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Original Research Article

Antibiotic Sensitivity in Post Cesarean Surgical Site Infection at a Tertiary Care Centre in Eastern Nepal

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ABSTRACT:

Introduction: Post cesarean surgical site infection (SSI) is one of the common complications diagnosed in 2.5%-16% of the cases and is associated with significant increase in maternal morbidity, hospital stay, costs, and psychological stress to the new parents. This study was designed to study the incidence of SSI and the antimicrobial resistance pattern in our hospital. **Methods**: This was a prospective observational study conducted from July 2015 to December 2015, in which all patients who were admitted with post cesarean SSI or developed SSI during their stay were included. Wound specimens were collected and susceptibility testing was carried out using disc diffusion technique. **Results**: The incidence of post cesarean SSI was 6.07% (47/774). Out of the 47 patients who had SSI, 35 (74.75%) had positive swab culture. The most important organism isolated was Staphylococcus aureus (82.85%) out of which 17 (58.62%) were MRSA strain. Resistance of Staphylococcus to penicillin was 84.6% whereas amikacin was found to be highly sensitive (>96%). Among the MRSA strain, resistance to ciprofloxacin, which is the currently used drug for prophylaxis, was 94%. Resistance to penicillins, cephalosporins, and clavulanate was also high. Resistance to vancomycin was also high (53%). Amikacin and chloramphenicol were found to be highly sensitive (94% and 90% respectively) in the MRSA group. **Conclusion**: MRSA is the leading cause of post cesarean SSI and is a matter of great concern. Amikacin and chloramphenicol were found to be highly sensitive in this group but unlike other studies, resistance of vancomycin was showing an increasing trend.

Keywords: cesarean section • methicillin-resistant staphylococcus aureus • microbial sensitivity tests • surgical wound infection

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INTRODUCTION:

Cesarean delivery (CD) is the most common surgical procedure performed by obstetricians, with a rate around 15% worldwide and around 27.3% in Asia.[1,2] One of the most common complications associated with cesarean section (CS) is infectious morbidity, out of which wound infection or Surgical Site Infection (SSI) is diagnosed in 2.5-16% of the cases. This rate depends on the pre-morbid condition of the patient as well as various surgical factors.[3,4] SSIs have shown to increase mortality, readmission rate, and length of hospital stay.[5,6] Post cesarean wound infections have undoubtedly been a surgeon's concern since time immemorial, but with

the increased isolation of atypical organisms and resistant strains of typical organisms, the problem has become a serious concern for care providers. Henceforth, the knowledge of common pathogens and their local antibiotic sensitivity patterns are cornerstone to the development of hospital infection prevention and control strategies.

This study was designed to study the rate of post cesarean SSI and the antimicrobial resistance pattern in our hospital.

METHODS:

This was a prospective, observational, hospital based study conducted between July 2015 to December 2015. All patients who were admitted in the postnatal ward with post cesarean SSI or developed SSI during their stay during the study period were included. Various associated risk factors were studied from their previous admission papers, labor sheets, theatre notes, discharge summaries, and history.

The diagnosis of SSI was made using the CDC clinical criteria.[7-9] It defines SSIs as infections related to the operative procedure that occurs at or near the surgical incision within 30 days of an operative procedure meeting any of the following: purulent exudate draining from the surgical site, a positive fluid culture obtained from the surgical site that was closed primarily, the surgeons' diagnosis of infection or a surgical site that requires reopening. Patients who could be managed on outpatient basis or those who refused admission were excluded from the study.

The wound swabs were sent at the time of admission and the microorganisms and their antibiotic sensitivity patterns were studied. The patients were given standard wound care with daily wound debridement, oral antibiotics, and correction of co-morbidities along with supportive therapy. Eventually secondary closure of wound was done or in some cases wound was allowed to heal by secondary intention. All details were recorded in a pre-designed proforma.

All analysis was carried out using the statistical software SPSS version 16 for Windows. The values have been expressed as mean and standard deviation or median and inter-quartile range whichever applicable.

RESULTS:

Out of the total 2852 deliveries during the study period, 774 (27.1%) were cesarean sections. Out of these, 47 (6%) patients were diagnosed with post cesarean SSI, according to the CDC criteria, and needed admission. Eight (17%) had undergone elective cesarean whereas 39 (83%) had emergency procedure. The mean age was 24.04 yr (*SD*=4.6). Thirty-five (74.8%) had positive swab culture and for the rest, culture was sterile. The most important organism isolated was Staphylococcus aureus (*n*=29, 82.9%) out of which 17 (58.6%) were MRSA variety. The sensitivity pattern is shown in Table 1 and Table 2. Escherichia coli were isolated in five cases (14.3%) whereas in one case (2.8%), Klebsiella was isolated. The sensitivity pattern is as shown in Table 3 and Table 4. Chloramphenicol and linezolid sensitivity was tested in two cases of E. coli. One case in each group was found to be sensitive to these drugs.

DISCUSSION:

Post cesarean SSI accounts for a considerable increase in the cost of health care and increased psychological stress to the new parents.[10,11] Varied incidence has been quoted in other studies in Nepal

Table 1*: Antibiotic sensitivity of Staphylococcus aureus in post cesarean SSI*

Antibiotic	Staphylococcus aureus (*n*=29)		MRSA (*n*=17)	
	S	R	S	R
Cloxacillin/ Cefoxitin	14 (48.3%)	15 (51.7%)	0	17 (100%)
Penicillin	4 (13.8%)	25 (86.2%)	0	17 (100%)
Cotrimoxazole	16 (55.2%)	13 (44.8%)	6 (35.3%)	11 (64.7%)
Erythromycin	14 (48.3%)	15 (51.7%)	6 (35.3%)	11 (64.7%)
Clindamycin	18 (62.1%)	11 (37.9%)	10 (58.8%)	7 (41.2%)
Gentamycin	20 (69%)	9 (31%)	12 (70.6%)	5 (29.4%)
Amikacin	28 (96.6%)	1 (3.4%)	16 (94.1%)	1 (5.9%)
Ciprofloxacin	4 (13.8%)	25 (86.2%)	1 (5.9%)	16 (94.1%)
Ofloxacin	3 (10.3%)	26 (89.7%)	0	17 (100%)
Ceftriaxone	0	29 (100%)	0	17 (100%)
Amoxicillin	1 (3.4%)	28 (96.6%)	1 (5.9%)	16 (94.1%)
Clavulanate	0	29 (100%)	0	17 (100%)
Vancomycin	12 (41.4%)	17 (58.6%)	8 (47.1%)	9 (52.9%)

S: Sensitive, R: Resistance

Table 2: Antibiotic sensitivity of Staphylococcus aureus to selective second line drugs

Antibiotics	Staph. aureus		MRSA	
	S	R	S	R
Tetracycline	1/2 (50%)	1/2 (50%)	1/2 (50%)	1/2 (50%)
Imipenem/Meropenem	4/4 (100%)	-	4/4 (100%)	-
Chloramphenicol	15/16	1/16	9/10 (90%)	1/10 (10%)
Linezolid	5/5 (100%)	-	2/2 (100%)	-

S: Sensitive, R: Resistance

Table 3: Antibiotic sensitivity of E. coli and Klebsiella in post cesarean SSI

Antibiotic	E.coli (*n*=5)		Klebsiella (*n*=1)	
	S	R	S	R
Penicillin	0	5 (100%)	0	1 (100%)
Erythromycin	1 (20%)	4 (80%)	0	1 (100%)
Gentamycin	3 (60%)	2 (40%)	1 (100%)	0
Amikacin	3 (60%)	2 (40%)	1 (100%)	0
Ciprofloxacin	1 (20%)	4 (80%)	0	1 (100%)
Vancomycin	1 (20%)	4 (80%)	0	1 (100%)

S: Sensitive, R: Resistance

Table 4: Sensitivity pattern of E. coli and Klebsiella to particular second line antibiotic

Antibiotic	E.coli (*n*=4)		Klebsiella (*n*=1)	
	S	R	S	R
Cloxacillin/ cefoxitin	0	4 (100%)	0	1
Cotrimoxazole	0	4 (100%)	0	1
Clindamycin	1(25%)	3 (75%)	0	1
Ofloxacin	1(25%)	3 (75%)	0	1
Ceftriaxone	1(25%)	3 (75%)	0	1
Amoxicillin	0	4 (100%)	0	1
Clavunate	0	4 (100%)	0	1

S: Sensitive, R: Resistance

with an incidence of 12.6% in a study done by Shrestha et al. at Dhulikhel hospital whereas 2.7% in another study done in Patan hospital.[12,13]

The risk factors for wound infections are multi-factorial with causes encompassing patient related factors, procedure related factors, and iatrogenic factors as well.[12] The presence of more than one risk factor or factors in combination increases the likelihood of poor prognosis in the form of increased hospital cost and stay. Emergency procedures, where the surgery was unplanned, were more likely to develop SSI. This is in accordance with studies done elsewhere.[12] Among the patient related factors, those with prolonged rupture of membranes, malnutrition, and anemia, and those presented in labor were at high risk of having SSI. The commonly identified surgery related risk factors were prolonged surgery, competency and experience of surgeon, and the method of placenta removal.

The most common organism identified in our study was Staphylococcus aureus followed by E. coli and Klebsiella. This is similar to NNIS service survey data that reported staphylococcus aureus as the most common (47%) causative organism causing SSI.[14]The species of microorganisms causing SSI were similar to other studies but over a period of time, more resistant strains have emerged.[15,16] Out of the total cases of Staphylococcus aureus, 58.62% were MRSA. The hospital incidence of MRSA in a study done in 2015 was found to be 53.57%.[17] This is higher when compared to the study done by Pandey et al. in Staphylococcus isolates from hospital where the rate of MRSA was 26.12%.[18] Similar result was found by Baral et al. in a study done in BPKIHS from eastern Nepal.[19] MRSA was isolated at the rate 75.5% from clinical samples in a study conducted by Rijal et al. in Pokhara Valley.[20] Similar study done in western parts of Nepal by Tiwari et al. also had shown alarmingly high (69.1%) rate of MRSA isolate which the authors have attributed to indiscriminate use of antibiotics and its accessibility.[21]

Staphylococcus aureus is one of the important organisms in SSI, more so because of the emergence of virulent antibiotic resistant strains. In the present study, the resistance of Staphylococcus to penicillin was 84.6%. Ineffectiveness to penicillin has been reported in other studies as well.[16,22,23] Overall, in the Staphylococcus group, amikacin was found to be highly sensitive (>96%) followed by second line drugs imipenem/meropenem, and linezolid (100%). Overall resistance to vancomycin was found to be 58% unlike other studies.[16,18,19]

Among the MRSA strain, resistance to ciprofloxacin, which is being currently used for prophylaxis was 94% and resistance to penicillins, cephalosporins, and clavulanate was also high (88%-100%); thus making the commonly used drugs fall out of favor. The resistance to penicillin and cephalexin was high in other studies as well.[18,19] Unlike this study, resistance to ciprofloxacin was

only 17% in the study done by Pandey et al., 12% in another study done by Baral et al. at BPKIHS in eastern Nepal, as well as various studies in the western world.[18,19,24] On the other hand, amikacin and chloramphenicol were found to be highly sensitive in the MRSA group (94% and 90% respectively), similar to other studies where resistance as low as 2-5% have been reported.[18,19,25] Chloramphenicol is a broad spectrum antimicrobial which is less frequently used nowadays due to its bone marrow toxicity and also because of the availability of other safer first line drugs. Its infrequent use presently may be the reason of low resistance of this drug.

Among the second line antibiotic sensitivity, linezolid was found to be highly sensitive (95-100%) whereas vancomycin was found to be sensitive in 47% unlike other studies from various parts of Nepal where vancomycin was found to be highly sensitive in MRSA group.[16,18,19]

CONCLUSION:

MRSA is the leading cause of post-cesarean SSI and is a matter of great concern. Amikacin and chloramphenicol were found to be highly sensitive but resistance of vancomycin was showing an increasing trend. Rational use of antimicrobials, active surveillance and reporting of SSI, implementation of infection control strategies, and their periodic review is the need of the hour.

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