International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Anamika et al. Int J Reprod Contracept Obstet Gynecol. 2025 Sep;14(9):2934-2939
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20252720

Original Research Article

An observational study of postoperative surgical site infection in abdominal obstetrics and gynecological surgeries in tertiary care set up of south Gujarat

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Received: 09 April 2025
Revised: 27 July 2025
Accepted: 29 July 2025

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ABSTRACT

Background: Surgical site infections (SSIs) represent a significant type of healthcare-associated infection, especially following major obstetric and gynecological surgeries. The incidence of SSI varies widely depending on patient health and type of surgery, that impacts hospital resources and patient recovery time. Despite advances in surgical techniques, SSIs remain a major cause of morbidity. This study aimed to investigate risk factors, bacterial patterns, and outcomes associated with postoperative SSIs in obstetric and gynecological surgeries.
Methods: Conducted as a prospective observational study over 10 months in the OG department of a tertiary healthcare center in south Gujarat, 50 patients with post-operative SSIs were consecutively recruited using purposive sampling. Inclusion criteria included major abdominal surgery patients with post-operative SSIs, with exclusions for non-consenting patients, laparoscopic procedures, and surgeries conducted outside the institution.
Results: Among 50 patients, the highest SSI incidence was found in cesarean sections (74%), with abdominal hysterectomies and laparotomies accounting for 16% and 10%, respectively. Most patients (60%) were aged 19-29 years, and 44% had a BMI of 30-39.9. About 52% showed bacterial growth in wound cultures, with *E. coli* (14%) and *Staphylococcus aureus* (10%) as predominant organisms. Notable infection-related outcomes included deep skin gaps in 40% of cases and slough formation in 22%.
Conclusions: This study highlighted the risk factors associated with SSIs in abdominal obstetric and gynecological surgeries, emphasizing high infection rates in cesarean deliveries. The findings underscore the importance of targeted infection control & effective postoperative care protocols to improve patient outcomes in this population.

Keywords: Cesarean section, Infection control, Obstetrics and gynecological surgery, Postoperative morbidity, SSI

INTRODUCTION

Surgical site infection (SSI) are a significant concern in healthcare, SSI is a type of hospital (healthcare) associated infection, in which a wound infection at surgical site occurs after an invasive surgical procedure. Surgical site infection are frequent, the incidence varies from 0.5 to 15% depending on the type of surgical procedure and underlying patient status.[1,2]

It limits the potential benefits of surgical procedures. The impact of SSI on hospital status and postoperative period of stay is considerable.

Despite advances in surgical methods and a better understanding of the etiology of wound infection and wound healing, post-operative wound infection (SSI) remains as one of the major cause of morbidity and sometimes mortality for patients undergoing surgical interventions.[3]

The obstetric and gynaecological procedures, that possess, a potential high risk of post-operative infection includes total abdominal hysterectomy, cesarean section and laparotomy done for obstetrics and gynecology causes. Compared with women delivered vaginally, those delivered by caesarean section at increased risk of infection (2-20-fold). The overall incidence of wound sepsis in India is from 10-33%.[4]

There are few known risk factors associated with the surgical wound infection. Important amongst them are obesity, advancing age, poor nutrition, diabetes mellitus, jaundice, smoking, malignant growth, presence of previous scar or radiation at the incision site, surgical error, severe cough, straining or vomiting, long-term use of steroids etc.[5]

Surveillance of post-operative wound infection (SSI) is a good method for demonstrating the scope of the problem. Keeping the aforementioned reasons in mind, the current study was carried out in order to detect clinical pattern of post-operative wound infections in obstetrics and gynecological surgeries. Present study aimed to assess the risk factors, pattern of organism and outcome in postoperative SSI.

METHODS

Study type

It was a prospective observational study.

Study place and duration

The study took place at the obstetrics and gynecology (OG) department of a tertiary healthcare center in south Gujarat for a period of 10 months June 2023- march 2024.

Inclusion criteria

Major abdominal surgery patients with post-operative SSIs.

Exclusion criteria

Non-consenting patients, laparoscopic procedures, and surgeries conducted outside the institution.

Data collection was approved by the ethics committee and spanned 10 months, with an additional 4 months for analysis and reporting.

Procedure

Fifty consecutive patients with post-operative SSI, meeting the inclusion criteria and consenting to participate, were enrolled based on a purposive sampling technique. Participants were selected from among those admitted for major abdominal procedures for obstetric or gynecological indications and were monitored in the post-operative ward for clinical or bacteriological signs of SSI, such as febrile morbidity, tenderness, wound discharge, and organism isolation. Infections were classified following CDC 2019 guidelines, which require occurrence within 30 days post-surgery and involve specified wound characteristics. The primary outcomes included identifying risk factors and organisms associated with SSI and assessing outcomes such as extended hospital stay, need for higher antibiotics, re-suturing, and other interventions. Secondary outcomes focused on SSI rates in major abdominal surgeries. Data were gathered from patient records and analyzed using statistical methods to derive insights on the incidence and management of SSI in the OG department.

RESULTS

In present study total of 50 patients fulfilling inclusion criteria were included.

Table 1: Age wise distribution of patients.

Age (years)	Frequency (n=50)	Percent
<20	2	4.0
20-29	28	56.0
30-39	11	22.0
40-49	5	10.0
>50	4	8.0

It was seen patients (56%) were aged between 20 and 29 years. Between 30 and 39 years (22%), with smaller proportions being over 40 years (18%) and below 20 years (4%).

Table 2: Showing BMI distribution of patients.

BMI (kg/m^2)	Frequency (n=50)	Percent
Underweight <18.5	4	8.0
Normal weight (18.5-25.99)	14	28.0
Overweight (25-29.99)	25	50.0
Obese (30-34.99)	7	14.0
Morbidly obese >35	0	00.0

According to this study, most of the patients with SSI were overweight (50%), while 28% had normal weight, 14% were obese, only 8% were underweight with no patient in morbidly obese category.

In our study, no risk factor was identified among 26% patients with SSI.

Anemia (22%) was found to be the most common risk factor for SSI followed by obesity and hypertension contributed 14% each, 8% with smoker and underweight, 6% were diabetic, 4% were from prolong PROM and 2% were immunocompromised.

Table 3: Risk factor associated with SSI.

Risk factor	Frequency	Percent
Anemia	11	22
Obesity	7	14
Hypertension	7	14
Smoker	4	8
Underweight	4	8
Diabetic	3	6
Prolong PROM	2	4
Immunosuppressive	1	2

Table 4: Showing the type of surgery among patients.

Type of surgery		Frequency (n=50)	Percent
Obstetrics Surgery	Cesarean section	37	74
Gynecological Surgery	Abdominal hysterectomy	8	16
	Laparotomy	5	10

Among the type of surgery, cesarean sections were the predominant type of surgery performed, accounting for 74% of SSI cases, followed by abdominal hysterectomies (16%) and laparotomies (10%).

Table 5: The timing of surgery among patients.

Timing of surgery	Frequency (n=50)		Percent	
Elective	13		26.0	
	OBS 3	GYN 10	OBS 6	GYN 20
Emergency	37		74.0	
	OBS 34	GYN 3	OBS 68	GYN 6

In this study, 74% subjects with SSI had emergency surgery and 26% subject with SSI had elective surgery. Among emergency surgeries, 68% were obstetrics surgeries, 6% were gynecological surgeries. Among elective surgeries, 20% were gynecological surgeries and 6% were obstetrical surgeries.

Table 6: Type of surgical procedure associated with SSI.

Type of surgical procedure	Frequency (n=50)	%
Clean	10	20
Clean contaminated	40	80
Contaminated	0	0
Dirty infected	0	0

In this study, 80% SSI patients had clean contaminated surgery whereas 20% had clean surgery with no patients belongs to contaminated and dirty wound.

Table 7: Distribution of post operative day.

POD	Frequency (n=50)	Percent
D<5	8	16.0
D5 to D10	25	50.0
D11 to D20	12	24.0
D21 to D30	5	10.0

In this study, 50% SSI occur between D5 to D10 post operatively, 34% after post op day 11, thus may be due to malnutrition, poor healing, unhygienic practice of the patient, whereas 16 % wound complicates within post op day 5 indicating infection (may be due to ascending infections, superficial skin infections, underlying systemic infections, prolong labor, severe anemia, etc.). In this study the average duration of hospital stay for women with SSI were around 12-14 days.

Table 8: Type of SSI among patients.

Types of SSI	Frequency (N=50)	Percent
Superficial incisional SSI	36	72
Deep incisional SSI	11	22
Organ/Space SSI	3	6

The most common type of SSI found in my study was superficial incisional SSI (72%), deep incisional SSI contributed to 22% and organ/space SSI was 6%.

Deep incisional SSI

In our study 11 patients had deep incisional SSI, out of the 11 patients, 8 patients had fascial sheath dehiscence and 3 had muscle plane dehiscence.

The patients who had muscular plane dehiscence were emergency cesarean section surgery, the indications for 2 of them were non progress of labor, 1 was failure of induction.

In 3 patients with space/organ SSI, 1 was elective surgery, the indications of which was lavage laparotomy and 2 were emergency surgeries, indications of which were uterine scar dehiscence after cesarean section and antepartum hemorrhage.

Microbiological cultures showed 48% of the wound sites were sterile, while 52% had positive growth. The most common organisms identified were *E. coli* (14%), *Staphylococcus aureus* and *Pseudomonas* (10%), *Enterococcus* (8%), *Peptococcus*, and *Klebsiella* (4% each) and *Streptococcus pyogenes* (2%).

Table 9: Various organism detected among patients.

			Frequency(n=50)	Percent
No Organism detected			24	48.0
Organism detected	Gram Negative Bacteria	*E. coli*	7	14.0
		Pseudomonas	5	10.0
		Klebsiella	2	4.0
	Gram Positive Bacteria	*Staph aureus*	5	10.0
		Enterococcus faecium	4	8.0
		Peptococcus	2	4.0
		Streptococcus pyogens	1	2.0

Table 10: Management according to type of SSI.

Types of SSI	Management	Frequency (N=50)	Percent
Superficial incisional SSI		36	72
Superficial skin gap	Secondary healing	8	16
Dehiscence up to subcutaneous layer	Daily dressing + re-suturing	28	56
Deep incisional SSI		11	22
Fascial sheath and rectal muscle dehiscence	Debridement followed by re-suturing	8	16
	Lavage laparotomy followed by re-suturing	3	6
Organ/Space SSI	Lavage laparotomy followed by re-suturing	3	6

Out of total organism detected, 28% were Gram negative and 24% were Gram positive. Out of the total organisms isolated, 17 organisms were isolated from emergency cases and 9 were from elective cases.

The most common type of SSI found in our study was Superficial incisional SSI which were 72%, in which 56% patients require daily dressing and results into re-suturing and a small proportion of 16% cured by secondary healing.

Deep incisional SSI contributes 22%, 16% patients underwent debridement followed by re-suturing, 6% among them required lavage laparotomy.

Organ/space SSI was 6% i.e. burst abdomen, all cases of burst abdomen required lavage laparotomy. The hospital stay was prolonged up to 30 days. There was no mortality in these cases.

Among patients who had SSI, 50 patients underwent primary intervention, among which 96% of them were discharged uneventfully, while 4% of them required further intervention necessitating higher antibiotics and re-suturing.

DISCUSSION

Postoperative surgical site infections (SSIs) remain a significant complication in abdominal obstetric and gynecological surgeries, contributing to increased morbidity, prolonged hospital stays, and additional healthcare costs. These infections can compromise surgical outcomes and patient quality of life, emphasizing the need for effective preventive measures and management strategies.

The incidence of SSIs in obstetrics and gynecology varies, influenced by factors such as surgical technique, patient demographics, comorbidities, and perioperative care practices. Cesarean sections, abdominal hysterectomies, and laparotomies are common procedures within this medical field, each presenting unique risks for infection. Understanding the epidemiology and microbiology of SSIs in this context is crucial for developing targeted interventions to reduce infection rates.

Patient-related factors such as age, dietary habits, body mass index (BMI), and underlying health conditions significantly impact the risk of developing SSIs. Additionally, the type of incision and method of skin closure used during surgery can influence the likelihood of infection. Identifying and analyzing these factors can aid in refining surgical practices and postoperative care protocols.

Despite advances in surgical techniques and aseptic procedures, SSIs continue to pose a challenge. The emergence of antibiotic-resistant bacteria further complicates treatment, underscoring the importance of continuous surveillance and research. This observational study aimed to investigate the prevalence and determinants of SSIs in abdominal obstetric and gynecological surgeries, providing insights into patient demographics, clinical practices, and microbiological profiles associated with these infections.

By systematically analyzing the incidence and contributing factors of SSIs in a cohort of patients undergoing these surgeries, the study seeks to inform clinical practices and enhance infection control measures. Ultimately, the goal was to improve patient outcomes and reduce the burden of postoperative infections in obstetric and gynecological surgical care.

This observational study analyzed the occurrence and characteristics of postoperative surgical site infections (SSIs) in a cohort of 50 patients who underwent abdominal obstetric and gynecological surgeries. The study aimed to identify risk factors, common pathogens, and outcomes associated with SSIs in these patients.

The majority of the patients (60%) were aged between 19 and 29 years, with smaller proportions being over 40 years (18%) and between 30 and 39 years (16%). In terms of BMI, 44% were classified as having a BMI of 30-39.99, 40% had a BMI of 19.1-29.99, and 8% were morbidly obese.

In concordance to present study Pathak et al, documented with mean of patients as 37.3 years.[6]

Cesarean sections were the predominant type of surgery performed, accounting for 74% of cases, followed by abdominal hysterectomies (16%) and laparotomies (10%). The main indications for surgery included meconium-stained liquor (MSL) in 18%, abnormal presentation in 12%, and previous cesarean sections in 10%. Additionally, 74% of the surgeries were emergency procedures, while 26% were elective.

Pathak et el, found obstetric surgeries had lower SSI incidence compared to gynecological surgeries. The factors contributed included age, presence of vaginal discharges, medical co-morbidities. Also each day increase in stay at hospital after surgery also increased risk of SSI.[6] Another study by Kulkarni et al, documented similar incidence of SSI in both elective and emergency surgical procedure.[8]

Among the patients, anemia (22%) was found to be the most common risk factor for SSI followed by obesity and hypertension contributed 14% each, 8% with smoker and underweight, 6% were diabetic, 4% were from prolong PROM and 2% were immunocompromised.

In study by Mamo et al, documented the risk factors for surgical site infection were age, preterm gestation, duration of labor, duration of rupture of membrane, chorioamnionitis, vertical skin incisions, pre-operation transfusion, abdominal hysterectomy and diabetes mellitus. Study concluded that the prophylactic antibiotic administration should be provided within one hour before the surgical incision or within two hours if the patients is getting vancomycin or floroquinolones.[9]

Pfannenstiel incisions were performed in 88% of cases, with midline vertical incisions in 12%. Skin closure was primarily subcuticular (84%) with the remainder being midline closures (16%). 50% SSI occur between D5 to D10 post operatively, 34% after post op day 11, thus may be due to malnutrition, poor healing, unhygienic practice of the patient, whereas 16% wound complicates within post op day 5 indicating infection (may be due to ascending infections, superficial skin infections, underlying systemic infections, prolong labor, severe anemia, etc.). In present study the average duration of hospital stay for women with SSI were around 12-14 days.

Postoperatively, 40% of patients experienced a full-length deep skin gap, while 26% had partial length superficial skin gaps.

Pathak et el, found obstetric surgeries had lower SSI incidence compared to gynecological surgeries. The factors contributed included age, presence of vaginal discharges, medical co-morbidities. 71% wound infection leads to increase in hospital stay for >7 days. Also each day increase in stay at hospital after surgery also increased risk of SSI.[6] The risk of SSI was more in women with clean contaminated wound, dirty wound, also related with BMI, midline incision and mattress sutures. Previous presence of scar, poor healing predisposed to development of SSI. Study concluded that meticulous preoperative workup and intraoperative surgical steps were important in reducing the risk of developing SSI.[10]

Microbiological cultures showed that 48% of the wound sites were sterile, while 52% had positive growth. The most common organisms identified were *E. coli* (14%), *Staphylococcus aureus* (10%), *Pseudomonas* (6%), *Enterococcus* (4%), *Peptococcus* (4%), and *Klebsiella* and *Streptococcus* (2% each).

In concordance study by Salmanov et al, found that most commonly identified pathogen were *Escherichia coli* (21.6%), *Enterobacter spp.* (13.1%), followed by *Klebsiella spp*. (8,1%), *Streptococcus spp*. (7%), and *Pseudomonas aeruginosa* (7%). The overall proportion of extended spectrum beta-lactamase production (ESBL) among Enterobacteriaceae was 17.1% and of methicillin-resistance in *S. aureus* (MRSA)15.8%. Resistance to third-generation cephalosporins was observed in 13.7% *E. coli* and 8.5% *Klebsiella spp*. isolates. Carbapenem resistance was in 9.7% of *P. aeruginosa* strains.[11]

The treatment outcomes indicated that 72% required re-suturing, 16% of the patients were cured by secondary healing, 12% among them required lavage laprotomy and 4% required re-suturing.

Black et al, stated that the surgeon should adhere to efforts in decreasing the incidence of SSI. In turn, this will improve health outcomes and decrease health care-related costs, thus increasing the value of health care that we provide to patients.[12]

This observational study on postoperative surgical site infections in abdominal obstetric and gynecological surgeries included 50 patients, predominantly aged 19-29 years (60%). The cohort comprised BMI categories with 44% having a BMI of 30-39.99. Cesarean sections were the most common surgery (74%), with emergencies constituting 74% of cases. Common surgical techniques included Pfannenstiel incisions (88%) with subcuticular skin closures (84%). Postoperatively, 40% had full-length deep skin gaps, and 22% had slough. Microbiological findings showed 52% of wounds with positive growth, predominantly *E. coli* (14%) and *Staphylococcus aureus* (10%). Ultimately, 70% of patients were cured, while 22% required resuturing, highlighting the importance of effective infection control and management strategies.

In my study there are several limitations that should be considered. There was a small sample size that limits the generalizability of the findings, with some patients had more than 1 risk factors identified that limits the main risk factor and the timing of antibiotics susceptibility reports limits the cautious use of antibiotics. Moreover, environmental factor not thoroughly explored.

CONCLUSION

Present study highlighted the diverse demographic and clinical characteristics of patients undergoing abdominal obstetric and gynecological surgeries and the associated risk of postoperative surgical site infections. It underscores the prevalence of infections in cesarean sections and the need for vigilant postoperative care. The findings emphasize the importance of infection control measures and the effective management of SSIs to improve patient outcomes in this surgical population.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Anamika, Bharti K, Bhatia S. An observational study of postoperative surgical site infection in abdominal obstetrics and gynecological surgeries in tertiary care set up of south Gujarat. Int J Reprod Contracept Obstet Gynecol 2025;14:2934-9.