

Case Report

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Unmasking The Unusual Respiratory Pathogen: *Kerstersia gyiorum*Authors: Vibha M¹, Kiran Chawla², Aman S Chandel³, Aswini Kumar Mohapatra⁴,

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ABSTRACT

Background

Kerstersia gyiorum is a rare gram-negative, oxidase-negative, non-fermenting coccobacillus belonging to the family Alcaligenaceae. Human infection with this organism is uncommon, and respiratory isolation has been only rarely described. We report a case of acute infective exacerbation in a patient with chronic bronchiectasis in whom *K.gyiorum* was identified from respiratory specimens, representing one of the rare cases from India.

Case report

A 44-year-old woman with long-standing cough, wheeze, exertional dyspnea, and recurrent rhinosinusitis presented with worsening respiratory symptoms. Evaluation revealed grade III clubbing, bilateral crepitations and rhonchi, peripheral edema, elevated jugular venous pressure, loud P2, and tricuspid regurgitation murmur. High-resolution computed tomography of the thorax demonstrated bilateral cystic and cicatricial bronchiectasis with centrilobular nodules and tree-in-bud opacities. She was initially managed as bilateral bronchiectasis with obstructive airway disease, cor pulmonale, and severe pulmonary hypertension, but required readmission after clinical deterioration. Laboratory findings showed neutrophilic leukocytosis, elevated C-reactive protein, and raised NT-proBNP. Chest radiography demonstrated bilateral hyperinflation with patchy non-homogenous opacities. Sputum and bronchoalveolar lavage cultures yielded moderate growth of gram-negative bacilli identified by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry as *K.gyiorum*. The isolate was susceptible to amikacin, gentamicin, ceftriaxone, ceftazidime, and ciprofloxacin. Mycobacterial and fungal cultures were negative. During the course of hospital stay she developed type 2 respiratory failure requiring non-invasive ventilation. Bronchoscopy was done which showed mucopurulent secretions in both bronchial trees. Treatment with intravenous ceftriaxone, azithromycin, bronchodilators, mucolytics and diuretics was started. Supportive care was continued. These measures led to gradual improvement and she was eventually discharged from hospital in stable condition.

Conclusion

This case highlights the need to keep *K.gyiorum* in the list of potential and emerging opportunistic respiratory pathogen in patients with chronic structural lung diseases. Identification of these organisms by advanced microbiological techniques is essential for early diagnosis and targeted antimicrobial therapy.

Keywords: *Bronchiectasis, Bronchoalveolar Lavage, Gram-Negative Bacterial Infections, Pulmonary Hypertension, Respiratory Tract Infections*

INTRODUCTION

Kerstersia gyiorum is a rare gram-negative, oxidase-negative, non-fermenting coccobacillus of the family Alcaligenaceae. It has been isolated from diverse human specimens including wounds, ear infections, sputum, bronchoalveolar lavage, and urine, however, reports of human infection remain uncommon.¹

K.gyiorum was first described in 2003 by Coenye et al. following a taxonomic study of nine clinical isolates obtained from leg ulcers, sputum, and fecal specimens and was hypothesized to share phenotypic similarities with *Alcaligenes faecalis*, while demonstrating distinct biochemical features.² Subsequent genomic analysis placed the species within the family Alcaligenaceae, in close phylogenetic proximity to *Alcaligenes*, *Bordetella*, and *Achromobacter*. These data supported the establishment of the novel genus *Kerstersia*, with *K.gyiorum* as its type and sole species.³

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Here we report a case of a middle-aged female with bilateral bronchiectasis with obstructive airway disease and severe pulmonary hypertension in whom *K.gyiorum* was identified as the pathogen causing an acute infective exacerbation. To the best of our knowledge, this is a rare documented case from India demonstrating *K.gyiorum* isolation from respiratory samples in a patient with chronic bronchiectasis.

CASE REPORT

A 44-year-old woman presented to our hospital with a long-standing history of chronic cough initially associated with sputum production later non-productive with wheeze and exertional breathlessness, both of which had worsened in the last one month prior to admission. There was no history of fever or haemoptysis, loss of appetite, loss of weight however there was a history of recurrent rhinosinusitis. There was no history of tuberculosis or COVID-19.

During her initial admission, she was afebrile with SpO₂ 98% on room air. Examination showed grade III clubbing, bilateral crepitations and rhonchi, pitting pedal edema, elevated JVP, loud P2, and a pansystolic murmur in the tricuspid area. HRCT thorax revealed bilateral cystic and cicatricial bronchiectasis with centrilobular nodules and tree-in-bud appearance, suggestive of post-infectious etiology. A diagnosis of bilateral bronchiectasis with obstructive airway disease, cor-pulmonale, and pulmonary hypertension was made and managed with bronchodilators, steroids, diuretics, and was discharged with symptomatic improvement.

Three days later, the patient was readmitted with worsening breathlessness and cough. She was conscious and oriented, with stable vital signs. With systemic examination revealing bilateral rhonchi and crepitations. Initial laboratory investigations showed leukocytosis (total WBC Count $11.1 \times 10^3/\mu\text{L}$) with neutrophilic predominance (76.9 %), elevated CRP, and an HbA1c of 6.1%, consistent with pre-diabetes. NT-proBNP was elevated at 2913 pg/mL. Chest Imaging showed bilateral hyperinflated lung fields with patchy non-homogenous opacities (Figure 1).

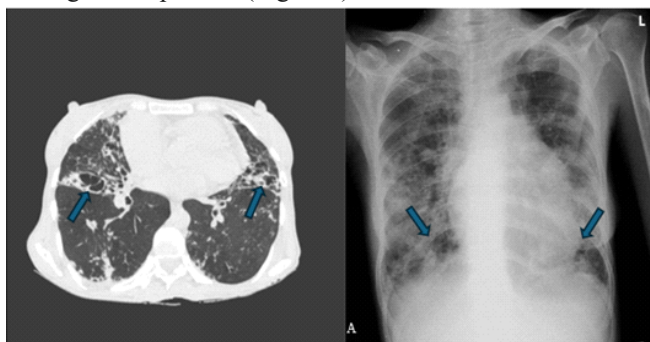


Figure 1: A- HRCT Thorax showing cystic and cicatricial bronchiectasis in bilateral lower zones (shown in arrow); B- X-Ray Chest showing bilateral cystic shadows in lower lung zones (shown in arrow)

Microbiological evaluation of sputum and bronchoalveolar lavage samples was done which demonstrated moderate growth of gram-negative bacilli which was identified using MALDI-TOF as *K.gyiorum*. On antimicrobial susceptibility these organisms were found to be sensitive to Amikacin, Gentamicin, Ceftriaxone, Ceftazidime and Ciprofloxacin (VITEK-2 system). Mycobacterial and fungal cultures were negative, and cytological evaluation showed an acute inflammatory process without evidence of malignancy. Molecular testing could not be performed owing to financial constraints. During the hospital stay, the patient developed worsening tachypnoea with arterial blood gas analysis

revealing type 2 respiratory failure with hypercapnia and hypoxemia. She was shifted to the high-dependency unit for close monitoring and managed with non-invasive ventilation using pressure support and eventually gradual improvement was seen. Bronchoscopy showed presence of copious mucopurulent secretions in both bronchial trees. These findings were suggestive of infective bronchiectasis.

She was treated by intravenous ceftriaxone (2g Intravenous infusion for seven days) and azithromycin (500mg for five days). Additionally nebulized bronchodilators, mucolytics, diuretics and supportive measures were also continued. By the tenth day of admission, she clinically improved and was discharged in a stable condition. Discharge medications included a combination of long-acting bronchodilators, nebulized agents, mucolytics, diuretics and sildenafil.

DISCUSSION

Evidence from recent case reports points to *K.gyiorum* as an emerging opportunistic pathogen, that spans across a spectrum of chronic and immunocompromised conditions including bacteremia from ulcerated skin, chronic osteomyelitis, chronic suppurative otitis media, lower-respiratory infections in long-term tracheostomy patients and respiratory colonization in individuals with neurodegenerative disease.⁴

This case illustrates a rare pulmonary infection with *K.gyiorum* in a patient with long-standing bronchiectasis and severe pulmonary hypertension, complicated by acute exacerbation and type 2 respiratory failure. The clinical significance of this organism was supported by the consistent isolation of the organism in two different respiratory samples – sputum and BAL, deterioration of patient condition and raised inflammatory markers coinciding with the organism's detection, radiographic evidence of new infiltrates and clinical improvement following targeted antimicrobial therapy. Molecular confirmation would have strengthened our confirmation; however, it could not be performed due to financial constraints.

Review of published cases of *K.gyiorum* infections shows variable antimicrobial susceptibility. While most isolates demonstrated susceptibility to broad-spectrum β -lactams, including piperacillin–tazobactam, cefepime, ceftriaxone, ceftazidime, imipenem, and meropenem, as well as to aminoglycosides such as gentamicin, tobramycin, and amikacin. Resistance was most frequently noted against trimethoprim–sulfamethoxazole, ampicillin, colistin, and certain cephalosporins. In the present case, the isolate demonstrated susceptibility patterns consistent with previously reported trends.⁵

Isolation of this pathogen from respiratory samples has been sparsely reported earlier by a few authors. A case from the United States reported the isolation of *K.gyiorum* from bronchoalveolar lavage in a patient with a chronic tracheostomy and multiple comorbidities.⁶ Advanced methods such as MALDI-TOF and 16S rRNA sequencing were needed for its identification, and because other organisms were also present, its role in causing infection was uncertain.⁷ Another report described its isolation in a patient with a neurodegenerative disorder suggesting that the organism acts as an opportunist in debilitated hosts.⁸ All these reports, including our case, underscores the importance of *K.gyiorum* as a rare pathogen seen in chronically ill hosts (Table 1). Its accurate identification relies on advanced microbiological facilities, and appropriate antibiotic therapy is essential for prompt recovery.⁹ There is a need for greater awareness among clinicians of uncommon organisms such as *K.gyiorum* which is essential for timely diagnosis and early management.¹⁰

Kerstersia gyiorum As An Unusual Respiratory Pathogen

Year	Author	Organ system involved/Diagnosis	Sample Collected	Sensitivity pattern	Treatment	Patient outcome
2012	Almuzara MN et al. [4]	Ear. Cholesteatoma Chronic Otitis Media	Purulent discharge of Bezold's abscess	Susceptible - Amoxicillin Ceftriaxone Cefazidime Cefepime Imipenem Trimethoprim-sulfamethoxazole Gentamicin Amikacin Ciprofloxacin Levofloxacin	Treatment with ampicillin-sulbactam at 1 g/6 h intravenously (IV) and dexamethasone at 8 mg IV every 8 h was initiated.	Recovered well
2014	Deutscher M et al. [6]	Respiratory system. lower respiratory infection	Bronchoalveolar Lavage	Susceptible - Gentamicin, Amikacin, Tobramycin, Cefepime, Piperacillin/tazobactam, Trimethoprim/Sulfamethoxazole. Intermediate - Ciprofloxacin	Treatment – Ciprofloxacin	Died on day 5 of second hospitalization
2014	Mwalutende A et al. [11]	Ear. Chronic Suppurative otitis media	Ear swab	Susceptible - piperacillin, cefotaxime, ceftazidime, gentamicin, imipenem, meropenem, and moxifloxacin, Intermediate - Ciprofloxacin	ciprofloxacin ear drops	Recovered. Ear discharge subsided
2015	Bostwick AD et al. [3]	Bloodstream infection (bacteremia with sepsis), secondary to chronic (left) lower-extremity ulcerations	Blood	Susceptible: ceftriaxone, trimethoprim-sulfamethoxazole Resistant: ceftazidime, cefepime, piperacillin-tazobactam Intermediate: cefotaxime	Initially started on vancomycin, clindamycin, and ciprofloxacin. Once Gram-negative rods were identified, vancomycin was stopped. The patient completed 14 days of ciprofloxacin and clindamycin.	Clinical improvement with resolution of acute kidney injury, coagulopathy, and transaminitis. Anemia also improved
2017	Lan Y et al. [1]	Left lower limb, Chronic Osteomyelitis	Swab from wound on left lower limb	Susceptible: Piperacillin–tazobactam, Ceftazidime, Ceftriaxone, Imipenem, Amikacin, Gentamicin, Tobramycin, Ciprofloxacin, Levofloxacin Resistant: Nitrofurantoin, Trimethoprim–sulfamethoxazole Intermediate: Cefepime, Aztreonam, Cefazolin	Intravenous Piperacillin-tazobactam & symptomatic & supportive therapy	Improved. Decline of inflammatory markers
2017	Baran I et al. [12]	wound on the dorsolateral surface of the right foot and a 2 × 3 cm wound on the outside of the right ankle. Buerger's disease	Debridement of wound on the dorsolateral surface of the right foot and a wound on the right ankle	Susceptible: Amikacin, Aztreonam, Ceftazidime Ciprofloxacin Meropenem, Netilmicin, Piperacillin, Piperacillin-tazobactam, Trimethoprim-sulfamethoxazole Resistant - colistin	IV ceftazidime and metronidazole treatment for 14 days.	Improved
2023	Sun Y et al. [8]	chronic neurodegenerative disease with lower respiratory tract infection	Sputum	Susceptible: Piperacillin /Tazobactam, Ceftazidime, Meropenem, Imipenem Amikacin, Aztreonam, Cefepime, Ticarcillin/Clavulanic acid, Trimethoprim/Sulfamethoxazole	Piperacillin/tazobactam IV for 14 days, traditional Chinese medicine, symptomatic & supportive therapy	Improved. Decline of inflammatory markers
2024	AlSunbul NF et al. [13]	Pressure ulcer in external ear in an immunocompromised patient	Ear swab	Susceptible: piperacillin–tazobactam, ceftazidime, levofloxacin, imipenem, and meropenem; intermediate to cefepime; and resistant to amikacin, gentamicin, tobramycin, ampicillin, azithromycin, cefazolin, cefuroxime, cefoxitin, cefotaxime, ciprofloxacin, and trimethoprim–sulfamethoxazole	intravenous ciprofloxacin and fluconazole, plus ofloxacin ear drops	- Improved

Table 1 : Review of various studies reporting isolation of *K.gyiorum*

CONCLUSION

This case emphasizes the isolation of *K.gyiorum* from respiratory samples which is a rare occurrence in India. It underlines the organism's potential as an emerging pathogen in chronic airway disease and emphasizes the importance of having reliable microbiological facilities for accurate diagnosis that facilitates the implementation of the appropriate therapeutic actions and playing a pivotal role in the patient's recovery.

Conflict Of Interest : None

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Author Contribution :

VM- Data collection, manuscript drafting and literature review; **KC-** Supervision of study, Data interpretation, manuscript editing and final approval; **ASC-** Data collection and manuscript drafting; **AKM-** Patient management and approval of final manuscript;

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