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Microbiological Spectrum and Antibiotic Susceptibility Pattern of Organisms Isolated from Pus Samples in A Tertiary Care Center

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ABSTRACT

Background: Pyogenic infections lead to the formation of pus and are characterized by pronounced local inflammatory responses, usually resulting from the multiplication of microorganisms leading to delayed wound healing, prolonged therapy, Multi drug resistance (MDR).
Objectives:
1. To study the Bacteriological profile of Pus samples.
2. To Determine the Distribution of Gram positive and Gram negative organisms.
3. To determine the antibiotic susceptibility pattern of isolated pathogens.
4. To Detect antibiotic resistance trends among pus isolates.
Methods: A Prospective Cross-sectional study done over a period of 10 months with Predefined Inclusion, Exclusion criteria and sample size of 320.Pus samples were subjected to Gram staining and culture inoculated and Antibiotic susceptibility testing was done on Mueller Hinton agar using Modified Kirby Bauer Disc Diffusion method. Statistical data analyzed using SPSS software, Chi-square test and odds ratio with 95% Confidence intervals.
Results: Out of the 320samples, 192(60%) were positive for Bacterial growth, while 70(22%) samples showed no growth and 58(18%) showed mixed growth. Gram negative isolates were (63.5%) predominant over Gram positive isolates (36.4%) and Klebsiella pneumonia, Pseudomonas, E.coli, S.aureus, CONS, are predominant isolates.
Conclusion: Routine bacteriological examination and susceptibility testing are crucial for effective management of pyogenic infections. Continuous monitoring of resistance patterns is essential to guide empirical therapy and to prevent emergence of multi resistant organisms.

Keywords: *Pyogenic infections, Pus, Bacteriological profile, Antimicrobial susceptibility, AMR.*

INTRODUCTION

Skin and soft tissue infections (SSTIs) refer to various infections that involve skin and underlying layers ranging from simple abscess to severe necrotizing infections and are most common HAI that accounts for significant morbidity and mortality. Patient with SSI stays additional of 7-11 days in hospital and 2-11 times higher risk of death compared to others without SSI. There is a diverse classification of SSTI based on clinical presentation and disease severity. Source control is the most important determinant of any infection. The goal of treatment is to reduce signs and symptoms, eradicate the causative organisms and prevent recurrences and avoid complications, mortality of the patient[1, 2, 3]. Immunocompromised conditions like diabetes mellitus, patient on corticosteroids, chemotherapy undergoing patients where invasion and survival of pathogens causes wound infection and delayed wound healing. Pus appearance in the post-operative wound itself contributes as important factor of infection. These may be endogenous or exogenous or it may be polymicrobial or monomicrobial in nature. Both aerobic and anaerobic bacteria have been found in hospital acquired infections (HAI),

especially postoperative wound infections.SSI surveillance is an active patient based prospective ante discharge and post discharge surveillance involving review of active medical records, visit to ICU, wards, surgeon and patient surveys [3, 4, 5].

Objectives

1) To study the Bacteriological profile of Pus samples.
2) To determine the Distribution of Gram positive and Gram negative isolates.
3) To determine the antibiotic susceptibility pattern of isolated pathogens.
4) To detect antibiotic resistance trends among pus isolate.

MATERIALS & METHODS

Study Design: A Prospective cross sectional study conducted over a period of 10 months from January 2026 to October 2026 in the Department of Microbiology, Navodaya Medical College, and Raichur.

Sample size: Sample size of this study is calculated with reference to article[6] by using formula

$n = z^2 \times p \times q / d^2$

p=70%=0.7, q=1-p=0.3, d=5%=0.05, z=1.96 (95% confidence level)

n=0.8064/0.0025=322.56. So Sample size of this study is 320.

Inclusion Criteria:

- Pus samples received from patients of all age groups
- Samples collected before initiation of antibiotic therapy

Exclusion Criteria:

- Inadequate or improperly collected samples.
- All no growth and contaminated samples.

Methodology:

Pus samples will be subjected to Gram staining and culture inoculated on to blood agar and MacConkey agar and will be incubated at 37°C for 24 hours.

Identification done by Preliminary tests like Gram's stain, hanging drop, catalase, oxidase test done and appropriate biochemical reactions like Slide Coagulase, Tube Coagulase, Bile Aesculin Agar, Optochin Sensitivity, Bacitracin Sensitivity will be put for Gram Positive Cocci and Indole Test, Citrate and Urease Reaction, Triple Sugar Iron Agar for Gram Negative Bacilli.[5, 6].

Antibiotic susceptibility testing: Antibiotic susceptibility testing will be carried out on Mueller Hinton agar using Kirby Bauer Disc Diffusion methodby using the Hi Media Antibiotic Discs. ESBL will be detected by combined disk test and Methicillin resistant Staphylococcus aureus (MRSA) by Cefoxitin 30 µg disc[1, 2]

Statistical analysis:

Data were analyzed using SPSS software. Chi-square test was applied and odds ratio with 95% Confidence intervals were calculated. A p value of < 0.05 was considered statistically significant.

RESULT:

During the study period from January 2026 to October 2026 in the Department of Microbiology, Navodaya Medical College, and Raichur, a total of 320 samples with clinical suspicion of skin and soft tissue infections were investigated. Pus samples were collected under strict aseptic precautions and processed for culture .Out of the 320 samples, 192(60%) were positive for Bacterial growth, while 70(22%) samples showed no growth and 58(18%) showed mixed growth. Gram negative isolates were (63.5%) predominant over Gram positive isolates (36.4%) and *Klebsiella pneumonia, Pseudomonas, E.coli, S.aureus, CONS,* are predominant isolates as shown in Table 1.

Table 1: Culture Growth of Pus Samples

Culture	Number	%
Culture Positive	192	60%

No Growth	128	40%
Mixed	58	18%

Present study shows out of 192, Gram negative isolates 122(63.5%) predominant over Gram positive isolates 70 (36.4%) and *Klebsiella pneumonia, Pseudomonas, E.coli, S.aureus, CONS,* are predominant isolates shown in Figure 1.

Figure 1

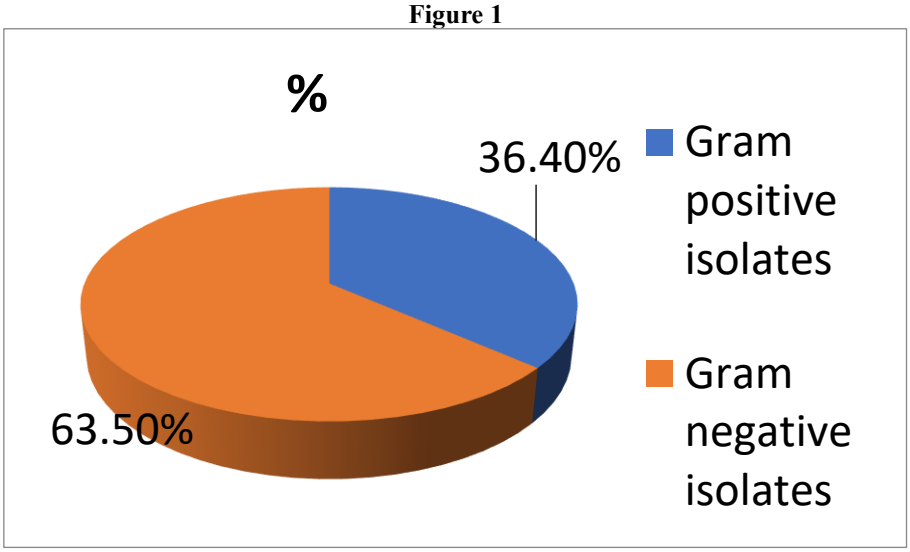
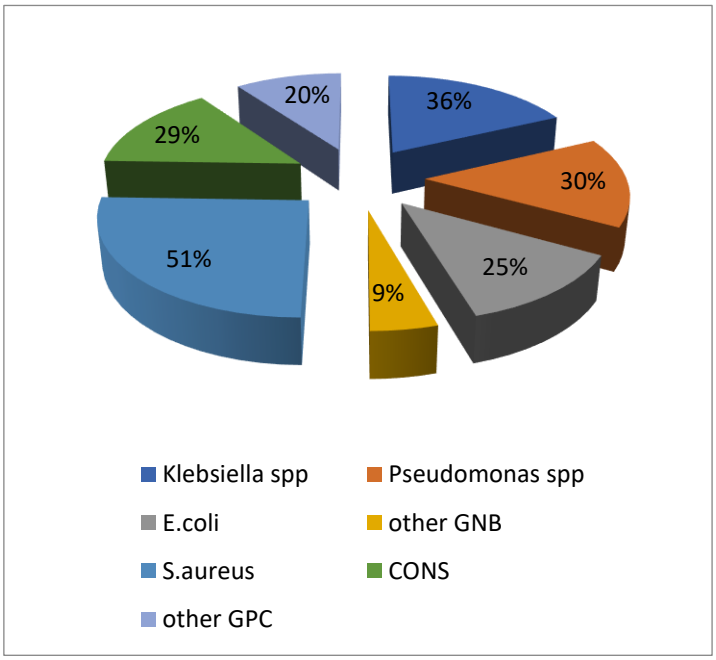


Table -2, Figure 2: Distribution of Bacterial isolates from Culture positive Pus samples.

Organism	No	%
Gram negative bacilli	122	63.5%
Klebsiella spp	44	36%
Pseudomonas spp	37	30%
E.coli	30	25%
Others	11	9%
Gram positive cocci	70	36.4%
S.aureus	36	51%
CONS	20	29%
Others	14	20%



Antibiotic Susceptibility pattern shows more resistance to the third and fourth generation cephalosporins, more sensitivity for beta-lactam/beta-lactamase combination drugs such as cefoperazone/sulbactam and amoxyclav ,meropenem,while

Gram positive isolates,like MRSA isolates showed resistance to erythromycin and to clindamycin. They were 100% sensitive to vancomycin and linezolid.

Table 3: Antibiotic Susceptibility of Gram negative bacterial isolates:

Antibiotic	Klebsiella (44)	E.coli (30)	Pseudomonas(37)
Amikacin(AK)	39%	42%	41.2%
Ciprofloxacin (CIP)	34.5%	37.2%	34%
Cotrimaxozole (COT)	73%	78%	71%
Doxycyclin (DOX)	42%	41%	41%
Amoxicillin-Clavulanate (AMC)	82.7%	80.5%	-
Piperacillin- Tazobactam (PTZ)	90.5%	92.5%	94%
Meropenem (MRP)	91%	93%	96.5%
Cefoperazone-Sulbactam (CFS)	89.2%	87%	-
Ceftriaxone (CTR)	62.5%	61%	-
Ceftazidime (CAZ)	-	-	90.4%
Cefepime(CPM)	-	-	93.2%

Table 4: Antibiotic Susceptibility of Gram positive bacterial isolates:

Antibiotic	MRSA(16)	MSSA(20)	CONS (20)
Penicillin (P)	42%	51%	47.5%
Ampicillin (AMP)	41%	52.7%	45%
Amoxicillin-Clavulanate(AMC)	72%	72%	70.5%
Ciprofloxacin(CIP)	40.5%	41%	39.2%
Levofloxacin(LE)	41%	45%	39%
Erythromycin(E)	33%	57%	30.5%
Clindamycin (CD)	45%	62.5%	39%
Cefoxitin (CX)	0%	100%	45%
Vancomycin (VA)	98%	91%	89%
Linezolid (LZ)	96.5%	90.5%	81%

DISCUSSION:

Pyogenic infections are among the commonly encountered bacterial infections in clinical practice significantly leading to morbidity and health care burden. As microbial distribution and resistance trends vary across geographical regions and health care settings, periodic surveillance and stewardship is essential. Present study shows culture positivity of 60% which is in accordance to study by Subathra devi et al [7] which shows 55.5% positivity rate highlighting the effectiveness of routine microbiological examination of pus samples.

In our study Gram negative isolates (63.5%) shows predominance over gram positive (36.4%) which correlates to studies done by Subathra devi et al 7, Roy et al [10] Which shows similar predominance highlights the ongoing development of antimicrobial resistance in clinically relevant pathogens leading to poor prognosis. In Present study ,Klebsiella spp are major isolates recovered from pus samples followed by Pseudomonas,E.coli among Gram negative isolates similar to study by Subathra devi et al, whereas Roy et al. shows predominance of Pseudomonas then Klebsiella, E.coli. S.aureus remain predominant gram positive isolate followed by Cons and others similar to study by sajjanar et.al [6], wadekar et.al [9].

Antibiotic Susceptibility pattern shows more sensitivity for beta-lactam/beta-lactamase combination drugs such as cefoperazone/sulbactam and amoxyclav ,meropenem,while Gram positive isolates,shows high sensitive for vancomycin and linezolid similar to above mentioned studies emphasizing the importance of antibiotic susceptibility testing in selecting effective antibiotics and preventing antimicrobial resistance.

CONCLUSION:

Present study emphasizes the importance of bacteriological profiling of pus samples in identifying the microbial etiology of pyogenic infections. It reinforces the importance of rational antibiotic use; periodic monitoring of syndromic hospital antibiograms and surveillance of antimicrobial resistance patterns and highlights the need for evidence based treatment decisions for effective management of pyogenic infections to reduce morbidity and mortality rates.

Ethical clearance:
Approval was obtained from the ethical committee of the institute for this study.

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