



Understanding Rheumatoid Disease in the Context of age and gender

Mariam A. Abdal GHader Ibrahim^{1*}, Eman K Saaf², Sundis Ali Abd alsalam³
^{1,2,3}Department of Chemistry, Faculty of Science, Omar El-Mukhtar University, EL Beida, Libya

دراسة حول مرض الروماتويد وعلاقته العمر والجنس

مريم عبد الله عبد القادر إبراهيم^{1*}، إيمان خليفة سعد²، سندس علي عبد السلام³
^{1,2,3}قسم الكيمياء، كلية العلوم، جامعة عمر المختار، البيضاء، ليبيا

*Corresponding author: Mariam.ibrahm@omu.edu.ly

Received: March 27, 2026

Accepted: May 07, 2026

Published: May 23, 2026

Copyright: © 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract:

Rheumatoid arthritis (RA) is a chronic autoimmune disease in which rheumatoid factor (RF) remains one of the most commonly used serological markers for diagnosis and clinical assessment. This study aimed to evaluate the distribution of RF results according to age and gender among individuals attending Al-Burj Medical Laboratory, Al-Bayda, Libya. A retrospective descriptive study was conducted on 106 serum samples collected during a six-month period in 2023. RF levels were measured using the Roche Cobas Integra 400 Plus analyzer and the RF-II immunoturbidimetric assay. Of the analyzed samples, 84 (79%) were from females and 22 (21%) from males. Elevated RF values were more frequently observed in females older than 40 years and males older than 60 years. According to the laboratory reference range, 91 samples (86%) showed normal RF values, whereas 15 samples (14%) exhibited abnormal levels. These findings demonstrate a predominance of RF positivity among females and older age groups, consistent with the known epidemiological pattern of RA. Further studies involving larger populations and additional biomarkers such as anti-CCP antibodies are recommended.

Keywords: Rheumatoid arthritis; Rheumatoid factor; RF; Autoimmune disease; Serological markers; Age distribution; Gender distribution; Libya.

المخلص:

يُعد التهاب المفاصل الروماتويدي (RA) من الأمراض المناعية الذاتية المزمنة، ويُعتبر عامل الروماتويد (RF) من أهم المؤشرات المصلية المستخدمة في تشخيصه وتقييمه سريريًا. هدفت هذه الدراسة إلى تقييم توزيع نتائج فحص عامل الروماتويد وفقاً للعمر والجنس لدى الأفراد المترددين على مختبر البرج الطبي بمدينة البيضاء - ليبيا. أجريت دراسة وصفية استيعابية شملت 106 عينات مصلية جُمعت خلال ستة أشهر من عام 2023. تم قياس مستويات عامل الروماتويد باستخدام جهاز Roche Cobas Integra 400 Plus والكاشف RF-II المعتمد على تقنية الفحص المناعي العكسي. أظهرت النتائج أن 84 عينة (79%) كانت للإناث و22 عينة (21%) للذكور، كما لوحظت القيم المرتفعة لعامل الروماتويد بصورة أكبر لدى الإناث فوق عمر 40 سنة ولدى الذكور فوق عمر 60 سنة. ووفقاً للقيم المرجعية للمختبر، كانت 91 عينة (86%) ضمن الحدود الطبيعية، بينما أظهرت 15 عينة (14%) قيماً غير طبيعية. تشير النتائج إلى زيادة إيجابية عامل الروماتويد بين الإناث والفئات العمرية الأكبر سناً، بما يتوافق مع الأنماط الوبائية المعروفة لالتهاب المفاصل

الروماتويدي. وتوصي الدراسة بإجراء دراسات أوسع تشمل مؤشرات حيوية إضافية، خاصة الأجسام المضادة للبيتيدات السيتروكلينية الحلقية (Anti-CCP).

الكلمات المفتاحية: التهاب المفاصل الروماتويدي؛ عامل الروماتويد؛ RF؛ الأمراض المناعية الذاتية؛ المؤشرات المصلية؛ التوزيع العمري؛ التوزيع حسب الجنس؛ ليبيا.

Introduction:

Rheumatoid arthritis (RA) is a persistent autoimmune disorder marked by joint inflammation and progressive structural damage that can lead to long-term disability. It affects between 0.5% and 1% of the global adult population, disproportionately targeting women [1]. Given the significant socioeconomic and health burdens associated with RA, prioritizing early detection and continuous monitoring is vital [2].

The development of rheumatoid arthritis (RA) stems from an intricate interplay between an individual's genetic predisposition and environmental triggers, which ultimately precipitates immune system dysregulation and enduring inflammation. Within the synovium, fibroblast-like synoviocytes (FLS) act as primary drivers of tissue proliferation and joint damage, whereas the advancement of the disease is fueled by pro-inflammatory cytokines [3]. From a genetic perspective, susceptibility to RA is heavily linked to specific variants, particularly those located inside the HLA region [4].

Rheumatoid factor (RF) is one of the most widely used serological markers in the diagnosis and clinical assessment of RA. Although RF lacks complete specificity, elevated levels are frequently associated with disease severity and may aid in identifying individuals at increased risk of developing rheumatoid arthritis. The diagnostic value of RF can be further enhanced when combined with other biomarkers, particularly anti-cyclic citrullinated peptide (anti-CCP) antibodies [5][6].

Despite the widespread use of RF testing, data describing its distribution among different demographic groups remain limited in Libya. Therefore, the present study aimed to evaluate the distribution of rheumatoid factor results according to age and gender among individuals attending Al-Burj Medical Laboratory in Al-Bayda, Libya.

Materials and Methods:

This retrospective descriptive study was conducted at Al-Burj Medical Laboratory, Al-Bayda, Libya, using rheumatoid factor (RF) test records collected over a six-month period during 2023. The study aimed to investigate the distribution of RF results among different age groups and genders and to determine the prevalence of abnormal RF values within the studied population.

A total of 106 serum samples were included in the analysis. Demographic data, including age and gender, were obtained from laboratory records. The study population consisted of 84 females and 22 males representing various age groups.

Rheumatoid factor measurements were performed using the Roche Cobas Integra 400 Plus automated clinical chemistry analyzer (Roche Diagnostics). Serum samples were analyzed using the cobas c pack RF-II reagent kit (RF-II, Rheumatoid Factors II; REF No. 20764574322), which is based on an immunoturbidimetric assay principle. The assay quantitatively measures rheumatoid factor levels through the formation of immune complexes that produce changes in turbidity proportional to the concentration of RF in the sample. To maintain consistency, all procedures adhered strictly to the manufacturer's guidelines and were executed under controlled laboratory conditions.

RF results were interpreted according to the laboratory reference range. Values below 14 IU/mL were considered normal, whereas values greater than 14 IU/mL were classified as abnormal. The obtained results were subsequently categorized and evaluated according to age and gender.

Data were summarized using descriptive statistical methods. Frequencies and percentages were calculated to determine the distribution of RF results among the studied population. Graphical representations were used to illustrate age- and gender-related variations as well as the proportion of normal and abnormal RF values.

Results and Discussion:

A total of 106 rheumatoid factor (RF) test records were analyzed during the study period. Female participants constituted the majority of the investigated population, accounting for 84 cases (79%), whereas males represented 22 cases (21%). This marked predominance of females is consistent with the well-established epidemiological pattern of rheumatoid arthritis, which has been reported to affect women approximately two to three times more frequently than men [1]. Previous epidemiological studies have attributed this disparity to hormonal influences, genetic susceptibility, and sex-related differences in immune regulation [4][7].

Analysis of RF results according to age demonstrated that elevated RF values among females were more frequently observed after the age of 40 years. In contrast, higher RF values among males were predominantly observed in older individuals, particularly those above 60 years of age. These findings

are in agreement with previous reports indicating that rheumatoid arthritis is most commonly diagnosed during middle age and that disease prevalence increases with advancing age [1] The observed age-related pattern may reflect cumulative exposure to environmental risk factors together with progressive alterations in immune function that accompany aging [8].

Evaluation of RF concentrations according to the laboratory reference range revealed that 91 samples (86%) exhibited RF values within the normal range, whereas only 15 samples (14%) showed abnormal RF values exceeding 14 IU/mL. Although the proportion of positive RF results was relatively low, the presence of elevated RF levels remains clinically relevant because RF is one of the most widely used serological markers for the diagnosis and assessment of rheumatoid arthritis. Elevated RF concentrations have been associated with increased disease severity and a greater likelihood of extra-articular manifestations [9].

The predominance of normal RF values observed in the present study may be explained by the heterogeneous nature of the tested population, as RF testing is frequently requested for individuals presenting with nonspecific musculoskeletal symptoms rather than confirmed rheumatoid arthritis. Furthermore, RF lacks absolute specificity and sensitivity for RA, emphasizing the importance of combining RF measurements with additional biomarkers, particularly anti-cyclic citrullinated peptide (anti-CCP) antibodies, to improve diagnostic accuracy [10]. Previous studies have demonstrated that anti-CCP antibodies provide superior specificity and may be detectable during the early stages of disease development, making them valuable complementary markers in clinical practice.

Overall, the findings of the present study indicate a higher frequency of RF testing among females and an apparent increase in RF positivity with advancing age. These observations support previously reported demographic trends of rheumatoid arthritis and highlight the importance of serological screening in populations at increased risk of disease development

Table (1): Demographic characteristics of the study population

Variable	Number (n)	Percentage (%)
Female	84	79
Male	22	21
Normal RF	91	86
Abnormal RF	15	14
Total	106	100

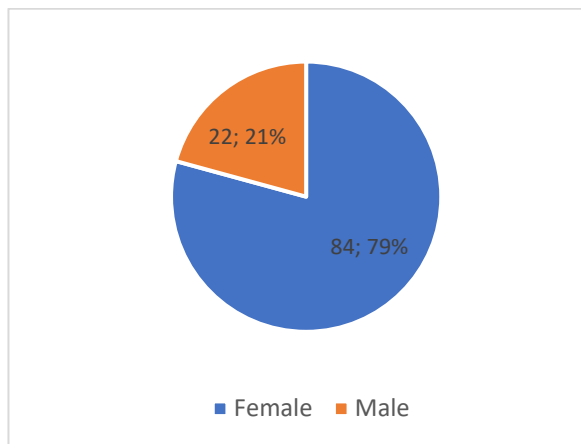


Figure (1): Gender distribution of the study population.

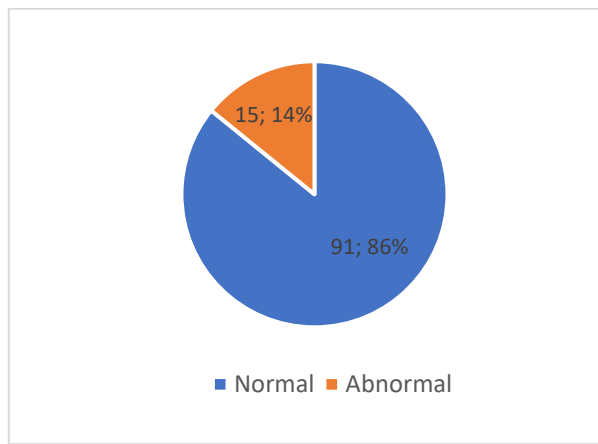


Figure (2): Distribution of normal and abnormal rheumatoid factor results in the study population.

The study population consisted of 84 females (79%) and 22 males (21%). To determine whether the observed higher frequency of abnormal RF values in females was statistically significant, a Chi-square test of independence was performed table 1.

Gender	Normal RF	Abnormal RF	total	Chi square	P – value
Female	71	13	84	0.117	0.732
Male	20	2	22		
Total	91	15	109		

Statistical analysis revealed a Chi-square $0.117 = (df = 1)$ with a corresponding P-value of 0.732. Since $P > 0.05$, the findings indicate no statistically significant association between gender and RF positivity within the studied cohort, despite the apparent numerical predominance among females. This lack of statistical significance is primarily attributed to the small sample size of male participants relative to females (22 vs. 84) and the heterogeneous nature of patients attending a general medical laboratory. This reinforces the study's recommendation for larger future cohorts to capture more precise epidemiological correlations.

Conclusion:

The present study demonstrated a higher frequency of rheumatoid factor (RF) testing among females than males, with elevated RF values being more commonly observed in older age groups, particularly among females over 40 years and males over 60 years. Although most samples exhibited RF values within the normal reference range, abnormal RF levels were identified in a subset of participants, highlighting the continued clinical importance of RF as a serological marker in the evaluation of rheumatoid arthritis.

The relatively small sample size and the absence of anti-cyclic citrullinated peptide (anti-CCP) antibody measurements represent limitations of the present study. Nevertheless, the observed findings were consistent with established epidemiological patterns of rheumatoid arthritis and provide preliminary data on RF distribution within the Libyan population. Further studies involving larger cohorts and additional biomarkers are recommended to improve disease characterization and early detection.

References:

1. Mohamed, E. A., & Mohamed, Z. A. E. L. (2015). Rheumatoid arthritis: The effect of physical rehabilitation guideline on improvement the activity of daily living (ADL) of female patients. *Assiut Scientific Nursing Journal*, 3(5), 176–191.
2. Cutolo, M., Kitas, G. D., & van Riel, P. L. (2014). Burden of disease in treated rheumatoid arthritis patients: going beyond the joint. *Seminars in Arthritis and Rheumatism*, 43(4), 479–488.
3. Nygaard, G., & Firestein, G. S. (2020). Restoring synovial homeostasis in rheumatoid arthritis by targeting fibroblast-like synoviocytes. *Nature Reviews Rheumatology*, 16(6), 316–333.
4. Okada, Y., Wu, D., Trynka, G., Raj, T., Terao, C., Ikari, K., Plenge, R. M., et al. (2012). Genetics of rheumatoid arthritis contributes to biology and drug discovery. *Nature*, 506(7488), 376–381.
5. Majithia, V., & Geraci, S. A. (2007). Rheumatoid arthritis: diagnosis and management. *The American Journal of Medicine*, 120(11), 936–939.
6. Abdelhafiz, D., Kilborn, S., & Bukhari, M. (2021). The role of 14-3-3 η as a biomarker in rheumatoid arthritis. *Rheumatology and Immunology Research*, 2(2), 87–90.
7. Vos, T., Allen, C., Arora, M., Barber, R. M., Bhutta, Z. A., Brown, A., Boufous, S., et al. (2016). Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: A systematic analysis for the Global Burden of Disease Study 2015. *The Lancet*, 388(10053), 1545–160.
8. Ghorban, K., Ezzeddini, R., Eslami, M., Yousefi, B., Moghaddam, B. S., Tahoori, M. T., Farrokhi, A. S., et al. (2019). PTPN22 1858 C/T polymorphism is associated with alteration of cytokine profiles as a potential pathogenic mechanism in rheumatoid arthritis. *Immunology Letters*, 216, 106–113.
9. Raychaudhuri, S., Sandor, C., Stahl, E. A., Freudenberg, J., Lee, H. S., Jia, X., De Bakker, P. I., et al. (2012). Five amino acids in three HLA proteins explain most of the association between MHC and seropositive rheumatoid arthritis. *Nature Genetics*, 44(3), 291–296.
10. Takase-Minegishi, K., Horita, N., Kobayashi, K., Yoshimi, R., Kirino, Y., Ohno, S., Emery, P., et al. (2018). Diagnostic test accuracy of ultrasound for synovitis in rheumatoid arthritis: Systematic review and meta-analysis. *Rheumatology*, 57(1), 49–58.