

A clinico pathological study of pleural effusion in children up to 18 years of age

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Abstract

Background: Pleural effusion is an indicator of a pathologic process that may occur in the setting of acute or chronic disease and is not a diagnosis in itself. Diagnosing the etiology of pleural effusion clinically with certainty is a challenging task. In the proposed study, we plan to use various diagnostic aids like pleural fluid analysis, pleural fluid cytology, pleural biopsy, ultrasonography, serological tests etc. help the physician to arrive at the diagnosis at an earlier course of the disease.

Aim: To study the clinical presentation of pleural effusion in children upto 18 years of age and Evaluate pathological, cytological and the role of radio-imaging modalities in diagnosis & management of pleural effusion.

Materials and Methods: In this prospective study, 80 clinically suspected cases of pleural effusion in children upto 18 years age were enrolled and subjected to

Biochemical and Microbiological and radiological test , period July 2019 to June 2020 .

Results: In this study we found Out of 80 clinically suspected cases, 41.25% patients of parapneumonic pleural effusion followed by 26.25% tuberculous and 16.25% empyema. Among younger age group (0-9yrs) population, predominant type of pleural effusion was parapneumonic (87.88%) while in older age group (10-18yrs) population, tuberculous PE (76.19%) was predominantly seen. In parapneumonic effusion patients, the chief micro-organism in blood culture was Streptococcus pneumoniae (33.33%) while in empyema, most common micro-organism was Staph. aureus (30.77%). A large majority (90%) of patients had exudative pleural effusion while only 10% patients had transudative pleural effusion. CBNAAT of pleural fluid was positive in 23.8% of tuberculous PE while a few empyema (7.7%) and parapneumonic PE (3.0%) also had CBNAAT positive.

Conclusions: Pleural effusion is a commonly encountered respiratory problem in younger children. In younger children, predominant type of pleural effusion was parapneumonic while in older children, tuberculous PE was dominant. Commonest microorganisms causing pleural effusion were *Streptococcus pneumoniae* and *Staphylococcus aureus*. Fever, cough, respiratory distress and chest pain were common presenting complains of pleural effusion. Clinically suspected cases were proved with X-ray chest and USG thorax. Majority of pleural effusion were exudative than transudates based on Light's criteria.

Keywords: USG, X-Ray, TLC, DLC.

Introduction

India has registered the second highest number of deaths among children under five years of age due to respiratory illnesses among which lower respiratory tract infections (LRTI) such as pneumococcal pneumonia and its complication like pleural effusion, empyema, etc. Pleural effusion is a commonly encountered problem considered by chest physicians, as a complication of respiratory infections like pneumonia. Detection of pleural effusion is done by physical examinations, chest X-ray ultrasonography chest and pleural tap. Asymptomatic transudates require no treatment while symptomatic transudates and almost all exudates require pleural tap, chest tube drainage, pleurodesis, pleurectomy or a combination. Pleural effusion may occur in the setting of acute or chronic disease and is not a diagnosis in itself. Pleural effusion is an indicator of a pathologic process that may be of primary pulmonary origin or of an origin related to another organ system or occasionally the first evidence of some other systemic disease. In Indian scenario, pleural effusion in children is a common

problem and with the advent of various diagnostic aids in this modern era like pleural fluid analysis, pleural fluid cytology, pleural biopsy, ultrasonography, serological tests etc. this study is planned.

Material And Methods

The present study was carried out in July 2019 to June 2020 in the Department of Pediatrics J.L.N. Medical College and associated group of Hospitals, Ajmer which provides pediatric care at this center. The study was conducted on 80 clinically suspected cases of pleural effusion in children upto 18 years age.

The Clinical history, general physical and detailed Systemic examination examinations including cardiovascular system, respiratory system, gastrointestinal system and central nervous system were done. Routine investigations (TLC, DLC, platelets, ESR, Mantoux test) Biochemical test(B. urea, S. creatinine, S. total protein, S. cholesterol, SGOT, SGPT, S. Na⁺, S. K⁺, S. Ca²⁺), Microbiological test(CRP, Gram's staining, sputum for AFB, culture for sensitivity), Chest X-ray, USG Thorax, CT Thorax, CBNAAT, Pleural fluid biochemical and pathological examination were done. A written consent will be taken by patient's father/mother. Data collection and analysis were done by relevant statistical study.

Observations and results

A study of 80 clinically proven cases of pleural effusion admitted in pediatrics department during July 2019 to June 2020 were studied.

Etiological categorization of patients of pleural effusion:

Diagnosis	Male	Female	Total Patients	Percentage
Parapneumonic Effusion	15	18	33	41.25
Tuberculous Pleural Effusion	15	6	21	26.25
Empyema	8	5	13	16.25
Nephrotic syndrome	4	0	4	5.00
Dengue Hemorrhagic Fever	2	1	3	3.75
Congestive Heart Failure	1	1	2	2.50
Chronic Liver Disease	1	1	2	2.50
Acute Lymphoblastic Leukaemia	1	0	1	1.25
Acute Pancreatitis	1	0	1	1.25
Total	48	32	80	100

In our study 41.25% patients were of parapneumonic effusion with 15 male and 18 female patients followed by 26.25% patients of tuberculous pleural effusion with 15 male and 6 female and 16.25% patients had empyema with 8 males and 5 females. Other diagnosis includes nephrotic syndrome in 5% patients, dengue

haemorrhagic fever in 3.75% while 2 cases each of congestive heart failure and chronic liver disease (2.5%) and 1 case each of acute lymphoblastic leukaemia and acute pancreatitis (1.25%) were also seen.

Microbiological profile of patients in various PE

Blood Culture	PPE	TPE	Empyema	Other PE	Total Patients	percentage
Sterile	14	20	1	10	45	56.25
Str. pneumoniae	11	0	3	0	14	17.50
Staph. Aureus	2	1	4	2	9	11.25
K. pneumoniae	2	0	0	1	3	3.75
CONS	2	0	1	0	3	3.75
P. aeruginosa	0	0	2	0	2	2.50
E. coli	2	0	0	0	2	2.50
H. influenzae	0	0	2	0	2	2.50
Total	33	21	13	13	80	100

We found that in majority (56.25%) of patients, culture was sterile followed by 17.5% had sensitivity for Streptococcus pneumoniae and 11.25% for Staphylococcus aureus. Other microorganisms found in culture were Mycobacterium tuberculosis, Klebsiella

pneumoniae, Coagulase negative staphylococci, Pseudomonas aeruginosa, Escherichia coli and Haemophilus Influenzae Type B. In parapneumonic effusion patients, the chief micro-organism in blood culture was Str. pneumoniae (33.33%) while in

tuberculous pleural effusion patients, most of culture was sterile (95.23%) and in empyema, most common

micro-organism was Staph. aureus (30.77%).

Classification of PE type based on Light’s criteria.

PE Type Etiology	Exudative pleural effusion	Transudative pleural effusion
Parapneumonic Effusion	33	0
Tuberculous Pleural Effusion	21	0
Empyema	13	0
Nephrotic syndrome	0	4
Dengue Haemorrhagic Fever	3	0
Congestive Heart Failure	0	2
Chronic liver disease	0	2
Acute Lymphoblastic Leukaemia	1	0
Acute Pancreatitis	1	0
Total	72 (90%)	8 (10%)

Here, we found that in 90% patients had exudative pleural effusion and only 10% patients had transudative pleural effusion.

Other microbiological investigations in various PE

PE type \ Test	PPE		TPE		Empyema		Other PE	
	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
Sputum for AFB	1	32	12	9	2	11	1	12
S.CRP	14	19	2	19	9	4	1	12

Patients with parapneumonic effusion, 1 patient (3%) was positive for sputum for AFB and 14 patients (42.42%) were CRP positive. In tuberculous pleural effusion, 12 patients (57.14%) were positive for sputum for AFB and 2 patients (9.52%) were CRP positive. In

empyema patients, 2 (15.38%) were positive for sputum for AFB and 9 patients (69.23%) were CRP positive. In other type of pleural effusion, 1 patient (7.69%) each positive for sputum for AFB and CRP.

Etiological diagnosis wise age distribution of PE patients

PE type Age Group	Parapneumonic pleural effusion		Tuberculous pleural effusion		Empyema	
	No. of Patients	Percentage	No. of Patients	Percentage	No. of Patients	Percentage
0-9 years (Younger)	29	87.88	5	23.81	8	61.54
10-18 years (Older)	4	12.12	16	76.19	5	34.46
Total	33	100	21	100	13	100

In younger age group (0-9yrs) population, predominant type of pleural effusion was parapneumonic (87.88%) while in older age group (10-18yrs) population, tuberculous pleural effusion (76.19%) was predominantly seen.

Discussion

The present study entitled “Clinico Pathological study of pleural effusion in children upto 18 years of age “was conducted at Department of Pediatrics J.L.N. Medical College and associated group of Hospitals, Ajmer. In our study majority of patients had complain of fever (91.25%) followed by cough (85%), respiratory distress (78.75%), chest pain (68.75%) and 37.5% of patients had other symptoms like anorexia, weight loss, haemoptysis etc. Majority(41.25%) patients were of parapneumonic effusion followed by 26.25% patients of tuberculous pleural effusion and 16.25% patients had empyema. We found that Hb was 11.76 gm/dl in parapneumonic effusion (PPE) patients while in tuberculous pleural effusion (TPE), most of patients were anaemic (Hb 9.28 gm/dl), Hb was 9.95 gm/dl in empyema and 10 gm/dl in other pleural effusion. On blood culture analysis, we found that in majority (56.25%) of patients, culture was sterile.). In parapneumonic PE, the chief microorganism in blood

culture was Str. pneumoniae (33.33%) while in empyema, most common micro-organism was Staph. aureus (30.76%). On naked eye examination, 74.67% patients had turbid pleural fluid, while 25.33% had clear pleural fluid. In pleural fluid study of PPE and empyema, predominantly neutrophilic type of cells was found while in TPE, predominantly lymphocytic type of cells was found. In biochemical analysis of pleural fluid, ADA level was found to be very high in tuberculous pleural effusion (>100 IU/L) while in parapneumonic pleural effusion and empyema, ADA level was less than 55I U/L.

Conclusion

Pleural effusion is a commonly encountered respiratory problem in younger children. Common types of pleural effusion found were parapneumonic followed by tuberculous pleural effusion and empyema. In younger children, predominant type of pleural effusion was parapneumonic while in older children, tuberculous PE was dominant. Commonest microorganisms causing pleural effusion were Streptococcus pneumoniae and Staphylococcus aureus. A few cases of pleural effusion were associated with other systemic disease e.g., nephrotic syndrome, dengue hemorrhagic fever, congestive heart failure, chronic liver disease, acute

lymphoblastic leukemia and acute pancreatitis. Fever, cough, respiratory distress and chest pain were common presenting complains of pleural effusion. Clinically suspected cases were proved with X-ray chest and USG thorax. Majority of pleural effusion were exudative than transudates based on Light's criteria.

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