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Severe Bordetella pertussis Infection in a Diabetic Elderly Female Presenting with Multisystem Complications: A Case Report

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ABSTRACT

Pertussis, caused by Bordetella pertussis, is traditionally a child illness; nevertheless, its frequency among older adults is increasing owing to waning immunity and incomplete vaccination. This case report depicts an 84-year-old woman with multiple comorbid conditions such as hypertension, diabetes mellitus, and ischemic heart disease with symptoms of fever, breathlessness, and productive cough. She was initially treated with a diagnosis of community-acquired pneumonia, which failed to show improvement on conventional empirical therapy. A nasopharyngeal PCR then confirmed Bordetella pertussis infection, and accordingly, a change in the treatment to Azithromycin was ensued, which resulted in significant clinical improvement. This case highlights the importance of keeping pertussis as one of the differential diagnoses in the respiratory condition in elderly patients with unusual presentation. It also underlines the necessity of increased awareness and promotion of adult booster immunization programs in order to reverse the risk of severe pertussis infection in older adults.

KEYWORDS: Bordetella pertussis, pertussis, elderly, community-acquired pneumonia, waning immunity, vaccination, atypical presentation, multisystem complications, case report.

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INTRODUCTION

Pertussis, commonly known as whooping cough, is a highly communicable respiratory infection caused by *Bordetella pertussis*. Although traditionally recognized in association with childhood illness, recent evidence suggests that pertussis can present atypically in older adults. Its clinical course may be more severe in this population, potentially due to age-related declines in immune responsiveness and the presence of comorbid conditions (Kilgore et al., 2016; https://doi.org/10.1128/CMR.00083-15). A notable increasing incidence of pertussis cases has been documented in various demographic groups, including older adults, attributable in part to waning immunity over time and suboptimal vaccination coverage in adults. Among individuals with multiple comorbidities—such as diabetes mellitus (DM), hypertension (HTN), and ischemic heart disease (IHD)—pertussis infection can be especially severe, increasing the likelihood of adverse outcomes (Cherry, 2019; https://doi.org/10.1542/peds.2019-1311).

This case report examines the presentation, diagnostic approach, and management of *Bordetella pertussis* infection in an 84-year-old female patient. She initially presented with clinical features consistent with community-acquired pneumonia (CAP), a scenario in which pertussis is seldom considered. Nevertheless, the uptick of pertussis, even among older adults, is now recognized as a significant public health concern. Factors contributing to this growing trend include diminished immunity over time following vaccination or infection and inadequate administration of booster vaccines among adolescents and adults (Mooi et al., 2014; https://doi.org/10.1017/S0950268813000071). In older adults, pertussis can manifest with pneumonia and other complications that exacerbate pre-existing conditions—such as DM, HTN, and IHD—thereby increasing the risk of hospitalization and mortality (Guiso et al., 2011; https://doi.org/10.1016/S0140-6736(11)60320-0). This population is particularly susceptible due to immunosenescence, an age-related reduction in immune function (Miller & Rest, 2017; https://doi.org/10.1016/B978-0-12-811353-0.00021-9).

1.1 Rationale

While pertussis is commonly viewed as a pediatric disease, it is notably uncommon in regions with comprehensive vaccination

programs, such as Saudi Arabia. The Kingdom of Saudi Arabia achieves approximately 98–99% coverage with the DTaP vaccine, reflecting robust public health initiatives that have largely controlled the disease across all age groups (Ministry of Health Saudi Arabia). As a result, pertussis incidence is exceedingly low, especially among adults and older adults. Thus, encountering pertussis infection with multisystem involvement in an older adult patient in this context is extraordinarily rare. Although it is often assumed that older adults retain residual immunity from childhood vaccinations and have reduced exposure risk, immunity can wane over time. Additionally, coverage of adult booster vaccinations may not be as extensive. Therefore, documenting such a case in Saudi Arabia—where the disease is otherwise well-controlled—provides important clinical insights and challenges prevailing assumptions (World Health Organization).

This case report highlights the atypical presentation of pertussis in an older adult with multiple organ system complications and challenges the notion of pertussis as an exclusively pediatric disease. By considering pertussis in the differential diagnosis of respiratory illnesses in older patients—even in populations with high vaccination rates—clinicians may improve diagnostic accuracy and patient outcomes. Recognizing the potential severity and varied clinical presentations of pertussis in older adults fosters better clinical vigilance and could ultimately contribute to more effective management strategies for similar cases in the future.

CASE REPORT

2.1Presentation to the Emergency Room

The patient, an 84-year-old female with a history of hypertension (HTN), diabetes mellitus (DM), ischemic heart disease (IHD), hyperlipidemia, and obesity, presented to the Emergency Room (ER) with a 5-day history of fever, shortness of breath (SOB), and productive cough. She reported a recent contact with a sick individual but denied chest pain, abdominal pain, gastrointestinal (GI), or neurological symptoms. Prior to admission, she lived independently in a small apartment, performing light household tasks and occasionally going for short walks in her neighborhood. Although she generally managed her daily activities on her own, she had limited social support and depended on a neighbor for transportation and assistance with more physically demanding tasks.

2.1.1 Initial Assessment:

- **CURB-65 Score:** 2
- **Vital Signs:** SpO2 88-90% on room air

2.1.2Physical Examination:

- **Chest:** Bilateral bronchial breath sounds with crepitations
- **Abdomen:** Soft and lax , no tenderness , no palpable agronomically
- **Cardiac:** audible 1st and 2nd heard sounds (S1S2) without murmurs or additional sounds
- **Lower Limbs:** Pitting edema present grade 1 count any tenders in call muscle

2.1.3 Laboratory Findings:

- **Renal Function:** Elevated creatinine (1.6 mg/dL)
- **Venous Blood Gas (VBG):** Acceptable levels

2.1.3.1**Vital Signs:**

Parameter	Value	**Normal Reference**
Oxygen Saturation (SpO2) on RA	88-90%	≥94% (on Room Air)
Heart Rate (HR)	136 beats/min	60-100 beats/min
Respiratory Rate (RR)	9 breaths/min	12-20 breaths/min
Blood Pressure (BP)	93/127 mmHg	Systolic: 90-120 mmHg, Diastolic: 60-80 mmHg
Temperature (Temp)	39.7°C	36.5-37.5 °C

2.1.3.2Laboratory Findings:

Test	Value	**Normal Reference**
Creatinine	1.6 mg/dl	0.6-1.2 mg/dL [4]
Venous Blood Gas (VBG)*	Acceptable	pH: 7.31-7.41; pCO2: 41-51 mmHg; $HCO3^-$: 23-27 mEq/L [5]

- **Chest X-Ray (CXR):** Bilateral consolidating change infiltrates suggestive of multi lobar pneumonia

2.3 Management Strategies:

2.3.1 Initial Management Plan:

The initial management plan was admitting the patient to negative pressure isolation room as suspected viral VS bacterial pneumonia empirically based, considering the patient's presentation with fever, SOB, and productive cough alongside the bilateral infiltrates seen on the chest X-ray. The patient was admitted under the presumptive diagnosis of community-acquired pneumonia (CAP) and isolated due to her history of contact with a sick person and image finding .

The initial treatment included:

- Isolate the patients and taking nasopharyngeal swap including viral aspiration panel and Atypical bacteria expiating to cause such clinical presentation including Legionella pneumophila and mycoplasma pneumoniae
- Oxygen therapy to maintain SpO2 > 92% and MAP > 65 mmHg
- Empirical antibiotics: oseltamivir , Moxifloxacin , and penicillin tazobactam. and all adjusted doses to creatinine clearance
- Dexamethasone (5 mg IV OD)
- Nebulization's, Omeprazole , and Lasix
- Prophylactic anticoagulation with Heparin (5000 units)
- Cardiovascular and nephrology consultations were requested.

Despite these interventions, the patient's clinical condition did not improve; her symptoms persisted, and her overall condition worsened. It wasn't until a nasopharyngeal Polymerase Chain Reaction (PCR) swab returned positive for *Bordetella pertussis* and undetected all nasal aspiration panel and other Atypical bacteria such as Legionella pneumophila and mycoplasma pneumoniae that the Infectious Diseases (ID) consultant recommended a change in the management plan. The empirical antibiotics were discontinued, and the patient was started on Azithromycin. Remarkably, within five days of this targeted therapy,

the patient showed significant clinical improvement and was discharged after complicate management plan course and no need to any further isolation.

2.3.2 Hospital Course and Follow-Up:

Day 5:

- **Clinical Status:** The patient remained febrile with ongoing SOB and productive cough. Her CURB-65 score remained at 2 despite initial treatment.
- **Examination Findings:**
  - Mildly decreased cough and sputum production
  - bilateral crepitations on auscultation
  - Prominent abdomen with mild lower limb edema

Diagnosis on Admission:

1. Community-Acquired Pneumonia (CAP)
2. Uncontrolled Diabetes Mellitus
3. Metabolic Syndrome with Hyperuricemia
4. Obesity (Grade 1)

Diagnosis of Evolution:

1. Acute Kidney Injury (AKI)
2. Hypoalbuminemia
3. Pertussis confirmed by positive *Bordetella pertussis* in Nasopharyngeal PCR Swap

Laboratory Updates:

- elevation in serum creatinine and Blood Urea Nitrogen (BUN)
- Low serum albumin levels

2.3.3Updated Management Plan:

- Discontinuation of the initial empirical antibiotics and anti viral
- Introduction of Azithromycin for pertussis as targeted treatment .
- Continuation of dropped isolation till complete clinical sylphs resolutions
- Continuation of supportive care, including oxygen therapy, fluids, and monitoring
- Albumin supplementation initiated
- Nephrology evaluation for AKI
- Allopurinol added for hyperuricemia
- Infectious Disease (ID) consultation advised an additional 2 days of isolation.

Day 6:

- **Clinical Status:** The patient's oxygen saturation on room air was maintained in RA without o_2 supplementary .
- Patients clinically significant improving in term of lower respiratory improving in adding to no more o_2 support regained .
- **Examination Findings:**
  - Persistent obesity-related findings with a reduction in cough and sputum
  - Stable vitals without significant new findings.
  - Decide to discontinue an isolation as completed treatment course in additional to improving clinically.
  - Home and family member that contacted her in the last 3 week suggest to revises prophylaxis azithromycin for 5 days and complete the vaccine programme .
  - Recommend the vaccination here assign contacts person by etanus, Diphtheria, and Pertussis(TDAP)ten Tetanus and Diphtheria (Td) Q10 years

Nephrology Review:

- The nephrology team reviewed the case and diagnosed diabetic nephropathy. Despite elevated creatinine, the patient maintained stable renal function throughout the hospitalization. Urine output was adequate.
- **Plan:**
  - Continuation of the same medication regimen
  - Urine examination and strict fluid balance monitoring

Cardiology Consultation:

- The cardiology team, evaluated the patient due to her history of IHD, DM, and HTN.
- **Findings:**
  - ECG: Sinus rhythm with left old bundle branch block (LBBB)
  - Echocardiogram: Normal left ventricular systolic function (EF 55%), normal valve function, and right-sided heart function Tricuspid Annular Plane Systolic Excursion (TAPSI 2.4, Systolic Pulmonary Arterial Pressure SPAP 27 mmHg)

- Troponin-I levels were normal, ruling out acute myocardial infarction.

- **Plan:**
  - Continuation of current medications with cardiac monitoring as needed.

2.3.4 Role of a Multidisciplinary Team in Complex Cases

In the management of this patient's multifaceted presentation—ranging from infectious etiologies to metabolic and cardiovascular comorbidities—a multidisciplinary approach was instrumental. Pulmonologists provided specialized insight into respiratory care, optimizing airway management and fine-tuning interventions for improving oxygenation. Geriatricians offered guidance on managing the patient's chronic conditions, ensuring that therapeutic decisions were tailored to her age-specific risks, such as heightened vulnerability to side effects and drug-drug interactions. Infectious disease specialists were pivotal in accurately identifying the pertussis infection and recommending appropriate targeted therapy, thus improving clinical outcomes and shortening the duration of hospitalization. By incorporating diverse expertise, including nephrology for acute kidney injury management and cardiology for optimizing cardiac status, the healthcare team ensured a comprehensive, patient-centered approach that addressed the complexity of the case and facilitated a more efficient recovery

2.3.5Timeline of the Patient's Clinical Course:

Day 1 (Onset): Patient experiences initial symptoms of fever, shortness of breath, and productive cough.

Day 5 (Hospital Presentation): Patient presents to the ER with a 5-day history of symptoms; initial diagnosis of Community-Acquired Pneumonia (CAP) made and empirical treatment started.

Day 10 (Diagnostic Confirmation): Persistent symptoms lead to nasopharyngeal PCR testing, which returns positive for Bordetella pertussis. Empirical antibiotics are discontinued, and targeted therapy with Azithromycin is initiated.

Day 15 (Improvement and Discharge): Patient shows significant clinical improvement with targeted therapy and supportive measures; discharged with recommendations for prophylaxis and vaccination.

DISCUSSION

This case underscores the diagnostic challenges and complexities of managing an elderly patient with a multisystem disorder who presents with respiratory symptoms. Initially, the patient was treated empirically for CAP, a common diagnosis in this age group, particularly given her risk factors, including DM, HTN, and IHD. However, the lack of clinical improvement despite appropriate therapy highlighted the need for reconsideration of the diagnosis.

Comparison with Previously Reported Adult Pertussis Cases

In the literature, adult pertussis cases are often characterized by prolonged, nonspecific coughs that can last several weeks to months before a diagnosis is confirmed (Cherry, 2019; Kilgore et al., 2016). Unlike the distinctive "whooping" cough commonly seen in children, adults and especially elderly individuals frequently present with milder or atypical respiratory symptoms that resemble other common conditions, such as CAP or bronchitis. Previous reports have demonstrated delayed recognition of pertussis in adults due to the lack of classic clinical features, resulting in increased morbidity and prolonged recovery times. The case presented here aligns with these findings, illustrating how an elderly patient initially managed as having CAP did not respond to standard treatment, prompting further diagnostic evaluations that ultimately confirmed pertussis.

Atypical Presentations in the Elderly

Elderly patients may manifest pertussis with subtle or less pronounced symptoms, often overlapping with existing comorbidities like diabetes, hypertension, and ischemic heart disease. Reduced physiological reserves, altered immune responses, and multiple concurrent medications can mask typical signs and complicate the clinical picture. For example, the absence of a classic "whooping" cough and the presence of nonspecific respiratory complaints can divert attention towards more common diagnoses such as pneumonia or heart failure exacerbations. This atypical presentation underscores the necessity of maintaining a broad differential diagnosis, incorporating advanced diagnostic testing like PCR for suspected atypical pathogens, and ensuring timely adjustments to management strategies when initial therapies do not yield improvement.

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CONCLUSION

this case illustrates the importance of considering pertussis in the differential diagnosis of respiratory symptoms in elderly patients, particularly when there is a history of contact with a sick individual and when standard empirical therapies fail. Early identification and targeted treatment are crucial in improving outcomes in this vulnerable population. Healthcare providers should maintain a high index of suspicion for pertussis when evaluating elderly patients with persistent cough who fail to improve on conventional therapies. In addition, reinforcing adult vaccination programs, including booster doses for tetanus, diphtheria, and pertussis (Tdap), is vital. Ensuring that older adults receive appropriate immunizations can significantly reduce the risk of infection, mitigate complications, and improve overall public health outcomes.

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