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ASSESSMENT OF ERYTHROPOIESIS AND IRON METABOLISM IN PATIENTS WITH ANEMIA OF CHRONIC DISEASES

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Abstract. The aim of the study was to study and evaluate the indicators of erythropoiesis and iron metabolism in patients with anemia of chronic diseases (AHD). The study materials included 92 patients with AHD, 23 of them men, 69 women. Methods - general analysis of blood and morphology of erythrocytes on the photo calorimeter "CFP" 3 position, microscope "Bioline". The biochemical parameters - serum iron, ferritin, transferrin, vitamin B12, folic acid, erythropoietin - were studied on the Roche Hitachi Cobas C 311 apparatus. The study and assessment of iron metabolism in patients with AHD, depending on the nosology of chronic diseases, shows that the level of serum iron has the greatest significant decrease compared with transferrin and ferritin. The assessment of erythropoiesis indices in patients with AHZ, depending on the nosology of the chronic disease, indicates that patients with chronic liver and gastrointestinal diseases have the highest significant changes in folic acid and vitamin B12 indicators compared to.

Relevance of the study. Chronic diseases are often accompanied by anemia, the frequency can reach 100% if the disease has a long duration (1,4,6). Anemia of chronic diseases (AHD) aggravates the course of the underlying disease, reduces the effectiveness of treatment, and increases the risk of various complications (3,7,9). Despite the high frequency of AHD, attention to it from medical science and practice is insufficient, there is no unified approach to the issues of etiopathogenesis, standards of diagnosis and treatment, and prevention of anemia. There is also no single classification of AHD, and in most cases in medical practice a classification based on the volume of red blood cells is used: microcytic, normocytic, macrocytic. Depending on the pathophysiology, AHD are divided into 2 groups - associated with insufficient production of red blood cells and increased destruction of red blood cells (hemolysis) (2). A number of authors propose to divide AHD into 3 groups: "Deficient" associated with iron deficiency, posthemorrhagic, vitamin B12 deficiency.

The latter classification helps practitioners choose the optimal treatment strategy – the first group is treated by a GP, the second group by appropriate specialists in the underlying disease, the third group by a hematologist. The pathogenesis of AHZ of the second group is the most complex, which is based on a violation of erythropoiesis (5, 11). Thus, currently there is no unified approach to the classification of AHD, diagnosis and treatment of AHD (1). Science and practice of healthcare do not pay sufficient attention to the study of the pathogenesis of AHD, the study of at least the main factors of erythropoiesis disorders and iron metabolism – indicators of serum iron, ferritin, vitamin B12, folate, erythropoietin (14). This would contribute to the targeted and effective treatment of anemia, which in turn would increase the effectiveness of treatment of the underlying disease, reduce the risk of death (2). In addition, it should be borne in mind that iron and folate deficiency is widespread in our republic (10).

Key words: anemia of chronic diseases, severity of anemia, chronic diseases, hemoglobin, erythrocytes, retrospective data.

Materials and methods. The study included 92 patients with various chronic diseases accompanied by anemia, out of 69 women and 23 men. The age of patients is 18 to 84 years. Laboratory studies of the general analysis of blood and the morphology of erythrocytes were carried out on the photo calorimeter "CFP" 3 position, microscope "Bioline". Biochemical parameters - serum iron, ferritin, transferrin, vitamin B12, folic acid, erythropoietin were studied on the Roche Hitachi Cobas C 311 device.

Results. In 92 patients with AHD, the parameters of iron metabolism were studied depending on the nosology of the chronic disease. The results showed that in all patients with AHD, serum iron levels were significantly lower compared to the control group, the difference was significant. At the same time, the lowest serum iron levels were found in patients with chronic gastrointestinal diseases, and the highest in patients with hypertension (GB), the difference is significant. Ferritin levels in all patients were significantly higher compared to the control group, however, the highest rates were observed in patients with chronic liver diseases (the difference is significant). The level of transferrin did not significantly differ depending on the nosology of the chronic disease.

Tabl 2

Indicators of iron metabolism in patients with AHZ depending on the nosology of chronic diseases

№	Chronic diseases	n	The average level of the indicator (M±m)		
			Serum iron	Ferritin	Transferrin
1	Diabetes	13	**10,6±1,6**	**106,6±18,6**	**2,6±0,3**
		*	p=0.001	p=0.02	p=0.45
2	Hr. liver diseases	17	**11,2±2,0**	**348,7±134,9**	**2,8±0,2**
		*	p=0.01	p=0.03	p=0.88
3	Rheumatism	20	**11,6±1,4**	**134,5±59,7**	**2,6±0,2**
		*	p=0.003	p=0.2	p=0.2
4	Hypertension	27	**12,7±1,1**	**124,2±47,6**	**2,8±0,1**
		*	p=0.007	p=0.2	p=0.80
5	Chronic gastrointestinal diseases	15	**6,6±0,8**	**131,7±45,9**	**2,8±0,2**
		*	p=0.0 00001	p=0.1	p=0.88
6	Total	92	10,9±0,7	167,1±42,1	2,7±0,1
		*	p=0,0001	p=0,01	p=0,2
7	Control	30	16,74±0,93	62,18±5,86	2,83±0,07
* Comparison of subgroups with controls.					

Vitamin B12 values in none of the patients with CCM were lower than those of the control group, and there was also no significant difference in indicators between various chronic diseases, the difference is not significant. There was also no significant difference in EPO indicators among the subgroups with chronic diseases compared with the control group. The level of folic acid was significantly reduced in the subgroup of patients with chronic gastrointestinal diseases compared with the control group, in the remaining subgroups there was no significant difference with the control group.

Tabl 2

Erythropoiesis indices in patients with AHZ depending on the nosology of the chronic disease

№	Chronic diseases	n	The average level of the indicator (M±m)		
			Vitamin B_{12}	EPO	Folic acid
1	Diabetes	13	**131,1±61,9**	**17,5±6,0**	**8,3±1,3**
		*	p=0.79	p=0.76	p=0.56
2	Hr. liver diseases	17	**161,0±33,1**	**26,6±11,3**	**8,0±1,2**
		*	p=0.26	p=0.34	p=0.70
3	Rheumatism	20	**160,0±23,5**	**19,6±9,1**	**7,7±1,3**
		*	p=0.18	p=0.67	p=0.88
4	Hypertension	27	**162,9±44,3**	**17,0±2,9**	**7,4±0,8**

		*	p=0.33	p=0.67	p=0.91
5	Chronic gastrointestinal diseases	15	**225,6±77,8**	**22,8±5,0**	**6,0±1,0**
		*	p=0.17	p=0.17	p=0.18
6	Total	92	**167,7±22,0**	**20,3±3,5**	**7,5±0,5**
		*	p=0.11	p=0.20	p=0.01
7	Control	30	**113,43±25,74**	**15,71±0,98**	**9,57±0,64**
* Comparison of subgroups with controls					

A comparative assessment of erythropoiesis and iron metabolism in patients with AHD, depending on the severity of anemia, showed that in all cases of anemia, there was a high significant difference in serum iron values with those of the control group. Ferritin levels in the severe anemia group were significantly lower than in the groups with mild and moderate anemia. However, in the group with mild and moderate anemia, ferritin levels were significantly higher than in the control group. Transferrin was significantly lower only in the group with moderate anemia. Vitamin B12 and EPO levels were significantly increased in the group with severe anemia, in the other groups there was no significant difference with the control group. The level of folic acid was significantly reduced in the group with mild anemia compared to the control group, in the other groups there was no significant difference with the control group.

Table 3

Comparative assessment of erythropoiesis and iron metabolism in patients with AHZ depending on the severity of anemia

№	The main factors of the pathogenesis of AHZ development	The average level of the indicator (M±m)			
		Control (n=30)	Severity of anemia		
			I. * mild anemia (n=49)	II. * the average degree of anemia (n=28)	III. * mild anemia (n=15)
1	Iron	16,74±0,93	11,1±1,0	12,7±1,2	6,8±0,7
			p=0.0004	p=0.01	p=0.00001
2	Ferritin	62,18±5,86	185,7±63,4	195,2±93,6	55,9±17,6
			p=0.05	p=0.16	p=0.73
3	Transferrin	2,83±0,07	2,8±0,1	2,6±0,1	2,9±0,2
			p=0.80	p=0.06	p=0.74
4	Viamin B12	113,43±25,74	145,9±33,2	171,8±43,2	231,0±64,5
			p=0.44	p=0.25	p=0.09
5	Erythropoietin	15,71±0,98	20,1±4,9	12,0±1,7	37,0±12,3
			p=0.38	p=0.07	p=0.09
6	Folic acid	9,57±0,64	6,5±0,7	8,4±0,7	8,9±1,2
			p=0.001	p=0.22	p=0.62
* Comparison of subgroups with controls.					

Thus, the results show that the study of serum iron, ferritin, transferrin, folic acid, vitamin B12, EPO allows for a pathogenetic approach to the diagnosis and treatment of anemia in patients with AHD.

Conclusions.

1. The study and evaluation of iron metabolism in patients with AHD, depending on the nosology of chronic diseases, shows that the level of serum iron has the greatest significant decrease compared with transferrin and ferritin.
2. Erythropoiesis indices in patients with AHD, depending on the nosology of the chronic disease, indicate

that patients with chronic liver and gastrointestinal diseases have the highest significant changes in folic acid and vitamin B12 compared with other chronic diseases

3. In patients with AHD, the severity of erythropoiesis and iron metabolism disorders depends on the severity of anemia.

4. The study of serum iron, ferritin, transferrin, folic acid, vitamin B12, EPO allows us to provide a pathogenetic approach to the diagnosis and treatment of anemia in patients with AHZ.

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