Original Research Paper

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MICROBIOLOGICAL PROFILE AND ANTIOBIOTIC SUSCEPTIBILITY OF ISOLATES FROM POST-OPERATIVE WOUNDS

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ABSTRACT

Aim: To determine the microbiological profile of bacteria causing surgical site infections with their antibiotic susceptibility pattern.

Materials and Methods: The study was a retrospective study. Data was collected from the exudates register in the microbiology laboratory for a period of 6 months.. The antibiotic susceptibility results of the isolates were calculated and resistance patterns were tabulated .

Results: 41 bacterial pathogens were isolated over a period of 6 months. Among the isolates,49% were enterobacteriacae,29% gram positive cocci and 22% were non-fermentors. The most commonest organisms were *E.coli* and *Staphylococcus* aureus.All the isolates of *Staphylococcus* were resistant to Penicillin and Erythromycin.30% were MRSA. Among the enterobacteriacae,the highest resistance was for Ampicillin and Cefotaxime.

Conclusion: Rational antimicrobial use and continuing surveillance of bacterial antimicrobial resistance at local levels are necessary to reduce emergence and spread of multidrug resistant organisms.

KEYWORDS : Antibiotic susceptibility, gram positive cocci, gram negative bacilli.

INTRODUCTION

Postoperative wounds are those **wounds are** acquired after surgical procedures.**wound** healing occurs **after** surgery normally.It follows a distinctive pattern: the inflammatory response, the proliferation of cells and tissues that initiate healing, and the final remodeling. Wound infections are considered as major complications of surgery.They can be classified into three types: incisional surgical wounds, deep incisional wounds, and organ-specific infections . Despite maintaining high standards of preoperative preparation, antibiotic prophylaxis, and operative procedures, postoperative wound infections remains a grave threat for the surgeons. Most common organisms causing post operative wound infections are staphylococcus and enterococcus species among gram positive cocci,enterobacteriacae family and non-fermenters among the gram negative bacilli.

The trend of post-operative infection varies depending on the operative area,the surgical procedure, patient characteristics, etc. For instance, approximately 5,00,000 infections per year take place in the United States among an estimated 27 million surgical procedures [5]. The incidence of hospital-based postoperative infection varies from 10%–25% in India While the global estimates of surgical site infection (SSI) have varied from 0.5% to 15%, studies in India have consistently shown higher rates ranging from 23% to 38%. The incidence of SSI may be influenced by factors such as pre-operative care, the theatre environment, post-operative care and the type of surgery. Many other factors influence surgical wound healing and determine the potential for, and the incidence of, infection. Therefore, the prevention of these infections is complex and requires the integration of a range of preventive measures before, during and after surgery.

Wound infection is becoming a major concern among patients and healthcare practitioners for its increased toll on morbidity and financial loss.. Active and passive surveillance of surgical site infections in the hospital will help the surgeons and clinicians to know the antibiotic susceptibility pattern related to nosocomial flora,which can help reduce postoperative complications.

Recording the antibiotic susceptibility results of each type of organism will help in formulating antibiotic policy & guide the surgeons and clinicians with the right empiric antibiotic.

AIM OF THE STUDY

The present study aimed

1. To collect data on the bacteriological profiles of wound infections from post operative wound isolates.
2. To collect data of antibiotic susceptibility patterns
3. To calculate the antibiotic susceptibility and resistance percentage of organisms for each antibiotic

MATERIALS & METHODS

STUDY DESIGN & STUDY TIME LINE

This retrospective study was conducted from November 2018 to January 2019 in SAVEETHA MEDICAL COLLEGE & HOSPITAL, CHENNAI, INDIA.

73 isolates were collected from wound swabs in the Microbiology Laboratory .

The samples were from the inpatients of Surgery, Medicine, Gynaecology, Neuro surgery, Plastic surgery and Orthopaedic wards.

DATA COLLECTION

First, the list of the positive cultures from the post operative wound swabs were collected from the exudates registers.The antibiotic susceptibility pattern of each isolate was noted and tabulated.

The antibiotic discs used for gram positive cocci are cloxacillin[10 mcg/disc],penicillin[10mcg/disc],cefazoin[30mcg/disc],erythromycin[15mcg/disc],clindamycin[2mcg/disc],gentamicin[10mcg/disc],ciprofloxacin[5mcg/disc],vancomycin[30mcg/disc] and linezolid[30mcg/disc]

Gram negative bacteria amikacin[10mcg/disc], ampicillin [10mcg/disc], ciprofloxacin [5mcg/disc], cotrimoxizole [30mcg/disc], cephalosporin [75/30mcg/disc], meropenem [10mcg/disc], pipperacillin tazobactum [100/10mcg/disc], imipenem [10mcg/disc] are used for GRAM NEGATIVE BACTERIA .The antibiotic susceptibility testing is done using the Kirby Bauer disc diffusion method according to the guidelines of Clinical Laboratory Standards Institute.

For the above mentioned six months from October 2018 to March 2019, the growths from the post-operative wound swabs were noted down. The organism and its Antibiotic Susceptibility Testing (AST) results were tabulated. The isolates were divided into three groups i.e. GRAM POSITIVE COCCI (GPC), ENTEROBACTERIAECEAE & NON-FERMENTERS. The AST results were noted down for each organism then the percentage of resistance or susceptibility was calculated for the group of organisms by adding each one.

RESULTS

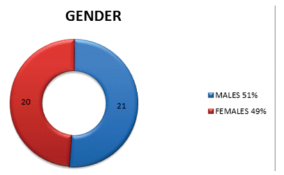

Figure 1 .NO. OF MALE AND FEMALES PATIENTS

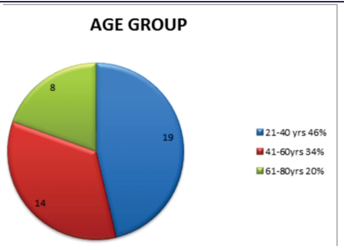

Figure 2: AGE GROUP OF PATIENTS

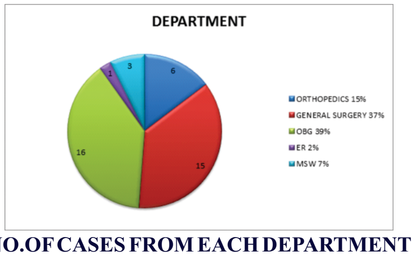

Figure 3. NO.OF CASES FROM EACH DEPARTMENT

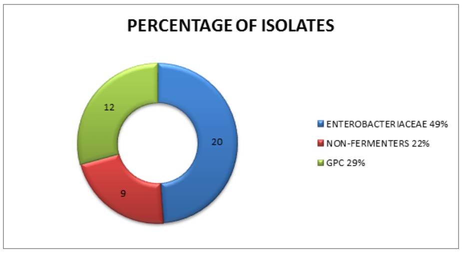

Figure 4.PERCENTAGE OF EACH GROUP OF BACTERIA FROM THE TOTAL NO.OF.ISOLATES

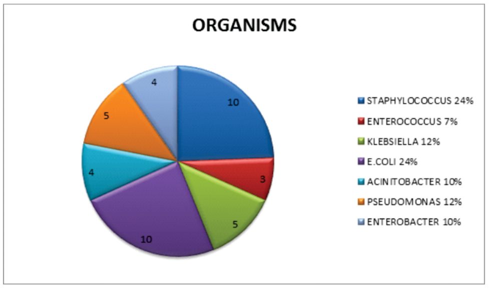

Figure 5 : PERCENTAGE OF ISOLATES OF EACH SPECIES OF BACTERIA

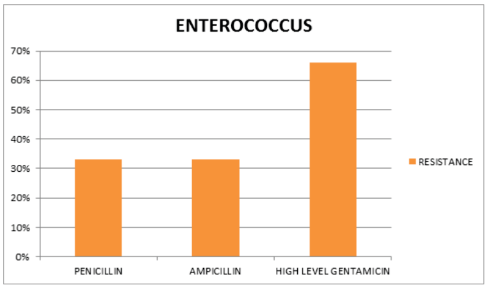

Figure 6.RESISTANCE OF ENTEROCOCCUS TO RESPECTIVE ANTIBIOTIC

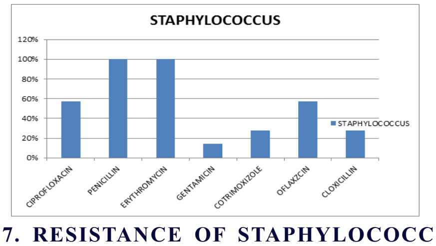

Figure 7. RESISTANCE OF STAPHYLOCOCCUS TO RESPECTIVE ANTIBIOTIC

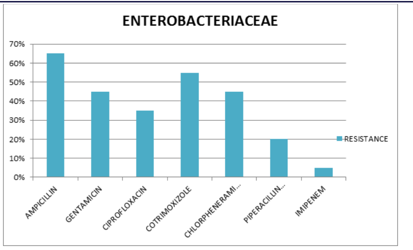

Figure 8..RESISTANCE OF ENTEROBACTERIACEAE TO RESPECTIVE ANTIBIOTIC

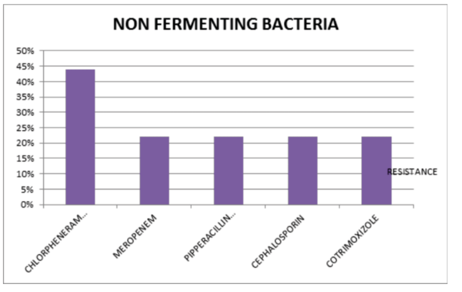

Figure 9.RESISTANCE OF NON FERMENTING BACTERIA TO RESPECTIVE ANTIBIOTIC

DISCUSSION

In our study a total of 41 isolates were studied which were isolated over a period of 6 months from November 2018 to April 2019.

Among the patients, the males and females were almost equal in number with 51% of males and 40% of female patients. In the study by Amaila Qaisar et al, there was a male preponderance with 39 male patients and 21 female patients. The ratio of male:female is almost 2:1.In another study by Walelign Dessie et al, the male and female patients were almost equal with 52.3% of female patients. This is comparable with our study. Another study by Bansal et al was also comparable with our study. Their male:female ratio was 1.2:1. The mean age of the patients in our study was 44.12 years.

The majority of the patients in our study were in the age group from 21 to 40 years. The percentage in this group was 46%.34% belonged to the age group 41 to 60 years and 20% belonged to the age group above 60 years. This distribution might reflect the fact that the patients' willingness for surgery decreases with increasing age.In the study by V. Negi et al, the mean age of the patient was 43.8 years and the peak incidence was when the age was greater than 50 years which was different from our study. In the study by God. Adwan et al, the mean age of the patients was 37.4 which was comparable with our study. In the study by Amaila Qaisar et al, the majority of the patients belonged to the age group between 20 to 40 years which was comparable to our study. In the study by What. Dessie et al, the median age of the patients is 30 which is comparable with our study. In the study by D.Bansal et al, maximum number of patients were in the age group between 41 to 60 years which is varied from our study. The mean age in the study by D. Bansal et al was 45 years. In the study by Mundhala et al, 50% of the patients were greater than 60 years of age. Comorbidities like diabetes and hypertension can increase the chances of infection.

The department wise distribution of the isolates showed that majority of the isolates (44%) we're from specimens collected from patients in the surgery department. Following surgery, obstetrics and gynaecology isolates were about 39%.Orthopaedics contributed to 15% of the isolates.

In our study, 49% of the organisms belonged to the enterobacteriace family, 29% of the organisms were gram positive cocci and 22% were non-fermenters.

The most commonest organisms isolated were *Staphylococcus species* (24%) and *E. coli* (24%). Klebsiella (12%) and *Psuedomonas* (12%), Acinetobacter (10%) and Enterobacter (10%) and finally Enterococcus (8%)

In the study by Nidhi et al, the percentage of *E. coli* was comparable with our study. *Acinetobacter* isolated in their study was almost double of our study. Our study hard 10% of *Acinetobacter* and their study had 19.6%.The percentage of *Klebsiella* and *Psuedomonas* was also increased marginally in their study. Enterobacter was marginally increased in our study. Their study included only the gram negative isolates. In the study by Daniela et al, 50.7% of the organisms isolated were *Staphylococcus* which was double of the the Staphylococcus isolated from our study. The *E. Coli* isolated were less compared to our study. *Psuedomonas* was comparable with our study. *Klebsiella* was decreased compared to our study.

In the study but Agunja et al, *Staphylococcus aureus* was 45.1% of the isolates which is almost double the percentage of our isolates. Enterobacteriace on the whole accounted for about 16.9 % which was less compared to our study where we had 49% of enterobacteriace. The percentage of *Pseudomonas* were comparable to that of our study. *Klebsiella* and *Enterobacter* were less compared to that of our study. In the study by V. Negi et al, the percentage of *Staphylococcus* was 50.4% which was double compared to our study. The percentage of *E.coli* was comparable to that of our study. The percentage of *Pseudomonas* were decreased compared to that of our study

In the study done by Amaila Qaisar et al, the percentage of *E. coli* was marginally higher compared to our study. *Staphylococcus aureus* was decreased compared to our study. The percentage of *Psuedomonas* was almost double compared to our study. In the study by K. D Mwambele, *Staphylococcus* aureus was comparable with that of our study. The percentage of both *Enterobacter* and *Psuedomonas* was increased compared to our study. The percentage of *E. coli* was decreased compared to our study.

In the study by W.Dessie et al, the percentage of *Staphylococcus aureus* was decreased compared to our study. The percentage of *E. coli* and *Klebsiella* pneumoniae were comparable with that of our study. The percentage of *Acinetobacter* was double compared to our study. In the study by Yoshio et al, the percentage of *Staphylococcus aureus* was almost comparable with our study. The percentage of *Pseudomonas* was increased compared to our study. In this study, the percentage of enterococci was highly increased almost equaling that of *Staphylococcus.*

In the study by Bansal et al, the percentage of *E. coli* was 50% which was double compared to our study. The percentage of *Staphylococcus aureus* was 33.33 which was also increased compared to that of our study. The percentage of *Pseudomonas* was comparable with that of our study.In the study by Mundhala et al, the percentage of *Staphylococcus aureus* is 36.3% which is increased compared to our study. The percentage of *E. coli* is decreased compared to our study. The percentage of *Acinetobacter* and *Pseudomonas* are also increased compared to our study.

Antibiotic susceptibility results become an important part of the treatment, moreover in a hospital acquired infection which maybe due to a multi-drug resistant nosocomial pathogen. Antibiotic susceptibility results and antibiogram help in the future planning of antibiotic policies.

In our study, in *Staphylococcus*, there was 30% of resistance to Cloxacillin indicating that 30% of the *Staphylococcus* were Methicillin resistant.All the Staphylococcal isolates were resistant to Penicillin and Erythromycin. 55% of the isolates were resistant to both Ciprofloxacin and Ofloxacin. 70% of the isolates were susceptible to Cotrimoxazole and 85% isolates were susceptible to Gentamicin.

The enterococcal isolates showed 33% resistance both to Penicillin and Ampicillin and 66% resistance to high level gentamicin. There has been an increase in the high level aminoglycoside resistance in enterococci.

In the enterobacteriace family, the isolates showed 65% of resistance to Ampicillin. There is 55% resistance to Cefotaxime which denotes the increased ESBL producing isolates.Isolates are 45% resistant to both Gentamicin and Cefepime. 50% of the isolates are resistant to Cotrimoxazole. Ciprofloxacin can be used since 65% of the isolates are susceptible to Ciprofloxacin. 80% of the isolates are susceptible to Piperacillin tazobactum which makes it one of the emperic drugs of choice. Only 5% of the isolates are resistant to Imipenem which is a healthy environment which shows decreased Carbapenem usage of surgical site infections.

Among the non-fermentors, there was 45% resistance to Cefipime. Cotrimoxazole, Cefeperazone sulbactum, Piperacillin tazobactum and Meropenem had 78% susceptibility.

In the study by Nidhi et al, among the enterobacteriace, there was 80% resistance to cefeperazone sulbactum, 65% resistance to piperacillin tazobactum and 50% resistance to both Amikacin and Cefepime. There was 40% resistance to Ciprofloxacin and Imipenem. Tigecycline was 75% susceptible to the isolates. The resistance to Amikacin was increased compared to our study. The resistance to Ciprofloxacin and Cefepime was comparable to our study. In this study the resistance to piperacillin tazobactum and Imipenem was drastically increased compared to our study.

In the study by Daniela et al, in the *Staphylococcus* isolates the resistance to oxacaillin, Penicillin and Gentamicin was comparable with our study. Compared to our study, the resistance to Ciprofloxacin and Erythromycin was greatly reduced.In the non-fermentors, the resistance to Meropenem was very high around 90%.In our study, the resistance to Meropenem is 22%.In enterobacteriace also our study showed less resistance to Imipenem compared to their study. We had 5% and the study by Daniela et al had 25%.The percentage of resistance to Ampicillin was decreased in our study compared to their study.

In the study by G. Adwan et al, the Ciprofloxacin resistance was comparable with that of our study. In the *E.coli* isolates, the resistance of both Ciprofloxacin and Cotrimoxazole were high compared to our study. In the study by Amaila Qaisar et al, the Staphylococcal isolates are less resistant to Cotrimoxazole compared to our study. The percentage of MRSA is lesser compared to our study. In the *E.coli* isolates, the resistance to Cefotaxime is slightly higher in our study. The resistance to Cotrimoxazole is comparable with our study. In the *Pseudomonal* isolates, there is only 22% of resistance to Meropenem compared to their study which has a resistance percentage of 40%.

Compared to the study by W. Dessie et al, the antibiotic resistance percentage was increased in all antibiotics for *Staphylococcus aureus* isolates. For Cloxacillin, our percentage was 3 times that of their study. The resistance percentage of Ciprofloxacin was 3 times higher and that of Erythromycin was 5 times higher. Among the enterobacteriace isolates, the resistance percentage for the third generation cephalosporin Cefotaxime, Ampicillin and Ciprofloxacinwas considerably lower in our study. In the study by Yoshio et al, the Ciprofloxacin resistance percentage for *E.coli* isolates were lesser compared to our study. For the *Pseudomonal* isolates, the resistance percentage were higher for all three antibiotics Cefepime, Piperacillin Tazobactum and Meropenem. The difference in Cefepime was the greatest, our resistance percentage being 15 times their study. This significance stresses the relationship between antibiotic usage and resistance.

In the study by Mundhala et al, in *Staphylococcus aureus isolates,* the resistance percentage of penicillin was comparable with our study. All the isolates were resistant to penicillin. In our study , all the *Staphylococcus aureus* isolates were resistant to Erythromycin compared to only 43% in their study. Ciprofloxacin resistance percentage was higher in our study and resistance to Gentamicin was only half compared to their study.

CONCLUSION

The alarming increase in rate of nosocomial infections makes it the need of the hour to prevent and curtail these infections. A disease given to the patient by the hospital for which he pays by increased hospital stay, morbidity and even mortality frightens the physicians and surgeons alike. For surgical site infections the environment in the skin where there is a breach in the epithelium provides a niche for the microorganisms. The nosocomial flora has also changed with the years, nowadays the hospital environment teaming with multidrug resistant organisms, which are very difficult to treat. Therefore prevention of transmission of multidrug resistant pathogens from the hospital environment and health care workers to the patients and cross infection between patients is inevitable. Knowledge of antibiotic resistance of bacteria recovered from surgical site infections is critical in optimization of prophylactic antibiotic therapy of surgical procedures in an effort to avoid selection of multidrug resistant organisms.

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