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Bacteriological Study of Post-Operative Wound Infections and Their Antibiogram in a Tertiary Care Hospital

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Abstract: The aim of this study was to determine the incidence of surgical site infections (SSI) in patients undergoing surgery and to identify common bacterial pathogens and antibiotic sensitivity. SSI significantly affect the patient's quality of life by increasing morbidity and extending hospital stays. This cross sectional study was conducted for a period of 1 year in a tertiary care hospital, Hyderabad. Patients who underwent surgery and had wound pus discharge were included in the study. A total of 242 samples were processed in the laboratory during the study period. Out of 242 samples, 212 samples yielded aerobic bacterial growth. 20 samples showed no bacterial growth after 48 hours of incubation. Among 212 bacterial isolates, S.aureus (63%) & Klebsiella (18%) were the commonest organisms. Antimicrobial Susceptibility Testing was carried out for all 212 isolates. S.aureus strains showed high degree of resistance for Ampicillin. Gram negative isolates showed even higher rate of resistance & commonly prescribed agents like Gentamicin, Cotrimoxazole & Ciprofloxacin. SSIs pose a major burden to the hospital and also to the patients. Although they cannot be completely eliminated they can be reduced by knowing the etiology of microorganisms & by formulating hospital antibiotic policy.
Keywords: Surgical wound infections, antibiotic resistance, staphylococcus, gram negative bacilli.

INTRODUCTION

Every operation in surgery is an experiment in bacteriology, this statement by Lord Moynihan provides the remarkable insight to the seemingly unpredictable nature of infection.

Far reaching advances in the field of medicine, techniques in surgery, dependable anaesthetic techniques, innumerable antibiotics, advances in the operating room maintenance after the introduction of the lamellar air flow systems and the body exhaust systems, have enriched the surgeon's armamentarium. As a result, the post operative infection rate has come down from about 70% in the pre – Listerian era to less than 1% in the developed countries [1].

When a patient enters the specialised environment of a modern hospital, he is exposed to both known and ill defined hazards. Infection is encountered when the first line of host defence – the cutaneous or mucosal barrier between environmental microbes and the host's internal milieu is impaired [2]. Inspite of these encouraging results wound infection still remains a major cause of post-operative morbidity and mortality. The term wound has been defined as a disruption of normal anatomical structure and, more importantly function [1].

Post-operative SSI are an important health care associated (HAI) infection & one of the most frequent causes of post op morbidity. WHO shows that SSIs are most frequently reported type of HAI in low and middle income countries with a pooled incidence of 11.8 episodes of SSI per100 surgical procedures [3].

Post-operative wound infection seldom causes death, yet it does prove to be an economic burden on the patient and the hospital administration because of prolonged convalescence, prolonged post operative hospital stay, nursing care and an unnecessary waste of time.

Bacteriological studies have shown that SSIs are universal & the etiological agents involved may vary with geographical location between various procedures, between surgeons, from hospital to hospital or even in different wards of the same hospital [4].

For effective control of wound infections and administration of judicious therapy, the data regarding the causative organisms and their antibiotic sensitivity patterns must be available. With this point of view, the present study was undertaken to study the prevalence of aerobic bacterial pathogens involved in causing SSI in our hospital and their antibiogram.

MATERIALS & METHODS

This cross sectional study was conducted for a period of 1 year in a tertiary care hospital, Hyderabad. Patients who underwent surgery and had wound pus discharge were included in the study.

Using sterile cotton swabs, two pus swabs/ wound swabs were collected aseptically from each patient suspected of having SSI. Gram stained preparations were made from one swab for provisional diagnosis. The other swab was inoculated on Blood Agar & Mac Conkey Agar plates & incubated at 37^0 C for 48 hrs before being reported as sterile.

Growth on culture plates was identified by its colony characters & the battery of standard biochemical tests [5]. Antimicrobial Susceptibility Testing (AST) was carried out by modified Kirby Bauer disc diffusion method on MHA & results were interpreted in accordance with CLSI guidelines. S.aureus ATCC 25923, E.coli ATCC 25922, P.aeruginosa ATCC 27853 were used as control strains for AST. All dehydrated media, reagents & antibiotic discs were procured from HI Media laboratories pvt ltd, Mumbai, India.

RESULTS

A total of 242 samples were processed in the laboratory during the study period. Out of 242 samples, 212 samples yielded aerobic bacterial growth. 20 samples showed no bacterial growth after 48 hours of incubation.

Among 212 bacterial isolates, S.aureus (63%) & Klebsiella (18%) were the commonest organisms. Antimicrobial Susceptibility Testing was carried out for all 212 isolates & results were depicted. S.aureus strains showed high degree of resistance for Ampicillin. Methicillin resistance was seen in 18% of all S.aureus isolates. Gram negative isolates showed even higher rate of resistance & commonly prescribed agents like Gentamicin, Cotrimoxazole & Ciprofloxacin were found resistant for most of the gram negative isolates.

Table-1: Isolation of Bacterial Agents

Organism	N	%
S.aureus	140	63
Klebsiella	40	18
E.coli	20	9
Pseudomonas	11	4.95
Proteus	5	2.25
Citrobacter	6	2.70

Table-2: Antibiotic Sensitivity Pattern of Aerobic Bacterial Isolates in SSIs

Antibiotic	S. aureus		Klebsiella		E.coli		Pseudomonas		Proteus		Citrobacter	
	N	%	N	%	n	%	N	%	n	%	n	%
Ampicillin	80	57.14	15	37.5	4	20	7	63.6	3	60	3	60
Amoxyclav	100	71.4	26	65	15	75	8	72.7	5	100	5	100
Amikacin	120	85.7	34	85	14	70	9	81.8	5	100	5	100
Ciprofloxacin	70	50	15	37.5	8	40	6	54.5	3	60	3	60
Vancomycin			NT		NT		NT		NT		NT	
Gentamycin	88	62.8	30	75	16	80	9	81.8	4	80	6	100
Meropenem	NT		38	95	19	95	9	81.8	4	80	6	100
Piperacillin +Tazobactum	NT		35	87.5	18	90	10	90.9	5	100	5	83.3
Cefoxitin	115	82.5	NT		NT		NT		NT		NT	
Cotrimoxzole	75	53.5	28	70	11	55	3	27.2	1	20	2	33.3
Cefotaxime	NT		32	80	12	60	8	72.7	5	100	6	100

NT – Not Tested

DISCUSSION

Inspite of advances in surgical techniques, management of SSIs remain a significant concern in a health care facility. Patients with SSIs face additional exposure to microbial populations circulating in a hospital set up which is always charged with microbial pathogens. The unrestrained & rapidly spreading resistance to the available array of antimicrobials further contributes to the existing problem. Most of the SSIs are hospital acquired & vary from hospital to hospital [6].

S.aureus, a gram positive cocci, is a major human pathogen & a predominant cause of SSIs worldwide with a prevalence rate ranging from 4.6% to 54.4% [7].

In the present study S.aureus was the predominant pathogen constituting 63%. This was consistent with reports from other studies [8-11].

Infection with S.aureus is most likely associated with endogenous source as it is a member of skin & nasal flora & also with contamination from environment, surgical instruments or from hands of health care workers [11, 12]. S.aureus has a predominant role in SSI due to emergence of MRSA strains.

In the present study methicillin resistance was seen in 18% of S.aureus isolates. This finding was in tandem with the study by Aggarwal *et al*., [13] which reported as 10%.

A study by Kownhar *et al*., [14] reported 21.7 % .The isolates in the present study were sensitive to Vancomycin.

Among Gram negative isolates, Klebsiella was predominant 18% followed by E.coli (9%), Pseudomonas (4.95%), Proteus (2.25%) & Citrobacter (2.7%).

In a study by Vikrant Negi [15], E.coli was predominant followed by Pseudomonas & Citrobacter.

Antibiotic Susceptibility results revealed a high degree of resistance for majority of bacterial isolates. For gram positive bacteria, Vancomycin &Amikacin were found to be most effective antibiotics.

Among gram negative isolates, Meropenem, Piperacillin – Tazobactum & Amikacin were found to be most effective whereas Ampicillin, Amoxyclav & Cefotaxim were the most resistant drugs.

The spread of resistant strains has been a global problem. The evolution of MDR strains due to strong selective pressure imposed by antimicrobial chemotherapy plays a crucial role in evolution of antibiotic resistant bacteria.

CONCLUSION

SSIs pose a major burden to the hospital and also to the patients. Although they cannot be completely eliminated they can be reduced by knowing the etiology of microorganisms & by formulating hospital antibiotic policy. This study gives an idea regarding aerobic bacterial profile of SSIs in our hospital & there by reducing rate of infection & improving patient care services by improving pre operative and post operative care. This study provides an initiative for antimicrobial prescribing guidelines & there by reducing the development of antimicrobial resistance.

Limitations

The limitations of our study was that, anaerobic bacterial profile & fungal cultures were not done on wound swabs obtained from SSIs. Further prospective studies can be undertaken in this regard.

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