Aetiology of exudative pleural effusion in clinical prospectus

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Abstract

Pleural effusion is common medical problem in clinical practices. Because extensive investigation is needed for diagnosis of pleural effusion especially exudative pleural effusion. But in some cases it remains undiagnosed. Parapneumonic effusion more common in younger age, in developed countries tubercular pleural effusion is common in all age group. Above 60 years malignant pleural effusion is suggested. This cross sectional study was conducted on department of respiratory medicine and department of Medicine in Dhaka Medical College Hospital (DMCH) during the period of January 2017 to July 2017. Clinically suspected 100 patients were enrolled in this study. Aetiology of pleural effusion was confirmed by clinical and laboratory diagnosis like x-ray, cytology, biopsy. This study showed 28(28%) were diagnosed as parapneumonic pleural effusion, 47(47.0%) as tubercular pleural effusion which was confirmed by ADA level and gene expert, 14(14%) were malignant pleural effusion was confirmed by histopathology of biopsy material and 11(11%) as undiagnosed pleural effusion. Among malignant pleural effusion, adenocarcinoma was 71.42%, large cell carcinoma was 14.28% , both small cell carcinoma and mesothelioma is 7.14%.

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Key words: EPE (Exudative pleural effusion), ADA (Adenosine deaminase)

Introduction

Pleural effusions is two type, transudative (TPE) and exudative (EPE)[1,2]. It is the most common problem in clinical practice[3]. EPE needs extensive evaluation and treatment more than that of transudative pleural effusion[2]. About 22% EPE remains undiagnosed and the most common causes of undiagnosed EPE are tuberculosis and malignancy[2,3]. In developed countries parapneumonic effusion is the most common in younger age group whereas in developing countries tubercular effusion is the most common in younger age group. Usually above 60 years EPE suggests malignancy[4]. Successful treatment depends on detection of exact aetiology, because it is a common diagnostic problem[5].

Sharp localizing chest pain which is worse on twisting or bending of body radiating to the upper abdomen or shoulder, deep inspiration, dry and non productive cough with hemoptysis may suggestive of endobronchial cancer or pulmonary thromboembolism[5]. On physical examination, tactile fremitus in palpation is either absent or attenuated, and the percussion note over a pleural effusion is stony dull or flat. In auscultation, the breath sounds are decreased or absent, and auscultatory percussion (Guarino's second method) is abnormal[6].

By clinical examination diagnostic procedure is started, then chest X-rays, pleural fluid analysis and pleural biopsy is the next step[7]. Posterioranterior and lateral chest radiographs usually confirm the presence of EPE. If doubt exists, ultrasound or computed tomography (CT) scans are definitive for detecting small effusions[2]. Physical, Biochemical, Microbiological, Cytological study, and Adenosine deaminase (ADA) of pleural fluid, traditional tuberculin skin test, sputum smear microscopic examination of acid fast bacilli (AFB) and pleural biopsy need to confirm EPE[2,3,8]. Predominate numbers of neutrophils, high LDH activity (>200 U/L) and protein level (>3 g/dl) in a

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pleural effusion indicate bacterial pneumonia[9]. Pleural fluid CRP level >1.38mg/dl indicates the strong possibility of a parapneumonic effusion[10]. Pleural biopsy provides diagnostic evidence for both tuberculosis and malignancy[3]. Higher RBC counts and lower adenosine deaminase (ADA) activity in pleural fluid resembling malignancy[9]. This study is to relate EPE with clinical manifestation and laboratory investigation for early diagnosis of diseases in patients. It will help in prompt treatment of patients that can shorten the hospital stay and less burden of economy of the patients.

Materials and Methods

Study Design: Cross-sectional Observational study

Place of Study: Department of respiratory medicine and Department of Medicine inDhaka Medical College Hospital (DMCH).

Study Period: January 2017 to July 2017.

Study population: Patient admitted on indoor medicine unit with exudative pleural effusion of Dhaka Medical College Hospital.

Sampling Method: Purposive Convenient Sampling.

Sample size: 100

Results

The findings of the study are described as follows in the tables, figures and texts.

Table- 1: Categories of study population based on pleural effusion findings

Study population (N=100)	Parapneumonic pleural effusion	Tubercular pleural effusion	Malignant	Undiagnosed
100 (100%)	28(28.0%)	47(47.0%)	14 (9%)	11(11%)

Among 100 cases, 28(28%) were diagnosed as parapneumonic pleural effusion, 47(47.0%) as tubercular pleural effusion, 14(14%) were malignant pleural effusion and 11(11%) as undiagnosed pleural effusion shows on table- 1

Table- 2: Age distribution of the study population (N=100)

Age group	Parapneumonic pleural effusion (n=28)	Tubercular pleural effusion (n=47)	Malignant (n=14)	Undiagnosed (n=11)	Total
18-40	17 (17.0)	18(18.0)	00	02 (2.0)	47(47.0)
41-60	07(7.0)	23(23.0)	02 (2.0)	08 (8.0)	40(40.0)
61-65	00	06(6.0)	12 (12.0)	01 (1.0%)	19(19.0)
Total (N=100)	28 (28.0)	47 (47.0)	14 (14.0)	11(11.0)	100 (100.0)

Figures in parentheses indicate percentage.

Most of the cases of study population were in the age group 18 to 40 years (47.0%). Among 47 patient tubercular were 18, parapneumonic were 17 and undiagnosed were 2(2.0%). In this table age group 61 to 65 years (19.0%). Among 19 patient tubercular were 6(6.0), malignant were 12 (12.) and undiagnosed were1 (1.0%) shows on table- 2

Table -03 showing the biopsy finding of malignant pleural effusion (n=14)

Biopsy finding	Total
Adenocarcinoma	08 (57.4%)
Large cell carcinoma	03 (21.4%)
Small cell carcinoma	02(14.28%)
Mesothelioma	01(7.14%)

Biopsy of pleura reveal adenocarcinoma was 57.4%, large cell carcinoma 21.4%, small cell carcinoma 14.28% and mesothelioma was 7.14% shows on table- 3

Table- 04 Findings of leucocyte in different pleural effusion

Investigation	Total Neutrophil/mm³ found mean±SD	Lymphocyte/mm³ found mean±SD
Parapneumonic pleural effusion (n=28)	1228.57±495.05	229.64±85.60
Tubercular pleural effusion (n=47)	98.72±46.56	472.34±199.40
Malignant pleural effusion (n=14)	171.42±72.62	500.00±156.89
Undiagnosed pleural effusion (n=11)	333.33±57.79	250.00±92.58

4. Data were analyst using Students Test; presented as Mean ± SD.

The cytological examination, where neutrophil predominant in Parapneumonic pleural effusion mean ± SD1228.57 ± 495.05, lymphocyte predominant in tubercular (472.34 ± 199.40) and mean ± SD500.00 ± 156.89 malignant pleural effusion, in undiagnosed pleural effusion found both neutrophil and lymphocyte is predominate showing on table - 04

Table- 05 Comparison to detection of etiology of lymphocyte predominate pleural effusion by cytological examination, ADA level, protein level, LDH level

Diagnostic group		N	Mean	Standard Deviation	P value
ADA level	Tuberculosis	47	53.59	10.14	<0.0001
	Malignant	14	28.2	15.31	
Cytological finding (lymphocyte)	Tuberculosis	47	472.34	199.34	0.6358
	Malignant	14	500.00	156.89	
Age group	Tuberculosis	47	43.70	13.94	<0.0001
	Malignant	14	62.57	2.53	

*Data were analyst using Student's Test.

It was revealed that in ADA level tubercular and malignant effusion (53.59 ± 10.14 vs 28.2 ± 15.31, p=<0.0001) and cytological finding (472.34 ± 3.68 vs 500.00 ± 156.89 p= 0.6358 and in age group (43.70 ± 13.94 vs. 62.57 ± 2.53years, p= <0.0001) shows on table- 5

Discussion

Light's criteria (protein level >3gm/dl and LDH level >200ID/L) differ the exudative pleural effusion from transudative pleural effusion[14]. TB is the leading cause of pleural effusion in some countries[15]. In 2016 according to WHO, Bangladesh is one of TB burden country in 30 highest TB burden country[16].

The phenomenon of the study is supported by International Journal of Advances in Medicine of Parikh P. *et al* in 2016[11] and 'International Journal of Medical Science and Public Health' by Bamaniya D. *et al* in 2014[17]. In this study, among 100 cases majority of the patients was tubercular pleural effusion (47%), parapneumonic was 28%, malignant was 14% and rest of undiagnosed.

Age group of the patient was supported by Porikh P, *et al*[12]. Another study 'Parapneumonic effusions: epidemiology and predictors of pleural infection' by Finch S. and Chalmers J. found parapneumonic effusion more common in young and middle age (18-50)[18].

The tubercular age group of this study is similar to the 'Role of ADA in differential diagnosis of pleural effusion by Jasani H. *et al*[16] and another original article 'Analytical study of clinical and etiological profile of patients presenting with pleural effusion to a tertiary hospital' by Reddy A., et al[19]. Mean age group of tubercular pleural effusion and malignant pleural effusion, is statistically significant (p value >0.0001). The study by Mohan KM. and CR. found age group is statistically significant [20]. In this present study clinical finding is supported by Godwin CM. *et a*l [21].

As per study, neutrophil predominant pleural fluid considered as parapneumonic effusion and predominance of lymphocyte in pleural fluid considered as tubercular or malignant pleural effusion. Because neutrophil predominant pleural fluid is indicating acute inflammatory process like pneumonia and in case of chronic disease like most of tubercular and malignant pleural fluids are lymphocyte predominance [22].

Tuberculosis is one of the causes of lymphocytic pleural effusion but malignancy, lymphoma, collagen vascular diseases and chylothorax is also responsible for lymphocytic pleural effusion [23]. Pleural fluid with raised protein level (>3gm/l), high lymphocyte count and ADA level is more than 40 indicate tubercular pleural effusion with sensitivity 90% and specificity 93%[24,25]. In high prevalent TB area ADA test support the diagnosis[13,26]. The mean average range of ADA level in tubercular and in malignant pleural effusion, which is statistically significant as similar to Afrasiabian S. *et al* [23].

As per this study, pleural biopsy shows that adenocarcinoma is maximum (71.42%), large cell carcinoma 14.28%, small cell and

mesothelioma is 7.14%. Mohan KM. *et al* and Ramesh P. *et al* found adenocarcinoma is maximum[20,27].

Conclusion

TB is the most common cause of pleural effusion in Bangladesh, the aetiology is revealed by that study. Cytological examination such as leukocyte examination can differ the acute case like parapneumonic effusion and chronic case like TB, malignancy. Now a days ADA level in pleural fluid, gene expert is used for diagnosis of pleural TB and in case of malignant pleural effusion histopatholgy, biopsy were done. Early diagnosis can less the hospital stay, patient burden and economical benefit of the patient.

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