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Case Report

Persistent Multidrug-Resistant *Klebsiella pneumoniae* ST147 Infection in a Senegalese Patient: A Case Report Highlighting Therapeutic Challenges in West Africa

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Abstract

This case report describes a persistent infection caused by *Klebsiella pneumoniae* sequence type 147 (ST147) in a 72-year-old woman in Senegal, who presented with a urinary tract infection. Laboratory analysis confirmed a multidrug-resistant strain, with whole-genome sequencing revealing resistance determinants including NDM-5, CTX-M-15, OXA-1, and several aminoglycoside resistance genes. Despite treatment with fosfomycin, the infection persisted, demonstrating the clinical challenges posed by ST147 in regions with limited access to novel antimicrobials. The case emphasizes the need for enhanced antimicrobial stewardship and surveillance in West Africa.

Keywords: *Klebsiella pneumoniae*; Multidrug resistance; ST147; Antimicrobial resistance; West Africa

Introduction

Klebsiella pneumoniae is a significant cause of healthcare-associated infections, responsible for urinary tract infections (UTIs), pneumonia, and sepsis worldwide. The sequence type 147 (ST147) clone is an emerging high-risk lineage characterized by its global spread and association with multidrug resistance [1]. It frequently harbors carbapenemase genes, such as NDM-5, which confer resistance to last-resort antibiotics, complicating treatment options [2]. Although K. pneumoniae ST147 has been widely reported in Europe, Asia, and the Americas, its prevalence and impact in sub-Saharan Africa remain poorly understood. This report describes a case of persistent UTI caused by K. pneumoniae ST147 in Senegal, highlighting the challenges posed by multidrug-resistant pathogens in resource-limited settings.

Case Presentation

A 72-year-old woman, bedridden for several months following a cerebrovascular accident, was seen in consultation at a local clinic in Dakar, Senegal, presenting with fever, confusion, and signs of a UTI. There was no recent history of hospital admission or antibiotic use. A urine sample was obtained and sent to the medical laboratory at Institut Pasteur in Dakar for cytobacteriological analysis.

Laboratory Findings

Urine culture confirmed the presence of K. pneumoniae, identified as ST147 via whole-genome sequencing. Antibiotic susceptibility testing, performed using the VITEK 2 system (AST-N372), revealed resistance to all tested antibiotics:

- Beta-lactams: Carbapenems, cephalosporins, and penicillins
- Aminoglycosides
- Fluoroquinolones
- Tetracyclines
- Sulfonamides

Genomic analysis identified the following resistance genes:

- Beta-lactamases: NDM-5, CTX-M-15, OXA-1, TEM-1D, SHV-11
- Aminoglycoside resistance genes: aac(3)-IIa, aac(6')-Ib-cr, aadA16 (homolog), rmtB
- Fluoroquinolone resistance mutations: GyrA-83Y, GyrA-87A, ParC-80I
- Tetracycline resistance gene: Tet(D)
- Sulfonamide resistance gene: sul1
- Phenicols resistance genes: catB4 (fragment), catA1

Plasmid profiling identified multiple replicons, including IncFII, IncX4, IncFIB(K), repB(R1701), IncFII(K),

IncFIA(pBK30683), and Col(pHAD28), suggesting a potential for horizontal gene transfer [3].

Additional laboratory tests showed:

- Full Blood Count: Elevated white blood cell count (11,200/mm³), mild anemia (Hb 11.0 g/dL), and normal platelet count (322,000/mm³)
- Biochemistry: Elevated C-reactive protein (CRP) at 5 mg/L, increased troponin I at 14.2 ng/mL, high D-dimer levels (1,472 ng/mL), and creatinine of 9.1 mg/L, consistent with a systemic inflammatory response.

Treatment and Follow-Up

The patient was treated with fosfomycin (Monuril 3 g, single dose) due to the extensive resistance profile of the isolated pathogen. A follow-up urine culture on April 19, 2024, confirmed the persistence of K. pneumoniae ST147 with the same resistance profile, indicating a therapeutic failure and a lack of effective treatment options. The patient's condition remained unchanged, and after April 19, she could not be contacted for further follow-up. Death was the most likely hypothesis of total loss of contact with the patient.

Discussion

This case illustrates the significant therapeutic challenges posed by multidrug-resistant K. pneumoniae ST147, particularly in resource-constrained settings. The presence of multiple resistance genes, including NDM-5 and CTX-M-15, emphasizes the pathogen's ability to survive under antibiotic pressure and highlights the potential for spread within the community and healthcare facilities [4]. The persistence of the infection despite fosfomycin therapy underscores the limited availability of effective treatment options for multidrug-resistant organisms in West Africa [5].

The rise of carbapenem-resistant Enterobacteriaceae, especially in low- and middle-income countries, calls for immediate action to enhance antimicrobial stewardship and improve surveillance systems. In Senegal, this could include establishing molecular diagnostics and expanding the use of whole-genome sequencing to monitor resistance trends. Furthermore, public health strategies should focus on preventing the spread of resistant pathogens through better infection control measures and targeted interventions in high-risk populations [6].

Conclusion

The reported case highlights the urgent need for more comprehensive approaches to managing antimicrobial resistance in West Africa. The challenges faced in treating this persistent infection with a multidrug-resistant K. pneumoniae ST147 strain reflect the broader issue of limited treatment options for resistant infections in resource-limited settings.

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