

MEDICINE

EARLY DIAGNOSIS OF KIDNEY DISEASE IN CHRONIC OBSTRUCTIVE DISEASE OF LUNG PROBLEMS COMBORIDE STATES IN THE CONDITIONS OF THE LOW ALTITUDE

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ABSTRACT

The high incidence of concomitant pathology on the part of the renal system can lead to a mutual burden of various diseases, which in turn requires additional methods of examination, prevention, and further mandatory medical correction in patients with chronic obstructive pulmonary disease.

Objective: to identify a moderately increased albuminuria and analysis of the functional state of the kidneys in chronic obstructive pulmonary disease in low altitude at an earlier stage of its manifestation.

Material and methods: 82 low-altitude patients (Tokmok) were examined with COPD of varying severity, as well as 10 healthy individuals. The average age was 60.53 + 15.48 years. In addition to general clinical examination, patients underwent an early marker of damage to the MIA, assessment of the function of external respiration and indicators of renal function, which included the calculation of glomerular filtration rate (GFR), analyzes of proteinuria, leukocyturia, hematuria, total protein and serum creatinine.

Results: In patients with COPD, an early and significant change in renal function indices is noticeably observed, which in turn tends to correlate with the degree of bronchial obstruction.

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Introduction. Chronic obstructive pulmonary disease (COPD) and diseases of the genitourinary system in combination, according to various studies, ranges from 32% [1] to 47.3% [2]. Many studies indicate a high frequency of changes in the kidneys in patients with COPD, which is 60.5% by sectional data [3]. The most likely and significant reasons that lead to a similar combination of pathology of the lungs and kidneys include the identified genetic predisposition, as well as tobacco dependence as the most aggressive risk factor [4-6, 18, 19, 25-26]. In everyday clinical practice, there is a significant underestimation of the manifestation of the incidence of renal dysfunction in patients with COPD, while in-depth and more targeted studies of this cohort reveal changes in renal tissue function. In determining and shaping pathological processes in the renal system, the most important role is played by such factors as the infectious, toxic, hypoxemic, and circulatory mechanisms associated with changes in the lungs. Determining the account of the resulting structural and functional disorders in the respiratory system entails changes in homeostasis, in the cardiovascular

system [36, 37], anemia, a violation of mineral metabolism in bone tissue, anxiety-depressive, mental disorders [38, 39], and renal dysfunction [40]. Also, the presence of chronic kidney disease (CKD) in patients hospitalized with exacerbation of COPD is associated with an increased mortality rate [41]. There is evidence that impaired renal function in patients with COPD progresses in parallel with the severity of the underlying disease and further mechanisms leading to a progressive decrease in renal plasma flow, tubular reabsorption, glomerular filtration rate (GFR), blood flow with increased renal vascular resistance [7-10, 20, 21]. Thus, D.S. Nurgazieva in the study of GFR in patients with COPD noted that most patients have stage II CKD [42].

There is evidence of some authors who simultaneously display changing morphological structures in the affected lungs, which in turn complicates, and in the future, exacerbates, the course of chronic kidney diseases [11, 12, 22]. Studies conducted by numerous authors distinguish the following main pathogenetic mechanisms leading to kidney damage:

- activation of the renin-angiotensin-aldosterone system;
- imbalance between the NO system and reactive oxygen species;
- inflammation;
- hyperactivation of the sympathetic nervous system [13-17, 23-24].

There is evidence that one of the earliest markers of renal damage, namely the glomerular filtration barrier, is moderately increased albuminuria (MIA). Patients with a history of arterial hypertension, diabetes mellitus, these indicators are closely interrelated with the cardiovascular risk factor, increased frequency of coronary heart disease (coronary heart disease), and further worsening of the prognosis of the disease [27]. Several studies have described a continuous relationship between cardiovascular and non-cardiovascular mortality on the one hand and MIA on the other [28-30]. Establishing and determining the assessment of MIA in pulmonary pathology, in particular in COPD, is devoted to only a few studies. Vulcun E. et al. [31] report its higher frequency among patients with COPD and a close almost linear relationship with the degree of saturation of hemoglobin with oxygen. Similar data are provided by Casanova C. et al. [32-34]. The authors emphasize that the relationship between MIA with the degree of hypoxia for varying severity of COPD, as well as its further prognostic role in the future with this nasology, is currently unclear.

The **aim** of the study is to study the frequency of MIA, as well as the features of the urinary system and its functional state in patients with COPD, depending on the severity, which will subsequently allow a comparative analysis of the revealed clinical and functional disorders.

Material and methods. 82 patients were examined in low-mountain conditions (Tokmok, Kyrgyz Republic, located at 762 meters above sea level), of which 38 were men and 44 were women with COPD with varying severity. The average age of which was 60.53 ± 15.48 years. The diagnosis and assessment of the severity of COPD were established in accordance with the criteria of the Global Initiative for Chronic Obstructive Lung Disease (GOLD, 2011).

In the examined patients, we analyzed such indicators as the function of external respiration (HFD): forced expiratory volume in 1 second (FEV 1%), instantaneous expiratory flow rate at 25, 50, 75%, l / s (MOS25, MOS50, MOS75 l / sec), Tiffno index, forced expiratory volume in 1 second / forced vital capacity of the lungs (FEV 1 / FVC%). Along with an assessment of the severity, we simultaneously studied the clinical symptoms characteristic of each of them, such as coughing, shortness of breath at rest and after physical activity, and the presence of sputum. Given the severity of COPD, all patients were divided into three groups. The first group consisted of 27 patients with mild COPD. The second group included 32 patients with moderate severity of COPD, and the third group included 23 patients with severe COPD. All groups of patients were comparable among themselves by sex and age. The control group (CG) consisted of 10 healthy individuals, which are comparable in gender and age with the main group of tested patients. The detection of MIA was determined using the microalbuminuria test (Erbalachema). The total parameters of the renal function were evaluated by calculating the glomerular filtration rate (rSCF). At the same time, analyzes of proteinuria, leukocyturia, hematuria, the concentration of total protein and serum creatinine were performed.

The obtained statistics were processed using the STATISTICA 6.0 program. The results of statistical processing are presented as mean \pm standard deviation. The normality of the distribution was determined by the criteria of Shapiro-Wilk and Lilliefors. The reliability of the differences between the groups of subjects was determined using the non-parametric Mann-Whitney test, as well as the parametric student t-test. For multiple statistical comparisons, the Kruskal-Wallis criteria were used,

and variance analysis was determined with the calculation of the coefficient F and subsequent post-hoc analysis. The obtained differences were considered significant at $p < 0.05$.

Research results. Indicators of external respiration function among patients analyzed groups are presented in Fig. 1

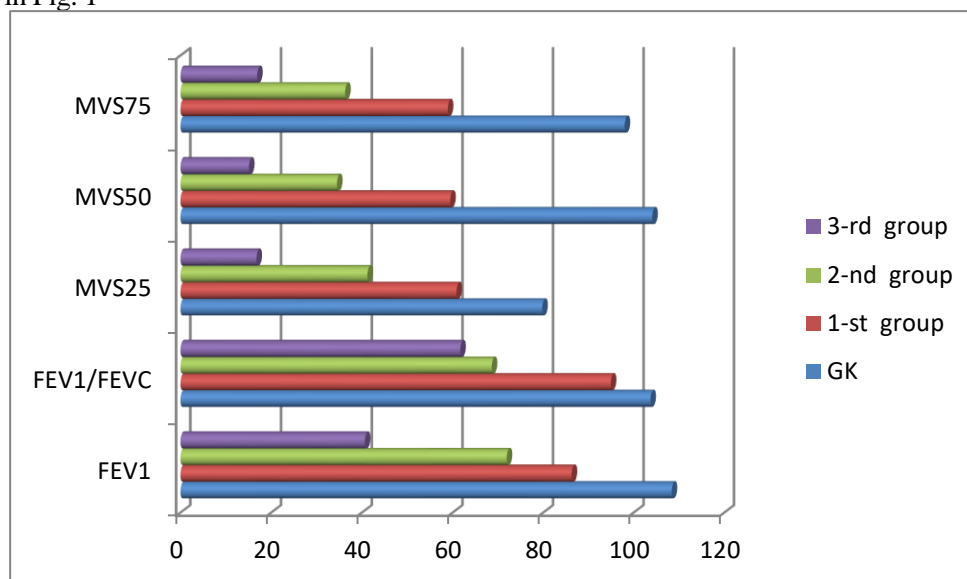


Fig. 1. EBF depending on the severity of chronic obstructive pulmonary disease.

Note: * $p < 0.01$ compared with the control group; differences between the groups of patients with COPD are significant ($p < 0.01$). The values of bronchial patency were found to be significantly reduced in patients with COPD compared with the group of healthy individuals ($p < 0.01$) (Fig. 1).

At the same time, a regular worsening of ventilation indices was noted as the disease progressed ($p < 0.01$).

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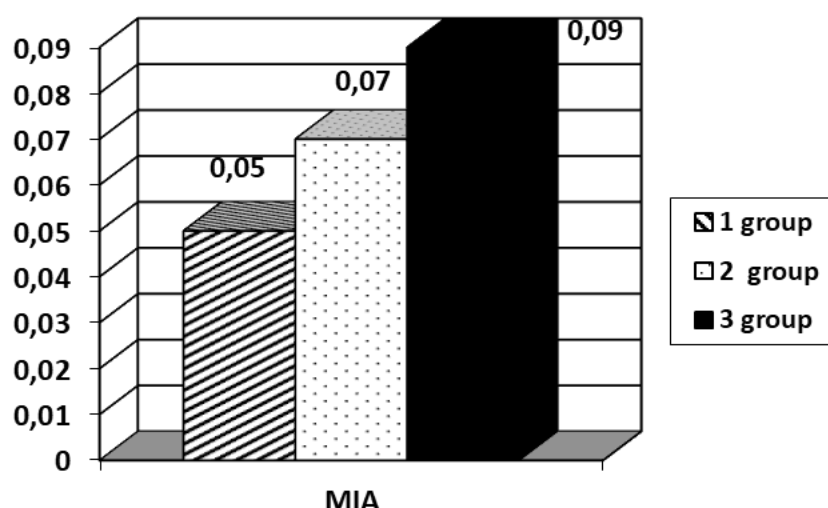


Fig. 2. Indicators of moderately increased (micro) -albuminuria depending on the severity of COPD

Finding out the parameters of MIA with an increase in bronchial obstruction in COPD, we obtained the following results. MIA in patients of the 2nd group was 0.07 ± 0.04 g / l, which tended to rise than in patients with mild COPD (0.05 ± 0.03 g / l, $p > 0.05$) Pronounced MIA was observed in patients with severe

course of bronchial obstruction, which reached 0.09 ± 0.03 g / l and significantly superior to similar parameters in the subjects, both in the 1st ($p < 0.001$) and in the 2nd group ($p < 0.05$), respectively (Fig. 2).

Studying the relationship of changes in renal function with the severity of broncho-obstructive syndrome, the following data were recorded. Compared with the control group, COPD patients had significantly low rates of filtration function and this was expressed in an increase in serum creatinine concentration, as well as in a decrease in eGFR. A clear progressive deterioration in renal function was noted as the severity of broncho-obstructive syndrome increased. In particular, eGFR for mild, moderate to severe, and severe COPD was 98.0 ± 11.3 ml / min / 1.73 m², 68.8 ± 7.4 ml / min / 1.73 m² and $64.5 \pm 5, 5$ ml / min / 1.73 m², respectively ($p < 0.01$). A similar dynamics was observed in the subjects with respect to the serum creatinine content ($p < 0.01$) (Fig. 3).

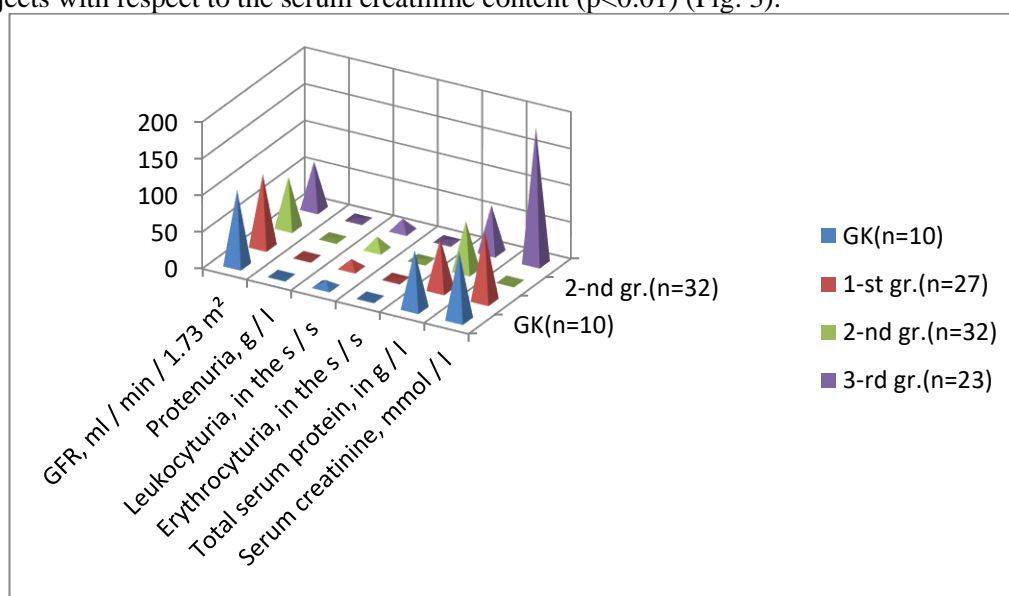


Fig. 3. Indicators of the functional state of the kidneys in patients depending on the severity of COPD

Note: * - $p < 0.01$ in comparison with the control group; ° - $p < 0.05$ in comparison with patients with COPD of the 1st group; ~ - $p < 0.05$ in comparison with patients with COPD of the 2nd group.

There was a steady increase in the degree of damage to the renal filter, as evidenced by an increase in the amount of protein in the urine with the progression of COPD (0.39 ± 0.09 g / l, 0.74 ± 0.28 g / l and 2.02 ± 0.60 g / l at stages 1-3 of COPD, respectively, $p < 0.01$ between groups and $p < 0.001$ compared with the control group) simultaneously with a parallel decrease in the concentration of total serum protein ($p < 0.01$) (Fig. 3) Determining the analysis of the cellular composition of the urinary sediment, showed an increase in the number of leukocytes and red blood cells in patients with COPD ($p < 0.01$), it should be noted that the greatest number of them in urinary sediment was recorded in patients with a severe course of this disease (Fig. 3).

We can agree with the results of numerous studies on the problem of COPD with systemic manifestations, when functional changes in the kidneys are clearly visible in patients. Our study revealed a progressive increase in MIA in low altitude (Tokmok) as the course of COPD worsens, which coincides with data from several scientific publications [32-34] on the relationship of the degree of hypoxemia in this disease with a violation of the glomerular filtration barrier. The most important aspect is the discovery of a direct association of the degree of MIA with the evolution of COPD, which subsequently allows us to consider it as a marker of the severity of the disease. This position is also consistent with our earlier obtained results in low altitude (Tokmok city), namely, a linear decrease in the filtration capacity of the kidneys as COPD increases [35]. In this aspect, further more detailed studies are needed to clarify the answer to the question posed: AS, along with GFR, is simply a marker of renal damage in COPD or all the same has an independent independent prognostic value for this associated pathology. The high incidence of concomitant pathology from the genitourinary system leads to a mutual burden of diseases and other systems. Determining the presence of signs of a pathology of the genitourinary system in patients with COPD, which in turn requires an additional, detailed examination for subsequent prevention and further medical correction.

Conclusions. 1. The detection in the low altitude of a moderately increased (micro) - albuminuria is the earliest marker of renal filter damage in COPD, which is noted in patients with a mild course of the disease, and also tends to increase further as it progresses.

2. Patients with COPD in low altitude show significant changes in renal function indicators, which correlate with the degree of bronchial obstruction.

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