MODERN CLINICAL AND IMMUNOLOGICAL METHODS FOR DIAGNOSIS OF LATENT TUBERCULOSIS INFECTION IN CHILDREN

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ABSTRACT

Given the invaluable role of the body's immune system in the development and progression of this disease, it is important to determine and assess the immune status of children diagnosed with tuberculosis. Based on the above, humoral immunity indicators, which are included among the immune status indicators in children with tuberculosis, were determined, and the results were interpreted and analyzed.

Relevance. The prevalence of tuberculosis among children is a variable indicator characterizing the epidemiological situation of tuberculosis and depends on socioeconomic, medical, and biological factors, as well as the anti-tuberculosis measures implemented in the region.

Latent tuberculosis infection (LTBI) is a condition in which a person has LTBI in the body, causing positive reactions to immunological tests, including tuberculosis allergens, in the absence of clinical and radiological signs of tuberculosis.

Objective : To improve the efficiency of detection of latent tuberculosis infection among children using immunological methods.

Materials and Methods . Ninety children were recruited for clinical and immunological studies. They were divided into three groups: the main group – children who had been in contact with a tuberculosis patient (n=38); the comparison group – children with a confirmed diagnosis of tuberculosis (n=37); the control group – healthy children without confirmed tuberculosis and with no history of contact with tuberculosis patients, n=15.

In the study, humoral immunity parameters were assessed in all children using the ELISA method and specialized test systems, including the main classes of serum immunoglobulins (IgA, IgM, IgG, IgE), cytokines (IL-1β, IL-4), as well as non-specific protective factors (complement component C3, procalcitonin).

Results. The results show that in both cases (in children with active tuberculosis and in contact children), cytokine concentrations were significantly higher than in healthy children ($p<0.001$). In children with a confirmed diagnosis of tuberculosis, a significant increase in IL-1β by 5.02 times ($p<0.001$) and IL-4 by 1.18 times ($p<0.05$), respectively, was detected.

In children who had been in contact with patients, the dynamics of the increase in serum cytokines differed from children with active tuberculosis. Thus, the level of IL-1β in contact children exceeded the control values by 1.63 times (52.18±3.51 ng/ml versus 32.01±4.17

ng/ml, p<0.001). At the same time, the concentration of IL-4 increased by 1.69 times (121.55±6.57 ng/ml versus 72.79±4.19 ng/ml, p<0.001).

Similar changes in both cytokines indicate no significant shifts in the intensity of the inflammatory process. This is due to the relatively low antigen load and moderate inflammatory activity. However, the high sensitivity and specificity of these cytokines to antigen exposure allows them to be considered as prognostic markers for assessing the development of pathology in children exposed to tuberculosis patients.

When comparing the study and control groups, contrasting changes were observed. In the study group, IL-1β levels were increased by 3.08 times (p<0.001) compared to the control group, while IL-4 concentrations, conversely, decreased, being detected in contact children only 1.42 times more often (p<0.05). This pattern is explained by a significant increase in proinflammatory cytokine (IL-1β) and a decrease in anti-inflammatory cytokine (IL-4) as the disease progressed. This indicates activation of the immune response to antigenic aggression, leading to an increased inflammatory reaction.

Conclusions. Thus, based on the above results, we recommend using IL-1β and IL-4 cytokines as prognostic markers with high sensitivity and specificity to determine the prognosis of the degree of disease progression in exposed children.

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