Original Article

Association of Cytological and Biochemical Oarameters with Pleural Effusion in Patients attending a Tertiary Care Hospital of Western U.P.

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Abstract

Background: Pleural effusion is the pathological accumulation of fluid in the pleural space. This study was done to assess the association of cytological, biochemical, radiological and microbiological parameters in the evaluation of pleural effusion.

Materials and Methods: Present study was done in Saraswathi Institute of Medical Sciences- OPD/IPD of Respiratory Medicine department. As per the inclusion /exclusion criteria the study included 70 participants. Ethical clearance was taken before the commencement of study. Data was analyzed using SPSS software version 26.

Majority of participants in present study were males. Majority belongs to age group 19-29 years with mean age was found to be 34.93 ± 12.99 years. Majority of patients had exudative type of pleural effusion. Lymphocytes was found to be higher as compare to neutrophils and other cells in Tubercular cases than Non-TB cases. Similar findings were found in other studies too.

Conclusion: The present study suggest that a high fluid ADA is a vital diagnostic tool and suggest its usage as a quick diagnostic method to diagnose Tuberculous Pleural Effusion.

Keywords: Pleural effusion, ADA, Cytological, Biochemical, Lymphocytes, Neutrophils

Introduction

Pleural effusion is the pathological accumulation of fluid in the pleural space, observed to be very common. Its causes vary widely, ranging from fairly harmless effusions accompanying viral pleuritis to prognostically highly relevant ones due to congestive heart failure or cancer.[1] Patients with a Non-malignant pleural effusion has a one-year mortality in the range of 25% to 57%.

The aetiology of pleural effusions differs according to geographic location, age at diagnosis,

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and advancements in diagnostic procedures and treatment of underlying causes. Thus, the challenge in defining the aetiology of pleural effusion is demonstrated by the fact that "unknown aetiology" accounts for over 15% of cases and above. [2]

Tuberculosis (TB) today remains an important public health problem throughout much of the world. Among lung pathology, tuberculous effusion is the most prevalent morbidity in India, followed by malignant effusion and a few cases of para-pneumonic effusion, the latter being extremely rare. India has the largest prevalence of tuberculosis in the world, accounting for two-thirds of all tuberculosis cases worldwide. It is a sole cause of more than a million deaths each year, mostly in developing countries.

This study was done to assess the association of cytological, biochemical, radiological and microbiological parameters in the evaluation of pleural effusion.

Materials and Methods

The study was done in Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh. The study population were the patients coming to the OPD/ IPD of Respiratory Medicine department. This study was based on the prospective analysis of blood parameters of 70 patients who had come to the OPD/ IPD between November 2020 and October 2022. Inclusion criteria includes participants with age more than 18 years and chest X ray showing evidence of pleural effusion.

All the participants were subjected to Diagnostic Pleurocentesis under aseptic precautions where, about 10 ml of fluid was aspirated and subjected to pleural fluid analysis –Biochemical, Microbiological, Pathological analysis was done. A written Informed consent was obtained for all the invasive procedures prior to it. Ethical clearance was taken prior to the start of this study from the Institutional Ethics Committee.

Patient who had undergone repeated pleurocentesis, bleeding disorders and Pregnant women were excluded from the study. The sample size for the study was calculated as per the formula $4pq/d^2$ where prevalence was taken as 22.5 % from previous literature and standard error was taken as 10% with 95% confidence interval. The final sample size was found to be 70.

Data was entered on MS Office Excel version 2019 and analyzed using SPSS Software version 26. P value was considered significant if it was less than 0.05.

Results

Table-1: Distribution of Age Groups

Age Groups	Frequency	Percentage
19-29	29	41.4
30-40	21	30.0
41-50	11	15.7
51 and above	9	12.9
Total	70	100.0

The present study has included 70 participants with majority of them belongs to 19-29 years age group. The minimum age was 19 years and the maximum was 65 years with mean age (±S.D.) was found to be 34.93 ± 12.99 years. Majority of respondents were male (57.1%).

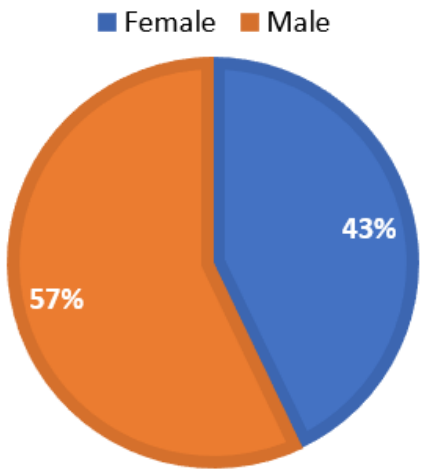

Fig 1: Gender distribution

The results showed that majority of participants has shortness of breath (85.7%), cough (58.6%) and fever (57.1%) with nearly half of them having chest pain (51.4%). Majority of the patients do not complaint of any loss in appetite or weight.

Table-2 Shows the Distribution of Fluid Colour

Fluid Colour	Frequency	Percentage
Exudate (Straw)	64	91.4
Transudate (Clear)	6	8.6
Total	70	100.0

The above table mention the distribution of pleural fluid colour where, higher proportion were observed to be exudative fluid (straw coloured) 91.4% and rest were observed to be transudative fluid (clear coloured) 8.6% cases.

According to Light's criteria, pleural fluid protein/serum protein ratio more than 0.5 was observed in exudate whereas for transudate less than 0.5 pleural fluid protein/serum protein ratio was found.

Table-3 Shows the Distribution of Fluid C/S

Fluid C/S	Frequency	Percentage
Growth	3	4.3
No Growth	67	95.7
Total	70	100.0

According to culture/sensitivity report, higher proportion of cases showed no growth. Where as only 4.3 % cases showed some growth during culture.

Table-4 Shows the Distribution of X-Ray Chest

		Conclusion		Total
		NON-TB	TB	
X-Ray Chest	B/L PE	0	1	1
	Left PE	3	27	30
	Right PE	7	32	39
Total		10	60	70

The above table show the distribution of x-ray chest where majority of case were having Right Pleural effusion with TB whereas, similar observation was found for Non-TB cases also.

Table-5 Shows the Mean Distribution of Lymphocyte, Neutrophil and Other Cells

	Conclusion	N	Mean	S.D.	Std. Error Mean	P Value
Lymphocytes	Non-TB	10	68.30	20.13	6.37	<0.001
	TB	60	85.55	11.43	1.48	
Neutrophils	Non-TB	10	25.90	17.25	5.45	0.001
	TB	60	11.95	11.09	1.43	
Other cells	Non-TB	10	5.80	3.74	1.18	0.002
	TB	60	2.92	2.35	0.30	

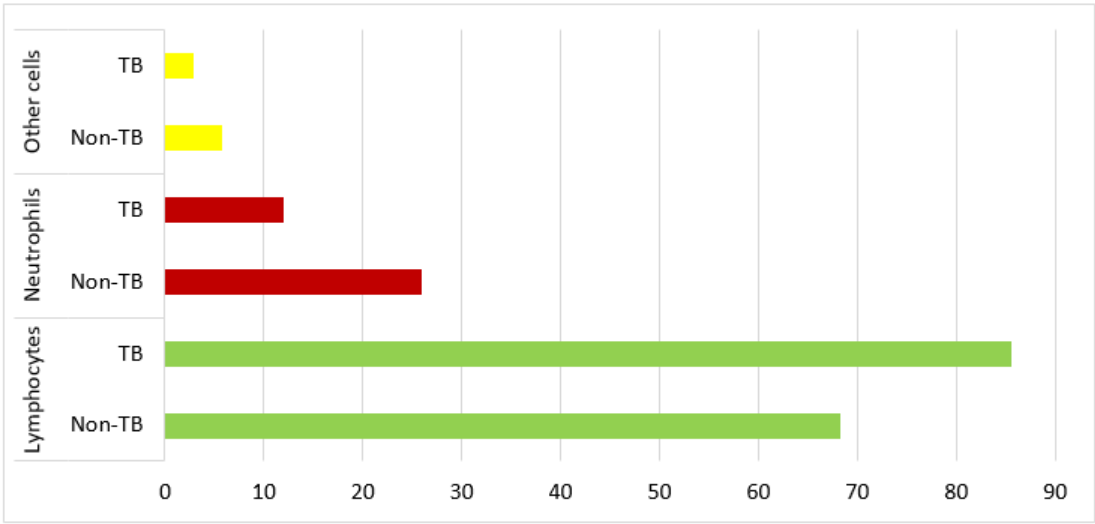

Figure-2 Shows the Mean Distribution of Lymphocyte, Neutrophil and Other Cells

The above table and figure show the mean distribution of lymphocyte, neutrophil and other cells

where significant difference have been observed to be present in TB and Non- TB cases for the lymphocyte, neutrophil and other cells category. Lymphocytes were comparatively higher in TB cases than in non TB cases.

Table-6 Shows the Mean Distribution of F-ADA, PF (S) AND PF (P)

	Conclusion	N	Mean	S.D.	Std. Error Mean	P Value
FADA	Non-TB	10	10.92	7.86	2.48	0.000
	TB	60	85.5	19.88	2.50	
PF(S)	Non-TB	10	121.88	71.46	22.60	0.000
	TB	60	81.07	39.78	5.14	
PF(P)	Non-TB	10	2.97	0.36	0.31	0.000
	TB	60	4.74	0.54	0.08	

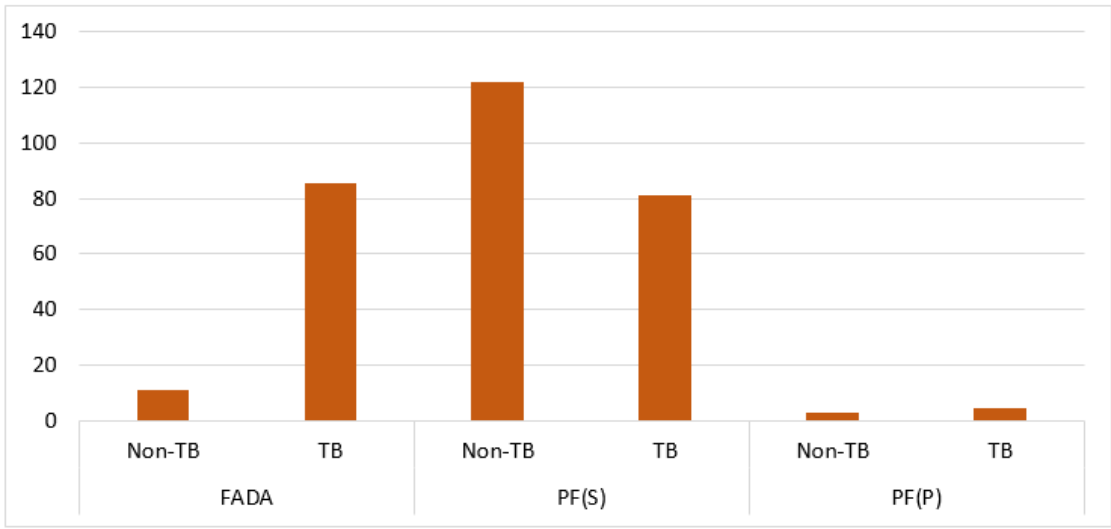

Fig-3 Shows the Mean Distribution of F-ADA, PF (S) AND PF (P)

Discussion

The present study observed that higher percentage of participants were found to be in age group 19-29 years. Ramaswamy et al.[3],study observed that the majority of participants belongs to age group 31-40 years. Qureshi et al.[4], study with similar background enrolled with age range 14-64 years. Their mean age was 30.9± 17.38 years. Whereas, in our study the mean age was 34.93 ± 12.99 years.

The commonest clinical sign was stony dullness to percussion. Pandit et al.[5]found 71.4% cases presented with pleuritic chest pain, breathlessness, dry cough and fever. Fever and cough were the commonest symptom (69.2%) followed by breathlessness and Pleuritic chest pain (61.5%). However, the present study observed the higher percentage of cases to having shortness of breath followed by cough and fever. Karkhanis et al.[6], study found that the pain is usually sharp and is exacerbated by movement of the pleural surfaces, as with deep inspiration, coughing, and sneezing.

In terms of weight loss where higher percentage of cases has been observed to have no weight loss in this present study findings however, Soe et al.[7], study observed significant weight loss (72.2%) for the cases which is not in the line of this present study.

This study observes the distribution of Diabetes mellitus where higher percentage of cases have no history of diabetes mellitus. Ezung et al.[8], study in this context showed 6% prevalence with diabetes mellitus presence.

For the case of neutrophils, and other cell category the present study also observed a decrease of mean values in TB patients. Ferreiro et al.[9], in this course discussed that presence of decrease in neutrophils is highly suggestive for TB. In this course Burgess

et al.[10], in their study overall documented that ADA, especially when combined with differential cell counts and lymphocyte/neutrophil ratios, remains a useful test in the diagnosis tuberculous pleuritis. Whereas study done by Popowicz et al.[11], documented that the proportion of neutrophils in pleural fluid was predictive of prognosis more strongly than lymphocytes.

With context to the distribution of F-Colour, higher proportion was found to be exudate (straw colour) 91.4% whereas smaller proportion (8.6%) represented transudate (clear colour). Reddy et al., also observed straw coloured fluid was more common pleural fluid in their study cases. The study further in this context mentioned that the most Tubercular pleural effusions are exudates with high adenosine deaminase (ADA), lymphocyte-rich, straw-colored and free flowing fluid, with a low yield on mycobacterial culture which is again in similar lines with present study findings.

The cases related to the cartridge based nucleic acid amplification test (F-CBNAAT) showed Tubercular bacilli was not found in higher proportion of cases. Srinidhi et al.[12] observed the role of CBNAAT in diagnosing pleural TB is limited due to its poor sensitivity which is in conformity to this study findings. Chakraborty et al.[13] also stated that for pleural fluid, CBNAAT owing to its low sensitivity, should not be included in the diagnostic protocol of pleural effusion in high prevalence areas**.**

Conclusion

In the present study it was observed that the most common cause of pleural effusion was Tuberculosis after Clinical, Radiological, Biochemical, Cytological and Microbiological correlation, although in India Tuberculous pleural effusion is very common and is the 2nd mostcommon cause of extra-pulmonary Tuberculosis after Tuberculous Lymphadenitis.

This study suggest that a high fluid ADA is a vital diagnostic tool and suggest its usage as a quick diagnostic method to diagnose Tuberculous Pleural Effusion.

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Conflict of Interest: Nil.

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