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Addressing first encountered community acquired ceftriaxone-intermediate *Streptococcus pneumoniae* in Hospital Taiping: A case report.

Muhammad Amirul Faris Zulkafli[1], Zarifah Zam, Anis Roziana Mohmad, Shazwani Zakaria, Mohd Rohaizad Mohd Rodzi, Norliza Abu Bakar
[1]Microbiology Unit, Pathology Department, Hospital Taiping, Perak

INTRODUCTION

Community-acquired pneumonia (CAP) is a significant public health concern, with *Streptococcus pneumoniae* being the most common causative agent.[1,4] *S. pneumoniae* is a gram positive diplococci in chain that typically colonizes in the respiratory tract and can lead to wide range spectrum of infections including pneumonia, otitis media to invasive diseases such as meningitis and sepsis.[4] Although ceftriaxone is commonly used to treat these infections, emergence of non-susceptible ceftriaxone *S.pneumoniae* strains presents a challenge for healthcare providers. Here, we present a case of patient who developed community-acquired pneumonia with bronchospasm due to ceftriaxone-intermediate *S. pneumoniae* isolate.

CASE REPORT

- A 45-year-old male with underlying schizophrenia presented to the emergency department with a 3-day history of fever, cough, and shortness of breath. The patient reported no recent travel, sick contacts, or antibiotic use in the preceding 3 months.
- Physical examination revealed tachypnea, rhonchi on auscultation, and oxygen saturation of 92% on room air. Initial laboratory testing showed arterial blood gases indicating type 1 respiratory failure and a chest X-ray confirming left lower lobe consolidation suggestive of pneumonia (Figure 1). The patient was started on supplementary oxygen via facemask and empirically started on intravenous amoxicillin/clavulanic acid.
- On the third day of hospitalization, sputum culture revealed gram positive cocci in chain colonies (Figure 2 and 3) which further identified as *S. pneumoniae* by Matrix-Assisted Laser Desorption Ionization Time-Of-Flight mass spectrometry (MALDI-TOF).
- The Epsilometer-test (E-Test) was carried out to determine the minimum inhibitory concentrations (MIC) of ceftriaxone (Figure 4), revealing an in vitro intermediate result of 1.5 µg/ml. Repeated MIC of ceftriaxone was reconfirmed by Institute Medical Research (IMR) which concordant with the previous MIC result. Serotyping of *S.pneumoniae* was identified as serotype 19C.
- Patient was completed IV amoxicillin/clavulanic acid for 5 days and resolution of symptoms and full recovery.

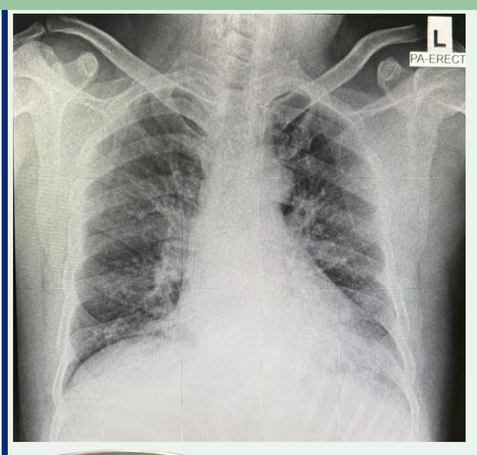

Figure 1: Chest X-ray showed Left lower lobe opacity with obscured left cardiac border

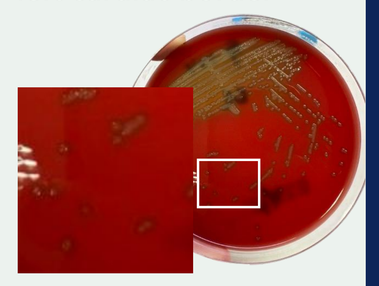

Figure 2: alpha lysis colonies on blood agar

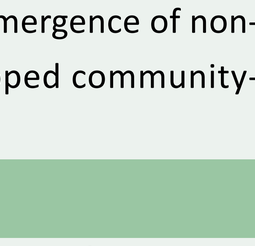

Figure 3: Gram positive diplococci

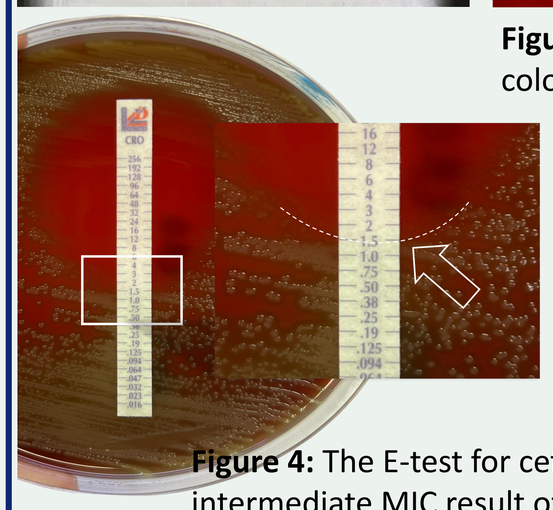

Figure 4: The E-test for ceftriaxone showed an intermediate MIC result of 1.5 µg/ml (arrow)

DISCUSSION

- The global prevalence of ceftriaxone-resistant *Streptococcus pneumoniae* highlights the urgent issue of antibiotic resistance. In Asia, resistance rates reached 20% in 2018-2019.[1] Malaysia's National Surveillance Antibiotic Resistant (NSAR) program reported a rise in ceftriaxone resistance from 0.4% in 2020 to 1.3% in 2022.[2]
- The Clinical and Laboratory Standards Institute (CLSI) has different interpretive criteria for ceftriaxone depending on whether the infection is meningitis or non-meningitis. For non-meningitis infections, susceptibility breakpoints are defined as ≤ 1.0 µg/mL for susceptible (S), 2.0 µg/mL for intermediate (I), and ≥ 4.0 µg/mL for resistant (R).[3]
- Certain factors increase the risk of developing infections from *S. pneumoniae.* These include prior use of antibiotics, especially cephalosporins, living in long-term healthcare facilities where resistant strains are predominant, and having underlying medical conditions that compromised the immune system.
- Treating infections caused by ceftriaxone-resistant *S. pneumoniae* can be difficult because these strains often resist other antibiotics like penicillins and macrolides. Clinician may have to use alternative antibiotics that might be potentially less efficacious or necessitate more frequent dosing.
- However, studies shows that administration of appropriate antibiotics at optimal doses usually prevents treatment failure in patients with community-acquired pneumonia caused by these resistant strains. This suggests that the outcome of pneumococcal pneumonia is more influenced by the pneumonia's clinical presentation rather than the antibiotic resistance of the bacteria. One reason for this may be that antibiotic levels in the lungs are usually higher than needed to treat the infection, even in cases of resistant strains, which reduces the risk of treatment failure compared to treating infections like otitis media or meningitis with β-lactams, where achieving sufficient antibiotic levels can be more challenging.[4]
- NSAR tracks antibiotic resistance in clinical samples to detect emerging resistance trends and guide antibiotic use. This resource offers timely resistance data to help healthcare workers choose effective antibiotics and aid public health strategies to prevent the spread of resistant strains.
- Non-susceptible ceftriaxone *S. pneumoniae* can cause hospital- and community-acquired infections. Effective control requires community-based surveillance, antimicrobial stewardship, and infection control measures. Public education on proper antibiotic use is also essential to prevent infections and combat resistance.

CONCLUSION

The first case of community-acquired ceftriaxone-intermediate *Streptococcus pneumoniae* at Hospital Taiping underscores the rising threat of antibiotic resistance. Accurate diagnostic testing and appropriate antibiotic selection enabled the patient's full recovery with intravenous amoxicillin/clavulanic acid, despite intermediate resistance.

REFERENCE

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3. Clinical and Laborotory Standards Institute (CLSI) Performance standards for antimicrobial susceptibility testing. 34th ed. CLSI supplement M100. Clinical and Laboratory Institute; 2024.
4.Cillóniz C, Garcia-Vidal C, Ceccato A, Torres A. Antimicrobial Resistance Among Streptococcus pneumoniae. Antimicrobial Resistance in the 21st Century. 2018 Mar 7:13–38. doi: 10.1007/978-3-319-78538-7_2. PMCID: PMC7122384.