

First case of pyogenic meningitis due to *Streptococcus pluranimalium* in Rwanda

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ABSTRACT

CASE: We report the first case of pyogenic meningitis due to *Streptococcus pluranimalium* in Rwanda in a 14-year-old male.

DISCUSSION: *Streptococcus pluranimalium* was isolated from animals and rarely reported in humans. Most reported cases were from middle- or higher-income countries due to the fastidiousness of the organism, which cannot be isolated using routine culture media, requiring advanced microbial identification systems. In Rwanda, as in other low-income countries, there is the emergence of multi-drug resistant bacteria, leading to increased use of carbapenems and vancomycin. This case is an eye-opener that antimicrobial stewardship efforts need to be augmented.

Keywords: Sepsis, Meningitis, *Streptococcus Pluranimalium*, Rwanda.

INTRODUCTION

Like the rest of the world, Rwanda shares the trend of emerging bacterial resistance, which threatens the effectiveness of successful treatment of infections using the limited available resources [1]. Recently in Rwandan tertiary hospitals, there has been a surge in multi-drug resistant pathogens mostly observed in adults patients, resulting in increased use of carbapenems and vancomycin [2,3]. Septic meningitis is still a life-threatening condition and it leaves the survivors with severe sequelae such as hearing loss and neurodevelopment deficits [4].

We present the first Rwandan case of *Streptococcus*

plurinarium in a 14-year-old male with septic meningitis.

CASE PRESENTATION

A 14-year old-male cattle herder with no significant past medical history presented to a health facility with the following chief complaint(s): fevers, headache, vomiting, seizures and left upper and lower limb weakness.

He was previously well until two weeks before admission. The clinical presentation started with a high-grade fever associated with diffuse progressive severe headache and generalized body weakness. He consulted the nearest health centre,

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where a blood smear for malaria was negative two times; thereafter, he was discharged back home with antipyretic drugs.

A high-grade spiking fever was noted two days later with a persistent severe headache. The family continued to give paracetamol without improvement. On day three, the clinical status worsened with altered mental status; he became more drowsy with refusal to drink and eat. So, the family brought him back to the health center where he was transferred immediately to the District Hospital (DH). At the district hospital (DH), a full blood count (FBC) showed leucocytosis of $27 \times 10^3/\mu\text{l}$, with a differential showing neutrophils of 87%, lymphocytes of 10.13%, monocytes of 1.98%, eosinophil of 0.02% and basophils of 0.87%. Physical examination findings from the DH were not available to the authors.

Antibiotic treatment was prescribed with meningitic doses of Cefotaxime (200mg/kg/day in 3 divided doses) and ampicillin (200mg/kg/day in 3 divided doses). On the second day post-admission, he developed generalized tonic-clonic seizures and generalized body weakness, leading to transfer to the tertiary hospital of Kigali University Teaching Hospital (CHUK).

On his arrival at CHUK, he was severely ill-looking with a decreased level of consciousness, mildly distressed with a temperature of 38°C. His neurological exam was significant for Glasgow Coma Scale (GCS) score of 10/15 (E2+V3+M5), neck stiffness, facial palsy/cranial nerve VII palsy, and left upper and lower limbs hemiparesis. Pupils were reactive to light bilaterally and the fundoscopic exam was normal. The abdomen was soft with tenderness on deep palpation at the right upper quadrant no hepatomegaly. The rest of his physical exams were normal.

The laboratory investigations: done on his first day of admission revealed transaminitis with aspartate aminotransferase of 111 IU/L (normal range 15–40 U/L) and Alanine transferase of 222 IU/L (normal range 10–45 U/L); the FBC showed leucocytosis of $31.7 \times 10^3/\mu\text{l}$ with Neutrophils of 90.7%, lymphocytes of 6.76%, eosinophil of 0.09%, basophils of 0.252% and monocytes of 2.18%. He also had moderate hyponatremia of 129 mg/dl thought to be due to a possible syndrome of inappropriate antidiuretic hormone secretion (SIADH). The SIADH could not be confirmed with urine biochemistry due to the stock-out of the urine dipstick strips and urine biochemistry reagents in the hospital laboratory during his hospital stay.

Imaging: Abdominal ultrasound showed thickened gall bladder wall with significant peri-cholecystic fluid collection suggestive of cholecystitis. The echocardiogram had normal findings. Brain Computed Tomography (CT) scan performed prior to second lumbar puncture was in favour of meningitis with multifocal cerebral infarcts as arterial cerebrovascular complications (Figure 1-2). CSF analysis: The CSF analysis was done three times (Table1). The 1st one (performed after 8 days of antibiotherapy) was turbid with leucocytosis of 2200 cells/mm³ with a neutrophilic predominance of 90%. The initial CSF culture grew *Streptococcus pluranimalium* using Vitek®2 (bioMérieux), the bacterial identification system from the Rwanda National Referral Laboratory (RNL). The antibiogram reported sensitivity to linezolid, erythromycin, and chloramphenicol and resistance to Vancomycin. There was hypoglycorrhachia (CSF glucose 22.5mg/dl, normal range 40–80 mg/l) and proteinorrachia (CSF protein level of 0.78g/l, normal range 0.05–0.4 g/L).

The second CSF analysis done on day 2 vancomycin and meropenem was still turbid with white blood cells of 890 cells/mm³ with neutrophilic predominance at 100%, but no bacteria seen on gram stain; glycorrachia and proteinorrachia improved slightly to 39.6mg/dl and 0.58gr/l respectively (Table 1). On his sixth day post-admission, the antibiogram became available and his regimen was changed to intravenous chloramphenicol at 100 mg/kg/day in four divided doses. After 15 days of chloramphenicol, he was afebrile and the third CSF analysis results available on 17th day post chloramphenicol initiation were clear with no leucocytes. Glycorrachia and proteinorrachia were respectively 54mg/dl and 0.26gr/l (Table 1).

Treatment: At CHUK, empiric therapy was initiated with intravenous cloxacillin, ceftriaxone, and metronidazole. On day 3 of admission, the patient's clinical status deteriorated rapidly with altered mental status and fevers, so his regimen was switched to meningeal doses of vancomycin and meropenem.

Neurological sequelae: After finishing 17 days of chloramphenicol, he remained afebrile with a normal GCS of 15/15 but with persistent left hemiparesis. On his 26th day post-admission, he was discharged home with continued physiotherapy at the nearest district hospital. At the follow-up visit at CHUK after one month, the patient had minimal recovery of his left hemiparesis

but could ambulate using crutches and had left upper limb motor function impairment.

DISCUSSION

This is the first case of *Streptococcus pluranimalium* infection reported in a paediatric patient in East Africa and from a low-income country to the best of our knowledge.

In low-income countries, bacterial meningitis has been one of the leading causes of death and neurodevelopmental deficits in children. The major bacterial pathogens in the paediatric population are *Streptococcus pneumoniae*, *Haemophilus influenzae type B* (Hib) and *Neisseria meningitidis* [4]. The introduction of the pneumococcal and Hib vaccines in childhood has reduced the incidence of bacterial meningitis [5]. In some instances, bacterial meningitis can originate from unusual organisms such as zoonotic pathogens [6].

Streptococcus pluranimalium is a non-haemolytic *Streptococcus* initially isolated in domestic animals as the cause of mastitis in cattle, genital tract, respiratory tract and tonsillar infections in goats and cats, and meningoencephalitis in the calf [7]. This streptococcal species is called *pluranimalium* because its pathogenicity is linked with various animals, including avian species, mammals, and fish [8].

There was an exposure to cattle in our particular case as our patient was a cattle herder. However, in the literature, most of the reported cases did not have a known animal exposure, except in one case reported to have contact with chicks [9].

All the previously reported human cases in the literature have been from high and middle-income countries. These cases underlined its association with brain abscess, subdural empyema, septicaemia, and purulent infective endocarditis (Table 2) [10]. It is a fastidious organism, which cannot be isolated using routine culture media, requiring advanced microbial identification systems. In our case, it was isolated at the Rwanda National Referral Laboratory using an automated microbial identification system (Vitek®2). However, in all seven cases previously reported, the most advanced laboratory analytical techniques which were not used in our case, failed to prove if this strain causes infections in humans [10].

In animal model studies, the complete genome sequencing study *S. pluranimalium* found different virulence factors that confer resistance

to macrolides and lincosamides [11]. Recent case reports conclude only on its implication in the treatment of brain abscess, septicaemia, subdural empyema and infective endocarditis, and report sensitivity to broad-spectrum antibiotics including macrolides, linezolid, quinolones, vancomycin, and chloramphenicol, so more data is needed on its antibiotic susceptibility in clinical practice [12].

Low-income countries lack access to automated microbial identification systems and molecular technologies needed to identify fastidious bacteria and determine antibiotic susceptibility. As a result, East African studies report the tendency of most clinicians to use broad-spectrum antibiotics for patients who do not respond to initial empiric treatment [13]. In this case, treatment was changed to vancomycin and meropenem upon transfer to the tertiary facility due to lack of clinical improvement, but the final antibiogram showed resistance to Vancomycin. Therefore, a lack of antibiotic susceptibilities can lead to the overuse and misuse of broad-spectrum antibiotics. In this particular case, the antibiotics initiated empirically and the provided management at the district hospital, including the lumbar puncture, led to a neurological deterioration of the patient.

CONCLUSION

This is the first case of *Streptococcus pluranimalium* reported in eastern Africa. In developing countries, escalation to broad-spectrum antibiotics in the absence of bacterial culture and antibiotic susceptibilities can have significant consequences, including patient complications and morbidity, in addition to increased prevalence of antimicrobial resistance.

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