

Yamasaki Y.L., Kubeka A.V.

DYNAMICS OF BLOOD SERUM BIOCHEMICAL MARKERS IN HEMODIALYSIS PATIENTS WITH CHRONIC KIDNEY DISEASE

Tutor: PhD, associate professor Devina E.A.

*Department of Biological Chemistry
Belarusian State Medical University, Minsk*

Relevance. Chronic kidney disease (CKD) is a state of progressive loss of kidney function, often leading to the need of renal replacement therapy, such as dialysis or transplantation. Currently, CKD is a significant medical problem with a prevalence of 3.6% to 25% among adults. The leading symptoms of CKD are mineral, acid-base and water-electrolyte imbalances.

Objective: analysis of biochemical blood parameters (uric acid, urea, potassium, phosphorus, total calcium, creatinine and beta2-microglobulin) in patients with kidney failure before and after hemodialysis. Evaluation of hemodialysis effectiveness.

Materials and methods. A study was performed on the blood serum of 68 patients (54% men and 46% women, ages 60±21) diagnosed with chronic kidney disease in the terminal stage (CKD5). All patients were undergoing treatment in the Nephrology and Hemodialysis Department of the State Institution "Minsk Scientific and Practical Center for Surgery, Transplantology and Hematology". Hemodialysis was performed on the patients using a standard bicarbonate solution through an arteriovenous fistula (4 hours 3 times per week). The devices used were Fresenius 4008Bc and 5008S with F7 and FX70 dialyzers. Biochemical parameters were determined on the analyzer Architect c8000 and the statistics were processed using the program Statistica 10 ($p>0.05$).

Results and their discussion. The dynamics of the main biochemical blood parameters in patients suffering from chronic renal failure were assessed before and after hemodialysis.

It has been shown that mineral metabolism, such as calcium-phosphorus metabolism, is disrupted in patients with CKD. Patients with a decrease in the glomerular filtration rate (GFR) ≤ 60 ml/min/1.73 m² experience hyperphosphatemia. The GFR for patients with CKD5 is less than 15 ml/min/1.73 m². We found an increase in phosphate ions in the blood serum (2.12 ± 0.32 mmol/l) and a decrease in the level of total calcium to 1.84 ± 0.14 mmol/l. After the hemodialysis procedure, the content of phosphate ions was restored to 1.32 ± 0.21 mmol/l. After hemodialysis the blood serum calcium level (1.91 ± 0.5 mmol/l) increased relative to the pre-dialysis level, however the indicator was still below normal.

There is a relation between beta2-microglobulin levels in the blood serum and the lowered GFR in patients with CKD. In the group of patients undergoing hemodialysis with Fresenius 4008Bc devices, beta2-microglobulin levels were 7 times higher than normal (20.5 ± 3.1 mg/l). In the group of patients using Fresenius 5008S devices - 10 times higher than usual (30.4 ± 9.5 mg/l). After hemodialysis through a high flux dialyzer, the concentration decreased significantly, but remained higher than normal (7.9 ± 2.7 mg/l).

We determined that the average level of uric acid in the predialysis period was 453.2 ± 31.5 μ mol/l, which is 2.2 times higher than normal. After dialysis, uric acid levels decrease but do not reach normal values. We also observed high urea content (24.0 ± 3.7 mmol/l, 3 times more than normal) and hyperkalemia (5.9 ± 0.3 mmol/l). After hemodialysis the blood markers decreased to normal. The creatinine concentration before the hemodialysis procedure was 10 times the normal amount (880.6 ± 180.7 μ mol/l). After the hemodialysis procedure the creatinine level decreased to 234.9 ± 47.2 μ mol/l (2.1 times higher than normal).

Conclusion. In patients with CKD5 kidney filtration is disrupted, resulting in hyperuricemia, increased blood urea nitrogen and creatinine, hyperkalemia, hypocalcemia, hyperphosphatemia and high beta2-microglobulin levels in the blood serum. After hemodialysis these parameters were normalized, showing that hemodialysis is an effective method in the treatment of chronic kidney disease.