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Original Research Article

One year study of aerobic bacterial profile and antimicrobial susceptibility pattern of pus samples

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ABSTRACT

Introduction: Pyogenic wound infection is one of the major cause of morbidity. The pace at which the bacterial isolates develop drug resistance is far exceeding the rate of discovery of newer drugs and thus highlights the need for conducting periodic studies to determine their antimicrobial susceptibility patterns.
Materials and Methods: This study was conducted from June 2015 to May 2016, in Santhiram medical college and general hospital. Pus samples submitted to Microbiology department were processed and identified using standard protocols. Antimicrobial testing of all isolates was performed by Kirby- Bauer's disc diffusion method as per CLSI guidelines.
Results: In our study a total of 490 pus samples were received, of which 279 (56.9%) were culture positive. Gram negative bacilli (78%) outnumbered Gram positive cocci (22%). Majority of samples were from Surgical departments (94.6%). E.coli (29%) was the commonest organism isolated followed by klebsiella spp. (19.7%), Staphylococcus aureus (15.4%).
All Staphycoccal isolates were susceptible to Linezolid, Teicoplanin, Vancomycin where as Gram negative bacilli were susceptible to Imipenem (96.7%), Piperacillin-tazobactum (84.7%), Gentamicin (62.2%), Cefeperazone sulbactum (57.6%). Among Pseudomonas isolates, Imepenem (97.2%), Piperacillin-tazobactum (94.3%), were effective drugs.
Conclusion: Microbiological analysis and antibiogram of pus isolates can serve as a useful tool for appropriate and judicial use of antibiotics and thus minimizing the evolution of drug resistance strains in future.

1. Introduction

Pyogenic infections are associated with local and systemic inflammation characterised with pus formation.[1] The cause of these infections may be either exogenous or endogenous. As the bacteria make their entry into the body, the immune cells accumulate at the site of entry to fight against the bacteria and eventually lead to formation of pus.[2]

Several studies have been conducted from time to time to access the bacterial profile and the antibiotic sensitivity pattern in pus samples, which will help the treating physician to start empirical treatment in patients until the lab culture reports are available.[3]

Though various studies show similarity in bacterial profile of pus samples, there is much variation in the susceptibility pattern of antibiotics which highlights the emergence of resistant bacteria and also a need for continuous surveillance of such changing trends. The present study was designed to evaluate the profile of aerobic pyogenic bacteria along with their susceptibility pattern to various antimicrobial agents.

2. Materials and Methods

In this study a total number of 490 pus samples obtained for aerobic culture and sensitivity from various inpatient and outpatient departments of Santhiram medical college and general hospital, Nandyal during the period of July 2015 to June 2016 were included. Informed consent was taken from

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the patient.

Pus samples collected with sterile cotton swabs and sterile syringes were transported and processed in microbiology laboratory immediately. Received pus samples were inoculated on blood agar, mac Conkey agar, chocolate agar and nutrient agar media and incubated at 37^0 C for 24 to 48 hrs under aerobic conditions. Identification of the organisms from the positive cultures was done by Grams stain, motility tests, oxidase tests, biochemical reactions as per the standard operative procedures.[4]

The antimicrobial susceptibility testing was done by Kirby bauer's disc diffusion method and interpretation was done as per clinical laboratory standard institution guidelines. Antibiotics like Pencillin (10 units), Amoxycillin plus clavulanic acid (20/10mcg), ciprofloxacin (5mcg), clindamycin (2mcg), erythromycin (15mcg), gentamicin (10mcg), Amikacin (30mcg), Sparfloxacin (5mcg), Netilmycin (30mcg), Ceftriaxone (30mcg), Ceftazidime (30mcg), Cefotoxime (30mcg), Cefeperazone and sulbactum(75/10mcg), Piperacillin and tazobactum (100/10mcg), Imepenem (10mcg), Linezolid (30mcg), Teicoplanin (30mcg), Vancomycin (30mcg) were tested (HIMEDIA INDIA). Results were analysed using MS EXCELL, 2007 version.

3. Results

A total of 490 samples were received for aerobic culture and sensitivity testing in microbiology lab. 279 (56.9%) isolates were culture positive and 211 (43.06%) were negative. Among culture positives 209 (74.9%) were from male patients and 70(25%) were from females (Figure 1). Male: female ratio is 2.99. With regard to age distribution among culture positive samples patients between 51-60 yrs contributed 29.3% (Table 1).

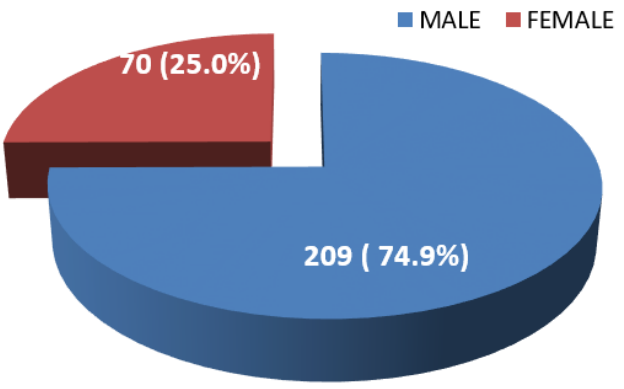

Fig. 1: Pie diagram showing gender distribution in culture positive sample

Among ward wise distribution of culture positive samples, general surgery department contributed 45.3% followed by orthopaedics (5.73%)and obstetrics and gynaecology (3.94%) (Figure 2).

Table 1: Age distribution among culture positive samples

Age	Number(%)
0 – 10	4 (1.4)
11 – 20	17(6.09)
21 – 30	28 (10.0)
31 – 40	38 (13.6)
41 – 50	75 (26.8)
51- 60	82 (29.3)
61 – 70	31 (11.1)
71 – 80	4 (1.4)

A total of 217 (78%) were Gram negative bacilli (GNB) and 62(22%) were Gram positive cocci(GPC) among culture positives (Figure 3)

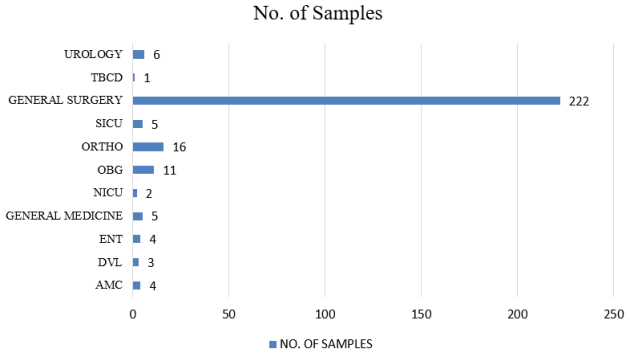

Fig. 2: Ward-wise distribution of samples

E.coli (29%) was the most common bacterial isolate among culture positives followed by *klebsiella spps* (19.7%), *Staphylococcus aureus* (15.4%) and *Pseudomonas spps.*(13.3%). Antibiogram of staphylococcus aureus revealed 4 (9.3%) MRSA, 39 (90.6%) MSSA both of which are 100% sensitive to vancomycin, linezolid and teicoplanin.

Among GNB's *E.coli* and *Proteus* ssps showed 100% sensitivity to imipenem where as *Klebseilla* spps showed 90.9% and *Pseudomonas* spps. showed 97.2% respectively.

4. Discussion

In our study, we found the predominance of Gram negative bacteria as the causative agents of pyogenic lesions which is supported by Zubair et al[5] and Ghosh et al.[6] we found that E.coli was the most common organism isolated which differs from the studies of Swati et al[7] and Birader et al[8] where they got *Pseudomonas* spps and *staphylococcus aureus* respectively. The above variation can be attributed to much bigger sample size in our study when compared to the mentioned studies.

Table 2: Bacterial isolates from culture positive samples (N = 279)

Bacterial Isolate	N umber (%)
Citrobacter spps	6 (2.2%)
Coagulase negative Staphylococcus	2 (0.7%)
Escherichia coli	81 (29%)
Enterobacter spps	1 (0.4%)
Enterococcus spps	9 (3.2%)
Klebsiella spps	55 (19.7%)
NFGNB	9 (3.2%)
Proteus mirabilis	21 (7.5%)
Proteus vulgaris	7 (2.5%)
Pseudomonas spps	37 (13.3%)
Staphylococcus aureus	43 (15.4%)
Streptococcus spps	8 (2.9%)
Total	279 (100%)

Table 3: Antibiotic sensitivity pattern of staphylococcus aureus (N=43)

Drugs	MSSA (39) (%)	MRSA (4) (%)
Penicillin	2 (5.1)	0 (0)
Amoxyclav	29 (74.3)	0 (0)
Ciprofloxacin	35 (89.7)	0 (0)
Clindamycin	31 (79.4)	2 (50)
Erythromycin	26 (66.6)	1 (25)
Linezolid	39 (100)	4 (100)
Teicoplanin	39 (100)	4 (100)
Vancomycin	39 (100)	4 (100)
Gentamycin	36 (92.3)	1 (25)
Netilmycin	38 (97.4)	4 (100)

Table 4: Antibiotic sensitivity pattern of *e.coli* (N= 81)

Drug	Sensitive (%)	Resistant (%)
Amoxy-clav	17 (20.9)	64 (79.0)
Ciproflaxacin	24 (29.6)	57 (70.3)
Sparfloxacin	21 (25.9)	60 (74.0)
Gentamicin	57 (70.3)	24 (29.6)
Amikacin	66 (81.4)	15 (18.5)
Ceftriaxone	16 (19.7)	65 (80.2)
Cefaperazone + sulbactum	43 (53.0)	38 (46.9)
Imepenem	81 (100)	0 (0)
Pipercillin + tazobactum	68 (83.9)	13 (16)

Table 5: Antibiotic sensitivity pattern of *klebsiella* sps (N=55)

Drug	Sensitive (%)	Resistant (%)
Amoxy- clav	12 (21.8)	43 (18.1)
Ciproflaxacin	25 (45.4)	30 (54.5)
Sparfloxacin	24 (43.6)	31 (56.3)
Gentamicin	26 (47.2)	29 (52.7)
Amikacin	30 (54.5)	25 (45.4)
Ceftriaxone	12 (21.8)	43 (78.1)
Cefaperazone + sulbactum	25 (45.4)	30 (54.5)
Imepenem	50 (90.9)	5 (9)
Piperacillin+ tazobactum	40 (72.7)	15 (27.2)

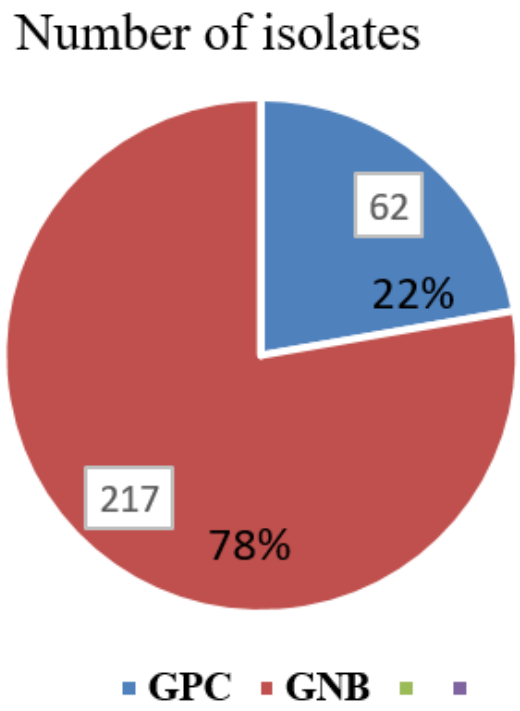

Fig. 3: Pie diagram showing distribution of culture positive isolates (N= 279)

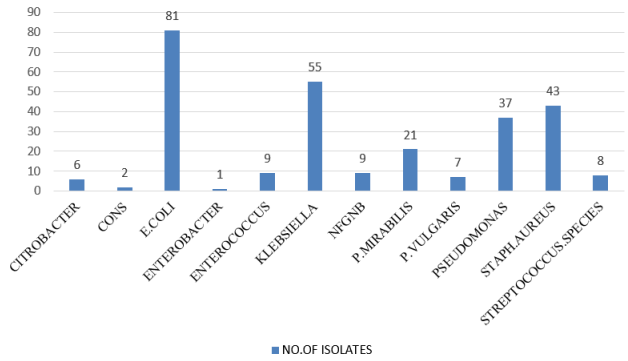

Fig. 4: Aerobic bacterial isolates from culture positive samples

Table 6: Antibiotic sensitivity pattern of *proteus* Sps (N=28)

Drug	Sensitive (%)	Resistant (%)
Amoxy- clav	18 (64.2)	10 (35.7)
Ciproflaxacin	23 (82.1)	5 (17.8)
Sparfloxacin	11 (39.2)	17 (60.7)
Gentamicin	20 (71.4)	8 (28.5)
Amikacin	21 (75.0)	7 (25.0)
Ceftriaxone	16 (57.1)	12 (42.8)
Cefaperazone + sulbactum	21 (75.0)	7 (25.0)
Imipenem	28 (100)	0 (0)
Pipercillin+ tazobactum	28 (100)	0 (0)

Table 7: Antibiotic sensitivity pattern of *pseudomonas* Sps (N= 37)

Drugs	Sensitivity (%)	Resistant (%)
Ciproflaxacin	30 (81.0)	7 (18.9)
Gentamicin	29 (78.3)	8 (21.6)
Amikacin	30 (81.0)	7 (18.9)
Netilmycin	30 (81.0)	7 (18.9)
Ceftriaxone	29 (78.3)	8 (21.6)
Ceftazidime	31 (83.7)	6 (16.2)
Cefotaxime	30 (81.0)	7 (18.9)
Cefaperazone+sulbactum	33 (89.1)	4 (10.8)
Imepenem	36 (97.2)	1 (2.7)
Piperacillin + tazobactum	35 (94.5)	2 (5.4)

In our study male: female distribution of pus isolates was 2.99 :1 which is similar to the studies of Swati et al and Pappu AK et al.[9]

Among Gpc's *Staphylococcus aureus* is the most common isolate in our study which also corelates with the studies of Tivari et al[10] and LeeCY et al,[11] but the prevelance of Methicillin resistant *Staphylococcus aureus* (MRSA) was low in our study 4 (9.3%) when compared to the studies Swati et al (35.9%). The reason can be because of the variation in the location of the hospitals where the studies were done. As our study was done in a hospital located in a rural area where the usage of higher class antibiotics was much lower when compared to above mentioned studies which were done in hospitals located in urban areas. All isolates of *Staphylococcus aureus* are 100% sensitive to vancomycin, which correlates with studies of Samra et al[12] but studies of Swati et al and Chauhan et al[13] showed 88% and 90.22% respectively.

In our study the percentage of *klebsiella* isolates which are imipenem resistant was closely similar to study of Birader et al. Our study showed much lower resistance to imipenem among pseudomonas isolates compared to studies of Raghav et al[14] and Swathi et al. The effectiveness of Piperacillin and tazobactum (PIT) and Amikacin (AK) on *pseudomonas* was much similar to study of Swathi et al and Sharma et al.[15] As surgical departments contributed to more numb er of culture positive isolates, it highlights the need for proper antibiotic coverage among the patients. In our study all the isolates of E.coli were sensitive to imipenem but in studies of Birader et al and Rhaghav et al 20% of isolates were resistant to imipenem.

5. Limitations of Our Study

1. Anerobic cultures were not done.
2. Lack of adequate history on prior antibiotic usage before sample was sent to the lab.

6. Conclusion

Pyogenic infections are a major concern in health care settings as they are the major cause of morbidity in many occasions. The situation has been more worsened now a days with the emergence of multidrug resistant strains. Inspite of some limitations, the present study can serve as an useful tool for clinicians for appropriate and judicial use of antibiotics which not only contribute to the better treatment but also aids in prevention of emergence of drug resistant strains in future.

7. Source of funding

None.

8. Conflict of interest

None.

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