



HEMOGLOBIN, ESR, IRON & TIBC, URIC ACID AND CRP LEVELS IN RHEUMATOID ARTHRITIS PATIENTS

Orthopaedics

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ABSTRACT

Rheumatoid arthritis (RA) is a chronic systemic inflammatory disease that causes joint destruction and functional disability. In this study we take 200 normal individual and 200 rheumatoid arthritis patient. For the biochemical parameter to be analyzed, blood samples were drawn from the antecubital vein avoiding venostasis. In all subjects a blood sample was collected after an overnight fast. The study found a significant decreased Hb% and significantly lower levels of serum iron & TIBC in RA patients as compared to control. The result suggested that routine dietary supplementation with multivitamins and a trace element is appropriate in rheumatoid arthritis patients.

KEYWORDS

Rheumatoid arthritis, Iron, TIBC, Uric acid, Anemia

INTRODUCTION:

Rheumatoid arthritis (RA) follows a chronic course and invariably involves significant long-term disability and morbidity. (1,2). Erythrocyte sediment rate (ESR) and C-reactive protein (CRP) are non-specific acute phase reactants. CRP is one of the best indicators of inflammation. It is synthesized in hepatocytes and its level increases in cases of infection, inflammation, malignancy and tissue damage. [3] ESR is an indirect marker of inflammation and is affected by conditions such as age, gender and anemia. [4] Although they are not specific, it was shown in the laboratory studies that ESR and CRP levels correlate with disease activation and radiographic findings in RA patients. [5] In addition to studies in literature revealing the fact that CRP is the most useful indicator in evaluation of disease activity, [6] there are also publications stating that there is strong correlation between disease and severity, and ESR.

Rheumatoid arthritis (RA) is a chronic systemic inflammatory disease that causes joint destruction and functional disability (7). Although recent advances in new therapeutic strategies and the development of biological agents have improved the prognosis of RA, a subset of patients do not respond to these biological agents (8). When dealing with patients with RA in both daily clinical practice and clinical trials, it is important to assess their disease activity and treatment response properly and accurately. The disease activity score (DAS), which combines information about swollen joints, tender joints, the acute phase response, and general health, is useful for this purpose (9). Laboratory markers such as the erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels have also been used as markers of inflammation (10-11). ESR is determined by a common hematological test and is the rate with which red blood cells sediment over a period of one hour. While it is a useful marker for evaluating disease activity, it is a non-specific measure of inflammation. Iron plays an important role in oxygen delivery, electron transport for energy procurement, the production of RNA by ribonucleotide reductase and cell division. Iron plays a potential role in oxidative stress mediated injuries and pathologies eg. rheumatoid arthritis (RA). Four decades ago it was suggested that iron may have a crucial role in the progression of inflammation in RA. Indeed, free radicals generated by iron can cause damage to lipids, proteins, carbohydrates and DNA. It is this believed to occur in rheumatoid joint (12). Our aim is to study the levels of ESR, Hemoglobin, Iron & Total iron binding capacity in patients with rheumatoid arthritis as compared to control.

MATERIAL & METHODS:

This study was undertaken in the Department of Orthopaedics, Sri Lakshminarayana Institute of Medical sciences, Pondicherry. The study was performed in 400 individuals of different age (20-70 years). In this study we take 200 normal individual and 200 rheumatoid arthritis patient. For the biochemical parameter to be analyzed, blood samples were drawn from the antecubital vein avoiding venostasis. In all

subjects a blood sample was collected after an overnight fast. Plain & Citrate vials were used for the estimation of ESR, Hb, Iron and TIBC respectively. ESR, Hb percentage, Iron, TIBC, CRP and Uric acid were measured.

Statistical Analysis :

The data are expressed as mean \pm sd. Statistical comparisons were performed by student t test.

RESULTS:

Present study the level of hemoglobin is significantly decreased ($p < 0.001$) in rheumatoid arthritis as compared to control. ESR, CRP and Uric acid is significantly increased in study group as compared to control. The Iron and TIBC levels were significantly decreased in study group as compared to control. Decreased levels of total iron binding capacity found in study group as compared to control.

DISCUSSION:

RA is a disease seen with inflammation in multiple joints, characterized by symmetrical and erosive synovitis which can develops severe disability and deformities, etiology of which is not known, with a chronic course and inflammatory character and which is systemic and autoimmune. It is seen in the whole world and in all races and ethnic groups. [13] The target in RA treatment is relief of pain, taking the disease under control, and prevention of joint erosions and systemic complications. RA is suspected, persistent joint swelling in more than 1 joint, early morning stiffness ≥ 30 minutes, or involvement of metacarpophalangeal or metatarsophalangeal joints.

CRP is one of the best indicators of inflammation. It is synthesized in hepatocytes and its level increase in cases of infection, inflammation, malignancy and tissue damage. [1, 13] CRP reflects short term change in disease activity in RA. [14] ESR is an indirect indicator of inflammation and its level is affected by conditions such as age, gender, anemia, fibrinogen level hypermagalobune and RF. [4] ESR reflects the past few weeks of disease activity in RA. [14] Despite their not being specific, it was shown in laboratory studies that ESR and CRP levels correlate with disease activity and radiographic findings in RA patients. [5, 15] In a study conducted by Mallya et al. in patients with RA, they examined the relation between ESR and CRP values, and objective, semi-objective and objective criteria of RA and they revealed the fact that there is a strong correlation between both ESR and CRP values and CRP showed a stronger relation compared to ESR with subjective and semi-objective criteria, including the morning arrest [15].

In this study, there was significant decrease in ESR values in the study and control group. There was no relation between CRP and disease activity in the control group. In the same way there was no relation between ESR and disease activation in the control group. As a result of

this study, we can say that there is a better correlation between disease activation and ESR in long-term in RA patients.

The causes of anemia in RA are not entirely clear although more than 60% of cases are anemia of chronic disease. Most common inflammatory rheumatic diseases are complicated by hematological abnormalities, including anemia, disorders of leukocytes, platelets, and the coagulation system, and hematological malignancy (16). Patients with rheumatoid arthritis (RA) may suffer from a variety of hematologic disorders, particularly anemia, leucopenia and thrombocytes.

We found that the high ESR group had significantly higher erosion score than control group. The disease duration may have contributed to higher erosion score in the high ESR group. Therefore, higher erosion score in high ESR group may be due not only to the disease duration but also to other inflammatory conditions. In addition, the vitamin B6 status of RA patients appears to associate with disease activity. Thus, the lower alanine aminotransferase levels in the high ESR group (compared to the low ESR group) may also be related to their higher levels of chronic inflammation. In terms of laboratory findings, the patients in the high ESR group had significantly lower alanine aminotransferase levels than the patients in the control group. Previous studies they mentioned ESR is a non-specific test that can be affected by many factors other than the acute phase response, including age, sex, the size, shape and number of erythrocytes, other plasma constituents (such as serum immunoglobulins and rheumatoid factor), various drugs such as salicylates, and even smoking (17). Therefore, it might be difficult to find the cause of high ESR. Previous studies (14,17) showed that patients who have high ESR despite being in remission may have progressive radiographic change. Additional treatment that decreases inflammation and prevents radiological progression might be considered in these patients

We found significantly decreased level of hemoglobin in study group as compared to control. Al Arfaj et al and shweta dwivedi et al (17-18) also reported increased percent hemolysis and decreased Hb level in their study. Hemolysis can occur due to their oxidative effect on the lipids of RBC membranes. Kamanli et al (19) reported, significantly decreased hemoglobin levels in Rheumatoid arthritis patients as compared to control. This result is inconcordance with our findings.

According to shweta dwivedi et al and Ravindra et al (18,20) the hemoglobin, Iron and TIBC levels are significantly low in Rheumatoid arthritis patients as compared to healthy subject. These results are in concordance with our finding. Anemia of chronic disease frequently present in RA. Decreased iron absorption was shown to be the result of active RA rather than a cause of ACD or iron deficiency. It has been hypothesized that bone marrow iron availability decrease due to decreased iron release by the mononuclear phagocyte system or that the anemia in ACD is due to ineffective erythropoiesis; these remain controversial theories (21). Ayhan et al (22) and his colleague reported low levels of hemoglobin in rheumatoid arthritis as compared to control.

shweta dwivedi et al and Karatas et al (18,23), found decreased mean hemoglobin concentration in rheumatoid arthritis patients as compared to control. Akyol et al (24) found no difference between Hb values of rheumatic patients and healthy individuals. ESR showed an increase in patient group compared to the control group. Circulating human red blood cells possess the ability to scavenge ROS generated extracellularly by activated neutrophil. Hence, the RBC with decreased antioxidant levels is easily destroyed. The significantly decreased values of RBC and Hb in the blood of RA patients observed in our study are supported by other workers who reported that increased ROS production is inactive of RBC destruction in patients with RA. (25) Agrawal et al (26) and his colleague reported anemia in Rheumatoid arthritis patients as compared to control. In which they present low Hb levels, low serum iron levels in their study.

CONCLUSION:

Patients with RA who have sustained high ESR despite clinical remission had more radiographic changes also consider and this result showed that high ESR patients with clinical remission may need more RA treatment to decrease inflammation. Arthritis patients have lower level of hemoglobin, higher levels of hemolysis and ESR,UA AND CRP as compared to control. Lower level of Hb, Iron and increased levels of TIBC is a marker of IDA and ACD which plays a

significant role in the etiopathogenesis in Anemia in Rheumatoid arthritis. An increased level of ESR,CRP and percent hemolysis is a marker of inflammation which plays a significant role in the etiopathogenesis of RA.

Table. 1: Comparison of ESR, Hb, Iron and TIBC, CRP and Uric acid values(M±SD) in patients Rheumatoid Arthritis and Control group.

S.NO.	Particulars	Control	Rheumatoid Arthritis(RA)
1	ESR(mm/hg)	11.08±1.80	24.38±3.20(p<0.001)
2	Hb(gm/dl)	12.32± 0.77	10.06± 1.84 (p<0.001)
3	Iron(μ/dl)	118.41±20.77	68.26± 47.10(p<0.001)
4	TIBC(μ/dl)	329.33±36.00	170.99± 90.72(p<0.001)
5.	CRP()	0.3± 0.3	0.9 ±0.8(p<0.001)
6.	Uric acid (mg/dl)	4.3±1.2	7.6±2.84(p<0.001)

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