

CAUSES AND OUTCOME OF PLEURAL EFFUSION IN CHILDREN IN A TERTIARY CARE HOSPITAL OF PESHAWAR, PAKISTAN

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ABSTRACT

Objective: To determine the causes and outcome of pleural effusion in children presenting to a tertiary care hospital.

Methodology: This cross sectional study was carried out in Department of Pulmonology, Lady Reading Hospital, Peshawar from August 2017 to August 2018. All the patients with age less than 15 years and having unilateral or bilateral pleural effusion were included in the study. All the children were assessed for the causes of pleural effusion. Pleural tap was performed and pleural fluid was sent for biochemical examination to determine whether the fluid was exudative or transudative. Pleural fluid was also sent for microbiological and cytological examination where, tuberculosis, other infection or malignancy was suspected. Data were recorded and analyzed using SPSS version 20.

Results: Total 82 cases of pleural effusion were enrolled of whom 51 (62.1%) were males. Pleural effusion was exudative in 67 (81.7%) cases while transudative in 15 (18.3%) cases. The most frequent cause of pleural effusion was parapneumonic effusion (60.9%) followed by congestive cardiac failure (15.8%), malignancy (8.5%), tuberculosis (4.8%), renal disease (2.4%) while (7.3%) cases remained undiagnosed. Regarding outcome, among 50 patients with parapneumonic effusion, 48 cases underwent tube thoracostomy, of which 36 cases received intrapleural streptokinase (SK). Among these 36 cases, 24 cases responded to SK while 12 cases underwent decortication.

Conclusion: Parapneumonic effusion is the most common cause of pleural effusion in children. Intra-pleural SK has good results in children and save many patients from surgery.

Key Words: Pleural effusion, Intrapleural streptokinase, Etiology, Pediatrics

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INTRODUCTION

Pleural space is a potential space between the parietal and visceral pleurae. This normal pleural space contains about 10 ml of pleural fluid because of balance between the hydrostatic and oncotic pressure in the visceral and parietal pleural capillaries. Pleural effusion is the collection of abnormal fluid inside the pleural cavity. There are two main types of pleural effusion i.e. transudative and exudative. Transudative pleural effusion results from imbalance between the vascular hydrostatic and oncotic pressure while exudative pleural effusion results from inflammatory processes of the pleura^{1,2}. The incidence of inflammatory pleural effusion in children is 8.5 per 100,000³. There has been a 2.2 fold rise in the incidence of pleural infection between 1995 and 2003 in patients less than 19 years and a 1.2 fold rise in patients more than 19 years of age². Heart failure and

malignancies are the leading causes of pleural effusion in adults while in children parapneumonic effusion are more common and account for majority of the cases followed by congenital heart disease and malignancies as rare causes⁴⁻⁷. The most common bacterium responsible for parapneumonic effusion is *Streptococcus pneumoniae* followed by *Staphylococcus aureus* and *H. Influenzae*⁸. It is rare for children to have an underlying lung disease, therefore, the prospects with treatment are always good. Children have got a high prevalence of pleural effusion but a low mortality rate⁹⁻¹². The treatment of pleural effusion mainly consists of treating the underlying cause.

In case of significant pleural infection, chest tube is inserted in the pleural cavity and repeated taps are not recommended⁸. In loculated parapneumonic effusion or empyema with pleural thickening intra-pleural fibrinolytic therapy has been recommended. The success

rate ranges from 80-90%¹³⁻¹⁶ with reduction in the hospital stay and mortality¹⁷. In case of failure of intra-pleural fibrinolytic therapy, other options are video assisted thoracoscopic surgery (VATS) and open decortication in advanced cases¹⁸.

Regarding pediatric pleural effusion, extensive work has been done in developed countries on the subject and data is available in international literature but for developing countries we have limited data. This study was aimed to determine the causes and outcome of pleural effusion in pediatric population in our set up.

METHODOLOGY

This cross sectional study was conducted in the Department of Pulmonology, Lady Reading Hospital, Peshawar from Aug 2017 to Aug 2018. Eighty two children less than 15 years old and having pleural effusion were admitted through OPD and Emergency Department. Written informed consent was taken for inclusion in the study. Ethical approval was taken from the Ethics Committee of Post Graduate Medical Institute Peshawar. Pleural tap was performed in patients and pleural fluid was sent for biochemical examination to determine whether fluid was exudative or transudative. Pleural fluid was also sent for microbiological and cytological examination where, tuberculosis, other infection or malignancy was suspected. Pleural biopsy was also taken

where needed.

Baseline hematology, urea, creatinine and urine D/R were performed. Additional investigations which were performed included CT scan of chest, echocardiography, renal ultrasound, sputum for acid fast bacilli (AFB), AFB culture, sputum & pleural fluid culture and sensitivity, lymph node excisional biopsy and fine needle aspiration cytology (FNAC) and 24 hours urinary protein.

Data were recorded and analyzed using SPSS version 20. Qualitative variables like gender, age, symptoms and causes were presented as frequency and percentage.

RESULTS

During the study period, 82 children with pleural effusion were admitted to the Department of Pulmonology. There were 51 (62.1%) males and 31 (37.9%) females. Their age ranged from 2 to 15 years. Age distribution is shown in Table 1.

The most common symptom found in these children were cough (82%) followed by fever (71%), dyspnoea (62%), chest pain (55%), anorexia (25%) and weight loss (17%).

Pleural effusion was exudative in 67 (81.7%) cases while transudative in 15 (18.3%) cases. The most common cause of transudative pleural effusion was heart failure (Table 2).

Table 1: Age distribution of study cases (n=82)

Age Groups (Years)	Frequency	Percentage
2-5	11	13.4
6-10	42	51.2
11-15	29	35.3
Total	82	100

Table 2: Causes of exudative and transudative pleural effusion of study cases (n=82)

Variable	Frequency	Percentage	
Exudative Pleural Effusion (n=67)	Pneumonia	50	60.9
	Malignancy	7	8.5
	Undiagnosed	6	7.3
	Tuberculosis	4	4.8
Transudative Pleural Effusion (n=15)	Congestive Cardiac Failure	13	15.8
	Renal Disease	2	2.4
Total	82	100	

Table 3: Culture and sensitivity pattern of study cases (n=40)

Microorganism	Frequency	Percentage
No Growth	30	75
MRSA	06	15
<i>Streptococcus pneumoniae</i>	02	5
<i>Klebsiella pneumoniae</i>	02	5
Total	40	100

Among the 50 cases of parapneumonic effusion, 40 samples of pleural fluid were sent for culture and sensitivity (C/S). Seventy five percent samples showed no growth of microorganism. Culture and sensitivity pattern is shown in Table 3.

Out of 50 cases of parapneumonic effusion, 48 children underwent tube thoracotomy and streptokinase (SK) was administered in 36 cases. Among these 36 cases, 24 showed good response in terms of pleural fluid drainage and lung expansion while in 12 cases there was still localized pleural effusion with pleural thickening and non-expanding lung; so they were referred to thoracic surgeon for decortications.

Seven cases turn out to be malignant, in which 5 were referred to oncology department for further management and one patient with malignancy expired during hospital stay while one left the hospital against the medical advice. In transudative effusion, 13 cases were having cardiac problems and two were having renal diseases which were referred to the concerned specialties for further care.

DISCUSSION

Pleural effusion is a common clinical presentation among children and adults in both developing and developed countries. Pediatrics pleural effusion is an abnormality which frequently develops due to collection of fluid in the pleural space. The prognosis of pleural effusion in children directly depends on the features of underlying disorders and the treatment approach. In this regard, infection based effusion can be successfully treated with antimicrobial agents. Most viral effusions usually resolve spontaneously. Generally, in untreated cases of pleural effusion, serious complications of empyema are expected. The most common symptoms observed in our study were cough, fever and dyspnea, which is in agreement to the previous studies¹⁹.

The cause of pleural effusion is mostly malignancy in developed countries while infection is the leading cause in developing or underdeveloped countries²⁰⁻²². Present study suggested 65.7% of the pleural effusion

as secondary to infections. In infections, pneumonia is the most common cause of pleural effusion in children accounting for about 50-70% in literature²². Present study supported this with 60.9% of the cases, secondary to pneumonia. This study also supports that pediatric pleural effusion is more common in boys than in girls and also in younger children in comparison with older ones²³. In children with parapneumonic effusion, the pleural fluid that was sent for culture and sensitivity, showed no growth in 75% of cases. This could be due to the previous use of antibiotics in primary or secondary care centers. Tuberculous pleural effusion is common in adults, while pulmonary tuberculosis is the main manifestation of the disease in children²⁴. The incidence of tuberculous pleural effusion is about 4.9% in children as reported in previous studies^{24,25}, while in our study it was 4.8%. Other causes of pleural effusion like CCF, renal disease and malignancy were also observed in our study which are the established causes of pleural effusion in children.

The most frequent therapeutic measure carried out was intravenous antibiotic therapy. In contrast to the study of Bose et al²⁶, in which only 50% of the children underwent tube thoracostomy, more children underwent the procedure in our study. The reason being that more children had complex and complicated parapneumonic effusion in our study. Empyema thoracis is para pneumonic effusion in which there is pus inside the pleural cavity. Although it has got low mortality (20%) as compared to adults²⁶ but if not treated on time it may progress to complication like thick pleural peel over the lung not allowing the lung to expand, broncho-pleural fistula, septicemia and dissection through the chest wall (empyema necessitans). Treatment options are chest tube insertion with or without fibrinolytics like instillation of intrapleural streptokinase, VATS and decortication.

A meta analysis of 10 trials showed that intrapleural fibrinolytics not only decreases the need for decortication and VATS but also reduces the duration of hospitalization^{14,27}. Ekingeen et al²⁸ observed the success rate of intrapleural fibrinolytic therapy from 72-96%. Our study

showed the success rate of 66% of intrapleural SK. This may be due to the advanced and late phase of empyema cases in our study in which the success rate decreases. No major complications were observed during tube thoracostomy or intrapleural SK administration. Two prospective randomized trials compared thoracoscopic decortication to the tube thoracostomy with fibrinolysis for empyema in children^{29,30}. Sonnappa et al²⁹ randomized 60 children with empyema to receive either per cutaneous chest drain with intra pleural urokinase or primary VATS. No significant difference between the two groups was found in length of hospital stay or radiological outcome at six months after intervention.

CONCLUSION

The most common cause of pleural effusion in pediatric age group is para-pneumonic effusion in contrast to adults where literature has shown TB and malignancy to be more common. Intra-pleural SK has good results in children and save many patients from surgery.

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CONTRIBUTORS

ZI conceived the idea, planned the study and drafted the manuscript. SAK, ZU, JA and MU helped acquisition of data, did literature search, statistical analysis and drafted the manuscript. MYK supervised the study and critically revised the manuscript. All authors contributed significantly to the submitted manuscript.