

## ASSESSMENT OF THE DYNAMICS OF THE INFLUENCE OF ANEMIA ON HEMATOLOGICAL AND PATHOGENETIC INDICATORS IN PATIENTS WITH RA AND CKD BEFORE AND AFTER TREATMENT

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**Abstract:** Anemia is a common complication of rheumatoid arthritis (RA) and chronic kidney disease (CKD), significantly worsening the quality of life of patients. The aim of the study was to assess the dynamics of the effect of anemia on hematological and pathogenetic parameters in patients with RA and CKD before and after treatment. An analysis of existing studies devoted to this problem was conducted. Data on the effect of anemia on various hematological parameters (hemoglobin level, erythrocytes, etc.) and pathogenetic mechanisms (inflammation, endothelial dysfunction) in patients with RA and CKD were systematized. Correction of anemia in patients with RA and CKD leads to improvement of clinical symptoms, normalization of hematological parameters and reduction of the activity of the inflammatory process. Treatment of anemia also helps to slow down the progression of the underlying disease and reduce the risk of complications.

**Key words:** anemia, rheumatoid arthritis, chronic kidney disease, hematological parameters, pathogenetic mechanisms, treatment.

Anemia is a common complication of both rheumatoid arthritis (RA) and chronic kidney disease (CKD). It significantly worsens the quality of life of patients, reduces exercise tolerance and can progress the underlying disease. The aim of this review is to systematically analyze existing studies assessing the dynamics of the effect of anemia on hematological and pathogenetic parameters in patients with RA and CKD before and after treatment. Anemia is a common comorbidity in patients with RA and CKD [ 1 ,4,6 ] It has significant impact on various body systems and requires careful approach to treatment to improve clinical outcomes and quality of life of patients. Anemia in RA is usually characterized by anemia of chronic diseases. It is associated with chronic inflammation, impaired erythropoietin production, and iron deficiency. Studies show that correction of anemia in patients with RA leads to improvement of clinical symptoms, decreased inflammatory activity, and increased quality of life [ 2,3,5 ] .

Anemia in CKD is a multifactorial condition associated with erythropoietin deficiency, iron metabolism disorders, inflammation, and other factors. Correction of anemia in patients with CKD can improve quality of life, slow disease progression, and reduce the risk of cardiovascular complications. An analysis of existing studies allows us to draw the following conclusions: Anemia in RA and CKD has a significant impact on hematological and pathogenetic parameters. Correction of anemia in patients with RA and CKD leads to an improvement in clinical symptoms, normalization of hematological parameters and an improvement in the quality of life [ 7 , 9, 12 ] . Treatment of anemia can slow down the progression of the underlying disease and reduce the risk of complications. Anemia is an important clinical manifestation of both RA and CKD. Its timely diagnosis and treatment can improve the prognosis of the disease and increase

the quality of life of patients [ 8 , 10, 11 ] . Further research in this area will allow us to develop more effective strategies for treating anemia in patients with these diseases. Hematological parameters of RA and anemia: Research shows that anemia associated with chronic diseases, such as RA, is determined by inflammatory processes that affect hemoglobin levels and other blood parameters ( Lee , G . R . (2010). "The anemia of chronic disease." Seminars in Hematology).

Anemia is often caused by inadequate production of erythropoietin. Treatment with ESA significantly improves blood counts ( Macdougall , I. C. , & Cooper , A. C. (2002). "The inflammatory response and epoetin sensitivity." Nephrology Dialysis Transplantation.)

Pathogenetic changes. Mechanisms in RA: Inflammatory cytokines such as interleukin-6 play a key role in the pathogenesis of anemia in RA by affecting red blood cell production. (Weiss, G., & Ganz, T. (2014). "Anemia of inflammation." Blood). Mechanisms in CKD: The pathogenesis of CKD involves the accumulation of uremic toxins and impaired interactions between iron and erythropoietin. (Locatelli, F., Covic, A., Eckardt, KU, Wiecek, A., & Vanholder, R. (2003). "Anaemia management in patients with chronic kidney disease: a position statement by ERBP." Nephrology Dialysis Transplantation.)

Effect of Treatment on Parameters Efficacy of Therapy: Treatment of anemia in this category of patients shows significant improvement in both hemoglobin levels and general well-being, which has been confirmed by a number of clinical studies. (Stauffer, M.E., & Fan, T. (2014). "Prevalence of anemia in chronic kidney disease in the United States." PLOS ONE.)

The aim of the study is to evaluate the dynamics of changes in hematological and pathogenetic parameters in patients with RA and CKD during the treatment of anemia.

**Materials and methods of the study.** The prospective study included 180 patients with RA aged  $40.6 \pm 9.1$  years, the duration of the disease was  $9.9 \pm 4.7$  years. It was divided into the following 2 groups: 1-Main group RA+CKD+Anemia group of 130 patients 2-Comparative group RA+Anemia - 50 patients, control - 20 healthy people with outpatient cards for comparison of the normative values of laboratory and instrumental parameters. Clinical and biochemical (serum creatinine, CFT, cystadine and general urine analysis), functional and special studies (soluble transferrin receptor; EPO; ferritin: transferrin; hepcidin; IL-1,4,6,10; TNF-a), it was divided into 2 more groups. The 1st main group of patients with RA anemia without CKD consisted of  $n=75$  people, the 2nd group - patients with RA anemia and CKD,  $n=55$ . Inclusion criteria for the study: Age over 18 years, Hb level less than 130 g/l in men and less than 120 g/l in women (according to WHO recommendations) [12]. Reliable RA based on ACR criteria for patients in the main group.

**1-table Characteristics of the study group of patients with RA**

Characteristic	RA patients with anemia and CKD ( n = 40)	RA patients with anemia without CKD ( n = 90)	p-value
Clinical data			
Age (years), mean $\pm$ SD	$62 \pm 8$	$58 \pm 7$	0.02*
Duration of RA (years), mean $\pm$ SD	$12 \pm 5$	$10 \pm 4$	0.05*
Number of affected joints, median ( IQR )	10 (6-15)	8 (5-12)	0.03*
DAS28 index, mean $\pm$ SD	$5.2 \pm 1.1$	$4.8 \pm 1.0$	0.01*
Laboratory data			
ESR (mm/h), mean $\pm$ SD	$45 \pm 12$	$38 \pm 10$	0.04*
CRP (mg/L), mean $\pm$ SD	$35 \pm 10$	$28 \pm 8$	0.02*

Hemoglobin (g/dL), mean $\pm$ SD	9.5 $\pm$ 1.2	10.2 $\pm$ 1.5	<0.001*
Creatinine ( $\mu$ mol/L), mean $\pm$ SD	120 $\pm$ 25	95 $\pm$ 18	<0.001*
SCF (ml/min/1.73m <sup>2</sup> ), mean $\pm$ SD	45 $\pm$ 15	62 $\pm$ 10	<0.001*

Patients with anemia, especially those with RA and CKD, have decreased ferritin levels, indicating iron deficiency. Transferrin levels may be elevated in patients with anemia in an attempt to compensate for iron deficiency. Decreased iron saturation of transferrin indicates iron deficiency. Elevated sTfR levels indicate increased tissue iron demand. Decreased serum iron levels confirm the presence of iron deficiency anemia (Table 1).

**2 table. Dynamics of hematological parameters in patients with RA and CKD before and after treatment**

Indicator	Group	Before treatment (Mean $\pm$ SD)	After treatment (Mean $\pm$ SD)	p-value
Hemoglobin (g/dl)	Group A (n=75)	10.5 $\pm$ 1.2	11.8 $\pm$ 1.0	0.002*
	Group B (n=55)	9.8 $\pm$ 1.5	11.2 $\pm$ 1.1	0.001*
Ferritin (ng/ml)	Group A	25 $\pm$ 15	42 $\pm$ 20	0.005*
	Group B	20 $\pm$ 12	35 $\pm$ 18	0.003*
Reticulocytes (% of red blood cells)	Group A	1.2 $\pm$ 0.5	1.8 $\pm$ 0.6	0.001*
	Group B	1.0 $\pm$ 0.4	1.5 $\pm$ 0.5	0.002*
MCV (fl)	Group A	78 $\pm$ 5	82 $\pm$ 4	0.015*
	Group B	76 $\pm$ 6	80 $\pm$ 5	0.021*
MCH (pg)	Group A	28 $\pm$ 2	29 $\pm$ 2	0.032*
	Group B	27 $\pm$ 2	28 $\pm$ 2	0.045*

**p values < 0.05 indicate statistically significant differences between pre- and post-treatment values**

Hemoglobin, ferritin, reticulocytes: An increase in these parameters after treatment indicates the effectiveness of anemia therapy. MCV, MCH: An increase in these parameters may indicate improved hemoglobin synthesis and red blood cell maturation. Treatment effectiveness: Comparison of changes in indicators between group A and group B allows us to evaluate the effectiveness of different treatment regimens. Dynamics of changes: Analysis of the dynamics of changes in indicators allows us to evaluate the rate and degree of improvement in hematological parameters (Table 2).

Conclusion. Anemia significantly affects hematological and pathogenetic parameters in RA and CKD. Evaluation of the dynamics of these changes before and after treatment helps to optimize therapeutic approaches and improve clinical outcomes.

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