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Evaluation of Several Hematologic and Serological Parameters in Rheumatoid Arthritis Patients

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Abstract

Rheumatoid arthritis (RA) is a chronic inflammatory disease that primarily affects the synovial joints and produces recurring inflammation of the synovial membrane, which ultimately causes joint degeneration, deformity, and disability. The current study included 110 blood samples collected from patients infected with rheumatoid arthritis (60) and 50 blood samples from controls. The results showed that investigation of some hematological tests revealed a high significant erythrocyte sedimentation rate (ESR) for the patient group compared to the control group (28.25 ± 2.72, 16.24 ± 1.83), respectively. But it is non-significant for patients for (WBC, RBC, and PLT) was (7.34 ± 0.25, 4.71 ± 0.08, and 248.26 ± 9.18), while the control group was (6.73 ±0.19, 4.96 ±0.10, and 263.64 ±8.26), respectively. As well as the result of the rheumatoid arthritis factor (Rh) level, there was a significant increase in patients with positive RF 45 (75.00%) and negative RF 15 (25.00%). while the result for the C-reactive protein (CRP) test for patients was positive 26 (43.33%) and negative 34 (56.67%).

Keywords: Rheumatoid arthritis, serologic test, CBC test, autoimmune disease, RF factor.

1. Introduction

Rheumatoid arthritis is a disordered inflammation resulting from a chronic autoimmune response, that affects both small and large joints in the body. Without treatment, this disease significantly shortens the patient's life, so it also indirectly results in death [1-3]. The pathogenesis of rheumatoid arthritis may be heterogeneous and have complex manifestations, as autoantibodies are a feature of positive rheumatoid arthritis, as they are a biomarker of an erosive disorder of the joint surface. Also, many changes may occur before the clinical onset of the disease; this stage may last for several years and may be characterized by the appearance of autoantibodies without any signs of arthritis [4]. We used the measure of the Erythrocyte Sedimentation Rate (ESR), which is a laboratory indicator for disease activity in clinical medicine and is still an important tool for tracking inflammatory diseases, especially rheumatoid arthritis [5, 6]. Therefore, ESR is a vital component of several rheumatic criteria for determining disease activity and improvement, as well as a laboratory activity sign for its treatment [7, 8]. The erythrocyte sedimentation rate (ESR) is used to track the body's heightened inflammatory activity [9, 10]. Although the ESR test lacks specificity, which is the only negative of its use in assessing illness severity, it can be increased in a variety of disorders through infections and

inflammation in addition to autoimmune diseases, as in the present results, this current study is compatible with [11], which concluded that ESR values can be raised in RA and utilized as a screening test to determine the intensity of the disease, although it has considerably poorer specificity than CRP and RF. The reason for elevated levels of ESR in RA may be an increase in fibrinogen levels, which makes the red blood cells sticky and accelerate the sedimentation process [12]. However, the rheumatoid factor (RF) is an autoantibody that targets the immunoglobulin G (IgG) fc, or crystallizable fragment. These autoantibodies target the joints during inflammation. Recently, the presence of anti-citrullinated protein antibodies (ACPAS) has been associated with rheumatoid arthritis. These autoantibodies target the joints during inflammation by modifying proteins in inflamed joints [13-15]. Therefore, one of the most important diagnostic criteria for rheumatoid arthritis, according to the European League Against Rheumatism (EULAR), is RF, in addition to anti-citrullinated protein antibodies (ACCPA) as serological markers. Several studies have suggested these tests as the best predictors of rheumatoid arthritis and also of cartilage and bone destruction [16-19]. As well as the C-reactive protein (CRP), is a cyclic protein with five links that is detected in blood plasma and rises in response to inflammation predominantly in the liver, though it can also be made by fat and inflammatory cells because it was initially discovered to be a material in the blood of individuals with acute inflammation that reacts with the carbohydrate (C) antibody in the pneumococcal capsule. The designation name given to CRP is due to the fact that CRP is high in persons with underlying illnesses such as advanced cancer, hepatitis, arthritis, tissue damage, viral or bacterial infection, and several other autoimmune problems [20, 21]. The aim of the current study is to assess the levels of some hematological parameters, including erythrocyte sedimentation rate (ESR), complete blood count (CBC), and blood groups in the studied groups (patients and controls), in addition to the estimated serological tests, including rheumatoid factor (RF) and C-reactive protein in these groups.

2. Materials and Methods

The present study included 110,000 blood samples collected from patients with rheumatoid arthritis by a rheumatology clinic in the Baghdad Teaching Hospital of Iraq from October 2022 to December 2022. A medical history was collected from each patient (age, sex, address, and absence of other diseases). The number was 21 males and 39 females. The ages ranged from 20 to 69 years, and 50 healthy persons (21 males and 29 females) were included for comparison. 5 milliliters of blood samples were divided into two test tubes; 3 ml of blood samples were left to clot at room temperature for 10–15 minutes and then centrifuged at 2500 rpm for 15 minutes to obtain serum for CRP, RF tests, and 2 ml EDTA tubes for ESR and blood grouping tests [22].

3. Results and Discussion

3.1. Erythrocyte Sedimentation Rate (ESR), WBC, RBC and PLT in rheumatoid arthritis patients and control groups

The current results show that the hematologic indicators had a highly significant ($P \leq 0.01$) value for ESR (28.25 ± 2.72) for patients and (16.24 ±1.83) for control, but there were no significant differences for other parameters (WBC, RBC, and PLT) (7.34 ± 0.25, 4.71 ± 0.08, and 248.26 ±9.18, respectively) for patients compared with the control group (6.73 ±0.19, 4.96 ±0.10, 263.64 ±8.26, respectively) **Table 1**

Table 1. Comparison between ESR, WBC, RBC and PLT parameters of patients and control groups**.**

Group	Mean ± SE			
	ESR (mm/h)	**WBC**	**RBC**	**PLT (%)**
Patients	28.25 ±2.72	7.34 ±0.25	4.71 ±0.08	248.26 ±9.18
Control	16.24 ±1.83	6.73 ±0.19	4.96 ±0.10	263.64 ±8.26
T-test	6.789 **	0.643 NS	0.252 NS	24.935 NS
P-value	0.0001	0.0624	0.0571	0.224
** Highly significant at (P≤0.01), NS= Non-Significant.				

As in the present results, this current study is compatible with [23], which concluded that ESR values can be raised in RA and utilized as a screening test to determine the intensity of the disease, although it has considerably poorer specificity than CRP and RF and corresponds to [11], whose result of the average ESR in the patient group was 42.7 ± 31, while in the control group it was 12.2 ± 3.0. As for the non-significant results of the WBC, RBC, and PLT parameters, they comply with [12]. This may be due to the fact that most of the patients used anti-rheumatic drugs, including MTX, as their primary medication or other treatments to control this disease. Therefore, the percentages of some results for patients remained normal and approached the control group.

3.2. Blood groups in rheumatoid arthritis patients and control groups

The results showed that blood groups were highly significant (P≤0.01) in blood group O (28 (46.67%)), which was the most prevalent among rheumatoid patients, followed by blood group B (15 (25.00%)), blood group A (13 (21.67%)), then blood group AB (4 (6.67%)), and highly significant for the control group as 21 (42.00%), 17 (34.00%), 8 (16.00%), and 4 (8.00%), respectively, but there are no differences between the same type for each of the study groups as shown in **Tables 1–2**.

Table 2. Distribution of study samples according to Blood groups in patients and control.

Group	No	A	B	AB	O	P-value
		No. (%)	**No. (%)**	**No. (%)**	**No. (%)**	
Patients	60	13 (21.67%)	15 (25.00%)	4 (6.67%)	28 (46.67%)	0.0002 **
Control	50	8 (16.00%)	17 (34.00%)	4 (8.00%)	21 (42.00%)	0.0021 **
P-value	--	0.071 NS	0.502 NS	1.00 NS	0.328 NS	---
** Highly significant at (P≤0.01) , NS= Non-Significant.						

Since blood type O is the largest proportion in these results, this may be because the majority of the Iraqi population has blood group O, so the results showed that the highest incidence of rheumatoid arthritis was in this group. This result conforms to [24]. That showed the study a result: the blood group O has the greatest percentage of patients with rheumatoid arthritis disease.

3.3. Rheumatoid factor (RF) percentage in rheumatoid arthritis patients and control groups

The study results showed a highly significant increase (P<0.01) of the rheumatoid factor influence in patients with rheumatoid arthritis; the positive percentage was in 45 (75.00%) and the negative in 15 (25.00%), while the results of the control group were in the positive percentage (0.00%) and the negative in 50 (100%), as shown in **Tables 1–3**.

Table 3. The percentage of rheumatoid factor in patients and control groups.

Group	No	Positive+ No. (%)	Negative- No. (%)	P-value
Patients	60	45 (75.00%)	15 (25.00%)	0.0001 **
Control	50	0 (0.00%)	50 (100%)	0.0001 **
P-value	--	0.0001 **	0.0001 **	---

** Highly significant at (P≤0.01).

The current study corresponds to [25], where (76%) were positive, (24%) were negative, and the control group was negative (100%). According to the results, the pathogenic factor played a significant role in infections as a result of the combination of antibodies in the inflammatory position, and this came in conformity with [26]. Therefore, the RF-positive percentage in patients is higher than the RF-negative.

Patients with rheumatoid arthritis and many other non-rheumatic disorders, including infections and chronic diseases, might show signs of the immunoglobulin class known as rheumatoid factors [27, 28]. According to numerous studies, the acuteness of rheumatoid arthritis disease and the rheumatic component are strongly correlated because this factor is titer as a measure of the depth of medication response rather than a prediction of the length or severity of the disease, so the value is lower in cases where the clinical symptoms decrease in patients [29].

3.4. C-reactive protein in rheumatoid arthritis patients and control groups

The results of C-reactive protein showed non-significant differences; the positive percentage was in 26 patients (43.33%), and the negative was in 34 (56.67%). While it was not expressed in the healthy group (0.00%), as shown in **Table 1-4**.

Table 4. The percentage of C - reactive protein in patients and control groups.

Group	No	Positive No. (%)	Negative No. (%)	P-value
Patients	60	26 (43.33%)	34 (56.67%)	0.302 NS
Control	50	0 (0.00%)	50 (100%)	0.0001 **
P-value	--	0.0001 **	0.0037 **	---

**Highly significant at (P≤0.01) , NS= Non-Significant.

C- reactive protein and serum ferritin are two of the most widely used acute phase indicators and have great value for monitoring disease activity; therefore, CRP was detected in some samples of patients with rheumatoid arthritis [30,31]. Other studies indicated that an increase in its concentration is associated with the severity of rheumatoid arthritis disease, and this illustrated the expression result in some infected patients without the other samples [32].

4. Conclusion

The high levels of ESR in (RA) patients were higher than the control, but no differences were observed in the numbers of WBC, RBC, and PLT in these patients , and There were significant differences in the levels of RF, and CRP for patients compared with the control.

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Conflict of Interest

There are no conflicts of interest.

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Ethical Clearance

The samples were gained according to Local Research Ethics Committee approval in Iraqi Ministry of Health No. 135857i on 6 /10/2022.

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