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Case Report (Open Access)

A RARE CASE REPORT ON MULTI-DRUG RESISTANT PNEUMONIA WITH TYPE 1 RESPIRATORY FAILURE

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ABSTRACT
Multi drug-resistant (MDR) infections have become a severe problem in health care settings with causing outcomes such as extended hospitalization, mortality, financial strain on the patients etc. Even though diagnostic advancements have taken place facilitating accurate and rapid detection of specific drug resistance patterns, lack of newer drugs in combatting infections has take toll on many patients. Usually, a bacterial colony cultured from any patient's sample being non susceptible to at least one agent in 3 or more antibiotic classes may be termed as a multi drug resistant bacteria and such infections can become fatal causing huge numbers of mortality if communicability is possible. Even endotracheal intubation can be a risk factor for acquiring pneumonia, shortly called as ventilator associated pneumonia (VAP). In this case report, the authors review a presentation of pneumonia which was found to be caused by multi drug resistant *Acinetobacter sp.* also causing type 1 respiratory failure in the patient.

Keywords: *Pneumonia, Drug Resistance, Antibiotic, Infection, Ventilator*

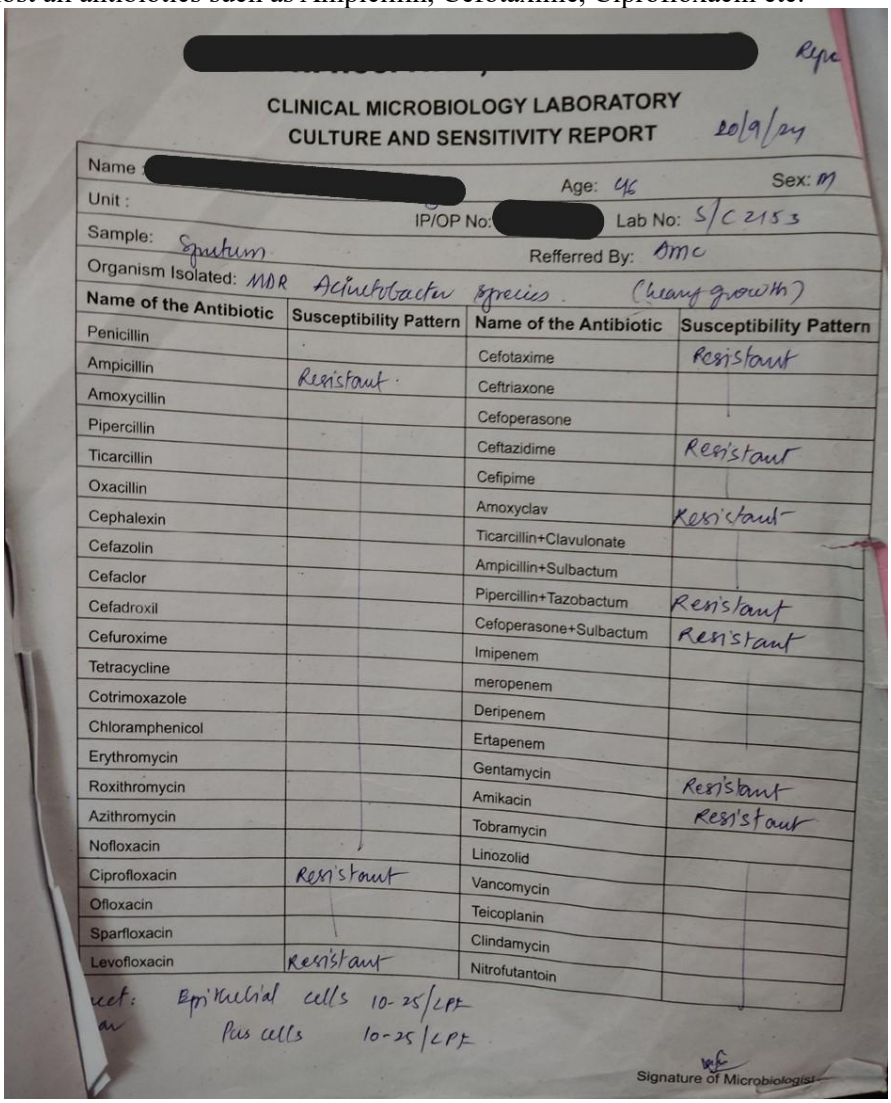
INTRODUCTION
The 2017 WHO listed *Acinetobacter baumannii* in the "critical" category of priority because of their resistant behaviour and ability to transfer the resistance via gene transfer mechanisms. The carbapenem resistant strain remains among the top 3 pathogens prioritized in the 2024 edition (WHO, 2024).
Type 1 respiratory failure, sometimes referred to as oxygen failure is characterized by low levels of oxygen levels in the patient's blood. It is usually a common characteristic of pneumonia infection which prevents oxygenation of blood thereby affecting parameters such as saturation, partial pressure of oxygen in blood etc. While oxygen supply is affected at a greater extent, the lung still can retain the carbon di oxide excreting ability and usually the partial pressure of it is unaffected. It is presented with signs and symptoms like tachypnoea, dyspnoea, bluish discolouration of skin, lips and fingernails (cyanosis) etc. Endotracheal intubation with mechanical ventilator remains the terminal therapeutic intervention in severe cases of respiratory distress. While not all cases are associated with mortality, those presented with comorbid conditions such as COPD, asthma, cardiac diseases etc with age as another factor often require critical care. Etiological factors such as pneumonia infection, pulmonary oedema, bronchoconstriction, pulmonary embolism remain the most causative factors. Additionally, CNS depressants can indirectly damage the brain's respiratory centres and lead to neuronal pathway induced respiratory failure. In pneumonia cases, the availability of alveolar space for gaseous exchange decreases, causing imbalances between ventilation in lungs and oxygenation of blood in capillaries leading to hypoxia. While in severe pneumonia cases, the lung becomes inflamed with alveolar capillary membranes unable to perform exchange of gases, causing entry of blood without oxygenation into systemic circulation. This increases oxygen demand and thereby increases the risk of death if not treated.

CASE
A 46-year-old male patient, alcoholic but with no co-morbidities, presented with non-productive cough, low grade fever for the last 10 days and also associated with dyspnea with insidious onset, progressive type since 5 days. No other complaints have been reported by the patient. Patient did not complain any kind of

chest pain and showed no signs of pedal edema or haemoptysis or abdominal distension. He also denies any history of interaction with any infected patient. He was a worker in a pharmaceutical company. He shares no medical history of other diseases or comorbidities.

Upon physical examination the patient was found to be afebrile, but tachypnoeic with elevated blood pressure of 150/100 mmHg, oxygen saturation of 63%. Pulse rate was 84 bpm and with auscultation, bilateral crepitus (left > right) and wheezing were noted. Cardiac sounds were normal, abdomen was soft during examination. Urine output was adequate with no signs of discomfort while urinating.

The patient was put on oxygen supplementation. Meanwhile, investigations revealed no detection of tuberculosis. However, baseline atrial blood gases report showed $pO_2$49mmHg, cCl^- 113 mmol/L, oxygen saturation 74%. Hemogram report shows WBC count 7400 cells/mm^3, Platelets 1,03,000 cells/mL, Hb 13.4 g/dL. RFT showed serum urea 62 mg/dL, BUN/Creatine ratio was 30:1. LFT showed elevated alkaline phosphate (567 IU/L), total bilirubin 1.8 mg/dL. On the 3rd day since admission, sputum was sent for culture and sensitivity with testing positive for heavy growth of Acinetobacter sp. sensitivity pattern showed resistant to almost all antibiotics such as Ampicillin, Cefotaxime, Ciprofloxacin etc.



CLINICAL MICROBIOLOGY LABORATORY
CULTURE AND SENSITIVITY REPORT

Name: [redacted] Age: 46 Sex: M
Unit: IP/OP No: [redacted] Lab No: S/C 2153
Sample: Sputum Refferred By: SMC
Organism Isolated: MDR Acinetobacter species. (Heavy growth)

Name of the Antibiotic	Susceptibility Pattern	Name of the Antibiotic	Susceptibility Pattern
Penicillin		Cefotaxime	Resistant
Ampicillin	Resistant	Ceftriaxone	
Amoxycillin		Cefoperasone	
Pipercillin		Ceftazidime	Resistant
Ticarcillin		Cefipime	
Oxacillin		Amoxyclav	Resistant
Cephalexin		Ticarcillin+Clavulonate	
Cefazolin		Ampicillin+Sulbactum	
Cefaclor		Pipercillin+Tazobactum	Resistant
Cefadroxil		Cefoperasone+Sulbactum	Resistant
Cefuroxime		Imipenem	
Tetracycline		meropenem	
Cotrimoxazole		Deripenem	
Chloramphenicol		Ertapenem	
Erythromycin		Gentamycin	Resistant
Roxithromycin		Amikacin	Resistant
Azithromycin		Tobramycin	
Nofloxacin		Linozolid	
Ciprofloxacin	Resistant	Vancomycin	
Ofloxacin		Teicoplanin	
Sparfloxacin		Clindamycin	
Levofloxacin	Resistant	Nitrofutantoin	

Epithelial cells 10-25/LPF
Pus cells 10-25/LPF

Signature of Microbiologist

Soon after the admission, the patient was put on non-invasive ventilation, BiPAP model till saturation reaches 100%. IV Amoxycillin+Clavulanic acid and IV Clarithromycin were administered along with

Oseltamivir capsule 75mg, twice a day. On 2nd day, nebulization of Ipratropium bromide and salbutamol, thrice a day and budesonide, twice a day were added to the treatment regimen along with IV Hydrocortisone 50mg, 4 times a day. His ABG reports have shown improvement on day 4. However, WBC count was elevated to 13000 cells/mm^3. Even though resistance was observed, the same antibiotics were continued for 5 days. After day 5, IV Meropenem and IV Polymixin B were introduced to the treatment plan along with N-Acetylcysteine. Polymixin B was discontinued after 3 days but Meropenem was continued for another 10 days with addition of Methyl Prednisolone IV. It was later shifted to oral route. Meanwhile the patient was diagnosed with hypertension and Telmisartan was prescribed. After 16 days of treatment, the patient's vitals and condition improved with signs of recovery from pneumonia. The patient was discharged on day 17 and as advised to follow up as outpatient with no significant complaints.

DISCUSSION

Acinetobacter baumannii, an aerobic gram-negative bacterium has become the leading cause for the transmission and associated events for multi drug resistant pneumonia. Along with superbugs such as MRSA and *S. pneumoniae* these pathogens have spread to various geographies irrespective of climate (Son *et al.,* 2017). However, cases of pneumonia due to *Acinetobacter* sp. have high mortality.

While a few authors claim environmental sources as risk factors, our patients even though had no co-morbidities share their occupational risk of work at pharmaceutical industry. While it itself cannot be considered a risk factor, associated risks such as working in a contaminated room might be possible. Studies states that the treatment in multi drug resistance pneumonia due to Acinetobacter sp. might have less mortality rates when treated with polymixin along with a carbapenem (Lenhard *et al.,* 2016). In our case, the patient was treated with Polymixin B and Meropenem which aided his recovery and must have prevented mortality.

MDR pneumonia cases usually present with a high mortality rate. One such study, involving 80 patients of which 45 died claims a mortality rate close to 43-55% (Falagas *et al.,* 2007) As a preventive measure to control the transmissions, appropriate hand hygiene and frequent hand washing is recommended when interacting with patients and to health care professionals working in clinical settings (Husni *et al.,* 1999).[5] Even after exposure and pathogenesis antimicrobial stewardship, infection control measures and surface disinfection remain the cornerstone measures for prevention of transmission of the pathogen (Liu *et al.,* 2020).

Due to the scenario of lack of effective drug responses to empirical antibiotics, researchers are studying the effectiveness of new age antibiotics such as peptides, bacteriophages, nanoparticle-based drug delivery, immunotherapy to combat these infections and effectively lower the mortality rates (Shein *et al.,* 2024) Novel therapies involving phages as therapeutic agents show evidence and development in studies on treatment for *Acinetobacter baumannii* infections (Li *et al.,* 2024).

CONCLUSION

In conclusion, Acinetobacter sp. have shown resistance to various antibiotics and their presentation in patients as pneumonia and other pulmonary manifestations has higher mortality rate. Supplementing with oxygen therapy if needed and antibiotic stewardship along with safer disinfecting mechanisms may not only treat the patient's condition but also prevent the spread of illness. Current studies focusing on novel therapies such as phage therapy, antibiotics in the form of peptides, nano formulations show some promise towards effective management of such a condition.

Conflict of Interest

The authors declare no competing interest that could influence the work in this paper.

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