CASE REPORT

23(97), May - June, 2019

ISSN 2321–7359 EISSN 2321–7367

Medical Science

Invasive pneumococcal disease (IPD) in preterm neonates: A case report with literature review

Hassan Al-Shehri✉

Background: ***Streptococcus pneumoniae*** **is a rare cause of neonatal sepsis although associated with high morbidity and mortality.** ***Objective:*** **To report a case of early-onset preterm neonatal pneumococcal sepsis due to a penicillin-susceptible pneumococcus.** ***Patients:*** **An extremely low birth weight infant (gestational age 26 wks), presented shortly after spontaneous vaginal delivery with a sepsis due to** ***Streptococcus pneumoniae*** **and with respiratory distress? At 4 hours of age, the C- reactive protein (CRP) level was 60 mg/L, white blood cell (WBC) count was 35,000/mm^3, the immature/total neutrophil ratio (I/T) was 0.15, and the platelet count was 190,000/mm^3. Blood culture yielded Gram-positive cocci in pairs that were identified as** ***Streptococcus pneumonae.*** ***Interventions:*** **Antibiotics were switched from ampicillin and gentamicin to vancomycin and cefotaxime considering the possibility of resistance to penicillin. However, the organism was susceptible to penicillin, so the antibiotic therapies stepped down to cefotaxime monotherapy only. Infant was continued on cefotaxime for 14 days.** ***Results:*** **Infant was discharged home at 41 weeks corrected gestational age, on full oral-feeding and not on any respiratory support. Neurodevelopmental assessment at 18 months corrected age for her prematurity was appropriate for her age.** ***Conclusion:*** **This is a rare case of invasive pneumococcal disease in our institute. The following risk factors were involved in the occurrence of this case: preterm birth, very low birth weight, premature onset of labour and prolonged rupture of membranes (more than 18 hours). Cefotaxime monotherapy in a later part of the treatment phase was effective.**

INTRODUCTION

The incidence of invasive pneumococcal infections is increasing worldwide. *Streptococcus pneumoniae* has been reported to contribute to 1.5 - 5% of all neonatal sepsis and it is reported to be rare.[1] Invasive pneumococcal disease (IPD) remains a major cause of morbidity and mortality worldwide, regardless of the availability of antibiotic therapy and vaccines.[7-9] It is clinically difficult to distinguish IPD from other causes of early neonatal infections like group B Streptococcus (GBS) and in most of cases prior bacteriology results may not be available for antibiotic prophylaxis.[2] In this case report we describe a case of early-onset preterm neonatal pneumococcal sepsis due to a penicillin-susceptible pneumococcus with its management.

CASE REPORT

A 630 gm female neonate was born to a 30-years old, primigravida, and healthy mother at 26 weeks of gestation by vaginal delivery. The mother presented to the hospital with preterm prelabour rupture of membranes (PPROM) for 5 days before delivery. She was afebrile with no signs or symptoms of ongoing chorioamnionitis. The mother was given Penicillin G for 2 days and then maintained on erythromycin as an antibiotic treatment regime for PPROM. Maternal urine culture was negative and urogenital swab for Group B streptococcus (GBS) was negative as well. The mother had no signs or symptoms of chorioamnionitis, did not receive any pneumococcal vaccine. At 26 weeks of gestation, she progressed to spontaneous vaginal delivery. The infant was delivered with respiratory distress. Positive pressure ventilation was given to the infant and eventually intubated for surfactant administration. The initial vital signs were stable. Axillary temperature was 36.8°C, heart rate was 150/min, respiratory rate was 50/min with oxygen saturation of 95% while ventilated through endotracheal tube on 21% of oxygen. Apgar scores were 5, 7, and 8 at 1, 5, and 10 minutes respectively. An umbilical arterial blood sample was sent for blood culture and the infant was started on ampicillin and gentamicin. C- reactive protein (CRP) at 4 hours of age was 60 mg/L with white blood cell (WBC) count of 35,000/mm^3; the immature/total neutrophil ratio (I/T) was 0.15 and the platelet count was 190,000/mm^3. Blood culture yielded Gram-positive cocci in pairs that were identified as *Streptococcus pneumonae.* Then the antibiotics were switched from ampicillin and gentamicin to vancomycin and cefotaxime considering the possibility of resistance to penicillin. However, the organism was susceptible to penicillin, so the antibiotic therapies stepped down to cefotaxime monotherapy only. The infant was stable on the 4th day of life and CSF was obtained by the lumbar puncture, but it was bloody and not conclusive from cell count point of view. CSF culture was negative. The infant was continued on cefotaxime for 14 days to avoid any possibility of CNS infections. The negative culture for CSF might be possibly due to antibiotics for initial 3 days prior to CSF sampling. Placental pathology showed acute amniotic infection with inflammatory response on both maternal and foetal aspects. Screening head ultrasound examination was reported as normal apart from grade 1 intraventricular haemorrhage (IVH) on the left side. CRP evaluations were as given in Table 1 and Figure 1. The infant was discharged from the hospital at 41 weeks of corrected gestational age, on full oral-feeding and not on any

✉*Correspondence to:* Hassan Al-Shehri; Department of Pediatrics, College of Medicine, Al Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia; Email: haalshehri@imamu.edu.sa

© 2019 Discovery Publication. All Rights Reserved. www.discoveryjournals.org | OPEN ACCESS

respiratory support. Neurodevelopmental assessment at 18 months corrected age for her prematurity was age-appropriate.

Table 1 CRP evaluations as a function of age of the baby

Sl No	Age of the baby	CRP, mg/l
1	4 hours	60
2	1 day	51
3	2 days	27
4	7 days	1

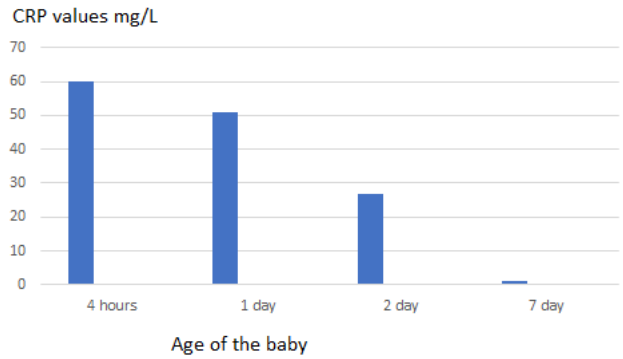

Figure 1 Bar graph for CRP trend over the first week of life

DISCUSSION

Invasive pneumococcal disease is a rare disorder and data suggests that it is the cause of 11.5% of neonatal sepsis and around 7% of IPD in children. Poor outcomes of IPD are frequently recorded in cases of early neonatal sepsis, especially when followed by maternal bacteraemia.[2] The most common primary diagnosis of IPD in neonates includes meningitis, bacteraemia without localization, pneumonia, bone and joint infections, and otitis media. Mortality rate and neurologic manifestations in survivors can reach over 50% and 13%, respectively.[2] Geelen *et al* summarized 43 cases of neonatal pneumococcal sepsis reported since 1972 along with 7 cases of their own.. In these cases, 50% were pre-term, mothers of 43% cases had rupture of membranes for more than 24 hours, 90% of the cases presented within 48 hours of birth and mortality rate was 50%.[3]

Nallusamy also reported 2 cases of invasive early-onset neonatal pneumococcal sepsis.[1] Data suggest that most of infants get infected at birth during vaginal delivery. Transplacental transmission and nosocomial transmission are other routes of infection.[1] It may be suggestible that pneumococcal infection of the female genital tract may be caused due to oral-genital contact as *Streptococcus pneumoniae* is a commensal of the upper respiratory tract. The gastrointestinal tract may be another route of infection. Risk factors for maternal infections may be intrauterine devices, recent birth and gynaecologic surgery.[1] Risk factors for neonatal pneumococcal sepsis may include genital inoculum, premature onset of labour, prolonged rupture of membranes (more than 18 hours), and low birth weight.[1,2] In our case, the risk factors were preterm birth, low birth weight, premature onset of labour, and prolonged rupture of membranes (more than 18 hours). Neonatal sepsis due to *Streptococcus pneumoniae* has not been previously reported in our institute.

As per literature review by Gomez *et al.*[4], all the neonates reported early onset of neonatal sepsis. Out of the 119 cases of neonatal *Streptococcus pneumoniae* infections, 36 cases had positive maternal cultures.[4] This signifies that mothers infected with *Streptococcus pneumonia* have high chances of transmitting the organism to their infants. The absence of maternal clinical signs or symptoms of infection, as seen in our case is in line with an ascending infection from the maternal genital tract. However, other mechanisms of infection such as transplacental transmission associated with maternal bacteraemia or passage through an infected birth canal may cause early onset sepsis as well.[4] McAdams et al.[5] also presented two cases of early-onset neonatal sepsis due to *Streptococcus pneumonia*. They also reported for the first time a case of sepsis due to penicillin-resistant *Streptococcus pneumoniae*.

The findings of the present case report are consistent with these previously reported findings as in our case also umbilical arterial blood culture yielded *Streptococcus pneumonae* but in contrast to the findings of McAdams et al.[5] in our case *Streptococcus pneumonae* was susceptible to penicillin. Considering the observations made in this study, it is recommended to use a third-generation cephalosporin in association with benzyl penicillin for empiric antibiotic therapy in infants with early onset sepsis in which a mother is known to have genital tract colonization with *Streptococcus pneumonae.* However, genital tract colonization with *Streptococcus pneumonae* was not reported in this case. The negative culture for CSF in this case might be possibly due to antibiotics for initial 3 days. However, as no guidelines for the management of IPD exist till date, additional vancomycin may be considered in areas with a high prevalence of penicillin-resistant *Streptococcus pneumonae.*[2,5]

It is suggestible to consider vaccination in third trimester in cases where maternal pneumococcal antibody levels are low. Neonatal infections could be reduced due to vaccination during the last gestational trimester with 3 mechanisms: increment in the active transfer of specific vaccine serotypes IgG to the foetus, enhanced delivery of secretory antibodies through the mother's milk and preventing genital colonization by increasing high IgG levels and mucosal CD17 lymphocytes. Vaccination during the third trimester of gestation could be a measure to follow in the future. However, there is insufficient evidence to evaluate whether pneumococcal vaccination during pregnancy could reduce infant infections.[1,2,6]

CONCLUSION

This is a rare case of invasive pneumococcal disease in our institute. The following risk factors were found to be involved in the occurrence of this case: preterm birth, low birth weight, premature onset of labour, prolonged rupture of membranes (more than 18 hours), and transplacental transmission of infection. Cefotaxime monotherapy in a later part of the treatment phase was effective. Initially, antibiotic therapies with ampicillin and gentamicin therapy then switching to vancomycin and cefotaxime and cefotaxime monotherapy eventually for 14 days was found to be effective in this case.

REFERENCE

1. Nallusamy R. Fatal early-onset neonatal sepsis due to Streptococcus pneumoniae. Med J Malaysia. 1998 Dec;53(4):442-5.
2. Jarovsky D, Marchetti IC, da Silva Mori MA, *et al.* Early-onset Neonatal Pneumococcal Sepsis: A Fatal Case Report and Brief Literature Review. Pediatr Infect Dis J. 2018 Apr;37(4):e111-e112.
3. Geelen SP1, Gerards LJ, Fleer A. Pneumococcal septicemia in the newborn. A report on seven cases and a review of the literature. J Perinat Med. 1990;18(2):125-9.
4. Gomez M1, Alter S, Kumar ML, *et al.* Neonatal Streptococcus pneumoniae infection: case reports and review of the literature. Pediatr Infect Dis J. 1999 Nov;18(11):1014-8.

© 2019 Discovery Publication. All Rights Reserved. www.discoveryjournals.org | OPEN ACCESS

5. McAdams RM, Garza-Cox S, Yoder BA. Early-onset neonatal pneumococcal sepsis syndrome. PediatrCrit Care Med. 2005 Sep;6(5):595-7.
6. Chaithongwongwatthana S1, Yamasmit W, Limpongsanurak S, *et al.* Pneumococcal vaccination during pregnancy for preventing infant infection. Cochrane Database Syst Rev. 2015 Jan 23;1:CD004903.
7. Suhair A Othman. Probiotics use in a neonatal unit in Port Sudan / Sudan: This combination is effective and should be part of the routine care. Medical Science, 2018, 22(89), 18-22
8. Zahra Ameri, Fereshteh Ghaljaeiz, Ali Navidian, Mahmood Imani. Investigating the Effect of Fetal Position on the Sleep-Wake State of Premature Neonates in the Neonatal Intensive Care Unit: A clinical trial study. Medical Science, 2018, 22(94), 533-538
9. Nas FS, Ali M, Aminu MA, Nasiru AS. Characterization of bacteria associated with untreated otitis media with effusion among primary school children in Kano Metropolis, Nigeria. Drug Discovery, 2018, 12, 72-75

Article Keywords
Preterm birth, invasive pneumococcal disease, neonates

Conflict of interest
None

Financial support
None

Article History
Received: 17 January 2019
Accepted: 25 February 2019
Published: May-June 2019

Citation
Hassan Al-Shehri. Invasive pneumococcal disease (IPD) in preterm neonates: A case report with literature review. *Medical Science*, 2019, 23(97), 269-271

Publication License
This work is licensed under a Creative Commons Attribution 4.0 International License.

General Note
Avoid print-versions. If required, article is recommended to print as color digital version in recycled paper. *Save trees, save nature*

© 2019 Discovery Publication. All Rights Reserved. www.discoveryjournals.org | OPEN ACCESS