

# Atypical case presentations of *Streptococcus pneumoniae* from level 1 trauma centre in India -A case series

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## ABSTRACT

*Streptococcus pneumoniae* is a rare cause of appendicitis, skin soft tissue, and bloodstream infections. The clinical significance of its isolation from samples of skin or soft tissues and pus from the appendix is poorly understood. Invasive pneumococcal disease (IPD) continues to be a problem in India, associated with a high case fatality rate despite treatment facilities available in the hospital settings. In the present study, we report three adult cases, one presented as acute appendicitis, the other had skin and soft tissue infection, and third presented with bloodstream infection caused by *Streptococcus pneumoniae* from our level 1 trauma center. The patients with acute appendicitis and soft tissue infection recovered when treated with appropriate antimicrobial therapy, however, the one with pneumococcal sepsis could not be revived.

**Keywords:** Appendicitis, invasive pneumococcal disease (IPD), skin and soft tissue infection, *Streptococcus pneumoniae*

## Introduction

*Streptococcus pneumoniae* (*S. pneumoniae*) is a common cause of pneumonia, meningitis, sinusitis, and otitis media in children and infants. However, there are case reports that have demonstrated highly atypical presentations of pneumococcal infections, those affecting the gastrointestinal system, central nervous system, ocular system, skin and soft tissues, and genitourinary tract.<sup>[1]</sup> Here we report unusual presentations of *S. pneumoniae* causing abdominal infections, skin and soft tissue infections and bloodstream infection from our tertiary care center.

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Studies have shown that *Streptococcus pneumoniae* can cause primary peritonitis in children and adults with underlying illness such as nephrotic syndrome, sickle cell disease, cirrhosis, and in an immunocompromised host.<sup>[2]</sup> With regard to skin and soft tissue infections, *Streptococcus pneumoniae* can either be a colonizer or a pathogen. The isolation of pneumococci from the skin and soft tissue infections is quite unusual, and it is difficult to interpret clinically since it can range from simple colonization in immunocompetent hosts to severe infection in patients with underlying conditions.<sup>[3]</sup> The isolation of *S. pneumoniae* from sterile body sites such as blood or cerebrospinal fluid (CSF) or other normally sterile sites is defined as invasive pneumococcal disease. It carries a mortality rate of 15%–20% within the first 72 h regardless of the primary cause.<sup>[4]</sup> Thus, even though being a rare entity, primary care physicians must include *S. pneumoniae* as one of the differential diagnoses for the above-mentioned presentations especially in patients with underlying risk factors.

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In this study, we evaluated the clinical significance of *S. pneumoniae* isolated from three rare cases of acute appendicitis, skin and soft tissues infection, and bloodstream infection from our tertiary care center.

## Material and Methods

This is a prospective study conducted over a period of 6 months from August 2018 to January 2019 at our tertiary care center. During the above time frame, three patients were admitted with atypical presentations of *Streptococcus pneumoniae*, which includes appendicitis, skin infection, and bloodstream infection. Pus and blood samples of these patients grew *Streptococcus pneumoniae*, which were identified up to the species level by matrix-assisted laser desorption/ionization-time of flight mass spectroscopy (MALDITOF MS), Biotyper OC, version 3.1 (Bruker Daltonics, Bremen, Germany). Antimicrobial susceptibility testing was performed by Kirby–Bauer disc diffusion method on Muller Hinton blood agar and by VITEK 2 AST-ST03 card (BioMérieux) system. The minimum inhibitory concentrations (MICs) were interpreted based on the Clinical and Laboratory Standard Institute (CLSI) criteria for *Streptococcus pneumoniae*. Patient's clinical details like age, sex, diagnosis, presence of a central line, antibiotics administered and its dosage for a particular number of days, dates of central line removal, comorbid illnesses, reports of other culture samples, and outcome of the clinical case scenario were documented. Patients' consent was obtained for publication in a written format.

### Case 1

A 26-year-old male was admitted to the emergency department with the complaints of fever, right-sided abdominal pain, and vomiting. The laboratory parameters demonstrated leucocytosis (18800 cells/mm<sup>3</sup> with 85% neutrophils). Ultrasound of the abdomen revealed enlarged appendix with interbowel fluid in the right iliac fossa suggestive of acute appendicitis. The patient underwent a laparoscopic appendectomy on an elective basis. The surgery revealed the presence of pus in the appendix. Appendicectomy was performed and pus was sent to the microbiology laboratory for culture. Following surgery, the patient was started on empirical antibiotics injection cefoperazone/sulbactam 1-g every 12 h and injection metronidazole 500-mg every 8 h. Pus culture drained from the appendix grew *Streptococcus pneumoniae*. The minimal inhibitory concentration of the pneumococcal isolate is described in Table 1. The treatment was changed to intravenous cefuroxime injection 3 grams 8 hourly along with 500 mg metronidazole every 8 h for 2 weeks. The patient was discharged after the completion of antibiotic dosage without any complications.

### Case 2

A 36-year-old male was admitted with a history of assault and stab injury to his left arm. On local examination, there was

**Table 1: Antimicrobial susceptibility profile of *Streptococcus pneumoniae* isolated from three cases**

Antibiotics	Minimum inhibitory concentration (MIC)		
	Case 1	Case 2	Case 3
Benzylpenicillin	≤ 0.06 (S)	≥ 8 (R)	≤ 0.06 (S)
Cefotaxime	≤ 0.12 (S)	4 (R)	≤ 0.12 (S)
Ceftriaxone	≤ 0.12 (S)	≤ 0.25 (S)	≤ 0.12 (S)
Chloramphenicol	2.0 (S)	2.0 (S)	2.0 (S)
Clindamycin	≤ 0.25 (S)	≤ 0.25 (S)	≤ 0.25 (S)
Erythromycin	≤ 0.12 (S)	≥ 8 (R)	≤ 0.12 (S)
Levofloxacin	≥ 16 (R)	1.0 (S)	1.0 (S)
Linezolid	≤ 2.0 (S)	≤ 2.0 (S)	≤ 2.0 (S)
Moxifloxacin	2.0 (I)	0.12 (S)	0.12 (S)
Rifampicin	≤ 0.06 (S)	≤ 0.06 (S)	≤ 0.06 (S)
Tetracycline	≤ 0.25 (S)	≥ 16 (R)	4.0 (R)
Tigecycline	≤ 0.06 (S)	≤ 0.06 (S)	≤ 0.06 (S)
Trimethoprim/sulfamethoxazole	160 (R)	160 (R)	160.0 (R)
Vancomycin	0.5 (S)	0.5 (S)	0.5 (S)

active spurting of blood from the left arm at the injury site and both the left radial and ulnar artery pulse were not palpable. Injection Tetanus 0.5 mL intramuscular (IM) stat, injection tetanus immunoglobulin 500 IU IM stat, injection Metrogl 100 mL intravenous (IV) stat, injection Augmentin 1.2 gram IV stat was given and tourniquet was applied to the left arm above the level of injury. Hematologic studies revealed the following values: white blood cells 15,300/mm<sup>3</sup> with 85% neutrophils, one eosinophil and one monocyte, haematocrit 32.1%, erythrocyte sedimentation 120 mm/h, blood glucose 72 mg/dL, serum creatinine 0.7 mg/dL, and blood urea nitrogen was 12 mg/dL. The patient was shifted to the operation theater and resection and primary anastomosis of the left brachial artery were performed along with median nerve repair. The patient postoperative stay was uneventful, and the patient was discharged. The patient then came to the outpatient department after 2 weeks with complaints of pus discharge from the left arm suture site. Pus culture sent for culture sensitivity grew *Streptococcus pneumoniae* susceptible to ceftriaxone, tetracycline, levofloxacin linezolid, vancomycin, rifampicin, clindamycin, and tigecycline. The isolate was however resistant to penicillin, erythromycin, cefotaxime, and tetracycline. The minimum inhibitory concentration (MIC) of the isolate is described in Table 1. Regular dressing of the wound was performed and the patient was treated with tablet augmentin 625 mg tds for 6 days.

### Case 3

A 36-year-old male presented to the emergency department with a history of fall from height (roughly 10 feet) with an impact on the right side elbow and right side gluteal region. There was a history of loss of consciousness with no history vomiting, seizures, and the ear, nose and throat bleed (ENT) bleed, chest pain, abdominal pain, difficulty in breathing, or hematuria. The patient had the following vitals on presentation: heart rate of 121 bpm, pulse oximeter reading 87% on room air, respiratory rate of 18 breaths per minute, a temperature of 35.7°C, and blood pressure 118/78

mmHg. On examination, the patient was hemodynamically stable and irritable with the Glasgow Coma Scale (GCS) being E3V2M5. The case was suspected to have a head injury with fracture of long bones (polytrauma). The local examination of the right arm and the right leg revealed swelling, tenderness, and deformity. X-ray findings revealed intertrochantric fracture of the right femur and right side olecranon fracture. The CT scan revealed right-sided thin frontal subdural hematoma (SDH), diffuse cerebral edema, effaced ventricles with no mass effect, and midline shift. CT of the cervical spine revealed C5 burst fracture with right lamina fracture, C6 vertebral body fracture along with C5–6 subluxation. The patient neck was immobilized with Philadelphia collar, and the patient was started on injection mannitol 100 mL IV BD, injection piperacillin/tazobactam 4.5 gm IV TDS, injection amikacin 500 mg IV BD, injection metrogyl 500 mg IV TDS. The patient underwent a decompressive craniectomy on an elective basis with the evacuation of the acute subdural hematoma (SDH) with lax duroplasty and the insertion of intracranial pressure (ICP) sensor. Postoperatively, the patient was shifted to the intensive care unit (ICU) and kept under observation. On the 6<sup>th</sup> postoperative day, the patient developed fever. Blood workup showed hemoglobin 9.5 g/dL, total leucocyte count (TLC) 15,450 cells/mm<sup>3</sup>, CRP 516 mg/L, urea of 32 mmol/L, creatinine of 1.83 µmol/L, sodium 132 meq/L, potassium 3.8 meq/L, and chlorides 98 meq/L. Bronchoalveolar lavage (BAL) and two sets of blood cultures were sent, one from the central line and one from peripheral line. BAL grew normal flora, both the blood cultures grew *Streptococcus pneumoniae*, the minimum inhibitory concentration (MIC) of the isolate is depicted in Table 1. The patient's antibiotics were changed to high dose intravenous ceftriaxone to cover the invasive *S. pneumoniae*. Despite all possible resuscitative measures, the patient's general condition did not improve with GCS being E3V2M1. The patient succumbed to death on the 10<sup>th</sup> day of ICU stay.

## Discussion

*Streptococcus pneumoniae* causing intraabdominal infections is a rare entity. The incidence of pneumococcal appendicitis is about 0.3% of appendicitis patients. There are no specific clinical features that might aid in the diagnosis. The clinical picture usually mimics appendicitis or secondary peritonitis with or without sepsis.<sup>[5]</sup> The predisposing factors for pneumococcal infections include splenectomy, alcohol consumption, connective tissue disorders, steroid use, diabetes mellitus, and intravenous drug use.<sup>[6]</sup> The real clinical challenge for the clinicians arises when it occurs in immunocompetent healthy young adults with no risk factors. Our case also had a similar presentation where we isolated *Streptococcus pneumoniae* from an adult patient with acute appendicitis with no underlying illness. This finding also correlates with few published case reports with no predisposing factors for pneumococcal infection.<sup>[7,8]</sup> Appendicitis is usually a polymicrobial infection in association with *Bacteroides fragilis* and *Escherichia coli*.<sup>[9]</sup> In our case there was a pure growth of only *S. pneumoniae* from the inflamed appendix, which is very rare.

This was similar to a few previous studies, which had reported *S. pneumoniae* as a single etiological agent of acute appendicitis.

The involvement of *S. pneumoniae* in causing skin and soft tissue infections is rare, but there are sporadic case reports showing that it can cause infections in adults with connective tissue disorders and immunosuppressive illness.<sup>[10]</sup> The common sites affected include the face and the neck region followed by the lower limbs and upper limbs. Other uncommon sites include the lower back and abdominal wounds following surgery. Most infections arise spontaneously without any precipitating factors. Local trauma was implicated in few previously published studies.<sup>[11-13]</sup> Our case was a surgical site infection with local trauma as a predisposing factor. Our isolate was resistant to penicillin, erythromycin, and cefotaxime. This finding was similar to a previously published study, which also had a similar resistance pattern.<sup>[3]</sup> Despite the pattern of antibiotic resistance the patient had a favorable clinical outcome. The favorable outcome and prognosis of our case was similar to other published reports.<sup>[1,3]</sup>

Invasive pneumococcal disease (IPD) causing pneumonia, meningitis, and bloodstream infection contributes to significant morbidity and mortality in all the age groups, particularly in children <2 years, adults more than 65 years of age. The most common co-morbid illness associated with IPD includes patients with underlying medical conditions like congestive heart failure, renal failure requiring dialysis, alcohol misuse, hematological malignancies, and human immunodeficiency virus infection (HIV) infection.<sup>[14]</sup> However, in our case study we could not get any history of the smoking, alcohol or drug abuse, diabetes, or any other underlying illness from the patient relatives, and the vaccination status was also unknown. Male gender, traumatic head injury, and polytrauma could be the risk factors in our case, which are documented in the literature as well.<sup>[15]</sup> We could not identify the source of pneumococcal sepsis in our case. This could be due the use of broad-spectrum antibiotics, which would have resulted in difficulty in identifying the primary focus at the time of admission in the ICU. Pneumococcal sepsis with an unidentified primary focus has the highest case fatality rate (36.9%), which was seen in our case study as well.<sup>[14,16]</sup>

## Conclusion

Pneumococcal disease is a major challenge in a developing country like India. Although uncommon, *Streptococcus pneumoniae* can manifest as appendicitis and skin and soft tissue infections in apparently healthy individuals. Thus, it should be considered as a probable etiologic event by the clinicians in both abdominal and skin infections in the community and nosocomial setting. India has the highest morbidity and mortality with regard to invasive pneumococcal disease among elderly adults. Despite having pneumococcal conjugate vaccines, the usage of the vaccines is still suboptimal in countries like India. Thus, the usage of the vaccines effectively depends on the clinician's awareness with regard to its benefits and current vaccination guidelines thereby

improving the quality of life in the elderly individuals and patients with risk factors.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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