

**IMMUNOPATOLOGICAL SHIFTS IN CHILDREN SURVIVED COVID-19 WITH  
COMORBIDITY OF NEPHROTIC SYNDROME WITH ATOPIA**

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**Introduction.** It is known that nephrotic syndrome (NS) occupies a dominant place in a number of kidney diseases, in which the nephrotic form of chronic glomerulonephritis (CGN) accounts for about 40% and is one of the common causes of chronic renal failure. Currently, more scientists are paying attention to atopic diseases in children, including atopic dermatitis (AD), which is characterized by genetically associated IgE-mediated atopic reactions. The prevalence of AD ranges from 5.5 to 30.8% in children aged 6–7 years and from 6.7 to 20.7% in children aged 13–14 years. At the same time, almost all organs and systems, including the kidneys, are involved in the pathological process.

**The aim** of the study was to study immunopathological changes in children who underwent COVID-19 with comorbidity of nephrotic syndrome with atopy.

**Material and methods.** Under our supervision were 40 children aged 7 to 11 years old, suffering from nephrotic syndrome (nephrotic form of CGN) on the background of atopic dermatitis, who underwent COVID-19. The patients were divided into two groups: group 1 - NS with AD-20; 2-group-NS without AD -20. The control group consisted of 25 practically healthy children of the same age. Clinical diagnosis was made on the basis of anamnesis, clinical laboratory and functional research methods, immunological parameters, as well as BP markers according to the SCORAD index. The state of cellular and humoral immunity, antigen-binding lymphocytes (ABL) of the kidneys, phagocytic activity of neutrophils (FAN), concentrations of immunoglobulin (Ig) E and circulating immune complexes (CIC) were studied. The material for the study was venous blood taken in the morning on an empty stomach. The digital data was processed by the method of variation statistics with the calculation of the reliability of numerical differences according to Student.

**Results.** According to the results of the studies, it was found that in the comorbid course of NS with AD, boys accounted for 70.0%, girls - 30.0%, which confirm the literature data. The duration of the disease - from the onset of the disease in NS

without AD - 6 years, an average of  $3.3 \pm 1.5$  years; with NS with AD - 8 years, on average  $4.5 \pm 2.2$ . Evaluation of the severity of AD in patients according to the SCORAD index showed that in children with comorbidity of NS with AD, a large percentage was moderate and severe forms, in the development of complications of NS in patients, a large percentage was also NS with AD. According to the results of the study of partial kidney functions in patients of both groups, when compared with the control group, there was a statistically significant decrease in daily diuresis, relative density of urine ( $P < 0.001$ ), an increase in daily proteinuria (more than 2.5-3.0 g/day), erythrocyturia, leukocyturia, ( $P < 0.001-0.01$ ), hyperlipidemia ( $P < 0.001-0.01$ ), increased blood fibrinolytic activity, hypercoagulability ( $P < 0.01$ ), increased serum urea and creatinine ( $P < 0.001$ ) hypoproteinemia, hypoalbuminemia and hypergammaglobulinemia ( $P < 0.01$ ). The results of immunological studies showed that, compared with the control group, all patients during the period of exacerbation (before treatment) showed a statistically significant decrease in T-lymphocytes (DM3), T-suppressors (DM8), T-helpers (DM4) and FAN ( $P < 0.001-0.01$ ), a significant increase in the number of B-lymphocytes (DM19) and ASL of the kidneys ( $P < 0.001$ ), an increase in serum IgE and CEC concentration ( $P < 0.001$ ). Immunopathological changes were more pronounced in patients of group 2 compared with group 1.

Impairment of immunity in children who have had COVID-19 with comorbidity of NS with AD is explained by the fact that the ability of T-cell clones to maintain the production of IgE by plasma cells is directly proportional to the production of IL-4 and the content of this cytokine in the blood of children with AD correlates with clinical manifestations, also IgE levels in the blood. The starting role in the development of the immunopathological process in NS probably belongs to the activation of the complement system, hyperproduction of IL-4 and impaired elimination of the CEC, which, accumulating on the basement membrane of glomerular vessels, cause the development of a local inflammatory reaction.

**Conclusions 1.** Immunopathological changes in children with NS comorbidity with AD are characterized by a deficiency of cellular immunity in the form of a decrease in DM3, DM4, DM8, FAN, an increase in the number of DM19, ASL of the kidneys, an increase in IgE in the blood serum, the concentration of CIC, which remain preserved even in the period of remission. **2.** In patients undergoing COVID-19, there is a longer persistence of immunopathological disorders, such as an increase in ASL of the kidneys, IgE and CEC concentration in blood serum, which

can serve as a criterion for immunodiagnosis in NS with AD and indications for the inclusion of adequate immunotherapy methods in complex treatment.