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Original Research Article

Assessment of serum procalcitonin, adenosine deaminase, lactate dehyrogenase, calcium, phosphorus in tuberculosis patients

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ABSTRACT

Tuberculosis is an infectious disease which is caused by bacteria. The disease is mostly transmitted from person to person, usually by inhaling bacteria – carrying air droplets. Tuberculosis commonly affects the lungs, but it can also affect any other organ of the body such as brain, intestine, kidneys or the spine. Tuberculosis is one of the most ancient disease of mankind for more than four thousand years. It is a chronic disease caused by Mycobacterium tuberculosis and spreads from person to person through air. The new modalities are very much helpful for the diagnosis and treatment of tuberculosis, Unfortunately people are still suffering with this disease. Worldwide it is among the top ten killer infectious disease secondly to HIV and COVID 19. According to World Health Organisation(WHO) tuberculosis is a global pandemic. The present study shows a very strong significant for the assess of serum procalcitonin, adenosine deaminse, lactate dehydrogenase, calcium, phosphorus and thyroid stimulation hormone in tuberculosis patients.

1. Introduction

Tuberculosis is an infectious disease caused by mycobacterium bacteria.[1,2] Tuberculosis typically affects the lungs, but can also effect the other organs of the body such as brain, intestine, kidneys or spine. Tuberculosis is one of the most ancient disease of mankind for more than four thousand years. It is a chronic disease caused by Mycobacterium tuberculosis and spreads from person to person through air.[3–5] The new modalities are very much helpful for the diagnosis and treatment of tuberculosis, unfortunately people are still suffering with this disease. Worldwide it is among the top ten killer infectious disease secondly to HIV and COVID 19.[6–8] According to World Health Organisation(WHO) approximately 1.8 million people die with tuberculosis every year.[9,10] Tuberculosis is a communicable and treatable disease. The new modalities are very much helpful for the diagnosis and treatment of tuberculosis,unfortunately people are still suffering with this disease. Worldwide it is among the top ten killer infectious disease secondly to HIV and COVID 19. According to World Health Organisation(WHO) tuberculosis is a global pandemic.[11–13] Procalcitonin (PCT), a 116 amino acid is the prohormone precursor of calcitonin, is expressed primarily in C-cells of the thyroid gland and to a smaller extent in neuroendocrine tissue of other organs, such as lungs and intestines. PCT is a marker of inflammatory response to infection. Adenosine Deaminase Activity (ADA) is a commonly used marker for the diagnosis of tuberculosis pleural effusion.[14] ADA is an enzyme involved in purine metabolism and is needed for the breakdown of adenosine and for the turnover of nucleic acid in tissue. LDH is an intracellular enzyme which catalyses the oxidation of L-lactate to pyruvate, the final step in the metabolic chain of anaerobic glycolysis.[15–17] Serum calcium significantly decreased to hypocalcemic levels and serum phosphorus significantly decreased but was within normophosphatemic limits in pulmonary tuberculosis.[18–20] Chemotherapy for tuberculosis managed to raise serum levels of both the ions, with hypocalcemia

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still persisting in majority of patients during treatment but getting resolved in a significant percentage of patients at the end of 6 months of treatment. Results indicate the need for calcium and phosphorus supplements in tuberculosis patients during chemotherapy.[21,22] The present study shows a very strong significant for the assessment of serum procalcitonin, adenosine deaminase, lactate dehydrogenase, calcium, phosphorus and thyroid stimulation hormone in tuberculosis patients.[23–26]

2. Materials and Methods

A total number of one hundred and fifty positive cases of mycobacterium tuberculosis were taken from the out patients department of pulmonology Owaisi Hospital & Research Centre (a teaching hospital of Deccan College of Medical Sciences, Hyderabad, Telangana State, India) These positive cases were compared with two hundred healthy controls. There was found significant assessment of serum procalcitonin, adenosine deaminase, lactate dehydrogenase, calcium, phosphorus in mycobacterium tuberculosis patients and healthy controls. The biochemical parameters were done in Cobas C311 and MinniVidas at Biochemistry Laboratory, Department of Biochemistry, Owaisi Hospital & Research Centre, Hyderabad, Telangna State India (a teaching hospital & research centre to Deccan College of Medical Sciences, Hyderabad, Telangna State India)

3. Results

The levels of Serum Procalcitonin are significant and raised in Tuberculosis Patients compared to Health Controls as

Serum Procalcitonin(ng/dl) < 0.5 ± 0.2 10.0 ±0.25 0.< 0.001.

The levels of Serum adenosine deaminase are significant and raised in Tuberculosis Patients compared to Health Controls as

Serum adenosine deaminase (IU/L) <30.0 ± 5.0 74.06 ±18.5 <0.001.

The levels of Serum Lactate dehydrogenase are significant and raised in Tuberculosis Patients compared to Health Controls as

Serum Lactatedehyrogenase (IU/L) 300.36± 28.06 442.94 ±45.85 <0.001.

The levels of Serum Calcium are significant and decreased in Tuberculosis Patients compared to Health Controls as

Serum Calcium (mg/dl) 9.34 +_ 0.46 7.72 ± 1.02 <0.001.

The levels of Serum Calcium are significant and decreased in Tuberculosis Patients compared to Health Controls as

The levels of Serum Phosphorus are significant and decreased in Tuberculosis Patients compared to Health Controls as

Serum Phosphorus (mg/dl) 3.45± 0.46 2.06 ± 0.8 <0.001.

4. Discussion

Mycobacterium tuberculosis has been rated as the leading cause of mortality due to an infectious disease.[27,28] Despite aggressive research conducted on this disease and its mechanism, the question still remains," how to control the disease"? The presence of reliable diagnostic markers is an important factor contributing to the successful treatment of any disease.[29,30] Serum Procalcitonin, Adenosindeaminase, Lactate dehydrogenase, Calcium and Phosphorus have been reported as a useful biomarker for diagnosis and prognosis of Tuberculosis.[31,32] Mycobacterium tuberculosis evades the innate antimicrobial defenses of macrophages by inhibiting the maturation of its phagosome to a bactericidal phagolysosome.[33] Phagosome formation triggers a preprogrammed pathway of maturation into the phagolysosome, a process controlled by Ca2+. In the present study, the decreased serum calcium levels in tuberculosis patients indicates a decreased availability of calcium for phagolysosome maturation, decreased efficiency of host antimicrobial activity and hence increased severity of the disease.[34]

5. Conclusion

Although currently available research does not validate the diagnostic utility of serum procalcitonin, adenosine deaminase, lactate dehydrogenase, calcium and phosphorus in mycobacteriumtuberculosis patients. procalcitonin in tuberculosis patients, results of the present study indicate that measurement of serum procalcitonin, adenosine deaminse, lactate dehydrogenase along with serum calcium and phosphorus could prove as a useful diagnostic marker for the disease. The findings imply that it is imperative to crack the underlying mechanism of increase in adenosine deaminase, lactate dehydrogenase and procalcitonin during bacterial infections (namely- Why bacterial infections induce the PrePCT gene? Is PrePCT preferentially proteolysed to PCT over the proteolysis of PCT to calcitonin, to result in the increased serum PCT and so on) to understand and improve its diagnostic utility. The present study encourages further research to validate the role of serum adenosine deaminase, lactate dehydrogenase PCT-serum calcium and phosphorus combination in differential diagnosis of latent versus active tuberculosis and mild versus severe tuberculosis. It also calls for research at the molecular level on the relative rate of post translational modifications of PrePCT and PCT. This could help us understand the specific situations in which serum PCT adenosine deaminase, lactate dehydrogenaseare increased. Serum Calcium and Serum Phosphorus significantly decreased in bacterial infections

Table 1: Comparison of serum procalcitonin, adenosine deaminase, lactate dehydrogenase, calcium and phosphorus in mycobacterium tuberculosis cases and healthy controls

Parameters	Healthy Controls	Tuberculosis	P values
Procalcitonin(ng/dl)	< 0.5 +_ 0.2	10.0± 0.25	< 0.001
Adenosine deaminase (IU/L)	<30.0 +_ 5.0	74.06 ±18.5	<0.001
Lactatedehyrogenase (IU/L)	300.36 +_ 28.06	442.94 ±45.85	<0.001
Calcium (mg/dl)	9.34 +_ 0.46	7.72 ±1.02	<0.001
Phosphorus (mg/dl)	3.45 +_ 0.46	2.06 ±0.8	<0.001

Mean +_ SD = <0.0001

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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