

# Sensitivity Pattern of Antimicrobial from Pneumonia Patients in Tertiary Care Hospital

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## ABSTRACT

**Objective:** The purpose of this research was to identify the bacterial isolates, the patterns of antibiotic resistance exhibited by those bacteria, as well as the characteristics that are related with individuals who have community-acquired pneumonia.

**Study Design:** Cross-sectional

**Place and Duration:** This study was carried out at Hayatabad Medical Complex from Jan 2022 to April 2022

**Methods:** Total 83 patients of both gender had pneumonia were presented. Included pneumonia patients were aged between 18-80 years. After obtaining informed written consent, detailed demographic information about the cases that were recruited was recorded. This information included the participants' ages, genders, body mass indexes, educational levels, and marital statuses. Frequency of antimicrobial sensitivity, sensitivity of bacteria and blood culture examination among all cases were assessed. SPSS 22.0 was used to analyze all data.

**Results:** Among 83 patients, majority 51 (61.4%) were males and 32 (38.6%) were females. Mean age of the patients was 61.7±5.37 years and had mean BMI 25.7±12.29 kg/m<sup>2</sup>. 63 (75.9%) patients were married and 43 (51.8%) cases were educated. Pulmonary tuberculosis was the most common co-morbidity followed by heart failure, COPD, and HIV/AIDS. Among the most prevalent bacteria isolated were *Klebsiella pneumoniae*, *Acinetobacter* sp., and *Pseudomonas* sp. Ceftriaxone and other third-generation cephalosporins were frequently prescribed to patients with pneumonia.

**Conclusion:** *Klebsiella pneumoniae* predominated in sputum cultures and showed increased sensitivity to beta-lactam and aminoglycoside classes of antibiotics. Over-60 years, male gender, and tuberculosis infection were the major contributors to increased danger.

**Keywords:** Pneumonia, Bacteria, Antimicrobial Sensitivity, Comorbidities

## INTRODUCTION

The parenchyma of the lungs becomes inflamed due to an infectious agent, and this condition is known as pneumonia. In addition to being the most prevalent disease, it also causes a great deal of suffering and death among the general public. Community-acquired and hospital-acquired pneumonia are the two main types [1,2]. Community-acquired pneumonia (CAP) is defined by the Infectious Diseases Society of America (IDSA) as an acute infection of the pulmonary tissue characterised by the presence of the an acute infiltrate on chest radiograph or phenomena based findings made in accordance with pneumonia in a patient who really do not obtain it from a the health care system or within the initial 48 hours after hospitalisation [3, 4].

CAP is a leading killer and medical emergency worldwide [4,5]. In Europe, CAP is predicted to kill between 1.6 and 10.6 individuals per 1000 each year [6], whereas in Asia, it is responsible for the deaths of approximately 1,000,000 adults per year [8]. Acute respiratory distress syndrome has a death incidence of between 6percentage and 15% in adults in Africa. Approximately 4 million instances of pneumonia occur each year in Sub-Saharan Africa, leading to nearly 200,000 fatalities each year [7]. Different studies put the incidence of bacteria CAP in Ethiopia somewhere from 38.7 and 45 percent [8,9].

Study results from Northern India indicated that vibrio cholera was resistant to furazolidone, co-trimoxazole, and nalidixic acid but susceptible to tetracycline in the Delhi area, however investigations from Bangladesh showed that the same strain of vibrio cholera was resistant to tetracycline.

[10] In 1987, the concept of extended-spectrum beta-lactamase (ESBL) was introduced. It has been shown that the three -lactamase inhibitors now available in clinical settings, which can be coupled with -lactams to limit hydrolysis, are only effective against class-A -lactamases and not against classes B, C, or D. Researchers are looking at other type B inhibitors that may prove

useful in combating organisms that produce carbapenases. [11] Antibiotic policy and antibiotic rotation have been shown to improve gram-negative organism susceptibility in an ICU investigation on ventilator-associated pneumonia by Didier Gruson et al. in France. [12]

Problems with antimicrobials are a worldwide issue [13], but they are especially severe in impoverished countries due to greater illness rates and less available resources. As an example, in Pakistan, doctors at public hospitals are often required to administer antibiotics that are ineffective against a wide range of bacteria because of shortages. Multiple Pakistani studies have already indicated alarmingly high rates of antibiotic prescription (51.5–52.5%, 52.4–52.4%, 48.1–48.9%; [10–14]). However, there is a severe lack of information from Pakistan [29] on the antimicrobial prescribing trends in relation to the World Health Organization (WHO) antimicrobial usage indices. The aforementioned justifications highlight the need of introducing a continual antimicrobial consumption tracking system in hospitals utilising standard methods as part of AMR prevention programs. The World Health Organization (WHO) has created a set of markers to monitor antimicrobial prescribing and usage in healthcare settings [12-15]. Hospital, prescription, patient-care, and supplementary indicators are all types of this data.

Researchers at a tertiary care hospital's infectious disease referral centre will look at the prevalence of different etiological microorganisms for pneumonia, as well as the drugs they respond to, and the co-morbidities that often accompany pneumonia.

## MATERIAL AND METHODS

This cross-sectional study was conducted at Hayatabad Medical Complex from Jan 2022 to April 2022 and comprised of 83 patients. After obtaining informed written consent, detailed demographic information about the cases that were recruited was recorded. This information included the participants' ages,

genders, body mass indexes, educational levels, and marital statuses. Patients who lacked a sputum culture test and patients whose medical records were missing important information were not included in this study.

Included patients were aged between 18-80 years. Posteroanterior chest X-ray infiltrates or air bronchograms were used to confirm a diagnosis of pneumonia in patients exhibiting the following symptoms: cough, purulent sputum changes, fever (or a history of fever 38°C), chest pain, spasms, crackles, leukopenia (4500/l) or leukocytosis (>10,000/l), and a lack of or an increase in white blood cell count. Culture analysis and Gram staining are further tests that can be performed to confirm a diagnosis of pneumonia.

Clinical Microbiology Laboratory (CML) received sputum and endotracheal aspirate (ETA) samples for microscopical evaluation of appropriateness. Using blood agar, MacConkey agar, and biochemical reactions, we cultured and identified the organisms in accordance with CML guidelines. Mueller-Hinton agar and the conventional disc diffusion methods were used to screen for antibiotic resistance. Disk diffusion results were analysed using CLSI standards. In order to analyse and evaluate the antibiotics susceptibility data, the WHO-NET Version 5.6 software was used.

Information was revised by hand to ensure uniformity and accuracy. The information was input into EPI data version 4.6, coded, and cleaned before being transferred to SPSS version 22 for statistical analysis. The data was presented in the form of tables and figures. In order to analyse the connection between the dependent and independent variables, logistic regression models were employed. CAP risk variables were evaluated using bivariate analysis, and those having a P-value 0.2 were analysed using multivariate methods. A significance level of P0.05 was used at the 95% confidence range.

## RESULTS

Among 83 patients, majority 51 (61.4%) were males and 32 (38.6%) were females. Mean age of the patients was 61.7±5.37 years and had mean BMI 25.7±12.29 kg/m<sup>2</sup>. 63 (75.9%) patients were married and 43 (51.8%) cases were educated. Pulmonary tuberculosis was the most common co-morbidity followed by heart failure, COPD, and HIV/AIDS. (table-1)

Table-1: Information of the presented patients

Variables	Frequency	Percentage
Mean age (years)	61.7±5.37	
Mean BMI (kg/m <sup>2</sup> )	25.7±12.29	
Sex		
Female	32	38.6
Male	51	61.4
Marital Status		
Married	63	75.9
Unmarried	20	24.1
Education Status		
Educated	43	51.8
Non-educated	40	48.2
Co-morbidities		
Tuberculosis	35	42.2
Heart failure	23	27.7
COPD	18	21.7
HIV/AIDS	7	8.4

Table-2: Association of bacteria and fungi among all cases

Variables	Frequency	Percentage
Culture Examination		
Fungi	45	54.2
Bacteria	38	45.8
Type of bacteria		
Klebsiella pneumoniae	15	18.1
Acinetobacter sp.	10	12.04
Pseudomonas sp.	7	8.4
Escherichia coli	4	4.8
Enterobacter sp.	2	2.4

Frequency of fungi was 45 (54.2%). Among the most prevalent bacteria isolated were Klebsiella pneumoniae, Acinetobacter sp., Pseudomonas sp., Escherichia coli and Enterobacter sp. table-2)

Ceftriaxone and other third-generation cephalosporins were frequently prescribed to patients with pneumonia among 44 (53.01%) cases, followed by meropenem, levofloxacin and cefotaxime.(Table-3)

Table-3: Patients with pneumonia who are given antibiotics on a "empirical" basis

Variables	Frequency	Percentage
Use of Antibiotics		
Ceftriaxone	44	53.01
Meropenem	14	16.9
Levofloxacin	10	12.04
Cefotaxime	8	9.6
Ciprofloxacin	3	3.6
Cefoperazone	2	2.4
Ceftazidime	1	1.2
Cefepime	1	1.2

All three antibiotics tested showed a high degree of sensitivity against Klebsiella pneumonia: meropenem (100%), imipenem (100%), and amikacin (90%). However, amikacin (65%) and kanamycin (60%). were both more effective against Acinetobacter sp. Levofloxacin (78 percent), amikacin (66 percent), and gentamicin (65 percent) were all more effective against Pseudomonas sp. than any of the other antibiotics tested.(Figure-1)

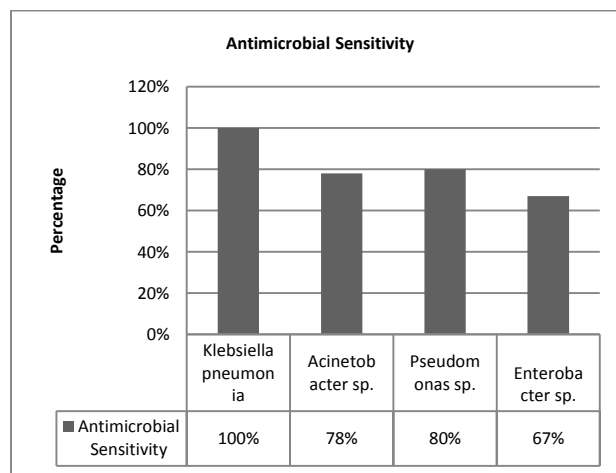


Figure-1: Sensitivity of bacteria among antibiotics

## DISCUSSION

Although "less than optimum" use of antimicrobials is a global concern, it is more severe in underdeveloped countries due to high infection rates and little resources [16,17]. This research provides policymakers with information that might be useful in their efforts to enhance antibiotic usage in chosen wards within a tertiary hospital.

In our study, pulmonary tuberculosis was the most common co-morbidity followed by heart failure, COPD, and HIV/AIDS. Out of 208 patients hospitalised with pneumonia, COPD, hypertensive, and diabetes were determined to be the most common concomitant illnesses [18]. Hospitalized pneumonia patients with COPD and diabetes mellitus were reported to have the greatest rates of concomitant illnesses [19] in an Argentine research by Luna et al. In most parts of the world, CAP is caused by a strain of bacteria called Streptococcus pneumoniae. The development of pneumococcal urine antigen has expanded the potential for etiological diagnosis. In affluent nations, the pneumococcal vaccination has contributed to a decline in the number of

pneumonia cases [20]. *Streptococcus pneumoniae*, *Streptococcus* spp., unusual pathogens, anaerobic Gram-negative pathogens, and *Pseudomonas aeruginosa* were listed as the most frequently occurring bacteria in patients with pneumonia by Luna et al. [19].

Meanwhile, *Klebsiella pneumoniae* was identified as the most prevalent bacterial species isolated from sputum samples. According to studies conducted by Rammaert et al. in Cambodia, female sex and diabetes diabetes were the most common risk factors for *Klebsiella pneumoniae* infection. One of the reasons why *Klebsiella pneumoniae* colonised people with bronchiectasis was the high incidence of TB complications in Cambodia [20]. Because of their weakened immune systems, TB patients are more likely to contract bacterial illnesses such as *Strep pneumoniae*, *Salmonella typhi*, and *Streptococcus milleri*, as reported by Samson et al. in Nigeria [21].

Researchers Boonsarngsuk et al. [22] discovered that patients with chronic *Klebsiella pneumoniae* had a productive chronic cough and, in some cases, hemoptysis. Consolidation is most prominent on a chest X-ray of a patient with chronic *Klebsiella pneumoniae* in the upper segment of the right lower lobe and the apical and posterior segments of the upper right lobe. As a result of its zonal predilection in a chronic course, it is sometimes misdiagnosed as pulmonary tuberculosis [22]. The research revealed two cases of persistent *K. pneumoniae* that were misdiagnosed as pulmonary tuberculosis. In light of the fact that many instances of *K. pneumoniae* were misdiagnosed as pulmonary TB, it is crucial for doctors to recognise this comparable clinical disease. The beta-lactam group medicines (meropenem and imipenem) and the aminoglycoside group medicines (amoxicillin, erythromycin, and tetracycline) were the most effective against *Klebsiella pneumoniae* in this referral hospital (amikacin). The prior healthcare institutions' irresponsible use of antibiotics, which led to antibiotic resistance [23], was largely to blame. In order to lessen the severity of the illness and the number of people who die from it, it is best to provide antibiotics early on in the course of treatment based on the sensitivity pattern.[24]

## CONCLUSION

*Klebsiella pneumoniae* predominated in sputum cultures and showed increased sensitivity to beta-lactam and aminoglycoside classes of antibiotics. Over-60 years, male gender, and tuberculosis infection were the major contributors to increased danger.

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