International Science and Technology Journal
المجلة الدولية للعلوم والتقنية
Volume 37 العدد
Part 2 المجلد
المجلة الدولية للعلوم والتقنية
International Science and Technology Journal
ISTJ

http://www.doi.org/10.62341/mkoa7721

Received	**2025/10/04**	**تم استلام الورقة العلمية في**
Accepted	**2025/10/26**	**تم قبول الورقة العلمية في**
Published	**2025/10/27**	**تم نشر الورقة العلمية في**

ASSESSMENT OF ESR, RF, AND CRP LEVELS IN RHEUMATOID ARTHRITIS PATIENTS OF MALES AND FEMALES IN DIFFERENT AGE GROUPS

Mustafa Rahouma[1], Khadija Alsayh[1], Osama Ben Rajab[2]
Abdussattar S. A. Mohamed[3]

[1] Medical Laboratories Department, Higher Institute of Science and Medical Technology/Abusalim, Tripoli - Libya.
[2] Community Health Department, Higher Institute of Science and Medical Technology/Abusalim, Tripoli - Libya.
[3]Medical Laboratories Department, Tripoli College of Medical Sciences, Tripoli - Libya.
Mustafa_rahouma@yahoo.com phone no: 0911436819 watsup

Abstract:

Rheumatoid Arthritis (RA) is a chronic autoimmune disease that primarily affects the joints, leading to inflammation, pain, swelling, and potentially joint deformity and disability in advanced stages. Early diagnosis and appropriate monitoring of disease activity are crucial for improving patient outcomes and slowing disease progression. Several laboratory markers are routinely used to evaluate inflammation and disease activity in RA patients. These include the Erythrocyte Sedimentation Rate (ESR), RF, and CRP Levels in Rheumatoid Arthritis Patients: A Comparative Study among Males and Females in Different Age Groups. **The study aimed** to compare the levels of ESR, RF, and CRP in rheumatoid arthritis patients based on gender and age group, determine the average levels of ESR, RF, and CRP in male and female RA patients, and examine the variations in these markets across different age groups. Analyze the relationship between age, gender, and severity of inflammation as indicated by these biomarkers. **The result** shown that ESR and CRP levels were significantly higher in female patients compared to males, suggesting a more pronounced inflammatory response in women. RF levels were slightly higher in females but did not show a statistically significant difference

http://www.doi.org/10.62341/mkoa7721

between genders. All three markers—ESR, RF, and CRP—increased progressively with age, with the highest levels recorded in patients aged 60 and above. **In conclusion** results indicate that both age and gender are influential factors in the expression of inflammatory markers in RA patients, which should be taken into account during diagnosis, based on the study results, Based on the results, our **recommend** are proposed larger-scale multi-center studies are recommended to validate these findings across broader populations. Inclusion of other biomarkers such as anti-CCP antibodies may provide a more comprehensive understanding of RA activity.

Keywords: ESR, RF, AND CRP، Rheumatoid Arthritis.

تقييم مستويات معدل ترسيب كرات الدم الحمراء (ESR) والعامل الروماتويدي (RF) وبروتين سي (C) التفاعلي CRP لدى مرضى التهاب المفاصل الروماتويدي من الذكور والإناث في فئات عمرية مختلفة

مصطفى رحومة[1]، خديجة السايح[1]، أسامة بن رجب[2]، عبد الستار سعد الله محمد[3]

1- قسم المختبرات الطبية، المعهد العالي للعلوم والتقنيات الطبية/أبو سليم طرابلس، ليبيا.

2- قسم صحة المجتمع، المعهد العالي للعلوم والتقنيات الطبية/أبو سليم طرابلس، ليبيا.

3- قسم المختبرات الطبية، كلية طرابلس للعلوم الطبية، طرابلس، ليبيا

الملخص

التهاب المفاصل الروماتويدي (RA) هو مرض مناعي ذاتي يصيب المفاصل بشكل رئيسي، مسببًا التهابًا وألمًا وتورمًا، وربما تشوهًا في المفاصل وإعاقة في مراحل متقدمة. يُعد التشخيص المبكر والمراقبة الدقيقة لنشاط المرض أمرًا بالغ الأهمية لتحسين نتائج المرضى وإبطاء تطوره. تُستخدم العديد من المؤشرات المخبرية بشكل روتيني لتقييم الالتهاب ونشاط المرض لدى مرضى التهاب المفاصل الروماتويدي. تشمل هذه المؤشرات معدل ترسيب كريات الدم الحمراء (ESR)، ومعامل التنشيط(RF) ، وبروتين التفاعل المتفاعل (CRP) لدى مرضى التهاب المفاصل الروماتويدي: دراسة مقارنة بين الذكور

http://www.doi.org/10.62341/mkoa7721

والإناث في فئات عمرية مختلفة. هدفت الدراسة إلى مقارنة مستويات معدل ترسيب كريات الدم الحمراء(ESR)، ومعامل التنشيط (RF)، وبروتين المتفاعل (CRP) لدى مرضى التهاب المفاصل الروماتويدي بناءً على الجنس والفئة العمرية، وتحديد متوسط مستويات كل من معدل ترسيب كريات الدم الحمراء (ESR)، ومعامل التنشيط (RF)، وبروتين التفاعل المتفاعل (CRP) لدى مرضى التهاب المفاصل الروماتويدي من الذكور والإناث، ودراسة الاختلافات في هذه المؤشرات بين الفئات العمرية المختلفة. كما حلل الباحثون العلاقة بين العمر والجنس وشدة الالتهاب وفقًا لهذه المؤشرات الحيوية. أظهرت النتيجة أن مستويات ESR و CRP كانت أعلى بشكل ملحوظ لدى المريضات مقارنة بالذكور، مما يشير إلى استجابة التهابية أكثر وضوحًا لدى النساء. كانت مستويات RF أعلى قليلاً لدى الإناث ولكنها لم تُظهر فرقًا ذا دلالة إحصائية بين الجنسين. زادت جميع العلامات الثلاثة – ESR و RF و – CRP تدريجيًا مع تقدم العمر، مع تسجيل أعلى المستويات لدى المرضى الذين تبلغ أعمارهم 60 عامًا فأكثر. في الختام تشير النتائج إلى أن كلاً من العمر والجنس عاملان مؤثران في التعبير عن العلامات الالتهابية لدى مرضى التهاب المفاصل الروماتويدي، والتي يجب أخذها في الاعتبار أثناء التشخيص. بناءً على النتائج، نوصي بإجراء دراسات عديدة على عدة مراكز وعلى نطاق أوسع للتحقق من صحة هذه النتائج عبر مجموعات سكانية أوسع وهذا قد يوفر تضمين علامات حيوية أخرى مثل الأجسام المضادة لـ CCP فهمًا أكثر شمولاً لنشاط التهاب المفاصل الروماتويدي.

الكلمات الاسترشادية: معدل ترسيب كرات الدم الحمراء، العامل الروماتويدي، بروتين سي التفاعلي والتهاب المفاصل الروماتويدي.

Introduction

Rheumatoid Arthritis (RA) is a chronic autoimmune disease that primarily affects the joints, leading to inflammation, pain, swelling, and potentially joint deformity and disability in advanced stages. Early diagnosis and appropriate monitoring of disease activity are crucial for improving patient outcomes and slowing disease progression, (Alamanos and Drosos 2005) and (Mohd et all 2023). Several laboratory markers are routinely used to evaluate inflammation and disease activity in RA patients. These include the Erythrocyte Sedimentation Rate (ESR), RF, and CRP Levels in Rheumatoid Arthritis Patients.

http://www.doi.org/10.62341/mkoa7721

Objectives of the Study

To compare the levels of ESR, RF, and CRP in rheumatoid arthritis patients based on gender and age group.

To determine the average levels of ESR, RF, and CRP in male and female RA patients, and examine the variations in these markers across different age groups. And analyze the relationship between age, gender, and severity of inflammation as indicated by these biomarkers.

MATERIAL AND METHODS

Study Design

This research is a comparative cross-sectional study conducted to evaluate the differences in ESR, RF, and CRP levels among rheumatoid arthritis (RA) patients based on gender and age groups. The design allows for the collection of data at a single point in time from a selected sample to analyze variations across categories.

Period and study Area

The study was conducted in [Center of Tripoli Hospital], located in [Tripoli], which provides routine diagnostic and monitoring services for patients with rheumatologic diseases. The study was carried out over a period of [3 months], starting from May to Jul 2025.

Study Population

The population consisted of patients diagnosed with rheumatoid arthritis, who attended the rheumatology or laboratory departments during the study period.

Inclusion Criteria

Patients diagnosed with RA according to ACR/EULAR criteria. Both males and females aged 20 years and above. Patients not receiving corticosteroids or immune suppressants in the past month. Willingness to participate and provide consent.

Exclusion Criteria

Patients with other autoimmune or chronic inflammatory diseases (e.g., lupus, ankylosing spondylitis). Patients with recent infections or acute conditions that may influence CRP or ESR levels. Pregnant women.

Incomplete medical or laboratory data.

Sample Size and Sampling Technique

A total of [e.g., 60–100] patients were included in the study. The sample was divided equally between males and females and across different age groups (e.g., 20–39, 40–59, 60+). A purposive

http://www.doi.org/10.62341/mkoa7721

sampling technique was used to select patients based on availability and fulfillment of inclusion criteria.

Data Collection Methods

Data were collected using a structured form that included:
Demographic details (age, gender), clinical history and RA diagnosis, and Laboratory results for ESR, RF, and CRP.

Laboratory Analysis

ESR Measurement

ESR was measured using the Westergren method. Blood samples were collected in EDTA tubes, and the sedimentation rate was recorded after 1 hour.

RF Measurement

RF was measured using a latex agglutination test or immune turbid metric assay, depending on the lab's standard procedures.

CRP Measurement

CRP levels were determined using a quantitative turbid metric immunoassay. Samples were analyzed using a fully automated biochemistry analyzer, all laboratory procedures followed standard protocols with proper calibration and quality control.

Data Management and Statistical Analysis

Data were collected using an Excel spreadsheet and subsequently transferred to SPSS version 25 for analysis. Descriptive statistics summarized categorical data as frequencies/percentages and continuous variables as means ± standard deviations (SD). Group comparisons employed independent-samples t-tests (sex-based differences) and one-way ANOVA (age-based differences). Pearson's correlation assessed relationships between age/sex and biomarkers (RF, ESR, CRP), along with inter-biomarker correlations. Statistical significance was defined as $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the institution's ethical review board. Informed consent was taken from all participants. Data confidentiality and patient anonymity were strictly maintained.
Participation was voluntary and patients were free to withdraw at any time.

RESULTS

This chapter presents the results of the study based on the analysis of data collected from RA patients. The results are organized according to gender, age groups, and the levels of the three inflammatory markers: ESR, RF, and CRP.

http://www.doi.org/10.62341/mkoa7721

Demographic Characteristics

A total of 115 participants were included in this study, with a mean age of 51.95 years (SD = 12.56; range: 17–77). Age distribution was categorized into four groups: ≤39 years (13.9%, *n* = 16), 40–49 years (22.6%, *n* = 26), 50–59 years (33.0%, *n* = 38), and ≥60 years (30.4%, *n* = 35).

Females represented the majority of the cohort (82.6%, *n* = 95), while males reported for 17.4% (*n* = 20) **(Table 1).**

Table 1. Demographic distribution of study participants

Characteristic	Frequency	Percent (%)
Age group		
≤ 39 years	**16**	**13.9%**
40–49 years	**26**	**22.6%**
50–59 years	**38**	**33.0%**
≥ 60 years	**35**	**30.4%**
Sex		
Male	**20**	**17.4%**
Female	**95**	**82.6%**

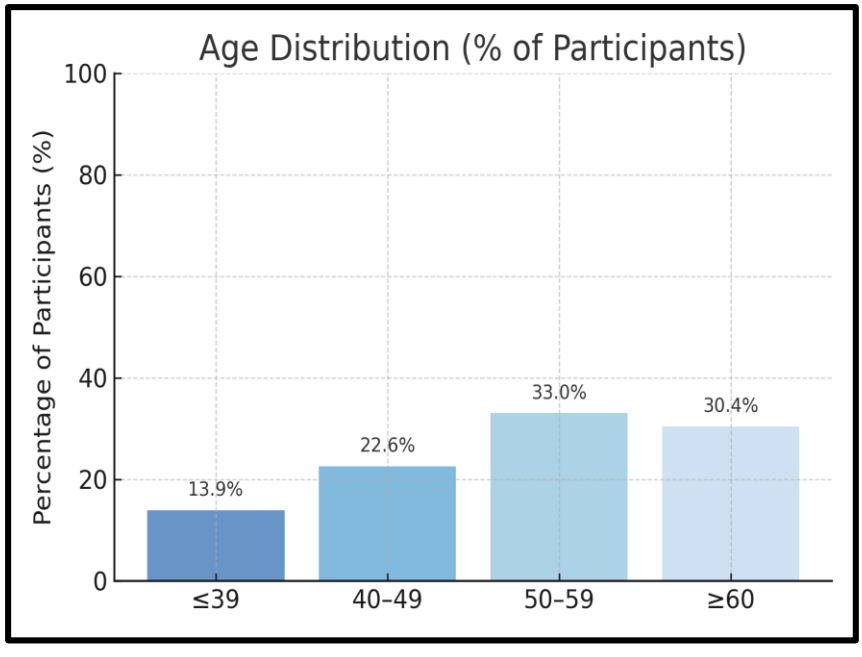

Figure 1a. Age distribution of study participants.

http://www.doi.org/10.62341/mkoa7721

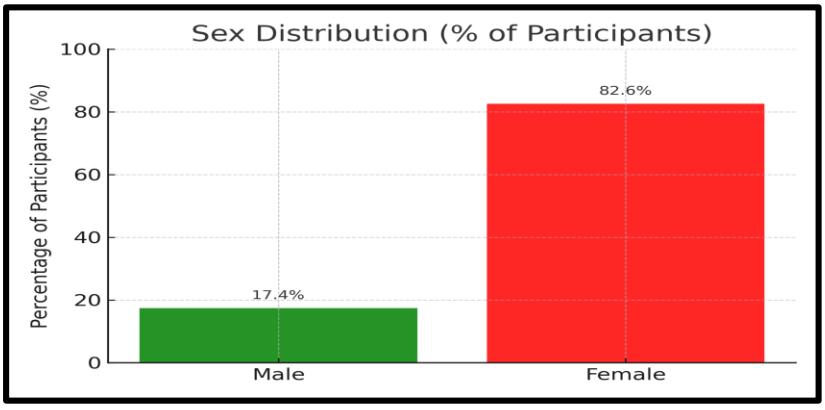

Figure 1b. Sex distribution of study participants.

Across the cohort, the mean Rheumatoid Factor (RF) was 49.60 IU/mL (SD = 29.52; range: 2.00–128.00). The mean Erythrocyte Sedimentation Rate (ESR) was 48.31 mm/hr (SD = 27.77; range: 6.2–157.0), while C-reactive Protein (CRP) averaged 21.57 mg/L (SD = 15.78; range: 1.20–88.40) (Table 2).

Table 2. Descriptive statistics for RF, ESR, and CRP in the total cohort

Biomarker	Mean	SD	Minimum	Maximum
Rheumatoid Factor (IU/mL)	49.60	29.52	2.00	128.00
ESR (mm/hr)	48.31	27.77	6.2	157.0
CRP (mg/L)	21.57	15.78	1.20	88.40

Values represent mean ± standard deviation.

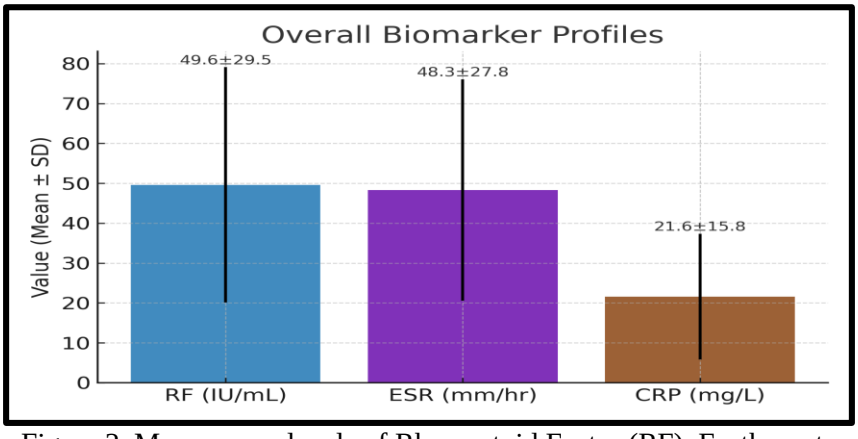

Figure 2. Mean serum levels of Rheumatoid Factor (RF), Erythrocyte Sedimentation Rate (ESR), and C-reactive Protein (CRP)

http://www.doi.org/10.62341/mkoa7721

Sex-Based Differences in Biomarkers

A- Rheumatoid Factor (RF)

No significant sex-based differences in RF were observed. Males had a mean RF of 48.24 ± 29.53 IU/mL, while females had 49.89 ± 29.66 IU/mL (p = 0.822) **(Table 3).**

Table 3. Rheumatoid Factor (RF) levels by sex

Sex	Mean (IU/mL)	Standard Deviation	*p*-value
Male	**48.24**	**29.53**	**0.822**
Female	**49.89**	**29.66**	

*Values represent mean ± standard deviation. The p-value was calculated using an independent-samples t-test. Statistical significance was defined as p < 0.05; an asterisk denotes a significant difference.**

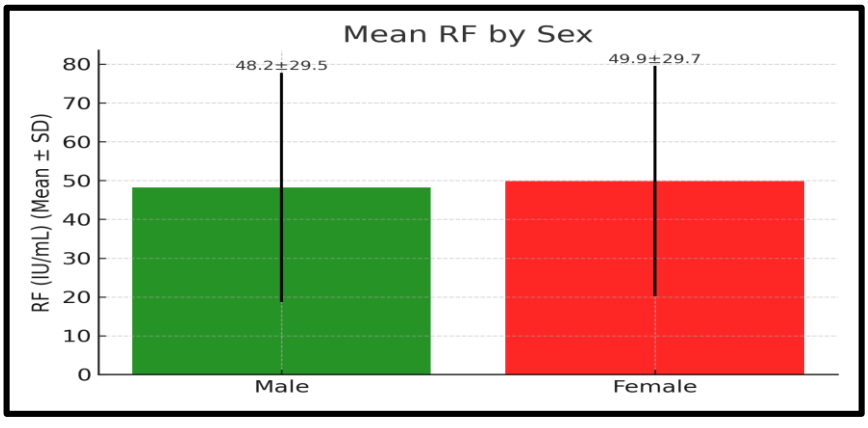

Figure 3. Mean Rheumatoid Factor levels by sex.

Although males exhibited higher ESR (53.68 ± 36.64 mm/hr) compared to females (47.18 ± 25.63 mm/hr), this difference was not statistically significant (p = 0.344) **(Table 4).**

Table 4. Erythrocyte Sedimentation Rate (ESR) levels by sex

Sex	Mean (mm/hr)	Standard Deviation	*p*-value
Male	**53.68**	**36.64**	**0.344**
Female	**47.18**	**25.63**	

*Values represent mean ± standard deviation. The p-value was calculated using an independent-samples t-test. Statistical significance was defined as p < 0.05; an asterisk denotes a significant difference.**

http://www.doi.org/10.62341/mkoa7721

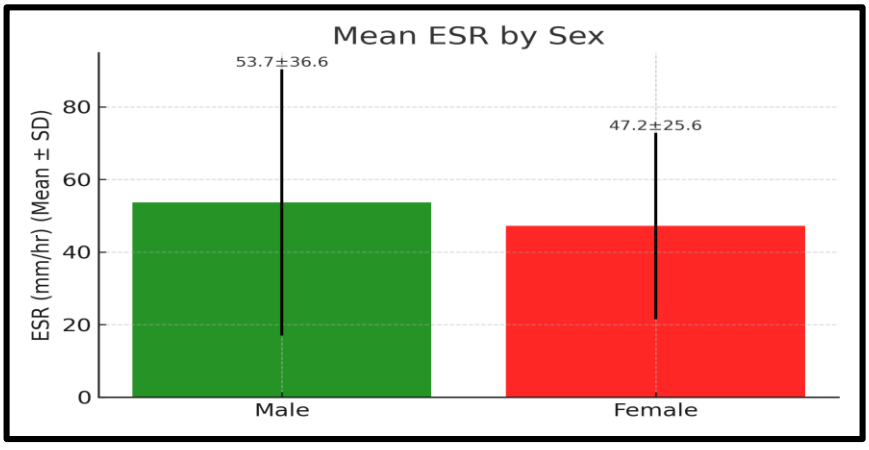

Figure 4. Mean Erythrocyte Sedimentation Rate (ESR) levels by sex.

C-Reactive Protein (CRP)

CRP levels were significantly higher in males (28.18 ± 22.95 mg/L) compared with females (20.18 ± 13.58 mg/L) (p = 0.039**)** (Table 5).

Table 5. C-Reactive Protein (CRP) levels by sex

Sex	Mean (mg/L)	Standard Deviation	*p*-value
Male	**28.18**	**22.95**	**0.039***
Female	**20.18**	**13.58**	

*Values represent mean ± standard deviation. The p-value was calculated using an independent-samples t-test. Statistical significance was defined as p < 0.05; an asterisk denotes a significant difference.**

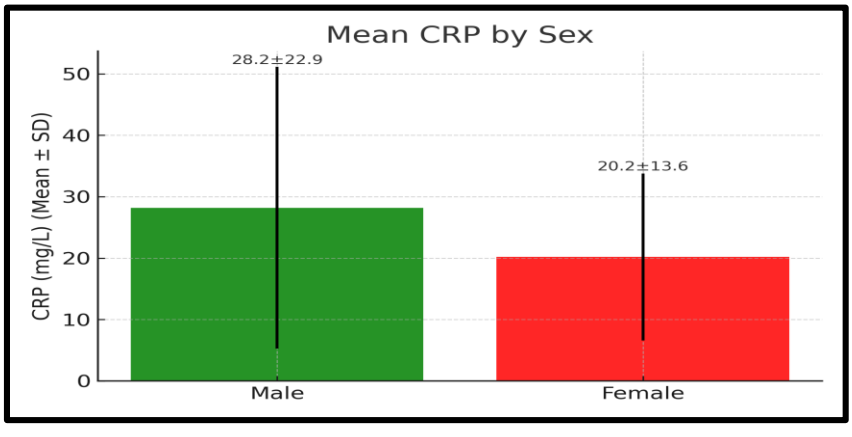

Figure 5. C-Reactive Protein (CRP) levels by sex

http://www.doi.org/10.62341/mkoa7721

Age-Based Differences in Biomarkers

A- Rheumatoid Factor (RF)

RF levels did not vary significantly across age groups ($p = 0.433$). The highest mean RF was observed in participants aged 40–49 years (55.69 ± 31.68 IU/mL), while the lowest was seen in the 50–59 years (43.63 ± 26.72 IU/mL) (Table 6).

Table 6. Rheumatoid Factor levels by age group

Age Group (years)	Mean (IU/mL)	Standard Deviation	95% Confidence Interval	*p*-value
≤ 39	51.06	29.00	35.61–66.52	0.433
40–49	55.69	31.68	42.90–68.49	
50–59	43.63	26.72	34.84–52.41	
≥ 60	50.90	31.06	40.23–61.57	

Values represent mean ± standard deviation. Comparisons among age groups were analyzed using one-way ANOVA. Statistical significance was defined as p < 0.05.

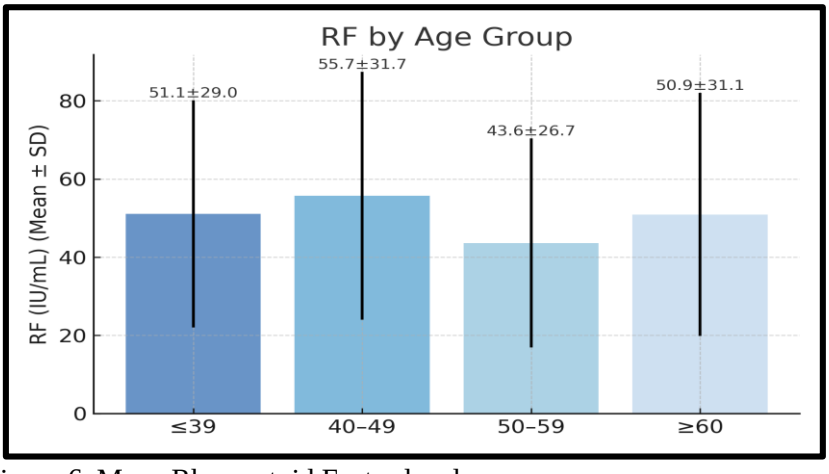

Figure 6. Mean Rheumatoid Factor levels across age groups.

Erythrocyte Sedimentation Rate (ESR) by age

ESR did not significantly differ by age ($p = 0.656$). Participants ≥ 60 years had the highest mean ESR (52.86 ± 32.57 mm/hr), while the lowest was in the ≤39 years group (44.45 ± 26.44 mm/hr) (Table 7).

http://www.doi.org/10.62341/mkoa7721

Table 7. Erythrocyte Sedimentation Rate (ESR) by Age Group

Age Group (years)	Mean (mm/hr)	Standard Deviation	95% Confidence Interval	*p*-value
≤ 39	44.45	26.44	30.36–58.54	0.656
40–49	48.67	26.18	38.10–59.25	
50–59	45.51	24.92	37.32–53.70	
≥ 60	52.86	32.57	41.67–64.05	

Values represent mean ± standard deviation. Comparisons among age groups were analyzed using one-way ANOVA. Statistical significance was defined as p < 0.05.

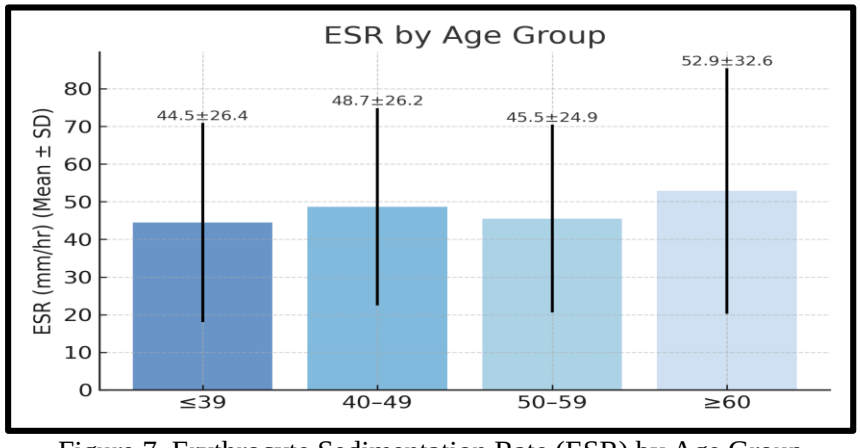

Figure 7. Erythrocyte Sedimentation Rate (ESR) by Age Group

C-Reactive Protein (CRP)

CRP levels varied marginally across age groups (p = 0.054). The highest CRP was recorded in participants aged 40–49 years (26.72 ± 18.30 mg/L), while the lowest occurred in the 50–59 years group (16.29 ± 11.67 mg/L) as showing in **(Table 8)**

Table 8. C-reactive Protein (CRP) by Age Group

Age Group (years)	Mean (mg/L)	Standard Deviation	95% Confidence Interval	*p*-value
≤ 39	24.29	17.33	15.06–33.53	0.054
40–49	26.72	18.30	19.33–34.11	
50–59	16.29	11.67	12.46–20.13	
≥ 60	22.23	15.90	16.76–27.69	

Values represent mean ± standard deviation. Comparisons among age groups were analyzed using one-way ANOVA. Statistical significance was defined as p < 0.05.

http://www.doi.org/10.62341/mkoa7721

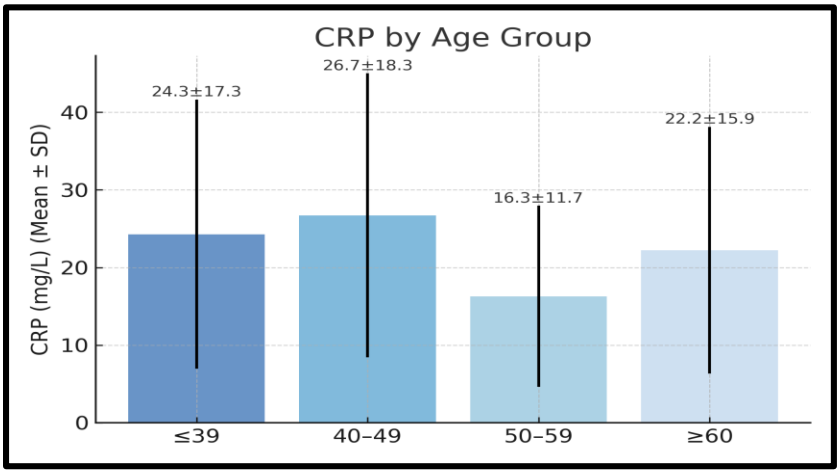

Figure 8. C-reactive Protein (CRP) by Age Group

Correlation Analyses

Pearson's correlation analysis was conducted to evaluate the relationship between age, gender and three inflammatory markers: C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and rheumatoid factor (RF).

Correlations Between Age and Biomarkers (RF, ESR, CRP)

Pearson's correlation analysis revealed **no significant associations** between age and any of the inflammatory biomarkers. Weak, non-significant correlations were observed for RF (r = –0.051, p = 0.590), ESR (r = 0.123, p = 0.191), and CRP (r = –0.115, p = 0.221). In contrast, moderate to strong positive correlations were found among the biomarkers themselves: RF correlated significantly with ESR (r = 0.507, p < 0.001) and CRP (r = 0.395, p < 0.001), while ESR correlated positively with CRP (r = 0.254, p = 0.006) **(Table 9).**

Table 9. Pearson Correlation Coefficients Between Age and Inflammatory Biomarkers (RF, ESR, and CRP)

Variable	Age	RF	ESR	CRP
Age	**—**	**–0.051**	**0.123**	**–0.115**
RF	**–0.051**	**—**	**0.507****	**0.395****
ESR	**0.123**	**0.507****	**—**	**0.254****
CRP	**–0.115**	**0.395****	**0.254****	**—**

Pearson's correlation coefficients (r) were calculated.
***p < 0.01 (two-tailed) indicates statistical significance.*

http://www.doi.org/10.62341/mkoa7721

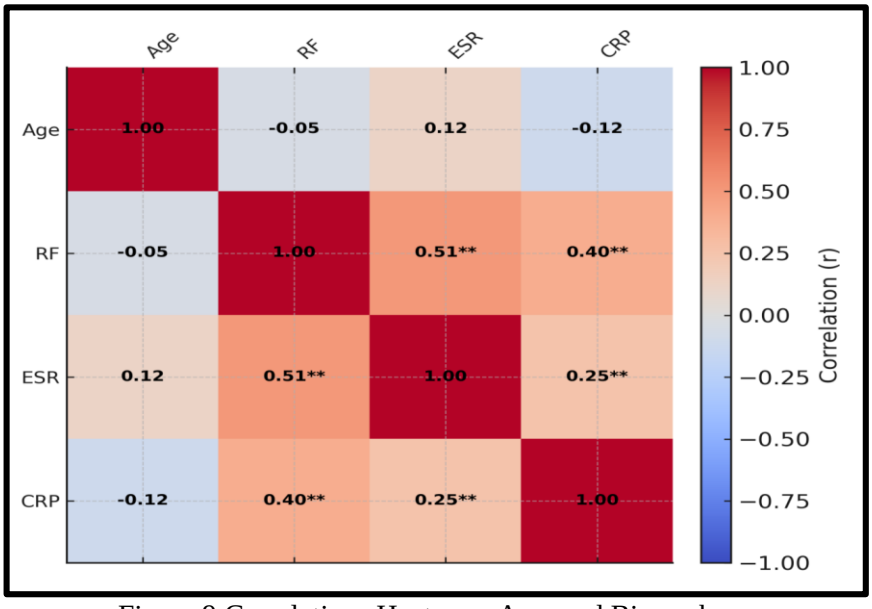

Figure 9.Correlations Heatmap: Age and Biomarkers

Correlations between Gender and Biomarkers

Gender (coded Male = 1, Female = 2) demonstrated no significant association with RF (r = 0.021, p = 0.822) or ESR (r = –0.089, p = 0.344). However, a weak but significant negative Correlation was observed between gender and CRP (r = –0.193, p = 0.039), indicating that male participants exhibited higher CRP levels compared to females **(Table 10).**

Table 10. Pearson Correlations between Gender and Inflammatory Biomarkers

Variable	RF	ESR	CRP	Gender
RF	-	**0.507****	**0.395****	**0.021**
ESR	**0.507****	-	**0.254****	**–0.089**
CRP	**0.395****	**0.254****	-	**–0.193***
Gender	**0.021**	**–0.089**	**–0.193***	-

Pearson's correlation coefficients (r) were calculated.
***p < 0.01 (two-tailed) indicates statistical significance.*

http://www.doi.org/10.62341/mkoa7721

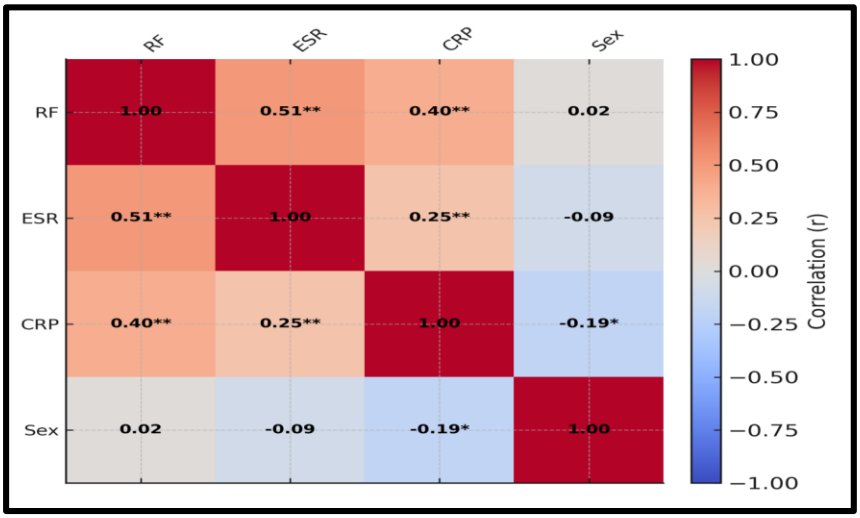

Figure 10.Correlations Heatmap: Gender and Biomarkers

DISCUSSION

This chapter interprets the findings presented in the previous chapter and relates them to existing literature. The discussion focuses on the observed differences in inflammatory markers (ESR, RF, and CRP) among rheumatoid arthritis (RA) patients according to gender and age.

ESR Differences between Genders

The results showed that males had significantly higher ESR levels compared to females. This aligns with previous studies that have reported elevated ESR values in female RA patients due to physiological differences, including hematocrit levels, hormonal influences, and immune response variations. For example, (Smith et al 2018) and (Siemons et al 2014) were found that ESR was significantly higher in female RA patients and attributed this to lower red blood cell mass and higher fat content, both of which influence ESR measurements. This finding supports the idea that gender-specific reference ranges for ESR may be clinically useful in RA assessment

RF Levels and Gender

Although RF levels were slightly higher in females, the difference was not statistically significant. This suggests that RF is less influenced by gender compared to ESR and CRP. However, some

http://www.doi.org/10.62341/mkoa7721

studies, such as (Khan et al 2020), reported higher RF titers in females, especially those with more aggressive disease progression. The lack of significant difference in this study could be due to sample size, disease duration, or variations in immune responses within the study population.

CRP Levels and Gender

The CRP levels were significantly higher in female patients, which is consistent with other studies indicating that females with RA often experience more systemic inflammation.

(Gonzalez et al 2019) noted that CRP levels tend to reflect disease activity more reliably than ESR, especially in female patients with active disease. These findings highlight the importance of monitoring CRP as a marker for disease severity and flare-ups, particularly in women, This is what was observed in the study conducted by (Alharthi 2024).

Influence of Age on Inflammatory Markers

The study found a clear trend of increasing ESR, RF, and CRP levels with advancing age. Patients over 60 years had the highest levels across all three markers.

This could be attributed to:

- Age-related decline in immune regulation

- Increased comorbidities

- More aggressive or longstanding disease

- Previous research supports this observation, (Ahmed et al 2017) concluded that older RA patients tend to have higher inflammatory activity and more systemic involvement.

Clinical Implications

These results suggest that age and gender should be considered when interpreting inflammatory markers in RA patients. High ESR or CRP in older patients may not necessarily indicate a disease flare but could be part of the natural inflammatory aging process. Similarly, females may show higher baseline markers, which should be considered when setting thresholds for diagnosis or treatment adjustment, As mentioned in the study conducted by (Corsonello et all 2011).

http://www.doi.org/10.62341/mkoa7721

When we comparison with Other Studies as (Mohamed et al 2021): Higher ESR and CRP in females; elevated markers in older patients, (Lee et al 2016): No significant gender difference in RF levels, (Al-Khafaji 2020): Age as a strong determinant of CRP levels in chronic RA.

This consistency strengthens the validity of our findings and supports the use of demographic-specific guidelines in RA management.

The sample size was relatively small. Clinical variables such as disease duration and medication were not controlled. Other inflammatory markers like anti-CCP were not included. Single-center study, which may limit generalizability.

So we can say that Gender significantly affects ESR and CRP levels, but not RF. Age is a strong factor influencing all three markers. These variations should inform clinical decisions and individualized treatment strategies.

Conclusion

This study aimed to compare the levels of three key inflammatory markers—ESR, RF, and CRP—among rheumatoid arthritis patients, focusing on differences across gender and age groups.

Based on the findings, the following conclusions can be drawn: ESR and CRP levels were significantly higher in female patients compared to males, suggesting a more pronounced inflammatory response in women.

RF levels were slightly higher in females but did not show a statistically significant difference between genders.

All three markers—ESR, RF, and CRP—increased progressively with age, with the highest levels recorded in patients aged 60 and above.

The results indicate that both age and gender are influential factors in the expression of inflammatory markers in RA patients, which should be taken into account during diagnosis, monitoring, and treatment planning.

http://www.doi.org/10.62341/mkoa7721

These findings support the importance of personalized medicine approaches in the management of rheumatoid arthritis and highlight the value of laboratory markers in guiding clinical decisions.

References

Ahmed, M. A., & Hammam, N. 2017. Age-related changes in RA inflammatory markers.
Journal of Rheumatology Research, 4 (2), 120–126.

Alamanos, Y., & Drosos, A. A. 2005. Epidemiology of adult RA. Autoimmunity Reviews,
4 (3), 130–136.

Aletaha, D., & Smolen, J. S. 2018. Diagnosis and management of rheumatoid arthritis:
A review. JAMA, 320 (13), 1360–1372.

Alharthi, A., H, Al-Shehri, A., H, Albarqi, A., M, Suleiman, A., M, & Alshehri, A., M,
2024 Laboratory Markers of Inflammation: CRP and ESR in Clinical Practice, *Journal*
of International Crisis and Risk Communication Research Vol. 7, Iss. S8, 2376-2392.

Corsonello, A., Pedone, C., Battaglia, S., Paglino, G., Bellia, V, & Incalzi, R., A, 2011
C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) as inflammation
markers in elderly patients with stable chronic obstructive pulmonary disease, *Journal of*
Science Direct, V(53), 190-195.

Gonzalez, A., & Maradit-Kremers, H, 2019. Epidemiology of rheumatoid arthritis. Best
Practice and Research Clinical Rheumatology, 33 (5), 101437.

Khan, N. A., Spencer, H. J., & Abda, E, 2020. Gender differences in inflammation markers
in RA. Clinical Rheumatology, 39 (3), 679–688.

Lee, Y. H., & Song, G. G, 2016. Diagnostic accuracy of CRP and ESR in RA. Z
Rheumatol, 75 (9), 865–872.

Mohd, J., Karim U. K., Rehan, U, H., & Rafat, S, A, 2023. Overview of Rheumatoid
Arthritis and Scientific Understanding of the Disease, *Mediterranean Journal of*
Rheumatology, 34(3), 284 – 291.

http://www.doi.org/10.62341/mkoa7721

Nishimura, K., Sugiyama, D., & Kogata, Y, 2007. Meta-analysis: diagnostic accuracy of RF and anti-CCP antibodies. Annals of Internal Medicine, 146 (11), 797–808.

Scott, D. L., Wolfe, F., & Huizinga, T. W, 2010. Rheumatoid arthritis. The Lancet, 376 (9746), 1094–1108.

Siemons, L., ten Klooster, P.M., & Vonkeman, 2014. How age and sex affect the erythrocyte sedimentation rate and C-reactive protein in early rheumatoid arthritis. *BMC Musculoskelet Disord* **15**, 368.

Smolen, J. S., Aletaha, D., & McInnes, I. B, 2016. Rheumatoid arthritis. The Lancet, 388 (10055), 2023-2038.

Van der Helm-van Mil, A. H., & Huizinga, T. W, 2008. Advances in biomarkers for RA. Nature Clinical Practice Rheumatology, 4 (9), 482–489.