

PROTECTIVE ACTION METABOLIC THERAPIES ON THE CORONARY CIRCULATION AT SICK ACUTE INFARCTION MYOCARDIA

G.T. Madjidova

Assistant of the Department of Internal Diseases №2 and Cardiology Samarkand State Medical University Samarkand, Uzbekistan

G.I. Sunnatova

Assistant of the Department of Internal Diseases №2 and Cardiology Samarkand State Medical University Samarkand, Uzbekistan

M.Raimova

Clinical Resident of the Department of Internal Diseases No. 2 and Cardiology Samarkand State Medical University Samarkand, Uzbekistan

<https://doi.org/10.5281/zenodo.7257619>

Abstract. By data WHO, in 2020 year ischemic disease hearts (CHD) takes one from first places among reasons disability and mortality population developed countries. One from most formidable manifestations ischemic heart disease is spicy heart attack myocardium (OIM).

Key words: cardiomyocyte, creatine phosphokinase, myocardium, systemic thrombolytic therapy.

ЗАЩИТНОЕ ДЕЙСТВИЕ МЕТАБОЛИЧЕСКИХ ТЕРАПИЙ НА КОРОНАРНОЕ КРОВООБРАЩЕНИЕ ПРИ БОЛЬНЫХ ОСТРЫМ ИНФАРКТОМ МИОКАРДА

Аннотация. По данным ВОЗ, в 2020 году ишемическая болезнь сердца (ИБС) занимает одно из первых мест среди причин инвалидности и смертности населения развитых стран. Одним из наиболее грозных проявлений ишемической болезни сердца является острый инфаркт миокарда (ОИМ).

Ключевые слова: кардиомиоцит, креатинфосфокиназа, миокард, системная тромболитическая терапия.

INTRODUCTION

At pathogenesis MI, t. e. in development ischemic necrosis muscles hearts, important role plays complete termination blood supply certain parts muscles hearts in result acute occlusion coronary arteries [2]. Already later 20-40 min after termination blood flow in coronary arteries appear first degradation changes cardiomyocytes [one], what appears in gradual decrease reserves glycogen, swelling mitochondria, destruction sarcoplasmic reticulum destruction mitochondria. At ischemic necrosis myocardium going on sharp decrease oxidative phosphorylation and simultaneous accumulation in muscle products anaerobic glycolysis, in particular lactate [2]. Simultaneously going on accumulation non-esterified fatty acids, observed gradual exit from cells ions potassium (K⁺), in damaged mitochondria and cytoplasm myofibril accumulate ions calcium (Ca⁺⁺) due to sharp decrease reserves energy substrates in cardiomyocyte [3]. So the way in result accumulation the above products, starts vicious a circle, which the aggravates ischemia and increases zone necrosis. And from microscopic necrotic changes myocardium in first watch termination blood flow on coronary arteries, already later 10-12 hours appear macroscopic foci necrosis muscles hearts, pointing on the extension and deepening of the necrotic process [3, four]. it defines need search ways

quick and effective recovery blood flow in coronary arteries With goal termination coagulation necrotic process and myocytolysis in cardiac muscle.

METHOD AND METHODOLOGY

At the present time there are three ways of recovery blood flow in occluded coronary arteries. Most common from them **the first** medicinal intracoronary thrombolysis, which provides partial recovery blood flow in coronary arteries. **Second** way - surgical revascularization myocardium, which allows reestablish blood flow in heart attack - responsible (IOA) through bypass shunting occluded site. **Third** - primary angioplasty and stenting heart attack - indicated coronary arteries, in result of which most fully succeed reestablish their patency [2]

However, exists a vision, what after recovery blood flow on heart attack - responsible arteries, t. e. at reperfusion myocardium, maybe go on about his damage due to lack endogenous energy substrates and occurrences ions Ca^{++} , equals how and products anaerobic glycolysis in damaged cells [ten]. At result develops persistent contracture muscular fibers [one]. laboratory indicator this negative process is increased concentration in blood biochemical markers damage myocardium - creatine phosphokinase and lactate dehydrogenase, also marker protein damage cardiomyocytes - troponin I [3].

Raise cardiospecific enzymes at AMI (often in tenfold size) some authors even recommend use how recovery indicator blood flow at acute occlusion IOA, t. e. how index reperfusion myocardium [13]. Standard medical therapy ischemic heart disease directed on the decrease needs myocardium in oxygen or on the increase his delivery through vasa dilatation. Thanks to big number clinical research, algorithms applications this therapy known and are postulated. On the today's day largest interest represents Group drugs, directed on the improvement efficiency recycling oxygen myocardium in conditions ischemia - metabolic therapy [13]. Change metabolism myocardium at ischemia and reperfusion open wide possibility for medical impact. Row research dedicated exactly trying conservation vitality cardiomyocytes after reperfusion [four]. However in most cases metabolic therapy started too much late, due to what probability medication hits in infarcted region in moment reperfusion was extremely low [four]. overcoming this problem, on the our sight, Maybe two ways or their combination: one) usage metabolic therapy on the prehospital stage together With main classes antianginal drugs; 2) introduction drug directly in recanalized heart attack-responsible artery, what could would, on all probability, more effectively and in enough coronary concentration influence on the suffering myocardium [12].

Our task was choice optimal drug, which the would answered next requirements: a drug must have high bioavailability, on mechanism actions to be energy substrate which the easily and available hits in cardiomyocyte and to be enough for a long time acting. Among majority famous metabolic drugs in biochemical plan most promising seems new domestic drug Mexidol [13], because the he is ready and the only substrate for receiving ATP cardiomyocyte, being simultaneously and powerful antihypoxant, thanks to what possible dot his applications is how stunned, So and hibernating myocardium.

On the today's day exist work, proving efficiency drug at patients suffering chronic

forms ischemic heart disease. Also known positive influence drug on the flow diseases at patients With diagnosis OKS without lifting segment ST, but No data about efficiency drug at patients With AMI on the prehospital period, a also in combined With intervention procedures systemic thrombolytic therapy. calls interest influence drug on the reperfusion damage myocardium.

Target research - the study performance prehospital therapy cytoprotector Mexidol With subsequent intracoronary introduction drug in first watch AMI in groups comparisons.

MATERIAL AND METHODS

AT study were included 102 patients With MI, hospitalized not later 4th hours from start diseases, from which formed 3 groups. the first amounted to 37 patients which on the prehospital stage carried out systemic thrombolytic therapy in combined With intravenous administration Mexidol in dose 200 mg. AT hospital them performed mechanical recanalization and angioplasty IOA With intracoronary introduction drug (200mg).

Second Group - 40 a patient, which Mexidol in dose 200mg primary intracoronary injected in time holding endovascular procedures . Patients third (control) groups (25 person) carried out angioplasty IOA.

AT within first 6 hours from start diseases everyone patients was completed selective coronorography, left ventriculography, procedure recanalization and angioplasty heart attack-responsible coronary arteries. AT study were included Patients With complete occlusion coronary artery in proximal or middle her thirds With antegrade blood flow TIMI 0. AT first group turned on patients With compulsory efficient systemic thrombolysis. Formation second and third groups produced in hospital through randomization patients.

Intravenous introduction Mexidol in first group started on the prehospital stage after introductions thrombolytics in dose 200 mg on the 150 ml physiological sky solution (FR). Patients first and second groups carried out intracoronary introduction Mexidol after first dilatation IOA (200 mg drug bred in 40 ml FR and injected in flow ten min). After graduation procedures carried out intravenous (3 times in day in flow 5 days), then intramuscular (3 times in day in flow 9 days) Introduction to drug With subsequent transition on the oral form drug on developed scheme.

Fence blood (5 ml from cubital veins) on the MarcheZ ry damage cardiomyocytes (troponin I mior globin) in compliance With existing recommendations carried out in moment recanalization and through 12 and 24 h after fulfillment procedures [eight]. After 15 minute incubation blood centrifuged at speed 4000 rpm in flow ten min. Serum frozen at -20° C. quantitative definition troponin I and myoglobin in serum blood carried out method enzyme immunoassay analysis with using monoclonal antibodies to myoglobin and cardiac isoform troponin I (diagnob static sets " Myoglobin ELISA ", " Troponin I ELISA ", DRG instruments GmbH, Germany) on the microE tablet photometer e-liza Mat-3000 (DRG International Inc., USA) at length waves 450 nm. Sensitivity used diagnostic sets for definitions myoglobin and troponin I amounted to 5.0 ng/ml and 1.0 ng/ml respectively. Diagnostic meaningful at damage myocardium were considered promotion concentration troponin I above 1.5 ng/ml and myoglobin above 90 ng/ml.

Efficiency introductions drug on the prehospital stage (37 patients) carried out With pomo shew filling standard survey kart doctors brigades ambulance help.

AT further all sick observed in department resuscitation and intensive therapy - ICU (for therapeutic sick), from whom on the third day from start diseases them translated in cardiological department. At absence contraindications was carried out Holter monitoring, echocardiography (EchoCG), bicycle ergometry.

Distinctive feature research appeared _ then, what everyone patients on the 10th day currents diseases performed ventriculography c subsequent comparative analysis global and segmental contractility for study influence preparation _ on the hibernating and stunned myocardium. Average term stay patients in hospital made up 12.1+1.8 day

Statistical treatment material carried out With help estimates quantitative and quality signs (t-test student, nonparametric criterion χ^2 and accurate criterion Fisher).

RESULTS AND DISCUSSION

AT tab. one presented initial clinical and laboratory data researched patients.

Majority sick (in mostly men) were smokers, suffered arterial hypertension and violations lipid exchange (more 60% cases ev). AT history neither at one patient not It was MI, t. e. at all this is was the first AMI in life.

At first group Patients received in stations bunk in average later 4.7 h from start anginal attack, in second - through 4.5 h, in third - through 4.2 h; scatter made up from 1.4 before 5 h. At all sick on the ECG noted formation prong Q in leads, relevant zone MI, in combined With elevation segment ST in these same leads. At 21.1% patients first, 14.3% - second and at 25.0% third groups in moment receipts observed frequent ventricular extrasystoles (single or paired). At 16.2% in second group and at 14.9% in first noted violation inside the ventricular conductivity (incomplete blot kadu left legs beam Gisa). Failure blood circulation appeared in form small quantities wheezing in lower departments lung, shortness of breath in at rest and tachycardia.

By data contrast ventriculography fraction ejection left ventricle (FV LV) amounted to in average 43.0±0.8%. Average meaning global and segmental contractility LV in researched groups presented on the rice one.

More often noted expressed akinesis anterolateral and apical segments LV (from 42 before 51%).

Together With topics in intact segments LV observed compensatory hyperkinesis, which , on data echocardiography, decreased and returned to norm through 1-2 weeks. Directly after diagnostic procedure selective coronary angi graphy (KAG) carried out interventional endo vascular procedure (balloon angioplasty or stenting IOA). Some clinical and angiographic characteristics in studied groups sick presented in tab. 2.

table 2

Index	Group		
	I	II	III
Average diameter	3.5±0.	3.4±0.3	3.3±0.4
Medium length	23±0.6	21±0.7	24±0.6

Average amount	1.3±0.	1.2±0.4	1.2±0.4
Availability	ten	0	0
	100	100	100
Average time	67±11	57±14	71±12
Average time copies.	20.9±6	23.3±8.	18.3±5.
Average	327±5	317±63	348±69
Angiographic	100	100	100

Table 3 Medical therapy in studied groups (%)

Medicines	Group		
	I	II	III
Nitrates	91±3.1	90±3.3	80±4.1
β-blockers	82±4.2	72±4.1	80±4.3
Antagonists Sa	52±5.2	43±5.2	40±5.1
Antianginal prepa			
one groups	0	0	0
two groups	61±5.1	63±5.2	72±4.8
three groups	43±5.1	42±5.3	34±4.9

Table 4 Contractility left ventricle on data echocardiography

Index	Group			R
	I	II	III	
Fraction ejection left	46±8	49±8	37±6	<0.05
Aneurysm	33.3±42	25.2±34	46.2±38	nd

Table 5 Data bicycle ergometr

Index	Group		
	I	II	III
Medium tolerance	89±19	81±17	51±26

AT 95% cases inside and intersystem collateral blood flow at examined patients absent . Only at one patient in first group noted Availability one degree collateral filling distal channels occluded arteries on intersystem collaterals. Angioplasty performed in average through 5.4±0.6 h from start anginal attack in first group, through 4.8±0.5 h - in second swarm, through 4.9±0.5 h in third. In all cases procedure was successful: absent threatening dissection, embolization distal riverbed, not observed slowdown antegrade blood flow. Average consumption contrast substances in groups was about the same. Recanalization coronary arteries performed hydrophilic conductors. For adequate estimates angiometric character risk occlusion carried out predilation balloon diameter 1.5-2 mm. After this carried out analysis afflicted site With help digital computer angiography With subsequent choice to balloon necessary diameter and achievement adequate angiographic result. After fulfillment procedures sick in flow 1-2 day observed in ICU (complications procedures and lethality is not registered), then

them translated in cardiological department.

At all patients flow diseases on the hospital stage It was smooth serious complications not noted. Sick received adopted in center medical therapy. Differences in researched groups on antianginal therapy on the hospital period AMI not It was (tab. 3).

Disaggregant therapy after completed endovascular procedures was standard: ticlopidine in dosage 500 mg/day in flow months and constantly aspirin 100 mg/day Through 7 days after her holding everyone sick carried out repeated echocardiography, later ten days at absence contraindications appreciated tolerance to physical load With help bicycle ergometry. Patients flow diseases which complicated development aneurysms front walls LV, sample With physical load not carried out. Data conducted research presented in tab. four and 5.

So the way in first and second groups not observed any speakers indicators FV LV on comparison With original (on data echocardiography), then how in third group noted decline FV in average on the 12% ($p < 0.05$). aneurysm LV observed _ at 9 sick in first, at 7- in second group. Availability aneurysms left ventricle at patients third groups noted more often - in fifteen cases (nd).

How it is seen from tables, the study tolerance to physical load carried out 26 patients: in first group , thirty - in second, 28 - in third, at this more high indicators marked in first and second groups.

It is known what study some components blood maybe to give important information how about quality, So and quantitative characteristics how ischemic damage myocardium [four]. Most important from them are troponins - proteins, localized on the thin myofilaments contractile apparatus cardiomyocytes. Troponin complex consists from 3 components - troponins FROM, T, I. Cardiac troponins T and I are specific proteins damage cardiomyocytes with approximately the same sensitivity and specificity [10,11]. Minimum time raise troponin after occlusion IOA is 4-6 h [6,7]. AT research the first fence blood on the markers damage was held in moment recanalization IOA. Range values concentrations troponin I in blood hesitated in studied groups from 0 before twenty ng/ml, in average made up 9 ± 5 ng/ml in I group against 13 ± 6 ng/ml in group control (nd). Because the one from tasks research was grade influence intracoronary introductions Mexidol on the reperfusion damage cardiomyocytes at angioplasty IOA in acute period development heart attack myocardium, a also the study efficiency prehospital introductions drug, then second control point fence blood determined through 12 hours how maximum raise concentrations troponin after reperfusion IOA [7,8]. The first fence blood performed at admission in hospital in flow one h,

Initial clinical and anamnestic and laboratory data surveyed persons

Index	Group		
	I (n=39)	II (n=41)	III (n=32)
Average age, years	53 ± 8.1	54 ± 9.1	58 ± 11.1
men in group, %	90.9 ± 2.7	80.5 ± 35.6	83.3 ± 36.1
Hypertensive disease, %	54.5 ± 39.1	64.2 ± 41.6	58.3 ± 38.6
Smoking, %	63.6 ± 37.5	69.7 ± 44.6	66.7 ± 36.1
ischemic heart disease in history, months	4.8 ± 1.9	6.4 ± 2.3	7.2 ± 3.1

hypercholesterolemia, %	54.5±39.1	67.3±34.1	58.3±38.6
Hypertriglyceridemia,%	63.6±37.5	57.6±42.5	38.5±42.4
Fraction ejection left ventricle, %	41.1±0.9	45.2±0.9	39.3±0.7
Failure circulation, %	33.2±3.5	18.4±3.4	35.9±4.1

With using monoclonal antibodies to myoglobin and cardiac isoform troponin I (diagnostic sets "Myoglobin ELISA", "Troponin I ELISA", DRG instruments GmbH, Germany) on the micro tablet photometer e-liza Mat-3000 (DRG International Inc., USA) at length waves 450 nm. Sensitivity used diagnostic sets for definitions myoglobin and troponin I amounted to 5.0 ng/ml and 1.0 ng/ml respectively. Diagnostic meaningful at damage myocardium were considered promotion concentration troponin I above 1.5 ng/ml and myoglobin above 90 ng/ml.

Efficiency introductions drug on the prehospital stage (37 patients) carried out With filling standard survey kart doctors brigades ambulance help.

AT further all sick observed in department resuscitation and intensive therapy - ICU (for therapeutic sick), from whom on the third day from start diseases them translated in cardiological department. At absence contraindications was carried out Holter monitoring, echocardiography (EchoCG), bicycle ergometry.

Distinctive feature research appeared then, what everyone patients on the 10th day currents diseases performed ventriculography c subsequent comparative analysis global and segmental contractility for study influence drug on the hibernating and stunned myocardium. Average term stay patients in hospital made up 12.1±1.8 day

Statistical treatment material carried out With help estimates quantitative and quality signs (t-test student, not parametric criterion χ^2 and accurate criterion Fisher).

second - through 12 h from clinical manifestations reperfusion, emerging in car ambulance help third fence - later 24 h. Concentration diagnostic squirrel in studied groups reliably varied ($p < 0.05$; **rice. 2**).

Maximum differences level concentration troponin I through 12 h observed between second and third groups ($p < 0.05$), what objectively maybe testify about smaller damage cardiomyocytes [9], then how between first and third group pami noted only trend ($p = 0.07$) to decrease cardiospecific enzymes (due to reperfusion damage cardiomyocytes), testifying about recovery blood flow in IOA [11,12].

Sensitive marker non-specific damage myocardium serves also myoglobin. Dynamics changes his concentration presented on the **rice. 3**.

Original level myoglobin was approximately equals in three groups then how on the second control point noted trend to decrease concentration myoglobin in second group on comparison With third, but these data were unworthy are true.

Everyone patients on the 10th day currents diseases was completed control ventriculography for estimates speakers global and segmental contractility myocardium LV. Dynamics FV LV, a also BWV and CSR LV in researched groups preda staged on the rice. 4-6.

AT groups With using cytoprotector Mexidol noted reliably more high FV, a also reliable positive dynamics final diastolic volume left ventricle (KDO LV) and final systolic volume left ventricle (CSR LV) on the 10th day currents diseases on comparison With control group.

Feature carried out work are three circumstances. Firstly, introduction cytoprotector Mexidol was carried out on the prehospital stage.

Secondly, introduction drug directly in IOA after her recanalization and angioplasty allowed reach restrictions reperfusion damage cardiomyocytes. Thirdly, application on the hospital stage metabolic therapy (Mexidol) favorably influenced on the hibernating myocardium, what confirmed at comparison global and segmental contractility myocardium left ventricle initially and on the 10th day diseases.

It is known what most early recanalization promotes restriction zones heart attack myocardium. it impossible without timely delivery patient brigade ambulance help in hospital. Interval time which the passed from call patient dispatcher before hospitalizations in BIT, in our research was less, than in some foreign research, and in average made up 109 ± 31 min, what allowed before execute recanalization and angioplasty IOA. Except Togo, some patients along with With thrombolytic therapy appointed cytoprotector. These Patients felt myself better and to moment receipts in BIT at them noted more stable quantities HELL, less sharply leaked reperfusion syndrome (decreased amount extrasystoles and noted not so significant the fall HELL, less often observed nausea and vomit).

Results experimental works witness are: how before started metabolic therapy, topics less expressed reperfusion damage cardiomyocytes. Low efficiency metabolic therapy maybe to be conditioned inadequate dose and/or inadequate impact introduced drug. Domestic cytoprotector Mexidol is one from first metabolic drugs, which the has fundamental mechanism actions. He enough fast accumulates in muscle hearts and It has long period half-life. At intravenous administered favorably influenced on the limitation zones damage and protection myocardium, what related With pronounced cardioprotective properties drug, providing improvement mitochondrial transport, energy stunned and hibernating myocardium in conditions acute and chronic ischemia.

On the basis received results proven what introduction drug directly in IOA on comparison With intravenous is more efficient for prevention reperfusion damage cardiomyocytes. it assumption It was confirmed data biochemical analyzes cardiospecific enzymes: revealed double reliable decline level concentration specific marker necrosis cardiomyocytes troponin I in group With intracoronary introduction Mexidol on comparison With control.

CONCLUSIONS

1. Recovery coronary blood flow in first four h from start development acute heart attack myocardium is pathogenetic way treatment diseases, defining his further flow and forecast.
2. Stenting and primary angioplasty heart attack-responsible coronary arteries is radical and efficient method recovery coronary blood circulation at sick sharp heart attack myocardium.
3. Prevention reperfusion damage myocardium With help cardioprotector Mexidol promotes significant raising clinical efficiency recovery coronary circulation. Maximum success marked at intracoronary administered drug directly after successful angioplasty heart attack - responsible coronary arteries.

4. Comparative data global and segmental contractility myocardium left ventricle testify what early Start introductions Mexidol promotes positive dynamics in development diseases.

REFERENCES

1. Madjidova GT et al. Nutritional Support for Patients with Coronavirus Infection // Texas Journal of Medical Science. - 2022. - T . 13. - S. 22-30.
2. .Madjidova GT Tactics of treatment of patients with acute coronary syndrome // Texas Journal of Medical Science. - 2022. - T . 13. - S. 37-42.
3. Madjidova GT, Sunnatova GI, Xamidov N. Features of Natriuretic Peptides in the Blood Plasma of Patients with Hypertrophic Cardiomyopathy // Texas Journal of Medical Science. - 2022. - T . 13. - S. 31-36
4. Tashkenbaeva EN et al. Changes in heart rate in acute myocardial infarction according to cardiac echocardiography // Scientific journal. – 2020. – no. 7 (52). - S. 51-54.
5. Madjidova GT, Sunnatova GI, Hamidov NS CLINICAL AND HEMODYNAMIC CONDITIONS AND HEART NATRIURETIC PEPTIDES IN THE BLOOD PLASMA OF PATIENTS WITH HYPERTROPHIC CARDIOMYOPATHY //Eurasian Journal of Medical and Natural Sciences. - 2022. - T . 2. - no. 5. - S. 211-219.
6. Madjidova GT, Sunnatova GI, Usarov SA ABOUT THE SYSTEM OF TREATMENT OF PATIENTS WITH ACUTE CORONARY SYNDROME //Eurasian Journal of Medical and Natural Sciences. - 2022. - T . 2. - no. 5. - S. 197-204.
7. Alisherovna SN et al. A Modern Approach to Risk Stratification in Patients with Heart Failure with Preserved and Reduced Ejection Fraction //Web of Scientist: International Scientific Research Journal. - 2022. - T . 3. - no. 5. - S. 73-81.
8. Alisherovna SN et al. FEATURES OF THE CLINICAL COURSE OF UNSTABLE ANGINA ON THE BACKGROUND OF COPD //Web of Scientist: International Scientific Research Journal. - 2022. - T . 3. - no. 5. - S. 82-86.
9. Alisherovna SN et al. FEATURES OF THE CLINICAL COURSE OF UNSTABLE ANGINA ON THE BACKGROUND OF COPD //Web of Scientist: International Scientific Research Journal. - 2022. - T . 3. - no. 5. - S. 82-86.
10. Alisherovna SN et al. Course of Myocardial Infarction in Young Women //Eurasian Medical Research Periodical. - 2022. - T . 7. - S. 106-111.
11. Mazhidova G. T., Muinova K. K., Rasuli F. O. Prognosis of the probability of developing myocardial infarction, taking into account family history in men at a young age // Scientific journal. – 2019. – no. 9 (43). - S. 55-57.
12. Samadova NA et al. Clinical and Diagnostic Features of Myocardial Infarction in Young Patients in Emergency Medicine //E-Conference Globe. - 2021. - S. 16-19.
13. Khasanjanova F.O. et al. Evaluation of the effectiveness of thrombolytic therapy in men with acute coronary myocardial infarction in young age //CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES. - 2021. - T . 2. - no. 1. - S. 144-149.
14. Khasanzhanova F.O. et al. EVALUATION OF THE EFFECTIVENESS OF THROMBOLYTIC THERAPY IN MEN WITH ACUTE MYOCARDIAL

- INFARCTION IN YOUNG AGE //Archive of Conferences. - 2021. - T . 15. - no. 1. - S. 48-52.
15. Alisherovna SN et al. FEATURES OF THE CLINICAL COURSE OF UNSTABLE ANGINA ON THE BACKGROUND OF COPD //Web of Scientist: International Scientific Research Journal. - 2022. - T . 3. - no. 5. - S. 82-86.
 16. Mazhidova G. T., Istamova S. S., Fatullaeva D. S. Effectiveness of biguanides in combined therapy of hypertension with metabolic syndrome // Scientific journal. – 2019. – no. 5 (39). - S. 72-74.
 17. Khasanzhanova F. O. et al. CLINICAL COURSE OF CHRONIC HEART FAILURE FROM LOCALIZATION OF ACUTE MYOCARDIAL INFARCTION //Eurasian Journal of Cardiology. – 2019. – no. S1. – p. 22
 18. Turdibekov Kh. I. et al. IMMUNOGENETIC ASPECTS OF BRONCH TONE REGULATION //BBK 51.1+ 74.58 K 22. - 2013. - P. 167.
 19. Ibadova D. et al. Methods for monitoring the effectiveness and safety of pharmacotherapy //Journal Bulletin of the Doctor. - 2013. - T. 1. - No. 02. - P. 57-59 .
 20. Ibadova D. et al. Principles of the use of thiazide and thiazide -like diuretics in the treatment of hypertension (literature review) //Journal Bulletin of the Doctor. - 2013. - T. 1. - No. 02. - P. . erle
 21. Mukhiddinov AI et al. HYPOTENSIVE THERAPY IN PATIENTS WITH ARTERIAL HYPERTENSION WITH METABOLIC RISK FACTORS // Youth and medical science in the XXI century. - 2014. - S. 228-229.
 22. Khasanzhanova F. O. et al. FACTORS AFFECTING LEFT VENTRICULAR DILATION IN PATIENTS WITH UNSTABLE ANGINA // Youth and medical science in the XXI century . - 2018. - S. 175-176.
 23. Muinova K. K. et al. The role of risk factors in the development of myocardial infarction in young men of 23 age depending on family history // Achievements of science and education. – 2019. – no. 11 (52). – P. 70-74 .