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THE PROBLEM OF NEPHROPATHY DEVELOPMENT IN PATIENTS HOSPITALIZED WITH CORONAVIRUS INFECTION

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Summary. One of the most common complications of COVID-19 is acute kidney injury (AKI). The frequency of AKI, according to various authors, varies widely and requires further study. Data on the prevalence of severe AKI, including those with renal replacement therapy (RRT), among patients with COVID-19 in the Uzbek population are limited [6]. Because AKI increases patient care costs, epidemiological data are essential for healthcare planning [7].

Data on the prevalence of various AKI phenotypes, their clinical features, the predictive role of changes in urine sediment, proteinuria, and markers of kidney damage in patients with COVID-19 in the Uzbek population are not available. In retrospective foreign studies, most patients with AKI were admitted with already impaired renal function [8, 9]. However, the prognostic role and predictors of the development of various AKI phenotypes remain unclear to date. The study of the predictive role of changes in urine sediment, proteinuria and biomarkers in the development of AKI and mortality in real clinical practice can become the basis for the development of an improved algorithm for managing patients with COVID-19: stratification of patients by risk of developing AKI, identification of high-risk groups,

Keywords: AKI, nephropathy, COVID-19, renal replacement therapy.

Relevance.AKI is a well-recognized risk factor for poor prognosis in patients with COVID-19 [4, 5]. Data for the Republic of Uzbekistan are limited [20], but also confirm an increased risk of in-hospital mortality in patients with AKI, which underlines the undoubted relevance of the problem. Despite a large number of publications, the prognostic role of AKI among predictors of mortality is not completely clear.

The long-term outcomes of AKI during the acute phase of COVID-19 are not well understood. The potential impact of AKI on the risk of readmission, death, development or progression of chronic kidney disease (CKD) after hospital discharge has not been evaluated in the Uzbek population. The high prevalence of COVID-19 and associated AKI highlights the need to study long-term global and renal outcomes to predict and plan care.

Data on the prevalence of AKI in COVID-19 are contradictory and vary widely (0.5% - 80.3%) depending on the severity of the disease [3, 5].

AKI has previously been shown to be a predictor of poor prognosis in hospitalized patients with COVID-19 [4, 5]. The high prevalence of AKI in the severe COVID-19 group [11, 12] and the increased risk of death in patients with AKI [5, 12] highlight

the need for further research into predictors of kidney injury in this population. In addition, most studies have examined prognosis regardless of the time of onset of renal impairment.

In domestic practice, predictors and associations of various AKI phenotypes in COVID-19, the prognostic value of changes in urine tests and biomarkers in relation to adverse outcomes have not been studied. The paucity and inconsistency of such works presented in the foreign literature confirms the need for further study of this problem [13, 14, 15].

The purpose of this study: To study the literature on the development of nephropathy in patients with COVID-19.

Following a spike in respiratory infections causing respiratory failure in Wuhan, Hubei Province, China, in December 2019, researchers identified a novel coronavirus later named "Severe Acute Respiratory Syndrome 2 Coronavirus" (SARS) by the World Health Organization (WHO). -CoV-2). On March 11, 2020, the spread of the virus was recognized by WHO as a pandemic. Despite all the achievements in the field of diagnostics and treatment, active anti-epidemic measures, the pandemic of a new coronavirus infection (COVID-19) remains one of the most urgent medical problems. In the past two years since the emergence of SARS-CoV-2, more than 400 million people have been infected and more than 5.5 million deaths have been caused by COVID-19 worldwide [16]. The Russian Federation (RF) has equally staggering numbers: 14 million infected and over 330,000 deaths as of February 2022. The statistics of Uzbekistan are as follows: 249,045 total registered infected, 1,637 deaths of hospitalized patients (according to OWID).

Initially, COVID-19 was considered as a predominantly respiratory infection, the mortality from which is associated with the progression of respiratory failure [1, 17]. The clinical picture resulting from infection with SARS-CoV-2 is varied and ranges from asymptomatic or acute mild respiratory infection to critical illness. Currently, many extrapulmonary manifestations of the disease have been described: lesions of the skin, nervous system, heart, hematopoietic system, as well as the liver and kidneys [2, 8, 9, 10, 11, 12]. The pathogenesis of multisystem lesions is not completely clear: the development of multiple organ pathology against the background of a severe course of the disease, the side effects of drug therapy, as well as the direct effect of the virus are discussed. In addition to the clinical picture, laboratory and instrumental signs, multiorgan damage is confirmed by the detection of virus RNA not only in the epithelium of the respiratory tract, but also in other tissues [3]. One of the most common extrapulmonary lesions in COVID-19 is kidney damage.

At the beginning of the pandemic, the first reports from China described a high incidence of hematuria (40% - 41.7%) and proteinuria (56% - 65.8%), but the development of acute kidney injury (AKI) was relatively rare (0.5% - 7%) in hospitalized patients with COVID-19 [1, 4, 5]. In subsequent studies, data on the

prevalence of AKI among hospitalized patients with COVID-19, despite the presence of uniform criteria for Kidney Disease: Improving Global Outcomes (KDIGO) 2012, varied significantly between and within countries. In publications from the United States of America (USA), the incidence of AKI according to the 2012 KDIGO criteria was more than 15%, with rates approaching 60% among hospitalized patients in some case series [5, 16, 17]. The frequency of AKI in patients requiring hospitalization in the intensive care unit (ICU), according to different authors, it is 29-70%, in some cases it reaches 80% [18, 19, 20]. Publications from European countries also demonstrated a heterogeneous prevalence of AKI from 17% to 52% [12, 13, 14, 15]. In a UK study that included patients from two hospitals in London, the incidence of AKI was 39% and the need for renal replacement therapy (RRT) was 8.7% among all enrolled patients and 22% among those with AKI [11]. According to studies from the Russian Federation, the incidence of AKI ranges from 17.6% to 29% among hospitalized patients with COVID-19, among deceased patients from 20.6% to 61% [10, 14, 15, 16]. The results of the largest study of AKI in the Russian Federation in hospitalized patients with COVID-19 demonstrated a high incidence of AKI among hospitalized patients (29%) and the need for RRT (3%) [10].

Data comparing the incidence of AKI in patients with COVID-19 and other non-COVID-19 conditions are conflicting. For example, when comparing data from more than 4,500 hospitalized patients divided into polymerase chain reaction (PCR) negative and positive groups in the UK, the incidence of AKI in the PCR positive group was more than twice as high: 26.2% and 12.4%, in groups with positive and negative PCR test results, respectively [18]. When comparing the prevalence of AKI with COVID-19 outside the ICU and non-severe community-acquired pneumonia, the epidemiological data are similar, the incidence of AKI is 16-25% [19]. A study from Hong Kong compared the incidence of AKI in patients with COVID-19 and severe acute respiratory syndrome (SARS), which had an outbreak in 2003 [40]. The undoubted advantage of the study was the hospitalization of all patients with laboratory-confirmed SARS in 2003 and COVID-19 in 2020 in Hong Kong. The incidence of AKI was shown to be higher among patients with SARS than in patients with COVID-19, but risk factors and adverse outcomes were similar in both diseases.

AKI can develop at the outpatient stage or within 48 hours after admission to the hospital, then it is considered community-acquired, or two days after hospitalization - hospital AKI. Researchers have noted an increase in the global incidence of community-acquired AKI relative to in-hospital AKI for diseases not associated with COVID-19, especially among the elderly and patients with chronic comorbidities [11, 12]. The frequency of community-acquired and in-hospital AKI in hospitalized patients with COVID-19, their ratio to each other, varies in different studies. In the COVID-19 patient population, the incidence of community-acquired AKI is higher than that of hospital-acquired AKI [8, 13]. The ratio of the incidence of community-acquired and hospital-acquired AKI ranged from 2:1 to 3:1 [8, 13].

Most studies examining the severity of AKI in patients with COVID-19 predominantly found elevations in serum creatinine consistent with the 2012 FSC 1st stage criteria. In a large UK study, more than half (51%) of patients with AKI had stage 1 AKI, 13% - the second stage and 36% - the third [11]. In a study from the United States, which included more than nine thousand patients, the incidence of AKI was 39.9%, of which 43% had the first stage, 22% - the second and 36% - the third [44]. In another retrospective analysis from Portugal, which included 554 hospitalized patients with COVID-19, the incidence of AKI was 60.6%, the majority of AKI cases were stage III (55.8%). In a meta-analysis of 13 studies that reported on the severity of AKI, the majority (44%) of patients with AKI had stage 1,

The rate of recovery of baseline renal function after AKI in patients with COVID-19 at the time of hospital discharge is not well understood. In an observational retrospective study from Spain, baseline renal function was not restored in 45.7% of AKI cases [12]. A study from Italy demonstrated that among those who survived AKI during hospitalization for COVID-19, 33% did not restore kidney function to baseline [11].

In addition, data on recovery of baseline renal function after AKI as a function of time to deterioration of renal function in hospitalized patients with COVID-19 are severely limited. According to a study from the United States, baseline renal function at the time of discharge from the hospital was in 94% among patients with community-acquired AKI [13]. In a retrospective study from Mexico, when analyzing recovery of kidney function after AKI among discharged patients, recovery of baseline kidney function was observed in 62% of cases with community-acquired AKI, and 94% with hospital-acquired [13].

Findings. Given the heterogeneity of evidence, even though there are standardized criteria for AKI recognized by the global medical community, the true prevalence of worsening kidney function in patients with COVID-19 is not completely clear.

Such significant differences in the frequency of AKI, according to the researchers, reflect the differences in national and regional health systems. These factors make it difficult to compare the incidence of AKI because they are based solely on the number of hospitalized patients.

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