

## CLINICAL AND MORPHOLOGICAL MANIFESTATIONS OF KIDNEY DAMAGE IN PATIENTS WITH SARS-COV 2

**KhamdamovBakhtiyorZaripovich<sup>1</sup>**  
**KhursandovIlyos Akhmeodvich<sup>2</sup>**  
**Askarov ToxirAskarovich<sup>3</sup>**  
**Teshayev Ulugbek Shukhratovich<sup>4</sup>**  
**Khamdamov Ilkhomjon Bakhtiyorovich<sup>5</sup>**  
**Mirkhodjayev Islam Asrorovich<sup>6</sup>**  
**Akhmedov Khayot Erkinovich<sup>7</sup>**  
**Khamdamova MukhayyokhonTukhtasinovna<sup>8</sup>**

<sup>1</sup>e-mail: [dr.hamdamov@mail.ru](mailto:dr.hamdamov@mail.ru)  
<https://orcid.org/0000-0003-3569-6688>

<sup>2</sup>e-mail: [ilyoxursandov@gmail.com](mailto:ilyoxursandov@gmail.com)  
<https://orcid.org/0009-0002-2372-8005>

<sup>3</sup>e-mail: [Askarovtohir57@gmail.com](mailto:Askarovtohir57@gmail.com)  
<https://orcid.org/0000-0002-3742-4742>

<sup>4</sup>e-mail: [ulug\\_leo@mail.ru](mailto:ulug_leo@mail.ru)  
<https://orcid.org/0009-0000-0052-2827>

<sup>5</sup>e-mail: [mr.ilyuwa@mail.ru](mailto:mr.ilyuwa@mail.ru)  
<https://orcid.org/0000-0001-5104-8571>

<sup>6</sup>e-mail: [islom-abx@mail.ru](mailto:islom-abx@mail.ru)  
<https://orcid.org/0000-0002-9387-0384>

<sup>7</sup>e-mail: [khayatkhan81@gmail.com](mailto:khayatkhan81@gmail.com)  
<https://orcid.org/0009-0005-0838-5720>

<sup>8</sup>e-mail: [muhayo-1969@mail.ru](mailto:muhayo-1969@mail.ru)  
<https://orcid.org/0000-0003-3128-6120>

Bukhara medical institute

### KEYWORDS

SARS-CoV2, kidneys, endothelium

### ABSTRACT:

An analysis of the clinical and morphological manifestations of kidney damage in patients who underwent SARS-CoV2 showed that the pathological process in the kidneys mainly proceeds according to an acute inflammatory type, characterized by the predominance of diffuse endocapillary exudation (79.41%), while in patients with long-term consequences of kidney damage after SARS-CoV2, diffuse endocapillary proliferation becomes prevalent (92.86%), which, after suffering from coronavirus endotheliitis, can inevitably lead to the development of chronic renal failure.

**Relevance.** To date, it has been established that the direct pathological effect of the SARS-CoV-2 coronavirus on the kidneys occurs through the receptors of the ACE<sub>2</sub> organ, an angiotensin converting enzyme. Progressive application with the protein component of the receptor leads to the destruction of the renal parenchyma. Mediocre pathological effects occur through disorders in the immune system as a result of a so-called cytokine storm (1,3,5,7).

SARS-CoV-2 affects both the innate and acquired immune response of the host. SARS-CoV-2 can induce an immune response in two phases: an early specific acquired immune response to eradicate the virus and inhibit disease progression, and uncontrolled inflammation as a responsible mechanism for ARDS. The virus spreads and affects tissues with ineffective immune responses (2,4,6,22,23).

Necrosis or apoptosis of T cells promotes the release of a cytokine storm leading to a reduction of T cells (C. Huang, et al., 2020), especially in cases with severe disease, lower circulating CD4+ and CD8+ T cells and higher, IL-10 and tumor necrosis factors- $\alpha$  (TNF $\alpha$ ) (9,11,13,15,24). Consequently, systemic inflammation harms viral clearance, contributing to the depletion of T cells (8,10,12,14).

Almost all patients with SARS-CoV-2 developed lymphopenia as an important marker of immune system disorders (17,19,21). Kidney macrophages play a key role in immune defense, as they are the predominant cells interacting with virus targets and can activate phagocyte and chemokine signaling (16,18,20,25). In addition, the cytopathic effect of the SARS-CoV-2 virus can directly damage renal tubular cells during infection and replication stages, spreading a complex immune response. In addition, the chemokine network, activation of complement cascades and coagulation play a potential role in the development of PP in patients with SARS-CoV-2 (3,4,7,8,26,27).

Macrophages, as important innate immune cells, can sense and respond to pathogens and generate inflammatory molecules to remove infectious agents and support tissue repair. The virus enters the macrophage, and they present the viral antigen to T helper cells-1 (CD4+ and Th1), which release interleukin-12 to further launch the Th1 cell. Activated Th1 cells stimulate B cells to produce antigen-specific antibodies and T killer cells (CD8+ and T<sub>k</sub>) to target cells containing viral antigen (5,7,28,29).

During SARS-CoV-2 infection, a decrease in the number of CD4+ and CD8+ cells and an increase in cytokine levels cause inflammation (4,9,11). As for the specific gravity of the SARS-CoV-2 virus, various subgroups of T cells are activated (8,10). Excessive cytokine production, which leads to ARDS, is associated with the outcome and severity of SARS-CoV-2. The increased inflammatory response caused by SARS-CoV-2 plays a key role in the severity of infection, the development of PP and death (14,15,30).

Cell death and tissue damage can occur due to the presence of high levels of circulating cytokines. In addition, erythrocyte hemolysis and anemia are observed, since cytokines can activate macrophages; together (vascular hemostasis disorders, anemia and injuries caused by cytokines) lead to multiple organ failure, including the kidneys. It is the hemolysis of erythrocytes, which develops as a result of a cytokine storm and causes disorders in the kidneys (2,7,18).

Such a high frequency of PP interest in patients with SARS-CoV-2 indicates the relevance of this problem.

At the same time, such aspects as the peculiarities of the clinical manifestations of PP in patients who have undergone SARS-CoV2 remain far from being determined. Information on changes in the dynamics of cellular and humoral immunity in PP in patients who have undergone SARS-CoV2 remains far from being studied. Solving these aspects of this urgent problem would make it possible to substantiate the importance of immunological changes in the pathogenesis of PP development, as well as to identify their clinical significance in the diagnosis and prognosis of the outcome of PP in patients who have undergone SARS-CoV2.

**The purpose of the study:** to study the nature and analysis of clinical and morphological manifestations of kidney damage in patients who have undergone SARS-CoV 2

**Research materials and methods:** The paper presents information on the comprehensive examination and treatment of 62 patients with kidney damage who underwent SARS-CoV-2. The distribution of patients was carried out on the basis of a promising targeted open randomized trial.

The period of research and collection of clinical material began in the second quarter of 2020 and ended in December 2023. At the same time, during the period from April to August 2020, the clinic also functioned as a specialized covid center, with the involvement of specialists from all directions in accordance with quarantine requirements. All patients were grouped into one main group.

The criteria for inclusion of patients in the main group were: the age of patients not younger than 20 and not older than 75 years; the presence of a history of coronavirus infection, with severe course, with signs of kidney damage during treatment; preservation of signs of kidney disease (proteinuria, albuminuria, micro- or macrohematuria, decreased glomerular filtration rate, high creatinine values and urea in the blood, etc.); the presence of a negative result of a PCR test for SARS-CoV-2 during hospitalization in our clinic; availability of the patient's voluntary informed consent to participate in a clinical trial.

Due to the fact that patients of the main group were admitted to the clinic with a different duration of the anamnestic period of the disease and the timing of SARS-CoV-2 before us, it became necessary to randomize the main group itself. Based on the principles of evidence-based medicine, we divided the main group of patients into two subgroups:

The first subgroup consisted of 34 (54.8%) patients who were transferred from a specialized covid infection clinic after achieving a negative result of a PCR test for SARS-CoV-2 with signs of kidney damage and the need for renal replacement therapy.

The second subgroup consisted of 28 (45.2%) patients who were transferred from other therapeutic clinics or hospitalized as in the initial treatment for the underlying disease. All of them had a history of SARS-CoV-2 and were treated in an inpatient setting at a specialized covid infection clinic. During the treatment, they were diagnosed with acute kidney damage, but by the time they were discharged from the hospital, remissions of complications had been achieved. However, subsequently, after 1 to 3 months, patients came to our clinic with the need for renal replacement therapy.

The chronology of hospitalization of patients with kidney damage after suffering SARS-CoV-2 showed that patients of the first subgroup were hospitalized in our clinic mainly (70.6%) during the peak of the first and second waves of the COVID-19 pandemic, whereas patients of the second subgroup turned to us for specialized help mainly after passing the waves of the COVID-19 pandemic for the period 2021-2023 (92.9%).

The diagnosis of kidney damage was established according to the recommendations of the global Fund for the Improvement of Kidney Diseases (KDIGO) in the presence of one of their three signs of manifestation of the pathological process in the form of: an increase in serum creatinine at 26.5 mmol/l and above for 48 hours; an increase in serum creatinine above 1.5 times compared with the baseline level during the previous 7 days; a decrease in the volume of urine formation of less than 0.5 ml / kg / hour for 6 hours.

All patients in the main group were divided by stages of kidney damage after suffering SARS-CoV-2, which were also recommended by KDIGO.

As our data showed, the third stage of kidney damage prevailed among the patients of the main group (62.9%), in which the creatinine level in the blood of patients increased 3 times from the initial level or the beginning of renal replacement therapy. In the remaining 37.1% of cases, patients had the first and second stages of kidney damage after undergoing SARS-CoV-2. In 17.7% of cases, the first stage of kidney damage was diagnosed, when the level of creatinine in the blood increased 1.5-1.9 times from the initial level, and in 19.4% of cases – 2 – 2.9 times under the same conditions.

The distribution of patients by age showed a predominance of patients in the age group of 51 and older (67.8%). At the same time, the distribution of the number of patients in the age group from 51 to 60 years and from 61 to 75 years turned out to be the same (for 21 patients or 33.9%). In second place were patients aged 41-50 years (24.2%). There were patients at a young age in only 8.1% of cases. It should be noted that among the patients of the first subgroup, the age group from 51 to 60 years prevailed, and in the second subgroup – from 61-75 years.

Glomerular filtration rate (ml/hour/kg) = [Urine volume (ml) x urine creatinine (mg/ml)] / [time (hour) x serum creatinine (mg/ml) x patient weight (kg)].

All patients underwent ultrasound examination of the kidneys in the conditions of the functional diagnostics room. To determine morphostructural changes in the kidneys, all patients of the main group underwent percutaneous puncture biopsy of the kidneys in the surgical department under aseptic conditions. The biopsy material was examined using a standardized histological technique with staining by examination under light in the conditions of the central research laboratory.

Factor analysis was used to study the mutual relationship of various studied features, which determined the dispersion of specific factors in the form of a dispersion cloud. Statistically significant linear combinations of a number of factors made it possible to reduce the dimension of the feature graphic cloud, which can be analyzed.

The linear construction of the data allowed us to compare specific factors with each other. This, in turn, was the key to studying the effects on the final result of the analyzed factors in each dispersion data cloud. The use of this method of statistical analysis made it possible to quantify the observed signs of changes.

The studied factors and their constituent immunological data were presented in quantitative form; the observed signs influenced by the studied factors were effective.

**The results and their discussion.** Before proceeding to the analysis of clinical and laboratory manifestations of kidney damage in patients who have undergone SARS-CoV2, we considered it fair to

present the background status of patients, that is, the presence of concomitant diseases. In total, 232 names of concomitant diseases were diagnosed among the patients of the main group. At the same time, for each patient, on average, there were 3.7 nosological forms of the disease concomitant with kidney damage. To a greater extent, the correlation was expressed among patients of the second subgroup – 4.3 pathologies, rather than among patients of the first subgroup – 3.3 nosological diseases. Among the patients of the first subgroup, an even half of the concomitant diseases (50%) were pathologies from the cardiovascular system. At the same time, among the patients of the second subgroup, the proportion of pathologies from the cardiovascular system was also the largest, but only 34.2% within the subgroup was equated. Concomitant diseases of the cardiovascular system were represented by coronary heart disease (29.9%), hypertension (44.3%), varicose veins of the lower extremities (11.3%) and atherosclerotic vascular lesion (14.4%).

Concomitant diseases from the respiratory system (25.4%) and digestive organs (19.8%) were noted in the second and third places in terms of frequency. At the same time, among the patients of the first subgroup, they were in the same proportion (18.8% each), whereas among the patients of the main group, patients with concomitant respiratory diseases prevailed (31.7%).

Concomitant diseases of the gastrointestinal tract among patients of the second subgroup amounted to 20.8%. Concomitant diseases of the respiratory system were represented by the presence of exudative pleurisy (50.8%), which were noted to a greater extent among patients of the second subgroup (55.3%), chronic obstructive pulmonary diseases (28.8%), which were noted mainly among patients of the first subgroup, and chronic nonspecific lung diseases (20.3%). Concomitant diseases from the gastrointestinal tract were represented by the presence of chronic colitis (43.5%), pathologies from the pancreato-hepatobiliary system (chronic hepatitis and chronic calculous cholecystitis – 19.6% each), peptic ulcer of the stomach and duodenum (6.5%) and chronic gastritis (10.9%).

Concomitant diseases of the musculoskeletal system were diagnosed in 8 (3.4%) patients, with their prevalence among patients of the second subgroup (4.2%) over the number of patients of the first subgroup (2.7%). In 62.5% of cases, they were represented by gout.

Diseases from the nervous system were noted in 2.2% of cases (1.8% in the first subgroup of patients and 2.5% in the second subgroup of patients). Another 17 (7.3%) patients had concomitant pathologies of diabetes mellitus (8.0% among patients of the first subgroup and 6.7% among patients of the second subgroup).

In a clinical examination of patients with kidney damage, 241 complaints were identified after undergoing SARS-CoV2. Although they were predominantly (55.2%) noted among patients of the first subgroup, nevertheless, for each patient of both subgroups, they accounted for the same proportion of 3.9 complaints per 1 patient. The main complaints of patients were general weakness (96.8%). At the same time, among patients of the first subgroup, it was noted in 94.1% of patients, and among patients of the second subgroup – in all cases.

Arterial hypertension was in second place in frequency (69.4%) of patients, which prevailed among patients of the second subgroup (75%) over the number of patients of the first subgroup (64.7%). Local swelling and puffiness of the face bothered 22 (64.7%) patients of the first subgroup and 16 (57.1%) patients of the second subgroup. A total of 38 (61.3%) patients had such complaints.

The next most frequent registration was complaints of urine discoloration (50%), which was noted in 38.2% of cases among patients of the first subgroup and in 64.3% of cases among patients of the second subgroup. Massive edema was noted in 23 (37.1%) patients, which prevailed among patients of the second subgroup (39.3%).

Hyperthermia was noted in 24 (38.7%) patients. At the same time, 19 (30.6%) patients had subfebrile hyperthermia, and 5 (8.1%) patients had febrile hyperthermia. This clinical sign of kidney damage, after undergoing SARS-CoV 2, was predominantly noted among patients of the first subgroup.

Dysuric phenomena were observed in 13 (21%) patients, and polyarthralgia – in 9 (14.5%) patients. At the same time, dysuric phenomena prevailed among patients of the first subgroup (26.5%), and polyarthralgia – among patients of the second subgroup (17.9%).

Kidney biopsy material was obtained in all patients of the main group in order to identify the features of morphological changes at the stage of development of the pathological process. In 46.77% of patients, signs of diffuse endocapillary exudation were detected, whereas in the remaining 53.23% of

cases, data were obtained indicating the presence of kidney damage by the type of diffuse endocapillary proliferation.

The puncture biopsy material showed an increase in the cellularity of neutrophils. Increased exudation of capillary endothelial cells was detected, and in some cases it was with signs of transition to proliferation. Infiltration of kidney tissue by neutrophils and monocytes was noted. There were biopsies with hemorrhagic character of the lesion. This type of changes in the kidneys correlated with exudative proliferation of endocapillaries.

In other cases, the lumen of the capillaries was narrowed with predominantly proliferative changes in the capillaries. The narrowing of the lumen occurred both due to increased proliferation and due to the deposition of immune complexes, mainly on the epithelial side of the basement membrane of the glomerular capillaries.

The variance of the distribution of these leading morphological values among patients of different subgroups was not unambiguous. Thus, among the patients of the first subgroup, diffuse endocapillary proliferation was noted only in 7 (20.59%) patients, whereas diffuse endocapillary exudation was a predominant kidney lesion and characteristic of 27 (79.41% of patients. In patients of the second subgroup, changes in the renal tissue were more prone to proliferative processes. The predominant type of lesion (26 patients, 92.86%) was diffuse endocapillary proliferation of renal vessels. We revealed the presence of diffuse endocapillary exudation in only 2 (7.14%) patients.

Thus, the nature and analysis of the clinical and morphological manifestations of kidney damage in patients who underwent SARS-CoV2 showed that the pathological process in the kidneys mainly proceeds according to an acute inflammatory type, characterized by the predominance of diffuse endocapillary exudation (79.41%). In patients with long-term consequences of kidney damage after suffering SARS-CoV2, diffuse endocapillary proliferation (92.86%) becomes prevalent, which after suffering coronavirus endotheliitis can inevitably lead to the development of chronic renal failure.

### Conclusions:

1. Анализ результатов больных перенесших SARS-CoV2, показал, что патологический процесс в почках преимущественно протекает по острому воспалительному типу, характеризующийся преобладанием диффузной эндокапиллярной экссудации (79,41%).
2. У больных с отдаленными последствиями поражения почек после перенесенного SARS-CoV2, преобладающим становится диффузная эндокапиллярная пролиферация (92,86%), которая после перенесенного коронавирусного эндотелиита неминуемо может привести к развитию хронической почечной недостаточности.

### Literature

1. Ассоциированный с COVID-19 васкулит, подтвержденный тканевой ПЦР в режиме реального времени: отчет о серии случаев / К. Е. Белозеров, И. С. Аврусин, А. А. Яковлев и др. // Лечение и профилактика. – 2023. – Т. 13, № 1. – С. 71-81.
2. Атипичный гемолитико-уремический синдром связанный с COVID-19 и применение терапии экулизумабом / А. В. Хомяков, Л. Ю. Журавлева, А. Е. Романова [и др.] // Вестник Челябинской областной клинической больницы. – 2023. – № 2(56). – С. 8-15.
3. Воробьев П. А. Рекомендации по диагностике и интенсивной терапии синдрома диссеминированного внутрисосудистого свертывания крови при вирусном поражении легких // Проблемы стандартизации в здравоохранении. – 2020. – № 5-6. – С. 71-94.
4. Клинические и прогностические критерии осложненного течения новой коронавирусной инфекции (COVID-19) / А. С. Сычева, А. Л. Кебина, А. Л. Верткин, и др. // Медико-фармацевтический журнал Пульс. – 2021. – Т. 23, № 9. – С. 147-153.
5. Covid-19: связь с патологией почек. Обзор литературы / Н. А. Томилина, Н. Ф. Фролова, Л. Ю. Артюхина [и др.] // Нефрология и диализ. – 2021. – Т. 23, № 2. – С. 147-159.
6. Confirmation of the high cumulative incidence of thrombotic complications in critically ill ICU patients with COVID-19 / F.A. Klok, M.J.H.A. Kruip, N.J.M. van der Meer, et al. // Thrombosis Research. – 2020. – Vol. 191 – P. 148–150.
7. Pathophysiology of COVID-19-associated acute kidney injury / M. Legrand, S. Bell, L. Forni, et al. // Nature Review Nephrology. – 2021. – Vol. 17 - No11 – P. 751-764.

8. Хамдамов Б.З. Comparative evaluation of methods of amputation related to tidiotarus with severe forms of diadetic foot syndrome. *European Science Review*. Austria, Vienna 2014 Septemba-October №9-10. - С. 58-60.
9. Хамдамов Б.З. Диабетик товон синдромида бажариладиган юкори ампутациялардан сунг беморларнинг хаёт кечириш сифатидаги узгаришлар тахлили. Самарканд. Биология ва тиббиёт муаммолари. №1, 2019., (107) - С. 115-117.
10. Хамдамов Б.З. Комплексное лечение синдрома диабетической стопы с критической ишемией нижних конечностей. *Журнал биомедицины и практики*. Ташкент 2020, Специальный выпуск. 5 часть. –С.801-814.
11. Хамдамов Б.З. Метод лазерной фотодинамической терапии в лечении раневой инфекции при синдроме диабетической стопы. *Биология ва тиббиёт муаммолари* №1 (116) 2020. – С.142-148
12. Хамдамов Б.З. Морфологические изменения при применении фотодинамической терапии в лечении раневой инфекции в эксперименте. *Журнал Морфология*. Санкт-Петербург. 2020. Том 157 (2-3). –С. 223-224.
13. Хамдамов Б.З. Оптимизация методов местного лечения гнойно-некротических поражений стопы при сахарном диабете. *Журнал. Тиббиётда янги кун*. 2018, №4 (24) - С.112-115.
14. Khamdamov B. Z., Akhmedov R. M., Khamdamov A. B. The use of laser photodynamic therapy in the prevention of purulent-necrotic complications after high amputations of the lower limbs at the level of the lower leg in patients with diabetes mellitus. *Scopus Preview. International journal of Pharmaceutical Research*. Volume 11, Issue 3, July-Sept, 2019
15. Khamdamov B. Z., Nuraliev N.A. Pathogenetic approach in complex treatment of diabetic foot syndrome with critical lower limb ischemia. *American Journal of Medicine and Medical Sciences*, 2020 10 (1) 17-24 DOI: 10.5923/j.20201001.05.
16. Khamdamov B.Z. Indicators of immunocytocine status in purulent-necrotic lesions of the lover extremities in patients with diabetes mellitus. *American Journal of Medicine and Medical Sciences*, 2020 10 (7): 473-478 DOI: 10.5923/j.20201001.08
17. Khamdamov, B., & Dekhkonov, A. (2022). Clinical and laboratory parameters of the wound process complicated by the systemic inflammatory response syndrome in patients with diabetes mellitus. *Journal of education and scientific medicine*, 2(3), 25-29. Retrieved from <https://journals.tma.uz/index.php/jesm/article/view/349>
18. Khamroev, U., & Khamdamov, B. (2022). Features of changes in endothelial system parameters in patients with diffuse toxic goiter. *Journal of education and scientific medicine*, 2(3), 62-67. Retrieved from <https://journals.tma.uz/index.php/jesm/article/view/358>
19. Эшбеков М.А., Хамдамов Б.З. Показатели тиреоидного профиля при различных клинических формах гломерулонефрита и корреляционные взаимосвязи с цитокиновой системой // *Журнал теоретической и клинической медицины*. Ташкент, 2023- №6.- С.175-185.
20. Хамдамов Б.З, Набиева У.П., Эшбеков М.А., Агзамова Т.А. Цитокиновый профиль у больных гломерулонефритом в зависимости от клинического течения// *Журнал теоретической и клинической медицины*. Ташкент, 2023- №4.- С.112-116.
21. Хамдамов Б.З., Эшбеков М.А. Взаимосвязи между показателями цитокинового и иммунного статуса у больных гломерулонефритом // *Биология ватиббиётмуаммолари*. Самарканд, 2023- №6. -С.274-278.
22. Хамдамов Б.З, Набиева У.П., Эшбеков М.А., Клинико-эпидемиологическая характеристика и корреляционные взаимосвязи с цитокиновой системой у больных с гломерулонефритом // *Журнал теоретической и клинической медицины*. Ташкент, 2024- №1.- С.175-185.
23. Khamdamov B.Z., Eshbekov M.A., Khamdamov A.B. Characteristics of the thyroid profile in various clinical forms of glomerulonephritis and correlations with the cytokine system // *American Journal of Medicine and Medical Sciences* 2024, 14(2): 458-465.
24. Khamdamov B.Z., Eshbekov M.A., Khamdamov A.B., Askarov T.A. Cytokine profile in patients with glomerulonephritis depending on the clinical course // *American Journal of pediatric medicine and health science*, 2024- Volume 2, Issue 2.-P.174-180.

25. Khamdamov B.Z.1, Eshbekov M.A. Immuno-endocrine markers of the course of chronic glomerulonephritis//XI Международная Научно-Практическая Конференция «Актуальные вопросы медицины»и «V спутниковый форум по общественному здоровью и политике здравоохранения», Баку, март 2024.- С.234-235.
26. Хамдамов Б.З., Набиева У.П., Эшбеков М.А. Уровень иммунокомплексных реакций при хроническом гломерулонефрите // Материалы международной научно-практической конференции «Образование, наука, медицина», посвященной 80-летию Академии Наук Республики Узбекистан, г.Ташкент, 22 июня 2023 г. Журнал теоретической и клинической медицины. Ташкент, 2023- № 3.-С.184.
27. EshbekovM.A.. Cytokine profile in patients with glomerulonephritis depending on the clinical course // International scientific-online conference “Development of pedagogical technologies in modern sciences”, Turkish, 2023- doi.org/10.5281/zenodo/10653893.
28. Эшбеков М.А., Бойманов Ф.Х. Иммунокомплексные механизмы в течении хронического гломерулонефрита. // International bulletin of Applied science and technology, April 2023, Volume 3, Issue 4.-P.168-172.
29. Eshbekov M.A., Khamdamov B.Z., Usmanova N.U. Immunocomplex mechanisms during chronic glomerulonephritis // International conference on Advance research in humanities, science and education, London, April 2023- P.504-513.
30. Eshbekov M.A., Khamdamov B.Z., Usmanova N.U.The significance of immunocomplex mechanisms during chronic glomerulonephritis // International conference on Advance research in humanities, science and education, Germany, May 2023- P.89-98.