

Meningitis Caused by *Streptococcus suis*: A Neglected Emerging Zoonotic Pathogen in Ghana

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ABSTRACT

We present the case of a forty six years old male who presented with sudden bilateral hearing loss, vertigo, headache, fever, chills and nausea. He is an alcoholic who handles fresh pork and consumes large amounts of pork on daily basis which puts him at high risk for *Streptococcus suis* infection. A culture of his cerebrospinal fluid yielded *Streptococcus suis*. *Streptococcus suis* infection is a neglected zoonotic pathogen that causes morbidity and mortality in humans. Pigs serve as the natural host for *Streptococcus suis*. After 7 days of treatment with intravenous Rocephin and 14 days of oral Erythromycin as per sensitivity patterns, all other signs and symptoms resolved, except for the bilateral hearing loss and mild ataxic gait. Human infection by *Streptococcus suis* is currently underreported and underdiagnosed in several countries especially in sub-Saharan Africa due to lack of awareness by the general public and physicians. We report the first reported case of meningitis caused by *Streptococcus suis* in Ghana.

Keywords: *Streptococcus suis*; Ghana; Meningitis; Neglected disease

INTRODUCTION

Streptococcus suis is a bacterium that causes disease mostly in pigs. It is however a neglected zoonotic pathogen that causes morbidity and mortality in humans [1]. In 2005, a large outbreak of this infection occurred in Sichuan China where 204 people were infected and 38 of them ended up dying [2]. Pigs serve as the natural host for *Streptococcus suis* [3]. *Streptococcus suis* is a one of thirty-five original capsular serotypes of streptococcus species that infect pigs [4]. It is however the most pathologically significant of the twenty-nine recognized streptococcal serotypes in pigs [4]. *Streptococcus suis* is a gram-positive bacterium that is made up of short chains hence described as grape-like [3]. It is lactose and catalase positive, shows no growth in 6.5% NaCl agar and Voges-Proskauer (VP) negative [3-6]. It can also be diagnosed via polymerase chain reaction [3,4].

S. suis causes a spectrum of diseases ranging from acute bacterial meningitis to septicemia and death in pigs [4]. In humans *Streptococcus suis* causes septicemia, meningitis, endocarditis, arthritis and septic shock with a very high mortality rate [2]. In humans it has a case fatality rate of 2.9% [7] and is the third leading cause of bacterial meningitis in Hong Kong(1). Bacterial

meningitis is the main clinical syndrome caused by the *Streptococcus suis* [1-8]. Classically it also leads to early hearing impairment in humans [9]. With prompt and appropriate antibiotic treatment, patients usually recover with post infectious sequelae of deafness and vertigo [10]. It is transmitted to humans via improper handling of infected pigs, direct inoculation through skin abrasions [4-11] and consumption of improperly cooked pork products [1]. It is thus considered as an occupational disease for people into pig farming and industries that deals with pork packaging. Serotype 14 and serotype 2 are the two main serotypes of pathological significance to man [4-7].

Human infection by *Streptococcus suis* is currently underreported and underdiagnosed in several countries especially in sub-Saharan Africa due to lack of awareness by the general public and physicians.

CASE PRESENTATION

We report the first published human case of meningitis caused by *Streptococcus suis* in Ghana. A forty six years old male with 3 days duration of headache, fever, chills, nausea, vertigo and sudden bilateral hearing loss who presented to the Out-Patient-

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Department of a hospital in Ashanti region of Ghana. His dietary habits include an absolute penchant for pork which he handles and consumes in large quantities, usually ill cooked. He has no known chronic illness and no known drug or food allergies. He consumes about 7 units of alcohol per week.

At presentation, he was lethargic and febrile with a temperature of (39.3°C). He was anicteric, not pale and hydration was satisfactory. His blood pressure was 130/70 mmHg with a pulse of 90 beats per minute, Neck was supple, Kernig's sign was negative but he had bilateral hearing loss and an ataxic gait. No other focal neurologic signs were noted. All other findings on examination was normal. Blood was sampled for routine laboratory test with normal findings. A blood culture also did not yield any remarkable results. All serologies including syphilis and HIV were negative. A lumbar puncture performed under aseptic techniques, was non traumatic, not under pressure but yielded misty white CSF with a larger volume clear. A culture of the CSF yielded *Streptococcus suis*, sensitive to ampicillin, cefotaxime, ceftriaxone, clindamycin, erythromycin, penicillin G and vancomycin (Figure 1).

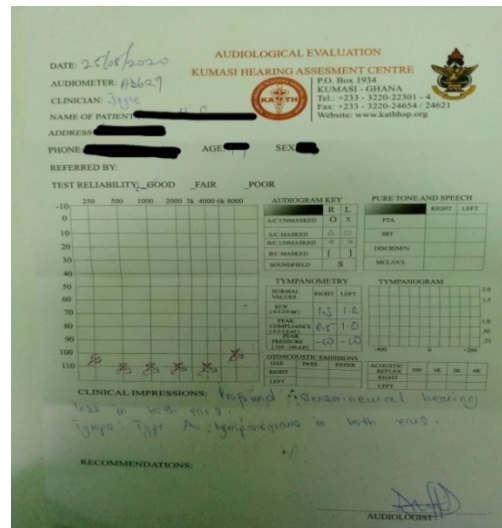


Figure 2: Sensorineural hearing loss.

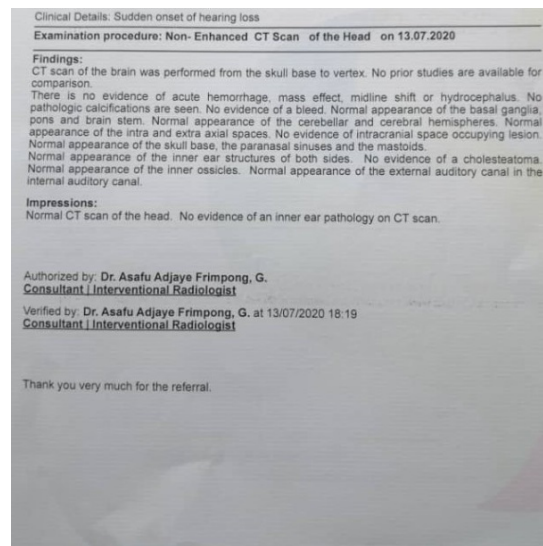


Figure 3: A CT scan of the head showed no pathology.

TEST	NORMAL	ABNORMAL	UNITS	REFERENCE RANGE
NB: "0.01" implies draw time unknown/not stated.				
CSF DIAGNOSTICS				
APPEARANCE: Blood stained AC				
SUPERNATANT: Clear & Colourless AC				
GLUCOSE, CSF	1.87 I	mmol/L	2.20-3.90	AC
PROTEIN, CSF	1.83 H	g/L	0.15-0.45	AC
CSF MICROSCOPY				
NEUTROPHILS	8	/mm ³		AC
LYMPHOCYTES	100	/mm ³		AC
RED BLOOD CELLS	>2250	/mm ³		AC
MICROSCOPY				
GRAM STAIN	See Below			AC
Leucocytes	1+			AC
Gram Pos Cocci	2+			AC
CULTURE AND SENSITIVITY				
CSF CULTURE: See Below				
ISOLATE	2+	<i>Streptococcus suis</i> isolated		AC
One of the most common zoonotic pathogens causing bacterial meningitis is <i>Streptococcus suis</i> . This pathogen has no natural reservoir in pigs and may cause meningitis, endocarditis and sepsis in humans after contact with pig or pork.				
AMPICILLIN	Sensitive			AC
CEFOTAXIME	Sensitive			AC
CEFTRIAXONE	Sensitive			AC
CLINDAMYCIN	Sensitive			AC
ERYTHROMYCIN	Sensitive			AC
PENICILLIN G	Sensitive			AC
VANCOMYCIN	Sensitive			AC
Electronically signed off by: Daniel Appoh				
AC, Asara, 17 Ridge Road, Roman Ridge, PMB 31, KANDA, Asara, Asara 032709680				
End of Report (H-High L-Low)(CL-Critical Low CH-Critical High)				

Figure 1: A culture of the CSF yielded.

Patient also underwent audiometry which revealed profound bilateral sensorineural hearing loss (Figure 2 and 3).

The patient was treated with Rocephin and Erythromycin as per the sensitivity pattern of antibiotics. After 7 days of intravenous Rocephin and 14 days of oral Erythromycin, all other signs and symptoms resolved, except for the bilateral hearing loss and mild ataxic gait. Currently, he is well but with a residual mild ataxic gait, walks unsupported with a few staggers and bilateral hearing loss. He was counselled on the possible benefit of a cochlear implant.

RESULTS AND DISCUSSION

Meningitis is the inflammation of the meninges and the subarachnoid space. It may spread to involve the cerebral cortex. Causative agent could be of bacterial or viral origin. Meningitis is the most common manifestation of *Streptococcus suis* infection occurring in about 68% of reported *S. suis* presentation [12]. Classically meningitis presents with fever, neck stiffness and altered mental status [13]. However, this classic presentation is found only in 44% of the patients [14]. *Streptococcus suis* is a zoonotic pathogen that causes infections in pigs and humans. Predisposing factors for transmission in humans include: male

sex, raw pork consumption, pig-related occupation, pigs or pork exposure, alcohol drinking, skin injury especially during pork exposure and underlying diseases contributing to immunocompromised conditions such as diabetes mellitus, splenectomy, immunosuppressive medications and cancer [13-15]. This case report describes a male alcoholic who handles fresh pork and consumes large amounts of pork on daily basis which puts him at high risk for *Streptococcus suis* infection. In this report the patient initially started experiencing non-specific symptoms of fever, headache, chills and nausea which was later followed by vertigo and bilateral hearing impairment. Clinical examination revealed a temperature of 39.3, ataxic gait and bilateral hearing loss. Case fatality rate from *Streptococcus suis* meningitis is low compared to meningitis of other origin (15). It was found to be 2.9% according to 2015 study by Anusha and others [13]. However post neurologic sequelae are more common. These include: hearing loss, ataxia, cognitive impairment and tinnitus [13-16]. The hearing loss is sensorineural in nature, can be irreversible and commonly associated with vertigo [2-16]. It is the most common sequelae. This reported case continues to experience ataxia and bilateral hearing loss after appropriate antibiotic treatment. Relevant laboratory investigations in the management of *Streptococcus suis* infections include full blood count which may show leukocytosis, blood culture, CSF biochemistry and culture, head CT scan or MRI and audiometry. Treatment is basically dependent on culture results but generally the organism is susceptible to beta-lactam antibiotics, such as the penicillins, and cephalosporins.

CONCLUSION

We report the first reported case of meningitis caused by *Streptococcus suis* in Ghana. *S. suis* infection should be considered a differential diagnosis in cases of meningitis that present with early hearing loss. It is also imperative to understand the factors that lead to the zoonosis, possible community spread and disease progression of *S. suis* infections. To achieve this there needs to be an epidemiological and clinical characterization of *S. suis* in sub-Saharan countries. To reduce morbidity and mortality associated with *S. suis* there also needs to be sensitization of the general especially populations at risk in the proper handling of pigs and pork products.

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CONFLICT OF INTEREST

All authors declare no conflict of interest

CONSENT FOR PUBLICATION

Patients consent was received in a written document

ETHICAL APPROVAL

Not required

AVAILABILITY OF DATA MATERIAL

Not required

CODE AVAILABILITY

Not required

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