ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: https://ijrps.com

Study of serum adenosine deaminase activity and c-reactive protein in patients of rheumatoid arthritis

Sangeetha R*[1], Ramesh Raju K A P[2], Hemapriya S[3], Suganthi V[4], Panneerselvam P[5]

[1]Department of Biochemistry, Government of Erode Medical College and Hospital, Erode-638053, Tamil Nadu, India
[2]Department of Orthopaedics, Government of Medical College and Hospital, Erode-638053, Tamil Nadu, India
[3]Department of Community Medicine, Government of Erode Medical College and Hospital, Erode-638053, Tamil Nadu, India
[4]Department of Physiology, Vinayaka Mission's Kirupananda Variyar Medical College & Hospital, Salem, Tamil Nadu, India
[5]Research Scholar, Department of Medical Physiology, Vinayaka Mission's Research Foundation (Deemed to be University), Salem, Tamil Nadu, India

Article History:

Received on: 09 Oct 2020
Revised on: 18 Nov 2020
Accepted on: 21 Dec 2020

Keywords:

Rheumatoid arthritis,
Inflammation,
Biomarker,
Infection

ABSTRACT

Rheumatoid arthritis (RA) is a chronic disease that causes inflammatory synovitis. The treatment plan of RA includes reducing inflammation and improving the quality of life. Hence, understanding the role of Adenosine deaminase (ADA) and C-reactive protein helps for a better plan of treatment. The present study was undertaken to determine the serum ADA activity and CRP in RA patients and correlate with the severity of the progression of the disease. 25 patients diagnosed with RA as per 2010 ACR/EULAR criteria and 25 age and sex matched healthy controls were included in the study after informed consent. Blood samples were collected from all the subjects after an overnight fast, serum separated was analyzed immediately for Adenosine deaminase (ADA) activity measured using colorimetric method of Guisti and Galanti. Disease score, C-reactive protein, RA factor, ADA and ESR were significantly higher in cases when compared with controls. Significant positive correlation was present between the disease score and C-reactive protein, RA factor among cases. A positive correlation was observed between the disease score and ADA, but it was not statistically significant among cases.

*Corresponding Author

Name: Sangeetha R
Phone: 9865230044
Email: sangeetharaja52@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i4.4724

Production and Hosted by

IJRPS | https://ijrps.com

© 2020 | All rights reserved.

INTRODUCTION

Rheumatoid arthritis(RA) is a chronic disease that causes inflammatory synovitis. It causes destruction of the articular cartilage and leads to erosions of the bone (Fauci *et al.*, 2008). The exact cause for the RA is still not clear. However, it was considered an autoimmune disorder. About 1% of the population were affected by the RA throughout the worldwide. In India, about 0.75% was affected. The diagnosis of RA is difficult as the symptoms are non-specific. However, the clinical and laboratory measures are helpful in diagnosis, treatment and prognosis (Sari *et al.*, 2003). There exist several biomark-

ers to assess RA pathogenesis. This is very crucial as a proper understanding of the disease helps to plan the treatment plan adequately. Adenosine deaminase (ADA) is one of the markers that assess RA (Vinapamula, 2015). ADA is an enzyme that involves in the metabolism of purine. It contributes to the conversion of adenosine into inosine. It is also considered a marker for cell mediated immunity. It was reported that the ADA involves in the regulation process of immune responses (Singh and Mehra, 2010). There was an increase in the ADA levels in the RA patients. C-reactive protein (CRP) is a protein that synthesizes in the liver and is a very important biomarker for inflammation. It contributes for compliment activation in the process of immunity (Giusti and Galanti, 1984). The treatment plan of RA includes reducing inflammation and improving the quality of life. Hence, understanding the role of ADA and C-reactive protein helps for a better plan of treatment. Hence, the present study was undertaken to determine the serum ADA activity and CRP in RA patients and correlate with the severity of the progression of the disease.

MATERIALS AND METHODS

Study participants

25 patients diagnosed with RA as per 2010 ACR/EULAR criteria and 25 age and sex matched healthy controls were included in the study after informed consent. Patients with Tuberculosis and liver disease are excluded from this study. This study was conducted between November 2016 to December 2017 in Government of Erode medical college & Hospital after getting approval from our institutional ethical committee.

Study design

Case-control study

Study setting

The present study was conducted at Government of Erode Medical College & Hospital, Tamil Nadu, India.

Methods

Blood samples were collected from all the subjects after an overnight fast, serum separated was analyzed immediately for ADA activity measured using colorimetric method of Guisti and Galanti. Analyses were done on using Landwind 400 autoanalyser (Giusti and Galanti, 1984).

Ethical considerations

The study protocol was approved by the institutional human ethics committee of Govt. Erode medical college & Hospital, Tamil Nadu, India. Informed consent was obtained from all the participants.

Statistical analysis

Data was analyzed using SPSS 20.0. The student t-test was applied to observe the significance of the difference. A probability value of less than 0.05 was considered significant. Pearson correlation was applied to observe the correlation between the variables.

RESULTS AND DISCUSSION

The mean age of the cases is 46.44±10 and controls are 46.44±10. Table 1 presents the comparison of clinical parameters among cases and controls. Disease score was significantly higher in cases when compared with controls (P<0.0001). Fasting blood sugar was not significantly different between the cases and controls. Urea levels were not significantly different between the cases and controls. Creatinine levels were not significantly different between the cases and controls. C - reactive protein levels were significantly higher in cases when compared with controls (P<0.0001). ESR was significantly higher in cases when compared with controls (P<0.0001). RA factor levels were significantly higher in cases when compared with controls (P<0.0001). Calcium levels were not significantly different between the cases and controls. Phosphorous levels were not significantly different between the cases and controls.

Uric acid levels were not significantly different between the cases and controls. ADA levels were significantly higher in cases when compared with controls (P<0.0001) (Table 1). Table 2 presents the correlation between the variables among cases. There was a positive correlation between the C-reactive protein and the disease score (r= 0.9471). This was statistically significant (P<0.00001). There was a positive correlation between the ADA and the disease score (r= 1445). This was not statistically significant. There was a positive correlation between the RA factor and the disease score (r= 0.9559). This was statistically significant (P<0.00001) (Table 2).

RA is a systemic inflammatory disorder that mainly affects hands and feet. The exact etiology of the disease is not clear, but it was thought that the deregulation of the immune system leads to RA. RA was considered as an autoimmune disorder that mainly involves the joins and also involves few organs (Nalesnik *et al.*, 2011). Throughout the world, nearly 1 percentage of people were affected by the RA. It was reported that impaired regulation of the immune system, especially linked with T and B lymphocytes mechanisms, leads to the release of cytokines in RA patients (Nalesnik *et al.*, 2011). In the diagnosis of RA, not only the joints and tendons

Table 1: Comparison of clinical parameters among cases and controls

Parameter	Cases (n=25)	Controls (n=25)	P value
Disease score	7.36±0.76	0.00±0.00	<0.0001***
Fasting blood sugar	89.4±26.71	85.64±10.90	0.5178
Urea	28.232±9.367	23.840±6.944	0.0657
Creatinine	0.876±0.2681	0.8528±0.2034	0.7318
C-reactive protein	3.5±1.86	0.404±0.170	<0.0001***
Erythrocyte sedimentation rate	27.32±10.36	17.04±5.19	<0.0001***
RA factor	121.32±61.84	21.32±7.22	<0.0001***
Calcium	9.272±0.943	9.46±0.636	0.4125
Phosphorous	3.828±0.772	3.3±0.459	0.0050
Uric acid	3.752±0.532	3.908±0.762	0.4054
ADA	15.144±3.734	9.908±2.076	<0.0001***

Data was expressed as mean and SD. ***P<0.001 is significant

Table 2: Correlation between the variables among cases

Parameter	Mean ± SD	Disease score	R value	P value
C-Reactive Protein	3.5±1.86		0.9471	< .00001***
ADA	15.144±3.734	7.36±0.76	0.1445	0.490734
RA	121.32±61.84		0.9559	< .00001***

Data was expressed as mean and SD. ***P<0.001 is significant

swollen is an indicator of the progression, but also the biomarkers. Biomarkers play a key role in monitoring the progression of the disease (Nalesnik *et al.*, 2011; Goronzy *et al.*, 2004). C-reactive protein, ADA and erythrocyte sedimentation rate were reported as the best indicators of RA (Matsui *et al.*, 2007; Hitoglou *et al.*, 2001). ADA is an important enzyme in the metabolism of purines. It is present in most of the tissues as well as in the serum. The present study was undertaken to determine the serum ADA activity and CRP in RA patients and correlate with the severity of the progression of the disease. C - reactive protein levels were significantly higher in cases when compared with controls (P<0.0001). ESR was significantly higher in cases when compared with controls (P<0.0001). ADA levels were significantly higher in cases when compared with controls (P<0.0001). To decrease the morbidity and mortality in the patients with RA, it is essential to diagnose it at the earliest and also to monitor the progression of the disease (Zamani *et al.*, 2012; van Ede, 2002). Earlier studies reported that there will be an increase in the ADA scores in patients with RA (Cordero *et al.*, 2001; Agarwal *et al.*, 1991). When the levels of ADA are increases, it is a clear indicator of cell mediated immunity (Rani *et al.*, 2006; Pallinti *et al.*, 2009).

It was reported that RA patients have higher levels of CRP and ADA when compared with healthy individuals (Giusti and Galanti, 1984; Singh *et al.*, 2013). Another study reported that RA patients have higher levels of biomarkers and they are positively correlated with the disease scores (Sari *et al.*, 2003). Surekha Rani *et al.* reported that ADA has a key role in the diagnosis of RA (Rani *et al.*, 2006). Interestingly, another study reported that though ADA is an important marker, it was not related to the disease score (Haque *et al.*, 2014; Samanta *et al.*, 2011). In the present study, there was a positive correlation between the ADA and disease score; however, it was not statistically significant. There was a significant positive correlation between the c reactive protein and disease score. Though, the findings of the study support the earlier studies. It recommends further detailed and controlled studies to confirm the same.

CONCLUSION

The study results support the C- reactive protein ADA as potential biomarkers to assess RA. Further detailed translational research is recommended to understand the molecular basis of the same.

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that they have no conflict of

interest for this study.

REFERENCES

Agarwal, M. K., Nath, J., Srivastava, V. 1991. A study of serum adenosine deaminase activity in sputum negative patients of pulmonary tuberculosis. *Ind L Tub*, 38:139–141.

Cordero, O., Salgado, F., Mera-Varela, A., Nogueira, M. 2001. Serum interleukin-12, interleukin-15, soluble CD26, and adenosine deaminase in patients with rheumatoid arthritis. *Rheumatology International*, 21(2):69–74. ISSN 0172-8172, 1437-160X.

Fauci, A. S., Braunwald, E., Jameson, J. L. 2008. Harrison's principles of internal medicine. pages 1514–1527, New York. McGraw-Hill, Medical Publishing Division. 17th Edition.

Giusti, G., Galanti, B. 1984. Methods of enzymatic analysis, Verlag Chemie. pages 315–323. Wiley. 3rd Edition.

Goronzy, J. J., Matteson, E. L., Weyand, C. M. 2004. Prognostic markers of radiographic progression in early rheumatoid arthritis. *Arthritis and Rheumatism*, 50(1):43–54.

Haque, S. S., Kumar, S., Tanweeruddin, M. 2014. Evaluation of Biochemical marker for the diagnosis of Rheumatoid arthritis. *Journal of Applied Pharmacy*, 6(3):322–326.

Hitoglou, S., Hatzistilianou, M., Gougoustamou, D., Athanassiadou, F., Kotsis, A., Catriu, D. 2001. Adenosine Deaminase Activity and its Isoenzyme Pattern in Patients with Juvenile Rheumatoid Arthritis and Systemic Lupus Erythematosus. *Clinical Rheumatology*, 20(6):411–416. ISSN 0770-3198, 1434-9949.

Matsui, T., Kuga, Y., Kaneko, A., Nishino, J., Eto, Y., Chiba, N., Yasuda, M., Saisho, K., Shimada, K., Tohma, S. 2007. Disease Activity Score 28 (DAS28) using C-reactive protein underestimates disease activity and overestimates EULAR response criteria compared with DAS28 using erythrocyte sedimentation rate in a large observational cohort of rheumatoid arthritis patients in Japan. *Annals of the Rheumatic Diseases*, 66(9):1221–1226. ISSN 0003-4967.

Nalesnik, M., Nikolić, J. M., Jandrić, S. 2011. Adenosine deaminase and C-reactive protein in diagnosing and monitoring of rheumatoid arthritis. *Medical Herald*, 8(1):163–168.

Pallinti, V., Ganesan, N., Rajasekhar, G. 2009. Serum biochemical markers in rheumatoid arthritis. *Indian journal of biochemistry & biophysics*, 46(4):342–344.

Rani, H. S., Madhavi, G., Srikanth, B. M. V., Jharna, P., Rao, U. R. K., Jyothy, A. 2006. Serum ADA and C-reactive Protein in Rheumatoid Arthritis. *International Journal of Human Genetics*, 6(3):195–198. ISSN 0972-3757.

Samanta, R., Shoukrey, K., Griffiths, R. 2011. Rheumatoid arthritis and anaesthesia. *Anaesthesia*, 66(12):1146–1159. ISSN 0003-2409.

Sari, R. A., Taysi, S., Yilmaz, O., Bakan, N. 2003. Correlation of serum levels of adenosine deaminase activity and its isoenzymes with disease activity in rheumatoid arthritis. *Clinical and experimental rheumatology*, 21(1):87–90.

Singh, H. V., Shrivastava, A. K., Raizada, A., Singh, S. K., Pandey, A., Singh, N., Yadav, D., Sharma, H. 2013. Atherogenic lipid profile and high sensitive C-reactive protein in patients with rheumatoid arthritis. *Clinical Biochemistry*, 46(12):1007–1012. ISSN 0009-9120.

Singh, S., Mehra, S. 2010. Approach to Polyarthritis. *The Indian Journal of Pediatrics*, 77(9):1005–1010. ISSN 0019-5456, 0973-7693.

van Ede, A. E. 2002. Purine enzymes in patients with rheumatoid arthritis treated with methotrexate. *Annals of the Rheumatic Diseases*, 61(12):1060–1064. ISSN 0003-4967.

Vinapamula, K. S. 2015. Serum Adenosine Deaminase as Inflammatory Marker in Rheumatoid Arthritis. *Journal of Clinical and Diagnostic Research*, 9(9).

Zamani, B., Jamali, R., Jamali, A. 2012. Serum adenosine deaminase may predict disease activity in rheumatoid arthritis. *Rheumatology International*, 32(7):1967–1975. ISSN 0172-8172, 1437-160X.