical incisions. In with SSI, 15 (53.6%) patients had Transverse incision and 13 (46.4%) patients had Vertical incision.

The association of type of incision with SSI was statistically significant (P=0.0238).

Table 5: Association between types of skin incision with SSI

	SSI		
Type of skin incision	**No**	**Yes**	**Total**
Perineal	9	0	9
Transverse	199	15	214
Vertical	64	13	77
Total	272	28	300

Chi-square value: 7.4788, **p-value:** 0.0238

In our study, 269 (89.7%) patients had Antibiotics used before surgery. With SSI, 25 (89.3%) patients had Antibiotics used before surgery.
The association of Preoperative antibiotics use with SSI was not statistically significant (P=0.9445).
In our study, 110 (36.7%) patients had Intra-operative blood transfusions.
With SSI, 12 (42.9%) patients had Intraoperative blood transfusions.
The association of Intraoperative blood transfusion with SSI was not statistically significant (P=0.4752).
The mean Duration of hospital stay before Surgery in Days (Mean ± S.D) of patients was 4.42±4.70 days.

Table 6: Association of mean duration of hospital stay before Surgery in days with SSI

		Number	Mean	SD	Minimum	Maximum	Median	P-Value
Duration of hospital stay before Surgery in Days	No	272	4.61	4.79	0.00	21.00	1.00	0.0317
	Yes	28	2.60	4.79	0.00	10.00	1.00	

In Without SSI, the mean Duration of hospital stay before Surgery in Days (Mean ± S.D) of patients was 4.61±4.79 days.

In With SSI, the mean Duration of hospital stay before Surgery in Days (Mean ± S.D) of patients was 2.60±4.79 days.

The association of the mean Duration of hospital stay before Surgery in Days with SSI was statistically significant (P=0.0317).
In our study, 9 (32.2%) patients required secondary suturing.
The mean Postoperative day of developing SSI (Mean ± S.D) of patients was 7.92±2.05 days.
The mean Post-operative day of hospital stay due to SSI (Mean ± S.D) of patients was 0.64±2.37 days.

Discussion

In our study 19 (6.3%) patients were ≤ 20 years of age, 133 (44.3%) patients were 21 to 30 years of age, 65 (21.7%) patients were 31 to 40 years of age, 60 (20.0%) patients were 41 to 50 years of age, 20 (6.7%) patient were 51 to 60 years of age and 3 (1.0%) patients were > 60 years of age. Present study showed that the mean Age (Mean ± S.D) of patients was 33.5500±11.0321 years.
We examined that the mean BMI (Mean ± S.D) of patients was 26.0467±3.0180 Kg/mt2.
We observed that, 91 (30.3%) patients were from the Lower class, 100 (33.3%) patients were from the Lower Middle class, 20 (6.7%) patients were from the Upper class and 89 (29.7%) patients were from upper middle class according to kuppuswamy scale.
Adane F, *et al*. (2019) [9] showed that caesarean section was 8.81% (95% CI: 6.34-11.28). Prolonged labor, prolonged rupture of membrane, presence of anemia, presence of chorioamnionitis, presence of meconium, vertical skin incision, greater than 2 cm thickness of subcutaneous tissue, and general anesthesia were significantly associated with surgical site infection post-Cesarean section.
Shrestha S, *et al*. (2014) [10] showed that the incidence rate of surgical site infection was 82 (12.6%). SSI was found to be common in women who had ruptured membranes before surgery, who underwent emergency surgery, and women who had vertical skin incisions and interrupted skin suturing during surgery. Surgical site infection following cesarean section is common.
Ezechi OC, *et al*. (2009) [11] showed that there were also significantly higher proportions of subjects with prolonged rupture of membrane (P=0.02), prolonged operation time (P=0.001), anemia (P=0.031) and multiple vaginal examinations during labor (0.021) among the women that had wound infection compared to the women that did not have a wound infection. After adjustment for confounders only prolonged rupture of membrane (OR = 4.45), prolonged operation time (OR = 2.87), and body max index > 25 (2.34) retained their association with post cesarean wound infection.
Ojiyi EC, *et al*. (2013) [12] showed that statistically significant risk factors for infection were: body mass index > 25 (P=0.003), prolonged rupture of membranes (P=0.0003), prolonged operation time (P=0.0011), anemia (P=0.0009) and blood transfusion (p<0.0001), multiple vaginal examinations during labour (p<0.0001) and long duration of labour before cesarean section (p<0.0001). To make cesarean section more acceptable to women in their environment, efforts should be concentrated on strategies to prevent the risk factors.
The data from the present study showed that 33 (11.0%) patients had Anaemia, 1 (0.3%) patients had Anaemia, Diabetes, HTN, 1 (0.3%) patients had Anaemia, Prolonged PROM, 7 (2.3%) patients had Diabetes, 8 (2.7%) patients had Gestational DM, 1 (0.3%) patients had Gestational DM, Gestational HTN, 19 (6.3%) patients had Gestational HTN, 20 (6.7%) patients had Hypertension, 6 (2.0%) patients had Obesity, 4 (1.3%) patients had Obesity, Gestational DM, 5 (1.7%) patients had Obesity, Gestational HTN, 12 (4.0%) patients had Obstructed labour, 4 (1.3%) patients had Prolonged labour and 27 (9.0%) patients had PROM.
It was found in our study that with SSI, 6 (21.4%) patients had Anaemia, 1 (3.6%) patients had Anaemia, Diabetes, HTN, 1 (3.6%) patients had Anaemia, Prolonged PROM, 2 (7.1%) patients had Diabetes, (10.7%) patients had Gestational DM, 1 (3.6%) patients had Gestational DM, gest. HTN, 2 (7.1%) patients had Gestational HTN, 1 (3.6%) patients had HTN, 1 (3.6%) patients had Obesity, Gestational DM, 4 (14.3%) patients had obstructed labour and 5 (17.9%) patients had PROM. So, the association of risk factors with SSI was statistically significant (p<0.0001).
We examined that, 101 (33.66%) patients had Gynaecological Surgery and 199 (67.33%) patients had Obstetrics Surgery.
We observed that 32 (10.7%) patients had Laparotomy Surgery, 199 (66.3%) patients had LSCS Surgery, 2 (0.7%) patients had Myomectomy Surgery, 58 (19.3%) patients had TAH+BSO Surgery and 9 (3.0%) patients had VH+PFR Surgery.
The present study showed that, 172 (57.3%) patients had Elective and 128 (42.7%) patients had Emergency. We examined that, 28 (9.3%) patients had developed SSI.
The data from the present study showed that 9(3.0%) patients had Perineal incision, 214 (71.3%) patients had Transverse incision and 77 (25.7%) patients had Vertical incision.
Pathak A *et al.* (2017) [13] showed that the majority of SSIs were superficial. In our study, all patients 28 (100.0%) had Superficial SSI.
Wassef MA *et al.* (2012) [14] showed that the most common organism was *Staphylococcus aureus* (24.3%) then Klebsiella pneumonia (18.5%). MRSA constituted 68% of S. aureus, ESBL-producing Gram-negative bacilli 41.8%, and multidrug-resistant 25.4%. This is an insight to risk factors associated with SSI, the causative pathogens and their sensitivity in their hospital that can help in updating the preoperative antimicrobial prophylaxis.
De D *et al.* (2013) [15] showed that in all age groups, Gram-negative bacilli were the commonest finding. The commonest isolate was Acinetobacter species (32.03%) followed by *Staphylococcus aureus* and coagulase-negative Staphylococcus (21.09%). 23.8% of *Staphylococcus aureus* strains were MRSA. By multivariate logistic regression premature rupture of membrane (PROM), antibiotics given earlier than 2 hours and increased duration of stay in the hospital were found to be significant. A proper assessment of risk factors that predispose to SSI and their modification may help in the reduction of SSI rates.
Malakar A *et al.* (2019) [16] showed that overall incidence of SSI was 9.17%. *Staphylococcus aureus* was the most common organism identified (38%), with a high incidence of Methicillin-Resistant *Staphylococcus aureus* (MRSA) (42.86%), followed by Pseudomonas (23.91%). Overall gram-negative bacteria were responsible for more than half of the cases. All the staphylococcal isolates including MRSA were susceptible to linezolid and regarding antibiotic susceptibility of gram-negative organisms, imipenem and piperacillin-tazobactam were most effective. There is emergence of drug-resistant strains of different bacteria such as Pseudomonas and coagulase-negative Staphylococcus. Injudicious use of antibiotics is one of the reasons for this and, hence, there is a need for a proper antibiotic protocol that should be formulated based on local trends and susceptibility of microorganisms. The present study showed that 10 (36.0%) patients had *E. coli*, 6 (21.0%) patients had

Staphylococcus aureus, 3 (11%) patients had *Acinetobacter Spp.*, 3 (11.0%) patients had Klebsiellapneumoniae, 1 (3%) patients had Proteus vulgaris and 5 (18%) patients had Pseudomonas aeruginosa. *E. coli* is highest susceptible to Amikacin & highest resistance is observed with Ciprofloxacin. *Staphylococcus aureus* is highly susceptible to Doxycycline & the highest resistance is observed with Ceftriaxone. Pseudomonas is highly susceptible to Amikacin and the highest resistance is observed with Levofloxacin. Highest susceptibility of Acinetobacter seen with Levofloxacin and Imipenem, highest resistance is observed with Ceftriaxone. The highest susceptibility of Klebsiella pneumoniae is observed with Imipenem.

Present study showed that, 269 (89.7%) patients had Antibiotics use prior to surgery.

Wassef MA, *et al.* (2012) [14] showed that the incidence of SSI infections was 9.2%. A significant increase was associated with a prolonged preoperative hospital stay, prolonged surgery, contaminated wounds, and the presence of the drain.

The present study showed that the mean Duration of hospital stay before Surgery in Days (Mean ± S.D) of patients was 4.4233±4.7037days. We examined that the mean Postoperative day of developing SSI (Mean ± S.D) of patients was 7.92±2.05 days. The mean post-operative day of hospital stay due to SSI (Mean ± S.D) of patients was 0.64±2.37days.

Dhamecha M, *et al.* (2014) [17] showed that out of 494 patients, 21 patients (4.25%) developed SSI. The highest rate of SSI (50%) was found in the age group 51-60 years. The rate of SSI for 0, 1, 2 & 3 basic risk indices was 1.59%, 3.15%, 5.85% & 25% respectively. The incidence of SSI was higher in elective surgeries as compared to emergency surgeries, a paradoxical finding of their study. Age, Basic SSI risk index, & electivity of the procedure were identified as the main predictors of surgical site infections.

We found that With SSI, 3 (10.7%) patients were ≤ 20 years of age, 14 (50.0%) patients were 21 to 30 years of age, 7 (25.0%) patients were 31 to 40 years of age, 2 (7.1%) patients were 41 to 50 years of age and 2 (7.1%) patient were 51 to 60 years of age. So, the association of Age in the group with SSI was not statistically significant (P=0.5224).

Our study showed that With SSI, 9 (32.1%) patients were from the Lower class, 7 (25.0%) patients were from lower middle class, 1 (3.6%) patients were from the upper class and 11 (39.3%) patients were from upper middle class. So, the association of Socioeconomic status with SSI was not statistically significant (P=0.5552).

Pathak A *et al.* (2017) [13] found that obstetric surgeries had a lower SSI incidence compared to gynecological surgeries (1.2% versus 10.3% respectively). Each day increase in stay in the hospital after the surgery increased the risk of contracting an SSI by 5%. Incidence and risk factors from prospective SSI surveillance can be reported simultaneously for Obstetric and Gynecological surgeries and can be part of routine practice in resource-constrained settings. The incidence of SSI was lower for Obstetric surgeries compared to Gynecological surgeries. Multiple risk factors identified in the present study can be helpful for SSI risk stratification in low-middle-income countries.

Steiner HL *et al.* (2017) [18] studied the epidemiology and pathophysiology of SSIs in gynecologic surgery and evaluated the current literature regarding possible interventions for SSI prevention, both as individual measures and as bundles. Data from the obstetrical and general surgery literature will be reviewed when gynecological data are either unclear or unavailable. Practitioners and hospitals may use this information as they develop strategies for SSI prevention in their own practice.

We observed that in With SSI, 8 (28.6%) patients had Gynecological surgery and 20 (71.4%) patients had Obstetrics surgery. So, the association of Type of surgery with SSI was not statistically significant (P=0.6007).

The present study showed that With SSI, 3 (10.7%) patients had Laparotomy Surgery, 20 (71.4%) I patients had LSCS Surgery, and 5 (17.9%) patients had TAH+BSO Surgery. So, the association of the pattern of surgical procedure with SSI was not statistically significant (P=0.8634).

In our study With SSI, 11 (39.3%) patients had Elective, and 17 (60.7%) patients had Emergency. Emergency procedures had more frequency of SSI than elective surgery. So, the association of Category of surgery with SSI was statistically significant (P=0.0425).

In our study With SSI, 15 (53.6%) patients had Transverse incision, and 13 (46.4%) patients had Vertical incision. So, the association of Type of incision with SSI was statistically significant (P=0.0238).

Jido TA *et al.* (2012) [19] showed statistically significant determinants of infection are: Long duration of labor before CS (*p*<0.001), Long operation time (P=0.009), heavy intraoperative blood loss, and blood transfusion (*p*<0.001). Eleven (25%) of the cases had CS due to obstructed labor compared to 15.3% of controls.

In our study With SSI, 25 (89.3%) patients had Antibiotics used before surgery. The p-value is 0.9445. So, the association of Preoperative antibiotic use with SSI was not statistically significant. With SSI, 12 (42.9%) patients had Intraoperative blood transfusions. So, the association of Intraoperative blood transfusion with SSI was not statistically significant (P=0.4752).

In our study, there was hardly any difference between the mean Age With SSI (31.2143±10.1993) and the mean Age Without SSI (33.7904±11.1038) and the p-value is P=0.2400. So, the association of mean Age with SSI was not statistically significant.

Ezechi OC, *et al.* (2009) [11] showed that the proportion of subjects with a body mass index greater than 25 was significantly higher among the subjects with wound infection (51.3%) than in the subjects without wound infection (33.9%) P=0.011.

Wloch C *et al.* (2012) [20] showed that being overweight (body mass index [BMI] 25-30 kg/m2 odds ratio [OR] 1.6, 95% confidence interval [95% CI] 1.2-2.2) or obese (BMI 30-35 kg/m2 OR 2.4, 95% CI 1.7-3.4; BMI > 35 kg/m2 OR 3.7, 95% CI 2.6-5.2) were major independent risk factors for infection (compared with BMI 18.5-25 kg/m2). There was a suggestion that younger women, and operations performed by associate specialist and staff grade surgeons had a greater odds of developing surgical site infection with OR 1.9, 95% CI 1.1-3.4 (< 20 years versus 25-30 years), and OR 1.6, 95% CI 1.0-2.4 (versus consultants), respectively.

It was found that the mean BMI With SSI was 26.0714±3.8483 the mean BMI Without SSI was 26.0441±2.9281 and the p value is P=0.9637. So, the association of mean BMI with SSI was not statistically significant.

In our study Without SSI, the mean Duration of hospital stay before Surgery in Days (Mean ± S.D) of patients was 4.6103±4.7919. In With SSI, the mean Duration of hospital stay before Surgery in Days (Mean ± S.D) of patients was 2.6071±4.7919. This was statistically significant (P=0.0317).

Fig 1: Surgical site infection

Fig 2: Surgical site infection

Acknowledgment

It is a privilege to express my sincere and deepest gratitude towards my teacher & guide Dr. Ashis Kumar Rakshit, whose invaluable guidance, constant encouragement, timely help, affectionate attitude, healthy criticism, and valuable suggestions helped me to complete my work. I extend my utmost heartfelt regards to all my honorable teachers and Dr. Dhruba Prasad Paul who has inculcated his vast knowledge and experience and made my learning not only possible but meaningful.

Conclusion

In our observation, we concluded that the incidence of SSI was higher for Obstetric surgeries compared to Gynecological surgeries. Multiple risk factors identified in the present study can be helpful for SSI risk stratification in our institution. Practitioners and hospitals may use this information as they develop strategies for SSI prevention in their own practice. As a part of preventive measures active surveillance of SSI and strict infection control practice is the need of the hour. Further evaluation with a larger sample size and molecular characterization of drug-resistant pathogens may be undertaken for valid conclusions.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article
Debnath S, Rakshit AK, Paul DP. Study of surgical site infection among patients undergoing obstetrics and gynaecological operation in a teaching institute. International Journal of Clinical Obstetrics and Gynaecology 2024;8(6):110-117.