



Salmonella paratyphi B meningitis in an infant

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CASE REPORT

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Abstract

We report a case of Salmonella paratyphi B meningitis in a 90 day-old male infant who was admitted with complaints of fever, vomiting and one episode of vacant stare. Clinically, the infant was found to be toxic and dull with a bulging anterior fontanelle. Subsequently, blood and cerebrospinal fluid cultures demonstrated the presence of Salmonella Paratyphi B organism.

Key Words

Salmonella Paratyphi B, meningitis, infant

Implications for Practice

- Salmonella paratyphi B (*S. schottmuelleri*) meningitis is a rare cause of meningitis in infancy.
 - In this patient, Salmonella paratyphi B organism was isolated from both blood and cerebrospinal fluid.
 - Paediatricians in developing countries should consider Salmonella infection in their differential diagnosis when treating an infant with pyrexia. Salmonella intracranial infections are associated with significant mortality, morbidity and treatment failure rates. Timely diagnosis of Salmonella, along with appropriate antibiotics will reduce the mortality and morbidity of the disease.
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Background

Salmonella paratyphi B also known as Salmonella schottmuelleri, only colonises humans. Infection occurs by ingestion of faecally contaminated food or water. Infections due to this organism pose a major public health problem in developing countries. These countries share several characteristics including rapid population growth, increased urbanisation, inadequate human waste treatment, limited water supply, and overburdened health care systems.¹ Central nervous system infections caused by Salmonella paratyphi B are uncommon in infants. Intracranial infections can be in the form of meningitis, brain abscess and subdural collections. In infants, meningitis due to Salmonella paratyphi B is diagnosed from blood cultures although its isolation from cerebrospinal fluid is very rare. The first case of Salmonella meningitis reported by Ghon (1908) was due to Salmonella Paratyphi B.² Cooke et al in their study demonstrated a higher percentage of Salmonella being cultured in the blood than in the cerebrospinal fluid.³ We report an infant with Salmonella paratyphi B meningitis, with Salmonella being cultured in both blood and cerebrospinal fluid.

Case details

A 90-day-old male infant, first born to non-consanguineous parents, presented with a history of fever for two days, one episode of vacant stare lasting for five minutes followed by one episode of vomiting. On examination the infant looked toxic and lethargic with a bulging anterior fontanelle. There were no skin rashes on the body. His vital signs were temperature 103°F, heart rate 142/min, and blood pressure 80/60 mmHg. Neurological examination revealed normal tone and reflexes with equal and reactive pupils. Fundoscopy examination was normal. Other systemic examination was within normal limits. Birth and developmental history had no relevant significance. The infant was on direct breast feeds and also receiving formula feeds. He was admitted with a provisional diagnosis of sepsis, probably acute CNS infection. Laboratory investigations revealed elevated total white blood cell counts of 25010 cells/cu.mm. with neutrophilic predominance. Liver function test, renal function test,



serum electrolytes, calcium and magnesium were normal. In view of suspected central nervous system infection, lumbar puncture was done. Cerebrospinal fluid analysis revealed elevated white blood cells of 1900 cells/cu.mm (polymorphs 70%, lymphocytes 30%). Biochemical parameters showed low glucose concentration (37 mg/dl with corresponding blood sugar 80 mg/dl), elevated protein of 130mg/dl, normal chloride and CSF staining showed gram-negative bacilli. As the CSF picture was suggestive of bacterial meningitis, the infant was started on ceftriaxone (100mg/kg/day). Subsequently, CSF and blood cultures showed *Salmonella Paratyphi B* (*S. schottmuelleri*) growth, which was sensitive to ceftriaxone, ampicillin and fluroquinolones. When blood and CSF samples were plated on blood agar, macconkey agar and chocolate agar, non-lactose fermenting growth (pink) suggestive of gram negative organism was seen on macconkey agar while moist grey growth was observed on blood agar and chocolate agar. Biochemical tests were later done of which, indole was negative and citrate was positive. Triple sugar iron produced abundant H₂S, characteristic of *Salmonella paratyphi B*. Organism produced an alkaline slope with an acid base and mannitol stab line was blurred. Urine cultures were sterile. After a thorough probe of the maternal/infant history, it was evident that the mother was preparing formula feeds using tap water which was not treated, filtered or boiled. The infant was continued on IV ceftriaxone for a period of four weeks. During the stay in hospital, the infant became afebrile within 48 hours of starting antibiotics and did not develop any neurological complications such as hydrocephalus, subdural collections or seizures. The infant's clinical status was duly monitored by neurological assessment and daily head circumference measurement. CSF analysis and neuroimaging done after four weeks of completion of antibiotic therapy were normal. As the infant had improved symptomatically and was haemodynamically stable, he was discharged after four weeks of treatment. Currently, the infant is on regular follow-up in outpatient department.

Discussion

Infection by the *Salmonella* group of organisms has a high prevalence in developing countries. However, meningitis due to *Salmonella* infection is a rare complication. *Salmonella* meningitis has been reported to occur in about 6% of children suffering from *Salmonella* infection. Among infants the incidence rate varies between 1.8-4%.¹

S. Paratyphi B infection is most commonly transmitted by the faecal-oral route. Humans are the major reservoir for *S. Paratyphi B*, with spread occurring by contamination of food products or water by excreta.⁴ In our case, it was detected

that the mother tended to use untreated (not boiled) tap water to reconstitute the formula feeds for her infant. Also noticed was a spate of water-borne diarrheal diseases in the area surrounding the patient's residence. An article published in a leading newspaper reported the necessity of admission of more than 40 cases of water-borne diarrhoeal diseases in the same locality as the patient due to contamination of water supply by sewage. We suspected this contamination to be the source of infection in the patient. It was necessary to screen the mother or caregiver of the infant for carrier state. Both the parents tested negative for *Salmonella* (Widal and stool culture).

Young children are more vulnerable to the complications of *Salmonella* infections like meningitis and septicemia. Decreased neutrophil intracellular killing function, reduced macrophage function, diminished antibody level and poor opsonin activity contribute to the vulnerability of these children to *Salmonella* complications.²

Intracranial *Salmonella* infections can take the form of meningitis, subdural infections, brain abscess, or subdural and epidural empyema. Clinical manifestations of *Salmonella* meningitis vary between adult and pediatric age groups. Brain abscess is more commonly seen in adults, in contrast to subdural collections.^{5,6}

Salmonella infection is not easy to detect clinically due to the varied nature of presentation. Many cases of invasive salmonellosis may not necessarily have a typical history. The most common presentation has been noted to be a triad of fever, bacteremia and meningitis. This is usually followed by altered consciousness levels and focal neurological loss.^{6,7} Clinical diagnosis can be difficult in patients who do not display signs of meningitis or have no focal loss.⁸

The American Academy of Pediatrics now recommends that treatment for *Salmonella* meningitis with cefotaxime or ceftriaxone should continue for four weeks or more, although relapses following cefotaxime therapy have been reported even with four weeks of treatment.⁹ Cerebral abscess due to *Salmonella* species have shown favourable improvement, when a combination of ciprofloxacin and third generation cephalosporins were used for prolonged periods.¹⁰ Choice of third generation cephalosporins in the treatment of *Salmonella* meningitis is because of the enhanced ability of the drug to penetrate into the cerebrospinal fluid. Other drugs usually used in the treatment of *Salmonella* infection such as ampicillin and chloramphenicol have been found to be associated with a higher rate of relapse. Also infected infants who have been



treated for a period of three weeks or less have a higher chance (75%) of relapse as compared to patients treated for four weeks. Due to the intracellular nature of the Salmonella organism and the difficulty in maintaining high intra cellular levels of antibiotics in the CSF, relapses are a complication to expect.⁹ There are many reports about the outbreaks of multidrug resistant Salmonella infections on the Indian subcontinent. In typhoidal isolates, the mechanism of resistance to ampicillin, chloramphenicol and cotrimoxazole is plasmid mediated and for quinolones it is chromosomally acquired. This is due to the widespread availability of these antimicrobial agents as over-the-counter drugs in these regions.¹¹ The S. Paratyphi B in this case was susceptible to third generation cephalosporins and treatment with ceftriaxone was continued for a period of four weeks.

The treatment protocol for Salmonella meningitis can be modified depending upon the sensitivity pattern of the organism and the clinical response to the antibiotic in use. The need to undergo subsequent lumbar punctures after first culture negative CSF depends on the clinical condition of the patient.⁹ Salmonella meningitis tends to cause a high percentage of neurological abnormalities, hence neuroimaging is recommended in all patients.¹² Plenty of information can be gleaned from neuroimaging giving valuable insights into the treatment choice, duration and prognosis of the disease. Due to financial constraints a neurosonogram was done on this patient.

Salmonella intracranial infections are associated with high mortality, and significant neurological sequelae in those who survive, with high treatment failure rates. Neurological sequelae include epilepsy, chronic hydrocephalus, hemiparesis, visual impairment, athetosis and mental retardation.¹³ These complications are commonly seen in patients who experience protracted fever (>10days) in spite of adequate antibiotic therapy. In the past, mortality rates due to meningitis were 40 to 60%. These numbers have reduced significantly due to optimal diagnosis and management.¹² To the best of our knowledge, this is the fourth case report of Salmonella Paratyphi B meningitis in the infancy age group with isolation in both blood and cerebrospinal fluid.

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PEER REVIEW

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests. We also declare that all the authors have approved the final version of this manuscript.

PATIENT CONSENT

The authors, Mahalakshmi R, Rajeshbabu B, Mohan R, Balakumaran D, Venkataraman P, Vinoth P N , declare that:



1. They have obtained written, informed consent for the publication of the details relating to the patient(s) in this report.
2. All possible steps have been taken to safeguard the identity of the patient(s).
3. This submission is compliant with the requirements of local research ethics committees.