Original Article

Comparative Study of Adenosine Deaminase Levels in Pleural Effusion of Tuberculous and Non Tuberculous Etiology; A Cross-Sectional Study

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Abstract

Background: Tuberculous pleural effusion (TPE) is very common in developing countries in comparison of developed countries; further TPE is one of the common characteristic of extra pulmonary tuberculosis. Adenosine deaminase (ADA) is an important enzyme which is found highly active in the diseases which induce cellular immunity. Therefore, the present study was designed to evaluate the accuracy of ADA level in the diagnosis of pleural effusion caused by tubercular etiology. **Subjects and Methods:** This was a cross-sectional type of study conducted at tertiary care institute. Total one hundred thirty five patients of pleural effusion were recruited for the study among them eighty nine pleural effusion patients were suffering with tuberculosis and forty six pleural effusion patients were without tuberculosis. A p-value < 0.05 was considered statistically significant. IBM SPSS Statistics 21 manufactured by IBM USA was used for entire calculations. **Results:** Findings of the present study have shown there was significant difference between ADA level of tubercular effusion patients (69.3±27.22) in comparison of non-tubercular pleural effusion patients (20.46±7.34). Further there was a significance difference between Lactate dehydrogenase (LDH) levels of the tubercular effusion patients (172.72±25.7) in comparison of non-tubercular pleural effusion patients (81.91±6356). However there was no significance difference between total protein (p>0.05), glucose level (p>0.05) and total cells (p>0.05) level of both groups. **Conclusion:** Finding of the present study showed that The ADA level was significantly high in pleural effusion patients with tubercular etiology in comparison of non-tubercular pleural effusion.

Keywords: Tuberculosis, ADA, LDH.

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Introduction

Adenosine deaminase (ADA) is an important enzyme which is found highly active in the diseases which induce cellular immunity. ADA catalyses the reaction of adenosine conversing to inosine; moreover, it has been found associated with differentiation of lymphoid cells.[1] Various studies have suggested different cut off values ranging from 30-100 IU/L for ADA level.[1,2] Tuberculous pleural effusion (TPE) is very common in developing countries in comparison of developed countries; further TPE is one of the common characteristic of extra pulmonary tuberculosis.[3-5] Finding of mycobacterium tuberculosis bacteria is the most important diagnostic tool for the diagnosis of pleural tubular effusion (PTE); However this process is an invasive method and process of mycobacterium growth is too slow in culture. Therefore, diagnosis is of PTE is still challenging for clinical evaluation of pleural effusion.[6]

However, pleural biopsy has been considered as confirm diagnosis for the suspected tubercular pleural effusion in orthodox clinical practice. Further, thoracocentesis is more similar process than complicated process of pleural tissue biopsy; moreover, evaluation of tubercular pleural effusion can be substitute for the confirmation of tubercular pleural effusion instead of pleural biopsy.[7] Estimation of ADA level is considered as an important tool for screening as well as diagnosis of tuberculous pleural effusion in many countries where patients of TB are extensively found.[8] Recent study showed that 2 to 3 million people die every year due to tuberculosis moreover 10 million new cases of tuberculosis are adding every year. Moreover, HIV patients are more susceptible for the tubercular infection.[9] Further, More than 70% pleural effusion cases TB has been found responsible in developing countries; however, this incidence is decreases up to 1% in developed countries.[10] TB has been classified into two types pulmonary and extra pulmonary.[11] Mycobacterium tuberculosis stimulates the various inflammatory processes which in turn induce synthesis of ADA in pleural fluid.[12-14] Further, Lian QL et al observed that ADA was significant marker for diagnosis of tubercular pleural effusion among the cases of pleural effusion.[15] ADA has been found associated with the differentiation and proliferation of lymphocyte especially immune cells T

lymphocytes.[16] Moreover, increased T lymphocyte activity and immune response in TB patients may increase the ADA enzyme in TB patients.[17] ADA activity is more than 12 times higher due to T lymphocytes activity in comparison of L lymphocytes activity. T lymphocyte has been found highly active in mycobacterium tuberculosis infection.[18]
Therefore, the present study was designed to evaluate the accuracy of ADA level in the diagnosis of pleural effusion caused by tubercular etiology.

Subjects and Methods

Type of study
It was an interventional type of study.

Study Population
Study population was divided into two groups. Group I consisted one hundred nine mild hypertensive patients (60 males and 49 females), between 20 and 40 years of age while group II included 50 normotensive subjects of same age and sex matched. All the patients were recruited from TMMC & RC, Moradabad. However, twelve mild hypertensive patients (7 males and 5 females) left the study in between due to various reasons and ninety seven mild hypertensive patients (53 males and 44 females) completed the yoga program. Inclusion criteria for the study were blood pressure from >140/90 mm Hg to <160/110 mm of Hg, 18 body mass index 18.5–25 kg/m2. Exclusion criteria were hypertensive patients on any type of anti hypertensive medicines or suffering from any type of chronic disease, any type of disability. This study was approved by ethical committee of TMMC & RC, Moradabad. All the participant of the study gave their inform consent before participating in the study.

Yogic intervention
Group I mild hypertensive patients were asked to perform yogic exercise "Nadi Shodhan Pranayama"[16,17] (forced one side nostril breathing) early in the morning for 30 minutes, 6 days in a week.

Measurements of blood pressure
Measurement of blood pressure was done twice before yoga intervention and three months after yoga intervention. Blood pressure was measured three times by auscultatory method at every 10 min interval by Sphygmomanometer.

Collection of sample
Fasting sample were collected early in the morning before and after yogic intervention.

Biochemical Parameters
MDA in serum was estimated by thiobarbituric acid method (TBA).19 TBARS assay kit Cayman chemical company Ann Arbor, USA and Biochemistry Analyser E-C5VZ(10k) manufactured by Transasia (India) were used for the biochemistry analysis.

Statistical Analysis
The results of the present study were expressed as mean ± SD. Unpaired student t test was used to evaluate the results. A p-value < 0.05 was considered statistically significant. IBM SPSS Statistics 21 manufactured by IBM USA was used for entire calculations.

Results

Total one hundred thirty five cases of pleural effusion were recruited for the present study among them tubercular pleural effusion patients were 65.92% and non tubercular cases were 34.07%. Further, out of forty cases of non tubercular effusion 17.77%, 9.62%, 0.07%, and 2.22% of cases were due to malignancy, pneumonia, congestive cardiac failure and rheumatoid arthritis respectively [Table 1].
Results of the present study have shown there was significant difference between ADA level of tubercular effusion patients (69.3±27.22) in comparison of non-tubercular pleural effusion patients (20.46±7.34). Further there was a significance difference between LDH levels of the tubercular effusion patients (172.72±25.7) in comparison of non-tubercular pleural effusion patients (81.91±6356). However there was no significance difference between total protein (p>0.05), glucose level (p>0.05) and total cells (p>0.05) level of both groups [Table 2].

Table 1: Distribution of study population among pleural effusion cases.

Diagnosis	Number of cases (%)
Tuberculous pleural effusion	89 (65.92%)
Non Tuberculous pleural effusion	46 (34.07%)
Malignancy	24 (17.77%)
Neumonia	13 (9.62%)
Rheumatoid arthritis	1 (0.07%)
Congestive cardiac failure	3 (2.22%)

Table 2: Comparison of all markers in both groups.

Variables	Tubercular pleural effusion		Non-tubercular pleural effusion		p value
	Mean±SD	SEM	Mean±SD	SEM	
ADA(IU/L)	69.3±27.22	±2.968	20.46±7.34	±1.84	<0.01
LDH	172.72±25.7	±5.14	81.91±6356	±7.39	NS
Total Protein	3.75±0.572	±0.5	3.89±0.62	±.061	NS
Glucose(mg/dl)	82.64±18.98	±12.026	79.47±23.27	±9.02	NS
T. cell count (/Cumm)	4012±1418.17	-	4262.96±1392	-	NS

Discussion

Tubercular pleural effusion is still undiagnosed even after advancement of diagnostic techniques and extensive researches. Results of the present study have revealed that commonest cause of pleural effusion were Tb (65.92%), malignancy (17.77%) and pneumonia (9.62 %). Finding of the current study is consistent with the previous study of Lima D et al.[23] in which they recorded similar causes of pleural effusion. Finding of the present study are very similar the previous study of Valdes et al,[21] in which they observed 62.8% pleural effusion were caused by tuberculous. On the other hand Reechaipichitkul W et al[24] and Barger Wet al[25] observed that malignancy is the commonest cause of pleural

effusion while very few cases of pleural effusion due to other cause.

Further, results of the present study showed that there were only few cases of pleural effusion due to other causes including congestive cardiac failure, rheumatoid arthritis and pneumonia.

According to various studies ADA is an important tool for the diagnosis of tubercular plural effusion.[26-28] In the present study ADA has been found significantly high ($p<0.01$) in tubercular effusion patients (69.3±27.22) in comparison of non tubercular pleural effusion patients (20.46±7.34). Findings of the present study are very similar to the findings of the prior studies of Ungerer JPJ et al[13] and Miserochi G et al.[26] Further, Leuallen EC et al[27] and Paddock FK[28] observed similar significant difference ADA in tubercular pleural effusion patients and non-tubercular effusion patients. Enzyme ADA found elevated in pleural fluid of tuberculosis patients.[13]

However, ADA found higher in pleural fluid of patient with malignancy then also it has a positive correlation with tuberculosis and it can be used for diagnosis of pleural effusion of tubercular aetiology.[24,26,27]

Further, a finding of the current study showed that LDH level ($p<0.01$) was significantly high in tubercular effusion patients in comparison of non tubercular pleural effusion patients. These findings are very similar to the findings of the previous studies of Burgess LJ et al,[20] Valdes L et al,[30] and De Oliveira HG[31] in which they observed significantly high LDH level in pleural effusion cases with tubercular etiology in comparison of without tubercular etiology.

Furthermore, the results of the present study revealed there was no significant difference between total proteins ($p>0.05$), glucose ($p>0.05$) and total cells ($p>0.05$) which are very similar to the findings of Valdes et al.[30]

Conclusion

Finding of the present study showed that The ADA level was significantly high in pleural effusion patients with tubercular etiology in comparison of non-tubercular pleural effusion.

Results of the current study suggest that ADA level can be an important marker for diagnosis of the tubercular pleural effusion; moreover, estimation of ADA level is rapid, minimal invasive and above all economical for the diagnosis of tubercular pleural effusion.

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