

A CASE OF COMMUNITY-ACQUIRED PNEUMONIA CAUSED BY *ENTEROBACTER CLOACAE* IN AN ELDERLY PATIENT WITH UNCONTROLLED HYPERTENSION AND HYPOKALEMIA

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Abstract

Enterobacter cloacae is a bacterium frequently found in nature and can act as a pathogen causing food borne illnesses. This report presents a case of community-acquired pneumonia (CAP) with sputum culture results identifying *E. cloacae*. The case involved an elderly patient with hypertension as a comorbidity and hypokalemia upon hospital admission. The patient improved following intravenous potassium supplementation, later transitioned to oral administration, in conjunction with antibiotic therapy. Clinicians are advised to remain vigilant and conduct thorough monitoring, as CAP caused by *E. cloacae* may result in deteriorating conditions, particularly in elderly patients with existing comorbidities.

Keywords: Elderly, Hypertension, Hypokalemia, Pneumonia

List of Abbreviations: Community-acquired Pneumonia (CAP), White Blood Cell (WBC), Prothrombin Time (PT), Electrocardiogram (ECG), Polymorphonuclear (PMN), Antibiotic Susceptibility Test (AST), World Health Organization (WHO), Becton Dickinson (BD).

Introduction

Community-acquired pneumonia (CAP) is an infectious disease characterized by inflammation of the lungs, commonly caused by pathogens such as bacteria, viruses, or fungi. CAP is the leading infectious disease globally, with high prevalence among children and the elderly (Tran *et al.*, 2022). The most common causative agent in both European and developing countries is *Streptococcus pneumoniae* (Osman *et al.*, 2021). Additionally, Gram-negative bacteria are the frequent causes of CAP in the elderly patients and are associated with high mortality rates (Osman *et al.*, 2021).

Enterobacter cloacae is a Gram-negative, facultatively anaerobic bacterium commonly found in the environment. It exists as a commensal organism in the human digestive system but can cause respiratory tract infections (Motiwala *et al.*, 2022). *E. cloacae* is classified among the ESKAPE pathogens, which are notorious for their ability to evade the biocidal effects of antibiotics (Motiwala *et al.*, 2022).

The causative pathogens of CAP are often difficult to identify in elderly patients due to reduced sputum production and the widespread use of broad-spectrum antibiotic. (Osman *et al.*, 2021). Furthermore, comorbidities and clinical conditions such as hypokalemia influence disease prognosis. Hypertension is the second most common comorbidity observed (Ghia and Rambhad, 2022). This report presents a case of CAP caused by *E. cloacae* in an elderly patient with uncontrolled hypertension and hypokalemia.

Case Report

A 68-year-old male presented with a one-week history of productive cough with mucopurulent white sputum, dyspnea, nausea accompanied by vomiting, generalised weakness, but no fever. His past medical history included hypertension, managed irregularly with amlodipine. He denied any prior history of surgery. Upon admission, the patient's vital signs were as follows: body temperature 36.3°C, blood pressure 190/100 mmHg,

heart rate 96 beats per minute, respiratory rate 22 breaths per minute, and oxygen saturation 98% on room air. Physical examination revealed no abnormalities; breath sounds were vesicular in both lung fields, with no rhonchi or wheezing. Laboratory results at admission showed a white blood cell (WBC) count of 19,580 cells/ μ L with 76.0% neutrophils and 12.1% lymphocytes, a prothrombin time (PT) of 17.9 seconds, a potassium level of 2.90 mmol/L, and a glucose level of 211 mg/dL.

Chest X-ray findings (**Figure 1**) suggestive of pneumonia, along with evidence of cardiomegaly. An electrocardiogram (ECG) was also performed (**Figure 2**), consistent with hypertensive heart disease or chronic cardiac remodelling due to long-standing hypertension.

Sputum samples for culture were collected on the first day of hospitalization, and broad-spectrum antibiotic therapy with ceftriaxone was initiated. The sputum culture identified *Enterobacter cloacae*. The isolate was sensitive to amikacin, gentamicin, aztreonam, piperacillin, piperacillin-tazobactam, ceftazidime, ceftriaxone, cefotaxime, cefepime, chloramphenicol, levofloxacin, moxifloxacin, meropenem, imipenem, and trimethoprim-sulfamethoxazole. Serial complete blood count tests were conducted on the third and seventh days of hospitalization. The WBC count decreased from 15,610 cells/ μ L on day three to 9,750 cells/ μ L on day seven. Ceftriaxone treatment was continued until the patient was discharged.

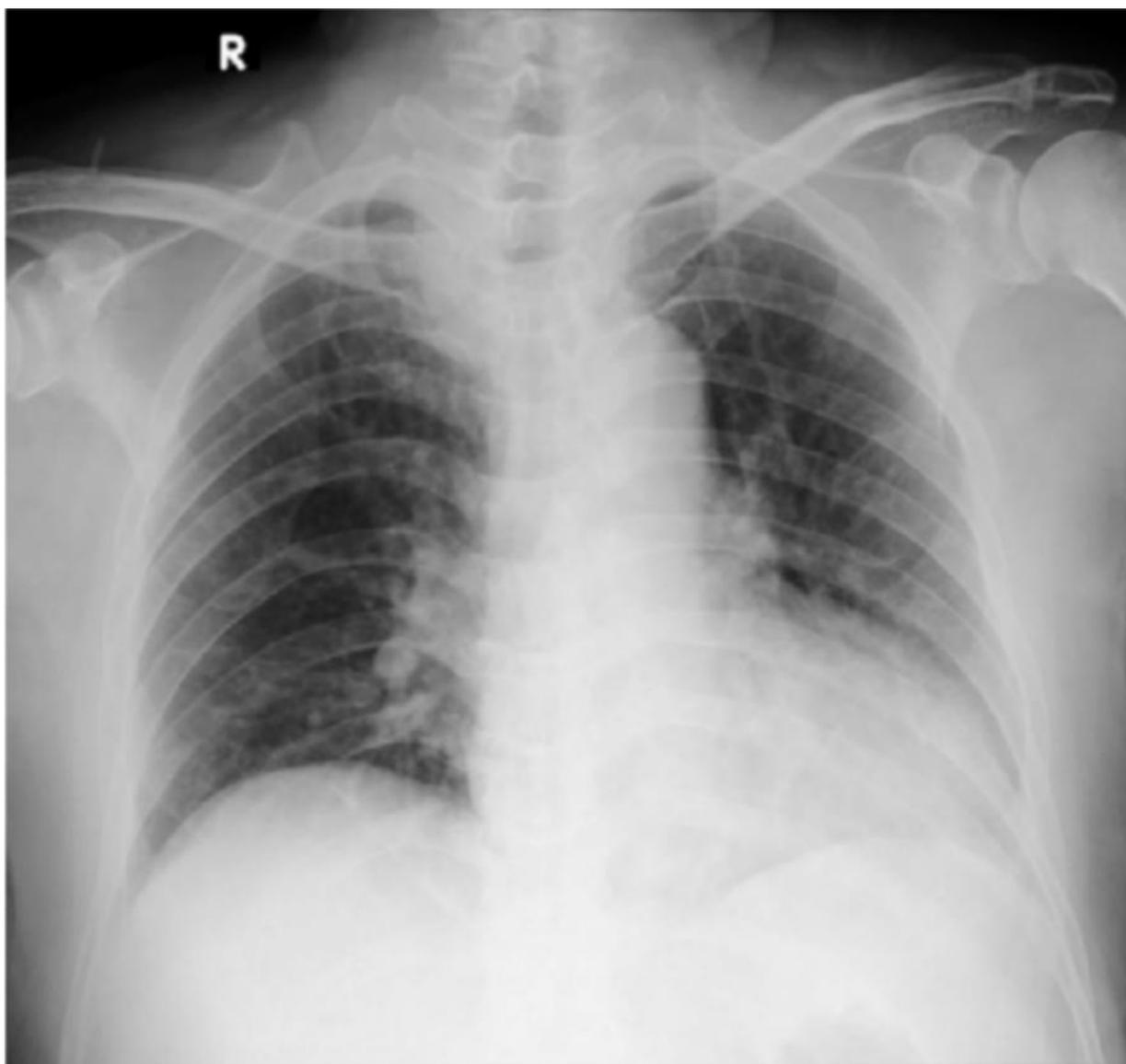


Figure 1: Chest X-Ray revealed a reticular pattern in the right and left parahilar areas at the bases of both.

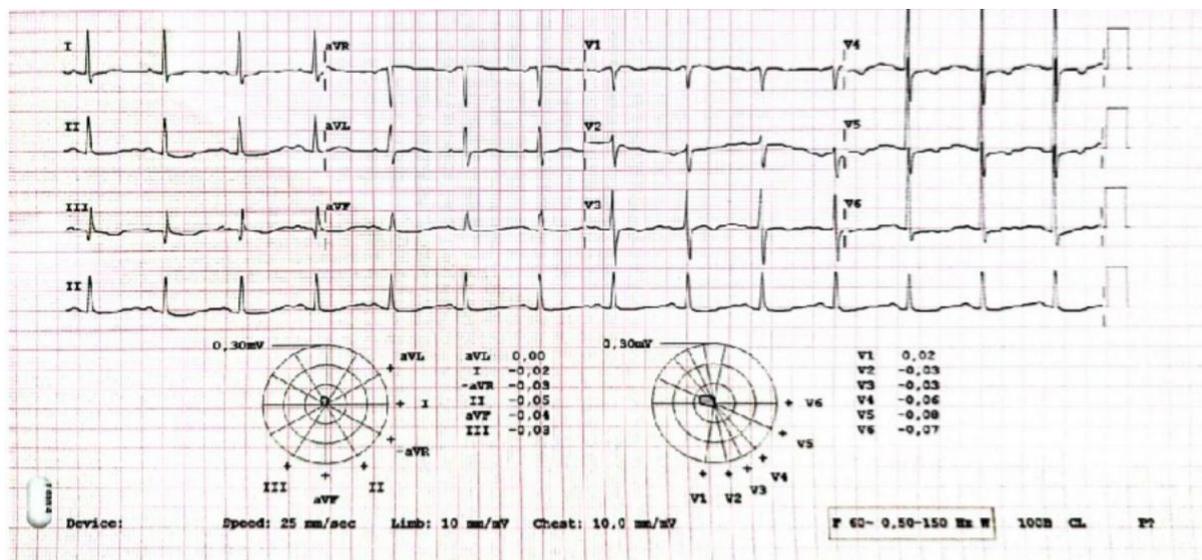


Figure 2: ECG Result's showing sinus rhythm with left ventricular hypertrophy and T-wave abnormalities.

The patient also received additional therapies during hospitalization, including intravenous metoclopramide, oral lansoprazole, and sucralfate syrup to manage nausea and vomiting. Potassium supplement tablets and intravenous fluids containing 1.5 grams of potassium chloride were administered to correct hypokalaemia. Potassium levels were monitored on the third and seventh days. The level increased from 2.90 mmol/L at admission to 3.1 mmol/L on the third day and 3.6 mmol/L on the seventh day. Nutritional intake was maintained at 1900 kcal/day with a low-fat, low-purine diet. Oral candesartan and nifedipine were prescribed for hypertension management. By the seventh day of hospitalization, the patient showed clinical improvement and was discharged.

Ethical consideration

Ethical approval to report this case was obtained from Institutional Review Board of Dr. Soetomo General Academic Hospital (Ethical Clearance No. 3272/121/4/X/2024).

Discussion

According to the World Health Organization (WHO), an individual is considered elderly if he/she is over 65 years old, while the United Nations defines elderly individuals as those aged 60 years or older (Çolak and Çakmakliogullari, 2021; Ghia and Rambhad, 2022). Advanced age can trigger and increase the risk of various health problems, including pneumonia. Ghia *et al.* (2022) reviewed 14 studies involving 1,500 samples and reported that individuals over 50 years of age have a 55.8% increased risk of developing community-acquired pneumonia (CAP) (Ghia and Rambhad, 2022). Co-morbid conditions in the elderly, such as hypertension, also contribute to the occurrence of CAP. In another study, it was found that patients with hypertension have a 23.7% increased risk of developing CAP (Tran *et al.*, 2022).

The purpose of sputum sampling is to identify the causative pathogen, and the collection is typically performed in the emergency room. The sample is then evaluated for its suitability for culture. According to the Murray and Washington scoring system, a sample is considered of good quality if it contains more than 25 white blood cells (WBCs) per 10 epithelial cells (Gadsby and Musher, 2022). In this patient's sputum sample, polymorphonuclear (PMN) cells were graded as 2+, indicating the presence of 10–25 WBCs per low-power field (LPF), and epithelial cells were graded as 1+, indicating 1–9 epithelial cells per LPF. Based on this scoring system, the sample was deemed suitable for culture.

Following sputum culture, the next step was pathogen identification and antibiotic susceptibility testing (AST). The BD Phoenix™ Automated Identification and Susceptibility system (BD, Canada) was used for this purpose. The pathogen identified was *Enterobacter cloacae* complex. *E. cloacae* is a rare cause of community-acquired pneumonia, with *Streptococcus pneumoniae* being the most common causative bacterium. A study by Tran *et al.* (2022) found that *E. cloacae* accounted for 12.3% of the Enterobacteriaceae group based on sputum culture results (Tran *et al.*, 2022). Isolating *E. cloacae* from sputum samples is also challenging. A study conducted by Çolak *et al.* (2021) reported that only 2 out of 46 sputum samples with isolated pathogens were identified as containing *E. cloacae*, highlighting the difficulty and rarity of detecting this organism in sputum culture (Çolak and Çakmakliogullari, 2021).

The AST results indicated that *E. cloacae* was sensitive to several antibiotics, including amikacin, gentamicin, aztreonam, piperacillin, piperacillin-tazobactam, ceftazidime, ceftriaxone, cefotaxime, cefepime, chloramphenicol, levofloxacin, moxifloxacin, meropenem, imipenem, and trimethoprim-sulfamethoxazole. It showed resistance to amoxicillin/clavulanic acid, ampicillin, ampicillin-sulbactam, and cephazolin. According to CLSI guidelines, this resistance profile is consistent with the wild-type *E. cloacae* (CLSI, 2025). Ceftriaxone, a Tier 1 antibiotic recommended by the CLSI (CLSI, 2025), was used and continued until the seventh day of the patient's hospitalization.

Identifying the etiology of hypokalaemia in patients with CAP can be challenging. The most significant contributing factor is often inadequate nutritional intake. The patient's frequent nausea and vomiting during illness

may have impaired nutrient absorption. A study by Ravioli *et al.* (2020) noted that a general decline in health status can lead to reduced nutritional intake, which may subsequently result in hypokalaemia (Ravioli *et al.*, 2021).

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Declaration of Conflicting Interests

The author(s) declared there is no conflicts of interest associated with this study.

Informed consent statement

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

Consent for Publication

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