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Bacterial Profile and Antimicrobial Susceptibility Pattern of Surgical Site Infections – A Retrospective Study

KEYWORDS: Surgical site infections, bacteria, antibiogram

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ABSTRACT ***Background:*** *Surgical site infections (SSI) are one of the common causes of health care associated infections leading to increased morbidity among the post operative patients and a therapeutic challenge to the treating surgeon.*

Materials and methods: *A retrospective study of post operative patients with SSI during a 6 month period was done based on the records. The bacteriological profile and antibiogram of isolates were analyzed.*

Results: *The rate of S.S.I was 5.1% and gram negative bacilli (GNB) were the more common pathogens 37/59 (62.7%), isolated with Esch.coli, constituting the highest 14/59 (23.7%). Imipenem was the most effective drug and ciprofloxacin was the least effective against Esch.coli.*

Conclusion: *The incidence of SSI is rising due to the emergence of multidrug resistant bacteria. Rapid diagnosis of these pathogens will reduce the morbidity and mortality rate of SSI.*

INTRODUCTION

Post operative wound infections continue to be a global health problem and a therapeutic challenge for the treating surgeons. Surgical site infection (SSI) is defined as an infection occurring at the incisional site within 30 days after an operative procedure or within one year of placement of an implant that has remained in situ. The infection may involve the superficial tissues or involve the deeper tissues or organs (1). SSI are the third most common hospital associated infections constituting about 14 to 16 % of these infections (2). The incidence of SSI varies from place to place and the health care facility. The rate varied from 3.6 % to 22.5 % in different studies across our country (3). It is necessary to study the prevalence, bacterial profile and antibiogram of SSI in each health care institution to evolve an antibiotic policy for empirical therapy of patients during pre operative and post operative period (4).

MATERIAL AND METHODS

A total of 1057 patients were operated by the general surgeons during a period of six months from July 2013 to December 2013 at our hospital. Among these 76 were clinically suspected as having SSI. Pus samples were collected from these patients by aspiration or a pair of sterile swabs from the site with standard aseptic techniques and sent to the microbiology dept. for culture and sensitivity test. All the samples were processed within one hour of receipt in the lab as per the standard procedures for isolation of aerobic bacteria. The bacteria isolated were identified by standard procedures and tested for antibiotic susceptibility by Kirby bauer disc diffusion method.

RESULTS

A total of 54 out of 1057 patients who underwent surgery during the study period were diagnosed as cases of SSI. Out of 76 suspected cases, 22/76 (28.9%) samples showed no growth of bacteria and the remaining 54/76 (71%) samples were culture positive, in which polymicrobial growth was observed in 5 cases. Among the total number of patients, 48 were male and 28 were female. Bacteria were isolated from 37/48 (77.1%) males and 16/28 (57.1%) females respectively. Majority of the patients were in the 30-50 age group 37/76 (48.7%). It has been found that the gram negative bacilli 37/59 (62.7%), were more than the gram positive cocci 22/59 (37.3%). *Esch. coli* 14/59 (23.7%) was the most predominant organism isolated followed by coagulase negative *staphylococci* (CONS) 11/59 (18.6%), *Pseudomonas species* 11/59 (18.6%) and *Staphylococcus aureus* 10/59 (16.9%) [Figure No. 1].

Figure No. 1: Bacterial etiology of SSI
Total no. of patients with SSI- 54
Total no. of bacteria isolated- 59

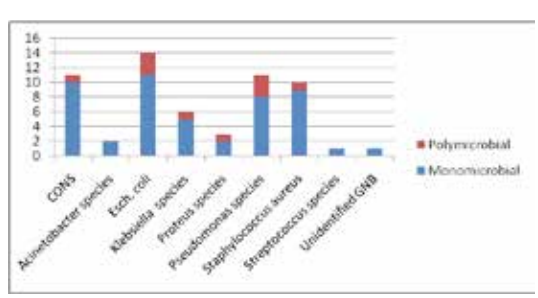

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Table No. 1: Antibiotic resistance pattern of gram negative bacteria (% resistance) (N=37)

Antibiotic	*Acinetobacter spp* n=2	*Klebsiella spp* n=6	*Pseudomonas spp* n=11	*Proteus spp* n=3	*Esch.coli* n=14	Unidentified GNB n=1	Total n=37(%)
Amikacin	1(50)	1(16.7)	2(18.2)	1(33.3)	2(14.3)	0(0)	7(18.9)
Amoxycillin/ clavulanic acid	1(50)	1(16.7)	5(45.4)	1(33.3)	10(71.4)	1(100)	19(51.3)
Amoxycillin	2(100)	1(16.7)	6(54.5)	1(33.3)	12(85.7)	1(100)	23(62.2)
Ceftazidime	2(100)	5(83.3)	7(63.6)	1(33.3)	10(71.4)	1(100)	26(70.3)
Ceftriaxone	2(100)	3(50)	7(63.6)	2(66.7)	7(50)	1(100)	22(59.4)
Cefuroxime	1(50)	4(66.7)	6(54.5)	1(33.3)	10(71.4)	1(100)	23(62.2)
Ciprofloxacin	2(100)	3(50)	10(90.9)	3(100)	10(71.4)	1(100)	29(78.4)
Gentamicin	2(100)	4(66.7)	8(72.7)	2(66.7)	9(64.3)	1(100)	26(70.3)
Imipenem	0(0)	1(16.7)	1(0.9)	1(33.3)	6(42.8)	1(100)	10(27)
Levofloxacin	2(100)	1(16.7)	8(72.7)	2(66.7)	8(57.1)	1(100)	22(59.4)
Meropenem	2(100)	1(16.7)	3(27.3)	0(0)	9(64.3)	0(0)	12(32.4)
Ofloxacin	2(100)	3(50)	7(63.6)	1(33.3)	12(85.7)	1(100)	26(70.3)
Piperacillin/ tazo-bactum	1(50)	2(33.3)	5(45.4)	0(0)	2(14.3)	1(100)	11(29.7)
Piperacillin	2(100)	1(16.7)	7(63.6)	1(33.3)	9(64.3)	1(100)	21(56.7)
Tobramycin	2(100)	3(50)	8(72.7)	1(33.3)	9(64.3)	1(100)	21(56.7)

Table No. 2: Antibiotic resistance pattern of gram positive bacteria (% resistance) (N=22)

Antibiotic	CONS n=11	*Staphylococcus aureus* n=10	*Streptococcus* spp. n=1	Total n=22(%)
Amikacin	2 (18.2)	3 (30)	1 (100)	6 (27.3)
Cefoxitin	1 (9.1)	1 (10)	0 (0)	2 (9)
Ciprofloxacin	5 (45.4)	8 (80)	0 (0)	13 (59)
Clindamycin	5 (45.4)	4 (40)	1 (100)	10 (45.5)
Co- trimoxazole	9 (81.8)	9 (90)	1 (100)	19 (86.4)
Gentamicin	8 (72.7)	4 (40)	1 (100)	13 (59)
Ofloxacin	3 (27.3)	5 (50)	1 (100)	9 (40.9)
Teicoplanin	1 (9.1)	2 (20)	0 (0)	3 (13.6)
Tetracycline	6 (54.5)	6 (60)	0 (0)	12 (54.5)
Vancomycin	0 (0)	0 (0)	0 (0)	0 (0)

DISCUSSION

The SSI rate in our study is 5.1%. The SSI rate in India was reported to be 3.6% to 22.5% (3). The results of our study are lesser than the previous reports (5, 6). The incidence of infection was more in male than the female patients. Similar observation has been reported previously. The reason behind this variation has not yet been established clearly (7, 8).

Gram negative bacilli 37/59 (62.7%), were present predominantly than the gram positive cocci 23(37.3%) which correlate with the previous reports (9, 10). *Esch. coli* was the most prevalent isolate among the gram negative bacilli and CONS, among gram positive cocci. *Staphylococcus aureus* was the most prevalent organism found in most of the studies, followed by *Esch. coli* and *Pseudomonas* (11,12,13,14). In our study it has been found that *Esch. coli* was predominant followed by CONS, *Pseudomonas* and *Staphylococcus aureus*.

Amikacin, imipenem, piperacillin/ tazobactum, and meropenem were found to be more efficient antibiotics against gram negative bacilli [Table No. 1]. Vancomycin, cefoxitin and teicoplanin were effective against gram positive cocci [Table No. 2].

Esch. coli showed high degree of resistance to amoxicillin, ofloxacin, cefuroxime, ceftazidime, ciprofloxacin and amoxycillin/ clavulanic acid. It was more sensitive to amikacin, tobramycin and imipenem. *Pseudomonas* was more resistant to ciprofloxacin and sensitive to amikacin, imipenem and meropenem [Table No. 1]. CONS were highly resistant to co- trimoxazole and gentamicin. Vancomycin, cefoxitin, teicoplanin, amikacin and ofloxacin were more effective against CONS. *Staphylococcus aureus* has shown more resistance to clindamycin, co- trimoxazole and ciprofloxacin. It was more sensitive to vancomycin, cefoxitin and amikacin [Table No. 2].

From the study it has been found that identification of the pathogen and choosing antibiotics based upon the antibiogram of the isolate plays a vital role for treating SSIs.

Our study supports the use of amikacin, imipenem, piperacillin/ tazobactum, and meropenem as effective against most of the gram negative bacilli and vancomycin, cefoxitin and teicoplanin against gram positive cocci in severe infections.

Increased rate of antibiotic resistance in the present study

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reveals that it may be an outcome of widespread use of broad spectrum antibiotics.

CONCLUSION

Despite the modern aseptic procedures followed in the hospital, SSI remains as a serious problem for patients and surgeons. Hospitals serve as a reservoir for SSIs as they harbor a variety of pathogenic microbes and multi drug resistant strains. Studying the bacteriological and antibiotic susceptibility profile of SSI paves way to select the empirical antibiotic accordingly and thereby reducing the rate of SSI.

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