

## Increased Frequency of Pleural Effusion with Pneumonia in Children presenting at a Tertiary Care Hospital of Karachi

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### Abstract

We report nine cases of children under the age of ten years with increased incidence of pleural effusion with pneumonia in two months i.e. March and April 2015 at the paediatric unit II, Abbasi Shaheed Hospital, Karachi. All children were admitted in our hospital with a history of fever, with or without rigors and chills, cough and dyspnoea. In younger children nasal flaring was observed. Initial chest X-ray done showed pneumonia with pleural effusion. This was followed by Chest ultra sound which revealed pleural effusion on either left or right side of the chest, depending upon the patient. Four of the patients required a thoracotomy tube for drainage of the pleural fluid. All patients were treated with intravenous antibiotics and showed improved results. Four of the nine patients required paediatric intensive care admission.

We have reported these cases due to our concern in the upsurge of pleural effusion with pneumonia which was previously not seen in the paediatrics department of a tertiary care hospital of Karachi.

**Keywords:** Pneumonia, pleural effusion, children, fever, cough.  
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### Introduction

Pneumonia is one of the leading causes of death in children<sup>1</sup>. Pneumonia causes 29% of all deaths in children less than 5 years of age. The incidence of pneumonia is 10 fold higher and the number of childhood related deaths due to pneumonia is ~2000 fold higher in the developing countries compared to the developed world<sup>2</sup>. Moreover, the incidence of complications of this disease in children is on the rise. A research conducted revealed an increase number of pleural effusions and empyema in children secondary to bacterial pneumonia caused by *H. Influenza* or *M. pneumonia/Streptococcus pneumonia*<sup>1,2</sup>.

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Pain, exaggerated deep breathing, coughing, pleural pain, grunting and guarding of respiration are present in most children in pneumonia with pleural effusion. Pain is localised on the side of the pneumonia and effusion. Child may lie on the affected side so as to decrease any respiratory excursions and may not allow anyone to touch the area affected. Complication of pneumonia includes a diffuse haziness at pleural surface or a dense sharply demarcated shadow, seen on X-ray, ultrasound or CT<sup>3</sup>.

Exudates, edema and local haemorrhage with extension, involvement of interalveolar septa and the pleura caused increased morbidity<sup>4</sup>. Thoracocentesis required once pleural effusion is diagnosed by clinical examination, chest X-ray, ultrasound and CT scan<sup>5</sup>.

Another research showed that out of 154 children diagnosed with pneumonia, 40 (26%) of them were reported to have pleural effusion. Majority of the cases had bacterial rather than viral aetiology<sup>6</sup>.

The incidence of pneumonia in children less than 5 years is averaged to be 0.29 episodes per

child-year in developing countries. Hence around 10 million cases occur in Pakistan every year. Amongst the community cases, 7-13% of patients requires hospital treatment and can prove life threatening if not treated effectively. There is evidence that the root causes of the disease lie in lack of exclusive breastfeeding, malnutrition, unhygienic environment, crowding and low birth weight. The main pathogens associated with pneumonia in children were identified as *Streptococcus pneumoniae*, *H. Influenza* and respiratory syncytial virus<sup>2</sup>. The most common complications in children suffering from pneumonia are pleural effusions and empyema<sup>7</sup>. The Group A streptococcus causes pneumonia with necrosis of the pulmonary tissue and pleural involvement with eventual empyema.

### Case 1

Patient A, 9 years old boy was admitted in Paediatric Unit II of Abbasi Shaheed Hospital, Karachi. According to the patient's mother the boy was in his usual state of health until 2 days back when he developed high grade fever associated with rigors and chills, fever was intermittent and was relieved by taking anti-pyretic syrup. It was also associated with dry cough which was on and off, mild in intensity. There was dyspnoea which manifested as nasal flaring and intercostal recessions. Then he developed intense pain in his left side of chest, it was dull and radiated to the back and the entire left side of the chest. There was no shift of pain. The pain was not relieved by taking analgesics and associated with headache. The patient suffered pneumonia 4-5 months back for which he was admitted in the hospital for one week. Otherwise, he did not have any significant complains of other systems. The patient has incomplete vaccination but BCG scar is present.

On examination a drowsy child with occipito-frontal circumference (OFC) of 53 cm, weight 24 kg and height 127 cm, respiratory rate 58/minute and heart rate 134/minute. He was anaemic and dehydrated. On inspection, nasal flaring was positive. Chest examination also revealed decreased chest

movements on left side and dull note on left middle and lower part of chest. Fine crepts were heard on middle and lower part of chest. Liver span was 13cm. On abdominal examination, it was soft and non-tender however, liver was 1 finger palpable. Spleen was not palpable and no other visceromegaly. Laboratory investigations of complete blood picture, serum calcium, alkaline phosphate and all other biochemical markers were in normal range.

The patient was treated with IV Ceftriaxone and Vancomycin, Paracetamol syrup and Ipratropium inhaler. He was also referred to the surgery department when he developed left sided pleural effusion. His leftthoracostomy was conducted as shown in Fig. 1. Tube was passed and pleural effusion was drained. Patient improved, was afebrile and was allowed liquid diet.

### Case 2

Patient B, 12 years old female was admitted in Paeds Unit II of Abbasi Shaheed Hospital, Karachi. According to the patient's mother the child suddenly developed high grade fever, 5 days back which was non-documented. It was associated with rigors and chills but not headache, nausea or any other complains. Fever was relieved by taking anti-pyretic medicine temporarily. She also developed chest pain, 2 days ago, on the left side of the chest which was sudden in onset, severe in nature, exaggerated by cough and relieved by taking anti-inflammatory drug. The cough is productive in nature with green sputum. The patient suffered from malaria a year ago. She is completely vaccinated.

On examination, the child was active and aware. Weight was 30 kgs, height was 150 cm, occipital-frontal circumference was 50 cm, respiratory rate 28/minute and heart rate 100/minute. On inspection, there was decreased movement on the left side of the chest. Trachea was centrally placed. On palpation chest expansion was less than 2 cm. Auscultation revealed decreased breath sounds on left middle or lower lobe. Abdominal examination showed no tenderness or visceromegaly. CBC was normal however haemoglobin levels came out to be

8.3 g%. X-ray and ultrasound revealed pleural effusion however the pleural fluid was too less to be drained. Treatment was initiated with Ceftriaxone IV, Paracetamol syrup, Ipratropium inhaler and Syrup Ferrous Sulphate,

### **Case 3**

Patient C, 7 years old, admitted in Paeds Unit II of Abbasi Shaheed Hospital Karachi, resident of Paposh, vaccinated admitted in ward through OPD with complaints of fever and cough for the past one week and difficulty in breathing and right side chest pain for the past 3 days. Fever was 102°F on documentation, associated with chills and subsided by taken anti-pyretic. The cough was non-productive and not time related. Chest pain was not associated with posture or any activity. He took antibiotic for one week but condition did not improve. Past medical history and birth history were unremarkable. He was completely vaccinated. BCG scar was positive. There was no history of TB or asthma in his family.

His weight was 10th centile and height was between 50 and 75 centile. Examination revealed decreased chest expansion on right side with a dull note on percussion. There was decreased air entry on the right side of the chest. The child has increased vocal resonance and bronchial breathing on right side. Rest of the systemic examination was unremarkable. Chest X-ray revealed opacification over the right side of chest. Ultrasound done showed minimal fluid, suggesting pleural effusion which could also have been reactionary fluid in pleural cavity. It was not possible to drain this fluid for DR, gram stain and culture. Initial investigation revealed haemoglobin of 9.9g% and a raise in WBCs. Treatment given was IV Ceftriaxone and Vancomycin and Paracetamol syrup.

### **Case 4**

Patient D, 8 years old, was admitted in Paeds Unit II of Abbasi Shaheed Hospital Karachi. According to the patient's father the boy was alright 10 days back when he developed a gradual, high

grade, non-documented fever. The fever was not associated with rigors and chills and was relieved by taking anti-pyretic syrup. It was also associated with non-productive cough. His past history consists of bouts of cough for the past 4 years.

On examination the boy weighed 17.5 kg, height was 113 cm, OFC 54 cm. He was also anaemic. Chest examination revealed decreased chest movements and expansion on left side, decreased air entry and dull percussion note on left side of chest. Rest of the systemic examination was unremarkable. X ray report showed pleural fluid on the left side of chest as shown in Fig. 2. Haematology report revealed mild hypochromic anisocytosis and positive rouleux formation. Haemoglobin level was also low, 10.7 g/dl. Chest ultrasound suggested left sided pleural effusion with collapse of left lung. Therefore, patient was treated with IV Ceftriaxone and Vancomycin, syrup Paracetamol and Ipratropium inhaler. He was referred to the surgery department where left tube thoracostomy was conducted, in which 10cc serous fluid was drained. Lab reports on pleural fluid showed presence of foamy macrophage cells. In the Acid-Fast Bacilli (AFB) smear test conducted, pleural fluid was negative for Acid-Fast Bacilli. DR and culture was negative. Child was kept on antibiotics and gradually improved after 7 days. Patient was afebrile and was allowed liquid diet.

### **Case 5**

Patient E, 7 years old, was admitted in Paeds Unit II of Abbasi Shaheed Hospital Karachi. According to the patient's father the girl was alright two weeks back when she developed a gradual, high grade, non-documented fever. The fever was associated with rigors and chills and was relieved by taking anti-pyretic syrup. It was also associated with non-productive cough. Her family history consisted of her uncle suffering from tuberculosis for the past one year. BCG scar was present, however immunization was incomplete.

On examination the girl weighed 16 kg, height was 105 cm, OFC 50 cm. Chest examination re-

vealed decreased chest movements and expansion on right side and dull percussion note on right side of chest. Rest of the systemic examination was unremarkable. Chest ultrasound suggested of right sided pleural effusion. Therefore, patient was treated with IV Ceftriaxone and Vancomycin and an anti-pyretic for fever. She was referred to the surgery department where ultrasound guided right tube thoracostomy was conducted, in which 5cc straw coloured, serous fluid was drained. Gram stain and culture report did not show any positive finding. Patient improved, was afebrile and was allowed liquid diet.

### Case 6

Patient F, 10 years old, was admitted in Paediatric Unit II of Abbasi Shaheed Hospital Karachi. According to the patient's mother the girl was alright 3 weeks back when she developed a gradual, high grade, non-documented fever. The child's height and weight were on the 25 centile (NCHS). Child had received only BCG vaccination. There was no history of contact. The fever was not associated with rigors and chills and was relieved by taking anti-pyretic syrup. It was also associated with non-productive cough.

On examination the girl weighed 22 kg, height was 115 cm. Chest examination revealed decreased chest movements and expansion on left side, decreased air entry and dull percussion note on left side of chest. Abdominal examination revealed 2 cm palpable liver. Rest of the systemic examination was unremarkable. Haematology report suggested mild hypochromic anisocytosis. Haemoglobin level was also low, 10.1 g/dl. Chest ultrasound suggested of left sided pleural effusion with collapse of left lung. Her typhoid test was negative; this report was brought by the parents from another hospital. It was not possible to drain the fluid, so the gram stain and DR and culture was not possible. Therefore, patient was treated with IV Ceftriaxone, paracetamol and Clarithromycin for atypical pneumonia. Patient improved, was afebrile and was allowed liquid diet.

### Case 7

Patient G, 10 years old male was admitted in Paediatric Unit II of Abbasi Shaheed Hospital, Karachi. According to the patient's mother the child suddenly developed high grade fever, since one week which was non-documented. It was associated with rigors and chills but not headache, nausea or any other complaints. Fever was relieved by taking anti-pyretic medicine temporarily. He also developed chest pain, 4 days ago, on the left side of the chest which was sudden in onset, severe in nature, exaggerated by cough and relieved by taking anti-inflammatory drug. He also complained of dry, non-productive cough for one week. He is completely vaccinated. His family history documented asthma (father) and tuberculosis.

On examination, the child was active and aware. Weight was 23 kg. On inspection, there was decreased movement on the left side of the chest. Trachea was centrally placed. Auscultation revealed decreased breath sounds on left lower lobe. On abdominal examination, 2 cm liver was palpable. CBC was normal however haemoglobin levels came out to be 10.6 g%. X-ray and ultrasound revealed pleural effusion. Ten cc pleural fluid was drained surgically by thoracotomy, it was yellow in colour, presence of RBCs and WBCs was detected however there was no sign of any organism or presence of AFB. Patient was also treated with Ceftriaxone intravenous, Paracetamol syrup and Salbutamol nebulizer.

### Case 8

Patient H, 6 years old female was admitted in Paediatric Unit II of Abbasi Shaheed Hospital, Karachi. According to the patient's mother the child suddenly developed high grade fever, since one week which was non-documented. It was associated with rigors and chills but not headache, nausea or any other complaints. Fever was relieved by taking anti-pyretic medicine temporarily. She also developed chest pain, 2 days ago, on the right side of the chest which was sudden in onset, severe in nature, exaggerated by cough and relieved by taking anti-

inflammatory drug. The cough was dry and non-productive. She is completely vaccinated. Her family history documented asthma and tuberculosis in distant relatives.

On examination, the child was active and aware. Weight was 15 kg. On inspection, there was decreased movement on the right side of the chest. Trachea was centrally placed. Auscultation revealed decreased breath sounds on right lower lobe. On abdominal examination, 2 cm liver was palpable. CBC was normal however haemoglobin levels came out to be 8.2 g%. X ray and ultrasound revealed pleural effusion however the pleural fluid was too little to be drained. Treatment was initiated with Ceftriaxone IV, Paracetamol syrup and Salbutamol nebulizer.

### **Case 9**

Patient I, 8 years old male was admitted in Paediatric Unit II of Abbasi Shaheed Hospital, Karachi. According to the patient's mother the child suddenly developed high grade fever, 10 days back which was non-documented. It was associated with rigors and chills but not nausea or any other complaints. Fever was relieved by taking anti-pyretic medicine temporarily. He also developed chest pain, 2 days ago, on the left side of the chest which was sudden in onset, severe in nature, exaggerated by cough and relieved by taking anti-inflammatory drug. The cough was non-productive. Three episodes of vomiting also occurred in the past two days. The child was completely vaccinated.

The young boy was sitting anxiously with respiratory distress. Weight was 19 kgs. On inspection, there was decreased movement on the left side of the chest. Auscultation revealed decreased breath sounds on left lower lobe and increased vocal resonance. Abdominal examination showed no tenderness or visceromegaly. CBC was normal however haemoglobin levels came out to be 8.1 g%. X-ray and ultrasound revealed pleural effusion, which was drained by ultrasound, guided pleural tap. Fluid drained was 600cc was drained from which 10cc was sent for diagnosis. Pleural fluid was straw

coloured, turbid exudate. Gram stain showed gram-negative bacilli and culture report received at a later date showed pseudomonas species, sensitive to Ceftriaxone. Patient was also treated with Ceftriaxone IV, Vancomycin, Syrup Ferrous Sulphate, Ipratropium inhaler, and Folic acid.

Overall the management in all the cases included intravenous fluids till the patient was stable enough to take his regular oral feed. All children were started with intravenous antibiotics for a minimum time period of ten days. The patient was switched to oral antibiotics once clinically stable and chest was clear both on auscultation and ultrasound (in case of pleural effusion). Neither immobilization of chest with adhesive plaster nor therapy with drugs capable of expressing cough was used.

Children with pain may not say anything, but will hold their chest with one hand, or not allow anyone one to touch them especially in the area where the thoracotomy tube is present. When pneumonia was not present or was under good therapeutic control, strapping of chest to restrict expansion afforded slight relief from pain. In some cases when the pain did not resolve with Paracetamol, NSAID (non-steroid anti-inflammatory drugs) helped to some extent. Where possible the children were given multivitamins with iron and Vitamin A and D orally.

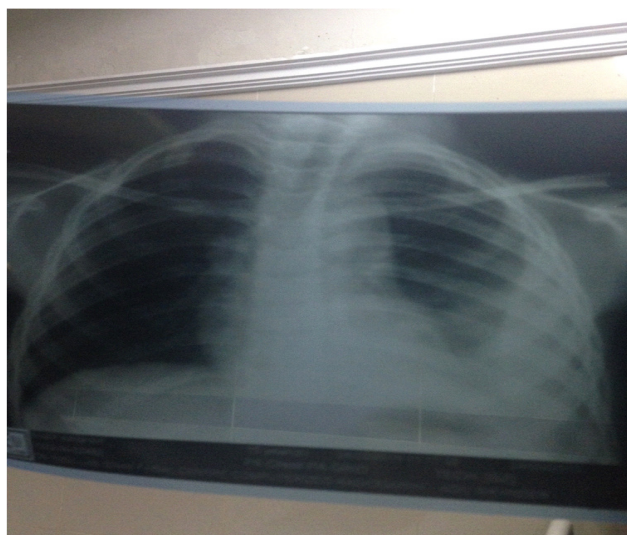
All children were investigated for TB especially with pleural effusion. Acid-fast Bacilli (AFB) was negative of pleural effusion fluid and the remaining tests such as ESR and MT were negative and there was no history of contact. Summary of all the cases is shown in (Table 1).

### **Discussion**

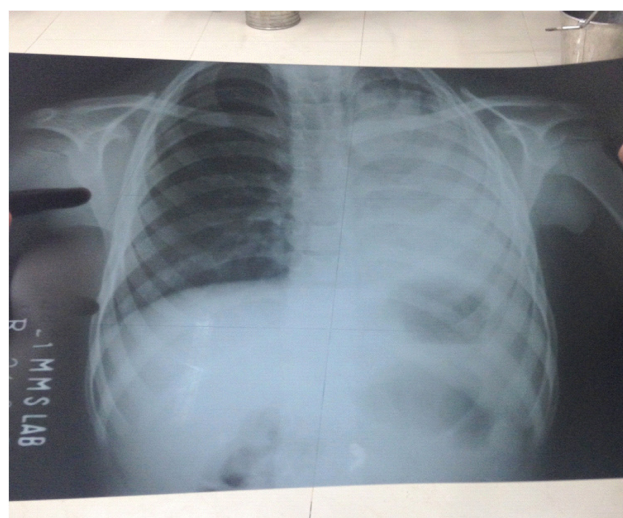
The cases show a trend of increased incidence of pleural effusion in children suffering from pneumonia. In these case series all the children had pneumonia with pleural effusion however in very few cases 3/6 required thoracotomy. All had low haemoglobin levels and received IV antibiotics. All required hospitalization. The majority of children had

**Table 1.** Shows the details of the cases mentioned above of children suffering from pleural effusion with pneumonia.

S.No	Name	Age	Sex	Clinical Presentations	Ultrasound And Chest X-ray	CBC	Final Diagnosis
1	A	9	Male	Fever, cough, nasal flaring, chest pain	Left side pleural effusion	Hb 7.5	Pleural effusion due to pneumonia
2	B	12	Female	Fever, cough, nasal flaring, chest pain	Left side pleural effusion	Hb 8.3	Pleural effusion due to pneumonia
3	C	7	Male	Fever, cough, nasal flaring, chest pain	Right side pleural effusion	Hb 9.9	Pleural effusion due to pneumonia
4	D	8	Male	Fever, cough, nasal flaring, chest pain	Left side pleural effusion	*Hb 10.7 Mild hypochromic anisocytosis and rouleux formation	Pleural effusion due to pneumonia
5	E	7	Female	Fever, cough, nasal flaring, chest pain	Right side pleural effusion	Hb 10	Pleural effusion due to pneumonia
6	F	10	Female	Fever, cough, nasal flaring, chest pain	Left side pleural effusion	*Hb 10.1 Mild hypochromic anisocytosis	Pleural effusion due to pneumonia
7	G	10	Male	Fever, cough, nasal flaring, chest pain	Left side pleural effusion	Hb 10.6	Pleural effusion due to pneumonia
8	H	6	Female	Fever, cough, nasal flaring, chest pain	Right side pleural effusion	Hb 8.2	Pleural effusion due to pneumonia
9	I	8	Male	Fever, cough, nasal flaring, chest pain	Left side pleural effusion	Hb 8.1	Pleural effusion due to pneumonia



**Fig. 1.** Left pleural effusion due to pneumonia (probably bacterial) in a 9 years old child (Patient A) suffering from pneumonia. Note the compressed lower lobe of the left lung. The effusion was evacuated and the left lung completely expanded after insertion of thoractomy and chest tube insertion.



**Fig. 2.** Left sided pleural effusion of 8 years old, boy (Patient D) suffering from pneumonia. Note the compressed upper and lower lobe of left lung and nearly complete haziness of the left lung. Compressed and atelectic left lung is seen. The pleural effusion drained was negative for tuberculosis and indicated a bacterial infection

incomplete immunization, however BCG scar was present in nearly all the children admitted in the paediatric ward.

Signs of pleural effusion in children are dyspnoea, dry cough and pain over the chest wall. Diminished or dull sounds are heard during auscultation over the affected chest area<sup>8</sup>.

*Streptococcus pneumoniae* has been identified as the most common bacteria among the children population to cause pneumonia and pleural effusion<sup>4,6</sup>. A study over the years 1980 - 2008 was conducted in which there were 12,815 cases of children with pneumonia, less than 5 years of age. It was estimated that there were 260,768 cases of pneumococcal pneumonia. It was found that pneumococcal cases and deaths were two fold as compared to other causes of pneumonia in children such as pneumococcal meningitis<sup>9</sup>.

The diagnosis of pneumonia is usually made by clinical manifestations confirmed by examination. The final diagnosis is based on the presence of chest radiographs. More recently the use of ultrasonography in the detection of pneumonia is becoming common. Studies show that it is an effective diagnostic tool, which can be used to identify the disease in children<sup>4,10,11</sup>. Differential diagnosis of causes of pneumonia in children includes bacterial, viral and tuberculosis which is endemic in our countries. Majority of the children had been on oral antibiotics prior to their admission in the paediatric ward. In none of the patients, the pleural effusion sent for analysis, was AFB positive. In only one case was pseudomonas isolated. The findings of these nine cases suggest that perhaps viral aetiology of the pneumonia in some of these cases is a possibility.

Moreover, all the patients admitted with pneumonia were anaemic and were diagnosed with microcytic hypochromic anaemia. Children and adult females form the majority of the Pakistani population have anaemia. This is due to lack of appropriate nutrition and pica especially in children<sup>12</sup>.

Pneumonia in children is managed by giving oxygen therapy if oxygen saturation is <92%. However if the condition is not very severe, oral Amoxicillin is given. Traditionally, ill children are treated with parenteral antibiotics and antivirals. If a complication like pleural effusion occurs then use of ultrasonography and intercostal drainage is advised<sup>4,7</sup>.

All cases with severe pneumonia in children should be treated with injectable antibiotics<sup>13</sup> as was the cases in our patients. Limitation in this case series was the inability to send all pleural effusion fluids for culture. Also viral culture was not done in any of the patients either of the pleural fluid or in the blood sample. Due to previous use of antibiotics in these children, blood culture did not yield any positive results.

Prompt treatment with injectable antibiotics and admission in the ward or the paediatric intensive care, did save the children, however, the distressing aspect is the lack of complete immunization, possibility of unhygienic conditions (lack of water in most areas), poverty and overcrowding, which needs to be addressed by health workers and policy makers

### **Conclusion**

These case series highlight an upsurge of pleural effusion with pneumonia in the period of last three months (January to April) in the cosmopolitan city of Karachi at Abbasi Shaheed Hospital hence paediatricians should be aware of this serious condition, its management and referral to a tertiary centre if necessary. Complete and updated immunisation of the children is vital to their wellbeing.

### **Conflict of interest**

The author has no conflict of interest and no funding/grant from any organization.

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