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

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Abstract: ***Adenosine deaminase (ADA) is an enzyme being involved in purine metabolism and plays a significant role in the immune system. The aim of this study was to investigate the use of adenosine deaminase levels in differentiating between rheumatoid arthritis and osteoarthritis. 50 patients with rheumatoid arthritis and 50 osteoarthritis patients 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 difference between ADA levels in serum of patients with rheumatoid arthritis and osteoarthritis (p<0.0001).We concluded that increased serum ADA activities in patients with RA may be dependent on and reflect the increase in phagocytic activity of macrophages and maturation of T-lymphocytes.As a result of cell-mediated immune response in RA patients, the activity of ADA, which catalyze the deamination of adenosine to form inosine elevated.The results indicated that serum ADA activity can be used for the diagnosis of RA disease to support clinical findings and as an index for disease RA but there is no increases in serum ADA level in OA.***

Keywords: Adenosine deaminase (ADA), purine metabolism, immune system, rheumatoid arthritis (RA), osteoarthritis (OA)

1. Introduction

Arthritis (from Greek arthro-, joint + -itis, inflammation; plural: arthritides) is a form of joint disorder that involves inflammation of one or more joints. Arthritisliterally means "joint inflammation" and describes over 100 conditions affecting joints and their surrounding tissues. Because the term does not describe the cause or type of joint inflammation, it is qualified with an adjective such as rheumatoid, osteo-, or psoriatic.[1]

Rheumatoid arthritis (RA) is an autoimmune disease where diagnosis is based on clinical and radiological features and presence of rheumatoid factor in serum.[2]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.[3]

Osteoarthritis (OA) is a slow progressive disorder of synovial joints .This joints disorder is characterized by a loss of balance between synthesis and degradation of the articular cartilage constituents leading to subsequent erosion of joint cartilage remodeling of the underlying bone osteophyte formation and variable degree of Synovitis.[4]

ADA is involved in the proliferation and differentiation of lymphocyte, particularly the T-cell subtype, which was found to play a crucial role in the metabolism of the immune system cells and it is essential for the proper development of both T and B lymphocyte in mammals.[5]ADA activity in serum obtained from patients with rheumatoid arthritis and osteoarthritis to assess the value of the test in the differential diagnosis of joint swellings.

2. Material & Methods

The present study was conducted on 100 female/male patients (50 RA and 50 OA) 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. Routine hematological & radiological investigation was also done. 100 cases selected from orthopedics OPD and Rheumatology diagnosed by orthopedician. The presence of RA and OA in patients was diagnosed by carrying out X- ray analysis of joint destruction as well as RF, C-reactive protein, & antinuclear antibody test.

Inclusion Criteria: Subjects with normal nutritional habits without supplementing with any vitamins during the last three months included in the study.

Exclusion criteria: None of these subjects were alcoholic or chronic smoker, & none of them suffered from any systemic diseases like hypertension, diabetes, not having any history of trauma to joints, & also subject's history of receiving any anti-inflammatory drugs in the three months were excluded from the study.

3. Result

The present study was conducted on 100 subjects aged between 40-70 years of both sex. The study group was further divided into two groups viz. 50 Rheumatoid Arthritis patients (RA) group and other 50 osteoarthritis patients (OA) group. Serum ADA was studied for the two groups.

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.The serum ADA level was

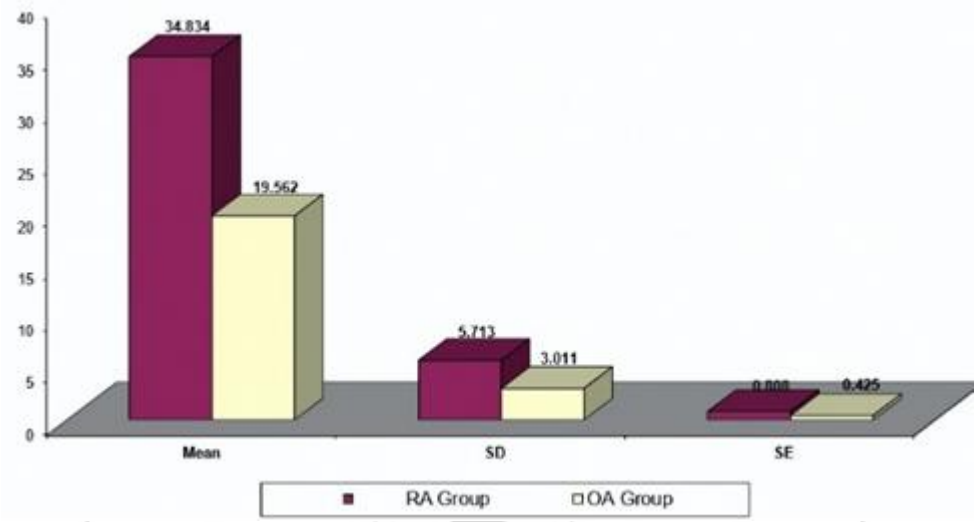
found to be Non-significant with a mean 19.56 ± 3.01 IU/L, while it ranged from 12.08 - 26.80 IU/L in osteoarthritis patients.

Serum ADA concentration was found to be increased 34.83±5.7 IU/L with a range of 15.80-46.80 IU/L in rheumatoid arthritis, While the significance was observed as compared to serum ADA level in osteoarthritis (OA) patients (19.56 ±3.01 IU/L with a range of 12.08-26.80 IU/L as evident by P-value (P<0.0001).

Comparison of Mean Serum ADA concentration (IU/L) in RA subjects with that of OA subjects

S.no	Values	RA group	OA Group
1	Mean	34.834 +/- 5.713	19.562 +/- 3.011
2	Range	25.80 – 46.80	12.08 – 26.80
3	SD	5.713	3.011
4	SE	0.808	0.425
5	DF	–	98
6	T	–	16.71
7	P-value	–	0.0001***HS

DF- Degree of Freedom
***HS-Highly Significant



4. Discussion & Conclusion

The mean serum ADA level was found to be increased significantly in rheumatoid arthritis as compared to that Osteoarthritis group. The increase in ADA level in RA might be due to that ADA has been considered as marker for cell mediated immunity. In many inflammatory and autoimmune disease, where the immunity status changes, It is determined that catalytic activity of ADA in serum changed as marker of cell-immunity. ADA catalytic activity increase is caused by its releasing from damaged cells, so as increasing of cell proliferation in RA.

The results of present study of serum ADA concentration was similar to results obtained by previous studies which suggested that serum ADA level in Rheumatoid Arthritis (RA) patients increases significantly as reported by petternsson et al (1984)[6], Sari et al (2003)[7], Surekha Rani et al (2006)[8], Milada et al (2010)[9], Zahra et al (2012)[10], Gautam et al (2013)[11]

Serum ADA activities showed a significant association in the rheumatoid arthritis group but there was not significant association in the group with osteoarthritis in this studyand also concordant by surekha et al (2006)[8].

The level of ADA in RA patients might be due to that during inflammatory process, this enzyme is released in extra cellular and serosal fluids and produces different level of ADA. The levels depend on the number of nuclear cells, especially T cells and macrophages. It is marker enzyme for the inflammatory disease like rheumatoid arthritis.

The mean serum ADA level was found to be decreased significantly in osteoarthritis as compared to rheumatoid arthritis patients.
The result of present study showed that in rheumatoid arthritis and osteoarthritis subjects. The serum ADA were significantly increased in only RA group because ADA is not increased in OA patients. Similar results were obtained in some studies done by Suleyman et al (2012).[12] RA shows increased serum ADA activity as compared to OA group.

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