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Prevalence of *Klebsiella Pneumoniae*, *Pseudomonas Aeruginosa* and *Staphylococcus Aureus* Isolated from Pus & Wound Swab & their Antibiotic Resistance Pattern

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Abstract-- **Studies on pus and wound swabs frequently identify *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae* as primary pathogens, with high rates of multidrug resistance (MDR) to common antibiotics. *Staphylococcus aureus* often shows significant methicillin resistance (MRSA) or Oxacillin resistance (ORSA) while *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* exhibit high resistance to third-generation cephalosporins and, increasingly, carbapenems..**

The presence of pathogenic bacteria in the wound does not imply infection. Infection occurs when one or more than one contaminant evades the host defenses, replicating in large numbers, attacks, and harms the host tissue. Different microbial organisms can infect wounds. They are likely *Pseudomonas aeruginosa, Staphylococcus aureus, Klebsiella pneumonia.*

This study was included 220 cases of pus and swab from the out and in patients. This study was conducted in Serum Analysis Center Pvt. Ltd.; Howrah. The duration of study period of January, 2026 to March, 2026.

Result-- **In this study *Klebsiella pneumoniae* in all age group shows Resistant in Cephalosporins group, Fluoroquinolones group, Penicillin group. Highly sensitive rate of Antibiotics is Tigecycline. Colistin highly Resistant antibiotics in *Klebsiella pneumoniae* and *Pseudomonas aerugenosa* in all age group. Piperacillin/Tazobactam and Cefoperazone/Sulbactam both are good response in *Pseudomonas aerugenosa* in all age group. Cefoperazone/Sulbactam also good performance in *Klebsiella pneumoniae* in all age group. In our study in all age group approx. 48.1% Oxacillin Resistant (ORSA) *Staphylococcus aures* are found. This findings is very important for our this clinical study. Linezolid and Tigecycline both are highly sensitve in *Staphylococcus aureus* in all age group.**

This study concludes early detection and appropriate antibiotic application remain a significant priority in controlling the development and spread of multidrug resistant organisms.

Keywords-- **Pus/Wound specimen; Klebsiella pneumoniae; Pseudomonas aeruginosa; Staphylococcus aureus; Antibiogram; Resistance; ORSA.**

I. INTRODUCTION

Pus and wound infections are frequently caused by *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*, which are leading causes of nosocomial infections. These pathogens exhibit high prevalence and significant multidrug resistance (MDR), including Methicillin-resistant *Staphylococcus aureus* (MRSA)or Oxacillin -resistant *Staphylococcus aureus* (ORSA) and extended-spectrum beta-lactamase (ESBL)-producing *Klebsiella pneumoniae*. High resistance to commonly used antibiotics like cephalosporins and Fluoroquinolones group necessitates urgent surveillance and tailored antibiogram-guided therapy.

Healthcare-associated infections (HAIs) represent a critical public health concern worldwide, contributing significantly to patient morbidity, mortality, and healthcare costs [1]. Among the various pathogens responsible for HAIs, *Staphylococcus aureus* , *Klebsiella pneumoniae* and *Pseudomonas aerugenosa* stand out as predominant causative agents, particularly in intensive care units where critically ill patients are at heightened risk [2]. The emergence and proliferation of antibiotic-resistant strains of these organisms have transformed the landscape of clinical microbiology and infection management. *Staphylococcus aureus*, a gram-positive bacterium, has demonstrated remarkable adaptability in developing resistance mechanisms against various antimicrobial agents. The evolution from methicillin-sensitive *Staphylococcus aureus* (MSSA] or Oxacillin sensitive *Staphylococcus aureus* (OSSA) to methicillin-resistant *Staphylococcus aureus* (MRSA) or Oxacillin resistant *Staphylococcus aureus* (ORSA) marked a significant milestone in the history of antibiotic resistance [3]. Currently, MRSA/ORSA infections pose substantial therapeutic challenges, with some strains exhibiting resistance to multiple drug classes, including glycopeptides, lincosamides, and fluoroquinolones [4].

The organism's ability to colonize both healthcare workers and environmental surfaces creates persistent reservoirs that facilitate transmission within healthcare facilities.

Klebsiella pneumoniae, a gram-negative member of the Enterobacteriaceae family, has emerged as a formidable pathogen in hospital settings. The widespread dissemination of extended-spectrum beta-lactamase (ESBL) producing *Klebsiella pneumoniae* strains has severely limited therapeutic options for treating infections caused by this organism [5]. Furthermore, the emergence of carbapenemresistant *Klebsiella pneumoniae* (CRKP) has created scenarios where few or no effective antibiotics remain available for treatment [6]. This organism's propensity for horizontal gene transfer contributes to the rapid spread of resistance determinants among bacterial populations. The correlation between environmental contamination and clinical infections has gained increasing recognition in recent years. Healthcare environments, including medical equipment, surfaces, and the hands of healthcare workers, serve as potential reservoirs for resistant organisms [7]. Studies have demonstrated that environmental isolates often harbor similar resistance patterns to those found in clinical specimens, suggesting possible transmission pathways within healthcare facilities [8]. Understanding these correlations is essential for developing effective infection prevention and control strategies.

The intensive care unit environment presents unique challenges for infection control due to the high acuity of patients, frequent invasive procedures, and extensive use of broad-spectrum antibiotics. These factors create selective pressure that favors the survival and proliferation of resistant organisms [9]. Healthcare workers' hands, despite being recognized as the primary vehicle for pathogen transmission, continue to be implicated in the spread of multidrug-resistant organisms when proper hand hygiene practices are not consistently followed [10].

Current surveillance programs focusing on antibiotic resistance patterns provide valuable insights into the epidemiology of resistant organisms within healthcare settings. However, comprehensive studies examining the relationship between clinical isolates, environmental contamination, and healthcare worker colonization remain limited [11]. Such investigations are crucial for understanding transmission dynamics and implementing targeted interventions to reduce the burden of healthcare-associated infections.

The present study was designed to investigate the antibiotic resistance patterns of *Staphylococcus aureus* and *Klebsiella pneumoniae* isolated from various sources within a surgical intensive care unit, including clinical specimens, environmental samples, and healthcare workers' hands. By examining these correlations, we aim to provide insights that can inform evidence-based infection control practices and contribute to the development of comprehensive strategies for combating antibiotic resistance in healthcare settings.

Centers for Disease Control and Prevention (CDC) define surgical site infections (SSIs) as infections that occur at the site of incision within 30 days of any surgery. Despite of having advance techniques in surgery SSIs is become predominant reason for hospital-acquired infection, which causes mortality, Morbidity and increase in medical expenses.[12] Uncontrolled, spreading of antibacterial resistance among bacterial agents creates more challenge in clinical and surgical practice for management to treat surgical site infections. Increasing resistance in microbes directly affected the effectiveness of antimicrobials and causes worldwide problem. In developing countries, the surgical site infection and wound infection is more serious due to the irrational prescription of antibacterial agents.[13] *Pseudomonas aeruginosa* is the Gram-negative bacteria that have nearly replaced Gram-positive bacteria Staphylococcus aureus in hospital acquired infections with Gram-negative rods, which become more common in recent years. When compared to a decade long retrospective investigation *Pseudomonas aeruginosa* has an increased prevalence of wound infections. [14]

In this study is the prevalence and antibiotic resistance patterns of *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* in pus and wound swabs are to identify the predominant pathogens causing wound infections, determine their susceptibility to commonly used antibiotics, and detect multidrug-resistant (MDR) strains.

II. Materials And Methods

Study Area:

The present retrospective study was carried out in the Referral Laboratory, Serum Analysis Centre Pvt. Ltd.; 177, Netaji Subhas Road, Halder Para, Howrah-711101, West Bengal, India.

Study Period:

This study was carried out a period of Three months from January 2026 to March 2026.

Study Samples:

The inclusion criteria for this study in all patients of both sexes of outpatients of pus/ wound specimen.

Sample Processing:

The study aimed to analyze of *Klebsiella pneumoniae, Pseudomonas aerugenosa* & *Staphylococcus aureus* of pus & wound specimen for three months. These samples were transported to the microbiology laboratory following standard protocols to maintain integrity and prevent contamination ensuring prompt processing for accurate isolation and identification. Clinical specimens were streaked onto appropriate culture media such as blood agar and MacConkey agar.

The cultures were incubated aerobically at 37°C for overnight incubation. Bacterial colonies were examined for characteristic morphology, biochemical reaction and confirmed as *Staphylococcus aureus*, *Pseudomonas. aeruginosa and Staphylococcus aureus* using the VITEK2 system (bioMérieux, Marcy-l'Étoile, France). The antimicrobial susceptibility of NFGNB isolates was determined according to established guidelines using the VITEK2 system. The VITEK2 system utilizes standardized antimicrobial susceptibility panels to assess susceptibility profiles against various antibiotics through automated turbidimetric methods. Susceptibility profiles were classified as susceptible, intermediate, or resistant. Data from the VITEK2 system, including identification and antimicrobial susceptibility profiles, were exported and analyzed using Microsoft Excel.

To maintain the quality of the VITEK system, the instrument undergoes regular calibration following the manufacturer's instructions. The reagents, including microbial identification and susceptibility cards, are also routinely calibrated using control strains such as *Ps. aeruginosa ATCC 27853*, *Klebsiella pneumoniae ATCC 13883*, and *Staphylococcus aureus Staphylococcus aureus* ATCC 25923 (Oxacillin susceptible) and *Staphylococcus aureus* ATCC 43300 (Oxacillin resistant) were used as the control strains. The prevalence of multi-drug resistance among isolates was determined based on criteria for defining resistance to multiple antibiotic classes [15].

Identification Of Isolates:

The isolates were identified using colony morphology, Gram staining, Motility test, Indole test, Citrate test [Simmons Citrate Agar media], Urease test [Urease Agar media + 40% Urea], Triple Sugar Iron Agar media, ONPG [Ortho-nitrophenyl beta-D-galactopyranoside] , Oxidase test, Catalase test, coagulase test , D Nase test and ORSA /MRSA test [16, 17].

III. RESULTS

Commonly Prescribed Antibiotic Classes:

1. Children (<18 years)
2. Adults (>18-64 years)
3. Older Adults (>64 years)

TOTAL NUMBER OF SAMPLE COLLECTION: 220

Table: 1.: Distribution of Pathogens from Wound/Pus specimen:

Pathogens	Total No. of Isolates [<18 Years]	Total No. of Isolates [>18-64 Years]	Total No. of Isolates [>64 Years]
Klebsiella pneumoniae	10	48	26
Pseudomonas aerugenosa	02	16	06
Staphylococcus aureus	16	38	06

Table: 2.: Prevalence of pathogens isolated on PUS/WOUND SWAB culture:

Pathogens	<18 Years		>18-64 Years		>64 Years	
	Male	Female	Male	Female	Male	Female
Klebsiella pneumoniae	10	00	30	18	16	10
Pseudomonas aerugenosa	02	00	12	04	03	03
Staphylococcus aureus	14	02	30	08	04	02

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Table: 3. Percentage of Resistant & Susceptibility of isolated *Klebsiella pneumoniae* to tested use of antibiotics in PUS/WOUND Culture [<18 Years]:

Total Isolates: 10

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Amoxicillin/ Clavulanic Acid	06	60.0%	04	40.0%
Piperacillin+Tazobactam	06	60.0%	04	40.0%
Cefuroxime	08	80.0%	02	20.0%
Ceuroxime Axetil	09	90.0%	01	10.0%
Ceftriaxome	09	90.0%	01	10.0%
Cefoperazone/Sulbactam	02	20.0%	08	80.0%
Cefepime	08	80.0%	02	20.0%
Ertapenem	08	80.0%	02	20.0%
Imipenem	02	20.0%	08	80.0%
Meropenem	02	20.0%	08	80.0%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	01	10.0%	09	90.0%
Amikacin	02	20.0%	08	80.0%
Gentamicin	02	20.0%	08	80.0%
Colistin	09	90.0%	01	10.0%
Tigecycline	01	10.0%	09	90.0%
Ciprofloxacin	08	80.0%	02	20.0%
Fosfomycin	04	40.0%	06	60.0%

Table: 4. Percentage of Resistant & Susceptibility of isolated *Klebsiella pneumoniae* to tested use of antibiotics in PUS/WOUND Culture [>18-64 Years]:

Total Isolates: 48

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Amoxicillin/ Clavulanic Acid	42	87.5%	06	12.5%
Piperacillin+Tazobactam	34	70.8%	14	29.2%
Cefuroxime	38	79.16%	10	20.84%
Ceuroxime Axetil	36	75.00%	12	25.00%
Ceftriaxome	36	75.00%	12	25.00%
Cefoperazone/Sulbactam	26	54.10%	22	45.90%
Cefepime	26	54.10%	22	45.90%
Ertapenem	26	54.10%	22	45.90%
Imipenem	30	62.50%	18	37.50%
Meropenem	28	58.30%	20	41.70%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	22	45.90%	26	54.10%
Amikacin	26	54.10%	22	45.90%
Gentamicin	24	50.00%	24	50.00%
Colistin	30	62.50%	18	37.50%
Tigecycline	08	16.60%	40	83.40%
Ciprofloxcin	38	79.10%	10	20.90%
Fosfomycin	08	16.60%	40	83.40%

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Table: 5. Percentage of Resistant & Susceptibility of isolated *Klebsiella pneumoniae* to tested use of antibiotics in PUS/WOUND Culture [>64 Years]:

Total Isolates: 26

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Amoxicillin/ Clavulanic Acid	08	30.70%	18	69.30%
Piperacillin+Tazobactam	08	30.70%	18	69.30%
Cefuroxime	08	30.70%	18	69.30%
Ceuroxime Axetil	08	30.70%	18	69.30%
Ceftriaxome	08	30.70%	18	69.30%
Cefoperazone/Sulbactam	06	23.80%	20	76.20%
Cefepime	10	38.40%	16	61.60%
Ertapenem	10	38.40%	16	61.60%
Imipenem	08	30.70%	18	69.30%
Meropenem	04	15.40%	22	84.60%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	04	15.40%	22	84.60%
Amikacin	08	30.70%	18	69.30%
Gentamicin	04	15.40%	22	84.60%
Colistin	22	84.60%	04	84.60%
Tigecycline	01	3.84%	25	96.16%

Table: 6. Percentage of Resistant & Susceptibility of isolated *Staphylococcus aureus* to tested use of antibiotics in PUS/WOUND Culture [<18 Years]:

Total Isolates: 16

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Cefoxitin Screen	10	62.50%	06	37.50%
Benzylpenicillin	15	93.75%	01	6.25%
Oxacillin	04	25.00%	12	75.00%
Gentamicin	01	6.25%	15	93.75%
Ciprofloxacin	15	93.75%	01	6.25%
Levofloxacin	15	93.75%	01	6.25%
Inducible Clindamycin Resistance	10	62.50%	06	37.50%
Erythromycin	10	62.50%	06	37.50%
Cotrimoxazole [Trimethoprim+ Sulphamethoxale]	01	6.25%	15	93.75%
Clindamycin	06	37.50%	10	62.50%
Linezolid	01	6.25%	15	93.75%
Daptomycin	01	6.25%	15	93.75%
Teicoplanin	01	6.25%	15	93.75%
Vancomycin	01	6.25%	15	93.75%
Tetracycline	01	6.25%	15	93.75%
Tigecycline	01	6.25%	15	93.75%
Nitrofurantoin	01	6.25%	15	93.75%
Rifampicin	01	6.25%	15	93.75%

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Table: 7. Percentage of Resistant & Susceptibility of isolated *Staphylococcus aureus* to tested use of antibiotics in PUS/WOUND Culture [>18-64 Years]:

Total Isolates: 38

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Cefoxitin Screen	16	42.10%	22	57.90%
Benzylpenicillin	26	68.40%	12	31.60%
Oxacillin	20	52.60%	18	47.40%
Gentamicin	18	47.40%	20	52.60%
Ciprofloxacin	36	94.70%	02	5.30%
Levofloxacin	26	68.40%	12	31.60%
Inducible Clindamycin Resistance	20	52.60%	18	47.40%
Erythromycin	26	68.40%	12	31.60%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	08	21.10%	30	78.90%
Clindamycin	26	68.40%	12	31.60%
Linezolid	01	2.63%	37	97.37%
Daptomycin	06	15.7%	32	84.3%
Teicoplanin	04	10.5%	34	89.5%
Vancomycin	04	10.5%	34	89.5%
Tetracycline	06	15.7%	32	84.3%
Tigecycline	01	2.63%	37	97.37%
Nitrofurantoin	01	2.63%	37	97.37%
Rifampicin	01	2.63%	37	97.37%

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Table: 8. Percentage of Resistant & Susceptibility of isolated *Staphylococcus aureus* to tested use of antibiotics in PUS/WOUND Culture [>64 Years]:

Total Isolates: 06

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Cefoxitin Screen	02	33.30%	04	66.70%
Benzylpenicillin	05	83.33%%	01	16.66%
Oxacillin	04	66.70%	02	33.30%
Gentamicin	04	66.70%	02	33.30%
Ciprofloxacin	05	83.33%%	01	16.66%
Levofloxacin	02	33.30%	04	66.70%
Inducible Clindamycin Resistance	05	83.33%%	01	16.66%
Erythromycin	02	33.30%	04	66.70%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	02	33.30%	04	66.70%
Clindamycin	02	33.30%	04	66.70%
Linezolid	01	16.66%	05	83.33%
Daptomycin	01	16.66%	05	83.33%
Teicoplanin	01	16.66%	05	83.33%
Vancomycin	01	16.66%	05	83.33%
Tetracycline	02	33.30%	04	66.70%
Tigecycline	01	16.66%	05	83.33%
Nitrofurantoin	02	33.30%	04	66.70%
Rifampicin	02	33.30%	04	66.70%

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Table: 9. Percentage of Resistant & Susceptibility of isolated *Pseudomonas aerugenosa* to tested use of antibiotics in PUS/WOUND Culture [<18 Years]:

Total Isolates: 02

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	01	50.00%	01	50.00%
Ceftazidime	01	50.00%	01	50.00%
Cefoperazone+Sulbactam	01	50.00%	01	50.00%
Cefepime	01	50.00%	01	50.00%
Ciprofloxacin	01	50.00%	01	50.00%
Levofloxacin	01	50.00%	01	50.00%
Amikacin	01	50.00%	01	50.00%
Aztreonam	01	50.00%	01	50.00%
Imipenem	01	50.00%	01	50.00%
Meropenem	01	50.00%	01	50.00%
Colistin	01	50.00%	01	50.00%

Table: 10. Percentage of Resistant & Susceptibility of isolated *Pseudomonas aeruginosa* to tested use of antibiotics in PUS/WOUND Culture [>18-64 Years]:

Total Isolates: 16

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	04	25.00%	12	75.00%
Ceftazidime	04	25.00%	12	75.00%
Cefoperazone+Sulbactam	04	25.00%	12	75.00%
Cefepime	04	25.00%	12	75.00%
Ciprofloxacin	06	37.50%	10	62.50%
Levofloxacin	04	25.00%	12	75.00%
Amikacin	04	25.00%	12	75.00%
Imipenem	06	37.50%	10	62.50%
Aztreonem	12	75.00%	04	25.00%
Meropenem	04	25.00%	12	75.00%
Colistin	15	93.75%	01	6.25%
Cotrimoxazole Trimethoprim+ Sulphamethoxale]	10	62.50%	06	37.50%

Table: 11. Percentage of Resistant & Susceptibility of isolated *Pseudomonas aerugenosa* to tested use of antibiotics in PUS/WOUND Culture [>64 Years]:

Total Isolates: 06

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	02	33.30%	04	66.70%
Ceftazidime	02	33.30%	04	66.70%
Cefoperazone+Sulbactam	02	33.30%	04	66.70%
Cefepime	04	66.70%	02	33.30%
Ciprofloxacin	04	66.70%	02	33.30%
Levofloxacin	04	66.70%	02	33.30%
Amikacin	02	33.30%	04	66.70%
Imipenem	02	33.30%	04	66.70%
Aztreonam	05	83.33%	01	16.66%
Meropenem	02	33.3%	04	66.7%
Colistin	04	66.70%	02	33.30%
Gentamicin	03	50.00%	03	50.00%

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IV. DISCUSSION

Despite adherence to basic pus/wound care principles, many patients still develop infections that necessitate accurate identification of causative organisms for appropriate management. The spectrum of isolated organisms and their antimicrobial susceptibility patterns often vary between hospitals, highlighting a dynamic trend. The development and spread of antibiotic resistance can be mitigated through the judicious use of antimicrobials, stringent infection control practices, and ongoing surveillance efforts.

Surgical site infections continue to pose a significant challenge in hospital settings, particularly in surgical wards where invasive procedures and prolonged hospital stays increase the risk of infection. This high isolation rate underscores the importance of microbiological evaluation of pus samples for targeted antimicrobial therapy.

Klebsiella pneumoniae, Pseudomonas aeruginosa, and *Staphylococcus aureus* are the primary pathogens isolated from pus and wound swabs, frequently showing high resistance to common antibiotics, including amoxycillin/clavulanic acid, 3rd generation cephalosporins, and high rates of MRSA/ORSA. *Pseudomonas aeruginosa* and *Staphylococcus aureus* are often the most prevalent, with *Klebsiella pneumoniae* dominating in surgical wards.

In this study *Klebsiella pneumoniae* in all age group shows Resistant in Cephalosporins group, Fluoroquinolones group, Penicillin group. Highly sensitive rate of Antibiotics is Tigecycline. Colistin highly Resistant antibiotics in *Klebsiella pneumoniae* and *Pseudomonas aerugenosa* in all age group. Piperacillin/Tazobactam and Cefoperazone/Sulbactam both are good response in *Pseudomonas aerugenosa* in all age group. Cefoperazone/Sulbactam also good performance in *Klebsiella pneumoniae* in all age group. In our study in all age group approx. 48.1% Oxacillin Resistant (ORSA) *Staphylococcus aures* found. This findings is very important for our this clinical study. Linezolid and Tigecycline both are highly sensitve in *Staphylococcus aureus* in all age group.

This study provides the evidence of high prevalence of antibiotic resistant bacteria in pus samples of patients collected. The prevalence and antibiotics resistance patterns of pyogenic bacterial isolates usually exhibit variability according to geographic areas and climate conditions. Existence of high drug resistance to multiple antibiotics in *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa* isolates from pus samples.

In this study and several other related reports points towards negligence on patients part, incomplete treatment schedules, antibiotics misuse, self-prescription, misprescription, lack of regional antibiogram data, and limited knowledge about multidrug-resistant isolates and antimicrobial resistance among clinicians. Updated knowledge of antimicrobial susceptibility profiles of clinical isolates will not only assist in designing the most appropriate dose-regimen and treatment schedule against wound infections but also help in curbing the alarmingly expanding menace of drug resistance.

V. CONCLUSION

In conclusion, pyogenic wound infections were found prevalent in *Staphylococcus aureus*, *P.seudomonas aeruginosa*, *Klebsiella pneumonia*. Bacterial isolates exhibited high to moderate levels of resistance against different classes of antibiotics. The susceptibility data from this report may be worth consideration while implementing empiric treatment strategies for pyogenic infections. At the same time, strict health policies should also be implemented to regulate the purchase and prescription and restrict the unsupervised antibiotic use as well as continuous monitoring and reporting antibiotic resistance.

This study indicates that treatment options for resistant bacteria pathogens are notably limited. Therefore, early detection and the judicious use of appropriate antibiotics are critical for managing and preventing the emergence and spread of multidrugresistant organisms.

Studies conclude that *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* are highly prevalent in pus and wound swabs, frequently exhibiting multidrug resistance (MDR). High resistance is observed against commonly used antibiotics (e.g., amoxycillin/clavulanic acid, cephalosporins), while carbapenems, vancomycin, and linezolid often show higher efficacy.

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