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Case Report

A Papuan infant with severe pertussis from the low coverage of immunization

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Abstract

Background : Pertussis is an acute bacterial infection of the respiratory tract caused by Bordetella pertussis. Without immunization and adequate therapy, the disease will evolve to severe complication. The purpose of the case report was to describe the diagnosis and treatment of severe pertussis from a Papuan infant in remote mountainous area of Papua.

Case report : A 5 months old male Papuan infant, lived in the mountainous area of Papua was admitted to the hospital after 1 week of cough. No history of DPT immunization. Physical examination revealed continuous coughing, sunken fontanel, sunken eyes, nasal flaring, chest retraction, and bilateral crackles. Laboratory examination showed white blood count was 87,600/µL, CRP 48 mg/dL, ASTO negative. He deteriorated and referred to ICU for Mechanical Ventilation. His bronchoalveolar lavage taken at day 10 confirmed *Pseudomonas* from the culture and *Bordetella pertussis* by the PCR.

Discussion : Children lived in the Honai without enough ventilation at the area of low coverage of immunization are susceptible to pneumonia. This infant was treated with Erythromicin and Ceftriaxon on admission with the idea that they will cover broad spectrum of antibacterial, atypical pneumonia or Pertussis infection. The Sputum culture from bronchoalveolar lavage showed *Pseudomonas* resistant to Amoxillin and Erythromicin, but sensitive to Amikacin. This finding explains why there was no clinical improvement after 2 weeks of Erythromicin. After changing to Amikacin, the clinical condition improved in 7 days.

Conclusion : On the area with low immunization coverage, the pediatrician should consider Pertussis as one of the possible etiology of pneumonia, and start treating early to get the better result and avoid severe complication. It recommended that all countries should consider expanding vaccination strategies to include adding Pertussis booster doses to pre-school children (4–6 years old), to adolescent and to those specific adults that have the highest risk of transmitting *Bordetella pertussis* infection to vulnerable infants.

Keywords : Papuan infant, pertussis, severe complication, immunization

Seorang Anak Papua dengan Pertusis Berat dari Daerah dengan Cakupan Imunisasi yang Rendah

Abstrak

Latar belakang : Pertusis adalah penyakit saluran nafas yang disebabkan Bordetella pertusis. Tanpa imunisasi dan terapi yang adekuat, penyakit ini bisa mengakibatkan komplikasi yang serius. Tujuan penulisan laporan kasus ini adalah untuk menggambarkan diagnosis dan terapi seorang anak Papua yang tinggal di pegunungan terpencil yang menderita pertusis berat.

Kasus : Anak laki-laki suku bangsa Papua berusia 5 bulan dibawa ke rumah sakit setelah menderita batuk dan sesak selama 1 minggu. Anak belum pernah mendapat imunisasi DPT. Pemeriksaan fisik terlihat batuk terus-menerus, ubun-ubun besar dan mata cekung, retraksi dan terdengar ronki pada paru. Laboratorium menunjukkan leukosit 87.600/µL, CRP 48 mg/dL, ASTO negatif. Karena keadaannya memburuk anak dirawat di ICU dipasang Ventilator Mekanik. Pada hari ke-10 perawatan dilakukan kultur dari sekret bronkus dan didapatkan *Pseudomonas* dan dari pemeriksaan PCR didapatkan kuman *Bordetella pertussis*.

Pembahasan : Anak tinggal di daerah dengan cakupan imunisasi rendah di rumah adat Papua (Honai) di pegunungan yang tidak tidak mempunyai ventilasi yang cukup. Pada saat awal sampai 2 minggu perawatan penderita mendapat terapi eritromisin dan ceftriaxson yang bisa digunakan untuk terapi pneumonia atipikal atau pertusis. Tetapi dari kultur sekret bronkus ternyata anak resisten terhadap amoksisilin dan eritromisin, tetapi sensitif terhadap amikasin. Setelah mendapat amikasin, keadaan anak membaik dalam waktu 7 hari.

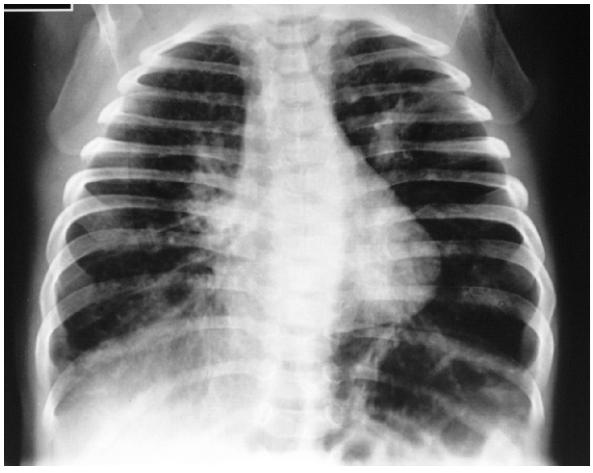
Simpulan : Pada daerah dengan cakupan imunisasi rendah, dokter anak harus mempertimbangkan pertusis sebagai etiologi dari pneumonia dan memberikan terapi sejak dini untuk mencegah komplikasi yang berat. Imunisasi booster terhadap pertusis sangat penting, termasuk didalamnya imunisasi untuk anak prasekolah (4–6 tahun), remaja dan dewasa yang bisa sebagai pembawa dan menularkan *Bordetella pertusis* kepada anak-anak.

Kata kunci : anak Papua, pertusis, komplikasi berat, imunisasi

CASE REPORT

A 5 months old male Papuan infant, well nourish, live in the mountainous area of Papua was admitted to the hospital after 1 week of cough and then shortness of breath and breastfeeding difficulty. High fever developed 2 days before admission and 4 times watery stool without mucous or blood on the day before admission. No history of DPT immunization. The infant had history of Pneumonia at the age of 2 months and hospitalized for 1 week at the same hospital.

Physical examination revealed temperature 37.6°C, respiratory rate 62/min, heart rate 148/min, peripheral saturation 88% without oxygen support, weight 7.2 kg, continuous coughing, sunken fontanel, sunken eyes, nasal flaring, chest retraction and bilateral crackles. Results of cardiovascular, gastrointestinal, and nervous system examinations were normal.



Laboratory examination showed white blood count was 87,600/µL, hemoglobin value 11.6 g/dL, platelet 487.000/µL. Blood smear evaluation: Hypo chromic, microcytic and leukocytosis dominated by PMN with no blast. Electrolytes were on the normal limit. CRP was positive (48 mg/dL), ASTO was negative and ESR 12 mm/hour. Stool analysis: consistency was soft, leukocyte +1, erythrocyte +1 and no parasite. Urinalysis was normal. Chest radiograph showed left and right lobe infiltrate.

First he was diagnosed as Pneumonia, Acute Gastroenteritis with some dehydration and well nourish infant. He was treated with Ceftriaxon and Erytromicin and fluid replacement, feeding with expressed breast milk by nasogastric tube.

Day 2 of hospitalization, the infant was heavily and continuously coughing without stopping several times in a day especially at night. Respiration rate up to 80x/minutes and body temperature rised to 39°C. Patient was move to the Intensive Care Unit (ICU). Patient developed tonic clonic seizure at the ICU.

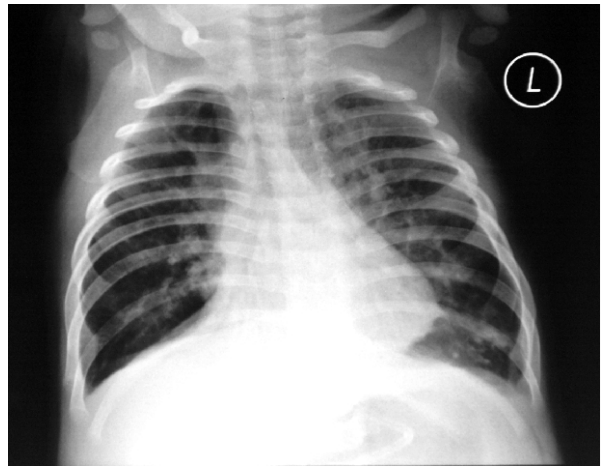
The patient slowly improved for a few days

Day 5 of hospitalization, white blood count decreased from 87,600/µL to 43.000/ µL. Blood culture taken on admission no growth found.

Day 9 of hospitalization, infant's condition deteriorated. He looked more dyspneic, heart rate more than 180x/minutes and respiration rate up to 100 x/minutes. Nasal flaring, head nodding, chest indrawing and crackles on auscultation. The infant was intubated and put on the ventilator. Chest X ray showed more infiltrate on left and right lung.

Day 10, performed bronchoalveolar lavage and send the specimen for culture and PCR examination for *Bordetella pertussis*.

Day 14 of hospitalization, 2 weeks of Ceftriaxon and Erythromicin, there was no clinical improvement, fever more than 38°C, respiration rate remain 60-70 x/minutes, chest auscultation found persistent rales on



left and right lung. White blood count decreased from 43.000/µL to 18.300/µL. Sputum culture from bronchoalveolar lavage showed *Pseudomonas* resistant to Amoxillin and Erythromicin, but sensitive to Amikacin. Ceftriaxon and Erythromicin changed to Amikacin and the fever and clinical condition improved after 7 days of Amikacin

Day 27 of hospitalization PCR examination confirmed *Bordetalla pertussis* positive from the bronchoalveolar lavage taken at the same day with the culture. White blood count decreased to 15.400/ µL, and ventilator on weaning process

Day 31 of hospitalization, after 3 weeks on the ventilator the infant was extubated.

The next day the infant was stable and moved from ICU to general ward.

DISCUSSION

Children live in the mountainous area in West Papua are susceptible to pneumonia. They live in a tent or Honai (a

traditional Papuan house, with only one door without windows and make fire to keep them warm), and several families live in one small Honai. This indoor air pollution and overcrowded room will increase the risk of pneumonia, especially in infant and young children.

This 5 months old infant with pneumonia showed *Bordetella pertussis* infection, complicated with secondary bacterial infection, *Pseudomonas* and also seizures as neurologic complications.

This infant never had Pertussis vaccination so he is particularly vulnerable to the disease. Some studies suggest that adequate protection against severe disease is achieved only after a 3-dose priming series at 2, 4, and 6 months of age.[1]

Immunization data from this village also showed low coverage of DaPT1 immunization, 52% in 2010 and 75% in 2011. While DaPT 2 and DaPT 3 coverage 27% and 35% in 2010 and 47% and 30% in 2011. This low coverage of Pertussis immunization adds more risk for infant and young children in this area to contract the infection.

Pertussis is an acute bacterial infection of the respiratory tract that is caused by *Bordetella pertussis*, a gram-negative bacterium. *B. pertussis* is a uniquely human pathogen that is transmitted from an infected person to susceptible people, primarily through aerosolized droplets of respiratory secretions or by direct contact with respiratory secretions from the infected person.[2] Unfortunately, source of Pertussis infection in this infant cannot establish. Patient's mother was healthy, well nourishes and has no symptoms of cough or fever.

Pertussis has an insidious onset with catarrhal symptoms (nasal congestion, runny nose, mild sore-throat, mild dry cough, and minimal or no fever) that are indistinguishable from those of minor respiratory tract infections. The catarrhal stage last approximately 1–2 weeks. The cough, which is initially intermittent, becomes paroxysmal. A typical paroxysm is characterized by a succession of coughs that follow each other without inspiration. Paroxysms of cough usually increase in frequency and severity as the illness progresses and usually persist for 2–6 weeks. Paroxysms can occur more frequently at night.[2] In this patient, symptoms develop gradually from only cough and then shortness of breath and high fever in one week to paroxysm cough. On day 2 of hospitalization suspicion of Pertussis arises, but the decision to check PCR for Pertussis came late after the condition deteriorate on day 10 of hospitalization. It was assume that if the etiology was Pertussis, treatment with Erythromicin can covered.

Early treatment of pertussis is very important. Clinicians should strongly consider treating prior to test results if clinical history is strongly suggestive of risk for severe or complicated disease. This infant was treated with Erythromicin and Ceftriaxon on admission with the idea that will cover broad spectrum of antibacterial, atypical pneumonia or Pertussis infection. Serial white blood examination showed a decrease in number, but because of multiple etiologies, pneumonia did not improved with the treatment.

B. pertussis pneumonia triggers a cascade of events that includes acute pulmonary vasoconstriction and pertussis toxin-mediated increases in circulating leukocyte mass. These responses ultimately compromise pulmonary blood flow, exacerbate hypoxemia, and create a vicious cycle of refractory pulmonary hypertension. Extreme leukocytosis that accompanies *B. pertussis* pneumonia in infants results from enormous numbers of bordetellae that proliferate in the airspaces of these very young patients.[3]

Public Health impact

In the context of child survival strategies, health care system should address pneumonia control. The key strategies for treating, preventing and protecting from pneumonia are: case management at all levels, vaccination, prevention and management of HIV

infection, improvement of nutrition and reduction of /low birth weight, control of indoor air pollution.

These interventions, if implemented, have the potential to reduce pneumonia mortality and morbidity by more than half. All countries should take steps to achieve Global Immunization Vision and strategy (GIVs) targets for measles and pertussis containing vaccines; countries that have not yet done so should add Hib and conjugate pneumococcal vaccines to their national immunization programs, especially if they have high child mortality. Promotion of exclusive breastfeeding and zinc supplementation are an important element of pneumonia prevention. Strategies to reduce rates of low birth weight and malnutrition will prevent pneumonia and should be encouraged. Indoor air pollution increases the risk of pneumonia. Strategies to reduce indoor air pollution may prevent pneumonia and should be encouraged. Strategies to prevent mother-to-child transmission of HIV and to improve the management of HIV infection and *P. jiroveci* pneumonia prophylaxis in children should be promoted in countries where HIV is prevalent.[4] Papua is one of the Indonesian province with highest HIV incidence (2.5%) Other preventive strategies, such as encouraging hand washing, should be promoted.

Global Pertussis Initiative (GPI) in 2002 recommend: all countries should consider expanding existing vaccination strategies to include adding Pertussis booster doses to pre-school children (4-6 years old), to adolescent and to those specific adults that have the highest risk of transmitting Bordetella pertussis infection to vulnerable infants.[5] The confirmed case of Pertussis infection in this area showed that there is circulating Bordetella pertussis the community, especially the adult as a source of transmission to the infant, so the expanding immunization coverage to the adolescent and adult need to be addressed.

Indonesian immunization schedule for DPT consist of 3 primary dosis on 2,4,6 months of age, booster at 18–24 months of age and at 5 years of age, but no more schedule for the adolescent and the adult. Advisory Committee on Immunization Practices (ACIP)and the American Academy of Pediatrics (AAP) and the American Academy of Family Physicians (AAFP) recommended further one dose of DaPT immunization for adolescent at the age of 11–12 years, one dose DaPT for adult (>18 years old) and every 10 years for people more than 65 years of age.[6] Indonesian Pediatric Association should review again the immunization schedule for DPT in attempt to decrease the Pertussis infection that tends to increased worldwide.

CONCLUSION

On the area with low immunization coverage, the pediatrician should consider Pertussis as one of the possible etiology of pneumonia, and start treating early to get the better result and avoid severe complication. It recommeded that all countries should consider expanding vaccination strategies to include adding Pertussis booster doses to pre-school children (4–6 years old), to adolescent and to those specific adults that have the highest risk of transmitting *Bordetella pertussis* infection to vulnerable infants.

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