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The study on incidence of surgical site infection and related pathogens in obstetrics and gynaecological surgeries in tertiary care centre

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Abstract

Background: Postoperative SSI is the most commonly reported nosocomial infection which constitutes a major public health care problem worldwide. The overall incidence of SSI in India constitutes 10%-33%.

Materials and Methods: The prospective observational study carried out in department of Obstetrics and Gynaecology in Goa medical college, Bambolim Goa from 1st November 2017 to 30th May 2019. Collection of data was carried using predesigned and pretested proforma. Surgical site infection was examined for its type and culture and sensitivity was performed on infected wound.

Results: During this study period, 2,574 patients underwent abdominal surgeries, out of which 127 patients developed postoperative surgical site infection with the incidence rate being 4.93%. The incidence rate was found higher in emergency cases (6.74%) as compared to that of elective (2.47%). The most common causative microorganism isolated being gram positive Staphylococcus aureus (35.36%) among which is MRSA followed by gram negative Acinetobacter (21.95%). All the gram positive MRSA were sensitive to Vancomycin (70.58%), followed by Linezolid (52.94%) and cilndamycin (52.94%). Second most common bacterial isolate Acinetobacter was sensitive to linezolid (38.89%).

Conclusion: There is emergence of drug resistance to most of the microorganism strains and awareness regarding the same should be considered. The prescription of the antibiotics should be considered after the culture report and decision to change antibiotics should be at consultant level. The technique of proper dressing has to be taught to interns and junior resident.

Keywords: Surgical site infection (SSI), MRSA (Methicillin resistant staphylococcus aureus, incidence, antibiotic susceptibility

Introduction

Surgical site infections are most common nosocomial infections and major cause of postoperative morbidity and sometimes mortality [1].

Infections that occur in the wound created by an invasive procedure are generally referred to as surgical site infections (SSI). SSIs are one of the most common causes of healthcare associated infections (HCAIs). SSIs are characterised by a breach of mechanical/anatomic defence mechanisms and are associated with greater morbidity, significant mortality, and increased cost of care [2].

The SSI is defined by CDC (Centre for Disease Control and Prevention) as an infection occurring within 30 days of surgery, in one of three locations: superficial, deep and/or spaces opened or manipulated during an operation [3, 4].

SSI is diagnosed based on evidence of clinical symptoms and signs which is further supplemented by microbiological culture analysis report. The most common microorganism responsible for SSI is from endogenous flora of patients skin which is primarily composed of aerobic gram positive cocci of which the most predominant is Staphyloccus aureus [5, 6, 7]. Considering all the stahpyloccocus aureus, the dangerous MRSA (Methicilln resistant staphyloccus aureus) is on rise often acquired during previous hospitalisation [8, 9]. The aerobic gram positive rods and gram negative rods, Coagulase negative staphylococcus aureus and Escherichia Coli are other skin flora which are acquired from contaminated gynaecological surgeries [10, 11, 12]. Other SSI are as a result of vaginal and endocervical flora which are usually polymicrobial and includes anaerobes, gram negative rods and enterococci [13].

The study will help us to identify most common microorganism contributing to SSI and to optimise the potential benefits of isolation and antimicrobial susceptibility testing of different microorganisms.

Functional infection control committee should employ strict infection control policies which will significantly reduce SSI.

Methods

The prospective observational study carried out in department of Obstetrics and Gynaecoloy in Goa medical college, Bambolim Goa from 1st November 2017 to 30th May 2019 after the approval of medical ethical committee. Qualitative data will be tested for significance using chi square test and continuous data will be tested for significance with two tailed t test with $p<0.05$ consider significant

This is a descriptive study of all the patients who were operated at our hospital for any obstetric and gynaecological cause. These patients were observed for the development of wound infections during their stay in the hospital. Those patients who developed SSI that require wound dressing or wound re suturing were included in the study after informed consent. An elaborate study of these cases with regard to the date of admission, history, clinical features of wound infection, type of surgery, emergency or elective, preoperative and postoperative management is done till patient is discharged from hospital.

In history presenting complaints, duration, associated comorbid conditions, associated remote infections are noted.

If SSI was present, the type of SSI, according to the CDC criteria, date of onset, and the microorganism(s) cultured were reported. The treatment given was documented.

Wounds that were confined to the skin and subcutaneous tissues were classified as superficial. Presence of swelling, tenderness, obvious oozing of pus were the main determinants for inclusion in this category.

Abscesses were opened in the ward to give way for the pus under pressure, while pus swabs were taken for microbial sampling. All the patients with these wounds were not re-operated, but secondary repair was undertaken after control of sepsis. No report of mortality was observed from these groups of patients.

Deep SSI was determined either through ultrasonography, clinical signs of intraabdominal sepsis.

Specimens were obtained by sterile swabs using aseptic technique and immediate transport and processing of the specimen after collection was done. Constant monitoring of the culture systems to detect growth identification of the organisms and antibiotic sensitivity testing were done. Reading of antibiotic sensitivity test was taken after putting on antibiotic disc.

Inclusion Criteria

All abdominal surgical procedures done in tertiary care centre which undergo SSI

SSI occurring within 2 week of surgery

Exclusion Criteria

Patients not operated in GMC

Patients coming with surgical site infection after getting discharge from hospital

Patients already having pre-existing infection at the surgical site

Results

The current study was undertaken in Goa Medical College in department of Obstetrics and Gynaecology from 1st November 2017 to 30th May 2019 after the approval of medical ethical committee. The study population consisted of 2,574 underwent abdominal surgeries and were eligible considering the inclusion criteria. Out of 2,574, there was postoperative SSI in 127 patients (4.93%).

In our study out of operated 2,574 cases, 1,482 were emergency surgery of which 100 patients were noticed to have SSI which contributed to 6.74% whereas among 1,092 elective surgeries, 27 patients developed SSI which accounted for 2.47 % (table 1).

Table 1: shows distribution of SSI in different types of operation

Type of surgery	Surgical site infection		Total	% of SSI
	Yes	No		
Elective	27	825	852	3.16%
Emergency	100	1622	1722	5.80%
Total	127	2447	2574	

Incidence of SSI in our study for gynaecological surgeries was 5.12%. Considering Obstetrical surgeries, we found that for elective surgeries it was 0.45% and for emergency cases it was 6.89%.

Culture analysis was undertaken on all post-operative SSI cases during the study period; including 127 cases, 87 (68.5%) yielded microbial growth. In the culture report, 16 cases were poly microbial or growth of multiple microorganism and 55.9% were mono microbial (table 2).

Table 2: Wound swab culture growth in relation to surgical site infection

Wound swab culture	No. of cases with SSI (n=127)	Percentage (%)
No growth	40	31.49%
Mono-microbial growth	71	55.90%
Poly-microbial growth	16	12.59%

Total of 82 bacterial isolates were identified. Majority of the bacteria isolated on culture were gram negative (47 out of 82 i.e. 57.31%) compared to gram positive (35 out of 82 i.e.42.68%). The predominant microorganism isolated in our study on wound swab is Staphylococcus aureus (29 out of 82 i.e. 35.36%). Of the staphylococcus aureus, 17 (89.47%) were MRSA, 1 (10.52%) was MSSA. Other bacterial isolates in the study include Acinetotobacter (21.95%) followed by Klebsiella (12.19%), Coagulase negative staphylococcus (12.19%), Pseudomonas (10.97%), Escherechia coli (9.76%), Enterococcus (6.09%), Citrobacter (2.43%) and streptococcus (1.21%) (table3).

Table 3: various bacterial isolates obtained from different SSI

Type of bacteria			Number (n=82)	Percentage of isolates (%)
Gram positive (n=35)	Staphylococcus aureus	MRSA	17	20.73%
		MSSA	2	2.43%
	Coagulase negative staphylococcus		10	12.19%
	Streptococcus		1	1.21%
	Enterococcus		5	6.09%
Gram negative (n=47)	Pseudomonas		9	10.97%
	Escherechia coli		8	9.76%
	Klebsiella		10	12.19%
	Acinetobacter		18	21.95%
	Citrobacter		2	2.43%

The antibiotic sensitivity pattern in our study, all the gram positive MRSA were sensitive to Vancomycin (70.58%), followed by Linezolid (52.94%) and clindamycin (52.94%). Second most common bacterial isolate Acinetobacter was sensitive to linezolid (38.89%). Pseudomonas aureginosa sensitivity pattern was observed for Linezolid (88.89%), piperacillin tazobactum (77.78%). Escherechia Coli was sensitive to amikacin, gentamicin and linezolid (87.5%) (table 4).

Table 4: susceptibility pattern of microorganisms isolated

Bacteria	Cf	Ak	Gen	vanco	Amox-clav	Mpm	Tmp-smx	Pit	Lnz	Clin
Staphylococcus aureus MRSA (17)	2 (11.76%)	7 (41.17%)	0	12 (70.58%)	2 (11.76%)	NT	5 (29.41%)	6 (35.29%)	9 (52.94%)	9 (52.94%)
Coagulase negative staphylococcus (10)	2 (20%)	2 (20%)	1 (10%)	4 (40%)	5 (50%)	NT	NT	2 (20%)	9 (90%)	6 (60%)
Enterococcus (5)	0	5 (100%)	1 (20%)	3 (60%)	3 (60%)	NT	NT	NT	5 (100%)	2 (40%)
P.Aeruginosa (9)	0	4 (44.44%)	3 (33.33%)	2 (22.22%)	3 (33.33%)	4 (44.44%)	NT	7 (77.78%)	8 (88.89%)	NT
E.Coli (8)	2 (25%)	7 (87.5%)	7 (87.5%)	1 (12.5%)	0	6 (75%)	1 (12.5%)	4 (50%)	7 (87.5%)	NT
Klebsiella (10)	0	6 (60%)	6 (60%)	2 (20%)	0	6 (60%)	0	4 (40%)	5 (50%)	NT
Acinetobacter (18)	0	3 (16.16%)	1 (5.56%)	5 (27.78%)	0	2 (11.11%)	7 (38.89%)	3 (16.16%)	7 (38.89%)	0

Cf=cefuroxime, Ak=amikacin, Gen=gentamicin, Vanco=vancomycin, amox-clav=amoxycilln clavulinic acid, Mpm=meropenem, Tmp-smx=trimethoprim sulphamethasoxole, Pit=piperacillin tazobactum, Lz=linezolid, clin=clindamycin

Discussion

The study conducted in the only referral tertiary care hospital in Goa over the period of 18 months based on the inclusion criteria; total 2574 operated patients were eligible for analysis that underwent abdominal surgeries in Goa medical college in obstetrics and gynaecology department. The present study showed the postoperative SSI was found in 127 patients out of 2,574 amounting for incidence of 4.93% which is comparable to Bhadauria AR *et al.* 6.12% and Harish babu *et al.* being 9.13%.

Incidence of postoperative SSI was more in emergency surgeries than elective surgeries (6.74% vs 2.47%). The similar results were observed in Bhaduria *et al.* study, which reported 16.01% in emergency surgeries and 3.67% in elective surgeries. Incidence of SSI in our study for gynaecological surgeries was 5.12% which is similar to Malakar A *et al.* which being 7.14%. Obstetrical surgeries in which we found that for elective surgeries it was 0.45% and for emergency cases it was 6.89%.In our study we found that incidence of infection is higher in emergency cases as compared to routine cases. The probable reason being the elective cases are better prepared. Most of the emergency cases are done at the trainee level. Hence longer period of time taken for surgery and with the possibility of higher blood loss in emergency cases compared to elective cases which are handled by Consultant. Ours being the only tertiary level postgraduate teaching institute in Goa these is a unavoidable parameter.

Culture analysis was undertaken on all post-operative SSI cases during the study period; including 127 cases, 87 cases had micro-organism growth on culture of the wound swabs (68.5%). 40 cases i.e. 31.5% were not showed any micro-organism growth on culture. In the culture report 16 cases were poly microbial or growth of multiple microorganism and 55.9% was mono microbial. Snehal Naphade *et al.* reported 38% patients had monomicrobial growth in the culture of wound swab, 27% patient had polymicrobial growth and35% patient had no growth on culture.

In the present study the most predominant microorganism that resulted in postoperative SSI after obstetrics and gynaecology surgery is gram positive aerobic staphylococcus aureus (32.39%) which is inoculated into the wound from skin. Among the Staphylococcus aureus, MRSA (89.47%) was most common and on rising trend. Eagye *et al.* has found the incidence of MRSA as 45%. The Acinetobacter spp. (21.95%) were significant gram negative bacilli which is considered as clinical evidence of health care associated infection followed by Klebsiella sp. (12.19%), Escherechia coli sp. (.9.76%), Enterococcus sp. (6.09%), Pseudomonas sp. (10.97%), Citrobacter sp. (2.43%), which most probabaly transferred from pelvic cavity during surgical procedure. Harish Babu *et al.* reported Staphylococcus aureus (31.03%) as the predominant bacteria isolated; E.coli (24.13%) and Pseudomonas aeruginosa (24.13%) were second predominant bacteria isolated.

Antibiotics sensitivity and resistance were tested for the respective organisms with respect to prior sensitivity pattern of the organism. All gram positive cocci were susceptible to linezolid, clindamycin and vacomycin. Antibiotic Sensitivity pattern for the Acinetobacter sp. was sensitive to linezolid (38.89%). Pseudomonas aureginosa sensitivity pattern was observed for Linezolid (88.89%), piperacillin tazobactum (77.78%). Escherechia Coli was sensitive to amikacin, gentamicin and linezolid (87.5%).

Conclusion

In the current scenario, the increasing trend of SSI is seen mostly due to increase in the number of surgeries which are performed. In the preoperative period SSI can be prevented by identifying SSI at early stages, proper preoperative workup of patient, correction of anemia, blood sugar level. This little efforts can significantly reduce the burden on the patient and the surgeons and further reduce morbidity and mortality. This will also ensure reduction in hospital stay and economical load on patient. The surgeon should consider proper surgical technique during the surgery and preoperative prophylactic antibiotics should be started to patients. From the above study we got an overview in the etilogical aspect of microorganisms in SSI in obstetrics and gynaecological surgeries. It also gave us insight regarding the susceptibility pattern of microorganisms and emergence of resistant strains. The antibiotic resistant strains can be reduced by meticulous and rational use of antibiotic and higher order antibiotic should be started only after culture and sensitivity report.

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