CORRELATION OF NEPHROPATHY AND ANEMIA IN DIABETES

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Abstract. Anemia is one of the main manifestations of decreased renal function in diabetic nephropathy (DN), the severity of which increases as renal failure progresses [1–5]. The development of anemia not only causes a decrease in tolerance to physical and mental stress, work ability and quality of life of the patient, but is also one of the leading mechanisms for the progression of kidney damage and an important risk factor for the development of macrovascular complications of diabetes mellitus (DM). In this regard, the diagnosis and treatment of anemia are becoming one of the pressing issues in the management of patients with DN, including at an early stage of kidney damage. The purpose of this study was to study the prevalence, clinical and pathophysiological features of anemia in patients with DN.

Keywords: DM, DN, diabetes, treatment, method.

INTRODUCTION

To study the prevalence of anemia, 1020 people were examined - 382 patients with DM 1 (37.5%) and 638 patients with DM 2 (62.5%) who were examined as part of the mobile diabetes center's visiting expedition program. Of these, DN was diagnosed in 510 people (50.0%). In all patients without DN, renal function was preserved (glomerular filtration rate (GFR) ≥ 60 ml/min). The state of kidney function in DN patients was assessed according to the stages of chronic kidney disease (CKD) according to the National Kidney recommendations

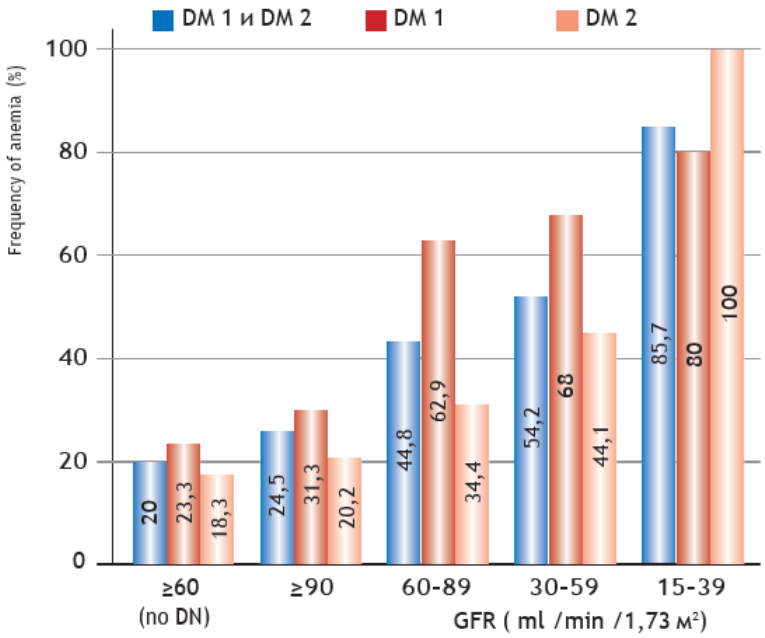

Fig 1. Frequency of detection of anemia in patients with DM 1 (n=382) and DM 2 (n=638) depending on the filtration function of the kidneys:

DN – diabetic nephropathy; DM – diabetes mellitus; GFR – glomerular filtration rate

RESULTS AND DISCUSSION

Foundation/Kidney Disease Outcomes Quality Initiative (NKF/DOQI) (Table 1) [2]. GFR was calculated using the Cockcroft–Gault formula and normalized to a standard body surface area (1.73 m2) [3]. Anemia in patients with DM without kidney damage was diagnosed according to the criteria recommended by the World Health Organization: blood hemoglobin (Hb) < 130 g/l - in men; Hb < 120 g/l – in women [4]; in the presence of DN - according to the criteria for identifying anemia in patients with CKD, proposed by NKF/DOQI, - Hb < 135 g/l - in men, Hb < 120 g/l - in women [2].

Table 1

Stages of chronic kidney disease		
Стадия	Characteristic	GFR (ml/min/1.73 m2)
1	Kidney damage with normal or increased GFR	≥90
2	Kidney damage with initial	60–89
3	decrease in GFR	30–59
4	Moderate degree of GFR reduction	15–29
5	Pronounced degree of reduction in GFR	<15 (or dialysis)

A comparative analysis of the frequency of detection of anemia in diabetic and non-diabetic kidney damage was carried out between 92 patients with proteinuric stage DN at DM 1 and 230 patients with a morphologically confirmed diagnosis of primary chronic glomerulonephritis (CGN).

To clarify the connection between the development of anemia and the production of endogenous erythropoietin (EPO) in 94 patients with DN (29 people (30.9%) suffering from DM 1, and 65 people (69.1%) with DM 2), the concentration of EPO in the blood serum was studied. The determination of EPO was carried out using the enzyme immunoassay method using the EPO ELISA Biomerica kit. Reference EPO values ranged from 4.3 to 32.9 mIU/ml. In these same patients, the state of iron metabolism in the body was assessed. Serum iron was determined using a photometric method, and serum ferritin and transferrin were determined using an immunoturbidimetric method using Roche diagnostic kits. The degree of transferrin saturation (TS) was also calculated. A ferritin value of <100 ng/ml was assessed as a decrease in iron reserves in the body, and an LT <20% was assessed as low iron bioavailability. Patients with a GFR less than 15 ml/min/1.73 m2 and/or receiving erythropoiesis-stimulating agent (ESA) therapy were not included in the study. For statistical processing of data, the arithmetic mean and standard deviation were calculated, and the significance of the differences was assessed using the Mann–Whitney test.

CONCLUSION

Thus, with DN, anemia is detected much more often than with other kidney diseases - its frequency is up to 25% with normal GFR and reaches up to 80-100% with a pronounced degree of decrease in the filtration function of the kidneys. At the earliest stage of DN - MAU - anemia occurs in almost every fourth patient, and with the formation of PU - already in every second patient. Anemia with DN is more severe than with primary nephritis. The main cause of anemia in patients with DN is an early decrease in the production of endogenous EPO with the development of its functional deficiency. This fact may serve as a basis for earlier initiation of SSE

therapy, after correction of iron deficiency, even with a moderate decrease in renal function. The connection between anemia and the indicator of diabetes compensation may indirectly indicate that when assessing the degree of compensation of carbohydrate metabolism, it is necessary to take into account the blood Hb level. Due to the fact that anemia contributes to a decrease in the quality of life, more rapid progression of both micro- and macrovascular complications, increasing the risk of death of patients from cardiovascular accidents, its timely diagnosis and treatment is important.

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