Original article:

A prospective study on antibiotic susceptibility pattern of bacterial isolates in a tertiary care teaching hospital

Pyarelal[1*]

[1]Associate Professor, Department of Pharmacology, MediCiti Institute of Medical Sciences (MIMS), Ghanpur, Telangana
Corresponding author: Pyarelal

Abstract

Introduction: Antibiotic resistance has always a great challenge for surgeons in treating post-operative wound infections. Therefore this study was carried out to isolate bacterial pathogens from a post-operative wounds in order to test their antibiotic resistance pattern.

Methods: A total of 162 post-operative patients were selected on the basis of inclusion and exclusion criteria admitted in MediCiti Institute of Medical Sciences (MIMS), Ghanpur, Telangana between August 2014 and Jan 2015. Out of 162 swabs taken from wounds of post-operative patients, only n=150 found culture positive analyzed in the Microbiology laboratory. The specimens were inoculated on an appropriate media for isolation of bacteria. Biochemical and serology tests were conducted to confirm the type of bacteria isolated. Antibiotic resistance test was also performed on each of the bacterial isolate, using the CLSI criteria.

Results: Most of the patients found to be males n=92 (56.79%) than females 70 (43.20%). Out of 162 samples from post-operative wounds, only n=150 found culture positive.Gram positive bacteria mostly isolated (n=84, 56%) whereas Gram negative bacteria accounted for (n=66, 44%) of isolates. The most frequently isolated organisms in Gram positive bacteria were S. aureus 52 (61.9%) and in gram negative E. coli 26 (39.3%).among gram positive bacterial isolates high level of drug resistance is seen in Ciprofloxacin (35%) and least resistance is seen in Vancomycin 12 (4%). In gram negative isolates gentamicin, Ciprofloxacin showed more resistance (12%) and least or no resistance is found by Imimpenem, Meropenem.

Conclusion: The rate of bacteria isolated from clinical specimens was high. The antibiotic resistance pattern will be useful for practicing clinicians.

Keywords: Prevalence, Bacterial isolates, Antimicrobial susceptibility pattern, Multidrug resistance

Introduction

The world-wide problem of rapidly spreading Antibiotic resistance has poses a great challenge for surgeons and physicians to manage the patients post-operatively, when chances of infections are at its peak. Patients with post-operative wound infections face additional exposure to microbial populations circulating in a hospital set up as the hospital environment is always charged with microbial pathogens. It has been realized that the spread of drug resistant organisms is related to the widespread use of antibiotics.Most post-operative wound infections are hospital acquired, and vary from one hospital to the other and are associated with complications, increased morbidity and mortality [1,2]. This resistance develops because of improper use of antibiotics, also other factors like more hospital stay further complicates the problem.

Rapid spread of resistant microbes affected the effectiveness of antimicrobials and created world-wide problem [3]. The condition is further worse in developing countries owing to irrational prescriptions

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of antimicrobial agents. In India anddeveloping countries septicemia is animportant cause of illness and deathamong hospitalized patients (Sharma et al1997, Diekma et al 2003).

Bacteraemia is a state in which bacteriacirculate through vascular system. Septicaemia is a life threatening conditionwhen bacteria multiply at a rate thatoutdoes their removal by phagocytes. Thesymptoms are produced by microbialtoxins and cytokines produced by inflammatory cells.

Both Gram positive and Gram negative bacteria have been found to cause hospital acquired infections, that can be confirmed by blood culture (Daniel et al, 2006, Manjula et al 2005). It is therefore necessary to know the causative agent obtained from culture analysis for preparing the antibiotic policy for effective management of nosocomial infections.

Therefore this study was carried out to isolate bacterial pathogens from a post-operative wounds in order to test their antibiotic resistance pattern.

Material and Methods

This prospective study was conducted at the Department of Pharmacology in collaboration with department of Microbiology at MediCiti Institute of Medical Sciences (MIMS), Ghanpur, Telangana. Patients were enrolled after obtaining informed consent from them or their attendants. The pus swabs were obtained from patients admitted in the post-operative ward of the hospital, after undergoing surgery from August 2014 to Jan 2015. The pus swab samples were obtained before cleaning of the wounds and were processed for isolation and identification of bacterial pathogens according to the standard microbiological techniques. Two pus swabs were collected aseptically with a sterile cotton swab from each patient (n = 162) clinically suspected of infected wounds.

Identification of Bacterial Isolates

Gram stained preparations were made from one swab collected and the other swabs were used for the isolation of the organism and inoculated on blood agar, MacConkey agar and mannitol salt agar. Culture plates were incubated aerobically at 37˚C for 24 to 48 hours. Growth on culture plates were identified by colony characteristics and further identified by gram staining and standard biochemical tests [4].

The antimicrobial susceptibility testing was done on Mueller Hinton agar by the Kirby Bauer disc diffusion method [5] and results were interpreted as per NCCLS guide line [6]. Antibiotics used were: Amikacin, gentamicin, Piperacillin, Vancomycin, ofloxacin, Ceftriaxone, ciprofloxacin, Imimpenem, Meropenem.

Results

Out of 162 patients included in our study on the basis of inclusion and exclusion criteria, most of the patients found to be males n=92 (56.79%) than females 70 (43.20%) (Table 1)

Pus swabs from 162 post-operative wound infections were analyzed in this study and processed for culture. Out of 162 samples, only n=150 found culture positive. The predominant isolates were gram positive bacteria (n=84, 56%) followed by gram negative bacteria (n=66, 44%)(Table 2). The most frequently isolated organisms in Gram positive bacteria were S. aureus 52(61.9%)followed by Staphylococcus. epidermidis18(21.4%), and least was Enterococci14(16.6%), whereas in gram negative E. coli 26 (39.3%) found to be mostly isolated followed by Pseudomonas aeruginosa15 (22.7%), Klebsiellapneumoniae12 (18.1%), Proteus mirabilis9 (13.6%)and Citrobacter spp. 4(6. 0%)(Table 2). As far as Antimicrobial sensitivity is considered, among gram positive bacterial isolates high level of drug resistance is seen inCiprofloxacin(35%), followed

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byOfloxacin(35%), Gentamicin (25%) and least resistance is seen in Vancomycin12 (4%) (Table 3). Of the gram negative isolates gentamicin, Ciprofloxacin showed more resistance (12%) and least or no resistance is found by Imimpenem, Meropenem (Table 3). Bacterial isolates that showed in-vitro resistance to more than one antimicrobial agent (or resistance to two or more classes of antibiotics) were considered to be multi drug resistance. Overall, 72 (48%) of the bacterial isolates showed multi drug resistance in this study, while 55 (36.6%) of the isolates were resistance to one antibiotic and only 14 (9.33%) isolates were found to be sensitive to all the antibiotics tested.

Table. 1 Demographic details of culture positive post-operative patients (n=162).

Age Group	**Male**	**Female**	**Total**
20-40	35	24	59
41-60	45	36	81
61-80	12	10	22
Total	92 (56.79%)	70 (43.20%)	162

Table. 2 Pathogens isolated from wounds of post-operative patients n=150.

Bacteria	**Isolates**	**Urine culture Positive**
Gram Negative (n=66, 44%)	E. coli sp	26 (39.3%)
	Proteus mirabilis	9 (13.6%)
	Pseudomonas aeruginosa	15 (22.7%)
	Klebsiellasp	12 (18.1%)
	Citrobactersp	4(6. 0%)
Gram Positive (n=84, 56%)	Enterococci	14(16.6%)
	Staphylococcus. epidermidis	18(21.4%)
	Staphylococcus aureus	52(61.9%)
	Total	150

Table 3. Antibiotic resistance pattern of the bacterial isolates.

Organism	**Gram Negative Bacilli (n=66, 44%)**	**Gram Positive Cocci (n=84, 56%)**
	Resistant (%)	**Resistant(%)**
Amikacin	5	15
Gentamicin	12	25
Ciprofloxacin	12	35
Ofloxacin	8	28
Piperacillin /tazobactum	5	22
Ceftriaxone	8	-

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Imipenem	0	-
Meropenem	0	-
Vancomycin	-	4

Discussion

The treatment of wound infections in post-operative patientshas always been a matter of significant concern for treating surgeons and physicians in a hospital. This problem further aggravated due to the rapidly spreading resistance to the available antimicrobial agents, the only choice with us to treat the infections. This has always a big problem, which can further complicated by patient additional exposure leading to hospital acquired infections. The hospital acquired infections are mainly associated with longer hospital stay of the patients.Therefore this study was undertaken inMediCiti Institute of Medical Sciences (MIMS), Ghanpur, Telanganaespecially involving post-operative wound infections. The selection of patients was restricted to those admitted in the post-operative surgical wards after undergoing various surgeries as the infection rates are highest in the surgical wards among the clinical departments. In our study, predominant isolates were gram positive bacteria (n=84, 56%) followed by gram negative bacteria (n=66, 44%)involved in causing post-operative wound infections. These observations are not in accordance to the study conducted by Raza MS et al. 2013, who showed more gram negative isolates than gram positive [7-9].

E. coli n=26 (39.3%)was the commonest gram negative bacteria isolated. E. coli invasion of the wound is a clear case of poor hospital hygiene, just like other implicated organisms which are frequent agents of nosocomial infections [10]. Staph. aureus52(61.9%)was the single predominant gram positive bacterial isolate obtained. Several reports have cited S. aureus as the predominant isolate involved in causing SSIs [11-13]. Susceptibility outcome revealed that Vancomycin was the most effective antibiotic against the gram positive bacteria. Aminoglycosides were effective against both gram positive and gram negative bacteria especially Amikacin. AMR was higher among gram negative isolates as compared to the gram positive bacteria. Similar results were reported earlier [14]. In our study, Overall, 72 (48%) of the bacterial isolates showed multi drug resistance, while 55 (36.6%) of the isolates were resistance to one antibiotic and only 14 (9.33%) isolates were found to be sensitive to all the antibiotics tested.

This suggests a very high resistance gene pool due perhaps to gross misuse, overuse and inappropriate use of the antibacterial agents [14]. The pattern is best understood in terms of selective pressure exerted on the organisms based on the current antibiotics use. Fluoro-quinolones and aminoglycosides are being more frequently prescribed in our settings. Hospitals provide an environment conducive to the spread of resistant organisms among population [15]. Additionally, higher multidrug resistance frequencies in a hospitalized population with intense exposure to antibiotics had been reported [16].

Conclusion

Limitations of the study being that anaerobic bacteria profile and fungal cultures were not done on wound swabs obtained from post-operative wound infection. A continuous monitoring and update studies on the local microbial isolates are an essential and mandatory requirement for a better management and treatment of post-operative wound infections. This

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would be supplemented with proper infection prevention and control measures and a sound antibiotic policy. This would result in better patient care, safety and health care outcomes.

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