

Original Research Article

Pleural effusion in a pediatric ward: clinical feature, etiology and outcome

Mohammad Ahad Adnan*, M. Delwar Hossain, M. Rezaul Haque, Tania Islam,
Ifthakhar Ahmed, Uttam Kumar Datta

Department of Pediatrics, Institute of Child and Mother Health (ICMH), Dhaka, Bangladesh

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*Correspondence:

Dr. Mohammad Ahad Adnan,
E-mail: ahadnann@gmail.com

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ABSTRACT

Background: Pleural effusion is a common respiratory complication in children. We aimed to document clinical feature, etiology, biochemical parameters and outcome of the admitted children with pleural effusion.

Methods: This cross-sectional study was conducted from January 2022 to June 2023 at pediatric ward of ICMH. All children from 6 months to 14 years presented with clinical features suggestive of pleural effusion and later supported by radiology and ultrasonography of chest either at presentation or owing to other systemic illness were enrolled. Children aged below 6 months, associated chronic illness and parental denial of giving consent were excluded. In indicated cases pleural fluid was tapped and sent to laboratory for physical, biochemical examination, staining, culture, GeneXpert, LDH and ADA assay.

Results: Out of 43 children, 19 underwent pleural tap and rest were managed conservatively. Most of the children were in between 2 to 6 years. There were 22 male and 21 female. Unilateral effusion was found in 25 children and 18 children developed bilateral effusion. All the children had documented fever. Other symptoms were cough, respiratory distress, chest pain, weight loss, abdominal pain, jaundice and blood mixed sputum. Physical signs correlated classical effusion features. The etiologies included DF, TB, para-pneumonic effusion, empyema, nephrotic syndrome, malignancy, acute viral hepatitis, heart failure and acute pancreatitis. There was no mortality and long-term complication in non-malignant cases.

Conclusions: DF outnumbered other causes of pleural effusion in recent times owing to recent Dengue outbreak. Tubercular effusion was leading cause among cases undergoing pleural tap.

Keywords: Pleural effusion, Dengue, Tuberculosis, Pneumonia, Nephrotic

INTRODUCTION

Pleural effusion is an abnormal collection of fluid in the pleural space. It develops either owing to excessive filtration or defective absorption of accumulated fluid. A primary lung pathology and secondary complication of many disorders can lead to pleural effusion.¹

The lung surface and inner chest wall surfaces are lined by visceral and parietal pleura, respectively. Normally 4-12 ml of fluid is present in the pleural space, that form a

thin layer of about 10 microL thickness.^{1,2} In comparison to interstitial fluid the pleural fluid has a higher level of bi-carbonate, lower level of sodium and large molecular weight protein (e.g. LDH) and a similar level of glucose.³

The process of inflammation of the pleura is called pleurisy, which may be accompanied by an effusion. Pleurisy may be dry, serofibrinous and purulent. The exact identification of nature is crucial in determining treatment option and to prevent complication. Again, the process of fluid accumulation divides the pleural effusion

into exudative (abnormal lymphocytic count) and transudative (increased hydrostatic or decreased oncotic pressure in the setting of normal capillary) (Dagenchew Assefa, Arthur b atan-aap). The leading causes of pleural effusion in children are bacterial pneumonia, heart failure, rheumatic carditis, intrathoracic malignancy, TB, SLE, aspiration pneumonitis, uremia, pancreatitis etc.¹

We aimed to document clinical feature, etiology, biochemical parameters and outcome of the children with pleural effusion at ICMH.

METHODS

This cross-sectional study was conducted from January 2022 to June 2023 at pediatric ward of ICMH. All children from 6 months to 14 years who presented with clinical features suggestive of pleural effusion and later supported by radiology and ultrasonography of chest as well as who developed effusion secondary to other systemic illness were enrolled into the study. Those having age below six months, associated chronic illness and parental denial of giving consent were excluded.

Total 43 children were enrolled. After enrollment detailed history was taken, thorough clinical examination was done in each patient. Children who had definite primary cause of effusion and for whom pleural tap is not indicated were not proceed to pleural fluid analysis. Rest of subjects underwent pleural tap. Pleural fluid was sent to laboratory for physical, biochemical examination, staining, culture, GeneXpert, LDH and ADA assay.

Written consent was obtained from each legal guardian. All data were recorded in pre-tested semi-structured questionnaire. Ethical clearance was taken from institutional review board of ICMH.

RESULTS

Effusion was initial presentation in 15 children. Again 28 children developed effusion later in disease course while in 4 patients pleural fluid analysis was warranted. So out of 43 children 19 underwent pleural tap and rest were managed conservatively.

Most of the children (30, 69.7%) were in between 2 to 6 years, while 8 (18.6%) children were below 2 years and 5 (11.6%) children were above 6 years respectively. There were 22 male and 21 female. So male female ratio was 1.04:1. Unilateral effusion was found in 25 children (12 in right side and 13 in left side) and 18 children developed bilateral effusion (Table 1).

Presenting symptoms and physical signs at the time of clinical diagnosis of pleural effusion were taken into account. All (100%) children had documented fever, while 40 (93%) had cough, 36 (83.7%) had respiratory distress, 27 (62.8%) had chest pain, 9 (20.9%) had history of losing weight, 8 (18.6%) had abdominal pain, 4 (9.3%)

had jaundice, 3 (6.9%) had history of TB contact in last 12 months and 2(4.6%) children had blood mixed sputum (Table 2).

Physical signs exclusive to respiratory systems were cyanosis (2, 4.6%), tachypnea (26, 40%), chest retraction (24, 55.8%), diminished chest movement (33, 76.7%), mediastinal shifting (18, 41.8%), diminished vocal fremitus (43, 100%), dull percussion note (43, 100%), diminished breath sound (43, 100%), and diminished vocal resonance (43, 100%) (Table 2).

In the first 6 months of the study 10 patients were admitted and in next 6 months another 12 patients were admitted. Almost half of the patients (21, 48.8%) got admitted from January 2023 to June 2023 (Figure 1).

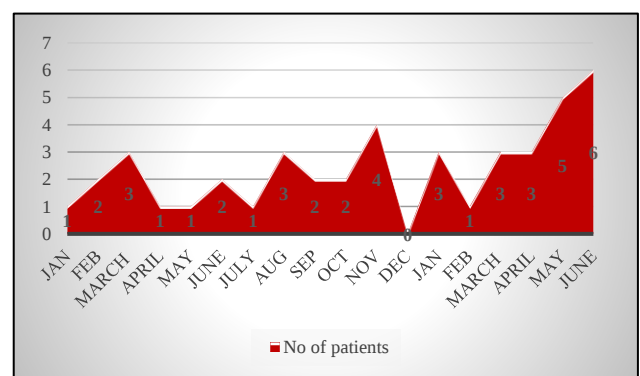


Figure 1: Month wise patient flow, (n=43).

Among the enrolled children the leading cause of pleural effusion was dengue fever. A total of 9 (20.9%) patients had dengue. Among the tapped cases tubercular effusion (7, 16.2%) was foremost, followed by para-pneumonic effusion and empyema, having 6 patients each. Nephrotic syndrome and malignancy shared same number of effusions by 4 patients each. Acute viral hepatitis was cause of effusion in 3 cases and both heart failure as well as acute pancreatitis had 2 cases (Figure 2).

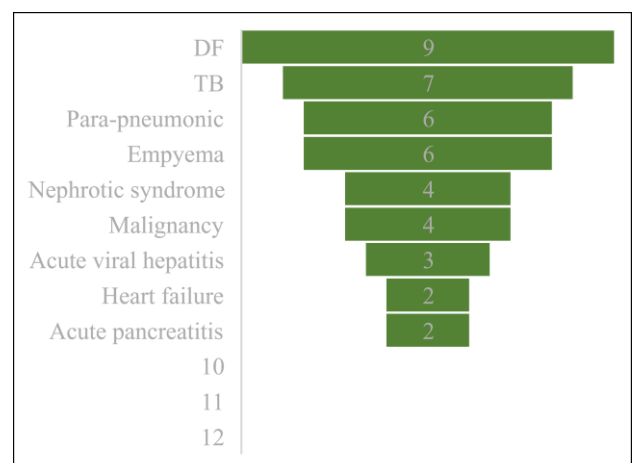


Figure 2: Etiological classification of pleural effusion, (n=43).

Pleural fluid of 19 patients were drawn and analyzed for protein, glucose, LDH and ADA while the former three were compared with blood level as well. These comparative findings are summarized in Table 3.

Among 43 enrolled patients 39 patients were managed till full recovery at ICMH. Patients were later followed-up at child asthma center after discharge. There was no mortality and long-term complication. Rest of 4 patients having malignancy were referred to Bangabandhu Sheikh Mujib medical university (BSMMU), where 3 patients were diagnosed as lymphoma and remainder 1 had soft tissue sarcoma who along with 1 patient of lymphoma died. Rest of 2 cases with malignancy have been getting protocol-based chemotherapy.

Table 1: Baseline characteristics of study subjects.

Baseline characteristics	Pleural tap done, (19)	Pleural tap not done, (24)
Age (In years)		
<2	1	7
2-6	15	15
>6	3	2
Gender		
Male	11	11
Female	8	13
Site of effusion		
Right	10	2
Left	9	4
Bilateral	0	18

Table 2: Presenting symptoms and respiratory signs of study subjects, (n=43).

Clinical presentations	N	Percentage (%)
Presenting symptoms		
Fever	43	100
Cough	40	93
Respiratory distress	36	83.7
Chest pain	27	62.8
History of weight loss	9	20.9
Abdominal pain	8	18.6
Jaundice	4	9.3
History of TB contact in last 12 months	3	6.9
Hemoptysis	2	4.6
Respiratory signs		
Cyanosis	2	4.6
Tachypnea	26	40
Chest retraction	24	55.8
Diminished movement of chest	33	76.7
Mediastinal shifting	18	41.8
Diminished vocal fremitus	43	100
Dull percussion note	43	100
Diminished breath sound	43	100
Diminished vocal resonance	43	100

Table 3: Comparative biochemical parameters of pleural fluid.

Diagnosis	Protein (pleural fluid: serum)		glucose (mg/dl)		LDH (pleural fluid: serum)		Pleural fluid ADA (IU/L)	
	<0.5	>0.5	<60	>60	<0.6	>0.6	<50	>50
TB		6	5	1		6		6
Para-pneumonic		5	4	1		5	4	1
Empyema		6	4	2		6	4	2
Malignancy	2		1	1	2		2	

DISCUSSION

This current study observed the age group from 2 to 6 years as the leading one, followed by <2 years group and >6 years group. A recent study conducted at Dhaka observed 1-4 years group as leading age group.⁴ Another study at Rajshahi, Dhaka also documented 1-4 years group to be most common age group for the pleural

effusion.⁵ Some researchers also found pleural effusion more common in younger children than the older ones.⁶

Male predominance as found in our study was in well concordance to some other studies done by Akand et al, Hossain et al and Saliya et al.^{4,5,7} The study conducted by Saliya et al enrolled children with pleural effusion both undergoing pleural tap and that without pleural tapping

much comparable to the current study.⁷ They found more than 85 percentage patients having unilateral effusion. While in our study 25 (58.1%) children had unilateral study. The current unusual surge of dengue fever in 2023 in Bangladesh as declared by world health organization (WHO) might the cause of more cases of bilateral pleural effusion. We also observed numbers of children with dengue fever with pleural effusion specially in last several months.

The classical symptoms and signs of pleural effusion were much alike the previous studies, as expected. Fever, cough, respiratory distress, chest pain were almost universal findings. Patients having TB often had history of weight loss and history of TB contact in last 12 month, though the former finding was also found in malignancy cases. Dengue, hepatitis and pancreatitis patients had abdominal pain as well. Positive respiratory signs were cyanosis, tachypnea, chest retraction, diminished chest movement, mediastinal shifting, diminished vocal fremitus, dull percussion note, diminished breath sound, and diminished vocal resonance. The findings are much similar to other previous studies.^{4,5,8}

Most of the previous studies enrolled cases undergoing pleural tap only. In contrast, in our study, we aimed to document the etiology of all effusion cases. Dengue fever outnumbered the other causes of effusion in current study. Even in the study done by Saliya et al who also enrolled cases irrespective of pleural tap, dengue was not foremost cause. Most of the patients in their study had parapneumonic effusion followed by empyema and tubercular effusion. Considering the cases with pleural tap only, effusion due to TB was most common followed by equal number of para-pneumonic effusion and empyema in our study. In a recent study at Dhaka observed empyema to be the leading cause followed by TB and parapneumonic effusion.⁴⁻⁸

We used lights criteria to determine the nature of pleural fluid, i.e., exudative or transudative in this study. Besides pleural fluid analysis other rational tests like gastric lavage/ induced sputum for AFB and GeneXpert, GeneXpert ultra, MT, CT scan of chest was done in indicative cases. We had observed a poor bacterial culture finding indicative of laboratory limitation. Only 3 cases with effusion had positive culture report with gram positive diplococci in 2 cases and 1 cases of pseudomonas respectively.

Most of the patients recovered fully. Patients having anti TB regimen were followed up regularly and they also had full recovery. Only 2 patients with malignancy died at a referral hospital.

Limitation

The leading etiology of pleural effusion in this study was heavily influenced by recent dengue outbreak. So, this finding may not be universally applicable. The sample size was relatively smaller as well. A further study with larger sample is recommended.

CONCLUSION

Dengue fever outnumbered other causes of pleural effusion in recent times owing to recent dengue outbreak. Tubercular effusion was leading cause among cases undergoing pleural tap. Proper diagnosis and prompt treatment ensued an excellent prognosis.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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