Original Article

Aetiological Diagnosis of Pleural Effusion: A cross sectional study

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Abstract

Pleural effusion is a common clinical problem with different possible causes. It can be due to local, systemic, infectious or non-infectious causes. Aetiological diagnosis is important for proper treatment. To evaluate the aetiological diagnosis of pleural effusion of hospitalized adult patients this cross-sectional, descriptive study conducted from April to September 2012 at Bangabandhu Sheikh Mujib Medical University (BSMMU). A total of 100 cases were selected by purposive sampling. Data were collected using a structured questionnaire. Complete history was taken either from patient or accompanying attendants. Clinical examination was done and relevant investigations report were collected. Data were analyzed using statistical package for the social sciences (SPSS). The mean age of the patient was 41.2 SD± 7.4 years with a male to female ratio of 3:1. Over half (52%) of the patients were poor, 34% were middle class and 14% were rich. Over two-third (67%) of the patients were smoker and the remaining 33% were non smoker. Out of 100 patients with pleural effusion, 52 had tuberculosis and 16 patients had malignancy. Among the malignant cases 14 were found to have bronchial carcinoma and 2, had lymphoma. The remaining 32 patient had other causes of pleural effusion which included nephrotic syndrome 14, congestive cardiac failure 5, cirrhosis of liver 4, rheumatoid arthritis 3, amoebic liver abscess 2, and undiagnosed 4. Tuberculosis is the predominant cause of pleural effusion in our country and the second leading cause is malignancy.

Keywords: *Pleural effusion, Tuberculosis, Malignancy.*

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INTRODUCTION

Pleural effusions are a common clinical condition in developed as well as developing countries like Bangladesh and physicians of all specialties encountered them. Fluid accumulation is associated with many medical conditions through many different mechanisms, including increased pulmonary capillary pressure, decreased oncotic pressure, increased pleural membrane permeability, and obstruction of lymphatic flow.[1]

Approximately one million patients worldwide develop pleural effusion each year.[2] It can be due to local, systemic, infectious or non-infectious causes.[3]

In an area with a high incidence of tuberculosis, the commonest causes of pleural effusion include tuberculosis (25%), neoplasia (22.9%), congestive cardiac failure (17.9%) and pneumonia (14%).[4]

Diagnosis of a pleural effusion begins with obtaining the patient's clinical history and doing a physical examination and is followed by chest radiography and analysis of pleural fluid, Mantoux/ tuberculin skin test, staining of sputum specimens for acid-fast bacilli (AFB) and bacteriological cultures in appropriate instances.[5,6] If necessary, the process continues with further investigative studies, such as computed tomography (CT) of the thorax, pleural biopsy, thoracoscopy, and, occasionally, bronchoscopy.[5] Several studies have reported relatively large numbers of patients in whom a definite diagnosis could not be made despite extensive investigations. This study was designed for aetiological diagnosis of pleural effusion and to find out the frequencies of different aetiologies.

MATERIALS AND METHODS

This prospective cross-sectional study was carried out in the department of medicine, Bangabandhu Sheikh Mujib Medical University. One hundred admitted patients aged

> 13 years irrespective of any sex with a clinical and radiological evidence of pleural effusion were enrolled through purposive sampling. Informed written consent was taken from each and every patient.History regarding age, sex, socioeconomic status, smoking habit, cough, fever, dyspnoea, hemoptysis, weight loss, sputum, hoarseness of voice was taken. Examinations were done to find out chest movement on respiration, mediastinal shifting, percussion note, breath sound, vocal resonance and added sounds. Complete blood count (CBC), Erythrocyte sedimentation rate (ESR), Chest X-ray, pleural fluid aspiration, biochemical, bacteriological and cytological tests of pleural fluid was done in all patients. Pleural biopsy, lymph node biopsy, bronchoscopy and bronchoscopic biopsy were done where there was a need. All the data were collected in a predesigned structured questionnaire. All the informations were edited and entered into a computer. Data were analyzed using descriptive statistics.

RESULTS

Majority cases of tuberculous effusion were in between 31 to 60 years of age and malignant effusion was between 41 to 70 years of age. No malignant effusion was found before 30 years of age.Other effusion did not show any age predictor (Table-1). Incidence of tuberculosis and malignancy as the cause of pleural effusion is much more common in male than in female. In the study, out of 52 cases of tuberculous effusion, 35 were male and 17 were female and out of 16 case of malignant effusion 12 were male and 4 were female.

Among 100 patents with effusion, 67 were smoker and 33 were non-smoker. Among 16 patients of malignant pleural effusion, 14 (87.50%) were smokers (Figure-I). In most of the cases of tuberculous and malignant effusions ESR was above 50 mm in 1st hour (Table-2). ESR within normal range does not exclude tuberculosis or malignancy as the cause of pleural effusion. Tuberculous, Malignant, and Parapneumonic effusion due to amoebic liver abscess were exudative in nature. Congestive cardiac failure, cirrhosis of liver and nephrotic syndrome cases yielded transudative effusion. Some of the nonspecific effusion was exudative and some were transudative (Table-3). Histology of pleural biopsy specimen was the corner stone for the diagnosis of pleural effusion. In 24 cases, tuberculosis was diagnosed by sputum culture for AFB and 3 cases were diagnosed by detection of AFB in pleural fluid. Bronchoscopy and biopsy was the main procedure for the confirmed diagnosis of bronchial carcinoma and its histological type as the cause of malignant pleural effusion (Table-4).

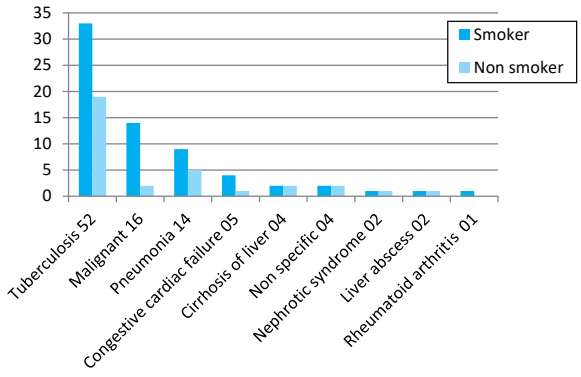

Figure 1: Smoking Habits of the patients having pleural effusion (n=100)

Table I: Age distribution in different group of effusion (N=100)

Age	Tuberculous	Malignant	Pneumonia	Congestive Cardiac failure	Cirrhosis of liver	Nephrotic syndrome	Liver Abscess	Non specific	Total
13-20	03	0	01	0	0	0	0	0	04
21-30	05	0	02	0	0	01	00	01	09
31-40	10	01	04	00	01	00	01	01	20
41-50	10	02	03	01	01	01	01	02	23
51-60	13	05	02	02	02	00	00	00	20
61-70	09	06	01	02	00	00	00	00	18
>-70	02	02	01	00	00	00	00	00	06
Total	52	19	14	05	04	02	02	04	100

Table II: Values of ESR of the patients having pleural effusion (N=100)

ESR- mm in 1st hour	Tubercular (N- 52)	Malignant (N-16)	Others (N-32)	Total (N-100)
<50 mm	03 (5.17%)	01(6.25%)	19(59.38%)	23(23%)
50-100mm	41(78.85%)	07(43.75%)	13(40.63%)	61(61%)
> 100 mm	08(15.38%)	08(50%)	00(00%)	16(16%)

Table III: Result of pleural fluid analysis (N=100)

Disease	Biochemical Analysis				Cellular Characteristics	Gram staining	Z-N Staining (AFB)	Malignant cell	C/S
	Protein gm/dl		Glucose gm/dl						
	>3	< 3	<60	>60					
Tubercular (n=52	52	00	48	04	Lymphcytes- plenty in 50 cases	No organism	(+)ve in 3cases	Absent	MTB (+)ve 24 cases
Malignant (n=16)	16	00	07	09	RBC (Plenty) with lympho 11 Mesothelial cell & ploymorph-3	No organism	(-)ve	Present in 4 cases	No growth
Pneumonia (n= 14)	14	00	14	00	plenty of polymorph with few lympho 6	Gram+ve cocci 7	(-)ve	Absent	Pneumococcalgr owth in 7 cases
CCF (n=05)	00	05	00	05	Lymphocyte (a few)= 4	No organism	(-)ve	Absent	No growth
Cirrhosis of liver (n=04)	00	04	00	04	Lymphocyte (a few)= 1	No organism	(-)ve	Absent	No growth
Nonspecific (n=04)	02	02	02	02	Lymphocyte (a few)= 5	No organism	(-)ve	Absent	No growth
Nephrotic Syn. (n=02)	00	02	00	02	Lymphocyte (a few)= 5	No organism	(-)ve	Absent	No growth
Liver abscess (n=02)	02	00	02	00	Lymphocyte (a few)= 2	No organism	(-)ve	Absent	No growth
R.A (n= 01)	01	00	00	00	Lymphocyte (a few)= 2	No organism	(-)ve	Absent	No growth

Table IV: Different procedures involved in confirmation of the diagnosis (N=100)

Disease	Diagnostic procedures involved to confirm the diagnosis					
	Pleural fluid Analysis	Sputum culture	pleural biopsy	Lymph node biopsy/FNAC	Bronchoscopic biopsy	Others
Tubercular (n=52	3(5.17%)	24(46.15%)	20(43.1%)	05(9.62%)	00(00%)	00(00%)
Malignant (n=16)	00(00%)		03(20%)	05 (11.76%)	08(80%)	00(00%)
Others (n= 32)	05(25%)					27(75%)

Tuberculosis was the most common cause of pleural effusion and among 100 patients with effusion 52 were due to tuberculosis. Bronchial carcinoma was found as the 2nd common cause of pleural effusion (16%). Pneumonia was found as the 3rd common cause (14%). No cause could be detected in 4 cases (Figure-II).

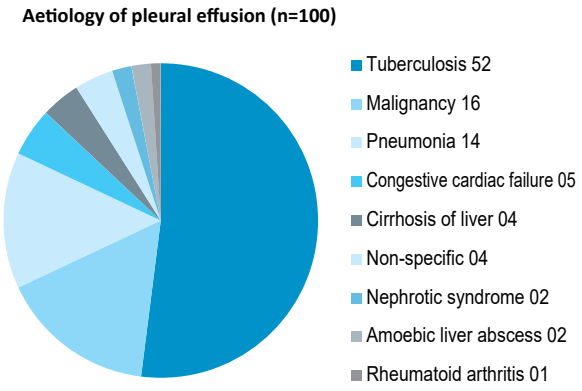

Figure 2: Etiology of pleural effusion

DISCUSSION

Pleural effusion is a very common problem in our clinical practice. Etiological diagnosis is essential for proper management of the effusion. In this study number of patients belonged to 31 - 60 years of age was 63 (63%). Incidence was found lower before 20 years (04%) and after 70 years of age (06%). which is more or less similar to another study in Bangladesh.[7] The incidence of tuberculosis was found highest between 51-60 years of age (25%) which corresponds to another study where the figure was 28%.[7] Bronchial carcinoma was highest between 51 to 70 years of age (56.25%) in this study. Al Quarain et al study says it is 46%. [8]

Pleural effusion was found to be much more common (67%) among smokers. Most of the patients (87.50%) with malignant pleural effusion and 64% of the patient with tuberculous effusion were smoker.

The etiology of pleural effusion has been studied extensively at different times. In a series of 97 patients with pleural effusion, Hoque E M et al. found following final diagnosis: Tuberculosis 60(62%), Malignancy 24 (25%) which included 12 cases of squamous cell carcinoma, 7 cases of adenocarcinoma, 3 cases of small cell carcinoma and 2 cases of lymphoma.[9] Others 13 (13%) which included, 6 cases of parapneumonic effusion, 3 cases of congestive cardiac failure, 2 cases of empyema and 2 cases of cirrhosis.[9] In present study, we have found 52 cases (52%) of tubercular effusion, which is quite similar (tubercular 62%) to study of Hoque E M et al.[9] This high incidence of tuberculosis in our country is probably due to poor socio-economic condition, overcrowding and inadequate health service facilities.

In this study, we have found 16 cases (16%) of malignant pleural effusion, of which 14 were of bronchial carcinoma and 2 cases of lymphoma. Out of remaining 32 cases, 14 cases were due to pneumonia, 5 cases were due to congestive cardiac failure and 4 cases were due to cirrhosis of liver caused by chronic hepatitis B viral infection. The results were more or less similar to that of Hoque E M et al. series except that the incidence of cirrhosis of liver which is more in this study.[9] This is probably due to overall increasing incidence of hepatitis B virus infection throughout the country.

In this study among 52 patients, 49 had increased ESR (more than 50 mmHg) while only 3 had it in normal range. Normal or nearly normal ESR does not exclude the diagnosis of tubercular effusion. In most of the malignant pleural effusion cases, ESR was more than 100 mm in 1st hour.

Among 52 patients, sputum for AFB were found positive in 14 (26.92%) cases and culture of the sputum yielded positive result in 24 (46.15%) cases. No AFB could be detected in rest of the cases. In one study, AFB was found in the sputum only in 3.12% cases.[10]

Among 16 patients with malignant effusion, sputum was collected from all patients and malignant cells were found in two sputum specimen (12.5%). In one study, malignant cells were found in the sputum in 2% cases.[10]

Most of the tuberculous effusion was straw colored 45 (86.53%). But four haemorrhagic effusions (7.69%) were also found in tuberculosis. As straw coloured effusion were also found in malignant effusion 2(12.5%), most of the cases of malignant pleural effusion were haemorrhagic 14 (87.5%). In Mostafa MG et al series, 6%of tuberculous effusions were found haemorrhagic and 18% of malignant effusion was found straw coloured.[11] Tuberculous, malignant, parapneunonic effusions and effusion due to liver abscess were found exudative (protein >3 gm/dl) with low glucose content whereas effusions due to CCF, cirrhosis of liver and nephrotic syndrome were found transudative with normal glucose content. In four cases of

nonspecific effusions, 2 cases were found exudative. High lymphocytes count was found in most of the cases of tuberculous and malignant pleural effusion.

Gram staining of pleural fluid revealed gram-positive cocci in seven cases (50%) of parapneumonic effusion but culture yielded growth of pneumococci in eight (57.14%) cases and staph. aureus in four (28.57%) cases.

In tuberculous effusion, it is believed to be the result of a delayed hypersensitivity reaction to tubercular protein.[8,12] They rarely contain any tubercle bacilli.[13,14]In this study, we found AFB in the pleural fluid of three patients with tuberculous effusion.

Out of 52 cases of tuberculous pleural effusion, pleural biopsy was done in 28 cases and it confirmed the diagnosis in 20(74.07%) cases. In Mostafa MG et al series it was 75%.[11] Lymph node biopsy findings were in favour of tuberculosis in 5 (8.62%) cases of tubercular effusion in this study.

In 16 cases of malignant pleural effusion pleural biopsies were done in 08 cases & bronchoscopy and biopsy of suspected lesions were done in 11 cases and lymph node biopsy was done in 8 cases. Positive result was found 13 cases in these studies.

Among 16 cases of malignant pleural effusion 14 cases were diagnosed as bronchial carcinoma and 2 cases are lymphoma. Among 14 cases of bronchial carcinoma 06 cases (42.85%) were squamous cell carcinoma, 4 cases (28.57%) were small cell carcinoma and 4 cases (28.57%) were adenocarcinoma. In one study, squamous cell carcinoma was found 60%.[10] Exfoliative cytology of sputum for malignant cells was positive in 1 case (10%) and malignant cells in the pleural fluid were found in 4 cases (40%). In one study those were 12.5% and 12.5% respectively.

In this study, we found five cases of pleural effusion due to congestive cardiac failure. Most of them had valvular and ischaemic heart disease including old Ml. In a study it was found 6%.[10]Although in developed countries, congestive heart failure, pneumonia and malignancy accounts for most of the cases of pleural effusion, in developing countries, tuberculosis is the major cause.[14]

In our study there were 14 cases (14%) of para pneumonic effusion. Pleural fluid was exudative in nature. In Hoque et al. study it was (6.19%).[15]In this series 4 cases (4%) of transudative effusion were due to cirrhosis of liver, which were confirmed by liver biopsy. In one study,cirrhosis comprises 4% cases.[7]

CONCLUSIONS

Tuberculosis and malignancies are the common causes of pleural effusion. Examination of pleural fluid and pleural biopsy play a very vital role in detection of aetiology of pleural effusion. FNAC or histopalhology of the accessible lymph nodes and pleural biopsy play an important role in the aetiological diagnosis to pleural effusion where pleural fluid analysis gives inadequate clues. So a combination of modalities might the approach to reach a specific diagnosis of pleural effusion.

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