

Salmonella typhimurium—A threat for a newborn

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ABSTRACT

The most common clinical manifestation of gram negative *Salmonella typhimurium* infection is gastroenteritis. In Poland extraintestinal infections occur in about 0.4% of cases of reported salmonellosis. Poor personal hygiene practices of parents are the most common cause of *Salmonella* spp. infections in the neonatal period. The neonatal salmonellosis is significantly more frequently reported in endemic areas such as Central Africa or India, than in Poland. The authors present a case of a newborn with *Salmonella typhimurium* sepsis, who was treated in the Department of Intensive Care and Congenital Malformations of the Neonates and Infants, Polish Mother's Memorial Research Institute.

Keywords: *Salmonella*; *Typhimurium*; Newborn; Infections

1. INTRODUCTION

Salmonella spp. is the most frequent cause of bacterial food-borne infectious diseases. However, recently there is an increasing incidence of infections resulting from the direct contact with carriers and animals. *Salmonella* bacilli and *Campylobacter* are the bacterial pathogens that are most often cultured in stool of patients with severe gastroenteritis or diarrhea [1].

Salmonella spp. infections are characterized by vast spectrum of clinical symptoms, from gastroenterocolitis to sepsis or meningitis. The course of the infection depends on virulence of bacteria and immune response of the host. After the infection, carrier-state may persist for several months [3].

2. CASE REPORT

The authors present a male neonate born at 40 weeks of

gestation by spontaneous vaginal delivery in good general condition with the birth weight of 3380 g. His Apgar score was 10. The boy was discharged from the primary neonatal care division on the 5 day of life. He was fed with breast milk and with formula. He did not vomit and his stools were normal. On the 8 day of life his parents noticed that the boy was less active and did not wake up for feeding. They sought advice of the primary care physician who decided to refer the child to the local hospital urgently. In the emergency room the neonate presented symptoms of shock with deep metabolic acidosis. Suspicion of sepsis was made and the boy was transferred to the Department of Intensive Care and Congenital Malformations of the Neonates and Infants of Polish Mother's Memorial Hospital Research Institute.

At the admission the neonate's condition was severe. The clinical examination revealed signs of significant dehydration, tachypnoe, increased muscle tone, reduced reaction to pain, numerous erosions in the oral cavity and papular skin lesions on the trunk and limbs.

The laboratory abnormalities included signs of metabolic acidosis (pH 7.14, Base Excess-19 mmol/L, lactic acid 40 mg/dL; normal value: 6.3 - 18.9 mg/dL), increased biochemical markers of infection (C-reactive protein 3.47 mg/dL; normal value: < 1.0 mg/dL) and signs of acute prerenal renal failure (creatinine 2.6 mg/dL; normal value: 0.3 - 0.7 mg/dL, urea 80 mg/dL; normal value: 4.3 - 34.2 mg/dL). After 48 hours *Salmonella typhimurium* was cultured in the stool and blood, but cerebrospinal fluid culture was negative. The result was verified by the Regional Sanitary and Epidemiological Station and members of the family were tested for carrier state.

On the first day of hospitalization intensive intravenous hydration was performed. Broad spectrum antibiotic therapy and total parenteral nutrition were administered. Based on the result of the antibiogram, antibiotic therapy was adjusted and it was continued for 21 days. Antibiotic therapy was ended after obtaining negative

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blood and stool culture and after normalization of biochemical signs of infection. Parenteral nutrition was continued for 9 days.

As a result of the treatment applied, the infant's condition improved. The neurological symptoms (increased muscle tone, disturbances concerning social interactions) were the clinical symptoms observed for the longest period of time. The boy was referred to the outpatient neurodevelopmental care facility. Now his development is normal.

3. DISCUSSION

Over 2500 serotypes of *Salmonella* spp. identified to date belong to the two species: *Salmonella enterica* and *Salmonella bongori* [1]. Before introducing modern genetic diagnostic methods, many serotypes were thought to be separate species. The old names-typhi, paratyphi, typhimurium, enteritidis and choleraesuis, are still being used in case of the serotypes that are most frequently diagnosed in humans [2]. In this paper the authors present the neonate with the severe *Salmonella typhimurium* infection.

Today the estimated incidence of *Salmonella* spp. infections in the developed countries, where the most often source of infection is contaminated food, is 500/100,000 with only 12 - 14/100,000 confirmed with laboratory tests. 20% of infected patients require hospitalization and 0.6 percent dies. The highest mortality rates can be observed among neonates, infants and immunocompromised patients. The estimated mortality associated with *Salmonella* spp. infections in people infected with HIV in Africa is 60% [3-5]. People younger than 20 and older than 70 years of age are the most prone to *Salmonella* spp. infections. The highest incidence of this type of infection is observed in the first years of life. 25% to 30% of pediatric patients are infants. Factors that make patients susceptible to *Salmonella* spp. infections are: reduced immunity, antibiotic therapy, malnutrition, neoplasms and reduced gastric acidity [6].

Although more than 90% of infections are caused by consumption of infected food (food-borne infections), there is an increasing incidence of infections resulting from the direct contact with carriers and animals recently [7].

According to the data of The Polish National Institute of Hygiene, in 2012 in Poland 8451 cases of salmonellosis were reported (morbidity 21.94/100,000) with only 185 cases of extraintestinal infections (Table 1). Sepsis was diagnosed in 85 patients and there was only one neonate in this group.

In the developed countries the incidence of neonatal infections caused by *Salmonella* spp. is low and such infections are usually caused by inappropriate food stor-

Table 1. Salmonellosis in Poland in 2012 r.—according to data of The Polish National Institute of Hygiene.

Salmonellosis	1.01.2012-31.12.2012	
	Number	Morbidity
Total	8451	21.94
Gastroenterocolitis	8266	21.46
Parenteral infection	185	0.48
Sepsis	85	0.22
Other parenteral	100	0.26

age, poor hygienic practices (improper hand washing) especially, when there are people with gastroenterocolitis or carriers in the child's environment [8]. Rarely *Salmonella* spp. infection in perinatal period develops by an ascending route in pregnant women with symptoms of gastroenterocolitis. In such cases neonates develop congenital infection, often presenting as sepsis or meningitis [9,10].

Clinical symptoms of neonatal *Salmonella* spp. infections are not specific and do not differ from infections caused by other Gram negative bacilli. The most common are: fever, rash, leucopenia, splenomegaly and abdominal distention. In the literature there are reports of hypotonia, anorexia, dehydration, hypersensitivity, jaundice, diarrhea, respiratory distress, hypothermia, seizures, pneumonia, meningitis, cerebral abscesses, cholecystitis. *Salmonella* spp. bacilli are sensitive to the third-generation cephalosporins, carbapenems, ampicillin, quinolones and co-trimoxazole [11].

In the presented case of the neonate the course of the infection was typical for *Salmonella* spp. infections described in the literature and included: diarrhea, anorexia, fever and dehydration. The diarrhea and anorexia probably caused dehydration, shock and prerenal renal failure. The neurological disorders observed, included: increased muscle tone, reduced pain reaction and disturbances of social interactions. Despite the evident neurological symptoms, the culture of the cerebrospinal fluid was negative and the result of its analysis was normal (cytosis 6, protein 75.0 mg/dL, glucose 49 mg/dL).

Neither splenomegaly, nor leukopenia (white blood cell count was $11.84 \times 10^3/\text{mm}^3$) was observed in this case.

The presented neonate comes from the rural environment of low economic status. Laboratory tests performed by the Regional Sanitary and Epidemiological Station excluded carrier-state of the mother and other members of the family. The mother denied symptoms of gastroenterocolitis during pregnancy as well. So the most probable route of infection was poor hygienic practices of the caregivers that could result in transmission of bacteria from animals in the farm. However, regarding the onset

of symptoms (8 day of life), a congenital infection is also probable.

4. CONCLUSION

The presented case shows that *Salmonella* spp. infections should be taken into consideration in neonates, especially from rural environment with non specific clinical symptoms including reduced activity or refusal to feed. It should be remembered as well, that children of mothers with gastroenterocolitis in the perinatal period may develop *Salmonella* spp. congenital infection. Loose stools in a neonate in the first days of life, particularly in babies fed with breast milk, may stay unnoticed, which may delay a medical intervention. In case of *Salmonella* bacilli infection this may result in development of a severe infection, shock, serious complications after meningitis or/and death [8].

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