

Incidence and Risk Factors for Surgical Site Infections Along with Microbiological Profile in Obstetrics and Gynaecological Surgeries at Referral Hospital in Southern Gujarat

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Abstract:

Aim: Surgical site infection is most common healthcare associated infection in rural hospital of developing countries. This study was carried out to estimate surgical site infection incidence rate among obstetric and gynaecological surgeries along with identification of most important risk factor and their microbiological profile in an Indian rural hospital.

Method: A prospective study was conducted in the Department of Obstetrics and Gynaecology, Referral Hospital, of southern Gujarat from August 2023 to July 2024. Surveillance for SSI was based on Centre for Disease Control (CDC) definition and methodology. Patients who developed inflammatory sign like pain, redness, wound gap, serous or pus discharge at surgical site was consider as SSI. Sample of wound swab collected & send to microbiology laboratory for culture and sensitivity report.

Result: A total of 960 female underwent a surgical procedure during study period out of these 106 patients develop SSIs. Incidence of our study was 11.04%. Majority of SSI was superficial who only involve skin and superficial tissue. LSCS had highest rate of SSIs because compare to other surgeries total number of LSCS performed is more and LSCS is mostly done by trainee doctor. In gynaecological surgeries total abdominal hysterectomy had higher rate of SSIs followed by exploratory abdominal surgeries. Anaemia (34.90%) was the most common risk factor for SSIs, which were followed by obesity, previous scare, emergency surgery and diabetes. In our study, culture positive samples were 90 out of 106 wound swabs. Among 90 culture positive *S. aureus* (28%) was most commonly isolated, followed by *E. coli* and other gram-negative bacteria.

Conclusion: Among the different hospital acquired infections (HAIs), SSIs contribute major part. This study helps in identification of various risk factor in rural hospital of India and by eliminating this risk factor we can decrease SSIs significantly. By microbiological profile of this patients, we can decide prophylactic therapy of patients who is undergoing for surgery.

Keywords: SSI, Health care associated infection, risk factor, Obstetric and gynaecological surgery, Microbiology, *S. aureus*.

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Introduction

Hospital acquired infections that could be occur in a hospital set up are surgical wound and other soft tissue infections, urinary tract, respiratory tract and blood stream infections. Postoperative surgical site infections (SSI) are an important hospital acquired (HAI) infection and one of the most common causes of post-operative morbidity. [1,2] The Centers for Disease Control [CDC] define an SSI as “an infection related to an operative procedure that occurs at or near the surgical incision within 30 days.” [3,4] Surgical site infections are frequent, the incidence varying from 0.5 to 15% depending on the type of surgical procedure and associated

risk factors. [5] They are the most common healthcare-associated infection (HAI), accounting for 31% of all HAIs among hospitalized patients. 5 SSI increases the rate of re-hospitalization; the use of health care, diagnostics and therapeutic resources and hospital costs. However, the incidence of wound complications in obstetric population varies with rates ranging from 2.8% to 26.6%. [3,6] The prevalence of SSIs following gynaecological procedures was greatest for abdominal hysterectomy (3.3%), gynaecological laparotomy (1.3%), and gynaecologic/obstetric surgery (1.1%). Obstetric surgeries had a lower SSI incidence compared to

gynaecological surgeries (1.2% versus 10.3% respectively). [1,5]

Risk factors for SSIs [1]

Risk factors for SSI are in following categories: demographic features, peri-operative co-morbid conditions like number of vaginal examinations up-to 48 h prior to surgery, presence of vaginal discharge, elevated blood sugar (due to either Diabetes mellitus or gestational diabetes). The presence of medical disease defined as presence of any of the following: hypertension, severe anaemia defined as preoperative haemoglobin <7 g%, or presence of any diagnosed systemic disease like renal, heart or liver disease. Requirement of blood transfusion pre-surgery, during or 48 hrs post-surgery was recorded.

Intraoperative factors that were explored were: emergency or nonemergency surgery, type of anaesthesia, wound classification, concomitant other surgical procedures and operative time. Operative time was measured as the time from skin incision to completion of skin closure and was classified as less than or up-to one hour, between 1 to 4 h and more than 4 h. An operative time more than 4 h was considered a risk factor for SSI. Administration of antibiotic prophylaxis with intravenous Cefazolin in the dose of 1 g given one hour prior to surgery and continued for maximum up-to 48 h was considered appropriate practice. Any deviation from above practice was noted as inadequate prophylaxis. Duration of pre and postoperative stay was calculated in days and compared for patients with and without SSIs. [1]

Therefore, the aim of the present study was to estimate the occurrence of 30-day postoperative SSI within our gynaecology and obstetrics department and to identify the associated risk factors along with bacteriological trend of SSI in order to give safe motherhood practices.

Material & Methods

A prospective study was conducted in the Department of Obstetrics and Gynaecology, Referral Hospital, of southern Gujarat from August 2023 to July 2024. A total of 960 females undergoing surgeries at our hospital were selected for study. Patients with SSI occurring within 30

days after operation were included. Patients who are not operated in our hospital or coming with surgical site infection after getting discharge from the hospital were excluded.

A detailed history was taken from all patients followed by general and systemic examination along with investigations. The patients were prepared for operative procedures either elective or emergency as per standard hospital protocol. Operated patients were followed up regularly, during the post-operative period. The wound was classified as per CDC criteria and were checked on 3rd. post operative day routinely and later according to the complaints of the patients.

Presence of erythema, pain and discharge were taken as signs of surgical site infection. Wound swabs were taken from where the discharge was present and sent for culture and sensitivity at microbiology laboratory of present institute.

List of obstetric and gynaecological procedures performed

The obstetric operative procedures performed were: lower segment caesarean section (LSCS), exploratory laparotomy for ectopic pregnancy.

The gynaecological procedures performed were: vaginal hysterectomy for 2nd or 3rd degree uterovaginal discharge; abdominal hysterectomy for fibroids or dysfunctional uterine bleeding. Exploratory laparotomy for ovarian cancer; anterior colporrhaphy for cystocele; cervical biopsy for suspected cervical cancer; tubal ligation, tubectomy & Ovarian torsion.

Results

Out of 960 operated cases, 633 females belonged to obstetrics department and 327 to gynaecology department. Among all operated cases that were followed up prospectively, 106 female developed signs of inflammation locally along with serous or pus discharge.

Out of 106 probably diagnosed cases of SSIs sent for Micro-organism identification and sensitivity, 16 samples were culture negative (15.09%) and 90 samples harbouring micro-organisms associated with SSI (84.90% Culture positivity rate among SSI samples). [Figure-1]

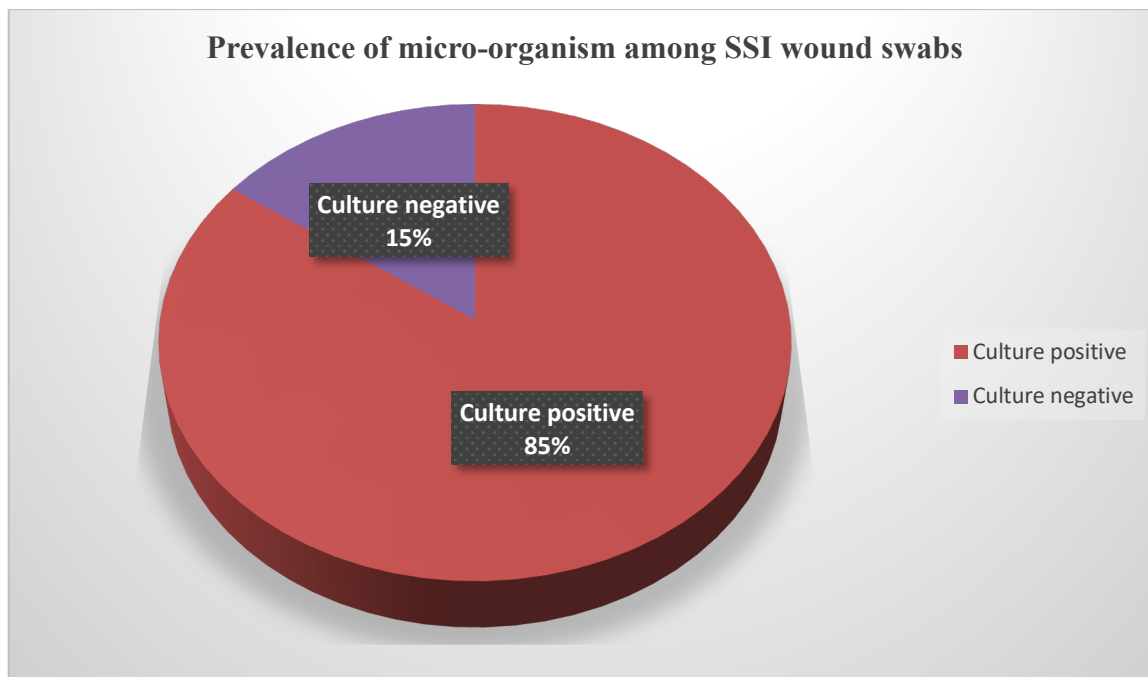


Figure 1: Prevalence of micro-organism among SSI wound swabs

In this study, types of different surgeries performed among SSI cases from operated females are also note. [Table-1] It was found out that post-operative infection/inflammation chances are highest in LSCS Pts followed by TAH.

Table 1: Type of Surgery performed among SSI females

Type of Surgery performed among SSI females	Numbers	%
LSCS	46	43.39
TAH	23	21.69
TAH with BSO	12	11.32
Exploratory Laparotomy	6	5.66
Tubal Ligation	4	3.77
Episiotomy	9	8.49
Vaginal Hysterectomy	6	5.66
Total	106	100

Extensions of infection to various level deciding the severity of SSI is also assessed and it was seen that 91.5% cases having only superficial infection were as rest of cases having deep tissue and organ invasion denoting the severe type of SSI. [Table-2]

Table 2: Type of dehiscence

S. No.	Type of dehiscence	No	% of cases of SSI
1.	Superficial surgical site infection (Skin + subcutaneous tissue)	97	91.5
2.	Deep surgical site infection (Muscles and or Fascial sheath)	8	7.54
3.	Organ/Space (Burst abdomen)	1	0.94
4	Total	106	100%

Risk factors in operated females also noted and revealed that anaemia is the major risk factor in developing countries accounting for 34.90% risk in present instituted other risk include obesity with BMI>24.99 is second most common risk factor in

female (23.58%). Previous surgical scare, diabetes, second stage LSCS, emergency surgery is different risk factor in patients for developing SSI. Malnutrition pertaining lowest risk (5.66%) for developing SSI. [Figure-2]

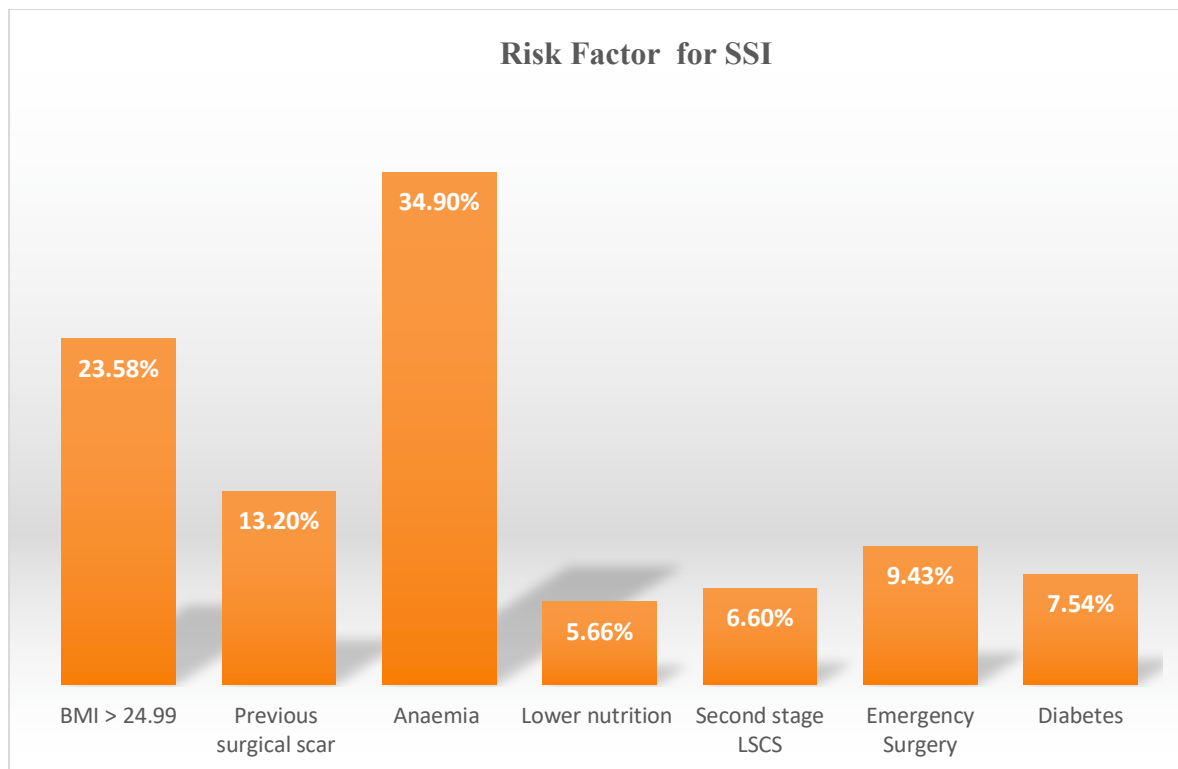


Figure 2: Risk factor for SSIs

As per the microbiology culture report Staphylococcus aureus out number other organisms in association with SSI (28.3% isolation rate), next common organism was E. coli (21.69%) followed by klebsiella spp., Acinetobacter and pseudomonas.

Enterococcus isolated in few numbers (1.88%). Multiple organisms associated with SSI in significant numbers (8.49%). Among 106 suspected SSI wound swabs, 15.09% were sterile. [Figur-3]

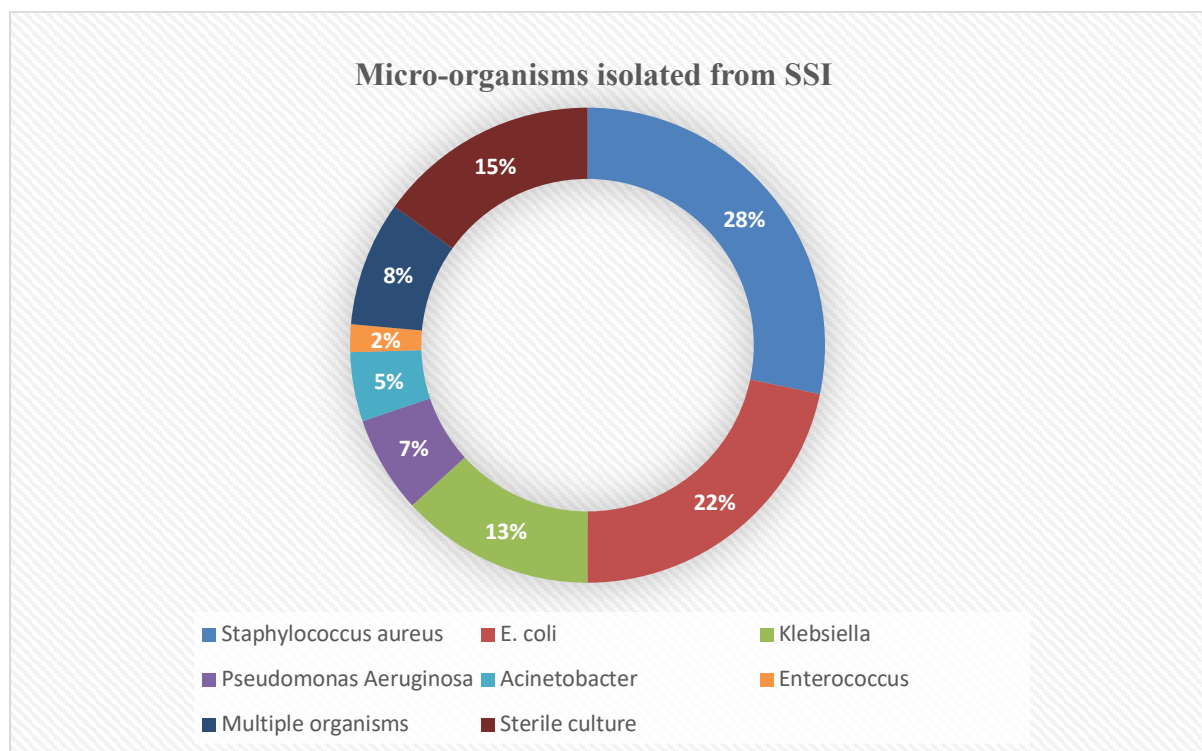


Figure 3: Micro-organisms isolated from SSI

Discussion

Study	Commonest Type Of Surgery Performed	Microorganism commonest isolated	Risk factor
Present	LSCS	Staph. Aureus	Anaemia
Pathak et al. [1]	Abdominal hysterectomy	--	Frequent vaginal examination
Shikha et al. [3]	LSCS	Staph. Aureus	Anaemia
Bharatnur S et al. [7]	Abdominal hysterectomy	E. coli	hypertension and severe anemia
Surekha Tayade et al. [5]	Total Abdominal Hysterectomy	Staph. Aureus	Anaemia

In the developing countries like India, safe mother & child practices are promoted it is very important to know the surgical site infection rate post operatively in obstetrics and gynaecological department. Since there are occasional studies present in this particular topic of SSI especially in reproductive age females, this study will guide the future aspect in maternal care

Above table-3, showing the comparison of different parameters between various studies. 11.04% of Incidence rate found out for SSI in this study. However, the higher incidence rate found out in the study of south India by Bharatnur S et al. [7] Compare to our study. Incidence rate ranging from 0.75% to 9% in different studies [3,5]. In low- and middle-income studies, the SSI rate is quite higher of 11% and in developed high income countries rate is only 2% [7,8,9]. The possible reasons for higher incidence rate are poor personal hygiene, higher burden of surgery in compare to men power being performed, less frequent sterilization. Among 106 collected swab samples for pus culture and sensitivity, 16 samples were culture negative denoting high probability of started empirical antibiotics before sending culture or not proper sample collection and transportation practices.

Out of 90 positive culture swabs, most common organism associated with SSI is staph. Aureus in our study. Similar results are also seen in the studies of Shikha et al. [3], Surekha Tayade et al. [5]. Out of 30 S. aureus isolates 12 isolates found to be MRSA (methicillin resistant S. aureus). MRSA is big problem in developing countries as healthcare worker are also became nasal & hand carrier of MRSA accounting for wide spread of infection. These isolates were most susceptible to vancomycin. The next common organism found was E. coli which was the most common in study of Bharatnur S et al. [7]. The commonest type of surgery associated with SSI in our study was LSCS, which is comparable with study of Shikha et al. [3] In the studies of Pathak et al. [1] Bharatnur S et al. [7] Surekha Tayade et al. [5] Abdominal hysterectomy found out commonly being with SSI. In our facility of referral hospital, a greater number of obstetric patients are coming and hence LSCS was on top in SSI. In many rural hospitals LSCS was commonly performed by trainee doctor and

multiple handling by nursing staff this led to longer duration of surgery which is risk factor for developing of SSI as compare to surgery performed by expert doctor. 91.5% of SSI was Superficial surgical site infection (Involving Skin + subcutaneous tissue) which is having good prognosis and easily manageable with proper dressing with antiseptics and antibiotics. Those SSI involving deeper tissues and organs requiring need for rehospitalization of patients, IV antibiotics, debridement and re-suturing of stitch line which ultimately lead to longer duration of hospital stay and increasing cost.

Patients related risk factor involved in promoting SSI are anaemia (highest individual risk factor) followed by obesity, previous scare, emergency surgery and diabetes were as under nutrition carries lowest risk. Presence of anaemia may alter immunity, reduces wound healing by hampering the oxygenation of wound tissue and increasing risk for SSI. Anaemia emerging as most common risk factor in females of reproductive age groups in many studies. [3,5,7] Pathak et al. [1] suggested frequent vaginal examinations as risk factor for SSI which is iatrogenic factor and drawing attention towards lacking of clean hand practices which is burning problem in Indian setup.

The steps for primordial and primary prevention of SSI are as follows

1. Screening of patients for underlying risk factor as mentioned above
2. Correction of haemoglobin and thus anaemia by vigorously implementing running government policy.
3. Clean surgical practices.
4. Awareness of hand hygiene among medical and paramedical staff.
5. Proper fumigation and sterilization of hospital ward and operation theatre.
6. Pre-operative bathing of patients with antiseptic soap.
7. Pre-operative and intra operatively judicious use prophylactic antimicrobial agents according to hospital stewardship program.

It is strongly recommended that in case of SSI before starting empirical therapy, proper collection and transport of wound swab to clinical

microbiology laboratory is mandatory. According to culture report, changes in antibiotics of empirical therapy is recommended in order to prevent occurrence of multidrug resistant pathogen like MRSA, VRSA and ESBL.

Conclusion

Among the different hospital acquired infections (HAIs), SSIs contribute major part. To ensure safe motherhood practices and preventing morbidities in reproductive females & gynaecological patients, SSIs must be prevented.

However, they cannot be irradiated but can surely be minimised by reduction of individual risk factor especially anaemia, clean surgical practices, spreading awareness among hospital staff and patients and implementing antimicrobial stewardship program for providing appropriate therapy. Regular surveillance of SSIs rate should be monitor in regular interval.

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