ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 17, Issue 7, 2024

Online - 2455-3891
Print - 0974-2441

Research Article

CLINICAL AND MICROBIOLOGICAL PROFILE OF PATIENTS ADMITTED WITH PNEUMONIA PRESENTING TO A TERTIARY CARE HOSPITAL IN SOUTHERN RAJASTHAN

AMIT SATISH GUPTA[1]*, HARSH SHARMA[2], VIDUSHI MEEL[2]

[1]Department of Pulmonary Medicine, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India. [2]Department of Respiratory Medicine, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India.
***Corresponding author: Amit Satish Gupta; Email: amitgupta2486@gmail.com**

Received: 04 May 2024, Revised and Accepted: 18 June 2024

ABSTRACT

Objective: Pneumonia is a leading cause of morbidity and mortality in India. This study was conducted to understand the clinical and microbiological profile of pneumonia patients presenting to our hospital and also to understand the resistance pattern among them.

Methods: It was a retrospective observational study. The duration of the study was 6 months (June 2023–December 2023). All patients admitted with a diagnosis of pneumonia (community-acquired pneumonia [CAP], hospital-acquired pneumonia [HAP], and ventilator-associated pneumonia [VAP]) were included in the study, and data were collected from previous medical records. Only those patients with pneumonia whose sputum or bronchoalveolar lavage culture was positive for an organism were included in the study.

Results: A total of 50 patients with pneumonia were included in the study. The majority of the patients were males (72%), with an average age of 62. CAP was diagnosed in 21 patients, HAP in 15 patients, and VAP in 14 patients. The most common organism isolated was *Klebsiella pneumoniae* (36%), followed by *Acinetobacter baumannii* (24%), *Pseudomonas aeruginosa* (16%), *Escherichia coli* (10%), and others (14%). Organisms isolated from HAP and VAP showed a higher prevalence of carbapenem resistance than those isolated from CAP patients.

Conclusion: *K. pneumoniae* was the most common organism isolated in CAP, HAP, and VAP patients in our study. The resistance pattern of *K. pneumoniae* showed a higher prevalence of carbapenem resistance in HAP and VAP patients as compared to CAP patients.

Keywords: Pneumonia, Hospital-acquired pneumonia, Ventilator-associated pneumonia, *Klebsiella pneumoniae.*

 DOI: http://dx.doi.org/10.22159/ajpcr.2024v17i7.51786. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

Community-acquired pneumonia (CAP) remains a common and serious illness despite the availability of potent new antimicrobials and effective vaccines. In the United States, pneumonia is the sixth leading cause of death from infectious diseases [1,2]. The mortality rate of pneumonia patients in outpatient settings is low, in the range of 1–5%, but among patients who require admissions to the intensive care unit, it approaches 25% [3-6]. The bacteriological profile of CAP patients is different in different countries and changing with time within the same country, probably due to frequent use of antibiotics, changes in environmental pollution, increased awareness of the disease, and changes in life expectancy. For example, *Streptococcus pneumonia*e remains the most common organism leading to CAP in most parts of Europe, the United States, the UK, and Iraq [7-10], whereas *Klebsiella pneumoniae* was the most common organism in a study from Singapore [11]. In India also, the bacteriological profile of pneumonia patients differs as per different geographic regions. This study was conducted to understand the bacteriological profile of pneumonia patients presenting to our tertiary care hospital in southern Rajasthan.

METHODS

This was a retrospective observational study conducted in a tertiary care hospital in southern Rajasthan. The duration of the study period was 6 months (June 2023–December 2023). All patients admitted with pneumonia were included in the study including patients admitted with CAP as well as patients who developed hospital-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP) at the time of admission to the hospital. All patients with diagnosis other than pneumonia were excluded from the study. The data were collected from medical records including sputum and bronchoalveolar lavage culture reports with antibiotic resistance patterns. Patients with no culture reports or negative culture reports were excluded from this study.

RESULTS

Fifty patients who were hospitalized with pneumonia were included in this study. The majority of patients were males (n=36, 72%), with an average age of 62 years. Patients admitted with CAP were 21, HAP were 15, and VAP were 14. The most common organism isolated was *K. pneumoniae* (n=18), followed by *Acinetobacter baumannii* (n=12), *Pseudomonas aeruginosa* (n=8), *Escherichia coli* (n=5), *Staphylococcus aureus* (n=2), methicillin-resistant *Staphylococcus aureus* (MRSA) (n=1), *Burkholderia* (n=1), COVID-19 (n=1), and swine flu H1N1 (n=2). *Klebsiella* was the most common organism isolated in patients with CAP (n=8) and also among HAP (n=5) and VAP (n=5) in our hospital (Fig. 1). *Klebsiella* isolated among HAP and VAP was more drug-resistant isolate as compared to the one isolated among CAP patients (Fig. 2). HAP and VAP showed more prevalence of carbapenem resistance as compared to the one isolated from community acquired pneumonia (CAP). Most of the patients who were having HAP/VAP had higher oxygen requirement and mortality rate as compared to CAP patients.

DISCUSSION

Out of 50 patients with pneumonia included in this study, 21 patients were of CAP, 15 patients had HAP, and 14 patients had VAP. Most of the patients were males and were of the elderly age group, with an average age of 62 years. Most of the patients had multiple comorbidities, the most common of which were smoking (55%), chronic obstructive pulmonary disease (COPD) (32%), hypertension (15%), and diabetes

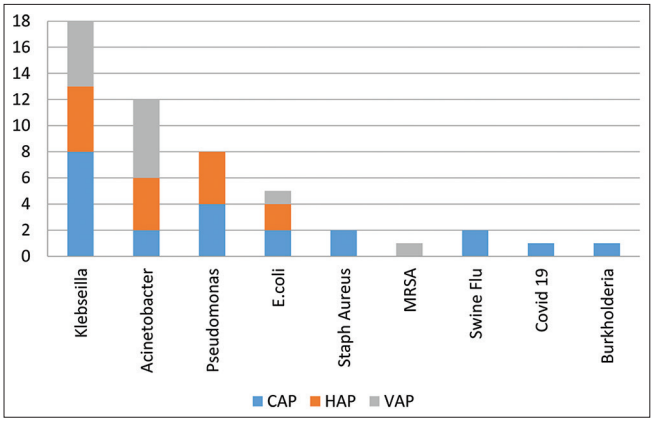

Fig. 1: Microbiological profile of patients admitted with pneumonia

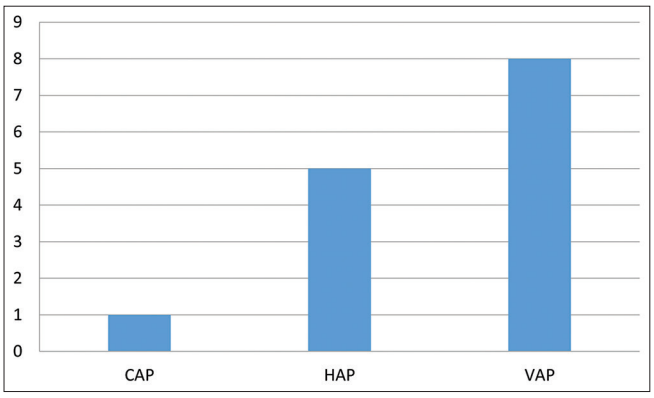

Fig. 2: Carbapenem-resistant *Klebsiella pneumoniae* in all three categories of pneumonia

(13%). In this study, *K. pneumoniae* (36%) was the most common organism isolated in sputum culture reports of CAP patients and also among HAP and VAP. Gram-negative bacteria were the most common organisms causing pneumonia in our study, followed by few cases of Gram-positive bacteria such as *S. aureus* and few viral causes such as COVID-19 and H1N1. This study highlights that in our region, Gram-negative bacteria play an important role in causing pneumonia even at a community level. A similar study conducted in Singapore also reported *K. pneumoniae* as the most common organism causing CAP [11]. It has been reported that old age, smoking, and COPD impair pulmonary defenses and predispose to CAP caused by Gram-negative bacteria [12,13]. Recent studies conducted in the last two decades have also shown a higher incidence of Gram-negative organisms causing culture-positive pneumonia [14-16]. *Klebsiella* was also the most common organism isolated in HAP as well as VAP, but it showed more antibiotic resistance as compared to CAP. Fig. 2 depicts a higher incidence of carbapenem-resistant *Klebsiella* in HAP and VAP as compared to CAP. A recent study conducted by Ramadan *et al.* [17] and Bush [18] also showed a higher incidence of carbapenem resistance among *K. pneumoniae* isolates of HAP and VAP patients. Other organisms isolated were *A. baumannii* (24%), *Pseudomonas* (16%), *E. coli* (10%), *S. aureus* (4%), MRSA (2%), *Burkholderia* (2%), COVID-19 (2%), and swine flu (H1N1) (4%). Those bacteria which were carbapenem resistant on culture usually showed *in vitro* sensitivity to colistin, minocycline, and tigecycline on culture. We had a higher proportion of patients with HAP and VAP as our hospital being a tertiary referral center received more complicated pneumonia cases who had already been treated outside and not improving. This may be the reason for the higher percentage of resistant *Klebsiella* isolates found in our study.

CONCLUSION

This study showed that *K. pneumoniae* was the most common organism isolated in CAP as well as HAP and VAP patients. There is a rising incidence of Gram-negative bacteria causing CAP, especially in developing countries possibly due to the overuse of antibiotics which is alarming. Gram-negative organisms isolated from HAP and VAP showed higher carbapenem resistance.

Institutional Ethical Committee clearance was taken before starting this study.

CONFLICT OF INTEREST

Nil.

AUTHORS FUNDING

Nil.

REFERENCES

1. Garibaldi RA. Epidemiology of community-acquired respiratory tract infections in adults. Incidence, etiology, and impact. Am J Med. 1985;78(6B):32-7. doi: 10.1016/0002-9343(85)90361-4, PMID: 4014285
2. United States Department of Commerce, Bureau of the Census. Statistical Abstract of United States. 104th ed. Washington, DC: USGPO; 1984.
3. Fang GD, Fine M, Orloff J, Arisumi D, Yu VL, Kapoor W, *et al*. New and emerging etiologies for community-acquired pneumonia with implications for therapy. A prospective multicenter study of 359 cases. Medicine (Baltimore). 1990;69(5):307-16. doi: 10.1097/00005792-199009000-00004, PMID: 2205784
4. Marrie TJ, Durrant H, Yastes L. Community-acquired pneumonia requiring hospitalization: 5-year prospective study. Rev Infect Dis. 1989;11(4):586-99. doi: 10.1093/clinids/11.4.586, PMID: 2772465
5. Torres A, Serra-Batlles J, Ferrer A, Jimeénez P, Cellis R, Cobo E, *et al*. Severe community-acquired pneumonia. Epidemiology and prognostic factors. Am Rev Respir Dis. 1991;144(2):312-8. doi: 10.1164/ajrccm/144.2.312, PMID: 1859053
6. Panchon J, Parrados MD, Capote F, Cuellao JA, Garnacho J, Veerano A. Severe community-acquired pneumonia. Etiology, prognosis, and treatment. Am Rev Respir Dis. 1990;142(2):369-73. doi: 10.1164/ajrccm/142.2.369, PMID: 2382902
7. Lode HM. Managing community-acquired pneumonia: A European perspective. Respir Med. 2007;101(9):1864-73. doi: 10.1016/j.rmed.2007.04.008, PMID: 17548187
8. Bartlett JG, Mundy LM. Community-acquired pneumonia. N Engl J Med. 1995;333(24):1618-24. doi: 10.1056/NEJM199512143332408, PMID: 7477199
9. Howard LS, Sillis M, Pasteur MC, Kamath AV, Harrison BD. Microbiological profile of community-acquired pneumonia in adults over the last 20 years. J Infect. 2005;50:107-13.
10. Al-Ghizawi GJ, Al-Sulami AA, Al-Taher SS. Profile of community- and hospital-acquired pneumonia cases admitted to Basra General Hospital, Iraq. East Mediterr Health J. 2007;13(2):230-42. PMID: 17684843
11. Lee KH, Hui KP, Tan WC, Lim TK. Severe community-acquired pneumonia in Singapore. Singapore Med J. 1996;37(4):374-7. PMID: 8993135
12. Shah BA, Singh G, Naik MA, Dhobi GN. Bacteriological and clinical profile of community acquired pneumonia in hospitalized patients. Lung India. 2010 Apr;27(2):54-7. doi: 10.4103/0970-2113.63606, PMID: 20616935
13. Ojuawo OB, Desalu OO, Fawibe AE, Ojuawo AB, Aladesanmi AO, Opeyemi CM, *et al.* Clinical and microbiological profile of adult inpatients with community acquired pneumonia in Ilorin, North Central, Nigeria. Afr Health Sci. 2020 Dec;20(4):1655-68. doi: 10.4314/ahs.v20i4.18, PMID: 34394226
14. Ailani RK, Agastya G, Ailani RK, Mukunda BN, Shekhar R. Doxycycline is a cost-effective therapy for hospitalized patients with community-acquired pneumonia. Arch Intern Med. 1999;159(3):266-70. doi: 10.1001/archinte.159.3.266, PMID: 9989538
15. Almirall J, Moratoó I, Riera F, Verdaguer A, Priu R, Coll P, *et al*. Incidence of community-acquired pneumonia and *Chlamydia*

pneumoniae infection: A prospective multicentre study. Eur Respir J. 1993;6(1):14-8. PMID: 7710453

16. Amsden GW. Pneumococcal macrolide resistance--Myth or reality? J Antimicrob Chemother. 1999;44(1):1-6. doi: 10.1093/jac/44.1.1, PMID: 10459803
17. Ramadan RA, Bedawy AM, Negm EM, Hassan TH, Ibrahim DA, ElSheikh SM, *et al*. Carbapenem-resistant *Klebsiella pneumoniae* among patients with ventilator-associated pneumonia: Evaluation of antibiotic combinations and susceptibility to new antibiotics. Infect Drug Resist. 2022 Jul 6;15:3537-48. doi: 10.2147/IDR.S371248, PMID: 35833009
18. Bush K. Alarming β-lactamase-mediated resistance in multidrug-resistant *Enterobacteriaceae*. Curr Opin Mirobiol. 2010;13(5):558-64. doi: 10.1016/j.mib.2010.09.006, PMID: 20920882