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# A Study of the Combined Usefulness of Pleural Fluid Lymphocytes / Neutrophil Ratio and ADA Value in the Diagnosis of Tuberculous Pleural Effusion

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**Abstract:** ***The present study was conducted from January 2019 to march 2020 in the SDSTRC AND RGICD, Hospital, BANGALORE. Observational study was design, with a sample size of 80. The data for this study was collected from 80 patients of pleural effusion fulfilling the inclusion/exclusion criteria admitted in SDSTRC and RGICD Hospital, BANGALORE using a proforma specially designed for the study. For tuberculous pleural effusion, diagnosis was made by demonstration of AFB in pleural fluid/sputum and/or ADA >40U/L and L/N ratio >0.75 in pleural fluid. In non-tuberculous pleural effusion evaluation was done for Exudative pleural fluid effusion.***

**Keywords:** ADA, Adeninine deaminase, LDH, lactate dehydrogenase, TB, tuberculosis

## 1. Introduction

Pulmonary tuberculosis is the most frequent cause of death by an infectious agent worldwide. Among the extra pulmonary presentations after tuberculous lymphadenitis, pleural TB is the second most frequent failure to diagnose and treat pleural TB can result in progressive disease with the involvement of other organs in as many as 65% of patients [1].

**Definition**

Pleural effusion is the abnormal collection of fluid in the pleural space.

It is classified into exudates and transudates based on Light's criteria. 2-4 The common exudative effusions encountered in clinical practice are tuberculosis, malignancy, para pneumonic or associated with collagen vascular disease. TB pleural effusion is seen in more than 90% cases. TB pleural effusion may be sequel to a primary infection acquired 6-12weeks previously or it may represent reactivation of TB.5

## 2. Methods

The present study was conducted from January 2019 to march 2020 in the SDSTRC and RGICD, Hospital, BANGALORE. Observational study was design, with a sample size of 80. The data for this study was collected from 80 patients of pleural effusion fulfilling the inclusion/exclusion criteria admitted in SDSTRC AND RGICD Hospital, BANGALORE using a proforma specially designed for the study. For tuberculous pleural effusion, diagnosis was made by demonstration of AFB in pleural fluid/sputum and/or ADA >40U/L and L/N ratio >0.75 in pleural fluid. In non-tuberculous pleural effusion evaluation was done for Exudative pleural fluid effusion.

## 3. Statistical Analysis

SPSS [Statistical Package for Social Science] version 20 IBM SPASS statistics was used to perform the statistical analysis.
Descriptive statics of the explanatory and outcome variables were calculated by mean, standard deviation for quantitive variables, frequecy and proportions for qualitative variables.

Inferential statistics like Independent sample t test was applied to compare the ADA and L/N ratio between Non – Tb and Tb groups.

Chi-square test was applied for categorical variables.

Pearson's correlation was applied to correlate the ADA and L/N ratio within the group

**Inclusion criteria**
Patients of exudative pleural effusion,
Age >18years,
Hemodynamically stable.

**Exclusion criteria**
Patients of transudative pleural effusion,
Age < 18years
Hemodynamically unstabie

**Diagnostic criteria**
Light's criteria were used to diagnose exudative pleural effusion. Exudative pleural effusion meets at least one of the following criteria

- Pleural fluid / serum protein >0.5,
- Pleural fluid LDH/serum LDH >0.6,
- Pleural fluid LDH more than two-thirds of normal upper limit for serum.

Criteria taken for diagnosis of tuberculous pleural effusion

- Demonstration of AFB in pleural fluid/sputum and / or
- ADA > 40 U/L and / or
- L/N ration > 0.75 in pleural fluid.

In non-tuberculous pleural effusion evaluation was done for Exudative pleural effusion. Besides a detailed history and clinical examination, the following investigations were carried out

**Investigations**
Complete haemogram, ESR, serum Urea, Serum Creatinine, Liver Function Tests, Sputum AFB, sputum CBNAAT, HIV ELISA, Chest x-ray, Diagnostic thoracentesis was done, and fluid sent for analysis of glucose, protein, cytology and cell count, LDH, AFB and gram stain, culture and ADA were done.

## 4. Results

A total of 80 patients of exudative pleural effusion were analyzed out of which 54 (67.5%) were males and 26 (32.5%) were females. They were mostly in the age group of 21-40years. The lowest age was 20years and highest age was 74years. ADA was done in all samples of pleural fluid.

Total ADA in pleural fluid of more than 40U/L with a pleural fluid L/N ratio of more than 0.75 was useful in differentiating between tuberculous and non-tuberculous pleural effusion. Tuberculosis was the most common cause of pleural effusion. Peak age of tuberculous pleural effusion was 21-30years. Out of 80 patients of exudative pleural effusion, 60 were tuberculous pleural effuision.

Out of 60 cases of tuberculous pleural effusion, 42 were males and 18 were females. Pleuritic chest pain was noted in 64 cases, followed by fever in 62 cases, dry cough in 59 cases and cough with sputum in 28 cases, hemoptysis in past history of TB was obtained in 7 cases and history of contact with TB patients in 14 cases. 38cases presented with left sided pleural effusion and 42 cases had moderate pleural effusion. Sputum smear for AFB and was done in patients who produced sputum and it tested negative and pleural fluid CBNAAT was positive in only 3 cases.

Total ADA was found to be >40U/L in all the cases with TB effusion (Table 11). All cases of TB effusion were lymphocyte predominant with L/N ratio >0.75. In cases of exudative pleural effusion due to non-tuberculous aetiology L/N ratio was <0.75 (Table)

**Table 1:** Age distribution of 80 cases of exudative plural effusion

| Age in years | Male | Female | Total | % |
|---|---|---|---|---|
| 20 -29 | 16 | 8 | 24 | 30 |
| 30-39 | 14 | 7 | 21 | 26.25 |
| 40-49 | 10 | 4 | 14 | 17.5 |
| 50-59 | 8 | 4 | 12 | 15 |
| >60 | 6 | 3 | 9 | 11.25 |

Table 1 shows the age variation was from 20 to 74years, Majority patients were in the age group of 20-39years
Table 2: Gender distribution

**Table 2:** Shows present study group consists of 67.5% male and 32.5% females

| Gender | Frequency | % |
|---|---|---|
| Male | 54 | 67.5 |
| Female | 26 | 32.5 |
| Total | 80 | 100 |

**Table 3:** Clinical features-symptoms

| Symptoms | Total | % |
|---|---|---|
| Pleuritic chest pain | 59 | 73.75 |
| Fever | 51 | 63.75 |
| Dyspnoea | 50 | 62.5 |
| Cough | 47 | 58.75 |
| Weight loss | 27 | 33.75 |
| Appetite loss | 29 | 36.25 |

Table 3 shows the pleuritic type of chest pain is the most frequently noted symptom in 59cases (73.75%) followed by fever 51cases (63.75), dyspnoea in 50 cases (62.5%) and cough in 47 cases (58.75%) respectively.

**Table 4:** Distribution of the subjects based on L/N Ratio

| L/N ratio | | GROUPS | | Total |
|---|---|---|---|---|
| | | NON-TB | TB | |
| Less than 0.75 | Count | 20 | 0 | 20 |
| | Percent | 22.70% | 0.00% | 22.70% |
| More than 0.75 | Count | 0 | 60 | 60 |
| | Percent | 0.00% | 75% | 75% |
| Total | Count | 20 | 60 | 80 |
| | Percent | 25% | 75% | 100.00% |
| Chi-square value- 80.0 | | | | |
| P value- 0.00* | | | | |

*significant

**Table 5:** Comparison of ADA and L/N Ratio between the Groups using Independent Sample T Test

| | | Minimum | Maximum | Mean | Std. Deviation | Mean diff | p value |
|---|---|---|---|---|---|---|---|
| ADA | Non-Tb | 17.7 | 39 | 30.49 | 5.21 | -22.29 | 0.00* |
| | Tb | 40 | 75.5 | 52.4 | 9.63 | | |
| L/N ratio | Non-Tb | 0.03 | 0.6 | 0.28 | 0.14 | -20.62 | 0.003* |
| | Tb | 1.5 | 100 | 26.18 | 34.79 | | |

*significant

**Table 6:** Pearson's Correlation between ADA and L/N Ratio

| | r value | p value |
|---|---|---|
| Non-Tb | 0.411 | 0.072 |
| Tb | -0.116 | 0.39 |

## 5. Discussion

Increased ADA activity in pleural effusion [9] is classically associated with tuberculosis. However it may occur due to a number of causes and this may negatively affect the diagnostic utility of ADA measurements and decrease its specificity in the diagnosis of TB [10]. Our results show that, at a cut off level are 40U/L, ADA has a sensitivity, specificity, PPV, NPV and efficiency of 61%, 71%, 83%, 45%, and 64% respectively [11]. When the L/N ratio's was considered together with ADA activity, the results improved considerably for the diagnosis of tuberculosis pleuiritis [12]. Parapneumonic and empyematous effusions are characterised by neutrophil-predominant, exudative

effusions. In the cases and tuberculosis pleurisy, a predominant lymphocyte count was usually found, resulting in L/N ratio of 0.75 or greater, whereas in other conditions of exudative pleural effusion, L/N ratio was found to be less than 0.75 [13].

TB pleurisy is traditionally diagnosed by either identification of M tuberculosis in pleural fluid and/or biopsy specimen cultures or from the presence granulomas in the pleural biopsy tissue [14]. Pleural fluid cultures have sensitivity of 20- 30%, pleural biopsy specimen 50-80%, depending upon the clinician's proficiency. Because of the long culture periods required, clinical and therapeutic decisions are often made before the lab results become available. Polymerase chain reaction, having a sensitivity of 78% for active disease, has not been found to be an efficient alternative.

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## 6. Conclusion

From the above discussion, it is concluded that combined use of the total ADA in pleural fluid of >40U/L with a pleural fluid L/N ratio >0.75 is a more efficient means of diagnosing tuberculous pleural effusion than the use of ADA alone.

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