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ROLE OF PLEURAL FLUID ADENOSINE DEAMINASE AND LYMPHOCYTE NEUTROPHIL RATIO IN DIFFERENTIATING TUBERCULOUS PLEURAL EFFUSION FROM OTHER EXUDATIVE EFFUSIONS

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Abstract

Tubercular Pleural Effusion is the second most common extrapulmonary tuberculosis with incidence of 3-5% in low burden areas and upto 30% in high burden areas. In general, a cutoff level of between 40 and 45 U/L is used with levels above this being indicative of tuberculosis. An ADA level above 70 U/L in a patient who does not have an empyema or rheumatoid arthritis (RA) is essentially diagnostic of tuberculous pleuritis. (1,2,5,6) High pleural fluid ADA levels have also been reported with a very small percent of other neoplasms, with Q fever, with Brucellosis and with Legionnaire's disease Lymphocyte/Neutrophil (L/N) ratio >0.75 is seen to be more likely of TB pleural effusion. (1,2)

Aim and Objectives:

- To evaluate the role of Adenosine deaminase (ADA) and Lymphocyte Neutrophil Ratio (L/N RATIO) in differentiating Tuberculous pleural effusion from other exudative pleural effusion.
- To study the demographical, clinical, radiological, and microbiological profile in various exudative pleural effusions.
- To assess Sensitivity, Specificity, PPV, NPV of pleural fluid ADA and L/N Ratio in tubercular and other exudative effusions.

Patients and Methods: An Institutional based Prospective Observational study was conducted among the patients attended the tertiary care centre in Warangal from May 2023 to April 2025.

In current study, ADA levels are seen to be elevated (> 40IUL) in all the patients with empyema (100%) followed by patients with tubercular pleural effusion (81.2%). This study demonstrates L/N ratio more than 0.75 in all patients with tubercular pleural effusion (100%) followed by patients with malignancy (95%) and parapneumonic effusion empyema (80%). Whereas, majority (71.4%) patients with empyema had L/N ratio less than 0.75.In present study a pleural fluid ADA has high sensitivity (93.1%), high Specificity (96%), high PPV (84%) and high NPV (66%). Pleural fluid L/N ratio also has high sensitivity (99%), high Specificity (100%), high PPV (89%) and high NPV (91%). Hence combined use of both these biochemical marker increases diagnostic accuracy.

Conclusion: When used in combined pleural fluid ADA and L/N ratio increase the diagnostic accuracy of tubercular pleural effusion and helps to differentiate from other effusion.

Keywords: Pleural Effusion, Exudative Pleural Effusion, Tuberculosis, Pleural Tuberculosis, Empyema

INTRODUCTION

Pleural Effusion is the collection of fluid between the two layers of pleura due to imbalance in the homeostatic factors in the secretion and absorption of Pleural fluid. Pleural effusions are classified into transudative, exudative pleural effusion based on Lights criteria. (1,2,3)

Measurement of the ADA level in pleural fluid is diagnostically useful because ADA levels tend to be higher in tuberculous pleural effusions than in other exudative effusions. ADA is the enzyme that catalyses the conversion of adenosine to inosine. In general, a cutoff level of between 40 and 45 U/L is used with levels above this being indicative of tuberculosis. An ADA level above 70 U/L in a patient who does not have an empyema or rheumatoid arthritis (RA) is essentially diagnostic of tuberculous pleuritis. (1,2,5,6)

High pleural fluid ADA levels have also been reported with a very small percent of other neoplasms, with Q fever, with Brucellosis and with Legionnaire's disease Lymphocyte/Neutrophil (L/N) ratio >0.75 is seen to be more likely of TB pleural effusion. (1,2). The common exudative effusions encountered in clinical practice are tuberculosis, malignancy, para pneumonic or associated with collagen vascular disease. Pleural fluid cell counts and differentials, glucose level, adenosine deaminase (ADA), fluid GeneXpert for Mycobacterium tuberculosis, fluid culture, and cytology are currently employed in the further evaluation of exudative pleural effusions.

AIM OF THE STUDY

To evaluate the role of Adenosine deaminase (ADA) and Lymphocyte Neutrophil Ratio (L/N RATIO) in differentiating Tuberculous pleural effusion from other exudative pleural effusion.

OBJECTIVES OF THE STUDY

1.To study the demographical, clinical, radiological, and microbiological profile in various exudative pleural effusions.

2.To differentiate various etiologies of exudative pleural effusion based on biochemical (ADA and L/N ratio) and pathological (cytological) analysis.

3.To assess Sensitivity, Specificity, PPV, NPV of pleural fluid ADA and L/N Ratio in tubercular and other exudative effusions.

PATIENTS AND METHODS

I)SAMPLE SIZE: 80

Sample size calculated by using the formula, Sample Size (N) = (1.96)2 X P (1-P) / M2

Where, P = Prevalence of the disease in the locality; M =Margin of error (5%)

II) DESIGN OF THE STUDY

Institutional based Prospective Observational study.

III)STUDY SETTING

Government Chest Diseases and TB Hospital, Hanumakonda, Warangal

IV)PERIOD OF STUDY

May 2023 to April 2025

V)INCLUSION CRITERIA

Patients who have given informed consent.
Age > 18 years and above.
Only diagnosed cases of tubercular and other exudative effusions by diagnostic thoracocentesis

VI)EXCLUSION CRITERIA:

Patients who have not given consent
Age< 18 years
Uncooperative patient
Patients with bleeding disorders
Patients with traumatic pleural effusions
Patients with local skin infections
Patients with very low platelet count (<50,000/cumm)
Hemodynamically unstable patients

VII)PROCEDURE AND DATA COLLECTION

Data was collected on standard proformas, detailing the present medical history, and past history. General physical examination, and systemic examination and useful investigations were done to confirm exudative pleural effusion.

Following Investigations are done in all patients

Routine investigations:

a.Hb, TLC, DC, Platelet count, ESR, Blood Sugar
b.Blood Urea, Serum Creatinine
c.Bleeding Time, Clotting Time
d.Mantoux Test

Chest x-ray PA view
Ultrasound chest
ECG
Sputum for AFB staining
HIV, HBs Ag, HCV
Pleural Fluid analysis (Cytological)

a.Total leukocyte count
b.Differential count
c.Cytology for malignant cells
a.Cell block for malignant cells Biochemical:Protein
b.Sugar
c.Adenosine deaminase (ADA) Bacteriological:
a.AFB Stain and CBNAAT
b.Gram`s stain
c.Culture and sensitivity

DATA ANALYSIS: Data quality was ensured through onsite supervision and review of completed forms. Data cleaning was done the same day of the data collection. The collected data were numerically coded and then data were entered using Microsoft Excel version 2016.The data was then exported to Statistical Package for Social Sciences software version 20 for analysis. Descriptive statistics like frequencies and percentages were done to study the baseline demographic characteristics. Statistical significance was fixed at P value of <0.05. Association between various variables was determined using Chi square test.

OBSERVATIONS AND RESULTS

A total of 80 patients are examined and studied to evaluate the role of ADA and L/N ratio in the differentiating Tuberculous pleural effusion from other exudative pleural effusions. Following results are obtained from the study:

Table 1: Distribution of study participants based on age (n = 80):

Age (in Years)	**Frequency (n=80)**	**Percentage (%)**
< 20 years	2	2.5
21 – 30	10	12.5
31 – 40	21	26.2
41 – 50	14	17.5
51 – 60	17	21.2
61 – 70	10	12.5
>70	6	7.5
Total	80	100
Mean Age = 28.48 ± 7.46 **Range = 18 to 80**		

In this study minimum and maximum ages are 18 years and 80 years, respectively. More number of patients with pleural effusion are seen between the age group of 31-40 years with a mean age of 28.48 ± 7.46 years.

Table 2: Distribution of study participants based on Sex:

Sex	Frequency (n=80)	Percentage (%)
Male	44	55
Female	36	45
Total	80	100

Table 3: Distribution of study participants based on Occupation

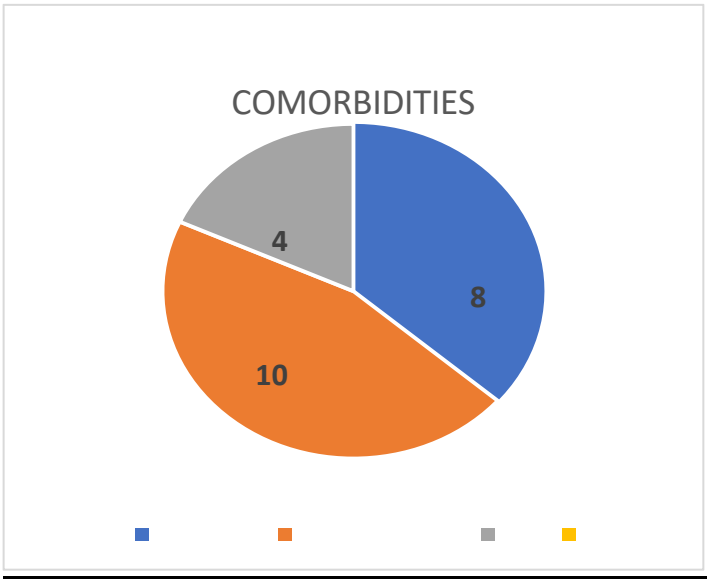
Occupation	Frequency(n=80)	Percentage (%)
Unemployed	25	31.3
Unskilled worker	17	21.3
Semiskilled worker	12	15
Skilled Worker	8	10
Clerical/Shop/Farm	14	17.5
Semi professional	3	3.8
Professional	1	1.3
Total	80	100

In the present study, pleural effusions are most commonly seen in unemployed patients with a percentage of (31.3%), followed in frequency by unskilled workers (21.3%), farmers (17.5%), semiskilled (15%), skilled workers (10%).

Table 4: Distribution of study participants based on addiction history (N=80)

Addictions Present	Males(n=44)	Females(n=36)
Smokers	23 (52.27%)	4 (11.11%)
Alcoholics	23 (52.27%)	2 (5.5%)
Tobacco chewers	9 (20.45%)	5 (13.8%)
Chi square value: 46.18 df: 1 P value: < 0.001		

In present study, patients with pleural effusions are assessed based on the addiction history. Addictions like smoking, alcohol consumption and tobacco chewing are predominantly seen among men. Smoking is present in (52.27%) males and (11.11%) females. Alcohol consumption is seen among (52.27%) males and (5.5%) females. Tobacco use is seen among (20.45%) males and (13.8%) females. There is significant association between presence of addictions and gender with a chi square value of 46.18 and p value<0.001.



Graph 1: Pie chart showing distribution of study participants based on comorbidities (N=80)

In the present study (12.5%) of total study population have systemic hypertension, followed by Diabetes (10%) and (5%) HIV positive.

Table 5: Distribution of study participants based on clinical symptoms (N=80)

Symptoms	Frequency(n=80)	Percentage (%)
Fever	40	50
Cough	52	65
Dyspnoea	13	16.3
Haemoptysis	3	3.8
Chest pain	49	61.25
Weight loss	47	58.8
Anorexia	41	51.2
Myalgia	7	8.8

In the present study majority of the participants came with complaints of cough (65%) and chest pain (61.25%) followed in frequency by weight loss, anorexia, and fever among (58.8%), (51.2%) and (50%) patients, respectively.

Table 6: Distribution of study participants based on CT findings (N=80)

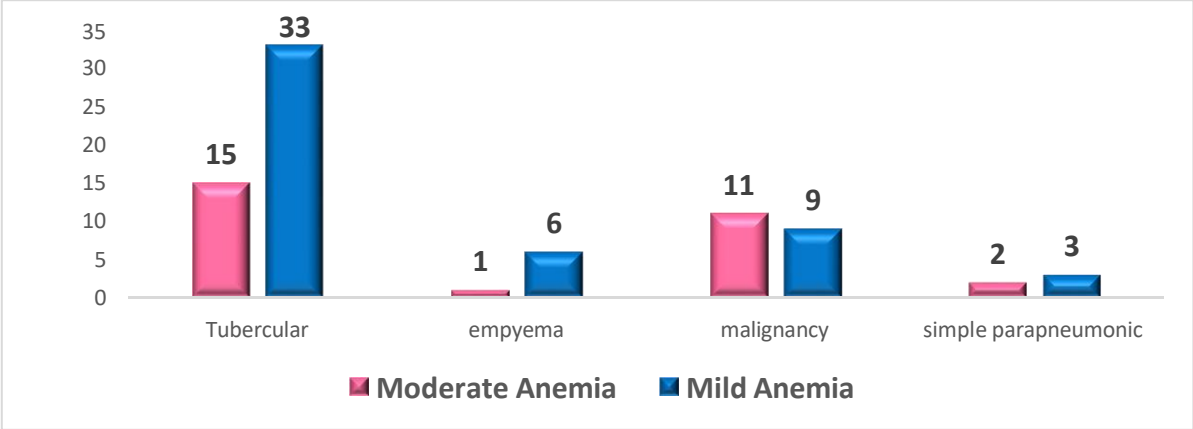
CT Findings	Frequency(n=80)	Percentage (%)
Collapse	2	2.5
Consolidation	4	5
Lamellar effusion	58	72.5
Loculated effusion	6	7.5
Mass	3	3.8
Empyema	7	8.8
Total	80	100

In the present study Lamellar effusion is the most common presentation found in (72.5%) effusions followed in frequency by empyema (8.8%), Loculated effusion (7.5%), consolidation (5%), mass (3.8%) and collapse (2.5%).

Table 7: Distribution of study participants based on pathology (N=80)

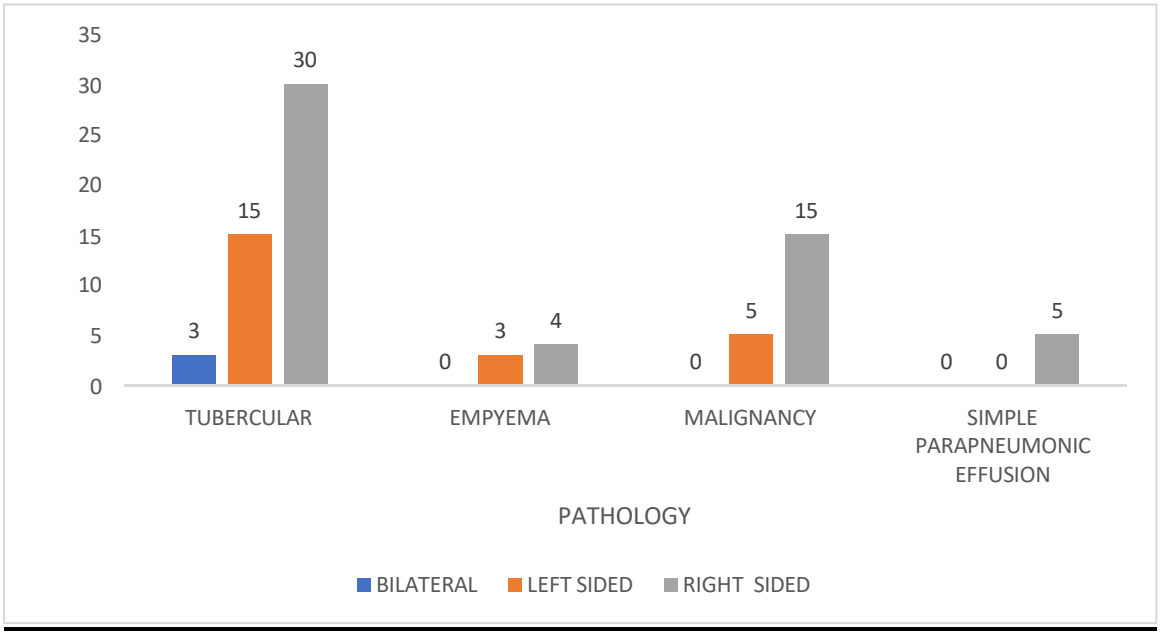
Pathology	Frequency(n=80)	Percentage (%)
Tubercular Pleural Effusion	48	60
Empyema	7	8.8
Malignancy	20	25
Simple Parapneumonic Effusion	5	6.3
Total	80	100

Among the 80 patients, 48 patients (60%) are having tubercular pleural effusion, followed in frequency by malignancy among 20 patients (25%), empyema in 7 patients (8.8%) and parapneumonic effusion in 5 patients (6.3%).



Graph 2: Bar graph showing distribution of study participants based on anaemia (N=80)

In the present study, 52 patients (65%) have mild anaemia and (35%) have moderate anaemia. Both mild and moderate anaemia are common in Tubercular pleural effusions followed in frequency by malignancy, empyema and simple parapneumonic effusion. There is no significant association between severity of anaemia and pathology of pleural effusion.



Graph 3: Bar graph showing distribution of study participants based on side of involvement (N=80)

In current study, (65.7%) of the patients has right side involvement followed by (28.75%) has left side involvement and only (3.75%) shows bilateral involvement.
Among bilateral pleural effusions Tuberculosis (100%) is the only cause. Right and left sided effusion are more common in Tuberculous pleural effusion, contributing to (65.7%) and (56.6%) respectively. There is no significant association between side of effusion and pathology of pleural effusion.

Majority patients participated in study has moderate effusion (63.75%) followed by massive effusion in (20%) patients and mild effusion in (16.25%) patients. P value is less than 0.001 hence is statistically significant. Mild and moderate effusions are most commonly seen in tubercular effusion contributing to (76.9%) and (70.5%) respectively. Massive effusions are caused by malignancy contributing to (53.33%). There is a significant association between severity of effusion and underlying pathology with a chi-square value of 34.65 and p value of<0.001.

Table 8: Distribution of study participants based on USG findings (n=80)

Pathology	FREE effusion (n=69)	LOCULATED effusion(n=11)
Tubercular	44(63.8%)	4(36.36%)
Empyema	1(1.4%)	6(54.5%)
Malignancy	20(28.9%)	0(0%)
Simple parapneumonic	4(5.797%)	1(9.09%)
Chi square value: 72.83 df: 6		
Effusion		

Free effusion is seen in 69 patients (86.25%) of study participants, followed by loculated effusion seen in 11 patients (13.75%). Free effusions is commonly seen in tuberculosis contributing to (63.8%) and loculated effusion is commonly seen in empyema contributing to (54.5%). There is a statistically significant association between type of effusion on ultrasound and underlying pathology of effusion with a chi-square value of 72.83 and p value of<0.001.

Table 9: Distribution of study participants based on appearance of pleural fluid (N=80)

Appearance of Pleural Fluid	Frequency(N=80)	Percentage (%)
Haemorrhagic	14	17.5
High Coloured	3	3.7
Pus	7	8.75
Straw	56	70
Total	80	100

On Pleural fluid examination, majority (70%) showed straw colour appearance followed in frequency by haemorrhagic, pus, and high coloured in (17.5) %, (8.75) %, (3.7) % respectively.

Table 10: Distribution of study participants based on microbiological analysis (N=80)

Microbiological Analysis	Positive (%)
Sputum smear	4(5%)
Sputum CBNAAT	6(7.5%)
Pleural Fluid CBNAAT	8(10%)

Pleural fluid CBNAAT has high diagnostic yield corresponding to (10%) compared to other microbiological investigations.

Table 11: Distribution of malignant pleural effusion based on pleural fluid cytology and cell block

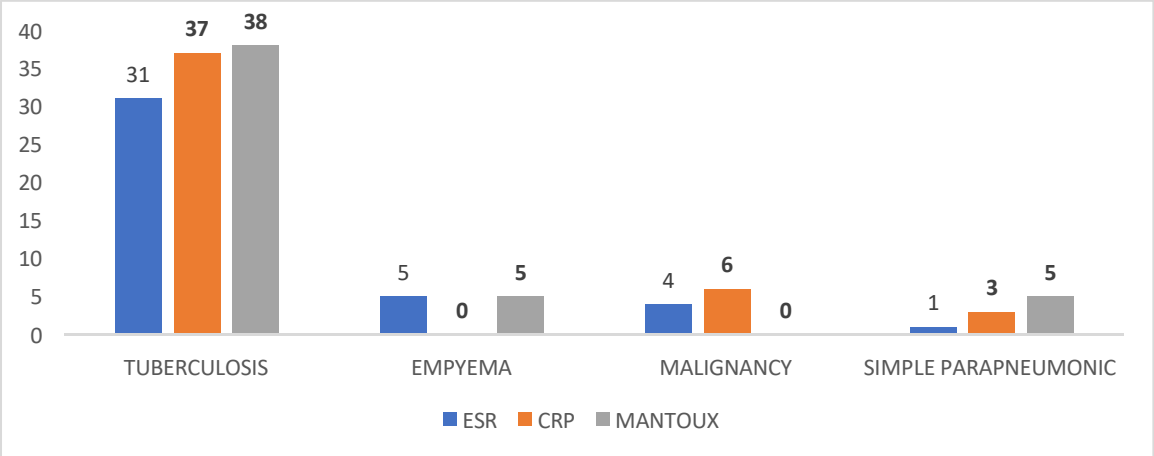
Pleural Fluid Analysis	Positive (%) (N=20)
Cytology	16(80%)
Cell Block	17(85%)

Low sugars are seen in 100% cases of TB and empyema. High ADA is seen in all cases of pleural effusions except in malignancy cases where low ADA is detected. High protein levels are seen in all cases of pleural effusion more in cases of malignancy. High LDH is seen in all cases of pleural effusion except in malignancy cases where low LDH is detected.

Table 12: Distribution of study participants based on pleural fluid gram staining, culture, and sensitivity of pleural fluid among study participants (n=80)

Gram Staining	Organism	Frequency	Percentage
Positive	Pneumococcus	1	1.3
	Streptococcus	2	2.5
	Klebsiella	1	1.3
Negative		76	95

On pleural fluid gram staining, majority (96.3%) was negative. Of the (3.8%) positive gram staining of pleural fluid, (2.5%) of streptococcus and (1.3%) of pneumococcus species and (1.3%) of klebsiella species is isolated.



Graph 4: Bar graph showing distribution of study participants based on other investigations(N=80)

In current study, among tubercular effusions elevated ESR is seen in (64.6%) patients and elevated CRP is seen in (77%) patients and Mantoux test is positive in (79%) patients. In empyema ESR is elevated in (71.4%) patients with normal CRP (100%) and with positive Mantoux in (71.4%). In malignancy ESR is normal in (80%) patients with normal CRP in (70%) with negative Mantoux (100%) patients. In simple parapneumonic effusion ESR is normal in (80%) patients with serum CRP elevated in (60%) and Mantoux test negative in (80%) patients.

Table 13: Distribution of study participants based on ADA (N=80)

ADA (IUL)	Frequency(n=80)	Percentage
<40	30	37.5
>40	50	62.5
Total	80	100
Minimum = 6.88 IUL Maximum = 425 IUL Mean = 59.99 ± 55.04 IUL		

On biochemical analysis of pleural fluid, ADA less than 40 IUL is seen in (37.5%) and ADA more than 40 IUL is seen in (62.5%) in this study. The minimum ADA level obtained is 6.88 IUL and maximum is 425 IUL with mean of 59.99 ± 55.04 IU/l.

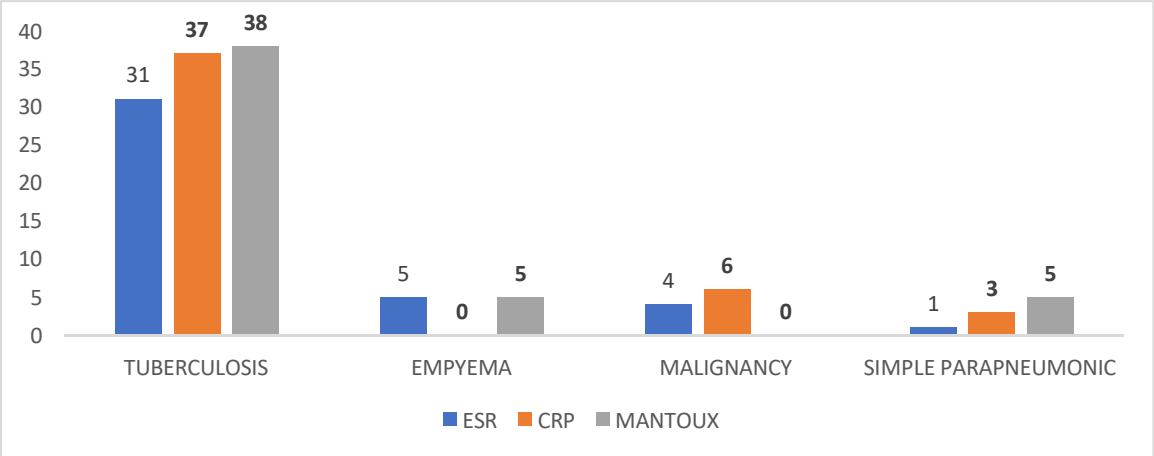
Table 14: Distribution of study participants based on L/N ratio (N=80)

L/N Ratio	Frequency(n=80)	Percentage
< 0.75	7	8.8
> 0.75	73	91.2
Total	80	100
Minimum = 0.17 **Maximum = 19** **Mean = 6.87 ± 6.43**		

On biochemical analysis of pleural fluid, L/N ratio less than 0.75 is seen in (8.8%) patients and L/N ratio more than 0.75 is seen in majority patients (91.2%) in this study. The minimum L/N ratio is 0.17 and maximum is 19 with mean of 6.87 ± 6.43.

Table 15: Etiological distribution of study participants based on ADA (N=+80)

Pathology	ADA Value (in IUL)	
	< 40 (%)	>40 (%)
Tubercular Pleural Effusion	9 (18.8)	39 (81.2)
Empyema	0	7 (100)
Malignancy	18 (90)	2 (10)
Parapneumonic Effusion	3 (60)	2 (40)
Total	30 (37.5)	50 (62.5)
Chi square value: 39.78 df: 3 P value: < 0.001		

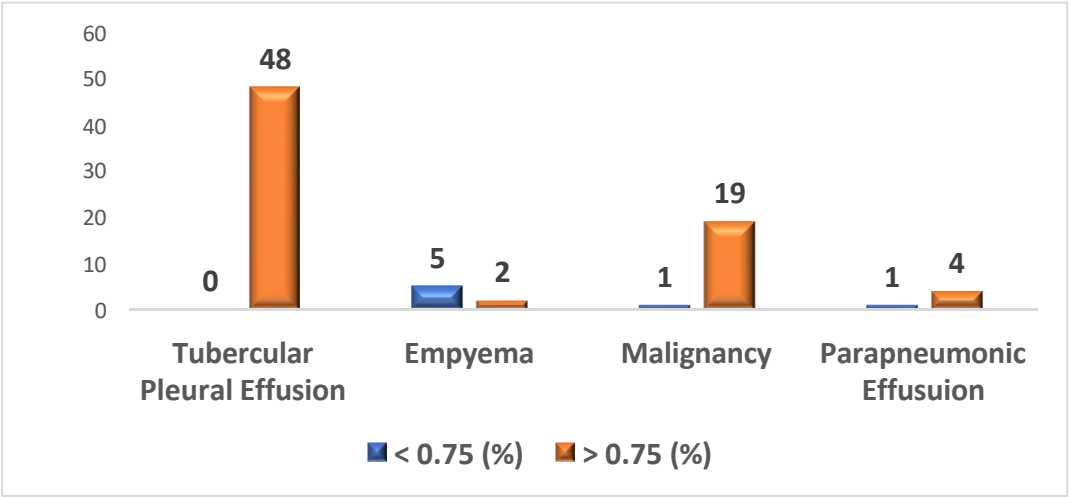


Graph 5: Bar graph showing etiological distribution of study participants based on ADA(N=80)

In current study, ADA levels are seen to be elevated (> 40IUL) in all the patients with empyema (100%) followed by patients with tubercular pleural effusion (81.2%). On the contrary, patients with malignancy (90%) and parapneumonic effusion (60%) had ADAlevel less than 40 IUL. Thus, this association in highly significant with Chi square value of 39.7 at degree of freedom of 3 with of the P value < 0.001.

Table 16: Etiological distribution based on L/N ratio among study participants (N=80)

Pathology	L/N Ratio	
	< 0.75 (%)	> 0.75 (%)
Tubercular Pleural Effusion	0	48 (100)
Empyema	5 (71.4)	2 (28.6)
Malignancy	1 (5)	19 (95)
Parapneumonic Effusion	1 (20)	4 (80)
Total	7 (8.8)	73 (91.2)
Chi square value: 40.19 df: 3 P value: < 0.001		



Graph 6: Bar graph showing etiological distribution of study participants based on L/N ratio (N=80)

This study demonstrates L/N ratio more than 0.75 in all patients with tubercular pleural effusion (100%) followed by patients with malignancy (95%) and parapneumonic effusion empyema (80%). Whereas, majority (71.4%) patients with empyema had L/N ratio less than 0.75. Thus, this association in highly significant with Chi square value of 40.19 at degree of freedom of 3 with of the P value < 0.001.

Table 17: Sensitivity, specificity, Positive predictive value (PPV) and negative Predictive value (NPV) of Pleural fluid ADA and L/N ratio among study population

Test	Sensitivity	Specificity	PPV	NPV
ADA level (>40 U/L)	93.1%	96%	84%	66%
LN ratio (0.75)	99%	100%	89%	91%

Both pleural fluid ADA and L/N ratio has high sensitivity, specificity, PPV and NPV which is very useful differentiating exudative pleural effusions.

Table 18: Etiological distribution of study participants based on ADA and L/N ratio (N=80)

Pathology	ADA Value (in IUL)		L/N Ratio	
	< 40 (%)	**>40 (%)**	**< 0.75 (%)**	**> 0.75 (%)**
Tubercular Pleural Effusion	9 (18.8)	39 (81.2)	0	48 (100)
Empyema	0	7 (100)	5 (71.4)	2 (28.6)
Malignancy	18 (90)	2 (10)	1 (5)	19 (95)
Parapneumonic Effusion	3 (60)	2 (40)	1 (20)	4 (80)
Total	30 (37.5)	50 (62.5)	7 (8.8)	73 (91.2)
Chi square value, df, P Value	39.78, 3, < **0.001**		40.19, 3, < **0.001**	

Only in tubercular effusion both pleural fluid ADA and pleural fluid L/N ratio is elevated with a P value <0.001 which is statistically significant hence combined use of ADA and L/N ratio increases the diagnostic accuracy in differentiating tubercular effusion from other exudative effusions. Pleural fluid ADA is found to be low and L/N ratio is elevated in malignant pleural effusion. In empyema patients' Pleural fluid ADA is high but L/N ratio is low

Distribution of study participants based on treatment given

All the tubercular pleural effusions (48%) has undergone thoracentesis and ATT therapy. Empyema patients (8.8%) are treated with closed tube thoracostomy. All Malignant pleural effusions (25%) have undergone thoracentesis and oncology management. Therapeutic thoracentesis and antibiotic coverage given for all simple parapneumonic effusion patients (6.3%).

DISCUSSION

The rupture of a subpleural necrotic focus in the lung into the pleural space causes tuberculous pleural effusion. Delayed hypersensitivity occurs when tuberculous proteins gain access to the pleural space, which increases the permeability of the pleural capillaries to protein. The intense inflammatory reaction in the parietal pleura also impedes the lymphatic drainage from the pleural space and leads to pleural fluid accumulation. The diagnostic steps as imaging methods, cellular, microbiologic, and biochemical analyses etc. often are not enough to confirm the etiology of effusion in some patients. These difficulties in diagnostic

have led to the search of new biomarkers that can facilitate the diagnosis. In high prevalence populations, pleural fluid adenosine deaminase (ADA) and/or Interferon gamma (IFN-gamma) test can be considered for diagnosing tuberculous pleural effusion.

Comparison of age distribution of study participants in present study and other similar studies:
In this study minimum and maximum ages are 18 years and 80 years, respectively. More number of patients with pleural effusion are seen between the age group of 31-40 years with a mean age of 28.48 ± 7.46 years. Pleural effusion is found to be more common in middle aged population in present study and which is comparable to other studies. (5,6,7,8)

Comparison of distribution of gender among study participants in present study and other similar studies
Pleural effusion is found be more common in males than females in present study and majority of other studies. Female predominance is seen in study done by Periwal et al and Mohan et al. Equal distribution of gender is seen in study done by Chordia et al. (5,6,7,8,12)

Comparison of comorbidities among study participants in present study and other similar studies
In present study Hypertension is the most predominant comorbidity accounting (12.5%) of total study population. In males Diabetes is the most common comorbidity accounting to (15.9%). In studies of TN Cargill et al, Bhatta et al Diabetes is found to be predominant comorbidity in pleural effusion patients. In study of Chordia et al Hypertension is found to be predominant. (10,11,12)

Comparison of addictions among study participants in present study and other similar studies
In present study Smoking is present in of (33.7%) patients (27 patients) among which (52.27%) are males and (11.11%) females. Alcohol consumption is seen among (31.25%) patients (25 patients) out of which (52.27%) are males and (5.5%) females. Tobacco use is seen among (17.5%) (14 patients) out of which (20.45%) are males and (13.8%) are females which is similar to studies of Pavit Tewatia et al, Chiner et al and Sina Parsey et al where most of smokers had developed pleural effusion. The Chi square value is 46.1 and P value is < 0.001 in present study which is statistically significant. Most of study participants in present study presented with cough (65%) and pleuritic chest pain (61.25%) which is found to be similar as studies done by Periwal et al, and Mohan et al.

Comparison of severity of effusion among study participants in present study and similar studies
Most of the patients in present study is having moderate pleural effusion (63.75%) which is similar to studies of Behera et al, Periwal et al, Jha et al and Chordia et al. P value is less than 0.001 which is statistically significant.

Comparison of distribution of study participants based on Microbiological analysis (N=80)
Pleural Fluid CBNAAT has highest percentage of positivity in the current study compared to sputum smear and pleural fluid smear which is comparable to other studies done by Periwal et al, Behera et al and Mohan et al. (5,6,7)

Comparison of distribution of study participants based on ESR, CRP and Mantoux test in tubercular effusions in study population and similar studies
In present study among tubercular effusions (55%) of the population had Mantoux positive, (57.5%) had C-reactive Protein elevated and (51.5%) patients had elevated ESR which is similar to other studies done by Periwal et al, Behera et al and Mohan et al. (5,6
Distribution of study participants based on aetiology in present study and similar studies
(60%) of study population developed tubercular pleural effusion followed by malignant (25%), empyema (8.75%) and simple parapneumonic effusion (6.25%) respectively. In studies of Periwal et al, Jha et al, Mohan et al, and Chordia et al similar distribution is observed among aetiology of exudative pleuraleffusions

Distribution of study participants based on ADA in present study and other similar studies
ADA levels are seen elevated (> 40IUL) in all the patients with empyema (100%) followed by patients with tubercular pleural effusion (81.2%). On the contrary, patients with malignancy (90%) and parapneumonic effusion (60%) had ADA level less than 40 IUL. Thus, this association in highly significant with Chi square value of 39.7 at degree of freedom of 3 with of the P value < 0.001. A similar trend is observed in studies conducted by Behera BK et al, Periwal et al, Jha et al and Mohan et al. (5,6,7,8)

L/N ratio in present study and similar studies

L/N ratio less than 0.75 was seen in (8.8%) patients and L/N ratio more than 0.75 was seen in majority patients (91.2%) in this study. The minimum L/N ratio was 0.17 and maximum was 19 with mean of 6.87 ± 6.43.

Present study demonstrates L/N ratio more than 0.75 in all patients with tubercular pleural effusion (100%) followed by patients with malignancy (95%) and parapneumonic effusion empyema (80%). Whereas, majority (71.4%) patients with empyema had L/N ratio less than 0.75. Thus, this association in highly significant with Chi square value of 40.19 at degree of freedom of 3 with of the P value < 0.001.In tubercular effusion both pleural fluid ADA and L/N ratio is elevated.

Comparison Of Sensitivity, Specificity, NPV And PPV Of ADA In present study and similar Studies.

A high Sensitivity, Specificity, PPV and NPV of pleural fluid ADA is seen in present study which is higher compared to studies done by Behera et al and Periwal et al. A similar finding is observed in study done by Jha et al. (5,6,7,8)

Comparison of sensitivity, specificity, NPV and PPV of L/N ratio in present study and similar studies.

Pleural fluid L/N ratio is found to have high Sensitivity, Specificity, PPV and NPV hence is very much relevant in increasing diagnostic accuracy of tubercular effusion and other exudative effusions. Combined use of pleural fluid ADA and L/N ratio is increasing the diagnostic accuracy.

SUMMARY

In the present study conducted among 80 patients attended tertiary care centre hospital of Telangana exudative pleural effusions are found to be more predominant in middle aged males (31-40) years of age. More common in smokers and alcoholics with increased incidence among unemployed population and is more commonly associated with diabetic patients. In the present study majority of the participants came with complaints of cough (65%) and chest pain (61.25%) followed by weight loss, anorexia, and fever among (58.8%), (51.2%) and (50%) patients, respectively. In present study Hypertension is the most predominant comorbidity accounting (12.5%) of total study population followed by Diabetes (10%) and HIV only (5%) of population. Vitals are stable for majority of patients as majority of patients presented with moderate amount of pleural effusion mostly with right sided involvement and lamellar effusion on CT findings. Among the 80 patients, 48 patients (60%) is having tubercular pleural effusion, followed by malignancy among 20 patients (25%), empyema in 7 patients (8.75%) and parapneumonic effusion in 5 patients (6.25%). In total study population majority of patients have mild anaemia (52 patients) and moderate anaemia is seen more in tubercular pleural effusion patients and malignant pleural effusion, while mild anaemia is found in empyema patients.

In this study only (10%) of the study participants are pleural fluid CBNAAT positive, sputum CBNAAT in (7.5%) patients and sputum smear positive in (5%) patients. On pleural fluid gram staining, majority (96.3%) was negative. Of the (3.8%) positive gram staining of pleural fluid, (2.5%) was streptococcus pyogenes and (1.3%) pneumococcus species and (1.3%) Klebsiella species is isolated. In present study, among tubercular effusions elevated ESR is seen in 80% patients and Mantoux is positive in 68.7% patients. bIn present study Tubercular pleural effusion patients are observed to have low sugar (61.2%), high ADA (80) %, high protein (60.8) % and high LDH (79.7) %. In malignant pleural effusion patients' low sugar (95%), low ADA (90%), low LDH (94.4%), and high protein (90%) is observed. In empyema low pleural fluid sugar (100%), increased ADA (87.5%), LDH (87.5%) and protein (75%) levels are observed. In simple parapneumonic effusion pleural effusion pleural fluid sugar and ADA is found to be near normal and LDH (80%) and protein (80%) is found to be elevated.

In current study, ADA levels are seen to be elevated (> 40IUL) in all the patients with empyema (100%) followed by patients with tubercular pleural effusion (81.2%). On the contrary, patients with malignancy (90%) and parapneumonic effusion (60%) had ADA level less than 40 IUL. Thus, this association in highly significant with Chi square value of 39.7 at degree of freedom of 3 with of the P value < 0.001.

This study demonstrates L/N ratio more than 0.75 in all patients with tubercular pleural effusion (100%) followed by patients with malignancy (95%) and parapneumonic effusion empyema (80%). Whereas, majority (71.4%) patients with empyema had L/N ratio less than 0.75. Thus, this association in highly significant with Chi square value of 40.19 at degree of freedom of 3 with of the P value < 0.001.

In present study a pleural fluid ADA has high sensitivity (93.1%), high Specificity (96%), high PPV (84%) and high NPV (66%). Pleural fluid L/N ratio also has high sensitivity (99%), high Specificity (100%), high PPV (89%) and high NPV (91%). Hence combined use of both these biochemical marker increases

diagnostic accuracy.

CONCLUSION

Both Pleural fluid ADA and L/N ratio are very high in Tubercular pleural effusion when compared to other exudative pleural effusion. These biochemical markers help to differentiate tubercular effusions from other exudative effusions. When used in combined, these biochemical markers increase the diagnostic accuracy of tubercular pleural effusion. Pleural fluid L/N ratio is useful in increasing diagnostic efficacy when combined with ADA particularly in those exudative effusions where pleural fluid ADA is in borderline of cut off values.

LIMITATIONS OF THE STUDY

1.Sample size of larger population will give a better accuracy of results.
2.Exudative effusions related to collagen vascular diseases, other causes like myxoedema, rare infectious causes are not included in the study.

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