

**Correlation of Inflammatory Markers with Pain Severity in Patients with Rheumatoid Arthritis and Polyarthritis**Jai Prakash<sup>1</sup>, Parth Sarthi<sup>2</sup>, Shahina Khan<sup>3</sup>, Durgesh Kumar<sup>4</sup>, Manju Jyoti Chaudhary<sup>5</sup><sup>1</sup>Associate Professor, Department of Physiology, Dr Brra GMC, Kannauj, Uttar Pradesh, India<sup>2</sup>Associate Professor, Department of Physiology, GMC, Jalaun, Uttar Pradesh, India<sup>3</sup>Assistant Professor, Department of Physiology, Dr Brra GMC, Kannauj, Uttar Pradesh, India<sup>4</sup>Associate Professor, Department of Physiology, Dr Brra GMC, Kannauj, Uttar Pradesh, India<sup>5</sup>Associate Professor, Department of Physiology, Dr Brra GMC, Kannauj, Uttar Pradesh, India

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**Abstract**

**Background:** Rheumatoid arthritis (RA) is a chronic autoimmune condition marked by persistent joint inflammation, progressive functional impairment, and systemic involvement. Commonly used inflammatory biomarkers such as rheumatoid factor (RF), erythrocyte sedimentation rate (ESR), and c-reactive protein (CRP) play an important role in assessing disease activity. Pain remains one of the most prominent clinical features of inflammatory arthritis and is frequently evaluated using the visual analogue scale (VAS).

**Aim & Objective:** this study aimed to examine the relationship between selected inflammatory markers (RF, ESR, CRP) and pain intensity measured by vas in patients diagnosed with inflammatory arthritis.

**Materials and Methods:** A Cross-Sectional Study Was Conducted On 64 Patients Attending The OPD Dr Brra GMC, Kannauj From July To December 2025. Participants Were Categorized Into Two Groups: Seropositive Rheumatoid Arthritis (N=32) And Seronegative Polyarthritis (N=32). Laboratory Investigations Included Measurement Of Rf, Esr, And Crp Levels. Pain Intensity Was Assessed Using Vas Scoring. The Association Between Inflammatory Markers And Pain Scores Was Analyzed Using Pearson's Correlation Coefficient.

**Results:** a statistically significant positive correlation was observed between VAS scores and RF ( $R = 0.469$ ,  $P < 0.01$ ) As well as CRP ( $R=0.479$ ,  $P < 0.01$ ). ESR Demonstrated A weaker but still significant correlation with Pain Scores ( $R=0.260$ ,  $P < 0.05$ ). However, no meaningful correlation was Identified between ESR and CRP levels.

**Conclusion:** The findings indicate that inflammatory markers, particularly RF and CRP, are associated with pain severity in patients with inflammatory arthritis. These biomarkers may serve as supportive tools for clinicians in assessing disease activity and guiding patient management.

**Keywords:** Rheumatoid Arthritis, Inflammatory Markers, C-Reactive Protein, Erythrocyte Sedimentation Rate, Pain Assessment, Visual Analogue Scale.

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**Introduction**

Rheumatoid Arthritis is a Chronic Inflammatory Disorder Of Autoimmune Origin That Mainly Targets Synovial Joints, Often Leading To Progressive Structural Damage And, Over Time, Functional Limitation. It Affects Nearly 0.5-1% Of The Population Worldwide And Is Seen More Commonly In Women.[1,2] Early Diagnosis And Timely Intervention Are Essential To Prevent Irreversible Joint Damage And Disability.[3] The Development of RA Does Not Depend On A Single Factor. Rather, It Is Believed To Result From An Interaction Between Genetic Predisposition And Environmental Exposures. This Interaction Leads To Activation Of Immune Responses And

Increased Production Of Pro-Inflammatory Cytokines Such As Tumor Necrosis Factor Alpha, Interleukin-6, And Interleukin-1.[4] These Cytokines Contribute To Ongoing Synovial Inflammation And Gradually Promote Cartilage And Bone Damage, Which Are Hallmarks Of The Disease.[5] From A Diagnostic And Monitoring Perspective, Laboratory Parameters Remain Important Supportive Tools. Rheumatoid Factor Is Widely Used, Although It Is Not Entirely Specific For Ra.[6] along With RF, Acute-Phase Markers Like ESR And C-Reactive Protein Are Routinely Measured. ESR Provides A General Indication Of Inflammation, But It Tends To Change Slowly.[7]

Crp, In Contrast, Rises And Falls More Rapidly In Response To Inflammatory Activity And Is Often Considered More Reflective of Current Disease Status.[8] pain Is One of the Most Noticeable Symptoms Reported by Patients With Inflammatory Arthritis. In Fact, For Many Individuals, It Is The Primary Reason For Seeking Medical Care. However, Pain Is Not Just A Physical Sensation; It Can Also Influence Mood, Daily Functioning, and Overall Well-Being. Because of This, Assessing Pain Accurately Becomes Essential In Clinical Settings. The Vas Is Commonly Used For This Purpose, As It Allows Patients To Indicate Their Perceived Pain Intensity In A Simple And Practical Way.

Even though both inflammatory markers and pain scores are frequently used in routine evaluation, their relationship is not always clear-cut. Some studies suggest that higher levels of inflammation are associated with increased pain, which seems logical.[9] At the same time, other reports show weaker or inconsistent associations. This difference may be due to the fact that pain perception is influenced by multiple factors, including duration of disease, extent of joint damage, and even psychological components.[10] Considering These Variations, It Becomes Important To Explore How Closely Laboratory Indicators Of Inflammation Relate To The Pain Experienced By Patients. A Better Understanding Of This Relationship May Help Clinicians Interpret Disease Activity More Effectively And Make More Informed Decisions Regarding Patient Management.[11-13] Therefore, The Present Study Was Carried Out To Examine The Correlation Between Inflammatory Markers-RF, ESR, And CRP and Pain Severity Measured Using The Vas In Patients With Inflammatory Arthritis.

## Materials & Methods

**Study Design:** The present study was carried out as a hospital-based cross-sectional observational study. The primary aim was to examine the relationship between inflammatory biomarkers and pain severity in patients diagnosed with inflammatory arthritis.

**Study Area \:** This study was conducted in the outpatient department of a tertiary care hospital. Patients with clinical features suggestive of inflammatory arthritis were evaluated and considered for inclusion.

**Study Population:** A total of 64 patients with inflammatory arthritis were included in the study. For the purpose of analysis, the participants were categorized into **Two Groups:** Group 1 Consisted Of 32 Patients with Seropositive Rheumatoid Arthritis, While Group 2 Included 32 Patients with Seronegative Polyarthritis. The Diagnosis of Rheumatoid Arthritis Was Established in

Accordance with the ACR/EULAR 2010 Classification Criteria.

**Inclusion Criteria:** Participants were included in the study if they were newly diagnosed cases of rheumatoid arthritis or polyarthritis, were aged above 18 years, and were willing to participate in the study by providing informed consent.

**Exclusion Criteria:** Participants were excluded if they had comorbid conditions such as diabetes mellitus, hypertension, or tuberculosis. Additionally, individuals with a recent history of using non-steroidal anti-inflammatory drugs (NSAIDs) or immunosuppressive therapy, as well as those suffering from other systemic inflammatory diseases, were not included in the study.

**Ethical Considerations:** The study protocol was reviewed and approved by the institutional ethics committee of the participating institution. Written informed consent was obtained from all participants prior to their enrollment in the study.

**Clinical Evaluation:** All participants underwent a comprehensive clinical assessment, which included the collection of demographic data, medical history, and a detailed physical examination. Pain severity was assessed using the visual analogue scale (VAS). Participants were asked to indicate their perceived level of pain on a scale ranging from 0 to 10, where 0 represented no pain and 10 represented the worst imaginable pain.

**Laboratory Investigations:** Blood samples were collected from the antecubital vein under aseptic conditions for laboratory analysis. The evaluated parameters included RF, ESR, and CRP. Rf levels were determined using a nephelometric assay based on antigen-antibody complex formation. ESR was measured by the Westergren method, which assesses the rate of red blood cell sedimentation in anticoagulated blood over a specified period. CRP concentrations were estimated using nephelometric techniques with commercially available diagnostic kits.

**Statistical Analysis:** Statistical analysis was performed using the statistical package for the social sciences (SPSS) software. Descriptive statistics were applied to summarize demographic variables, while the student's *t*-test was used to compare mean values between the study groups. The relationship between inflammatory markers and pain scores was assessed using Pearson's correlation coefficient. A *p*-value of less than 0.05 was considered statistically significant.

## Results

**Demographic Characteristics:** A total of 64 patients with inflammatory arthritis were included in the study. The gender distribution revealed a

higher proportion of females compared to males in both groups. In the RA group, there were 10 males and 22 females, whereas the polyarthritis group comprised 12 males and 20 females. Statistical analysis showed that the difference in gender distribution between the two groups was not significant. The mean age of patients in the RA group was  $41.03 \pm 12.46$  years, while that of the polyarthritis group was  $31.75 \pm 10.92$  years. This difference in mean age was found to be statistically significant, indicating that patients with rheumatoid arthritis were generally older than those with polyarthritis.

**Comparison of Inflammatory Markers:** The mean values of inflammatory markers were found to be higher in patients with RA compared to those with polyarthritis. The mean rf level in the RA group was  $89.56 \pm 100.32$ , whereas the polyarthritis group showed a mean value of  $18.48 \pm 22.63$ ; this difference was statistically highly significant. Similarly, ESR values were elevated in RA patients, with a mean of  $73.25 \pm 26.07$  mm/hr, compared to  $44.50 \pm 32.27$  mm/hr in the polyarthritis group. Crp levels also demonstrated a marked difference between the groups, with a mean value of  $149.80 \pm 170.64$  mg/l in RA patients and  $36.38 \pm 66.17$  mg/l in polyarthritis patients. In addition, pain scores assessed using the vas were higher in the RA group ( $7.25 \pm 0.62$ ) compared to the polyarthritis group ( $6.56 \pm 0.56$ ), indicating greater pain severity among patients with RA.

**Correlation Analysis:** Correlation analysis was performed to assess the relationship between inflammatory biomarkers and pain severity. A moderate positive correlation was observed between pain scores measured using the vas and RF ( $r = 0.469$ ,  $p < 0.01$ ), indicating that higher RF levels were associated with increased pain severity. A similar positive correlation was found between vas scores and CRP levels ( $r = 0.479$ ,  $p < 0.01$ ), suggesting that elevated CRP concentrations were related to greater pain intensity. The correlation between vas and ESR was comparatively weaker ( $r = 0.260$ ,  $p < 0.05$ ), although it remained statistically significant. However, no statistically significant correlation was observed between ESR and CRP levels.

## Discussion

The present study examined the relationship between inflammatory biomarkers and pain severity in patients with inflammatory arthritis. The findings showed that rheumatoid factor (RF), erythrocyte sedimentation rate (ESR), and c-reactive protein (CRP) levels were significantly higher in patients with rheumatoid arthritis compared to those with seronegative polyarthritis. These observations are in agreement with earlier studies that have emphasized the importance of

inflammatory biomarkers in assessing disease activity.[14,15] one of the important findings of this study was the significant positive correlation between CRP levels and pain severity. CRP is an acute-phase protein synthesized in the liver in response to inflammatory cytokines, particularly il-6. [16] owing to its rapid response to inflammatory stimuli, CRP is often regarded as a sensitive indicator of active inflammation. The observed association in this study suggests that increased systemic inflammation may contribute to higher pain perception in patients with inflammatory arthritis.

A moderate positive correlation was also observed between rf levels and pain scores. Although rf is mainly used as a diagnostic marker, previous studies have reported that higher rf titers may be linked with more severe disease manifestations, including greater joint damage and functional limitation. [17] this could partly explain the association between rf levels and pain severity observed in the present study. In comparison, ESR demonstrated a relatively weaker correlation with pain severity. ESR is known to be influenced by several physiological and pathological factors such as age, gender, hematocrit, and plasma protein levels.[18] These factors may limit its specificity as an inflammatory marker when compared with CRP. Moreover, ESR reflects cumulative inflammatory activity over a longer duration, whereas CRP provides a more immediate indication of ongoing inflammation. Interestingly, no statistically significant correlation was found between ESR and crp levels in this study. Similar findings have been reported in previous studies and may be explained by differences in the biological behavior and response kinetics of these markers.[19] while CRP levels tend to rise and decline rapidly with changes in inflammatory status, ESR shows a slower and more gradual response, which may result in discrepancies between the two parameters. Pain in inflammatory arthritis is inherently multifactorial. Although inflammation plays a central role, other factors such as structural joint damage, peripheral and central sensitization, and psychological influences can also affect pain perception.[20] therefore, the moderate correlations observed in this study indicate that inflammatory markers alone may not fully account for the variability in pain experienced by patients. From a clinical perspective, these findings have practical relevance. The results suggest that CRP and RF may serve as useful adjuncts in evaluating symptom burden in patients with inflammatory arthritis. Combining laboratory parameters with clinical tools such as the visual analogue scale (VAS) may enhance disease assessment and assist clinicians in making more informed treatment decisions.

However, certain limitations of the study should be acknowledged. The sample size was relatively small, which may affect the generalizability of the findings. In addition, the cross-sectional design limits the ability to establish causal relationships between variables. Further longitudinal studies with larger sample sizes are required to better understand the dynamic association between inflammatory markers and pain severity.

### Limitations

The present study has several limitations that should be considered while interpreting the findings. The sample size was relatively small, which may limit the generalizability of the results. In addition, the study was conducted at a single center, which may not fully represent the broader patient population.

The cross-sectional design further restricts the ability to establish causal relationships between inflammatory markers and pain severity. Moreover, additional biomarkers, such as anti-ccp antibodies, were not included in the analysis. Therefore, future studies involving larger sample sizes and longitudinal follow-up are required to provide a more comprehensive understanding of the relationship between inflammatory markers and pain severity.

### Conclusion

The findings of the present study indicate that inflammatory biomarkers are associated with pain severity in patients with inflammatory arthritis. Among the evaluated markers, c-reactive protein (CRP) and rheumatoid factor (RF) demonstrated stronger correlations with pain intensity compared to erythrocyte sedimentation rate (ESR).

These results suggest that certain inflammatory markers may be more closely related to symptom severity. Overall, the study highlights the potential clinical value of inflammatory biomarkers in assessing disease activity and symptom burden in patients with rheumatoid arthritis. Integrating laboratory findings with clinical assessment may enhance disease monitoring and support more informed therapeutic decision-making.

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