CASE REPORT

Preterm delivery and neonatal meningitis due to transplacental acquisition of non-typhoidal *Salmonella* serovar *montevideo*

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SUMMARY

A male infant was born at 34 weeks' gestation to a primigravida mother. The mother had a history of 1 day of diarrhoea and mild fever 8 days prior to delivery. Her blood culture was negative during the illness and her stool did not grow any pathological organism. The baby had poor feeding during the first day of his life followed by hypoglycaemia and episodes of seizure on day 2 and 3 of life. Blood culture of the baby and placental swab from the mother grew *Salmonella* serovar *montevideo*. Both baby and mother were treated with a course of cephalosporin for 21 and 7 days, respectively. Although non-typhoidal *Salmonella* often causes gastroenteritis in normal humans, it can cause invasive diseases in immunocompromised hosts and people at extremes of ages. Transplacental spread of *Salmonella* needs consideration in favourable epidemiological scenarios as its implications on fetal and newborn's life are serious.

She was administered an intramuscular dose of bet-methasone 5 h prior to delivery. She was afebrile throughout labour. Liquor was clear. Intermittent fetal cardiac monitoring throughout labour was normal.

The baby was vigorous at birth with Apgar's 8 and 10 at 1 and 5 min, respectively. Birth weight, length and head circumference were 1.95 kg, 45 cm and 30.5 cm, respectively. He was supplemented with nasogastric formula feed for initial 36 h of life due to poor feeding. His blood sugar dropped to 1.8 mmol/L at 40 h of life needing an intravenous bolus of 10% dextrose at 2 mL/kg. He also had an episode of prolonged apnoea an hour after the dextrose bolus. Blood sugar was normal at the time of apnoea. While on treatment he developed focal clonic seizure of the right upper limb on day 3 of life. He had three more focal seizures on day 4 and 5 of life.

BACKGROUND

Non-typhoidal salmonellosis in obstetric population is very rare. The mother can harbour non-typhoidal *Salmonella* (NTS) without manifesting any symptoms or occasionally with very mild symptoms. Chances of transplacental infection to the developing fetus are high and can lead to serious complications. To date no screening methods are available to identify NTS in obstetric populations due to rarity of its incidence. Thus the prompt consideration of NTS in sick newborns is necessary in context of the presence of risk factors for NTS in mothers. There are hardly very few reports of *Salmonella* serovar *montevideo* meningitis in newborns.

CASE PRESENTATION

A male infant was born at 34 weeks of gestation by normal vaginal delivery to a primigravida mother who was admitted with preterm rupture of membrane and labour since last 3 and 2 h, respectively, prior to the delivery. The mother had a history of 1 day of diarrhoea and low-grade fever 8 days prior to the delivery. Blood and stool samples taken for culture on the first day of illness had grown nothing. She was not treated with any antibiotics as the diarrhoea and fever were short lived and lasted only for 24 h. She was immune to rubella and varicella zoster, and was negative for syphilis and HIV infections. She did not have a history of smoking or alcohol intake during antenatal period. Her husband was a full-time worker in a poultry farm.

INVESTIGATIONS

Blood tests performed after first apnoeic episode revealed slightly raised white cell count of $20 \times 10^9/L$ with neutrophilia. Platelets, haemoglobin, urea electrolytes and liver function tests were within normal limits. Lumbar puncture performed revealed slightly turbid cerebrospinal fluid (CSF). White cell count in CSF was 76 with predominant polymorphs seen under microscope. CSF protein and sugar were 2.9 g/L (0.15–1.3 g/L) and 2.8 mmol/L (2.8–4.2 mmol/L), respectively. Gram stain showed Gram-negative bacilli. Blood and CSF culture grew NTS. Culture of placenta also grew NTS. NTS strain was sensitive to ceftriaxone. Subsequently samples were sent to national bacterial reference laboratory where serovar *montevideo* was isolated from neonatal blood as well as maternal placental specimen.

Cranial ultrasound and MRI of the brain performed after seizure were reported normal. Repeat CSF analysis after 3 weeks of antibiotic therapy revealed normal cell counts and protein levels.

DIFFERENTIAL DIAGNOSIS

- *Listeria* meningitis
- Gram-negative bacterial meningitis

TREATMENT

The baby was treated initially with intravenous benzylpenicillin and gentamicin which was subsequently changed to ceftriaxone after sensitivity results. Intravenous ceftriaxone was administered

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for total 21 days. Phenobarbitone started after initial seizure was gradually withdrawn fully by 4 weeks of age. He required intravenous fluid support for initial 6 days of life followed by gradual withdrawal of intravenous fluid, as nasogastric feed supplements were established. Nasogastric nutrition was continued until full oral feeds were established. The mother was also treated with intravenous ceftriaxone for a total of 7 days.

OUTCOME AND FOLLOW-UP

The baby is doing well at 6 months follow-up. His developmental milestones are appropriate for 6 months of age.

DISCUSSION

Non-typhoidal salmonellosis has been increasingly recognised in previous outbreaks as an important cause of invasive bloodstream infections in immunocompromised hosts.¹ *Salmonella* species are Gram-negative Enterobacteriaceae that are ubiquitous in distribution and are an important cause of gastroenteritis and other systemic illness in humans. In endemic regions *Salmonella typhi*, *paratyphi* A, B and C are the most common causes of *Salmonella*-related gastroenteritis and febrile illness. The prevalence of the *Salmonella* excretors among pregnant women has been reported at around 0.2% with high likelihood of detection in the presence of diarrhoea.^{2–3} *Salmonella enterica* serovar *montevideo* has been traced with the help of pulsed field gel electrophoresis to originate from sources such as cheese, chicken and poultry products in previous outbreaks.^{4–6}

NTS presents commonly as acute gastroenteritis though asymptomatic carriers are well known to occur in about 4.7% of healthy individuals.⁷ Diarrhoea, abdominal cramps, mild fever and rarely blood in the stool are usual presenting features. Bacteraemia is noted in as many as 8% of the cases with extremes of age, immunocompromised status and steroid therapy being the fore-runners in most of these patients. Five to 10% of patients with bacteraemia may develop serious invasive infections such as meningitis. Transplacental transmission of *Salmonella* has well been recognised with serious complications such as miscarriage, neonatal sepsis, septic shock and neonatal deaths.^{8–10} Non-typhoidal salmonellosis infection in newborns has predilection to cause invasive illness including meningitis.¹¹ This may be attributed to relative non-immune competitiveness at this age.

NTS are diagnosed on the basis of isolation in culture media. At present no serological tests are commercially available except in research settings to diagnose NTS.¹² Ideally two sets of blood culture and culture from suspected sources such as placenta should be sent to isolate NTS if bacteraemia is suspected in newborns.

Treatment of *Salmonella* is controversial. Coughlin *et al*¹⁰ suggested treatment of invasive salmonellosis by amoxicillin or cephalosporin. Gericke *et al*¹³ identified multidrug-resistant *Salmonella* serovar *montevideo* from 26 babies due to in vivo cross transfer of plasmids from *Escherichia coli* and *Klebsiella* spp. In a study of Malawian children suffering from NTS, case death rate has been reported as approximately 50%.¹⁴ We could not find any case death rate for premature newborns. Appropriate infection control measures including meticulous

hand hygiene practices would help in preventing transmission of this bacterium to other hosts.

We conclude that diarrhoea and fever in obstetric patients should be cautiously evaluated in the context of epidemiological risk factors of NTS associated with the couple in question, as in our case. *Salmonella montevideo* meningitis in a newborn is extremely rare but can occur in favourable epidemiological scenarios. Newborns should be promptly treated with cephalosporin and treatment should be tailored as per sensitivity results.

Learning points

- ▶ Non-typhoidal salmonellosis can present as an asymptomatic carrier state in obstetric population.
- ▶ Transplacental transmission can cause meningitis due to relative immune deficiency of newborns.
- ▶ Prompt recognition of risk factors in mother and adequate treatment of neonate is mandatory for a successful outcome.

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Competing interests None.

Patient consent Obtained.

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