

## Bacterial Profile and Antibiogram of Pus Isolates in a Tertiary Care Hospital

Manoj Kumar<sup>1</sup>, Nayannika Lakra<sup>2</sup>, Ashok Kumar Sharma<sup>3</sup>, Amber Prasad<sup>4</sup>,  
Kumari Seema<sup>5</sup>

Professor and HOD<sup>1</sup>, Junior Resident<sup>2</sup>, Associate Professor<sup>3</sup>, Assistant Professor<sup>4</sup>,  
Assistant Professor<sup>5</sup>

(Department of Microbiology, Rajendra Institute of Medical Sciences (RIMS), Ranchi, 834009, Jharkhand, India)

Corresponding author: Nayannika Lakra

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### Abstract:

**Background:** Pyogenic infections are still a frequent and serious problem in clinical practice. Knowledge of pathogens causing these infections and their sensitivity patterns can be helpful in selection of appropriate antimicrobial therapy. Hence periodical monitoring of bacterial profile and their antibiotic susceptibility pattern is important.

**Objective:** To know the spectrum of pyogenic bacteria isolated from pus samples and to determine the antimicrobial susceptibility pattern of the isolates.

**Material and Methods:** This study was conducted from January 2018 to June 2018 in the Department of Microbiology at RIMS, Ranchi. The samples of pus received were processed to isolate and identify bacterial pathogens as per standard bacteriological techniques. Antibiotic susceptibility testing was done by Kirby-Bauer disc diffusion method.

**Results:** Out of the total 327 pus samples processed, 60.55% samples were culture positive. Majority of culture positive samples were from IPD patients. *Staphylococcus aureus* was the most common organism isolated followed by *Klebsiella* sp. and *Pseudomonas* sp.. Predominance of Gram-negative bacteria (59.62%) was seen as compared to Gram-positive bacteria (40.38%). Among the Gram-positive isolates, vancomycin and linezolid were the most susceptible drugs whereas among the Gram-negative isolates, the most susceptible drugs were piperacillin-tazobactam and imipenem.

**Conclusion:** Changing antimicrobial resistance poses a challenge in treating pyogenic infections. Thus it is necessary that such studies are carried out to practice evidence based medicine and to avoid the misuse of antibiotics thereby leading to effective management of these infections and prevention of emerging drug resistant strains.

**Keywords:** pyogenic infections, aerobic bacteria, antimicrobial resistance

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### I. Introduction

Pus is a thick, white to yellow fluid formed by aggregation of dead leucocytes, cellular debris, necrotic tissues and bacteria characteristic of pyogenic infections.<sup>1</sup> These infections are difficult to treat due to drug resistant bacterial pathogens and are a significant cause of morbidity and mortality in the patients.<sup>2</sup>

Pyogenic infections may be exogenous or endogenous. Exogenous infections are usually associated with traumatic injuries, burns etc. whereas endogenous infections and abscesses may be associated with appendicitis, cholecystitis etc.

The most common pyogenic bacteria are *Staphylococcus aureus*, *Enterococcus* sp. and coliform bacteria such as *Escherichia coli*, *Klebsiella* sp., *Proteus* sp. and *Pseudomonas aeruginosa*.<sup>3,4</sup> Though the bacterial profile from pus samples remain similar, there is considerable variation in the antimicrobial susceptibility pattern of isolates. The indiscriminate use of antibiotics has led to the increase in multidrug resistant organisms (MDRO).<sup>5</sup> Hence there is a need for continuous surveillance, regular reporting and antibiogram guided prescription of such changing trends.

## II. Aims and Objectives

To identify the bacterial pathogens isolated from pus samples and to determine their antimicrobial susceptibility pattern.

## III. Material And Methods

A cross-sectional study was conducted in the Department of Microbiology at RIMS Ranchi, which is a tertiary care centre for a period of six months, from January 2018 to June 2018. During this time period pus samples (n=327) were obtained from patients attending OPDs and admitted in various wards and ICUs of the hospital. Data collection included age, sex, department and a brief history of illness of the patients.

The samples were processed as per standard bacteriological techniques for aerobic cultures.<sup>6</sup> Samples were inoculated on nutrient agar, blood agar, MacConkey agar and in brain-heart infusion (BHI) broth and were incubated at 37°C for 24 to 48 hours. The isolated bacteria were identified using standard microbiological methods which included colony morphology, Gram's staining and biochemical tests.

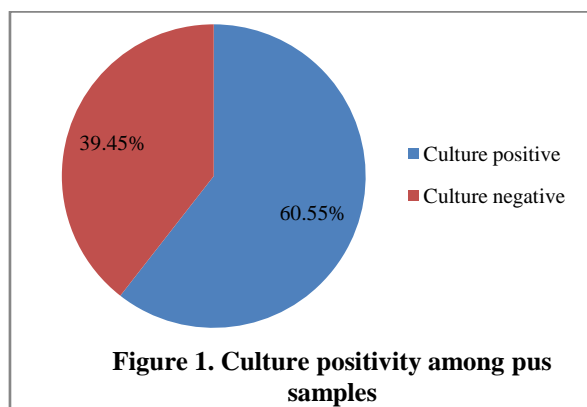
The antimicrobial susceptibility testing was done by Kirby-Bauer disk diffusion method and interpreted as per Clinical and Laboratory Standards Institute (CLSI) guidelines.<sup>7,8</sup> Standard antibiotics like erythromycin (15 µg), clindamycin (2 µg), co-trimoxazole (1.25/23.75 µg), linezolid (30 µg), tetracycline (30 µg), vancomycin(30 µg), chloramphenicol (30 µg), ciprofloxacin (5 µg), gentamicin(10 µg), ampicillin (10 µg), amikacin(30 µg), piperacillin-tazobactam (100 /10 µg), cefepime (30 µg), cefotaxime ( 30 µg ), imipenem (10 µg) and ceftazidime (30 µg ) were tested (HIMEDIA, Mumbai, India) .

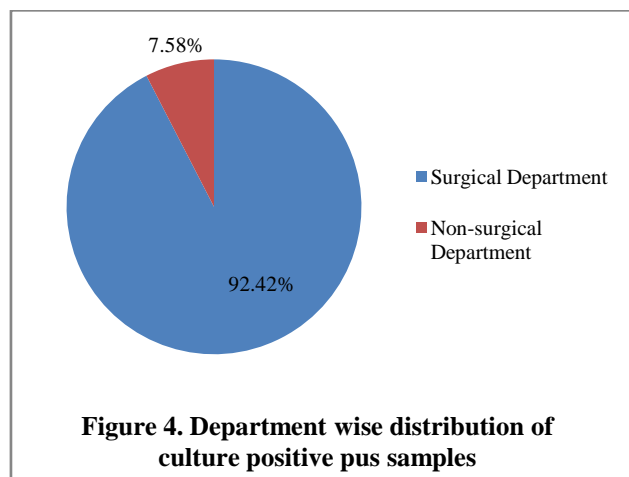
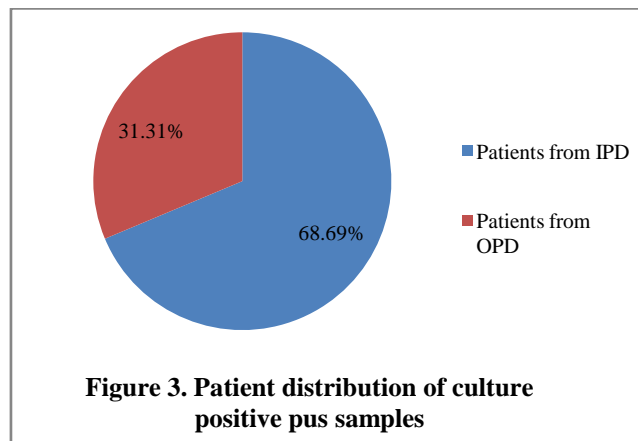
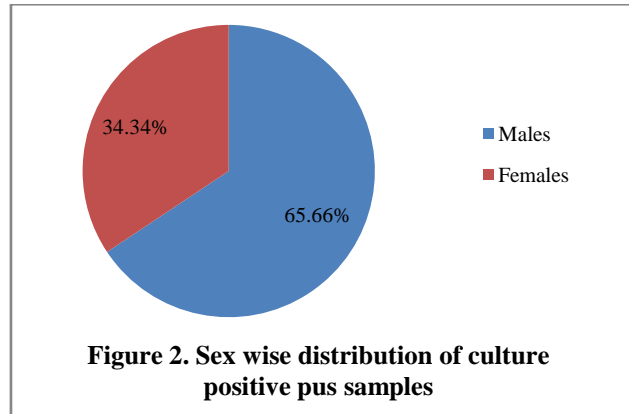
Results obtained were analyzed by counts and percentages using Microsoft Excel, 2007 version.

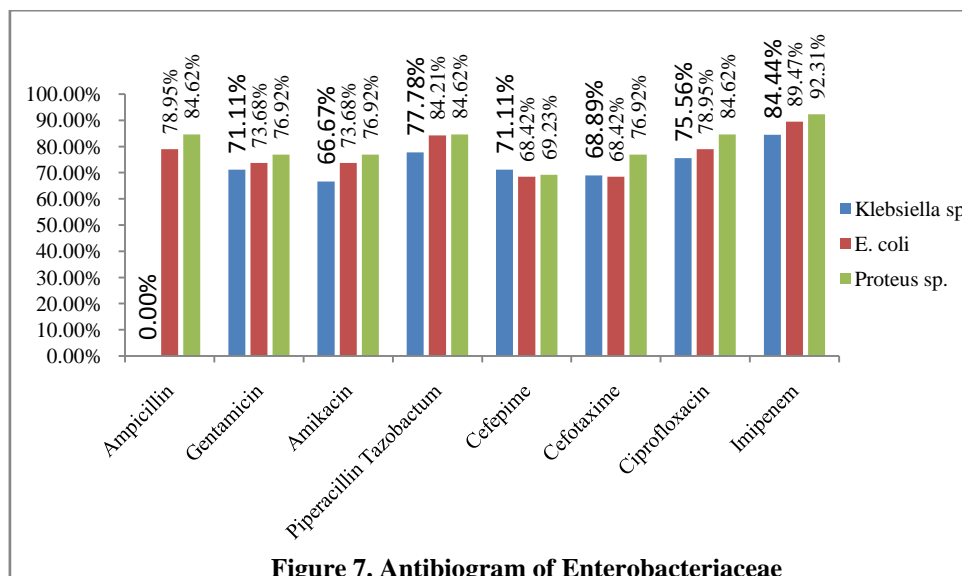
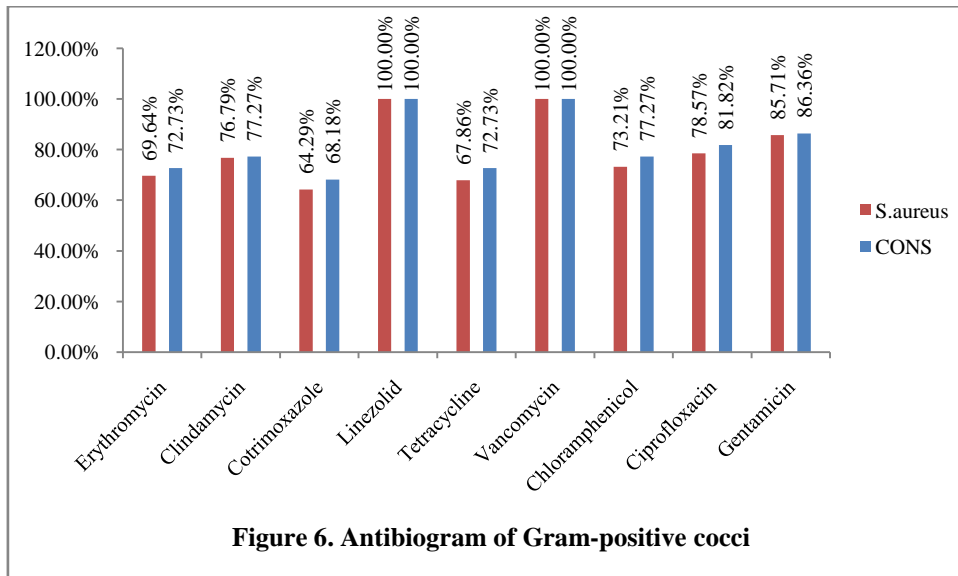
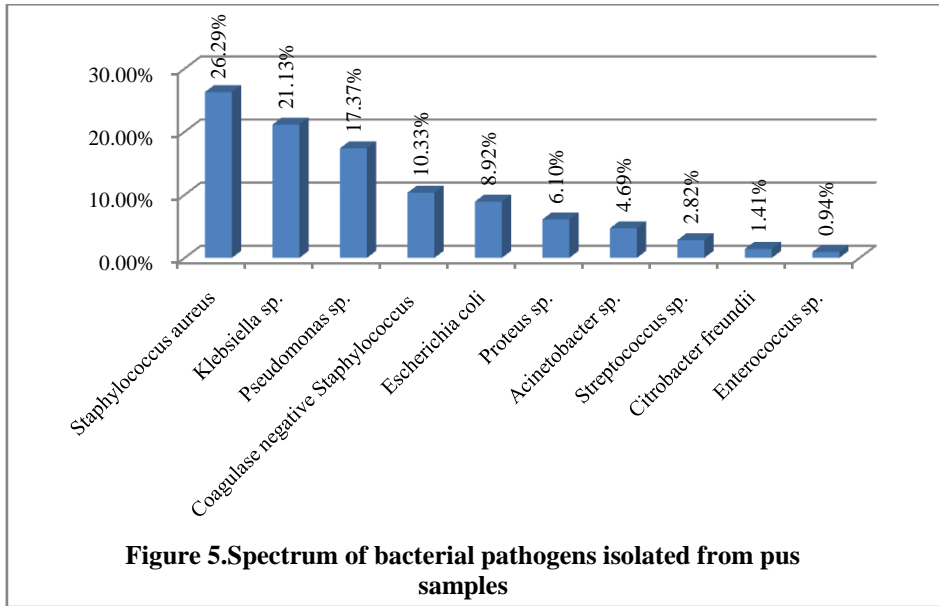
## IV. Result

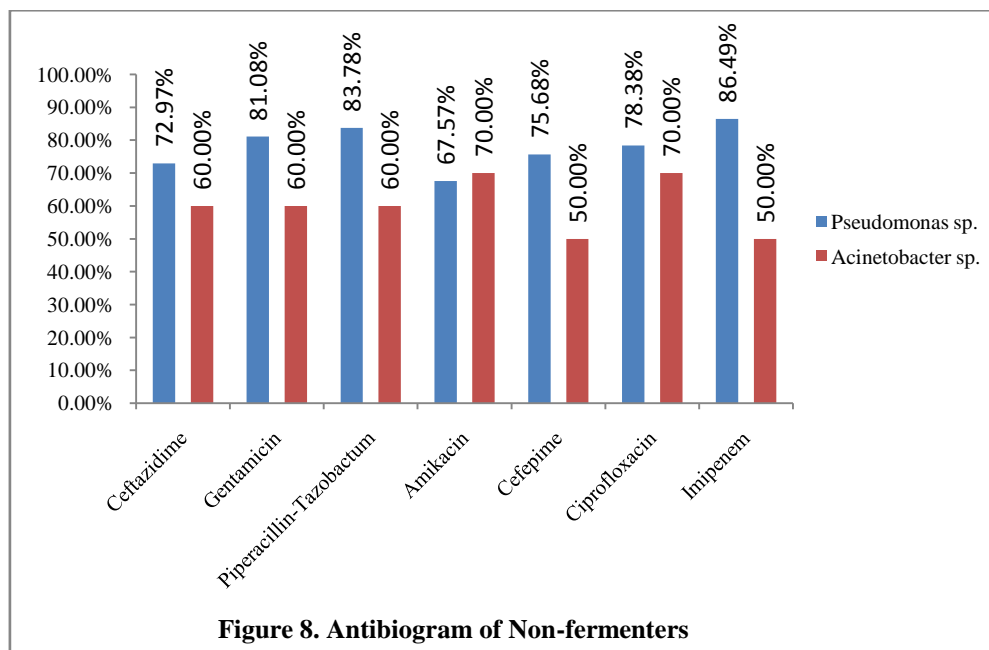
Out of 327 pus samples received, 198 (60.55%) yielded positive culture while 129 (39.45%) showed no growth ( Figure 1). Monomicrobial growth was seen in 92.42% (183/198) samples whereas 7.58% (15/198) samples yielded two pathogens. Among culture positive samples, 130 were obtained from male patients and 68 from female patients (Figure 2). Inpatient department contributed to 68.69% of culture positive samples (Figure 3). Number of culture positive samples from surgical departments was greater than those from non-surgical departments (Figure 4).

The most common pathogen isolated was *Staphylococcus aureus* (26.29%) followed by *Klebsiella* sp.(21.12%) and *Pseudomonas* sp.(17.37%) (Figure 5). Gram-positive and Gram-negative organisms isolated were 86 and 127 in number respectively. Gram-positive isolates were most susceptible to vancomycin and linezolid. Majority of Gram-negative isolates were susceptible to imipenem and piperacillin-tazobactam. The antimicrobial sensitivity patterns of Gram-positive isolates, Gram-negative isolates of *Enterobacteriaceae* family and non-fermenting isolates are depicted in Figures 6,7 and 8 respectively.









## V. Discussion

Our study showed a high culture positivity rate of 60.55% which is comparable to the study by Gill *et al.*<sup>9</sup> The male : female distribution of culture positive samples was 1.91:1 while that shown by the study by Pappu A.K. *et al.* was 1.43:1.<sup>10</sup>

The present study revealed *Staphylococcus aureus* to be the most commonly occurring pathogen in pus samples which is in agreement with the studies by Tiwari P. *et al.*<sup>11</sup> and Lee C.Y. *et al.*<sup>12</sup>; however, Agnihotri N. *et al.*<sup>13</sup> found it to be the second most common pathogen. The study by Roopa C. *et al.*<sup>14</sup> found *Escherichia coli* to be the pre-dominant isolate. There was preponderance of Gram-negative isolates (59.62%) over Gram-positive (40.38%), which was also shown by studies by Biradar A. *et al.*, Basu S. *et al.* and Mantravadi *et al.*<sup>2,15,16</sup>.

*Staphylococcus aureus* isolated showed 100% susceptibility to vancomycin and linezolid and also a good susceptibility to gentamicin(85.71%) which is similar to that found by Chauhan M. *et al.*<sup>17</sup> Good susceptibility to imipenem was seen in *Klebsiella sp.*(84.44%), *Escherichia coli*(89.47%) and *Pseudomonas sp.*(86.48%) which was in concordance with the studies by Perween *et al.* and Rao *et al.*<sup>18,19</sup>.

## VI. Conclusion

Pyogenic infections were found to be prevalent at our tertiary care hospital. They can lead to increased morbidity, prolonged hospital stay and expensive treatment. Knowledge of common pathogens and their resistance status for commonly used antibiotics is essential to guide the clinician in treating these infections.

In our study *Staphylococcus aureus* isolates showed the highest incidence and resistance to different classes of antibiotics in bacterial isolates was seen.

The emergence of multidrug resistance strains poses a challenge in treating these conditions. The antibiotic sensitivity data from such studies will help in judicious selection of antibiotics which will contribute not only in successful treatment of these conditions but will also prevent the emergence of drug resistance.

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