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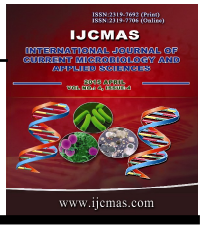

Original Research Article

A Study of Microbiological analysis and its sensitivity pattern of Postoperative Wound Infections

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K e y w o r d s

Nosocomial infection, Postoperative wound infection, SSI (surgical site infection)

A B S T R A C T

The Microbiological analysis of wound infection in 95 patients was undertaken during the study. The location and type of wound considered and the identification of bacterial isolates was determined by standard microbiological techniques. A total of 79 bacterial isolates were obtained from 95 wound culture samples. In 41 cases, the isolated culture were mono microbial, 39 cultures were polymicrobial whereas no growth was obtained in 15 cases. *Staphylococcus aureus* was the most predominant organism (48.1%) followed by *Pseudomonas aeruginosa* (18.98%) and *E. coli* (17.72%). The aim of this study was to identify postoperative infection and to determine their current antimicrobial resistance to commonly prescribed drugs.

Introduction

Nosocomial infection constitutes a major public health problem worldwide today. SSI are the second most common nosocomial infections (Biadglegne *et al.,* 2009; Nichols, 2001; Insan *et al.,* 2013). These remain a complication of surgical procedure resulting in increase morbidity, mortality and cost (Insan *et al.,* 2013). One of the major problems faced by patients in now a day is to deal with the post surgical infections, as most of these are being caused by multiple drug resistant bacteria (Raza and Ranabhat, 2013). The most common types of nosocomial infections that occur in a hospital set up are surgical wounds and other soft tissue infections, urinary tract infections, respiratory and blood stream infections (Insan *et al.,* 2013). SSIs occurs when a bacteria is present within a wound. The bacteria may be transferred by contact from surgeons or nurse's hands, the bacterial could be airborne during surgery, and or the patient may come in contact with bacteria after surgery (NINSS, 2001). According to Nichols (2001) infection varies from surgeon to surgeon, hospital to hospital, from one surgical procedure to another, and most importantly from one patient to another.

The emergency of poly antimicrobial resistant strains of hospital pathogens has also presented a new challenge in the provision of good quality in patient care (NINSS, 2001). The battle between bacteria

and their susceptibility against drugs is yet problematic among public, researchers, clinicians and drug companies who are always looking for effective new molecules (Majeed and Izhar, 2005; Raza and Ranabhat, 2013; Lalithambigai *et al.,* 2014; Verma *et al.,* 2012).

The objective of present study is to survey the microbiological etiology of surgical wound infections and to determine their current antimicrobial pattern against commonly used antibiotics in the hospital.

Materials and Methods

Sample population

About ninety five patients were taken during the course of study that comprises of 40 males and 55 females between the ages of 10 to 65 years and had undergone different kinds of surgery including general surgery, gynecological or obstetric surgery as well as orthopedic surgery (NINSS, 2001; Majeed and Izhar, 2005).

Sample collection

All the wounds were judged as infected by the presence of purulent material. Before wound cleaning and dressing, the exudates from each wound site was carefully collected by using sterile cotton swab (Biadglegne *et al.,* 2009). All the samples were labeled properly and immediately transported to the Microbiology lab of SGRRITS Dehradun for further processing.

Processing of samples

All the samples were inoculated over the Blood Agar and MacConkey's agar medium within two hours of collection and incubated at 37^{o}C aerobically for 24 hrs, the plates showing no growth were incubated for another 24 hrs. The isolates were identified by colony morphology, Gram's staining and conventional biochemical characterization tests (Lalithambigai *et al.,* 2014). Antibiotic susceptibility pattern and evaluation of the isolates were further performed on using Mueller Hinton agar medium (Raza and Ranabhat, 2013; Mamal, 2014) against 10 antibiotics.

Result and Discussion

A total of 95 wound samples were isolated from the postoperative sites, in which 15 wound sites were found sterile and does not contain any micro-organism, remaining 80 sites contain various types of micro flora. Out of 80 wound sites, 41 sites harbor only single type of microorganism whereas 39 sites represents multiple type of bacterial population, whereas the screened 31 sites contain 6 type of different bacterial species in different numbers.

In present study only multiple samples were further under taken in to the consideration due to variability in results and sensitivity.

Table 1 represents the name of organisms with its percentage of occurrence. The most common pathogen present in post operative wound infection was viz., *Staphylococcus aureus* (48.1%) followed by *Pseudomonas aeruginosa* (18.98%), *E. coli* (17.72%) and *Staphylococcus epidermidis* (10.1%).

All the identified and screened strains were analyzed on Muller Hinton Agar (MHA) for their sensitivity and resistance pattern against commonly used antibiotics.

Table 2 revealed the sensitivity pattern of isolated and identified organisms, with their percentage occurrence of sensitivity and resistance against each antibiotic. The sensitivity patterns define that the higher sensitivity percentage was given by

Carbapenem (100%), Penicillin and its derivatives (97.4%), Quinolones (82.2%), Aminoglycosides (77.2%) whereas the maximum resistance was given by Fosfomycin, Fusidic acid, Cetaperazone (100%), Macrolides (86%) and Cephalosporins (69.6%).

Superficial surgical site infections are most common problem in surgical practice. These are more prevalent after emergency in surgical procedures. It could be attributable to the fact that most of these patients are from low socioeconomic group with maximum number of patients being elder, malnourished and majority has co-morbidities like diabetes, chronic liver disease and some are on immuno - suppressive agents. Modern series continue to report 4–7 % wound infection rate on general surgical services and is responsible for the greatest delay in Hospital discharge (Mamal, 2014; Bibi *et al.*, 2012).

In this study the frequently isolated organism was *Staphylococcus aureus*. In the Nosocomial infection national surveillance service (NINSS) survey (1997–2001) which report *Staphylococcus* (47%) including of methicillin resistant *Staphylococcus aureus* (MRSA) and *Staphylococcus epidermidis* (Coagulase Negative) as the most common organism which is responsible for causing SSI (NINSS, 2001; Mulu *et al.*, 2012; Gautam *et al.*, 2013).

An explanation to the above finding could be that in most of our surgical procedures the gastrointestinal tract was violated and results in contamination of the wound edges at the time of surgery. The other common pathogens isolated includes, *Pseudomonas sp., E. coli, Streptococcus sp., Proteus sp., and Enterobacter sp* (Anil, 2013).

When considering sensitivity patterns, all strain of pathogenic microorganism are highly sensitive against Carbapenem (Imipenem, Meropenem), Penicillin derivatives (Pipracillin/ Tazobactum). We also found that *Staphylococcus aureus* is 100% sensitive to glycopeptides (Vancomycin), a finding that is identical to other national studies (Bessa *et al.*, 2013; Manikandan and Amasth, 2013; Anil, 2013). *Pseudomonas* also showed a maximum sensitivity to penicillin derivatives (Pipracillin/ Tazobactum) in our study and is already reported (Gautam *et al.*, 2013; Amoran *et al.*, 2013). Third generation Cephalosporin (ceftazidime) and Aminoglycoside (gentamycin) has a potent anti *Pseudomonas* activity (Majeed and Izhar, 2005). The antibiotic sensitivity of other isolates showed a variable pattern of resistance and susceptibility.

Macrolides and Cephalosporins are ineffective against most of the pathogens isolated from our study and are associated with super infections. Different Cephalosporin groups have different propensities for promoting super infection. Demographically we are witnessing an increasing proportion of hospitalised elderly patients who are much more susceptible to such super infections. This may be due to extensive and over use of the Cephalosporins in last two decades as documented in other studies (Eagye *et al.*, 2007). Quinolones, aminoglycosides and monobactum showed average spectrum of sensitivity for isolated organisms.

It is with above evidence and data in mind; that microbiologists and pharmacists develop a new ‘standard surgical regime’ for prophylaxis and empirical therapy when results of pus culture and sensitivity are pending. There are compelling evidence that Cephalosporins are ineffective against the common pathogens causing SSI and it is time for surgeons to court ‘new’ antibiotics

effective against today's pathogens for both prophylaxis and empirical therapy.

This study gives us an insight to the current state of causative pathogens and their sensitivity from superficial incisional SSI in our hospital.

Table.1 List of Bacterial isolates recovered from patient's post operative wounds

S.No	Name of organism	No. of organism	Percentage (%)
1	*S. aureus*	38	48.1
2	*S.epidermidis*	8	10.1
3	*Escherichia coli*	14	17.72
4	*Proteus mirabilis*	3	3.79
5	*Pseudomonas aeruginosa*	15	18.98
6	*Enterobacter sp.*	1	1.26
	Total	79	100

Table.2 Antimicrobial susceptibility patterns of wound culture isolates

	E. coli (n=14)		*Staph. aureus* (n=39)		*P.* aeruginosa (n=15)		*Enterobacter* spp. (n=1)		*Proteus mirabilis* (n=3)		*S. epidermidis* (n=7)		%age	
Antibiotics	S	R	S	R	S	R	S	R	S	R	S	R	%S	%R
Penicillin Derivatives	12	2	39	0	15	0	1	0	3	0	7	0	97.4	2.5
Carbapenem	14	0	39	0	15	0	1	0	3	0	7	0	100	0
Quinolones	8	6	39	0	7	8	1	0	3	0	7	0	82.2	17.7
Monobactum	11	3	28	11	7	8	1	0	3	0	7	0	72.1	27.8
Cephalosporins	5	9	11	28	8	7	0	1	0	3	0	7	30.3	69.6
Aminoglycosides	7	7	39	0	12	3	1	0	2	1	0	7	77.2	22.7
Macrolides	0	14	11	28	0	15	0	1	0	3	0	7	13.9	86.0
Lincomycin	0	14	25	14	0	15	0	1	0	3	0	7	31.6	68.3
Glycopeptides	0	14	39	0	0	15	0	1	0	3	0	7	49.3	50.6
Miscellaneous	2	14	0	39	0	15	0	1	0	3	0	7	0.05	100

%R = Percentage Resistance; % S = Percentage Sensitivity

We suggest that surgeon, pharmacist, Epidemiologist and microbiologist, to take their local infecting organism/sensitivity pattern into account when formulating prophylaxis as well as empirical therapy guideline for individual surgical site. We also suggest that the chosen antibiotic must have antimicrobial susceptibility for the common prevalent stains of micro-organisms.

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