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PATTERN OF PYOGENIC PATHOGENS AND THEIR ANTIMICROBIAL SENSITIVITY IN PUS ISOLATES AT RURAL TERTIARY CARE HOSPITAL IN NORTH INDIA

Medical Science

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ABSTRACT

INTRODUCTION-The skin and soft infections (SSTIs) is one of the most common complications after trauma, burn, and surgical procedures resulting pus, which is a collection of dead WBCs, cellular debris, and necrotic tissues. The emergence of resistance necessitates periodic studies to determine their antibiogram. The objective of the current study is to characterize the pyogenic bacteria and to determine their antibiotic susceptibilities.

MATERIALS AND METHODS- Pus samples from National institute of medical science (NIMS) Hospital was collected and processed as per CLSI guidelines.

RESULTS-Analysis of 252 pus samples showed 73.81% culture positivity (M: F=1:0.45). *E.coli* (33.87%) was the most common organism followed by *Staphylococcus aureus*(29.03%).The most sensitive drug in Gram negative bacteria were susceptible to Imipenem(96.60%) Teglicyclin(95.45%). The most sensitive drug among Gram positive cocci was Linezolid(100%), Vancomycin(100%), Teicoplanin (92.60%). The most sensitive drug in *Pseudomonas spp*. was Imipenem(90%), Piperacillin-Tazobactum(90%), Aztreonam(90%). The most sensitive drug in *CONS* was Vancomycin(100%),Linezolid(100%), Tetracycline(85.71%), Doxycycline(78.57%).

CONCLUSION-Rapid emergence of multidrug-resistant bacteria poses a serious threat to public health globally due to the limited treatment options however the changing trends of antimicrobial susceptibility in bacterial isolates from pus can serve as a vital tool for clinicians to start empirical treatment of patients at the earliest.

INTRODUCTION

Pyogenic infections are characterized accumulation of dead leucocytes along with local and systemic inflammation [1]. A breach in the skin provides entry to the bacteria followed by the body's defense mechanism bringing immune cells against the bacteria. Eventually, accumulation of these cells produces pus which is a thick whitish liquid [2]. Although the introduction of antimicrobials have drastically changed the course and outcome of the infection but the inadvertent use of antibiotics has introduced the emergence of drug resistance among causative organism which is turning out to be a great challenge to the clinicians. Virulent strains adapt quickly to changing environment worsens the situation and draws a matter of concern [3]. Numerous studies have been conducted all over from time to time to find out the bacterial profile and the antibiotic susceptibility pattern of the pyogenic organisms which in particular relevant for the treating physician for starting an empirical treatment of patient [4].

Though the bacterial profile from pus samples remain similar in various studies, although there is a significant variation in the antibiotic susceptibility in different studies but the overall bacterial profile results are overlapping among the studies which is valuable for starting empirical therapy prior to antibiotic susceptibility tests. This study was done to further find out the prevalence of various pyogenic bacteria together with their antibiotic sensitivity. Further there is a need for a continuous surveillance of changing trends in bacterial pathogen and their susceptibility patterns.

MATERIALS AND METHODS

This is a prospective study in which a total number of 252 pus samples were obtained for aerobic culture and sensitivity from different IPDs & OPDs of National institute of medical science (NIMS) Hospital Jaipur Rajasthan from May, 2018 to November, 2018. Pus samples were collected with sterile disposable cotton swabs and aspirates in syringes and were processed at the microbiology laboratory NIMS medical college. Samples were inoculated on Blood agar, Mac Conkey agar and Nutrient agar and were incubated at 37°C for 24 hrs to 48 hrs in aerobic condition. After incubation, identification of bacterium from positive cultures was done with a standard microbiological technique which includes motility testing by hanging drop preparation, gram staining

and biochemical reactions such as Catalase, Coagulase , Indole , Methyl red, Voges- Proskauer, Citrate, Urease, Phenyl pyruvic acid test and Oxidase test [6]. The antibiotic sensitivity testing of all isolates was performed by Kirby Bauer's disc diffusion method [7] on Muller Hinton agar with antibiotic dosage and interpretation as per CLSI guidelines [8]. Standard antibiotics Meropenem(10µg), Gentamycin(10µg),Tetracycline(30µg),Cefotaxime(30µg), Ampicillin(10µg), Levofloxacin(5µg), Doxyccline(30µg), Ceftazidime(30µg), Amikacin(30µg), Ciprofloxacin(5µg), Imipenem(10µg), Tigecycline(15µg), Cefepime(30µg), Chloraphenicol(30µg), Piperacillin-Tazobactam(100/10µg),Aztr eonam(30µg), Piperacillin(100µg), Penicillin(100µg), Azythromycin(30µg), Ofloxacin(5µg), Linezolid(30µg), Vancomycin(30µg), Ceftazidime(30µg), Erthromycin(15µg), Cefoxitin(30µg), Teicoplanin(30µg) were tested.

S.aureus ATCC 25923 and E.coli ATCC 25922 were used as quality control [9]. All the culture media, biochemical media and antibiotics used were obtained from Hi Media.

RESULTS

Out of 252 pus samples obtained from the various IPDs & OPDs of National institute of medical science (NIMS) Hospital Jaipur Rajasthan for aerobic culture and sensitivity, 186(73.81%) samples yielded a positive culture whereas 66(26.19%) samples showed no growth.

Among 186 samples, 128(68.82%) were male patients and 58 (31.18%) were female patients giving a male: female ratio of 1:0.45with predominance in 31-50 age groups with 22.58 % of isolates Among the isoloates, *E.coli*(33.87%) was the most predominant organism followed by *Staphylococcus aureus*(29.03%), *Pseudomonas spp*.(16.13%) and *CoNS*(10.22%). The most sensitive drug in Gram negative bacteria was Imipenem(96.60%) closely followed by Teglicyclin(95.45%), while highest resistsnce was found in Ciprofloxacin with minimum sensitivity(8.0%). While in *Pseudomonas spp*. highest sensitivity was found in Imipenam(90%), Piperacillin-Tazobactam(90%), Aztreonam(90%) and lowest sensitivity was found in Ciprofloxacin(43%). The sensitivity pattern in

gram positive isolates were different in as in *Staphylococcus aureus* the most sensitive drug was Linezolid(100%) followed by Vancomycin(100%) and Teicoplanin (92.60%) while the pattern in *CoNS* was Vancomycin(100%), Linezolid(100%), Tetracycline(85.71%), Doxycycline(78.57%).

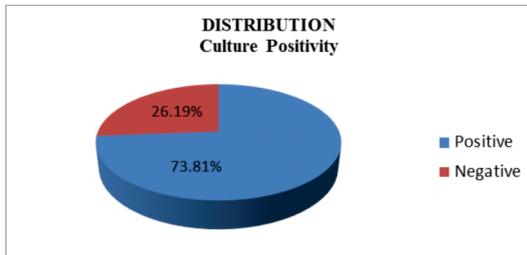**Figure. 1 Culture Positivity Among Pus Samples**

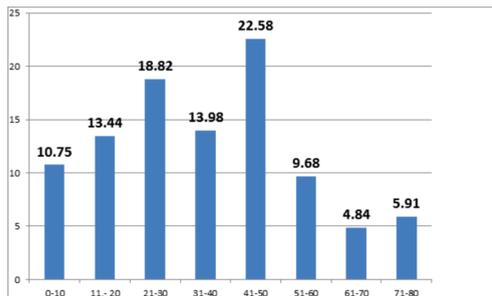**Figure 2. Distribution Of Positive Samples According To Age Group (%)**

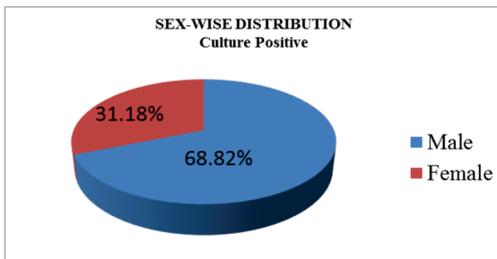**Figure 3. Distribution Of Positive Culture According To Sex**

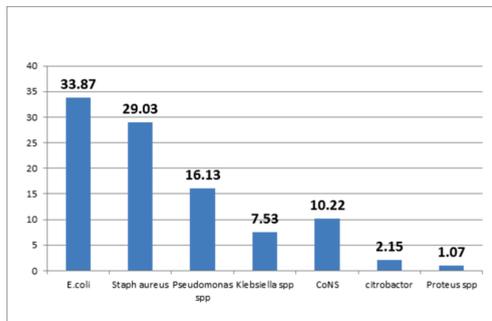**Figure 4. Prevalence rate of bacterial isolates**

Figure 5. Antimicrobial sensitivity pattern of Gram Negative Bacteria other than *Pseudomonas spp. (%)*
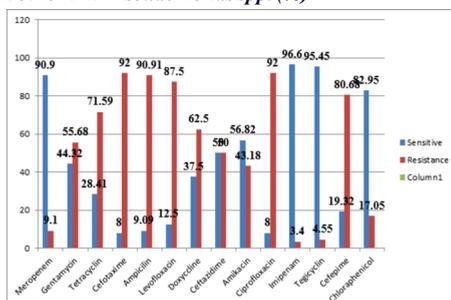

Figure 6. Antimicrobial sensitivity pattern of *Pseudomonas spp. (%)*
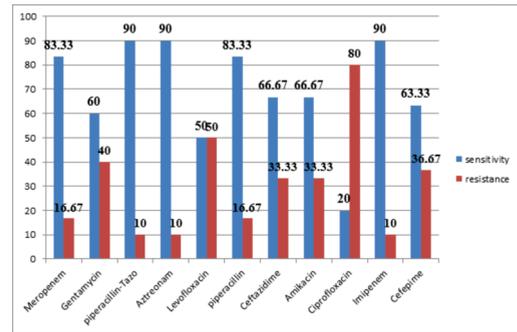

Figure 7. Antimicrobial sensitivity pattern of *Staphylococcus aurus (%)*
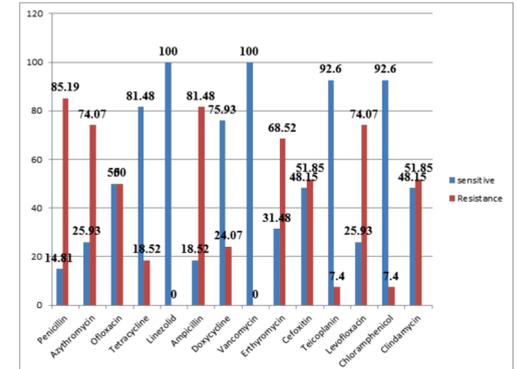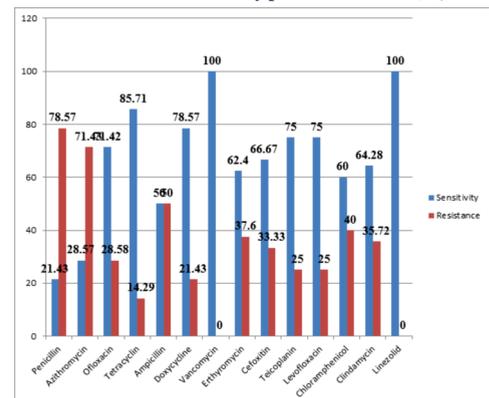

Figure 8. Antimicrobial sensitivity pattern of *CoNS (%)*

DISCUSSION

Pyogenic infection is one of the most common presenting complaints in hospitalized patients and outpatients departments. Also wound infection is conclusively the most common complications in postsurgical patients.[10] causing increased trauma care, prolonged hospitals stay, and treatment.[11]

Present study was done to find out the prevalence and sensitivity pattern among pyogenic bacteria's in various pus isolates. The isolates were predominantly male and in 30-50 age group which was in accordance to previous study by Swati duggal et al.(12)*E.coli*(33.87%) wasthe most common isolate followed by *S.aureus*(29.03%), *Pseudomonas spp*(16.13%) and *CoNS*(10.22%). which is in contradiction with studies by Mantravadi HB et.al.,PoonamVerma et. al., D.V.M.V.S.V. RaghavRao et. al. (13,14,15).However, Ramesh Knnans et al.[16] supported our result and showed E.coli as most common isolate followed by *Klebsiella spp* (21%) and *S,aureus* (10%).

E. coli followed by *Pseudomonas spp* was the most common GNB isolated from the pus samples in our study. Though *S. aureus* was the predominant organism in gram positive group, gram-positive cocci accounted for only 36.55% of the total isolates, while gram negative accounted for 63.45%. Similar results of GNB predominance were also reported by Ghosh et al.[17] and Zubair et al.[18].

Among the various antimicrobials, sensitivity pattern within GNB was found highest by Imipenem(96.6%) followed by Teglicycline(95.45%) while lowest sensitivity was observed in b-lactams and fluroquinolones, with Cefotaxim(8.0%), Ciprofloxacin(8.0%) and Ampicillin(9.05%) sensitivity rates. while in *Pseudomonas spp*, Imipenem(90.0%),Aztreonam(90%) and Piperacillin-Tazobactam(90.0%) showed highest sensitivity however Ciprofloxacin(42.5%) and Levofloxacin (50.0%) showed low sensitivity zones. The above results were in accordance with the other previous studies by Taiwo et al, Rao et al and Basu et al [9,15,20]

In gram positive organisms *S.aureus* showed highest sensitivity against high end drugs like linezolid(100%) and Vancomycin(100%) indicating emergence of resistance to the first and second line drugs However in CoNS, Doxycycline(78.57%) and Levofloxacin(78.6%) also gave decent sensitivity rates after Linozolid(100.0%) and Vancomycin(100.0%). Similar result were also reported by Mohammad ShahidRaza et at 2013[21] and Rao et al [15], with Vancomycin and Linozolid with highest sensitivity rates in gram positive cocci while resistance against Macrolides and Penicillin groups. Studies by Javeed et al. [22] revealed 99.6% resistance to ampicillin, 72.7% to erythromycin on the other hand over 90% sensitivity to vancomycin and linezolid.

Conclusively the sensitivity pattern against antimicrobials is a vital for empirical antibiotic chemotherapy prior to culture sensitivity results. Variation in the sensitivity pattern along with demographic and geographic factors and emergence of resistance among microorganism demands further studies based on prevalence of causative organisms and their sensitivity profile.

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