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# C-reactive protein as a disease activity marker in rheumatoid arthritis

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***Abstract*---**Introduction: CRP is a valuable marker and regulator of systemic inflammation in RA that also appears to play a direct role in bone destruction and radiographic progression. CRP has also been implicated in the etiology of common comorbidities associated with RA. Decreasing CRP levels with RA treatment may contribute to reductions in disease activity, although beneficial effects of RA treatment seem to occur irrespective of CRP values. Aim: The purpose of this study was to examine whether levels of C-reactive protein (CRP), a sensitive marker of disease activity in rheumatoid arthritis (RA). Materials & methods: This study was carried out on 39 RF Positive patients from both sexes male and female from different age group at NIMS Super-Specialty Hospital, Sobha Nagar, Jaipur, Rajasthan. Inflammatory markers were performed in the laboratory. Results: In the current study, the majority of Rheumatoid Arthritis patients belong to the age group of 41 to 60 (58.97%) and male to female ration were 1:2. C - reactive protein found highly significant positive correlation. Out of total Rheumatoid Arthritis patients, 7.69% patients have normal C - reactive protein level and 92.30% have highly increased CRP level. There were highly significant positive correlations between ESR and RA. Out of total patients, 10.25% patients have normal Erythrocyte sedimentation rate and 89.74%

have increased erythrocyte sedimentation rate. Conclusion: CRP play important roles in the management of RA, elevated CRP levels have prognostic value. Comparisons between ESR and CRP suggest that both tests are similar and useful in disease activity.

***Keywords*---**RA (rheumatoid arthritis), RF (rheumatoid factor), CRP (C - reactive protein), TLC (total leukocyte count), ESR (erythrocyte sedimentation rate).

## Introduction

Rheumatoid arthritis (RA) is a chronic, progressive autoimmune disorder characterized by synovial proliferation and degradation of articular cartilage and bone with often progressive joint damage and disability, immunological abnormalities, systemic inflammation, increased co-morbidity, and premature mortality.[1] It affects 1% of the population globally and also occurs among one in a thousand children as juvenile RA. It is much more common in women than men, and it affects 2-3 times more frequently in women than men.[2] Severity and prognosis of RA are influenced by a variety of demographic factors, such as gender, age, profession, and educational status.[3] Clinical factors, such as symptom duration, number of involved joints, rheumatoid nodule, systemic manifestations, and radiologic changes at initial analysis are important prognostic factor.[4] Rheumatoid arthritis is recognized to be associated with chronic inflammation and markers of systemic inflammation such as C-reactive protein (CRP), erythrocyte sedimentation rate.[5] erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and rheumatoid factor (RF) are useful laboratory findings affecting the prognosis of RA.[6] Traditionally, the erythrocyte sedimentation rate (ESR) have been the most widely used marker of inflammation in RA[7] but ESR levels respond slowly to inflammatory stimuli and, thus, to changes in disease activity.[8] Role of CRP in Rheumatoid arthritis: CRP is more than just a measure of inflammation or infection; it is also an immunological regulator.[9] CRP an acute phase protein which is synthesized by hepatocytes and secreted into the circulation as pentameric CRP (pCRP)[10] in response to proinflammatory cytokines in particular IL-6.[11] CRP binding to immunoglobulin Fc gamma receptors (FcγR) which promotes the production of pro-inflammatory cytokines and leading to an amplification loop of inflammation.[12] Normally CRP is involved in the host's defense mechanisms against infectious pathogens.[13] Circulating CRP level is normally tested, as it is an inexpensive and readily available biomarker to assess systemic inflammation in RA.[14] Elevated CRP levels are associated with greater RA disease activity and Along with DA, CRP is identified to be associated with radiological damage in RA.[15]

## Materials and Methods

The present study was carried out on 130 Arthritis patients in which 39 patients fulfill the 1987 revised American College of Rheumatology criteria for classification of RA (formerly, the American Rheumatism Association), during January 2020 to January 2022, all cases were attended in NIMS Super-Specialty Hospital, Sobha Nagar. Ethical approval to conduct this study was granted by

institutional ethics committee, National Institute of medical sciences & research, Jaipur. All patients had active RA. The following parameters were recorded for each patient at the time of diagnosis, age, gender, duration of symptoms before diagnosis, length of follow-up, family history of RA, morning stiffness, distribution of involved joints, the history of infection and physical activity individually. Blood samples were drawn for laboratory investigations in the concern department and analyzed. Routine laboratory tests such as complete blood cell count (CBC), ESR, CRP and rheumatoid factor (RF) were determined by standard methods before and after treatment.

Rheumatoid Factor (RF) Test is a useful laboratory parameter because RF positive RA patients have more frequent joint deformity and extra-articular manifestation. C - Reactive Protein Detection**:** For the detection of CRP in serum, the finecare™ CRP rapid Quantitative test kit was used. CRP Rapid quantitative test is based on fluorescence immunoassay technology. The finecare CRP Rapid quantitative test uses a sandwich immune-detection method. ESR Detection: for the detection of ESR westergren method was used. After the first one hours of testing, reading were recorded.

**Statistics**

The statistical analysis was done using Microsoft Office Excel 2007, put into in a table, evaluated with percentage.

**Results**

Table No 1: Sex distribution in Rheumatoid arthritis patients

| Sex Distribution | | |
|---|---|---|
| Sex | No. Of patients | Percentages (%) |
| Male | 14 | 35.89% |
| Female | 25 | 64.10% |
| Total | 39 | 100% |

Table No 2: Age distribution in Rheumatoid arthritis patients

| Age Distribution | | | |
|---|---|---|---|
| Age group | Age in years | No. Of patients | Percentages (%) |
| Group 1 | 01-20 years | 2 | 5.12% |
| Group 2 | 21-40 years | 11 | 28% |
| Group 3 | 41-60 years | 23 | 58.97% |
| Group 4 | More than 60 | 3 | 7.6% |
| Total No. Of Patients | | 39 | 100% |

Table No 3: Inflammatory Markers in Rheumatoid arthritis patients

| Parameters | Normal (%) | Increase (%) | Total % |
|---|---|---|---|
| CRP | 03 (7.69%) | 36 (92.30%) | 100 % |
| ESR | 04 (10.25%) | 35 (89.74%) | 100% |

Detailed clinical examinations were performed. Among the 130 patients, 39 patients were seropositive. In this present study age distribution of the patients in Rheumatoid arthritis, males are 35.89% and females are 64.10% (Table No.1). Male-female ratio was 1:2. The age distributions of the patients in rheumatoid arthritis are as follow. It's divided in 4 groups. The majority of patients belong to age group of 41-60 years (58%) (Table No. 2). Association of C - reactive protein (CRP) and Erythrocyte Sedimentation Rate (ESR) with disease activity and inflammation measure in the table no 3. We found highly significant positive correlations between RA and CRP, out of 39 Rheumatoid Arthritis patients, 7.69% patients have normal C - reactive protein level and 92.30% have highly increased CRP level. There were highly significant positive correlations between ESR and RA. Out of total patients, 10.25% patients have normal Erythrocyte sedimentation rate and 89.74% have increased erythrocyte sedimentation rate (Table No 3).

**Discussion**

The results of our study confirm the observation of previous studies that the serum concentrations of inflammatory markers are elevated in the majority of patients with RA. Age and sex were independently associated with the levels of both acute phase reactants in early RA, although the effects appeared to be strongest on the ESR. According to the findings of the current study, 35.89% of cases were male and 64.10% were female. In our study, the majority of cases belong from group 3 (58.97%) are between the ages of 41 to 60, 28% group 2 between the ages of 21 to 40, 7.6% group 4 between the ages of more than 60 years and the remaining 5.12% group 1 are between the ages of 1 to 20 years. Shrivastava AK et al reported on 110 patient's the mean age of the 110 patients with RA was 46.71 ± 7.12 years and the patient group was comprised of 30 males and 80 females.[1] In present study, a statistically significant positive correlation was observed between CRP and RA; here 7.69% patients have normal CRP level while 92% have increased. ESR also reported high in RA patients. In this study 10.25% patients have normal ESR level while 89.74% have increased, which shows the inflammation. Carl K. Orr et al reported on 223 patients, significant positive correlation between CRP and the level of inflammation in the biopsy retrieved and positive correlation was also observed between ESR and the level of inflammation in the biopsy retrieved. According to this study CRP has a moderately strong relationship with disease activity.[16] Liseth Siemons et al studied on erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) in RA, both the ESR and CRP were associated with age, sex, and BMI, although the association with BMI disappeared in multivariate analyses. ESR and CRP levels significantly increased with age (β-ESR = 0.017, $p < 0.001$ and β-CRP = 0.009, $p = 0.006$).[7] Where Lee et al found CRP values to be higher in males than in females, other studies have reported the opposite.[18,19] Yoo Seob et al, stated on Inflammatory markers such as ESR and CRP were higher at diagnosis in the seropositive group ($p<0.01$).[20] M. Milovanovic et al As revealed platelet count, CRP and IL-6 were elevated reflecting the same feature of the inflammatory response.[21]

**Conclusion**

Rheumatoid arthritis is a Inflammatory disease. In the present study the levels of C-reactive protein were extensively high in the RA patients. It is clear with this

study that while CRP has a moderately strong relationship with disease activity, but there clearly remains a role for this inexpensive and readily available biomarker in the evaluation of disease activity in the majority of those with RA. The understanding of the pathophysiology of RA and precise knowledge of the possible triggers of the inflammation may open novel therapeutic approaches. That's why; the present study suggests the importance of measuring the biomarkers of inflammation assessed in the study not only to determine the severity of inflammation but also to develop targeted treatment strategies for better management of the condition.

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**Author declaration:**

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