

# Serum MDA (Malondialdehyde), hs-CRP and Adenosine Deaminase Levels in Pulmonary Tuberculosis Patient's

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**Abstract-** Tuberculosis, one of the oldest infectious diseases known to affect humans, as well as cattle is a major cause of death worldwide. This disease, which is caused by bacteria *Mycobacterium tuberculosis* complex, usually affects the lungs, although other organs are involved in up to one-third of cases. Transmission usually takes place through the airborne spread of droplet nuclei produced by patients with infectious pulmonary tuberculosis. More than 5 million new cases of tuberculosis (all forms, both pulmonary and extra pulmonary) were reported to the World Health Organization (WHO) in 2005; >90% of cases were reported from developing countries of Asia (4.9 million), Africa (2.6 million), the Middle East (0.6 million), and Latin America (0.4 million).

Recent data on trends indicate that in 2005 tuberculosis incidence was stable or falling in most regions; the result is a small decline globally from figures in previous years. This global reduction is due largely to an apparent peaking in sub-Saharan Africa, where incidence had risen steeply since the 1980s as a result of the HIV epidemic and the paucity of health services. In Eastern Europe, incidence increased during the 1990s because of deterioration in socioeconomic conditions and the healthcare infrastructure; however, after peaking in 2001, incidence has recently stabilized. (1) Two out of every five Indians are infected with TB bacillus. Every day about 5,000 people develop the disease. Patients with infectious pulmonary tuberculosis disease can infect 10-15 persons in a year. In India almost 0.37 million people die every year. In the year 2006 the programme had achieved a case detection rate of 66 percent as against global target of 70 percent. In the present study is undertaken with the aim of estimating the following biochemical parameters in the serum of pulmonary tuberculosis patients and analysing the changes with reference to the severity of the disease. 1. Malondialdehyde (MDA), 2. High sensitivity c-reactive protein (hs-CRP), 3. Adenosine deaminase (ADA).

**Index Terms-** Serum malondialdehyde (MDA), serum hs-CRP, Serum Adenosine deaminase (ADA) levels.

## I. INTRODUCTION

Tuberculosis, one of the oldest diseases known to affect humans, it particularly in under developed and developing countries is a Major cause of death worldwide. This disease, which is caused by Bacteria of the *Mycobacterium tuberculosis*

complex, usually affects the lungs, although other organs are involved in up to one-Third of cases. If properly treated, tuberculosis caused by drug-Susceptible strains are curable in virtually all cases. If untreated, the disease may be fatal within 5 years in 50–65% of cases. Transmission usually takes place through the airborne spread of Droplet nuclei produced by patients with infectious pulmonary Tuberculosis. (1) More than 5 million new cases of tuberculosis (all forms, both Pulmonary and extra pulmonary) were reported to the World Health Organization (WHO) in 2005; 90% of cases were reported from Developing countries. The number of reported cases began to increase in the late 1980s to the early 1990s this is attributed to acquire immune deficiency syndrome (AIDS), epidemic, homelessness and decreased focus on tuberculosis control Programs.

This increase in MTB infections focused considerable attention on the development of assays for the rapid diagnosis of MTB infections and molecular methods were at the center of the effort. The goal was to design very sensitive assays that would allow for the direct detection of MTB from clinical specimens. However, this goal has proven to be more difficult to reach than originally anticipated. The standard methods for detection of MTB include Acid-Fast Bacilli (AFB) smear and conventional liquid culture methods which are associated with increased risk of developing tuberculosis. Tuberculosis is an important socio economic problem in our country and it is closely linked with health education, health consciousness, and preventive awareness. (2)

The Pulmonary tuberculosis both markers of active inflammatory process, MDA and hs-CRP levels are increased indicating tuberculosis diseases process is active. Hence it can be concluded that in addition to serum ADA levels, estimation of MDA and hs-CRP levels are useful biochemical parameters to assess whether the tuberculosis disease process active as identification and culture AFB is a time consuming process.

## II. MATERIALS AND METHODS

The present study is conducted in the Department of Biochemistry and Department of CHEST AND T.B, S.V.S. Medical College and Hospital, Mahabubnagar. A total of 30 pulmonary tuberculosis patients were studied. Among these 15 were cases and 15 were controls. Each subject was selected as per inclusion criteria. on the basis of vital signs like cough; fever,

headache, AFB-positive, Mantoux test-positive chest x-ray etc. The biochemical parameters of cases were compared with those of normal (control group) persons.

**Collection of Blood Samples:**

About 2ml of blood is collected under aseptic condition. It is allowed to clot and serum is obtained, with precautions to avoid hemolysis. With that sample Serum malondialdehyde (MDA), hs-CRP and Adenosine deaminase (ADA) levels. All investigations were done on same day of sample collection.

Malondialdehyde is estimated by Thiobarbituric acid (TBA) method,<sup>(8)</sup>

Estimation of hs-CRP by Chemiluminescence immunoassay (CLIA).

Estimation of adenosine deaminase (ADA) levels by Spectrophotometric method of Giusti and Galanti.<sup>(9,10)</sup>

**III. RESULTS**

The present study included a total number of 30 subjects comprising of 15 cases and 15 controls. The following table shows the comparative statistical analysis of the laboratory parameters used in assessing the serum malondialdehyde (MDA), hs-crp and Adenosine deaminase levels in pulmonary tuberculosis patients.

**COMPARATIVE STATISTICAL ANALYSIS OF ALL BIOCHEMICAL PARAMETERS in controls and cases**

S.no	Investigation	Values	Controls	Cases
1.	MDA	Mean	291.46	523.28
		S.D	64.55	133.78
		S.E	16.66	34.54
		t-value	6.0441	
		p-value	<0.0001	
2.	hs-CRP	Mean	1.52	22.94
		S.D	0.85	10.84
		S.E	0.22	2.08
		t-value	7.6226	
		p-value	<0.0001	
3.	ADA	Mean	21.54	50.93
		S.D	5.24	11.15
		S.E	1.35	2.87
		t-value	9.2357	
		p-value	<0.0001	

S.D: Standard deviation S.E: Standard error mesn

**Statistical Analysis:** Mean and standard deviation (S.D.) of all variables were calculated and compared with those of controls. Statistical significance was assessed by applying the student's t-test, p-value <0.01 were considered significant.

**IV. DISCUSSION**

Tuberculosis, one of the oldest diseases known to affect humans, its prevalence is high under developed and developing countries and an important cause for morbidity, mortality in worldwide. This disease is caused by bacteria of the *Mycobacterium tuberculosis* complex, it is a major global health problem and even in developed countries there is a resurgence of tuberculosis infection due to the growing number of people infected with Human Immunodeficiency Virus (HIV). Early confirmatory diagnosis of tuberculosis is difficult to establish because of its pleomorphic clinical presentation. Delayed diagnosis and treatment may be associated with many serious complications. The most commonly used laboratory method for definitive diagnosis of tuberculosis is to demonstrate the presence of tubercle bacilli either by smear or culture of sputum and biological fluids. Newer methods such as those involving the implication of bacterial DNA by the PCR and comparable systems, are not available for wide spread use in primary and medium level health care centers. The sensitivity of PCR technique varies from 30% to 90% and the specificity from 88% to 100%. Various immunoassays such as antigen and/or antibody detection in CSF samples have been developed with variable sensitivities and specificities. Hence, despite extensive work on TB, only few specific diagnostic tests are available.

The present study is aimed to find any relationship for its specific marker ADA levels and inflammatory markers like MDA and hs-CRP. ADA has been considered as a marker of cell-mediated immunity and its activity has been studied in various infections including TB. Considering that both humoral and cell-mediated immunity play an important role in tuberculosis infection, it has been suggested that ADA activity in serum and biological fluids is highly specific and sensitive biochemical marker for tuberculosis.<sup>(3,4)</sup>

The determination of ADA activity in controls and tuberculosis patients showed value of 21.54±5.24U/L and 50.93±11.15U/L respectively showing there by ADA values are increased in test group indicating active inflammatory process. Many reports have shown the levels of ADA in serum are elevated in patients suffering with pulmonary tuberculosis patients. The ADA values in the cases studied here are above that of cut off values for the diagnosis of pulmonary tuberculosis. Based upon ADA values and other investigations patients were put on anti tuberculosis treatment and their response to treatment was clinically followed up. All cases who are treated for tuberculosis based upon ADA values responded well for treatment. Serum ADA was found to be a selective marker of immune stimulation in tuberculosis. Abnormally high levels of serum ADA in all the patients with pulmonary tuberculosis indicates that serum ADA could be a good diagnostic tool for pulmonary tuberculosis.

Malondialdehyde is a metabolic product of prostaglandins which are formed as result of peroxidation of poly unsaturated fatty acid (PUFA). Severe oxidative stress can cause increased lipid peroxidation and elevated MDA levels. During pulmonary inflammation, increased amounts of ROS (reactive oxygen species) and Reactive nitrogen intermediates (RNI) are produced as a consequence of phagocytic respiratory burst. One of the

manifestations of these mediated processes is lipid per oxidation.<sup>(5, 6)</sup> The determination of MDA levels in controls and tuberculosis patients showed value of  $291.46 \pm 64.55$  nmol/dl and  $523.28 \pm 133.78$  nmol/dl respectively showing there by MDA values are increased in test group. Indicating active inflammatory process present in these cases.

High sensitivity C - reactive protein is one of the acute phase proteins that increase during systemic inflammation. The increased levels of CRP indicate that pulmonary tuberculosis is associated with an inflammatory response.<sup>(7)</sup> The determination of hs-CRP levels in controls and tuberculosis patients showed value of  $1.52 \pm 0.85$   $\mu$ g/ml and  $22.94 \pm 10.84$  respectively showing there by hs-CRP values are increased in test group, indicating active inflammatory process present in these cases.

The present study both markers of active inflammatory process, MDA and hs-CRP levels are increased indicating tuberculosis diseases process is active. Hence it can be concluded that in addition to serum ADA levels, estimation of MDA and hs-CRP levels are useful biochemical parameters to assess whether the tuberculosis disease process active as identification and culture AFB is a time consuming process.

## V. CONCLUSION

The results of present study of estimation of ADA levels along with MDA and hs-CRP levels in serum of tuberculosis patients admitted in our hospital show that ADA, MDA, hs-CRP values are elevated in all cases of clinically proved cases of tuberculosis infection. The results confirms that MDA, hs-CRP and ADA are interrelated in tuberculosis indicating active inflammatory process, With the increased peroxidation of membrane lipids there is release of membrane bound ADA enzyme in plasma. The present biochemical markers analysed in clinically and microbiologically proved tuberculosis patients are simple inexpensive and rapid tools for the early detection of disease and may help in preventing impending complication and mortality rate as a result of tuberculosis infection in population.

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