Features of Cognitive disorders Violations in Patients with Type 2 Diabetes Mellitus with the Terminal Stage of Chronic Kidney Disease on Hemodialysis

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Abstract

We examined and examined 115 patients suffering from type 2 diabetes mellitus (DM 2) with chronic kidney disease (CKD) IV-V degree. on program hemodialysis. Of these, women were - 53, men - 62.

According to the degree of chronic brain ischemia (CBI), patients were divided into 3 groups:

1 gr. - 35 (30,4%) patients with CKD IV-V degree and CBI 1 degree;

2 gr. - 37 (32,2%) patients with CKD IV-V degree and CBI 2 degree;

3 gr. - 43 (37,4%) patients with CKD IV-V degree and CBI 3 degree.

All 115 patients were performed by all studies that included generally clinical (general blood test, general urine analysis), biochemical (blood sugar, glycemic profile, glycated hemoglobin HBA1C, urea, creatinine, blood electrolytes, lipid spectrum, coagulogram, etc.), Hormonal blood tests, BDNF, S100, NSE in the blood, ECG, ultrasound of the internal organs, dopplerography of the main arteries of the head, if necessary, patients were sent to the increase in the radiological, ultrasound of internal and genital organs, consultation of the cardiologist, neurologist, nephrologist, ophthalmologist, surgeon, etc.

A brief scale of assessment of cognitive functions or Mini-Mental State Examination (MMSE) is a short questionnaire out of 30 points.

Significant correlations of the MMSE level and a number of indicators are revealed. A correlation relationship with the level of glycated hemoglobin, BDNF by clinical demographic indicators in all groups of patients has been detected: the duration of hemodialysis, the duration of DM 2, age, education.

Keywords: Diabetes Mellitus Type 2; Chronic Kidney Disease; Cognitive Disorders

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Background

According to researchers, the prevalence of cognitive violations is high among adults with chronic kidney disease (CKD), and these two states have several common risk factors, which suggests that they may have a common pathogenesis. The damage to the microvascular in the kidneys is a characteristic feature of the two most frequent causes of CKD, diabetes mellitus type 2 (DM 2) and arterial hypertension [1].

Similarly, neurovalizing markers of microvascular damage to the brain are associated with an increased risk of reducing cognitive functions and dementia [2,3]. These results of neurovizualization are more common in patients with CKD compared to patients with normal kidney function [4].

Besides that, among patients with DM 2, microvascular diseases of the brain are predictors of nephropathy and progression to the terminal stage of chronic kidney disease (TCKD) [5].

Thus, the presence of violations of cognitive functions can identify patients with systemic microvascular diseases that are included in the risk group for the development and progression of CKD. While a biopsy is required to evaluate microvascular diseases in the kidneys, and to evaluate microvascular diseases in the brain requires visualization, testing of cognitive functions is non-invasive and less expensive.

The violation of the cognitive function can also predict patients to the progression of the kidneys due to less use or commitment to the CKD risk reduction strategies. For example, treatment of arterial hypertension may be less intense in patients with cognitive impairment due to the fear of developing side effects.

Thus, the assessment of the cognitive function can be potentially useful for clarifying the forecast of terminal renal failure in patients from the risk group.

All of the above emphasizes the relevance of this study.

The goal is to study the characteristics of cognitive violations in patients with type 2 diabetes mellitus with the terminal stage of chronic kidney disease.

Material and Methods of Investigation

We examined and examined 115 patients suffering from type 2 diabetes mellitus (DM 2) with chronic kidney disease (CKD) IV-V degree. on program hemodialysis. Of these, women were - 53, men - 62. The average age of men amounted to 67 ± 4.2 years, and the average age of women is 64 ± 5.6 years. 20 patients of the relevant age amounted to a group of control.

Inclusion criteria

Patients with type 2 diabetes mellitus, located on software hemodialysis, with CKD IV-V degree.

Exception criteria

Pregnant women, children and young people with type 1 DM 1, patients with cardiovascular pathology before establishing the diagnosis of DM 2, autoimmune thyroiditis (hypothyroidism).

According to the degree of chronic brain ischemia (CBI), patients were divided into 3 groups:

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- 3 gr. - 43 (37,4%) patients with CKD IV-V degree and CBI 3 degree.

All 115 patients were performed by all studies that included generally clinical (general blood test, general urine analysis), biochemical (blood sugar, glycemic profile, glycated hemoglobin HBA1C, urea, creatinine, blood electrolytes, lipid spectrum, coagulogram, etc.), Hormonal blood tests, BDNF, S100, NSE in the blood, ECG, ultrasound of the internal organs, dopplerography of the main arteries of the head, if necessary, patients were sent to the increase in the radiological, ultrasound of internal and genital organs, consultation of the cardiologist, neurologist, nephrologist, ophthalmologist, surgeon, etc.

A brief scale of assessment of cognitive functions or Mini-Mental State Examination (MMSE) is a short questionnaire out of 30 points, widely used for the primary assessment of the condition of cognitive functions and screening their violations, including dementia. Any rating is more than 27 (out of 30) is effective normal. Below this, 20 - 26 indicates a slight dementary; 10 - 19 moderate dementia, and below 10 - severe dementia.

The obtained data was processed using Microsoft Excel and Statistica_6 computer programs. The average arithmetic (m)

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was calculated, the standard deviation of the medium-average or an average arithmetic error of all N repeats (M). The presence of differences in the level between groups was estimated by the value of the confidence interval and the Student's criterion (P). Differences were considered statistically significant at p < 0.05.

Research Results

Table 1 shows the distribution of inspected patients by sex and age. As can be seen from table 1, patients prevailed in the age category from 60 to 74 years as among men and women - 18/20 cases, respectively.

Age, years	Number of men	Number of women
18-44 (young age)	7 (13,2%)	6 (9,7%)
45-59 (middle-aged)	13 (24,5%)	16 (25,8%)
60-74 (elderly age)	18 (33,9%)	30 (48,4%)
75 and older (senile age)	15 (28%)	10 (16,2%)
Total : n = 115	53 (46%)	62 (54%)

Table 1: Distribution of patients by gender and age (WHO, 2017).

Table 2 shows the average values of the points used questionnaires in patients with DM 2 in groups.

Test of MMSE			
1 group n = 35	**2 group n = 37**	**3 group n = 43**	**p**
19 ± 2,3*	16 ± 3,2	11 ± 0,6	<0,001
Control, n = 20			
39 ± 0,6			

Table 2: Medium values of the points used questionnaire MMSE in patients depending on the degree of chronic brain ischemia.

Note: * - P - Statistical significance of average data between groups and control

Table 2 shows that patients with DM 2 depending on the degree of MMSE data on questionnaires were significantly different from the control group (healthy persons) in the estimation of the MMSE test scales.

MMSE	Glycemia to eating mmol/l	HbA1C %	BDNF ng/ml	CBI degree	The duration of hemodialysis	The duration of DM 2	Age	Education	GFR
1 gr	0,35	0,88	0,64	0,69	0,67	0,75	0,71	0,76	0,88
2 gr	0,38	0,75	0,56	0,71	0,59	0,72	0,70	0,72	0,89
3 gr	0,39	0,89	0,67	0,74	0,78	0,79	0,73	0,77	0,88

Table 3: The correlation (R) of MMSE values with various indicators for groups.

As can be seen from table 3, significant correlations of the MMSE level and a number of indicators are revealed. A correlation relationship with the level of glycated hemoglobin, BDNF by clinical demographic indicators in all groups of patients has been detected: the duration of hemodialysis, the duration of DM 2, age, education, glomerular filtration rate.

In this case, the connection with the glycemia on an empty stomach was unreliable. In the analysis of the research results, cognitive disorders were associated with an increase in the risk of terminal CKD by 41% and an increase in the risk of terminal CKD by 50% or a decrease in glomerular filtration rate.

Participants with cognitive disorders dominated in 2 and 3 groups of patients, they had a lower average glomerular filtration rate (GFR) and a higher level of albuminuria.

The correlation relationship was found between the indicators of cognitive function and demographic indicators - age, education (r = 0.76/0.88) [6-10].

Conclusions

The correlation between the indicators of the cognitive function and demographic parameters is the age, education (R = 0.76/0.88), as well as with the level of reduction of glomerular filtration rate (R

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= 0.69). Participants with cognitive disorders dominated in 2 and 3 groups of patients, they had a lower average glomerular filtration rate (GFR) and a higher level of albuminuria.

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