



BRONCHOPNEUMONIA IN A 5-MONTH-OLD INFANT ASSOCIATED WITH ANAEMIA: A CASE REPORT

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ABSTRACT

Introduction: Acute lower respiratory tract infections, particularly bronchopneumonia, remain a leading cause of childhood morbidity and mortality worldwide. The coexistence of bronchopneumonia and anaemia creates a harmful physiological synergy that significantly accelerates respiratory distress and increases the risk of severe clinical outcomes. This case report aims to highlight the necessity of simultaneously assessing respiratory and haematological parameters to optimise clinical recovery in young infants.

Case Presentation: A 5-month-old boy was referred to the hospital with worsening shortness of breath, lethargy, fever, and a rattling cough after three days of treatment at a community health centre. Physical examination revealed tachypnoea, oxygen saturation of 90% on nasal cannula oxygen, chest wall retractions, bilateral rales, and decreased skin turgor. Laboratory tests showed

leukocytosis and severe microcytic hypochromic anaemia. A chest X-ray revealed patchy supra- and parahilar infiltrates on the right side, confirming the diagnosis of bronchopneumonia.

Management and Outcome: The patient received supportive care, including oxygen therapy, fluid and nutritional support. Pharmacological therapy included broad-spectrum antibiotics (ampicillin and gentamicin), packed red blood cell transfusion, and symptomatic medications. The patient's clinical condition improved significantly, with resolution of respiratory distress, fever, and diarrhoea. Haemoglobin levels normalised, and the patient was discharged in good condition after a 5-day hospital stay.

Discussion: The case illustrates the clinical complexity of bronchopneumonia complicated by significant anaemia in a young infant. Bronchopneumonia impairs alveolar gas exchange, while anaemia reduces total oxygen-carrying capacity, exacerbating tissue hypoxia. A comprehensive approach—comprising appropriate treatment of the respiratory infection, respiratory support, correction of clinically significant anaemia, and subsequent investigation into the underlying cause of anaemia—is essential to optimise clinical recovery and reduce the risk of recurrence.

Keywords: Bronchopneumonia, anaemia, infant, blood transfusion, case report.

INTRODUCTION

Acute lower respiratory tract infections, particularly bronchopneumonia, remain one of the primary drivers of childhood morbidity and mortality worldwide, accounting for roughly 15% of all deaths in children under five years of age (World Health Organisation, 2022). Severe pneumonia and anaemia are common in many children under five years of age. Anaemia leads to hypercapnia and slows down red blood cell maturation, thereby facilitating the development of ischaemic syndrome. Pneumonia is most commonly caused by viruses, bacteria, or fungi.

In low and middle-income countries, the clinical management of bronchopneumonia is frequently complicated by systemic comorbidities, among which anaemia is one of the most prevalent (Simanjuntak & Saragih, 2024; Sukarno et al., 2023). In Indonesia, epidemiological assessments indicate that 30%-50% of infants and young children suffer from anaemia, predominantly iron-deficiency anaemia resulting from dietary deficiencies and rapid physiological growth (Akbar et al., 2025; Juffrie et al., 2020).

The coexistence of bronchopneumonia and anaemia creates a harmful physiological synergy that significantly accelerates respiratory distress and increases the risk of severe clinical outcomes (Chisti et al., 2022; Oktafia et al., 2021).

Bronchopneumonia impairs alveolar gas exchange, while concomitant anaemia reduces total oxygen-carrying capacity by decreasing circulating haemoglobin concentrations (Behairy et al., 2018; Simanjuntak & Saragih, 2024). This dual mechanism exacerbates tissue hypoxia and abnormal ventilation-perfusion ratios, predisposing young infants to acute respiratory failure and prolonged hospitalisation (El Sakka et al., 2014; Satıcı et al., 2020). Beyond gas-exchange impairment, iron deficiency compromises host immune defences by dampening T-lymphocyte proliferation and impairing macrophage bactericidal activity, thereby increasing susceptibility to severe infections (Akbar et al., 2025; Morey et al., 2015). Conversely, acute infection induces systemic inflammation that upregulates hepcidin expression, further suppressing erythropoiesis and worsening underlying anaemia (Sukarno et al., 2023).

Although numerous epidemiological studies demonstrate a clear association between low haemoglobin levels and pneumonia severity in under-five populations, managing severe anaemia in the setting of acute pulmonary infection presents complex clinical challenges (Akbar et al., 2025; Kurugol et al., 2012). Decisions regarding packed red blood cell transfusions must carefully balance the immediate need to restore tissue oxygen delivery against potential transfusion-related risks, particularly when immune-mediated mechanisms or infection-induced hemolysis are present (Kurugol et al., 2012).

This case report presents a 5-month-old infant diagnosed with severe bronchopneumonia complicated by profound microcytic hypochromic anaemia requiring blood transfusion support. By documenting the patient's clinical course, diagnostic workup, and response to multimodal therapy, this paper highlights the necessity of simultaneously assessing respiratory and haematological parameters to optimise clinical recovery in young infants.

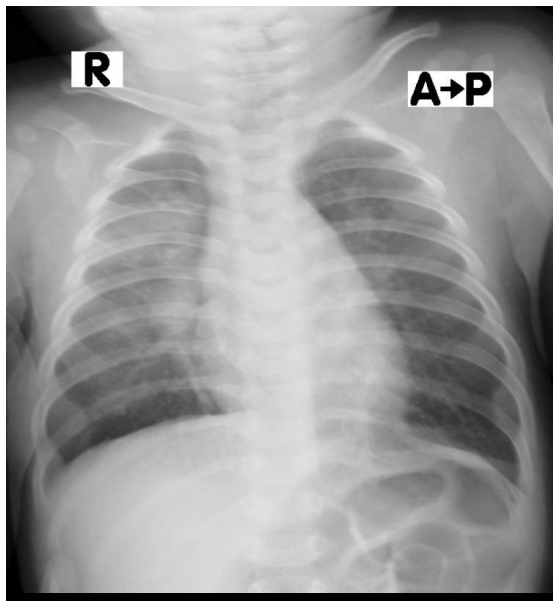
CASE REPORT

A 5-month-old boy was referred from the community health centre's inpatient ward to RSI Mabarrot Bungah. The patient had been treated at the community health centre for 3 days, with shortness of breath as the main complaint, which had begun 3 days prior to admission. According to the medical history provided by the patient's mother, the shortness of breath worsened with coughing and did not improve with rest. These symptoms were accompanied by lethargy, diarrhoea, a fluctuating fever that had persisted for two weeks, and a rattling cough. Whilst hospitalised at the health centre, the patient was given oxygen, intravenous fluids, antipyretics, medication for diarrhoea, and cough and cold syrup. After three days' treatment at the community health centre, the child's shortness of breath worsened, the cough became progressively worse, the child was lethargic, and urine output decreased. As there was no improvement, the patient was referred to the hospital.

Whilst at RSI Mabarrot Bungah, the patient underwent a re-examination, and from the above data, it emerged that the child had been reluctant to eat or drink for the past two weeks, that

the sputum was thick in consistency, contained no blood, and was beginning to turn green. The child has been experiencing nausea, vomiting and diarrhoea for the past three days; cold sweats were denied, and cyanosis of the body and extremities was denied. Previously, the patient had never experienced shortness of breath, and there was no history of asthma or high blood pressure. Prior to admission, there was a history of the child taking paracetamol drops and cough and cold syrup, which the parents had purchased themselves from a chemist's. The patient's mother had a normal pregnancy, and the patient was born vaginally with the assistance of a midwife at RSI Mabarro Bungah, with a birth weight of 3,200 grams and a head circumference of 50 cm. The patient was exclusively breastfed, received all recommended vaccinations up to age 4 months, and had appropriate growth and development for her age.

Physical examination revealed a temperature of 37.8 °C, a respiratory rate of 50 breaths per minute, and oxygen saturation of 90 per cent with oxygen supplementation via a nasal cannula at 2 litres per minute; body weight was 7.4 kg with a height of cm. On physical examination, the patient presented with slight anaemia, chest wall retractions, bilateral rales, minimal wheezing and decreased skin turgor. Initial laboratory tests at the community health centre showed a e and leukocytosis, whith the chest X-ray revealed patchy supra- and parahilar infiltrates on the right side. Based on these overall findings, the patient was diagnosed with bronchopneumonia.



X-ray revealed patchy supra- and parahilar infiltrates on the right side

During hospitalisation, a repeat complete blood count was performed as the patient became increasingly weak whilst in the ward; laboratory results during hospitalisation showed on 3 March: Hb 10.3, white blood cells: 9,700, MCV 74, neutrophils 72; on 5 March: Hb 9.5, white blood cells: 10,390, MCV 70, neutrophils 70; on 7 March, haemoglobin 8.4, white blood cell count: 3,400, MCV 69, neutrophils 30; on 9 March, haemoglobin 12.7, white blood cell count: 6,680, MCV 76, neutrophils 30. HDT suggests hypochromic microcytic anisocytosis anaemia, suspected iron deficiency anaemia – neutropenia and relative lymphocytosis suggestive of a viral infection

The patient received supportive care, including bed rest, fluid and nutritional support, and oxygen via a nasal cannula. Pharmacological therapy included ampicillin, gentamicin, packed red cell transfusion, ranitidine injections, ondansetron injections, salbutamol nebulisation with budesonide, zinc, L-Bio, and oral suspension containing ambroxol, cetirizine, dexamethasone, salbutamol and Tremenza. The antibiotic course was continued for a total of 10 days. The patient was discharged in good condition after a 5-day hospital stay. At discharge, the patient's clinical condition had improved. Shortness of breath and fever had resolved, the cough had subsided, diarrhoea had ceased, and the patient had begun to eat and drink again. Temperature (°C): 36.6, Pulse (beats per minute): 123, Respiratory rate (breaths per minute): 24, SpO₂ (%): 98; no rales or wheezing were detected on auscultation of the lungs; the patient's haemoglobin levels had improved, and the clinical condition had improved; platelet count, haemoglobin and white blood cell count were normal.

DISCUSSION

Anaemia and pneumonia are two of the most common pathological conditions among young populations, and they often occur simultaneously. Children under five and pregnant women are highly susceptible to anaemia, especially in low-income countries. Epidemiological surveys highlight this vulnerability: in Indonesia, basic health data indicate that more than 50% of children and adolescents are anaemic, with prevalence rates reaching 28% to 38% or higher in children under five (Akbar et al., 2025; Simanjuntak & Saragih, 2024; Sukarno et al., 2023).

Bronchopneumonia is a common lower respiratory tract infection in children, particularly during infancy. In this case, the patient was a 5-month-old infant diagnosed with bronchopneumonia and concomitant anaemia requiring a red blood cell transfusion.

Infants are particularly susceptible to respiratory infections because their immune system and respiratory defence mechanisms are still developing. Observational studies in Indonesian pediatric populations show that the majority of childhood pneumonia cases occur in infants aged 6 to 24 months, where immune responses remain hyporesponsive (characterised by lower IL-12p70 production and suboptimal T-cell function), and narrow airway anatomy predisposes to obstruction and infection (Akbar et al., 2025). Clinical manifestations of bronchopneumonia in this age group may range from cough and fever to tachypnoea, chest wall retractions, abnormal breath sounds, and impaired oxygenation, depending on disease severity.

Anaemia represents an important concomitant condition in this patient. In infancy, anaemia may result from several causes, including iron deficiency, acute or chronic inflammation, blood loss, haemolysis, nutritional deficiencies, or underlying haematological disorders (Kurugol et al., 2012; Simanjuntak & Saragih, 2024; Sukarno et al., 2023). During an acute infection, inflammatory processes can interfere with iron metabolism and erythropoiesis, potentially contributing to or worsening anaemia. Specifically, pulmonary inflammation triggers inflammatory pathways (such as STAT3 and SMAD4 via IL-6) that upregulate serum hepcidin, a master regulator that degrades cellular iron exporters and suppresses erythropoiesis, leading to inflammatory anaemia (Sukarno et al., 2023). Conversely, significant anaemia reduces the blood's oxygen-carrying capacity. This creates a hypoxic environment in the respiratory circulation and exacerbates abnormal ventilation-perfusion ratios (Akbar et al., 2025; Simanjuntak & Saragih, 2024). Furthermore, low hemoglobin levels compromise alveolar macrophage function by reducing their capacity to acquire iron, creating an immune system imbalance that can worsen lung infections (Akbar et al., 2025; Simanjuntak & Saragih, 2024; Sukarno et al., 2023).

The relationship between anaemia and respiratory infection can be explained by haemoglobin's role in oxygen delivery. Blood oxygen content depends largely on haemoglobin concentration and oxygen saturation. Therefore, a substantial reduction in haemoglobin may

compromise tissue oxygen delivery even when peripheral oxygen saturation is relatively preserved. Recent clinical research demonstrates a strong association between iron deficiency anaemia (IDA) and increased incidence and severity of pneumonia in children aged 29 days to 5 years (Akbar et al., 2025; Simanjuntak & Saragih, 2024). Studies conducted across several Indonesian regional hospitals show that anaemic children have up to a two-fold increased risk of developing severe pneumonia (e.g., $OR = 2.004, p = 0.0125$ in West Sumba; $RR = 1.69, p = 0.023$ in Jambi), with over 76% of severe pneumonia cases presenting with concomitant iron deficiency (Akbar et al., 2025; Simanjuntak & Saragih, 2024).

However, the correlation between haemoglobin levels and pneumonia severity remains nuanced across different clinical settings (Sukarno et al., 2023). For instance, a cross-sectional study at RSUD Wangaya, Denpasar, observed no statistically significant correlation between baseline haemoglobin levels and severe pneumonia ($p = 0.26$), reflecting findings in broader literature where other clinical biomarkers (such as leukocyte count, zinc, or vitamin D) may drive disease trajectory (Sukarno et al., 2023). Furthermore, while microcytic hypochromic iron deficiency is the predominant aetiology in infants, acute, severe hemolytic processes can also complicate respiratory infections (Kurugol et al., 2012; Simanjuntak & Saragih, 2024). Rare cases demonstrate that atypical pathogens like *Mycoplasma pneumoniae* can trigger immune-mediated, Coombs-positive severe hemolytic anaemia even in the setting of mild pulmonary disease, reinforcing that severe drops in haemoglobin do not always correlate linearly with the physical extent of lung infiltration (Kurugol et al., 2012).

In patients with pneumonia and anaemia, assessment of respiratory status should consequently be accompanied by evaluation of haemoglobin levels and overall tissue perfusion. The severity of anaemia, clinical symptoms, oxygenation status, the presence of active bleeding, and underlying comorbidities should all be considered when determining the appropriate management strategy.

In this patient, a red blood cell transfusion was administered as part of the management of clinically evident anaemia. Transfusion is generally considered when anaemia is severe or associated with clinically significant manifestations, particularly where there are signs of impaired

oxygen delivery, haemodynamic instability, significant blood loss, or other conditions in which increasing the oxygen-carrying capacity may provide clinical benefit. However, the decision to transfuse should not be based solely on a haemoglobin level. In autoimmune- or infection-triggered hemolytic contexts, red blood cell transfusions carry a risk of accelerating immune-mediated destruction and should be approached cautiously, often utilising inline blood warmers (Kurugol et al., 2012). The clinical condition and the underlying cause of the anaemia must always be taken into account, requiring an individualised assessment of potential benefits and risks in children with acute infection.

The expected benefit of a red blood cell transfusion in this context is an increase in circulating haemoglobin and, consequently, an improvement in the blood's oxygen-carrying capacity. This may help support tissue oxygenation during an acute infectious process. Nevertheless, a transfusion does not correct the underlying cause of the anaemia. Once the acute condition has stabilised, further evaluation of the aetiology of anaemia remains necessary. Diagnostic tools such as erythrocyte indices (e.g., MCV, MCH, Mentzer Index) and serum ferritin measurements are essential for confirming microcytic hypochromic iron deficiency or for ruling out hemolytic and systemic etiologies (Akbar et al., 2025; Simanjuntak & Saragih, 2024). Depending on the clinical context, post-stabilisation management should include assessments of nutritional intake, iron supplementation, evidence of blood loss, chronic disease, and other haematological abnormalities (Akbar et al., 2025).

Management of bronchopneumonia in children generally consists of appropriate supportive care, close monitoring of respiratory status and oxygenation, and antimicrobial therapy when a bacterial or atypical infection is clinically suspected (Kurugol et al., 2012). Supplemental oxygen should be provided when hypoxaemia is present and in accordance with the severity of respiratory compromise. Adequate hydration and nutritional support are also important, particularly in infants who may have difficulty feeding due to tachypnoea, fever, or respiratory distress. Serial assessment of respiratory rate, oxygen saturation, work of breathing, body temperature, level of consciousness, and feeding ability is useful for evaluating the patient's response to treatment.

The coexistence of bronchopneumonia and anaemia in this case highlights the importance of a comprehensive approach to paediatric patients. Acute infection may increase metabolic and oxygen requirements, whilst anaemia reduces the circulatory system's capacity to meet these demands. When pulmonary disease further impairs oxygen exchange, these factors may contribute to greater physiological stress and increase the likelihood of respiratory failure (Akbar et al., 2025; Simanjuntak & Saragih, 2024). Therefore, clinical improvement should be assessed not only by the resolution of respiratory symptoms but also by improvements in general condition, feeding tolerance, oxygenation, haemodynamic stability, and haematological parameters.

The prognosis of bronchopneumonia in infants is influenced by several factors, including age, infection severity, nutritional status, immune status, underlying comorbidities, and treatment response. In a 5-month-old infant with concomitant anaemia, closer monitoring may be warranted because young age and reduced oxygen-carrying capacity can increase physiological vulnerability during an acute respiratory infection. Improvement in respiratory effort, oxygen saturation, feeding, and general clinical condition can serve as important indicators of therapeutic response. Follow-up evaluation of the anaemia is also necessary to determine whether the haematological abnormality has resolved and to identify or address its underlying cause. Early screening, parental nutritional education, and targeted iron supplementation remain critical preventive interventions to reduce the risk of severe pulmonary complications in young children (Akbar et al., 2025; Simanjuntak & Saragih, 2024).

Overall, this case illustrates the clinical complexity of bronchopneumonia in a young infant complicated by significant anaemia requiring a blood transfusion. The case highlights the importance of simultaneously assessing respiratory and haematological status, as reduced haemoglobin levels may compromise oxygen delivery during an acute pulmonary infection. Comprehensive management—comprising appropriate treatment of the respiratory infection, respiratory support where indicated, correction of clinically significant anaemia, and subsequent investigation into the underlying cause of the anaemia—is essential to optimise clinical recovery and reduce the risk of recurrence.

CONCLUSION

This case illustrates the clinical complexity of bronchopneumonia in a 5-month-old infant complicated by severe microcytic hypochromic anaemia requiring packed red blood cell transfusion. The coexistence of acute pulmonary infection and anaemia created a harmful physiological synergy, as impaired alveolar gas exchange combined with reduced oxygen-carrying capacity exacerbated tissue hypoxia and increased the risk of severe clinical deterioration. Comprehensive management—including appropriate antimicrobial therapy, respiratory support with supplemental oxygen, correction of clinically significant anaemia through transfusion, and symptomatic care—resulted in significant clinical improvement, with resolution of respiratory distress, fever, and diarrhoea, normalisation of haemoglobin levels, and safe discharge after a 5-day hospital stay. This case highlights the importance of simultaneously assessing respiratory and haematological parameters in young infants, as reduced haemoglobin levels may compromise oxygen delivery during acute pulmonary infection, and underscores the need for follow-up evaluation of the underlying cause of anaemia, along with early screening, parental nutritional education, and targeted iron supplementation as critical preventive interventions to reduce the risk of severe pulmonary complications in young children.

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