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Research Article

Study of Adenosine Deaminase (ADA) Activity in the Serum of Rheumatoid Arthritis Patients

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Abstract: Adenosine deaminase (ADA) is an enzyme involved in purine metabolism. It plays a significant role in the immune system. The aim of this study was to investigate the use of adenosine deaminase levels in rheumatoid arthritis (RA) patients. 50 patients with rheumatoid arthritis and 50 controlled subjects enrolled the study. They were matched in sex and age. ADA estimation was done by using the UV-VIS spectrophotometer in the department of biochemistry SP medical college, Bikaner. The results showed a statistically significant level of serum ADA in RA patients ($p<0.0001$). From the study it can be concluded that increased serum ADA activities in the patients with RA may be dependent on and reflect the increased phagocytic activity of macrophages and maturation of the T-lymphocytes. Due to the cell-mediated immune response in these patients, the activity of ADA that catalyzes the deamination of adenosine to form inosine is elevated. The results of the study have indicated that serum ADA activity can be useful for diagnosis of RA disease. It can be used for supporting the clinical findings and as an index for disease RA.
Keywords: Adenosine deaminase (ADA), purine metabolism, immune system, rheumatoid arthritis (RA), UV-VIS spectrophotometer.

INTRODUCTION

Rheumatoid arthritis (RA) is a systemic autoimmune disorder causing chronic inflammation and proliferation of the synovial tissues, destruction of articular cartilage and also affects many other sites that include the heart, blood vessels and skin [1].

In general population the prevalence of RA is believed to range from 0.5-1.0% [2]. US ambulatory health care system data (2001-2005) has estimated the prevalence of RA among 1.5 million US adults [3]. RA is reported to affect almost 1% of adult population worldwide and approximately 0.75% of adult Indian population [4].

Diagnosis of RA is done on the basis of clinical and radiological findings and presence of rheumatoid factor in serum. The characteristic feature of RA is non-specific inflammation of the peripheral joints with joint swelling, morning stiffness, destruction of articular tissues and joint deformities [5]. Early diagnosis of RA is challenging because the early symptoms can be non-specific (e.g., fatigue, malaise, muscle soreness, weakness, low-grade fever and weight loss) [6]. The classification of RA is done by a score-based algorithm system according to according to the 2010 ACR-EULAR classification criteria for rheumatoid arthritis [7, 8].

Adenosine deaminase (ADA) is an enzyme involved in the metabolism of purine bases, catalyzing the deamination of adenosine, forming inosine in the process [9].

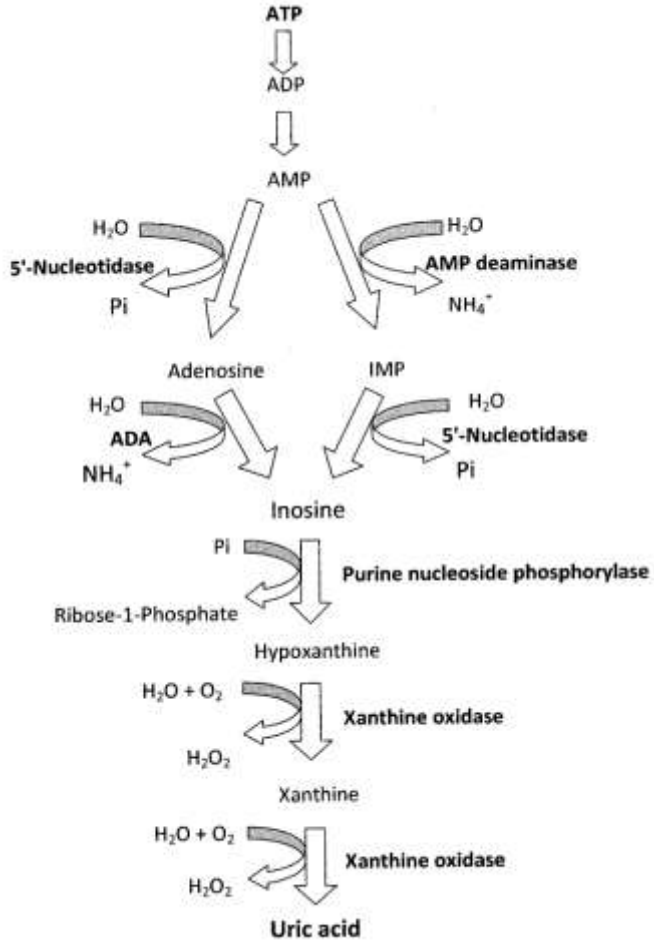
ADA, as a marker of activation of cellular immunity may help in better understanding some pathophysiological aspects of RA. It may also help to relive the triggering factors of inflammation and to promote the new therapeutic approaches [10].

MATERIAL AND METHODS

The present study was conducted on 50 female/male RA patientsand 50 controlled subjects aged between 40-70 years in biochemistry department of S.P medical college. They were randomly selected irrespective their caste and creed. A thorough physical examination was carried out on all the patients and the presence of RF in serum.

Catalytic activity of ADA was determined by kit method using adenosine as a substrate, and the results were read by spectrophotometer.

The principle of the method was as follows: by the actionof adenosine deaminase, ammonium is released from adenosine and together with phenol nitroprusside reagent and sodium hypochlorite alkaline solution gives indophenol blue colour whose intensity is proportional to the amount of released ammonium, which is catalytic activity of total adenosine deaminase.



RESULTS

The present study was conducted on 100 subjects aged between 40-70 years of both sex. 50 Rheumatoid Arthritis patients (RA) and 50 controlled group. Serum ADA was studied for the two groups. Serum Adenosine deaminase (ADA) varied from 13.30-31.25 IU/L with a mean as 19.14 ± 4.62 IU/L in normal control subjects. The mean serum ADA concentration was found to be raised to 34.83±5.71 IU/L with a range of 25.80 - 46.80 IU/L in Rheumatoid arthritis patients.

Table 1: Mean Serum ADA concentration (IU/L) in RA subjects with that of control

S. No	Values	Control group	RA Group
1	Mean	19.136 +/- 4.618	34.834 +/- 5.713
2	Range	13.30 – 31.25	25.80 – 46.80
3	SD	4.618	5.713
4	SE	0.653	0.808
5	DF	–	98
6	T	–	15.108
7	p-value	–	0.0001***

*** Highly significant, DF - Degree of Freedom

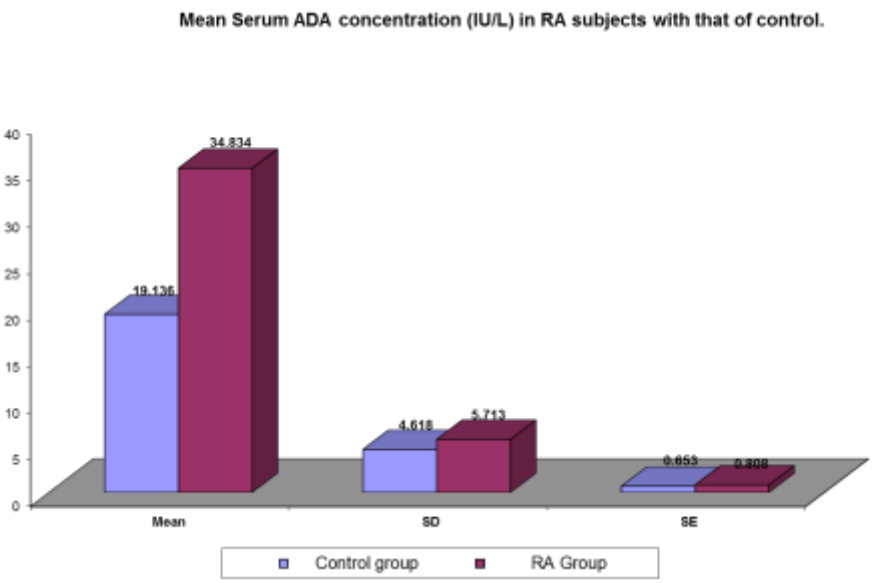


Fig. 1: Mean serum ADA concentration (IU/L) in RA subjects with that of control

DISCUSSION

The mean serum ADA level was found to be increased significantly in rheumatoid arthritis as compared to that of control.

The increase in ADA level in RA, might be due to that ADA has been considered as marker for cell mediated immunity [11]. The immunity status changes in many inflammatory and autoimmune diseases. The changed catalytic activity of ADA in serum has been reported as a marker of cell-immunity [5, 10]. It is supposed that the catalytic activity of ADA is increased due to its release from the damaged cells and the increased cell proliferation in RA [12, 13].

During inflammatory process the level of ADA becomes different because of its release in extra cellular and serosal fluids. The level of ADA depends on the number of nuclear cells, especially T cells and macrophages [14, 15]

The results of present study of serum ADA concentration has been found t be similar with the results obtained by earlier studies which had suggested that the serum ADA level in Rheumatoid Arthritis (RA) patients increases significantly as reported by Petternsson *et al*. [16], Surekha Rani *et al*. [17], Sari *et al*. [18], Milada *et al*. [19], Gautam *et al*. [20] and Zahra *et al*. [21].

CONCLUSION

From the study it can be conclude that increased serum ADA activities in RA patients may be dependent on and reflects the increase in phagocytic activity of macrophages and maturation of T-lymphocytes [22]. The activity of ADA responsible for catalyzing the deamination of adenosine to form inosine is elevated in RA patients due to this cell-mediated immune response [23, 24]. The results of the study have indicated that serum ADA activity can be useful for the diagnosis of RA disease in order to support clinical findings and as an index for disease RA.

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