ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Bacteriological Profile of Postoperative Wound Infections in a Tertiary Health Care Hospital.

M Jeyaprakash[1], S Umadevi[2]*, S Pramodhini[2], MV Pravin Charles[2], and KS Seetha[2].

[1]Medical Student, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidhyapeeth University, Pillaiyar kuppam , Pondicherry, India.
[2]Department of Microbiology, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidhyapeeth University, Pillaiyar kuppam , Pondicherry, India.

ABSTRACT

Post-operative wound infection is one of the important HAI along with device associated infections. Study aimed to identify the common aerobic bacterial agents causing SSI and their sensitivity pattern. Bacterial agents were identified by standard techniques using conventional methods. Antibiotic sensitivity testing done by Disc diffusion methods. Staphylococcus aureus identified as most common bacteria.Gram negative bacteria isolated more compare to gram positive cocci. Aminoglycosides can be selected as prophylactic antibiotics for gram negative bacilli. Macrolides or Tetracycline / Doxycycline can be selected as prophylactic antibiotics for gram positive bacteria. Associated factors to increase the rate of SSI were not identified in our study. Hospital Infection Control measures must be proper in every hospital.

Keywords: SSI, Gram negative bacilli, Staphylococcus aureus

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Hospital acquired infection (HAI) is a serious health hazard worldwide. World Health Organization (WHO) [1] described it as one of the major infectious diseases having huge economic impact despite advances in the control and prevention of Nosocomial infection, they continue to remain a major side effect of hospital treatment and contribute significantly to the rate of morbidity, mortality and cost of care.

Surgical site infections are the third most commonly reported nosocomial infection and they account for approximately a quarter of all nosocomial infections. A recent prevalence study found that SSIs were the most common healthcare-associated infection, accounting for 31% of all HAIs among hospitalized patients [2]. The wound classification system categorizes all surgeries into: clean, clean/contaminated, contaminated, and dirty, with estimated postoperative rates of surgical site infection (SSI) being 1%-5%, 3%-11%, 10%-17%, and over 27%, respectively.

They have been responsible for the increasing cost, morbidity and mortality related to surgical operations and continues to be a major problem even in hospitals with most modern facilities and standard protocols of preoperative preparation and antibiotic prophylaxis. Surgical site infection rate has varied from a low of 2.5% to a high of 41.9% [3]. Due to significant changes in microbial genetic ecology, as a result of indiscriminate use of anti-microbial, the spread of antimicrobial resistance is now a global problem. Present study was carried out to find out common bacterial pathogens responsible for postoperative wound infection and their antibiotic susceptibility pattern. It assists the surgeons in the appropriate selection of antibiotics pre operatively and it helps in the Hospital Infection Control to act against hospital acquired infections.

Aims and Objectives

To find out the most common bacterial pathogens responsible for post-operative wound infection and their antibiotic susceptibility pattern. Our study also aimed to correlate the association of risk factors with post-operative wound infection.

MATERIALS AND METHODS

The project was started after getting approval for conducting the study by the Human ethical committee . Adult patients who had undergone surgery in all departments in a tertiary health care hospital. A total of fifty pus samples were collected and processed immediately by direct examination by gram staining and was inoculated in Blood agar & Macconkey agar. The culture plates were incubated at 37° c for 24- 48hrs aerobically. Bacterial isolates were identified by conventional methods using standard techniques [4]. All isolates further subjected to antibiotic susceptibility testing using a panel of antibiotics by kirby Bauer method on Muller Hinton agar according to CLSI guidelines [5].

In all cases, preoperative, intraoperative, and postoperative details also studied. Information was collected in a case record form for age, sex, date of admission, associated co-morbid condition, reason for admission, type of surgery: emergency or planned, procedure, preoperative and postoperative stay, preoperative antibiotic prophylaxis and type of wound clean, potentially infected and frankly infected wound. All patients followed up in wards till discharge from the hospital [6].

An Informed written consent was obtained from all the patients after explaining them the purpose and nature of the study in their own language.

Statistical analysis

Both descriptive and inferential statistics was used to analyze the data. Data was expressed as mean ± standard deviation. Statistics calculated by simple ratio and percentage.

RESULTS

A total of fifty samples were collected and analyzed in our study. Patients

Included in our study are adults of age group ranging from 20-60yrs. Majority of them are male patients. Out of the fifty samples studied, 32(64%) showed growth on culture. Eighteen (36%) samples were sterile.

Among the total fifty samples, most of the samples received from General surgery department followed by obstetrics and gynaecology, orthopedics respectively (Table1). Out of the 32 samples which showed culture positive , a total of 35 isolates were identified as pathogen. Multiple organisms isolated from three samples. About 63% of isolates were gram negative bacilli. Remaining belongs to Gram positive bacteria.

Among the Gram negative bacilli, E.oli being the predominant organism. Likewise, Staphylococcus aureus constitute 69.2% of gram positive cocci isolated (Table 2). Antibiotic susceptibility pattern analysed in our study for both Gram negative bacilli and gram positive cocci. Different panel of antibiotics were used for both types of bacteria according to latest CLSI guidelines. Gram negative bacilli showed 77% sensitivity to Amikacin and Piperacillin-Tazobactum, but less in case of Cotrimoxazole, Ciprofloxacin , Ceftrioxone and Ampicillin (Table 3). Among the gram positive cocci studied, they were more sensitive to antibiotics like Vancomycin , Erythromycin and Tetracycline (Table 4).

In relation to associated factors for post-operative wound infection studied, it showed very few cases were diabetics. No history of chronic steroid therapy, immunosuppression or prolonged hospitalization (more than a month) was noticed. Regarding the history of prophylactic antibiotics analysed which showed 90% of cases were receiving Ciprofloxacin prior to surgery.

DISCUSSION

Post-operative wound infection is one of the most common nosocomial infections in developing countries. Though the surgery taken place in a sterile environment using sterile instruments, some of the cases leads to wound infection. Every surgery irrespective of speciality or type of surgery will be done under antibiotic coverage. But still surgical site infection occurs due to many reasons. Nowadays the virulent microbial agents are the major cause of such infections, it is very essential to identify the bacterial agents as early as possible inorder to treat the patient appropriately.

Patients who develop SSIs are twice as likely to die, 60% more likely to spend time in an ICU, and more than five times more likely to be readmitted to the hospital [6].

In our study only fifty suspected cases of surgical site infections were included. Out of the fifty samples only 32(64%) showed culture positive, remaining are sterile. Culture positivity is more when compare with studies done in developed countries [13] where only 11 % or even less prevalence reported. Prevalence rate of surgical site infection was reported as about 25% from Sudan [15]. Very high rate of surgical site infection ie,75% reported from Ethiopia [10] and also one study Saraswathy etal from Pondiherry showed a still higher rate of 87% recently [16]. One of the latest report from Uttar Pradesh (UP) proved only 33% SSI [11]. But in our study we found about 64% of total samples studied showed culture positivity , which is definitely high. This positivity was not out of all surgeries done in our institute, only swabs collected from suspected cases. In general SSI varies with institute to institute, region to region, country to country which can be explained that various factors involving in SSI. Factors responsible are environmental flora of individual Hospital, immune status of hospitalized patient, Duration of hospital stay and Microbial factors.

It also reflects about the proper Hospital Infection Control measures. Rate of SSI also varies with the class of wound like Clean, Clean-Contaminated ,Contaminated and Dirty or Infected [17].

Majority of samples in our study were obtained from General surgery ,where the number or surgeries naturally more hen compare to other speciality. One study from Karachi was explaining about the relation between the types of surgery and infection rate. That study showed inguinal hernia repair was associated with high infective rate [13]. Our study could not analyse that aspect as the duration of study as well as number of cases studied were less.

In relation to the aetiological agents analyzed, our study showed predominantly Gram negative bacilli (62.9%) were responsible for SSI . Remaining 37.1% were Gram positive cocci. For most SSIs, the source of

pathogens is the endogenous flora of the patient's skin, mucous membranes or hollow viscera. When mucous membranes or skin is incised, the exposed tissues are at risk for contamination with endogenous flora [20].

Among the gram negative bacilli, E coli (8/22) being the commonest in our study. Likewise in Gram positive cocci, Staphylococcus aureus (9/13) is leading. Other gram negative bacilli isolated were Klebsiella, Pseudomonas aeruginosa, Nonfermenting gram negative bacilli, Proteus vulgaris and Citrobacter sp, which is shown in Table 2.Causative agents are almost same in many studies, but they differ in their frequency of isolation. Studies from Gujarat and Haryana [12] showed similar findings as ours ie, predominant gram negative bacilli, which was about 68 % and 63% respectively. Although the predominant group of organisms belongs to gram negative bacilli, in majority of studies staphylococcus being the most common organism isolated. In our study also sthaphylococcus (9/35) being the commonest among all aetiological agents. Similar findings reported from UP, Haryana, Gujarat ,Karachi and also from kerala [15]. Among the gram negative bacilli the predominant bacteria varies in different studies, Pseudomonas isolated more in study from UP (23%) and Haryana (27%). Study from Karachi resemble our study, showing E.coli (27%) as the common one. Klebsiella (23%) as common gram negative bacteria reported from Ethiopia. Variations in these aetiological agents speaks about the hospital flora.

Staphylococcus is consider as the most common bacterial agent responsible for SSI as reported by many studies, but the resistant strain like MRSA isolation rate is less. In our study there was no MRSA isolated. One study from kerala reported 9.6% of S.aureus was MRSA. Among the other Gram positive cocci, Enterococcus, Coagulase negative Staphylococcus and Streptococcus pyogenes isolated in our study, they constitute only 5.7%, 2.8% and 2.8% respectively, of total isolates identified. Most of the studies showed gram positive cocci isolated was only staphylococcus aureus.

Antibiotic sensitivity pattern of the isolates will be helpful in the selection of prophylactic antibiotic prior to surgery. Many studies have analysed that also. In our study our finding was Gram negative bacilli were more susceptible to Amikacin (77%) and Piperacillin –Tazobactum (77%), which was followed by Gentamicin (64%). Ciprofloxacin and Cotrimoxazole comes next. A study from Gujarat reported that most of the gram negative bacilli were sensitive to fluoroquinolone, about 80% in case of Pseudomonas , 75% for Proteus sp, 63% for E.coli and Klebsiella sp [14]. But in our study sensitivity to Ciprofloxacin is only 32% in gram negative bacilli and 38% in Gram positive cocci. Study from Haryana deals with only Pseudomonas sp, which are highly sensitive to imipenem (76.9%), followed by meropenem (70.4%), cefoperazone/sulbactam (62.1%), Ticarcillin/ clavulanate (60.7%), and Amikacin (53%) [12]. Latest report from Ethiopia in 2014 showed that gram negative bacteria and Gram positive cocci are highly sensitive to Gentamicin (83%) and Vancomycin (1oo%) respectively. This findings correlates with our study. Like vancomycin, Lenizolid also showing same type of response against gram positive bacteria in our study. Next to Vancomycin and Lenezolid , Gram positive cocci are sensitive to Erythromycin (69%) and Tetracycline (61%).

As this Antibiotic sensitivity pattern will help in selecting prophylactic antibiotic before surgery, though second line antibiotics like Imipenem, Meropenem, Vancomycin showing very good effect on bacteria, not recommend for prophylaxis considering the cost effect as well as leads to resistant strains further. In our study majority of cases were receiving ciprofloxacin as prophylaxis, this is one of the reason for high prevalence of SSI in our study. Usage of Third generation Cephalosporins have been increased in many hospital irrespective of the type of infection in last decade. At the same time resistance to this drug also enormously increased. So it is not an ideal drug for prophylaxis , but still in many hospitals it is continuing as drug of choice. Nowadays most of the studies reporting less sensitivity [12]. In our study also showed only 23% were sensitive to this group of drugs.

As very few cases only gave history of Diabetic mellitus, could not able to analyse further. No other associated factors identified in our study. From our study it was found to know that Aminoglycosides are better choice against gram negative bacilli, followed by Piperacillin Tazobactum and Erythromycin or Tetracyline for gram positive cocci.

Limitations of our study are less number of samples studied due to short duration of study, our study could not deals with the prevalence of SSI based on the type of surgery , duration of surgery and duration of hospital stay and anaerobic culture methods were not included.

ISSN: 0975-8585

Table 1: Distribution of samples based on different specialities

Specialties	n -50 (%)
General surgery	22 (44)
Obstetrics & gynecology	16 (32)
Orthopedics	12 (24)

Table 2: Common bacterial agents isolated

	Organisms isolated	**N – 35**
A	Gram Negative Bacilli	22 (62.9%)
	Escherichia coli	8
	Pseudomonas aeruginosa	4
	NFGNB	5
	Kleb.pneumoniae	3
	Proteus vulgaris	1
	Citrobacter sp	1
B	Gram positive cocci	13 (37.1%)
	Staph.aureus	9
	Enterococcus	2
	CoNS*	1
	Strep.pyogenes	1

***Coagulase Negative Staphylococcus**

Table 3: Antibiotic sensitivity pattern of gram negative bacilli

Antibiotics	n-22 (%)
Ampicillin	2(9)
Gentamicin	14(64)
Amikacin	17(77)
Cotrimoxazole	7(32)
Ciprofloxacin	8(36)
Ceftrioxone	5(23)
Piperacillin- Tazobactum	17(77)

Table 4: Antibiotic sensitivity pattern of Gram positive cocci

Antibiotics	N- 13 (%)
Penicillin	2(15)
Erythromycin	9(69)
Cotrimoxazole	5(38)
Gentamicin	6(46)
Tetracycline	8(61)
Ciprofloxacin	5(38)
Vancomycin	13(100)
Linezolid	13(100)

CONCLUSION

SSIs are one of the most common Hospital acquired Infection (HAI). Gram negative bacilli are the predominant group of bacterial agents. But Staphylococcus aureus being the most common pathogen in SSI. Selection of prophylactic antibiotic has a major role in reducing the prevalence of SSI in any Hospital. In addition to the virulent bacterial agents, associated factors like Types of surgery, Duration of surgery, Duration of hospital stay, Immune status of individuals, Age of the patients also need to analyse inorder to decrease the

rate of Hospital Acquired Infections. So it is necessary to do further analysis on these factors in future research for the Health care point of view.

ACKNOWLEDGEMENT

We acknowledge the support of ICMR (STS Project under ICMR)

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