

Case Report

Community-acquired bacterial meningitis due to hypervirulent *Klebsiella pneumoniae* in a patient with newly diagnosed diabetes mellitus – a case report

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Key words: *Klebsiella pneumoniae*, hypervirulent, community-acquired bacterial meningitis, diabetes mellitus.

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Received: 16 Jul 2023, accepted revised version: 05 Nov 2023, Published 06 Nov 2023

Competing Interests: Authors have declared that no competing interests exist

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Introduction

Acute bacterial meningitis is a disease manifesting rapid inflammation of the meninges with invasion of the subarachnoid space [1]. The commonest organisms causing community-acquired acute bacterial meningitis are *Streptococcus pneumoniae*, *Neisseria meningitidis*, and *Haemophilus influenzae* type bB [2]. Although *Klebsiella pneumoniae* is well known to cause hospital-acquired meningitis following neurosurgical interventions, community-acquired meningitis due to *K pneumoniae* is rare [2]. The emergence of hyper-virulent strains of *Klebsiella pneumoniae* has led to an increase in more severe disease with complications (3). Diabetes mellitus is a common precipitating factor for community acquired *Klebsiella* meningitis. Early microbiological diagnosis and initiation of antimicrobial treatment are the cornerstone to reduce the case fatality rate and morbidity associated with this disease [4].

Case report

A 64-year-old female was admitted with a three-day history of fever, nausea and vomiting and a reduced level of consciousness for one day. She was a resident of a village, Thalathuoya, in the Central Province of Sri Lanka and did not have any recent travel history. She denied any symptoms suggestive of a respiratory tract or urinary tract infection. On

admission, she was febrile with a temperature of 101°F. Her Glasgow coma scale (GCS) admission was 13/15. There was mild neck stiffness. Kernig's sign was negative. Blood pressure was 110/70mmHg with a pulse rate of 100 beats per minute. Her respiratory system and abdominal examinations were normal. There were no focal neurological signs. There was no sinus/mastoid tenderness. Due to the high clinical suspicion of meningitis, she was started on meningitic doses of intravenous ceftriaxone after obtaining blood and urine for culture.

Result of the laboratory investigations were as follows; White blood cell count (WBC) was 14.27×10^9 /L with 91% neutrophils, haemoglobin 14.0g/dL, platelets 248×10^9 per L, ESR 46mm/ 1 hour $\rightarrow$ 109mm/1 hour and C reactive protein (CRP) was 26.5mg/L. Liver function tests, renal function tests and serum electrolytes were normal. Her urine full report was normal. Urine culture did not show any growth. The chest X-ray was normal. Her random blood sugar on admission was 312mg/dl and fasting blood sugar on the following day was 364mg/dl and a diagnosis of diabetes mellitus was made. Non contrast CT brain was normal. Her arterial blood gases on admission revealed a pH of 7.44 with compensated metabolic acidosis and an anion gap of 17. A lumbar puncture was performed the day following admission. Cerebrospinal fluid (CSF) analysis showed an opaque fluid (Figure 1) with a WBC of $1460/\text{mm}^3$ with 97% neutrophils and 3% lymphocytes and RBC of $3650/\text{mm}^3$. CSF glucose was very low (undetected) whereas serum blood glucose at the time of lumbar puncture was 181mg/dl. CSF protein level was 898.5mg/dl. CSF cultures did not show any growth, probably because antibiotics were started before lumbar puncture. Blood cultures, however, were positive for *Klebsiella pneumoniae* (hypervirulent strain) (Figure 2) after one hour of incubation. The isolate was sensitive to almost all antibiotics.



Figure 1: Thick, purulent CSF on initial lumbar puncture



Figure 2: Hypervirulent *Klebsiella pneumoniae* growth on blood agar

She was treated with intravenous (IV) ceftriaxone 2g 12 hourly, for a total of 21 days. Clinical improvement was evident within 2 to 3 days of starting antibiotics and her GCS improved to 15/15. She was also treated with IV dexamethasone which was gradually tapered while in the hospital. As she was diagnosed with diabetes mellitus, she was started on subcutaneous soluble insulin which was subsequently converted to oral hypoglycaemics. She was discharged following a complete recovery.

Discussion

While the classical triad of fever, neck stiffness and altered mental status are seen in only 44% of presentations, 95% of patients display at least two of the symptoms of fever, neck stiffness, headache and altered level of consciousness (GCS score of less than 14) [5].

The main predisposing factor for community acquired *Klebsiella pneumoniae* meningitis is diabetes mellitus, older age and a preexisting *Klebsiella pneumoniae* bacteraemia [6].

Community-acquired *Klebsiella pneumoniae* meningitis patients are more likely to have had preceding infections such as pneumonia, otitis media, pyogenic liver abscesses, septic endophthalmitis, urinary tract infections, perianal abscess, necrotizing fasciitis, and lumbar discitis (3,4). While the case fatality rate of *Klebsiella* meningitis is around 30%-40%, the survivors are likely to have residual neurological deficits [6].

Among the different phenotypes of *Klebsiella pneumoniae*, the hypervirulent phenotype is an emerging phenotype causing invasive diseases. It differs from the classical phenotype by its hypermucoviscosity and highly invasive nature [3]. The hypervirulent form is mainly prevalent in Asia. Gastrointestinal colonization is the main risk for transmission and infection [3].

A better clinical outcome in a patient with *Klebsiella* meningitis is dependent on several factors such as early recognition and early prompt initiation of antimicrobial therapy. Specifically, the initiation of antibiotics before deterioration of consciousness to a level GCS of less than 7 has been associated with good outcomes [6].

The choice of antibacterial and the duration of treatment in *Klebsiella pneumoniae* meningitis has not been determined. However, patients treated with ciprofloxacin, carbapenems, and aztreonam also have shown a response [4]. The duration of therapy ranges from 14 to 21 days, but the choice of treatment and the duration of treatment are determined by the individual patient response. Emerging antibacterial resistance is a common threat as in all infective diseases [4]. There has been evidence of favorable outcomes with the use of steroids in acute bacterial meningitis with a reduction in systemic complications and reduced neurological sequelae [5].

Conclusion

Community-acquired *Klebsiella pneumoniae* meningitis should be a differential diagnosis in a patient presenting with clinical features of acute bacterial meningitis, especially in the setting of diabetes mellitus. The presence of hypervirulent strains of this organism in Sri Lanka poses a challenge. A high degree of clinical suspicion, microbiology support for prompt diagnosis and effective treatment is the cornerstone of a better outcome and reduced morbidity and mortality.

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