Study of Bacteriological Profile of Post Operative Wound Infections in Surgical Wards in a Tertiary Care Hospital

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ABSTRACT

Introduction: Surgical site infections (SSIs) are known to be one of the most common causes of nosocomial infections worldwide and account for nearly 20% to 25% of all nosocomial infections. Surgical site infection rates are reported to range from 2.5% to 41.9% globally resulting in high morbidity and mortality.

Material and Methods: All the pus samples of clinically suspected of SSI were immediately processed by standard bacteriological techniques. Antibiotic susceptibility testing was performed.

Results: Out of total 117 pus specimens received in the Microbiology laboratory from 117 suspected SSI cases, 58(49.57%) cases were culture positive and so this cases were considered as definitive cases of SSI giving a SSI rate of 2.69%. The most common organism isolated from SSI cases was *Psuedomonas aeruginosa* (29.31%) followed by *E.coli* (25.86%). Among β – lactam antibiotics, all the gram negative bacilli showed maximum sensitivity towards Carbapenemes and Piparacillin-tazobactum**.** 25% staphylococcus aureus isolates were identified as Methicillin Resistant Staphylococcu aureus (MRSA).

Conclusion: Every hospital needs to organize its infection control program. Failure to implement infection control policies and lack of awareness are the factors contributing to hospital infections and disease.

Keywords: Surgical Site Infections, Antibiotic Resistanace, MRSA, Infection Control

INTRODUCTION

World Health Organization (WHO) describes hospital acquired infections to be one of the major infectious diseases having a hugeconomic impact worldwide.[1] These infections affect about 2 million people annually resulting in 5% to 15% of them requiring hospitalization.[2,3]

Surgical site infections (SSIs) are known to be one of the most common causes of nosocomial infections worldwide and account for nearly 20% to 25% of all nosocomial infections.[4] Surgical site infection rates are reported to range from 2.5% to 41.9% globally resulting in high morbidity and mortality.[5,6] Approximately 2% to 5% of the 16 million people undergoing surgical procedures each year develop surgical site infection[6-8] with more recent data putting it at two-thirds of patients who undergo operations.[9] The situation is more severe in developing countries where resources are scarce and staffs are always in short supply.[4,10] Surgical site infections (SSI) are the third most commonly reported nosocomial infection and they account for approximately a quarter of all nosocomial infections.[11] As the control of postoperative complications is an essential component of total quality management, it becomes important to determine the prevalence of surgical site infections, assess the magnitude of the problem and provide a rationale to set priorities in infection control in the hospitals. Not many studies are done in India in this direction.

Hence the present study had been undertaken with the aims and objectives to isolate the different organisms from post-operative wound infections, to determine the antibiotic sensitivity pattern of these isolates and to determine the rate of SSI

MATERIAL AND METHODS

This study was conducted in the Department of Microbiology, Government Medical College and Hospital, Nagpur from January 2016 to December 2016. The study population included the patients from Department of Surgery, Government Medical College and Hospital, Nagpur who had undergone operations and who developed signs/symptoms of postoperative wound infections. Surgical sites were considered to be infected according to the set of clinical criteria recommended by the surgical infection task force. The CDC criteria were used to define the type of surgical wound using the wound contamination class system.[12] The approval of Institutional Ethics committee, Government Medical College and Hospital, Nagpur was obtained.

Inclusion criteria: 117 randomly selected clinically suspected cases of postoperative wound infections from Department of Surgery, Government Medical College and Hospital, Nagpur were included in the study.

Exclusion criteria*:* All the wound infections other than postoperative wounds were excluded from the study.

All the pus samples or wound swabs of clinically suspected of SSI cases received in the Department of Microbiology, Government Medical College and Hospital, Nagpur were immediately inoculated and streaked onto nutrient agar, 5% sheep blood agar and MacConkey agar (Hi-Media, India). Plates were incubated aerobically at 37°C for 24 hours.[13] Isolated organisms were processed and identified according to standard bacteriological techniques.[14] Antibiotic susceptibility testing was performed by Kirby-Bauer disk diffusion technique.[15] The drugs used were as per the CLSI 2013 guidelines. All the staphylococcal isolates were subjected to determination of methicillin resistance by cefoxitin disc diffusion method. All the Gram negative isolates were subjected to determination of β lactamase,AmpC

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β-lactamase and metallo β-lactmases.[16]

STATISTICAL ANALYSIS

Microsoft office 2007 was used for the statistical analysis. Descriptive statistics like mean and percentages were used for interpretation of data.

RESULTS

Out of total 117 pus specimens received in the Microbiology laboratory from 117 suspected post operative wounds which had clinical signs/symptoms of infection i.e. suspected SSI cases, 58(49.57%) cases were culture positive and so this cases were considered as definitive cases of SSI. Thus cases 58(49.57%) were diagnosed as the SSI cases out of 2150 total surgeries conducted in operation theatre of Department of Surgery giving a SSI rate of 2.69%. Out of these culture positive SSI cases, 17(14.52%) were clean contaminated wounds and 100 (85.47%) were clean wounds.

The most common organism isolated from SSI cases was *Psuedomonas aeruginosa* (29.31%) followed by *E.coli* (25.86%).

Among β – lactam antibiotics, all the gram negative bacilli showed maximum sensitivity towards Carbapenemes and Piparacillin-

S.No	Organism isolated	Number (%)
1	*Psuedomonas aeruginosa*	17 (29.31)
2	*E.coli*	15 (25.86)
3	*Klebsiellae pneumoniae*	09 (15.51)
4	*Staphylococcus aureus*	08 (13.79)
5	*Acinetobacter baumanii*	05 (8.62)
7	*Citrobacter freundii*	03 (5.17)
8	*Proteus mirabilis*	01 (1.72)
	Total	58 (100)

Table-1: Organisms isolated from SSI cases (n=58)

Gram negative bacilli	Antibiotics		
	Of (%)	Ak (%)	Pb (%)
Psuedomonas aeruginosa (17)	10 (58.82)	11 (64.70))	04(23.52))
E.coli (15)	06 (40)	06 (40)	03(20)
Klebsiellae pneumonia (09)	05 (55.55)	04(44.44)	02 (22.22)
Acinetobacter baumanii (05)	02 (40)	02 (40)	02 (40)
Citrobacter freundii (03)	02 (66.66)	02 (66.66)	02 (66.66)
Proteus mirabilis (01)	00(00)	00(00)	00(00)

Of- Oflaxacin, Ak- amikacin, Pb- Polymyxin B

Table-3: Resistance pattern of the Gram negative bacilli against fluoroquinolones, aminoglycoside and polypeptide isolated from SSI cases

Organism	Antibiotics(%)								
	E	Cn	Cz	Co	T	G	Cf	Va	Lz
Staphylococcus aureus (n=08)	07 (87.50)	03 (37.50)	04 (50)	07 (87.50)	08 (100)	04 (50)	04 (50)	00 (00)	00 (00)

E-Erythromycin, Cn-Cefoxitin, Cz-Cefazolin, Co-trimoxazole, T-Tetracycline, G-Gentamycin, Cf-Ciprofloxacin, Va-Vancomycin, Lz-Linezolid

Table-4: Antibiotic resistance pattern of *staphylococcus aureus* isolated from SSI cases

S. No	Organism	Number of ESβL producer organisms(%)	Number of Ampcβ lactamase producer organisms (%)	Number of metallo-β-lacatmase producer organisms(%)
1	*Psuedomonas aeruginosa* (17)	04 (23.52)	0 3 (17.64)	--
2	*E.coli* (15)	01(6.66)	0 3 (20)	
3	*Klebsiellae pneumoniae* (09)	02(22.22)		
5	*Acinetobacter baumanii* (05)	01(20)		
6	*Citrobacter freundii* (03)		01(33.33)	
7	*Proteus mirabilis* (01)	01(100)		

Table-5: β-lactamase production among Gram negative bacilli

Gram negative bacilli	Antibiotics								
	A(%)	Ac(%)	PIT (%)	Pc(%)	Cn(%)	Cfz(%)	Cpm(%)	Ip(%)	MRP(%)
Psuedomonas aeruginosa (17)	17(100)	14(82.35))	04(23.52))	5(29.41))	16(94.11)	13(76.47)	8(47.05)	06(35.29))	05(29.41)
E.coli (15)	15(100)	12(80)	05(33.33)	03(20)	02(13.33))	02(13.33)	3(20)	05(33.33)	05(33.33)
Klebsiellae pneumonia(09)	9(100)	6(66.66)	6(66.66)	01 (11.11)	2 (22.22)	2 (22.22)	2 (22.22)	04 (44.44)	02(22.22)
Acinetobacter baumanii (05)	05 (100)	03 (60)	01 (20)	01 (20)	01 (20)	01 (20)	01 (20)	02 (40)	01 (20)
Citrobacter freundii (03)	03 (100)	03 (66.66)	01(33.33)	01(33.33)	03 (100)	00(00)	00(00)	00(00)	00(00)
Proteus mirabilis (01)	01(100)	00(00)	1(100)	00(00)	00(00)	00(00)	00(00)	00(00)	00(00)

A-Ampicillin, Ac-Amoxycillin-clavulanic acid, PIT – Piperacillin-tazobactum, PC-Piperacillin, Cn-cefoxitin, Cfz-ceftazidime, Cpm- Cefepime, Ip- Imepenem, MRP-Meropenem

Table-2: Resistance pattern of the Gram negative bacilli against β – lactam antibiotics isolated from SSI cases tazobactum. Out of these eight staphylococcal isolates, two (25%) isolates were identified as Methicillin Resistant Staphylococcu aureus (MRSA).

DISCUSSION

Post-operative wound infection still remains one of the most important causes of morbidity and is one of the most common nosocomial infection[17] in surgically treated patients. In the present study, an attempt has been made to know the various bacterial flora responsible for surgical site infections and their antibacterial susceptibility pattern. The rate of SSI varies greatly worldwide and from hospital to hospital. The rate of SSI varies from 2.5% to 41.9% as per different studies.[18-21] The incidence of SSI in the present study is 2.69% even though high, is in agreement with the various studies.

The most common organism isolated from SSI cases in the present study was *Psuedomonas aeruginosa* (29.31%) followed by E.coli (25.86%).Ramesh et al 2013[22] reported *E. coli* (20.8%) as the most common organism isolated followed by *S. aureus* (16.1%) from SSI cases.Whereas some studies also revealed *Staphylococcus aureus* as the most common organism isolated from *SSI*.[19,22] The high incidence of gram-negative organisms in the post operative wound infections can be attributed to be acquired from patient's normal endogenous microflora[23]

The present study also revealed that all the gram negative bacteria(GNBs) isolated were having a very high percentage of resistance to β-lactam antibiotics and also were showing a low susceptibility to cephalosporins and aminoglycosides. Extensive use of inappropriate antibiotics in empirical therapy can cause emergence of such resistant bacterial strains, especially in healthcare centers. .These GNBs showed maximum sensitivity towards piperacillin-tazobactam, imepenem and polymyxin B. This finding coincides well with Patel et al et al 2011.[23]

Our study also revealed that all the staphylococci showed maximum sensitivity towards Vancomycin and Linezolid which is again in accordance with Raza et al 2013.[24] In the present study we isolated 25% MRSA from SSI cases. Naik et al 2011[25] reported isolation of 9.6% of MRSA from SSI cases whereas Ramesh et al 2013[22] reported isolation of 66.37% MRSA from SSI cases.

CONCLUSION

A better Surveillance system for surgical site infection with feedback of appropriate data to surgeons is highly recommended to reduce the SSI rate in tertiary health care centres. Thus, every hospital needs to organize its infection control program. Failure to implement infection control policies and lack of awareness are the factors contributing to hospital infections and disease. Guidelines and protocols for basic infection control practices such as hand washing, written protocols of perioperative, intraoperative and post operative infection control practices should be widely available and adhered to.

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