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Research Article

A Study on the Incidence of Surgical site Infections and related Pathogens in Obstetrics & Gynaecology in a Tertiary Care Hospital in Andaman & Nicobar Islands

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A B S T R A C T

Background: Surgical site infection is one of the most common complications after any operative procedure.

Aim: To determine the incidence of postoperative surgical site infection in Obstetrics and Gynaecology and also to identify the common causative organisms and their susceptibility to antimicrobials.

Material & Methods: We have analysed data from all the postoperative patients suffering from Surgical Site Infection (SSI), from December 2018 to November 2019 in Andaman and Nicobar Islands Institute of Medical Sciences (ANIIMS).

Result: 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.

Conclusion: 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 need for a proper antibiotic protocol that should be formulated based on local trends and susceptibility of microorganisms.

Keywords: Surgical Site Infection, Caesarean Section, Hysterectomy, MRSA, Pseudomonas, Andaman & Nicobar

Introduction

Surgical Site Infection (SSI) is defined as a proliferation of pathogenic microorganisms which develops in an incision site either within the skin and subcutaneous fat (superficial)

and musculofascial layers (deep) or in an organ or cavity, if opened during surgery.[1] This is a serious complication after any surgical procedure, and is responsible for 20% to 25% of all hospital-acquired infections.[2] There are many known risk factors to any SSI, including local factors such as hematomas, seromas, suture material, poor surgical technique, degree of contamination and also factors like age, nutrition, hygiene and other associated diseases. This increases the patient morbidity and hospital stay and is a burden to health care system.

In the developed countries, there are established antimicrobial policies; but, on the contrary, in our country, although a national policy of antibiotics for common systemic infections is in place, its application varies widely, mostly due to diverse climatic conditions and population in India, that affects the prevalence of organisms. Poor awareness of national antibiotic policy among doctors, especially general physicians working in remote areas in India, leads to widespread empirical use of antibiotics which is often inappropriate. Emergence of antibiotic resistant organisms has therefore occurred over the years, which is a real threat for future. Local microbial aetiology and susceptibility to antimicrobials, differ in different parts of India, and institutional policies will help in curbing inappropriate antibiotic use.

Andaman and Nicobar Islands Institute of Medical Sciences (ANIIMS) is the only referral tertiary care hospital in Andaman and Nicobar islands. We have conducted this study in the Department of Obstetrics and Gynaecology to know about local bacteriological profile and antibiogram of surgical site infections following obstetric and gynaecological procedures.

Materials and Methods

This was a cross-sectional study conducted over one year, from December 2018 to November 2019 in the Department of Obstetrics and Gynaecology, Andaman and Nicobar Islands Institute of Medical Sciences (ANIIMS), India. Prior to the sample collection, approval from Institutional Ethical Committee was obtained. Sterile cotton swabs were collected aseptically avoiding skin flora contamination from all the patients having clinical Surgical Site Infection (SSI) fulfilling inclusion and exclusion criteria as follows.

Inclusion Criteria: Patients presenting with SSI after gynaecological and obstetric operations such as elective and emergency Lower Segment Caesarean Section (LSCS), hysterectomies and other gynaecological operations.

Exclusion Criteria: Patients undergoing episiotomy.

All the swabs were placed in sterile test tubes and were sent to Department of Microbiology for bacteriological analysis.

Specimens were inoculated into blood agar and MacConkey's agar and incubated at 35-37°C and examined after 24 hours for any growth. Those having no growth were again incubated for 24 hours. Growth on culture plates were identified by colonial morphology, Gram stain and battery of standard biochemical tests.[3] Antimicrobial susceptibility testing was carried out using Kirby-Baeur disk diffusion method on Mueller Hinton agar as per Clinical Laboratory Standards Institute (CLSI) guidelines.[4] We presented the data in table formats and analysed using MS Excel and frequency distribution tables.

Result

Over the period of one year, total 990 caesarean sections and 210 gynaecological operations (hysterectomy, laparotomy and others) were performed. Out of 1200, there were clinical surgical site infections in 110 cases (9.17%). Table 1, shows the distribution of SSI in different types of operations, which revealed maximum number of SSI (70 out of 110) occurred in cases of emergency caesarean section, but the incidence of SSI was highest after laparotomy (15%).

Out of these 110 samples processed, 87 (79%) yielded bacterial growth. Monomicrobial growth was seen in 82 samples and polymicrobial growth was seen in five cases. Total of 92 bacterial isolates were identified. Majority of the bacteria isolated were gram-negative bacteria (49 out of 92, i.e., 53.26%). Overall, *Staphylococcus aureus* was the predominant bacteria (35 out of 92 i.e. 38%) followed by *Pseudomonas-aeruginosa* (23.91%) (Table 2).

Table 1.Distribution of SSI according to different types of operations

Type of Surgery		Total Number of cases	Surgical Site Infection	Percentage (%)
Gynaecological Operations	Abdominal Hysterectomy	140	10	7.14
	Vaginal Hysterectomy	30	02	6.67
	Laparotomy	40	06	15
Obstetrical Operations	Elective Caesarean Section	340	22	6.47
	Emergency Caesarean Section	650	70	10.77
	Total	1200	110	9.17

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Table 2.Various bacterial isolates obtained from different SSI

Type of bacteria			Number (n=92)	Percentage of isolates (%)
Gram Positive (n=43)	Staphylococcus Aureus	MRSA	15	16.30
		MSSA	20	21.74
	Coagulase Negative Staphylococcus		07	7.60
	Enterococcus species		01	1.09
Gram Negative (n=49)	Pseudomonas Aeruginosa		22	23.91
	Escherichia coli		12	13.04
	Klebsiella species		08	8.70
	Acinetobacter species		03	3.26
	Citrobacter species		02	2.18
	Proteus species		02	2.18

Table 3.Susceptibility pattern of bacteria isolates

Bacteria	Amp	Ak	Gen	Cip	Aug	Ipm	Cfs	Pit	Lz
S.Aureus MSSA (20)	06 (30%)	16 (80%)	08 (40%)	09 (45%)	15 (75%)	NT	15 (75%)	17 (85%)	20 (100%)
Coagulase Negative Staphylococcus (07)	02 (28.56%)	04 (57.14%)	03 (42.86%)	02 (28.57%)	05 (71.43%)	NT	NT	NT	07 (100%)
Enterococcus (01)	00	01 (100%)	01 (100%)	NT	01 (100%)	NT	NT	NT	01 (100%)
P.Aeruginosa (22)	07 (31.81%)	15 (68.19%)	12 (54.55%)	08 (36.36%)	14 (63.64%)	17 (77.27%)	15 (68.18%)	22 (100%)	NT
E.Coli (12)	04 (33.33%)	06 (50%)	03 (25%)	05 (41.67%)	09 (75%)	12 (100%)	10 (83.33%)	11 (91.67%)	NT
Klebsiella (08)	04 (50%)	05 (62.5%)	05 (62.5%)	04 (50%)	07 (87.50%)	06 (75%)	07 (87.50%)	07 (87.50%)	NT

Amp: Ampicillin, Ak: Amikacin, Gen: Gentamycin, Cip: Ciprofloxacin, Aug: Augmentin, Ipm: Imipenam, Cfs: Cefeperazone/Sulbactum, Pit: Piperacillin/Tazobactum, Lz: Linezolid.

All the isolates of MRSA (15) were susceptible to linezolid and vancomycin.

Regarding antibiotic susceptibility (Table 3), all the staphylococcal isolates including MRSA and CONS were susceptible to Linezolid. *Pseudomonas* was the second commonest organism isolated, which was sensitive to piperacillin-tazobactum and imipenem. Same sensitivity pattern was also observed with *EscherichiaColi* and *Klebsiella* too.

Discussion

This study over 1 year in the only referral tertiary care hospital of Andaman and Nicobar Islands showed that the overall incidence of SSI following gynaecological and obstetrical operations was 9.17% which was comparable with the study done by Harish Babu et al. and another study by Dessie et al. but much less than the finding of a similar study conducted in Punjab (18.88%).[5,6,7] Incidence of postoperative wound infection was much more in emergency LSCS compared to elective LSCS (10.77% vs. 6.47%). Overall incidence of SSI following caesarean section varies from 0.3% to 51.17% in various studies.[8,9,10,11] Diabetes, anaemia, advancing age, increased duration of operations were some of the known risk factors.

We found the incidence of SSI following abdominal hysterectomy was 7.14%, which was similar to the study by Harish Babu et al.[5] In contrast, incidence of SSI following laparotomy was 15%, which was the highest due to the frequent presence of other comorbidities among these patients who were taken for laparotomy due to various indications and also due to large amount of blood loss and frequent placement of drains which also act as a source of infection from external environment.

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The principal microorganisms that cause wound infections after obstetric or gynecologic surgery are aerobic staphylococci and streptococci, which are inoculated into the wound from the skin and aerobic Gram-negative bacilli (such as *E. coli, K. pneumoniae* and *Proteus* species) and anaerobes, which are transferred from the pelvic cavity as the surgeon closes the abdominal wound. In our study, we found that *Staphylococcus aureus* was the most common isolate identified. Similarly different studies from different parts of India concluded that *Staphylococcus aureus* was the most common causative organism for SSI.[5,7,12] We have found methicillin resistance in 15 out of 35 isolates of *Staphylococcus*, that is, 42.86% of staphylococci are MRSA strain. This finding was evidently more than some contemporary studies, who found MRSA in the range of 10% to 21%.[12,13,14] Eagye et al. had found the incidence of MRSA as 45%, which was close to our finding.[15] So, there is definitely an increasing trend of MRSA, which can be attributed to rampant use of antibiotics by general physicians to treat common infections caused by *Staphylococcus*. Regarding antibiotic sensitivity, we did not find any resistance to linezolid or vancomycin in the MRSA group. We also did not find any resistance to linezolid and vancomycin among the coagulase-negative *Staphylococcus aureus* (CONS) group, which is definitely a positive finding in the present scenario, where there is already case reports of vancomycin-resistant CONS strains. This finding may be helpful in treating MRSA and CONS infections in future.

Gram-negative infections were responsible for more than half of all the SSIs (53.26%). In this group, *Pseudomonas* was the commonest (23.91%), followed by *E. coli* (13.04%). This finding was consistent with the findings by Masaadeh HA et al. and Sohn et al., who found it to be the most common isolate.[16,17] But conversely studies by Negi et al. and Dessie et al. showed that *E.Coli* was more prevalent than *Pseudomonas*.[6,12] We found a higher prevalence of *Pseudomonas* (23.91%) compared to other studies by Kaur (15%) and Mundhada et al. (12%).[7,18] Only one study from Southern India came out with a similar incidence of *Pseudomonas* in SSI, that is, 24.13%.[5]

P.aeruginosa strains were moderately sensitive to gentamicin, amikacin and cefoperazone sulbactum with susceptibility in the range of 50% to 70% and 100% sensitive to piperacillin-tazobactum. This bacterial isolate of *Pseudomonas* was more resistant than previous studies and clearly indicates that the *Pseudomonas* strains are becoming more resistant to the commonly prescribed antibiotics day by day and is a definite concern to the clinicians.[16] Other common gram-negative isolates were also highly resistant to ampicillin and sensitive to imipenem, amoxycillin-clavulanic acid and piperacillin-tazobactum. This development of highly resistant bacterial strain has been a global problem and our study also points to the same.

Conclusion

Surgical site infection is a nightmare to every surgeon and meticulous operative technique, maintenance of proper asepsis, decontamination of operation theatres and timely administration of appropriate preoperative antibiotics are necessary to prevent this. But when it cannot be prevented, it must be treated effectively and for that we need to start the appropriate and most effective antibiotic. This study helped us to get an insight into local microbial aetiology in obstetrics and gynaecological surgeries as well as their susceptibility pattern to antibiotics. Furthermore, the high prevalence of antibiotic-resistant strains also point to the concerning problem of irrational and prolonged use of antibiotics, which needs to be taken care of immediately by proper formulation of local institutional antimicrobial policies.

Informed consent was obtained from individual participants included in the study.

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Conflict of Interest: None

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