A neonate with *Bordetella pertussis* pneumonia presenting with cough and cyanosis

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**Abstract**

Pertussis pneumonia in a young infant is often fatal as it can easily be misdiagnosed and because infants have weak immune systems before they receive routine infant immunization. The so called “whooping cough” pneumonia can cause respiratory distress, hypoxemia, and disease progression leading to increased morbidity or mortality. Herein, we report the case of a 21-day-old female newborn who presented with poor intake and cyanosis with mild cough and nasal stuffiness. After admission, her cough worsened and was accompanied by persistent hypoxemia and vomiting after oral feeding. Pertussis pneumonia was considered on the fourth day of hospitalization, and *Bordetella pertussis* was diagnosed by DNA analysis on the sixth day of hospitalization. The patient was immediately given azithromycin and her general condition gradually improved, and she was discharged after a total hospitalization of 16 days. A nasopharyngeal swab for pertussis from her mother was positive. We suggest that all pregnant women should receive pertussis vaccinations in the third trimester of pregnancy. (J Pediatr Resp Dis 2013;9:87-90)

**Key words:** *Bordetella pertussis, hypoxemia, cyanosis, pneumonia*

**INTRODUCTION**

Pertussis is an acute respiratory tract infection and a highly contagious endemic bacterial disease caused by *Bordetella pertussis* that was initially reported in the 1500s. It is acquired through direct contact or inhalation of respiratory droplets, and the rates of transmission in school and household settings have been reported top range from 50-80% and 30-87%, respectively.¹ Pertussis vaccinations for children were introduced in Taiwan in the 1950s. The World Health Organization has estimated that, since the end of the 1980s, about 80% of all children worldwide have received pertussis vaccinations, and that this prevents about 38 million cases and 600,000 deaths every year. Despite the tremendous success of the vaccination, an estimated 17 million cases and 180,000 deaths still occur annually.² It is important to note that the risk of pertussis infection is gradually increasing in infants under 3 months old, in whom the risk of severe disease, hospitalization and death is high.³ A study from the United Kingdom reported that there were 14 pertussis-related deaths in infants in 2012, the highest number reported in a year since 2001 and double the number of the year before.⁴ ⁵ Similar results have been reported in the United States, Canada and Australia. The young infants who died in these reports were too young to have benefited from protection provided by the routine infant immunizations, which are generally given at 2 months of age. Herein, we report the case of a newborn infant with pertussis infection caused by household contact.
CASE REPORT

A 3-week-old female newborn was admitted to our hospital due to intermittent cyanosis during coughing and vomiting after oral feeding. She had been brought to our outpatient clinic and was diagnosed with acute pharyngitis and oral thrush. However, the poor appetite with vomiting after oral feeding and cyanotic face persisted despite medication. She was therefore taken to our emergency department and was admitted for further evaluation and management. Her medical history showed that she was a full-term healthy baby with a birth weight of 3310 g. Her mother had received regular prenatal examinations, and all were within normal limits. Her 11-year-old sister had a common cold with coughing in the previous week, but recovered spontaneously within a few days. Her parents were Vietnamese but denied a history of travel or other specific contact. According to her parents, her general condition and activity had been good with no coughing, and no episodes of fever were noted at home. No fever, diarrhea, rhinorrhea, or skin rash were noted on admission, and her vital signs were a temperature of 37.7°C, pulse rate of 158 beats per minute, and respiratory rate of 56 times per minute. Oxygen saturation was between 85% and 90% at rest. A physical examination showed a sick infant with poor activity. Her nose was congested and purulent sputum was found in her throat, and breath sounds were decreased over bilateral lower lung fields. The other findings were unremarkable. Chest radiography revealed opacity over the right lower and left upper lung fields with prominent bowel gas (Figure 1). Blood tests revealed a white blood cell count of 12,010/mm³, neutrophils 22%, lymphocytes 68%, metamyelocytes 2%, hemoglobin 13.1 g/dl, platelets 455,000/mm³, sodium 135 mmol/l, potassium 5.2 mmol/l, and glucose 90 mg/dl. Urinalysis showed 3 plus bacteria and 2 plus leukocyte esterase. The results of a nasopharyngeal swab for respiratory syncytial virus and serology for Mycoplasma pneumoniae IgM were negative, and no bacteria grew in a blood culture test.

She was placed in an oxygen hood with an inspired oxygen fraction (FiO₂) of 0.30, and given symptomatic treatment and chest physical therapy. During the hospitalization, her cough worsened and was accompanied with cyanosis with oxygen desaturation to 80%-90% even though she was in the oxygen hood at an FiO₂ of 0.30. Poor activity and vomiting after feeding were also noted. A nasopharyngeal swab for Bordetella pertussis was sent to the Taiwan Centers for Disease Control (CDC) on the fourth day of hospitalization, and positive bacterial culture and polymerase chain reaction results were reported two days later by. The patient was then given azithromycin oral suspension, and she gradually improved thereafter. After 16 days of hospitalization, she was discharged under good oral feeding and stable respiratory condition. The CDC contacted her family, and her caregivers including her father, mother, grandfather and grandmother were tested with nasopharyngeal swabs for pertussis. Positive results were found from her mother’s specimen.

DISCUSSION

Pertussis in the first three months of life is frequently severe and often fatal.6,7 The severity of pertussis and the rapidity of its progression is affected by a number of factors such as the presence of transplacentally acquired maternal antibodies to Bordetella pertussis, the infectious dose of bacteria that the infant receives, co-infection with respiratory viruses and genetic factors related to the pathogen or the infant. The source
of pertussis in young infants is usually a household contact (most often the mother) who has an illness involving a cough that is not recognized by physicians or family members as pertussis.

In this case, the newborn infant was diagnosed with pertussis pneumonia which was thought to be due to maternal infection. Vomiting post oral feeding with intermittent apnea and cyanosis were noted during the first four days, followed by the development of a severe paroxysmal cough and poor intake. Azithromycin was given on the sixth day of admission based on the positive *Bordetella pertussis* results from the CDC, and she was discharged under a stable condition 16 days later. We were unable to determine the vaccination history of her mother as she was unable to communicate in Chinese.

Young infants who are too young to be immunized are at high risk of infection from their household members. The production of protective antibodies to *B. pertussis* in newborns is most important for the prevention of *Bordetella* infection. As a response to the increasing rates of pertussis in the United Kingdom, the Department of Health recently recommended that all pregnant women in the United Kingdom should be offered pertussis vaccinations in the third trimester of each pregnancy. The Advisory Committee on Immunization Practices in the USA also updated their recommendations in October 2012 to advise that all pregnant women of 27-36 weeks gestation should receive pertussis vaccinations. This has been supported by a number of studies including a recent study demonstrating that the waning of pertussis antibodies after immunization pre-pregnancy or in early pregnancy resulted in low levels of antibodies in 2 to 3-month old infants, such that it was unlikely to provide sufficient protection until infant primary immunizations were complete. This is because antibody levels to pertussis vaccine antigens peak after just 14 days and begin to wane thereafter. Maternal vaccination in the third trimester of pregnancy, however, is likely to result in high levels in the mother at a time of maximum transplacental transfer of antibodies to the infant. These immunizations are likely therefore to confer protection against pertussis in the first weeks of life, however the effectiveness against clinical infection has yet to be shown. Although no serological guidelines for protection against pertussis have been defined, high levels of antibodies are thought to provide better protection than low levels. The benefits can also be inferred from other studies showing protection from infection after the infusion of serum containing anti-pertussis IgG, and through studies showing an association between cord antibody levels and protection from pertussis.

In conclusion, *Bordetella* infection should be considered in infants with symptoms of upper respiratory tract infection, respiratory distress, and paroxysmal cough with cyanosis. The laboratory findings of leukocytosis and lymphocytosis are favorable prognostic factors in pertussis. Immunization of pregnant women in the third trimester seems to be beneficial in protecting young infants from pertussis infection.

**REFERENCES**


