

Original Article



Clinicopathological Study of Pleural Effusion In A Tertiary Care Hospital.

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Abstract

Background: Pleural effusion is an excess fluid that accumulates between two pleural layers. Pleural fluid analysis and cytology are the mainstays for diagnosing various pulmonary diseases. Levels of adenosine deaminase (ADA) are particularly useful in areas where the prevalence of tuberculosis is high. **Objectives:** To find the clinical profile and various etiology of pleural effusion in respect of age and sex and level of adenosine deaminase in the different causes of pleural effusion. **Materials and Methods:** This was an observational study carried out in the Department of Laboratory Medicine of a tertiary level teaching hospital, Khwaja Yunus Ali Medical College & Hospital (KYAMCH), Enayetpur, Sirajganj, Bangladesh. Biochemical analysis was done by Olympus AU-400 and cytology was done by Papanicolaou stain. **Result:** A total of 173 cases of diagnosed pleural effusion was taken in the present study. Tuberculosis was the primary etiology of the total 82 cases (47.39%), followed by malignancy accounting to 30 cases (17.34%). These two were followed by parapneumonic effusion (10.40%). ADA level is highest in TB (167U/L) in comparison with malignancy, transudative cause and other causes. **Conclusion:** Most common cause of pleural effusion in the tertiary hospital setting is tuberculosis, followed by malignant pleural effusion and ADA level is highest in TB than any other cause.

Key words: Pleural effusion, Adenosine deaminase (ADA), Papanicolaou stain, Exudative fluid, Tuberculosis.

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Introduction

Pleural effusion is an excess fluid that accumulates between the two pleural layers.¹ It is not a disease entity but is either a manifestation of a complication of the pulmonary or nonpulmonary disease and can lead to grave consequences if not managed timely. The list of causes of pleural effusion is quite exhaustive. They are classified broadly into exudative and transudative based on light's criteria.² Congestive cardiac failure (CCF) is the most common cause of transudative pleural effusion worldwide.² Among exudative pleural effusion, in the west the most common causes are malignancy and pneumonia, but in India and Bangladesh, it is tubercular effusion followed by malignant effusion and a very few due to parapneumonic effusion. Pleural fluid analysis and cytology are the mainstays for diagnosing various pulmonary diseases.³

Analysis of pleural fluid can have an important contribution for the investigation of patients with pleural effusion.⁴ Cytological examination not only helps for diagnosing cancer but also for staging and prognosis of disease.⁵ Levels of adenosine deaminase (ADA) are particularly useful in areas where the prevalence of tuberculosis is high.⁶

Materials and Methods

This was a retrospective observational study over a period of eight months from September 2020 to May, 2021. The study was carried out in the Department of Laboratory services of a tertiary level teaching institution of north Bengal of Bangladesh.

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A total of 173 consecutive cases of pleural effusion of both gender of more than 10 years were included in the study.

Patient over 10 years of both genders, Patient who had given valid consent were included and Patient below 10 years of age, Patients with hemothorax and chylothorax, Hemodynamically unstable patient, Patients who have not done ADA.

The present institutional-based retrospective study was undertaken after obtaining Ethical clearance. A total of 173 patients presenting with pleural effusion were studied. A detailed history was taken, clinical-radiological examination and routine laboratory examination were done like; hemoglobin, total and differential WBC count, erythrocyte sedimentation rate (ESR), random blood sugar, serum proteins, urine and sputum examination and tuberculin test are carried out for all the patients. A plain X-ray chest P/A view was done. Physical examination of pleural fluid was done in which the color, amount and nature of fluid were noted. Cytological examination, like total and differential leukocyte count (TDLC) was done by manual method. Glucose and protein estimation of pleural fluid was also done including ADA level was measured by spectrophotometric method. Clinicocytological and ADA correlation was done in all the cases for the diagnosis of tubercular pleural effusion. Pleural fluid was collected in 2 separate containers; one for biochemical analysis – protein, glucose and ADA estimation, and another for TDLC and cytological examination. About 20ml of fluid was collected for this study. The pleural fluid was subjected to the above-mentioned tests within 3-4 hours of collection. Glucose, Protein, ADA levels were estimated by a spectrophotometric method using (Olympus-AU-400) instrument. Besides there Gram's stain, ZN stain, culture and sensitivity were done. TDLC: Total leukocyte count (TLC) of pleural fluid was performed after dilution with WBC diluting fluid (Turk's fluid) in an improved Neubauer's chamber and the cells were counted by an automated method. For Differential leukocyte counts (DLC) –pleural fluid was centrifuged at 3000 rpm for 15 minutes. The slides were prepared from the sediment and stained with Field's stain or Giemsa stain.

Pleural fluid glucose and protein were estimated by fully automated analyzer Olympus-AU-400.

Pleural fluid ADA was determined by a spectrophotometric method using Olympus-AU - 400 instruments.

Pleural fluid cytology

Method of preparation of smear: About 20 ml of pleural fluid was taken for cytological examination. The fluid was centrifuged in a conical tube at 1500 rpm for 5- 10 minutes. The supernatant was discarded and smears were made from the sediment and fixed by 95% ethanol of wet smear for Papanicolaou stain.

Results

A total of 173 cases of diagnosed pleural effusion was taken in the present study. Among all (n-173) the exudative type was far more common than the transudative one (93.06% vs 6.93%). (Table I)

Table-I: Distribution of cases according to etiology

Effusion type	Aetiology	Male (%)	Female(%)	Number of cases (%)
Exudative effusion Number: 161(93.06%)	Tuberculosis	47(57.31%)	35(42.68%)	82 (47.39%)
	Malignancy	22	08	30 (17.34%)
	Others	29	20	49 (28.32%)
Transudative effusion Number: 12 (6.93%)	Miscellaneous	10	02	12(6.93%)
Total				173(100%)

Tuberculosis was the primary etiology of the total 82 cases (47.39%) whereas malignancy was the next most prevalent cause accounting for 30 cases (17.34%).

Table-II: Age and sex-wise distribution of pleural effusion.

Age group	Male	Female	Total	Percentage
a (11 - 20)	2	6	8	4.6
b (21 -30)	12	16	28	16.2
c (31 – 40)	11	16	27	15.6
d (41 - 50)	24	7	31	17.9
e (51 – 60)	25	10	35	20.2
f (>60)	34	10	44	25.5
Total	108(62%)	65(38%)	173	100

Male patients outnumbered female patients by 26% (male 62% vs female 38%). The majority of the patient were in the age group of (>60) and out of which males were 34 and the rest were female. The second most common age group was e(51 – 60 years) comprising 20.2% (35 cases) of the population studied. (Table II)

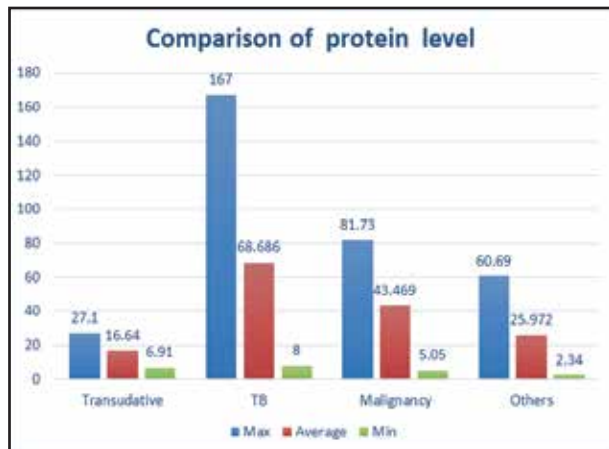


Figure-1: Comparison of protein level

Figure-1: The biochemical analysis of pleural effusion was found (figure-1) that protein level(167 gm/L) is the highest in tuberculosis followed by malignancy (81.73gm/L), others (60.69 gm/L) and transudative (27.1gm/L) causes. By performing average and minimum values were found a similar result.

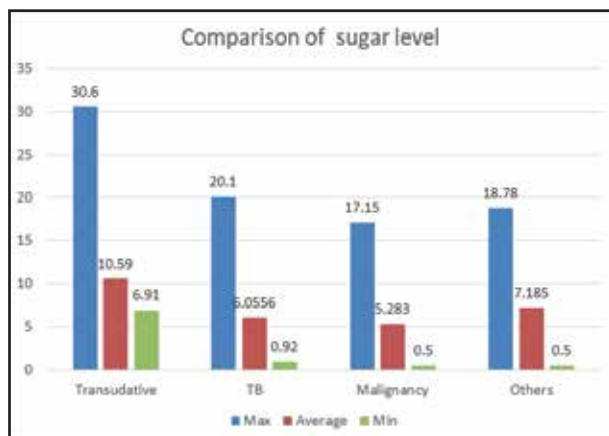


Figure-2: Comparison of sugar level

Figure-2: After biochemical analysis of pleural effusion (figure-2) we found that glucose level was highest in transudative (30.6mmol/L) cases in comparison to tubercular (20.1 mmol/L), malignant (17.15 mmol/L), and other (18.78 mmol/L) cases.

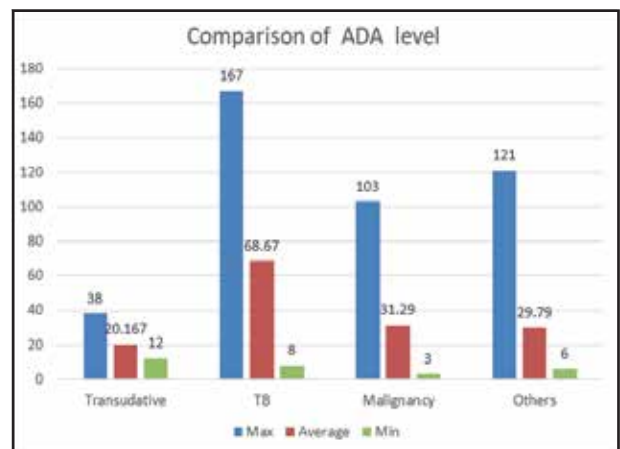


Figure-3: Comparison of ADA level

Estimation of ADA was the highest in TB (167U/L) in comparison to malignancy, transudative cause and other causes (figure-3)

Discussion

In the present study, the most common etiology is tuberculosis (47.39%), followed by malignant pleural effusion (17.34%). Other aetiology of pleural effusion are of different diseases. This study result corroborates closely with the findings of Jindal⁷ and Valdes et al.⁸

Tuberculosis was also the leading cause of pleural effusion in a study conducted by Maikap MK et al, while worldwide CCF is the most common cause of pleural effusion.^{9,10} A study conducted in respiratory intensive care set up by Chinchkar N J et al. found malignancy to be the most frequent cause of pleural effusion.¹¹ The present study showed a lesser frequency of transudative effusion which is almost closer to the study of Bar P. K et al.¹²

The majority of the cases of pleural effusion were males as compared to females in the present study (57.31% vs 42.68%) having a male: female ratio of 1.34:1. The male preponderance is similar among tuberculosis and malignant pleural effusion (2.75:1) group also. Sharma SK et al and Maikap et al also found a similar male majority in their studies.^{9,13}

In the present study, the patients with pleural effusion were found in all age groups ranging from 11 years boy as the youngest subject and 84 years aged female was the eldest. Patients aged more than 60 aged groups represent the largest group (25.43%). In between 31 and 40 age group (29.34%) was the largest group in the study of Parikh P and co-researchers.¹⁴ Many authors reported that values of ADA were significantly higher in tubercular pleural effusions.^{15,16} In the present study, 47.39% of tubercular pleural effusion had ADA levels in the range of 8-167 IU/L and the average ADA was 68.67 IU/L. Malignant pleural effusion was found in 17.34% of cases which was quite similar to different articles published previously like F Y Khan et al (15.55%), Maikap et al (14%) and Chinchkar NJ et al(24%).^{9,11,16}

Conclusion

The most common cause of pleural effusion in a tertiary hospital setting is tuberculosis, followed by malignant pleural effusion. Protein and ADA levels are the highest in TB than any other cause. So in a community setup, implementation of measures to decrease the burden of tuberculosis is required.

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