

AEROBIC BACTERIOLOGICAL PROFILE WITH ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF PUS SAMPLES AT A TERTIARY CARE HOSPITAL IN JAIPUR



Microbiology

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ABSTRACT

Background: Pyogenic infections can be caused by various microorganisms and may co-exist as poly microbial infections which require antibiotic therapy. The inappropriate use of antibiotics has led to major problems of MDRO's contributing to morbidity and mortality. Even though the bacteriological profile of pus samples in many studies remain the same, antimicrobial susceptibility pattern of these isolates has shown a lot of variation. This study was conducted to assess bacteriological profile of pus samples and their antimicrobial susceptibility pattern

Materials and Methods: A retrospective study was carried out from April to June 2021. 540 pus culture aerobic bacterial isolates were included. The samples were cultured on Blood and MacConkey agar. After aerobic incubation at 37°C for 18-24 hrs, organisms were identified by conventional bacteriology methods as per laboratory protocol and antimicrobial susceptibility was tested by Kirby Bauer disc diffusion method as per CLSI 2020 guideline.

Results: Out of 540 pus isolates, 452(83.7%) were gram negative bacilli and 88(16.3%) were gram positive cocci. *Pseudomonas* spp. 173(31.9%), was most common gram negative isolate while *S. aureus* 66(12.19%) was most common Gram positive isolate. Most of gram negative isolates were susceptible to Imipenem and Polymyxin and gram positive isolates to vancomycin and linezolid.

Conclusion: To combat resistance irrational use of antibiotics should be avoided. Also regular surveillance helps in implementing better therapeutic strategies to reduce morbidity and mortality.

KEYWORDS

Pus isolates, Bacteriological profile, antimicrobial susceptibility pattern,

INTRODUCTION

Pyogenic infection is characterized by local inflammation and pus formation. Accumulation of dead leukocytes and pyogenic bacteria commonly known as pus. (1) Pyogenic infections may be endogenous or exogenous. (2). Skin and soft tissue infections (SSTIs) are caused by microbial pathogens during or after trauma, burn injuries, and surgical procedures (3). These result in the production of pus. Both aerobic and anaerobic bacteria have been implicated in wound infections which commonly occur under hospital environment resulting in significant morbidity, prolonged hospitalization and huge economic burden (4).

The inadvertent use of antibiotics leads to emergence of antimicrobial resistance among bacterial pathogens, which in turn acts as a great challenge to the health services. Moreover, highly virulent strains and capacity to adapt quickly to changing environment worsens the situation and draws a matter of concern (5).

In most of the studies major prevalent isolates are aerobes which includes Gram positive cocci like *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus pyogenes*, *Enterococci* while Gram negative bacilli like *Pseudomonas*, *Escherichia coli*, *Klebsiella pneumoniae* and *Proteus*.

Though the bacteriological profile of pus samples remain similar in various studies, but a considerable variation in the antibiotic susceptibility pattern of these isolates highlighting the increasing threat of emergence of resistant bacteria and hence a need for a continuous surveillance of such changing trends. Therefore, a study was conducted at a tertiary care centre in Jaipur to study the changing trends in antimicrobial resistance in various pus isolates.

OBJECTIVES

1. To identify and isolate aerobic bacteria from pus samples.
2. To study antimicrobial susceptibility pattern of aerobic bacteria.

MATERIALS and METHODS

This retrospective study was conducted in the Department of Microbiology at SMS Medical College, Jaipur from April 2021 to June 2021 for a period of 3 months. Pus samples which received in microbiology laboratory, were processed for Gram staining and culturing. The samples were aseptically inoculated on Blood agar and MacConkey agar plates, incubated aerobically at 35°C–37°C for 24–48 h. Identification and characterization of isolates were performed on the basis of Gram staining, microscopic characteristics, colony characteristic, and biochemical tests using standard microbiological methods as per laboratory protocols.

Antibiotic susceptibility testing of all isolates were performed by Kirby Bauer's disc diffusion method on Muller Hinton agar and interpreted as per Clinical and Laboratory Standards Institute guidelines 2020.

The isolates were tested against Amikacin (30µg), Ampicillin (10µg), Ciprofloxacin (5µg), Ceftazidime (30µg), Gentamicin (10µg), Imipenem (10 µg), Polymyxin (300U), Trimethoprim-sulphamethoxazole (1.25/23.7µg), Piperacillin tazobactam (100/10µg), Cephoperazone sulbactam (75/10µg), Tigecycline (15µg), Aztreonam (30µg), Tobramycin (10µg), Doxycycline (10mcg), Cefepime (30µg), Cefoxitin (30µg), and vancomycin (30µg) were obtained from Himedia Laboratories. Colistin MIC determination was done by Broth microdilution (BMD) method. Vancomycin sensitivity test done by Vanco-screen agar.

RESULTS

Among 540 culture positive patients, majority were in the age group of 21 to 30 years which was 146 cases followed by 31-40 years and then 1-10 years which was 94 and 83 cases respectively. Interestingly male were predominant than female which were 381 (70.56%) and 159 (29.4%) cases respectively. The male and female distribution in the most common age group of 21 to 30 Years was 102 and 44 cases respectively (Table 1). *Pseudomonas* was the most common isolated bacteria (32.03%) from pus which was followed by *Klebsiella* (19.62%) and *Escherichia coli* (15.37%). (Table 2)

Table 1: Age and gender distribution of study population

AGE GROUP	MALE	FEMALE	TOTALN(%)
<1 yr	09	15	24(4.4%)
1-10	61	22	83 (15.4)
11-20	54	13	67 (17.4%)
21-30	102	44	146 (27.1%)
31-40	66	28	94 (17.4%)
41-50	41	20	61 (11.3)
51-60	23	09	32 (5.9%)
61-70	14	08	22 (4.1%)
71-80	05	00	05 (0.9%)
>80 yr	06	00	06 (1.1%)
Total	381 (70.56%)	159 (29.44%)	540 (100%)

Table 2: Different bacterial isolates from positive Aerobic pus culture

BACTERIAL ISOLATES	FREQUENCY	PERCENTAGE
Pseudomonas	173	32.03%
Klebsiella	106	19.62%
Escherichia Coli	83	15.37%
Staphylococcus aureus	66	12.22%
Enterobacter cloacae	35	6.48%
Acinetobacter	27	5.0%
Proteus spp.	16	2.96%
Coagulase Negative Staphylococcus	15	2.78%
Citrobacter	11	2.04%
Enterococcus spp	07	1.3%
Burkholderia	01	0.19%
TOTAL	540	100%

Table :3 Antimicrobial susceptibility pattern(%) of various Gram negative and Gram positive pus isolates

ANTIBIOTICS	Pseudomonas	Acinetobacter	klebsiella	E. coli	Enterobacter	Proteus	S.aureus	CONS	Enterococcus
Amikacin	43.4	22.2	31.4	42.2	31.4	75	60.6	66.7	48.9
Aztreonam	37.6	-	-	-	-	-	-	-	-
Ampicillin	-	7.4	4.8	4.8	2.8	6.3	-	-	-
Cefepime	39.3	14.9	14.2	14.5	14.3	31.3	62.1	60	-
Cefoperazone-Sulbactam	24.9	-	-	-	-	-	-	-	-
Cefoxitin	-	-	-	-	-	-	16.7	20	-
Ceftazidime	30.6	7.4	3.8	7.2	8.5	25	-	-	-
Ciprofloxacin	27.2	15.6	15.6	15.6	8.5	18.8	13.6	40	-
Colistin	100	-	-	-	-	-	-	-	-
Clindamycin	-	-	-	-	-	-	53.1	40	-
Doxycycline	-	-	-	-	-	-	86.4	86.7	48.9
Erythromycin	-	-	-	-	-	-	25.8	20	14.3
Gentamycin	38.2	36.1	34.6	36.1	2.8	37.5	75.8	86.7	28.6
Imipenem	54.3	81.9	61.5	81.9	60	87.5	-	-	-
Linezolid	-	-	-	-	-	-	100	100	85.7
Polymyxin	-	93.9	92.3	93.9	97.1	18.8	-	-	-
Piperacillin-Tazobactam	38.2	31.3	15.4	31.3	20	75	-	-	-
Tigecycline	-	100	100	100	62	25	-	-	-
Trimethoprim-sulphamethoxazole	-	21.7	11.5	21.7	11.4	6.3	71.2	66.7	14.3
Tobramycin	39.3	-	-	-	-	-	-	-	-
Teicoplanin	-	-	-	-	-	-	72.7	80	48.9
Vancomycin	-	-	-	-	-	-	100	100	85.7

DISCUSSION

In this study male predominance (70.56%) was observed as compared to female(29.4%). Findings were similar to other authors like Nareen Zahra et al(6) and Krishnamurthy S et al (7) showed male preponderance 65.80% and 64% respectively. The majority of the isolates were in the age range of 21 to 30 years which were 146 (27.03%) similar to another studies of Biradar et al (1) and Danghachew Muluye et al(8) .

In the present study Gram-negative bacteria were the dominant isolates 83.7% from pus samples compared to Gram-positive bacteria 16.3%, which are in agreement to several earlier studies by Swati Duggal et al(9) and Batra et al(10). In another studies, *S. aureus* was the dominant bacterial species from wounds followed by *P. aeruginosa*, *klebsiella*, and *E. coli* (Rajiv et al(11)&Biradar et al(1).In study of Gomatheswari et al (12) *Klebsiella* species was predominantly isolated(22.5%) followed by *Staphylococcus aureus* (17.2%), *Pseudomonas aeruginosa*(15.8%).

Pseudomonas. was the most predominant organism 32.03% followed by *klebsiella* but other worker Gomatheswari et al(12) have found *Klebsiella* as the predominant organism present in wound infection. Other workers like A.Ananth and S. Rajan (13), has shown *Pseudomonas* as second most disease causing organism. However many workers have found *Pseudomonas* as the most predominant organism in their studies like Swati Duggal et al (9), and Soumya Kaup and Jaya Sankarankutty (14). *Staphylococcus aureus* has been reported as a predominant organism by Biradar et al(1), Rajiv et al (11)and Rashida Akter Khanam et al.(4).

Antimicrobial sensitivity profile showed most of the gram negative isolates as multi-drug resistance. *Pseudomonas aeruginosa* is most sensitive to Imepenem(54.6%), Amikacin(43.4%) alongwith 100% sensitivity to colistin and least sensitive to cefoperazone sulbactam (24.9%) .

Among other Gram negative bacilli *klebsiella* , *E. coli*, *Acinetobacter* shows high sensitivity to Tigecycline (100%) ,Polymyxin and Imipenem but high resistance to Ampicillin and cephalosporins. Similar results were also shown by other studies like Biradaret al(1), Rugira Trojan et al(16) . Among gram positive cocci, 83.33% isolates of *Staphylococcus aureus* were resistant to Cefoxitin (MRSA) . These findings were similar to study of tertiary hospital ,Amritsar where, 75% of *Staphylococcus aureus* were found to be Methicillin resistance, (Manmeet Kaur et al(15)). *Staphylococcus aureus* also showed a 100% sensitivity to linezolid which correlated with Rozina Arshi Khan et al.(17) *Staphylococcus aureus* and CONS both were 100% sensitive to vancomycin, and Linezolid while *Enterococcus* showed 85.7% sensitivity to linezolid and 85.71% sensitivity to vancomycin.

CONCLUSION

The bacteriological profile of wound infections and their antimicrobial sensitivity pattern may vary according to study population,time period and geographical criteria , as observed by different studies. On account of inappropriate and irrational use of antibiotics , multidrug-resistant bacteria are emerging. Hence it becomes essential to know the prevalent profile and sensitivity pattern to guide the clinicians to start the empirical treatment.

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