

A study of adenosine deaminase level for differentiation and diagnosis of tuberculous pleural effusion from non tuberculous effusion in north coastal Andhra Pradesh

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Abstract: The aim is to study the significance of adenosine deaminase levels in the diagnosis and differentiation of tuberculous pleural effusion from other non tuberculous pleural effusions. **METHOD:** A total of eighty (80) patients of pleural effusion were included in the study, out of which 50 were cases of tuberculous pleural effusion and 30 controls of non tuberculous pleural effusion. **RESULTS:** Adenosine deaminase levels in pleural fluid were increased in cases with 150.86 ± 15.73 IU/L (mean \pm SD) compared to that of controls with 19.93 ± 2.14 IU/L (mean \pm SD) with a statistically significant 'p' value of <0.001 . Lactate dehydrogenase levels in pleural fluid were increased in cases with 220.82 ± 30.99 u/l (mean \pm SD) compared to controls with 75.40 ± 15.54 u/l (mean \pm SD) with statistically significant 'p' value of <0.001 . **CONCLUSION:** Increased ADA levels are suggestive of tuberculous effusion, hence help in the diagnosis and differentiation of TB effusion and other non TB effusions.

Keywords: Tuberculosis, Pleural effusion, Adenosine deaminase, Lactate dehydrogenase.

I. Introduction

Tuberculosis caused by Mycobacterium tuberculi, a serious worldwide problem because of predicted spread of AIDS and specific communicable diseases to normal population. It is the most common cause of pleural effusion in countries like India and accounts for 25% of all pleural effusions. In 2010 an estimated 8.8 million incident cases occurred and TB was estimated to account for nearly 1.5 million deaths, making it the second most common cause of death due to an infectious disease.¹

Tuberculous pleurisy is thought to be the result of a delayed hypersensitivity reaction in response to the presence of mycobacterial antigens in the pleural space.² This immunological reaction causes the stimulation and differentiation of lymphocytes which release lymphokines, which in turn activate macrophages for an enhanced bactericidal effect. In tuberculous pleural effusion lymphocytes are predominant but all lymphocyte predominant fluids are not tuberculous, they may be malignant.³ so there is a need to differentiate various cases of pleuritis. Thus ADA estimation is a quick and relatively inexpensive method to differentiate various pleural effusions.

In the present study, the tuberculous pleural fluid was viscid and cell count was more whereas it was non viscid and cell count was low in non tuberculous pleural effusion. Yet it is difficult to establish diagnosis in as many as 20% cases in spite of good clinical and radiological examination and examination of aspirated pleural fluid. In these conditions a specific test is needed for reliable diagnosis with all these considerations, a prospective hospital based study was designed to compare pleural adenosine deaminase level for establishing the diagnosis and for differentiation of tuberculous pleural effusion from non tuberculous pleural effusion. Adenosine deaminase (ADA) is a glycoprotein containing glucosamine and galactosamine residues. The enzyme is present in the cytoplasmic fraction of the cell and a certain amount is located in the nucleus. Muscle contains lowest amount of ADA. In blood cells ADA activity is seen in erythrocytes, lymphocytes and granulocytes. It is ten times higher in lymphocytes, particularly T lymphocytes. The enzyme is widely distributed in animal tissues. Adenosine deaminase enzyme is found in most cells but is increased in tuberculous pleural effusion. It is involved with the proliferation and differentiation of lymphocytes especially T- lymphocytes. For this reason ADA has been considered as a marker for cell mediated immunity and in particular as a marker of the activation of T-lymphocytes. Several reports have suggested that an elevated pleural fluid ADA level predicts tuberculous pleuritis with a sensitivity of 90-100% and a specificity of 89-100%.

Lactate dehydrogenase (LDH) is an enzyme present in almost all the tissues of the body. The tissue levels of LDH are about 500 times higher than those normally found in serum. It is a hydrogen transfer enzyme which catalyses the oxidation of L- lactate to pyruvate in the presence of NAD as hydrogen acceptor. The reaction is reversible. Increase in the total LDH level is seen in any condition which causes necrosis of body cells. Since total LDH is increased in many conditions the study of isoenzymes of LDH is of great importance.⁴

II. Materials and Methods

The study comprised of 80 consecutive patients of pleural effusion, both male and female who attended the department of tuberculosis and chest diseases, King George Hospital, Visakhapatnam, Andhra Pradesh, India. 50 patients with tuberculous effusion were taken as cases and 30 patients with non TB effusion as controls.

Inclusion criteria for cases

1. Diagnosed cases of untreated tuberculosis with pleural effusion

Exclusion criteria for cases

1. Effusion due to cirrhosis of liver
2. Malignancy lung
3. Left ventricular failure

Inclusion criteria for controls

1. All non tuberculous pleural effusions

Exclusion criteria for Controls

1. Tuberculous pleural effusion

Pleural fluid was collected from patients in sterile bottles after obtaining their consent. All samples were analysed immediately.

Estimation of ADA levels in pleural fluid was done by Galanti and Guisti method.⁵

Principle: ADA hydrolyses adenosine to ammonia and inosine. The ammonia formed further reacts with phenol and hypochlorite in an alkaline medium to form a blue indophenol complex. The color of the indophenol complex is directly proportional to the amount of adenosine deaminase present in the sample. Normal value = <30 IU/L

Estimation of LDH was performed by UV kinetic method.

Principle: LDH catalyses the conversion of pyruvate to lactate and the reduced coenzyme NADH to NAD⁺. LDH activity in the sample is directly proportional to the rate of decrease in the absorbance of NADH at 340 nm. Normal range is 100-200U/L.

III. Results

In the present study mean values of ADA among cases is 150 ± 15.73 IU/L (mean \pm SD) compared to that of controls 19.93 ± 2.14 IU/L (mean \pm SD) with a statistically significant with a 'p' value of < 0.001. Mean value of LDH among cases is 220.82 ± 30.99 IU/L (mean \pm SD) compared to that of controls 75.40 ± 15.54 IU/L (mean \pm SD) with a significant 'p' value of <0.001.

IV. Discussion

Eighty patients of pleural effusion both male and female were studied for ADA and LDH levels. Fifty were cases of tuberculous pleural effusion and thirty controls of non tuberculous pleural effusion. In all cases and controls ADA and LDH were measured by appropriate methods.

Tuberculosis is the common cause of effusion in countries like India. Tuberculous effusion is an acute granulomatous pleuritis occurring as a sequel to recent tuberculous infection in young adults and children, who usually do not have apparent parenchymal TB radiologically. May occur in older adults with reactivation tuberculosis. TB pleuritis is a result of delayed hypersensitive reaction that occurs in response to the presence of mycobacterial antigens in pleural space. The antigens may gain access to pleural space from the rupture of a small, sub pleural caseous focus, thus forming effusion. The lymphocytes are predominant in tuberculous pleural effusion.

In the above study it was found that pleural fluid levels of adenosine deaminase have increased in cases with 150.86 ± 15.73 IU/L (mean \pm SD)when compared to controls 19.93 ± 2.14 IU/L (mean \pm SD) with a 'p' value of <0.001 which is statistically significant. The values in the present study are in consistent with the study of Pratheep Raintawan et al.⁶ The increased levels predict tuberculous pleuritis ,thus ADA has been considered as a marker for cell mediated immunity and in particular as a marker of the activation of T lymphocytes.

In the present study LDH levels increased along with ADA. Mean value of LDH among cases is 220.82 ± 30.99 IU/L (mean \pm SD) compared to controls 75.40 ± 15.54 IU/L (mean \pm SD) with a significant 'p' value of <0.001. The values in the present study are in consistent with the study of Pratheep Raintawan et al.

V. Conclusion

Tuberculosis is a major health problem because of predicted spread of AIDS ,hence estimation of ADA levels helps in the early diagnosis and differentiation of various pleural effusions, especially tuberculous effusion.

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