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BACTERIOLOGICAL PROFILE AND ANTIBIOGRAM OF SURGICAL SITE INFECTION IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction: Surgical site infections are responsible for 31% of all Hospital Acquired infections (HAIs) among all hospitalized patients[4]. This study is undertaken with the aim of determining the aerobic bacteriological profile and antibiogram of isolated pathogens to know the SSI prevalence and to formulate guidelines for therapy in our tertiary care hospital.

Methodology: The present study was conducted with a total of 200 clinical cases of suspected surgical site infections in department of Microbiology, SVMC, Tirupati. Taking all the specimen collection precautions, two pus swabs were collected from the infected surgical site from each patient. One swab was used for smear preparation for Gram's staining and the second swab was used to inoculate onto blood agar and MacConkey agar. Antibiogram of the isolated organism was done on Mueller-Hinton agar by Kirby-Bauer Disc diffusion method

Results: A total number of 200 clinical suspected cases of SSIs were included in the present study. Of these, 116 were females and 84 were males. Among 200 cases, 115 showed positive cultures and 133 aerobic organisms were isolated. In 15 cases, poly microbial growth seen. Among the isolates, 40.59% were Gram positive cocci and 59.41% were Gram negative bacilli. Among these, the frequently isolated is *Staphylococcus aureus* (28.57%) followed by *Escherichia coli* (18.79%) and *Klebsiella pneumonia* (18.04%). All the Gram positive cocci isolated are resistant to Penicillin and showed 100% susceptibility to Vancomycin. All Gram negative bacilli isolated showed highest susceptibility to Imipenem (92.4%), followed by Piperacillin/Tazobactam (82.27%) and Amikacin (77.2%).

Conclusion: SSI s should be investigated properly to identify bacteriological agent responsible and its antibiotic sensitivity pattern to administer suitable antibiotic to treat the condition. This will reduce the hospital stay and financial burden to the patient.

KEYWORDS : Surgical site infections (SSIs), incidence, pathogens, Antibiogram

INTRODUCTION

Center for Disease control and prevention (CDC) defines Surgical site infection (SSI) as those infections typically occurring within 30days of an operation at the site or part of the body where surgery took place or within a year if an implant is left in place and the infection is thought to be secondary to surgery[1-3]. Surgical site infections are responsible for 31% of all Hospital Acquired infections (HAIs) among all hospitalized patients[4]. SSIs are associated with 3% mortality rate and 75% of SSI-associated mortality directly attributable to the SSI[5].

Epidemiological information of SSIs has been collected since the 1960s[6]. In 1992 the term surgical wound infection was changed to Surgical Site Infection (SSI) by The Surgical Wound Infection Task Force[7].

According to NHSN data an overall SSI rate of 1.9% between 2006 and 2008[8]. Approximately half of SSIs (40-60%) are preventable by application of evidence based strategies that include infection control programmes, surveillance, antimicrobial prophylaxis, carrier state eradication and education[9]. At present antimicrobial resistance has become a global burden due to significant changes in microbial genetic ecology due to improper use of antimicrobials.

This study is undertaken with the aim of determining the aerobic bacteriological profile and antibiogram of isolated pathogens to know the SSI prevalence and to formulate guidelines for therapy in our tertiary care hospital.

MATERIAL AND METHODS

The present study was a cross-sectional study conducted in department of Microbiology, SVMC, Tirupati. A total of 200 clinical cases of suspected surgical site infections were studied during October 2017 , January 2019. These cases were taken from patients admitted for surgery in surgical units of the departments of General Surgery, Orthopedics, Obstetrics and Gynaecology, SVRR Government General Hospital.

Inclusion criteria:

- Serous or non-purulent discharge from surgical site.
- Serous or non-purulent discharge from surgical site with signs of inflammation like edema, redness, warmth, tenderness, induration or pus discharge from surgical site.
- Sutures removed deliberately by the surgeon due to localized collection (serous or purulent).

Exclusion criteria:

Infected burn wounds, age < 18 years, cellulitis, stitch abscess, surgical sited < 48 hours from the time of completion of surgery and episiotomy wounds.

Sample collection and processing:

Proper history of the patient was taken including antimicrobial prophylaxis and post-operative prophylaxis. Informed written consent was obtained from the patients. Taking all the specimen collection precautions, two pus swabs were collected from the infected surgical site. One swab was used for smear preparation and Gram's staining. The smear was screened for the presence of bacteria and pus cells. The second swab was used to inoculate onto blood agar and MacConkey agar and incubated at 37 °C for 18-24 hours. The growth on plates was identified by using standard bacteriological techniques. Antibiogram of the isolated organism was done on Mueller-Hinton agar by Kirby-Bauer Disc diffusion method.

RESULTS

A total number of 200 clinical suspected cases of SSIs were included in the present study. Of these, 116 were females and 84 were males. Age-wise distribution of patients showing 47.5% belong to 21-40 years age group, followed by 33% belonged to 41-60 years age group, 10% belonged to above 60 years age group and 9.5% were below 20 years age group. Among 200 cases, 115 showed positive cultures and 133 aerobic organism isolated. In 15 cases, poly microbial growth seen. The rate of isolation from emergency surgeries was 58.08% and from elective surgeries was 56.25%.

Table 1: Age-wise distribuation of cases and culture positivity

S.No.	Age group	Cases (N=200)	Number of Positive cases (N=115)	Isolation %
1	≤ 20 years	19	7	36.84%
2	21-40 years	95	52	54.73%
3	41-60 years	66	42	63.63%
4	≥ 61 years	20	14	70%

Among 133 aerobic bacterial pathogens isolated from SSI cases, 40.59% were Gram positive cocci and 59.41% were Gram negative bacilli.

Table 2: Aerobic bacterial pathogens isolated from SSI cases

Organisms	Monomicroial	Polymicrobial	Number of isolates	Percentage among the isolates
Staphylococcus aureus	29	9	38	28.57
Staphylococcus epidermidis	6	1	7	5.26
Enterococcus faecalis	6	3	9	6.76
Klebsiella pneumoniae	16	8	24	18.04
Escherichia coli	19	6	25	18.79
Proteus mirabilis	2	2	4	3.0
Citrobacter freundii	3	0	3	2.25
Pseudomonas aeruginosa	16	3	19	14.28
Enterobacter aerogenes	1	0	1	0.75
Acinetobacter baumanii	2	1	3	2.25

Table 3: Antibiotic sensitivity pattern of aerobic Gram positive cocci isolated from SSI cases (N=54)

Antibiotic	Susceptibility (%)	Resistance (%)
Pencillin G	0 (0)	54 (100)
Co-trimoxazole	29 (53.7)	25 (46.3)
Amoxyclav	21 (38.88)	33 (61.11)
Amikacin	40 (74.07)	14 (35.18)
Levofloxacin	28 (51.85)	26 (48.14)
Piperacillin-Tazobactam	39 (72.22)	15 (27.77)
Oxacillin	27 (50)	27 (50)
Ceftriaxone	26 (48.14)	28 (51.85)
Vancomycin	54 (100)	0 (0)

Gram positive cocci showed 100% susceptibility to Vancomycin. Among 38 *Staphylococcus aureus* isolated, 22 (57.89%) were MRSA and 16 (42.11%) were MSSA.

Table 4: Antibiotic susceptibility pattern of Gram negative bacilli isolated from SSI cases (N=79)

Antibiotic	Susceptibility (%)	Resistance (%)
Amoxicillin / Clavulanate	13 (16.45)	66 (83.54)
Amikacin	61 (77.2)	18 (22.78)
Co-trimoxazole	42 (53.16)	37 (46.83)
Cefotaxime	23 (29.11)	56 (70.88)
Imipenem	73 (92.40)	6 (7.59)
Levofloxacin	47 (59.49)	32 (40.50)
Piperacillin / Tazobactam	65 (82.27)	14 (17.72)

All Gram negative bacilli isolated showed highest susceptibility to Imipenem, followed by Piperacillin/Tazobactam and Amikacin. *Pseudomonas aeruginosa* (19) isolates showed 84% sensitivity to Carbenicillin.

DISCUSSION

SSI doubles the patients' risk of mortality after surgery. Extra bed occupancy reaponsible for increased financial burden associated with SSIs. In the present study of 200 suspected surgical site infections, the incidence of culture positivity is 57.5% similar to other studies conducted by Gangadharan SS et al (73.5%)[11], Ananthi B et al (59.8%)[12], Amatya J et al (60.56%)[13], Budhani D et al[14]. Preethi Sri et al reported lower incidence i.e., 1.7%[15] and Siddiqui N et al 9.41%[16]. In the present study the highest rate of SSI was observed in the age group of above 60 years i.e., 70% similar to the studies done by Sukla YP et al (62.5%)[17], Amrutham R et al (64.2%)[18]. In this study, the rate of isolation of pathogenic organisms is higher in the emergency surgeries (58.08%) similar to the studies conducted by Mundhana AS et al (45%)[19], Gangadharam SS et al (41%)[11]. In the present study, Gram negative bacilli (59.40%) are predominant isolates than Gram positive cocci (40.60%). This is similar to studies conducted by Amrutham et al (63.75%)[18], Ananthi B et al (55%)[12]. In the present study, *Staphylococcus aureus* is the most common organism isolated and this is similar to the studies done by Gangadharam SS et al[11], Siddiqui N et al[16], Mundhana AS et al[19]. *Escherichia coli* is the second most common organism and it is similar to otherstudies conducted by Mundhana AS et al[19] and Siddiqui et al[16].

In the present study MRSA isolation rate is 57.89%. this is similar to other studies conducted by Preethi Sree P et al (75%)[15], Amrutham R et al (65.7%)[18]. In the present study Gram positive cocci shown heighest sensitivity to Vancomycin (100%) followed by Amikacin (74.07%) and Piperacillin / Tazobactam (72.22%) and these findings are similar to Amrutham R et al[18], Ananthi B et al[12]. In the present study antibiotic susceptibility pattern of Gram negative bacilli isolated shown highest sensitivity to Imipenem (92.4%), followed by Piperacillin / Tazobactam (82.27%) and Amikacin (77.2%), Pseudomonas isolated shown 84.2% susceptibility to Carbenicillin and these findings are similar to Budhani D et al[14], Gangadharan SS et al[11], Preethi Sree P et al[15].

CONCLUSION

SSI s should be investigated properly to identify bacteriological agent responsible and its antibiotic sensitivity pattern to administer suitable antibiotic to treat the condition. This will reduce the hospital stay and financial burden to the patient.

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