*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*
*e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 1 Ser.15 (January. 2020), PP 18-23*
*www.iosrjournals.org*

# A Study of the Clinico-Etiological Profile, And Outcome of Pleural Effusion in Children of Age 0-12 Year

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***Abstract***
***Introduction:*** *Pleural effusion is accumulation of excess quantity of fluid within the pleural space due to excess formation or when there is decrease fluid removal by the lymphatic.*
***Objective:*** *To describe the clinical feature, radiological finding, and laboratory data children of age 0-12 year and to find out etiological agents determine treatment outcome.*
***Materials and methods:*** *Hospital based cross-sectional prospective observational study in children from 0 to 12 years of age with diagnosis of pleural effusion in pediatric ward of Regional Institute of Medical sciences, Imphal from September 2017 to August 2019.*
***Results:*** *During the period of study a total of 90 patients with pleural effusion were studied. Out of them, maximum patients (76.6%) were in the age group of 0-5 years. Male and female patients were 51 (56.7%) and 39 (43.3%) respectively. 68.9% children with pleural effusion were malnourished and most of the children (46.7%) belonged to lower middle class whereas only 21.1% children belonged to upper middle class according to Kuppaswamy scale of socioeconomic status. 57.8% of pleural fluid cultures were positive for organisms, whereas 42.2% was sterile. Staphylococcus aureus was commonest organism cultured form pleural fluid in 44.4% of the cases followed by Streptococcus pneumoniae in 6.7% of cases and the least cultured organisms were Pseudomonas aeruginosa and Klebsiellaspp in 3.3% of cases each. The most common presenting complaint was fever and cough (100%) followed by shortness of breath (45%), chest pain (21.1%). Antibiotics and drainage, the main modality of treatment was done in 94.4% of the cases, whereas decortication was done in 5.6% of the cases. Most of the patient (95.5%) get cured and only 4.5% of the patient died.*
***Conclusion:*** *Pleural effusion is more common in 0-5 years of age group and more in male than female. Malnutrition and lower socioeconomic status are the major risk factors associated with pleural effusion. Staphylococcus aureus is the most common etiological agent isolated. Most common clinical presentation was fever, cough and shortness of breath. Right sided effusion is more common. The successful management lies in intravenous antibiotics with chest tube drainage. Early diagnosis, prompt and effective treatment will reduce the mortality and morbidity of patient.*

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Date of Submission: 13-01-2020 Date of Acceptance: 29-01-2020

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## I. Introduction

Pleural effusion is accumulation of excess quantity of fluid within the pleural space due to excess formation (from the interstitial spaces of lung, parietal pleura, or peritoneal cavity) or when there is decrease fluid removal by the lymphatic.[1]The most common cause of pleural effusion in children is bacterial pneumonia occurring in at least 40% of cases, with up to 60% of effusions resulting in the formation of empyema.[2] A variety of other disease account for the remaining cases, including tuberculosis, heart failure, rheumatological causes, metastatic intrathoracic malignancy, lupus erythematous, aspiration pneumonitis, uremia, pancreatitis, sub diaphragmatic abscess etc.

Pain is the principle symptom, exaggerated by deep breathing, coughing, and straining. The patients may be asymptomatic, if the effusion is small. Large fluid collections can produce cough, dyspnoea, chest retractions, tachypnea, orthopnea, or cyanosis. Physical finding like dullness on percussion, decreased or absent breath sound, diminution in tactile fremitus, occasionally fullness of intercostal spaces may present, crackle and rhonchi may be audible.

Pleural effusion and empyema are known complications of bacterial pneumonia. Streptococcus pneumoniae is the predominant cause of bacterial pneumonia worldwide and it is commonly implicated as the cause of paraneumonic effusions and empyema.[3]Establishing a diagnosis of tubercular pleural effusion can be

difficult because the classical finding (lymphocytic exudative pleural effusion, pleural granulomata, and cutaneous sensitivity to purified protein derivatives) have low specificity in children.[4]

The treatment of empyema remains controversial, particularly in children. Therapeutic options include systemic antibiotics alone, thoracocentesis, tube thoracostomy, with or without instillation of fibrinolytic agents; and more invasive techniques such as thoracoscopic surgery, mini-thoracotomy, and standard thoracotomy with decortication.[5]

In RIMS, we are encountering quite a few number of children with pleural effusion. However the exact data of incidence, clinical feature, etiology, and outcome are not well defined. So with the above background, the present study was taken up to study the various etiological factors, clinical profile, radiological finding and outcome of pleural effusion in children admitted in the Pediatric ward of RIMS, Imphal.

## II. Materials And Methods

The study was a cross-sectional study in the Department of Pediatrics and Department of microbiology, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur for a period of two years from September 2017 to August 2019,

**Inclusion Criteria:**

1. Children with clinical sign and symptom and radiological impression of pleural effusion admitted in the pediatrics ward, RIMS.
2. Children of parents or LAR (Legally Authorized Representative) who gave informed consent.
3. Children (7-12years) who gave assent or willing to participate in the study.

**Exclusion Criteria:**

1. Any patients with history of chest trauma.
2. Patients with history of cardio-thoracic surgery.
3. Children with congenital malformation of lung
4. Children those receiving chemotherapy or radiotherapy for malignancy
5. Children having pleural effusion secondary to chronic disease like nephrosis, liver cirrhosis, connective tissue disease, and congestive heart failure.

A total of 90 Patients admitted in the inpatient ward according to the inclusion and exclusion criteria were enrolled after informed consent. A complete history, work up, examination done in a structured form and following investigations done: Complete blood count, Chest X-ray, CT scan. After all aseptic and antiseptic precaution, pleural fluid sample was collected by pleural tapping and sent to Microbiology department for pleural fluid culture and sensitivity, Pathology department for pleural fluid routine examination, RNTCP centre for CBNAAT(Cartridge Based Nucleic Acid Amplification Test). The results of the study are discussed below.

## III. Statistical Analysis

Data was checked for consistency and completeness and then entered and analysed using SPSS version 21.0 IBM for WINDOWS. Descriptive statistics like Mean, percentage, SD will be used.For inferential statistics Chi square test, Fisher exact test were utilized and p value of <0.05 was taken as statistically significant.

## IV. Results And Observation

A total of 90 patients with pleural effusion were studied.

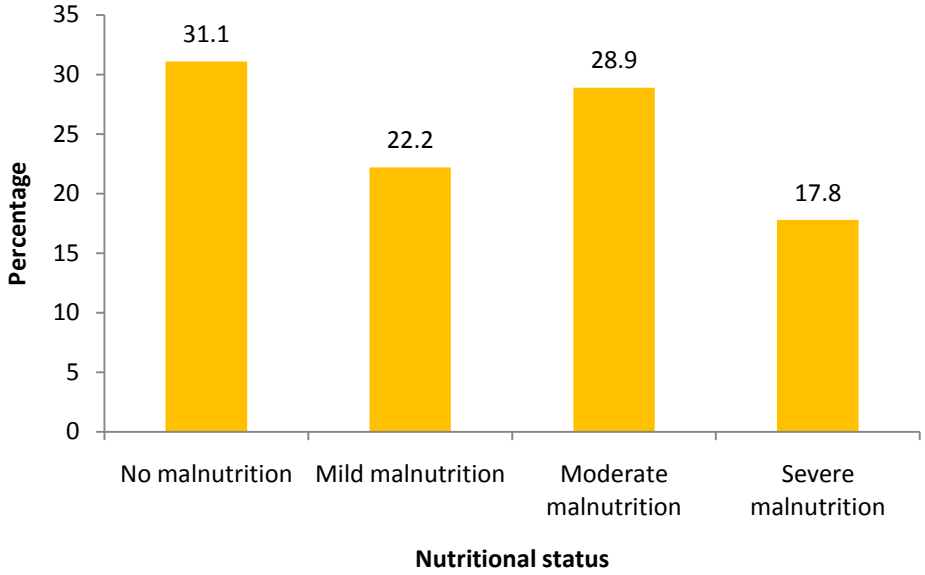
**Table 1: Age distribution of patients studied**

| Age in years | No. of patients | % |
|---|---|---|
| 0-5 | 69 | 76.6 |
| 6-10 | 20 | 22.2 |
| >10 | 1 | 1.1 |
| Total | 90 | 100.0 |

Out of 90 patients studied 69 (76.6%) were in age group 0-5 years, 20 (22.2%) were in age group 6-10 years, and 1 (1.1%) patient was more than 10 years of age.(Table1)

Out of 90 patient 51 (56.7%) were male and 39 (43.3%) were female. Out of 90, 42 (46.7%) was found to have lower middle class, 19 (21.1%) was in upper middle class, 17 (18.9%) was in lower class, 12 (13.3%) was found to have upper lower class.

**Figure 1: Nutritional status distribution of patients studied.**




Out of 90 patient 62 (68.9%) patients were found to have malnutrition. Out of these, 26 (28.9%) patients had moderate malnutrition, 20 (22.2%) patients had mild malnutrition, and 16 (17.8%) had severe malnutrition.(Figure 1).

**Table 2: Causative organism distribution of patients studied**

| Causative organism | No of patients | % |
|---|---|---|
| Staphylococcus aureus | 40 | 44.4 |
| Sterile | 38 | 42.2 |
| Streptococcus pneumoniae | 6 | 6.7 |
| Klebsiellapneumoniae | 3 | 3.3 |
| Pseudomonas aeruginosa | 3 | 3.3 |
| Total | 90 | 100.0 |

Out of 90, in 40 (44.4%) patients staphylococcus aureus was isolated, in 38 (42.2%) patients culture was sterile, in 6 (6.7%) patients streptococcus pneumoniae was isolated, in 3 (3.3%) patients klebsiellapneumoniae and in 3 (3.3%) Pseudomonas aeruginosa were isolated.(Table 2).

**Table 3: Clinical features distribution of patients studied**

| Clinical features | No of patients (n=90) | % |
|---|---|---|
| Fever | 90 | 100.0 |
| Cough | 90 | 100.0 |
| chest pain | 50 | 55.5 |
| shortness of breath | 42 | 46.6 |
| Abdominal pain | 16 | 17.7 |
| vomiting | 2 | 2.22 |

Out of 90 patient, fever and cough was present in all patient, chest pain was present in 55.5%, shortness of breath was seen in 46.6%, abdominal pain was seen in 17.7% and only 2.2% patient presented with vomiting.(Table 3).

Out of 90 patient 53 (58.8%) patients show right sided pleural effusion and 34 (37.8%) of patients show left sided, and 3 (3.4%) patients show bilateral presentation

**Table 4: Treatment Modality distribution of patients studied**

| Treatment Modality | No of patients | % |
|---|---|---|
| Antibiotics and drainage | 85 | 94.4 |
| Decortication | 5 | 5.6 |

| | | |
|---|---|---|
| Total | 90 | 100.0 |

Out of 90 patients, 85 (94.4%) patients responded to antibiotic and drainage and (5 5.6%) patient underwent decortication.(Table 4)

**Table 5. Outcome distribution of patients studied**

| Outcome | No of patients | % |
|---|---|---|
| Cured | 86 | 95.5 |
| Died | 4 | 4.5 |
| Total | 90 | 100.0 |

Out of 90 patients, 86 (95.5%) patients got cured and 4 (4.5%) died.(Table 5)

**Table 6: Outcome distribution in relation to treatment modality of patients studied**

| Outcome | Treatment Modality | | Total | P value |
|---|---|---|---|---|
| | Antibiotics and drainage | Decortication | | |
| Cured | 83(97.6%) | 3(60%) | 86(95.5%) | P=0.0143 |
| Died | 2(2.4%) | 2(40%) | 4(4.5%) | |
| Total | 85(100%) | 5(100%) | 90(100%) | |

P=0.0143, statistically significant, Fisher Exact test

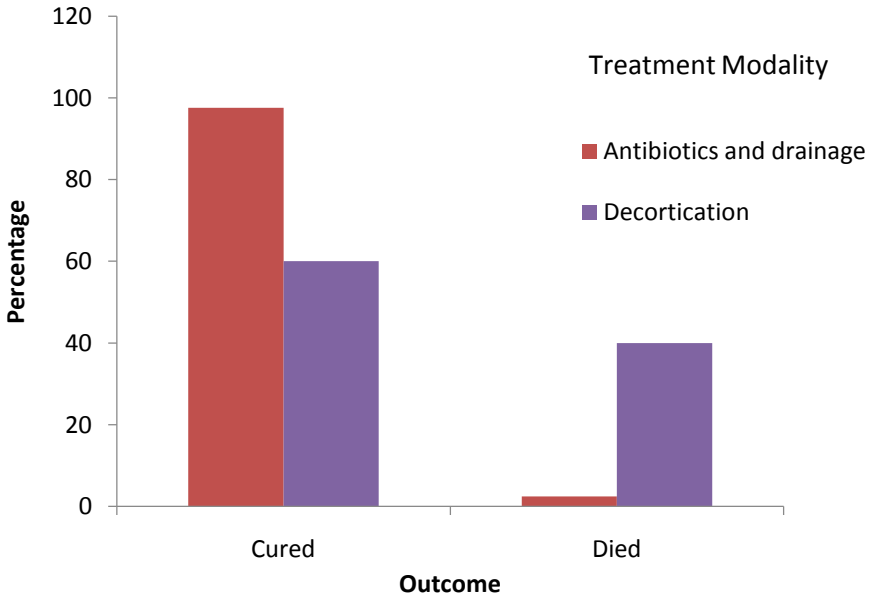



**Figure 2: Outcome distribution in relation to treatment modality of patients studied**

Table 6 (Figure 2) shows relation between outcome and treatment modality of patients studied. Out of 90 patients, 85 patients were treated with antibiotics and drainage. Out of these 83 (97.6%) patients got cured and 2 (2.4%) patients died, 5 patients went for decortication out of these 3 (60%) patients got cured and 2 (40%) patients died. Its P value is 0.0143 (<0.05) which is statistically significant.

## V. Discussion

A total of 90 patients with pleural effusion were studied. Out of them, maximum patients (76.6%) were in the age group of 0-5 years which was similar to the findings of Narayanappa D et al[6] who found maximum (90%) patients in the same age group. This may be due to higher incidence of malnutrition in the under five children leading to poorer immunity causing higher preponderance to infection.

Out of the total 90 patients studied, there were 51 (56.7%) males and 39 (43.3%) females. HasanM et al[7] also reported a higher incidence among males (67.7%) than females (33.3%) showing male predominance probably due to greater attention to the male children.

In the present study, 68.9% children with pleural effusion were malnourished similar to the studies by Rao MSP et al[8]andYilmatz E et al[9] also showed that malnutrition was a common association with effusion in children which might be due to predisposition of malnourished children to recurrent, severe and complicated infection.

In the present study, most of the children (46.7%) belonged to lower middle class whereas only 21.1% children belonged to upper middle class according to Kuppaswamy scale of socioeconomic status. This can be explained by the fact due to poor hygiene, poor sanitation, poor nutrition, lack of money, resources, and education infections are more common in lower socioeconomic status than upper socioeconomic status.,

In the present study, 57.8% of pleural fluid cultures were positive for organisms, whereas 42.2% was sterile. Staphylococcus aureus was commonest organism cultured form pleural fluid in 44.4% of the cases followed by Streptococcus pneumoniae in 6.7% of cases and the least cultured organisms were Pseudomonas aeruginosa and Klebsiella pneumonia in 3.3% of cases each. These findings were similar to the study by Borade A et al[10] where most of the cases were staphylococcus (28.33%), followed by Streptococcus pneumonia (16.67%), Pseudomonas aeruginosa (5%) and Klebsiella pneumonia (1.67%). Aggarwal N et al[11] also found that Staphylococcus aureus was the commonest organism cultured from pleural fluid in 58.4% cases while 35.3% of pleural fluid samples were sterile due to previous use of antibiotics. Other causes are streptococcus pneumoniae, pseudomonasand Klebsiellapneumoniae. Shah K et al[12] suggested that although pleural fluid might be often sterile due to prior antibiotic administration, it must be sent for culture. In the study by Dutta V et al[1] Streptococcus pneumoniae was the commonest cultured organism (54%).

In the present study, the the most common presenting complaints were fever (100%), and cough (100%) followed by shortness of breath in 45% cases, chest pain in 21.1%. Lingayat AM et al[13] also found fever (94.02%), cough (85.07%) and breathlessness (94.02%) were the commonest symptom followed by refusal of feeds in 71.64% cases and chest pain in 71.14% cases. The clinical presentation of the disease was also similar to other study by Mangete ED et al.[14]

In the present study, right sided pleural effusion is seen in 58.8% and left side is seen in 37.8% and bilateral effusion is seen in 3.4%. HasanM et al[7] also found right sided effusion in 53.3% of the cases and 40% of the cases and bilateral effusion in 6.6% of the cases. Chest X-ray and thoracocentesis were main diagnostic tools similar to the study done by Hasan M et al.[7]

Antibiotics and drainage was the main modality of treatment done in 94.4% of the cases in the study, whereas decortication was done in 5.6% of the cases. Similarly Lingayat AM et al[13]also found that antibiotics and intercostal drainage was the mainstay treatment done in 95.53% cases whereas complicated patient needed other treatment modality like decortication (2.98%) case and VATS (1.49%). Similarly, Ramireddy K[15] et al also found that maximum cases (51.72%) were treated with combination of IV antibiotics and intercostal tube drainage (ICTD) and 22.41% of cases needed both ICT drainage and decortications.

In the present study, most of the patient (95.5%) got cured and only 4.5% of the patient died. Similarly Lingayat AM et al[13]also found that maximum patient survived and only one patient died. Mortality rate varied in different studies ranging from 3.5% as reported by Mangeteet al1[4] to as high as 19.6% in study by Arya et al[16]

In the present study, maximum patients (95.5%) got cured and 4.5% of the patient died. Antibiotics and drainage was the main modality of treatment done in 94.4% of the cases in the study and out of this 97.6% of cases got cured and 2.4% of cases died 2 patient died because of septicemia. In contrast, decortication was done in 5.6% of the cases and out of these 60% of cases got cured and 40% of patient died. It might be because decortication was done in severely ill and complicated cases who did not respond to antibiotics and chest tube drainage. Surgical and anesthetic complication is also another risk factor in decortication, thereby increasing the morbidity and mortality.

## VI. Conclusion

The conclusion that we can draw from the present study is that pleural effusion is more common in 0-5 years of age group and more in male as compared to female. Malnutrition and lower socioeconomic status are major risk factor associated with pleural effusion Staphylococcus aureus is the most common etiological agent isolated. Most common clinical presentation was fever, cough and shortness of breath. Right sided effusion is more common. The successful management lies in intravenous antibiotics with chest tube drainage. Early diagnosis, prompt and effective treatment will reduce the mortality and morbidity of patient.

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