A COMPARATIVE STUDY OF RENAL DYSFUNCTION IN THE FIRST 3 DAYS AND AFTER 3 MONTHS IN DYNAMICS IN PATIENTS WITH MYOCARDIAL INFARCTION

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Abstract. *Coronary heart disease (CHD) is the leading cause of disability and death among cardiovascular diseases worldwide and is a global health problem. In recent years, biomarkers such as NGAL, KIM-1, and Cystatin-C have become increasingly important in the diagnosis of acute kidney injury.*

The main advantage of these biomarkers is that their levels increase in serum or urine in the early stages of kidney injury, before creatinine levels increase.

Keywords – *myocardial infarction, acute kidney injury, biomarkers, NGAL, KIM-1 and cystatin C, S-T segment in electrocardiography.*

Introduction. A number of studies have shown that the development of acute renal failure in myocardial infarction is associated with decreased perfusion and decreased filtration in the kidneys as a result of decreased cardiac output[2]. The addition of acute renal failure has a severe negative effect on the general condition of patients and is observed in 10-60% of cases [1,3].

The study of kidney dysfunction in myocardial infarction and its early diagnosis and study in dynamics are of great practical importance. Recent studies have shown that acute kidney injury following myocardial infarction is a risk factor for both short - and long-term adverse outcomes. The 10-year mortality rate from myocardial infarction is 15% in mild acute kidney injury, 23% in moderate acute kidney injury, and 33% in severe acute kidney injury [4,5,6].

The purpose of the study: comparative study of the dynamics of acute kidney injury in patients with acute myocardial infarction.

Materials and methods. Based on the set goals and objectives, our study involved 60 patients diagnosed with acute myocardial infarction treated in the cardioresuscitation department of the Multidisciplinary Clinic of the Tashkent Medical Academy in 2024 - the main group, and 30 patients treated in the cardiology department and diagnosed with stable angina pectoris of functional classes III-IV - the control group. The main group of patients consisted of 38 (63,3%) men and 22 (36,7%) women. The average age was 60,5±7,4. The control group included 16 men and 14 women, and their average age was 63,6±5,9 years.

The main group of patients, in turn, was divided into two subgroups based on electrocardiographic changes. The first group consisted of 32 patients with electrocardiographic ST-segment elevation, whose mean age was 57,4±3,68. Of these, 23 were men and 9 were women. The second group consisted of 28 patients with no S-T segment elevation on electrocardiography, their mean age was 63,8±2,87 (13 women, 15 men). Patients were prescribed standard treatment for acute myocardial infarction (antiischemic, ACE inhibitor or sacubitril/valsartan, β-blockers, statin, antiplatelet agents, anticoagulants).

The control group included 30 patients with stable angina pectoris functional class III-IV. This group of patients received standard treatment for ischemic heart disease.

Determination of laboratory parameters.


Serum Cystatin-C and Serum NGAL levels were determined using the ELISA method on a semi-automatic Mindray MR 96A device. Detection range: 0,313-20 ng/ml, Sensitivity: 0,188 ng/ml. and Detection range: 0,156-10 ng/ml, Sensitivity: 0.094 ng/ml.

Results and discussion Standard treatment in patients with acute myocardial infarction observed in our study we studied laboratory changes after 3 months. Of the patients included in the 3-month follow-up, 5 (4 with S-T segment elevation and 1 without S-T segment elevation) died from early and late complications of myocardial infarction and were excluded from the study. In our observation, we compared the indicators of NGAL, KIM-1 and cystatin C, which are considered the main markers of

acute kidney injury, on the third day of the disease and after 3 months. Figure 1 below illustrates the dynamics of the change in the NGAL indicator.

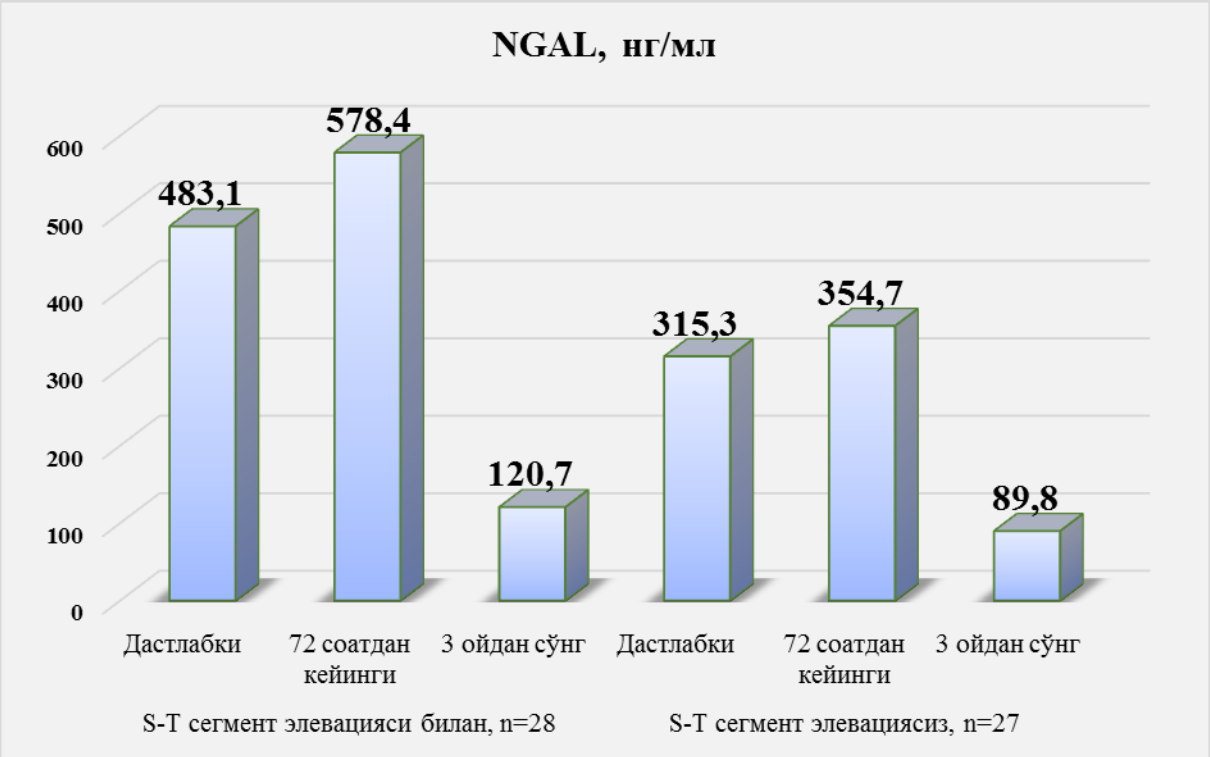
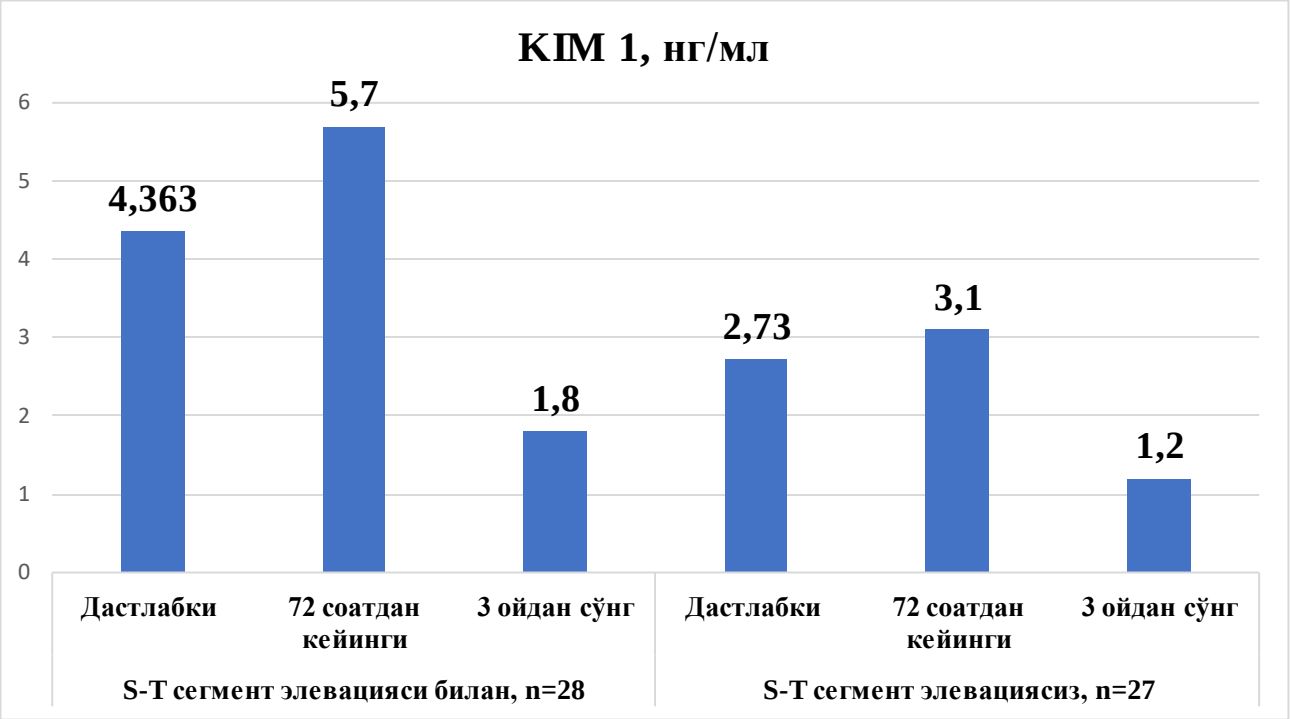


Figure 1. Changes in NGAL levels over time in patients with acute myocardial infarction.

As shown in the figure, in patients with S-T segment elevation, the urinary level of neutrophil gelatinase-associated lipocalin (NGAL) was 483,1±34,57 ng/ml, and when re-tested 72 hours after treatment, its level was 578,4±24,5 ng/ml, an increase of 1,2 times. When they were compared, a significant difference ($p<0.05$) was noted. In the second group, its level increased 1,12 times from 315,3±32,5 ng/ml to 354,7±28,4 ng/ml during 3-day dynamic observation, but a significant difference was not detected. After three months, a significant decrease ($p<0.001$) in the NGAL indicator was noted in both groups, respectively, by 120,7±28.6 ng/ml and 89,8±26,7 ng/ml.

We also studied the dynamics of KIM-1 indicators in the main group of patients in our study. The results are presented in Figure 2 below.

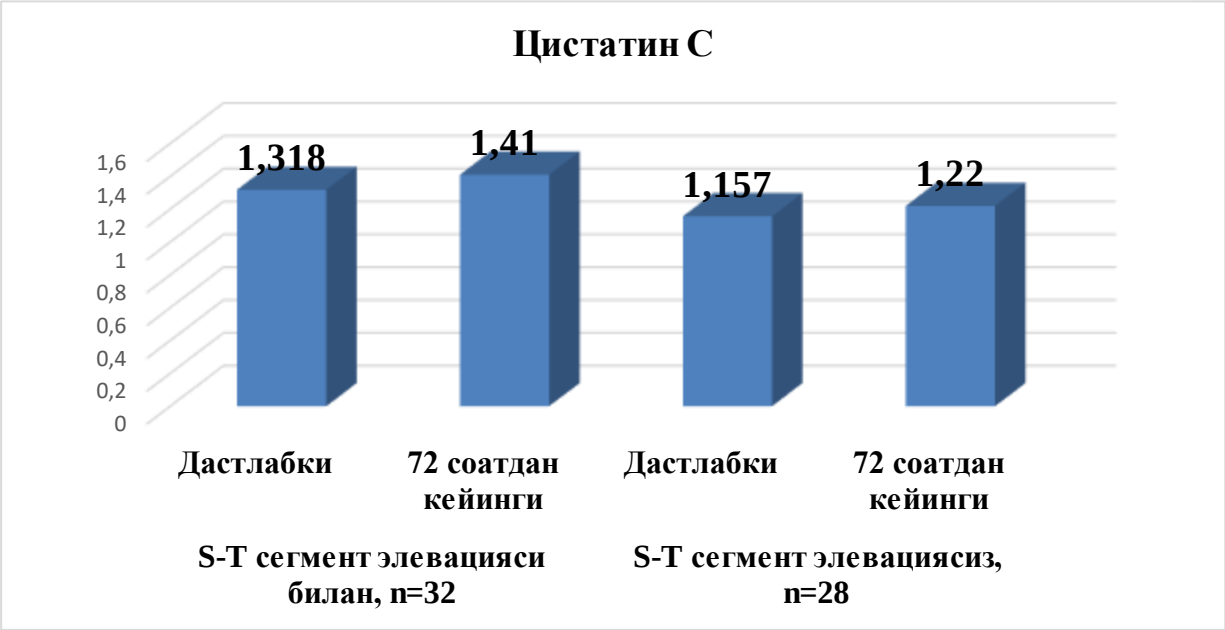


As shown in the figure-2, KIM-1 levels in the first group were initially 4,363±0,147 ng/ml. On the third day of treatment, its level was 5,7±0,15 ng/ml, and when compared, a significant (P<0,001) difference was observed. After three months, its level was 1,8±0,3 ng/ml, and a highly significant (P<0,001) difference was detected. In patients without S-T segment elevation, the mean urinary KIM-1 level was initially 2,713±0,089 ng/ml, and after three days it was 3,1±0,1 ng/ml (P<0,01), and after three months it was 1,2±0,2 ng/ml (P<0,001).

Cystatin-S indicators, which are considered to be the main markers in the assessment of the functional state of the kidneys in patients with myocardial infarction, were also evaluated dynamically.

The obtained results are presented in Figure 3.

Figure 3. Cystatin S indicators in dynamics in patients with acute myocardial infarction



As shown in the figure-3., cystatin C levels in patients with S-T segment elevation increased from 1,318±0,034 mg/l to 1,4±0,03 mg/l in dynamics and after three months amounted to 1,3±0,02 mg/l, and a significant difference (P<0,05) was noted between them. In the second group, its amount was initially 1,157±0,034 mg/l and after 3 days it was 1,22±0,04 mg/l. In the third month of our observation, cystatin C indicators were equal to 1,1±0,03 mg/l. Cystatin C levels were found to be significantly lower than NGAL and KIM-1 levels in patients with myocardial infarction after 3 months. These results confirm the long-term persistence of renal dysfunction in patients with myocardial infarction.

Conclusions. A comparative analysis of patients with acute myocardial infarction on the third day of the disease and 3 months later showed a significant decrease in markers of renal dysfunction. These positive changes are associated with the nephroprotective effect of angiotensin-converting enzyme inhibitors and angiotensin receptor antagonists in the treatment of myocardial infarction.

The scientific significance of the study results is that NGAL has a higher sensitivity and specificity than creatinine, KIM-1, and cystatin-C in the early diagnosis of kidney damage in patients with myocardial infarction. The detection of NGAL indicators has created the possibility of early treatment of acute renal failure in myocardial infarction.

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