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# Comparison of C - reactive protein And erythrocyte sedimentation rate biomarkers for identification of immunological disorders in Tertiary Care Hospital

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***Abstract*---**Background: In this exploratory study, a cross-comparison was made between CRP, ESR, RA-Factor, and ASO tests for 300 individuals of both males and females in tertiary care hospitals to find an association that is not identified through the immunological marker. The quantitative approach was utilized to check the high ESR rate for an individual who has a positive CRP. The data were analyzed using SPSS version 25. Results: suggest that CRP and ESR play a role in patients with immunological disorders, and a significant relationship was identified between CRP and ESR. The mean and standard deviation of CRP were $n$=1.4 ± 0.4, ESR 25 ± 15.9 mm/minute, $n$ =RA-Factor 1.6 ± 0.4, and ASO 1.3 ± 0.4, respectively CRP are mostly positive in serological disorders. Linear regression

showed a strong positive association between ESR and CRP, with a significant P value less than 0.05.

***Keywords*---**C-reactive protein, Erythrocyte Sedimentation, rheumatoid arthritis

## Introduction

The most common screen test for inflammation is erythrocyte sedimentation rate (ESR). For ESR the classical method for identification is the Westergren method by the International Council for Standardization in Hematology (ICSH). However, this procedure requires 60 min to obtain results. While performing tests, including specimen collection, sedimentation apparatus, and methodological factors (Alifax, Padova, Italy), an automated ESR measuring device that has recently entered the market. This technology analyzes the ESR in tiny quantities of blood (150 μL) using a micro agglutination approach that takes only 20 s to complete and detects the reaction of RBCs with inflammatory plasma proteins. Careful evaluation of this approach to the reference process is necessary to validate the system's correctness(Cha et al., 2009). serum of the patients in an acute phase of pneumococcus infection showed that homopentameric protein is called C-reactive protein (Sproston *et al.*, 2018). C-reactive protein is produced as an acute-phase reactant predominantly in the liver in response to stimulation by interleukin (IL)-6, TNF-α (tumor necrosis factor) (TNF)- and IL-1β (Interleukin-1) which are produced at the site of inflammation. CRP has been used as a marker to diagnose and predict the severity of inflammatory diseases. Identification of the root cause of illness in cases of increased erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels can be difficult, particularly in individuals with serologically non-reflective clinical symptoms. We wanted to find out how often individuals with apparently unclear clinical symptoms and persistently elevated Blood ESR/CRP values ultimately lead to definite diagnoses (Bitik *et al.*, 2015 & Batlivala, *et al,*2009). The two most often used laboratory tests for identifying the acute phase response and, consequently, for diagnosing and monitoring inflammatory disorders are the erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) (Lapić, *et al,*2020). C-reactive protein has been demonstrated to be a better indicator of the acute phase reaction than erythrocyte sedimentation rate in laboratory-based investigations of consecutive individuals with increased C-reactive protein or erythrocyte sedimentation rate. Changes in the acute phase response are quickly discovered by this more sensitive test.(Cha et al., 2009). The ESR was significantly greater in RA patients compared to those with HCV-A, and the CRP tended to be more often positive. These help the clinician rapidly and simply assess the long-term effectiveness of the medication as well as the ranges of disease activity. These final data measurements can help identify the issues the patient is having and will also support the development of a far more thorough grasp of the person's development. CRP is a more direct measure of inflammation than ESR, it is more sensitive to short-term changes, is associated with radiological progression in RA, and is considered at least as valid as ESR to measure RA disease activity (Fayed *et al,* 2023). A characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic

intervention" is the definition given for biomarkers (Bout *et al,* 2023). Biomarkers that can help with AS diagnosis and disease activity monitoring might enhance clinical care and extend our understanding of pathogenesis. These are insensitive, with two-thirds of people with clinically active illness and confirmed AS having levels within normal range. To that aim, there is still a critical need to find more effective diagnostic and monitoring methods. Although osteomyelitis is linked to more surgeries, amputations, and permanent usage of drugs, it is crucial to distinguish it from soft-tissue infection of the foot. (Hwang *et al.*, 2023 & Lavery et al., 2019). Changes in the two prevalent acute phase reactants, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are also linked to the disease activity in JIA patients in addition to these hematopoietic biomarkers (Sonia, *et al,*2023). The study aims to evaluate the diagnostic and prognostic values of these two (CRP and ESR) biomarkers and identify which one is more appropriate for a specific clinical situation.

## Method and Material

### Study Design
A study was cross-sectional observational

### Study Setting
The study was conducted at Lady Reading Hospital-MTI (LRH), Al-Khidmat Hospital (AKH), and as well as the Department of MLT Skill Lab at Abasyn University.

### Study Duration
The study duration is Four-Months.

### Sample Technique

### Assessment of CRP and serological marker
For CRP Test sample was collected in Gel and Heparin Tube. After that sample was Centrifuge sample at 3000 rpm for 3-5 minutes. Take 50ul serum of the patient sample with 50ul CRP latex and wait for Two minutes for agglutination.

### Assessment of ESR
For ESR Test sample was collected in EDTA tube and after that blood sample is placed on a vertical on Westergren tube stand the tube in an undisturbed place for one hour. After one hour RBC settles down and notes the result.

**Result**

In this study, we have included both males and females of 300 individual male 49.3% *(n*=148), while female 50.7 % (*n*=152) shown in figure (1), of different ages were in included show in figure (2).

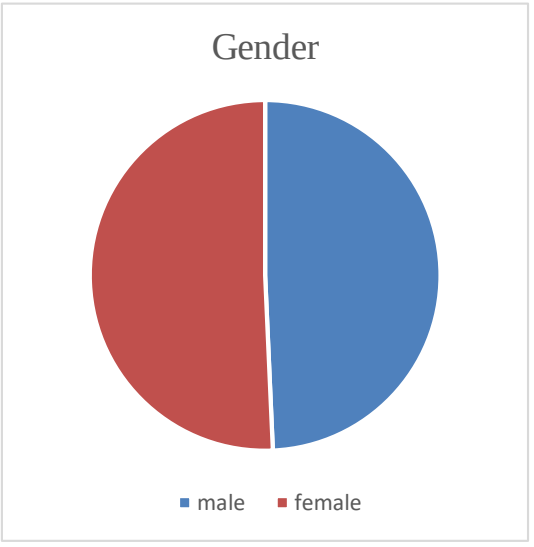


Figure 1: Gender wise distribution


Figure 2 Age-wise distribution

The descriptive statics show that patients having ESR <15mm/hr there CRP positive cases is 9, 16 to 30mm/hr positive cases is 103, 31 to 45 mm/hr positive CRP cases is 62, and ESR above 45 mm/hr positive CRP cases is 29 shown in table (1).

Table (1) No of Positive cases of CRP correlates with ESR

| ESR Result | ESR Patient (*n*) | CRP Patient (*n*) |
|---|---|---|
| <15 mm/hr | 88 | 9 |
| 16-30 mm/hr | 123 | 103 |
| 31-45 mm/hr | 58 | 62 |
| >45 mm/hr | 31 | 29 |

The positive C-Reactive Protein (CRP) patients were 176 (58.7%) with a mean and the standard deviation is (1.4 ± 0.4), Rheumatoid Arthritis is 104 (34.7%) with a mean and the standard deviation is (1.6 ± 0.4) Anti streptolysin is 36 (12%) with mean and the standard deviation is (1.3 ± 0.4) shown in the Table (2). The linear regression state shows a strong positive association between ESR and CRP with a significant P value of < 0.05 with mean and standard deviation ±0.9.

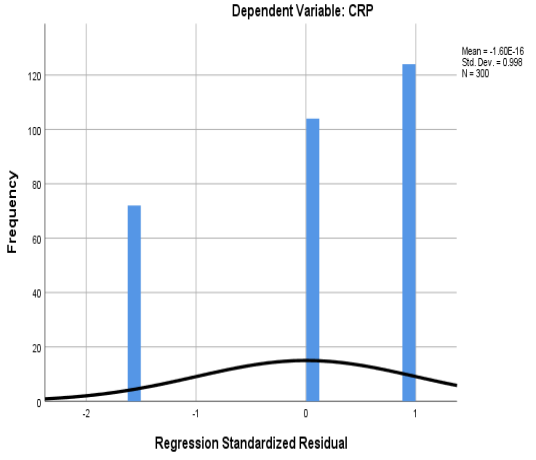


Figure (3) Linear regression of CRP and ESR

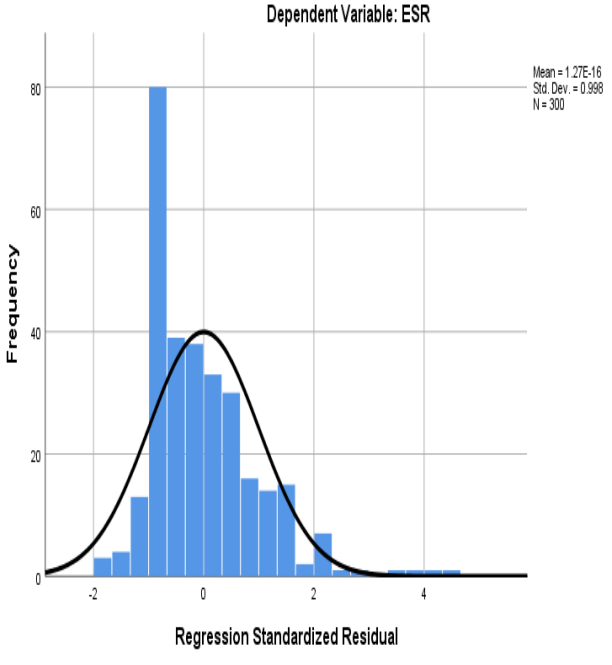


Figure (4) Regression Standardized Residual

Table (2) Mean and standard deviation of CRP, ESR, RA-FACTOR, and ASO

| | Mean and Standard deviation |
|---|---|
| CRP | 1.4 ±0.4 |
| ESR | 25 ±15.9 |
| RA-Factor | 1.6 ±0.4 |
| ASO | 1.3 ±0.4 |

One sample T Test show that ASO is significant with P-Value is < 0.05. There are significant values p is < 0.05 with a mean square of 27.1 and the standard deviation is 0.3 as shown in figure (2).
Positive cases of Anti streptolysin

Table (3) Positive cases of ASO

| Frequency | Percentage % | Mean and Standard deviation |
|---|---|---|
| 36 | 12% | 1.3 ± 0.4 |

**Discussion**

In this study patients with ESRs below 15 mm/hr have a CRP positive case 9 which is lower bound. Patients having positive CRP have high ESR rates. The results of the linear regression indicate a substantial positive correlation between ESR and CRP, with a significant P value of less than 0.05. T Test results with a P value of 0.05 demonstrate the significance of ASO. CRP level increases more rapidly than ESR in early-stage inflammatory diseases and begins to decrease more quickly than ESR. Therefore, we defined the time when the CRP level decreased to normal and the clinical symptoms of patients resolved as the recovery time (Çiftel *et al* 2023). Specifically, anti-nuclear antibodies (ANA), rheumatoid factor (RF), HLA-B27 antigen, and anti-cyclic citrullinated peptide (CCP) antibodies are used for patient classification, while erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are utilized for the definition of the Juvenile Arthritis Disease Activity Score (Pelassa, *et al* 2023). Inflammaging patients have previously demonstrated poorer outcomes following an acute illness with sepsis and cardiovascular disease these findings may correlate with an adverse outcome in the post-operative period following emergency laparotomy given its significant physiological burden. Existing blood-based biomarkers, such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR), provide rapidly accessible and cost-effective methods of detecting inflammation(George & Mukherjee, 2023). Standard biomarkers of acute inflammation C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) may be subject to limitations in the assessment of inflammation that is more chronic or low-grade in nature. There is a need for accurate markers of low-grade or chronic inflammation that are stable and not subject to acute factors. Novel or emerging inflammatory biomarkers that may represent promising alternatives include the neutrophil-lymphocyte ratio, glycoprotein acetyls, and soluble urokinase plasminogen activator receptor. These markers have demonstrated utility in a variety of clinical conditions (including cancer and cardiovascular disease), may offer increased sensitivity in people with some conditions, and may outperform the standard ESR and CRP in specific situations. These markers can also be positively influenced by healthy lifestyle changes and habits. While the complete clinical relevance and best uses of these markers are still being elucidated, they may offer new avenues for exploring the multi-faceted nature of chronic inflammation(Lucius, 2023).

## Conclusion

Three hundred participants from this study were examined for the relationship between CRP, ESR, RA FACTOR, and ASO. These findings suggest that CRP and ESR plays a role in immunological disorder There was also a significant correlation between CRP and ESR in our study most of the CRP-positive cases an 16-30 mm/hr ESR and on borderline or <15 mm/hr identify some positive CRP cases. These findings enable us to identify immunological disorders.

## Limitation

In this study, we have only analyzed the patient on a quantitative basis further study is needed on parameters basis analysis.

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This study did not receive any funding from any organization.

## Conflict of interests

The authors declare no conflicts of interest

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