THE IMPACT OF IMMUNE STATUS ON THE CLINICAL COURSE AND TREATMENT OUTCOMES OF BRONCHOPULMONARY DISEASES IN YOUNG CHILDREN OF THE ARAL SEA REGION

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Relevance. The devastating environmental crisis in the Aral Sea region poses severe hazards to pediatric health. The immature respiratory and immune systems of young children are highly vulnerable to the constant inhalation of toxic dust-salt aerosols, which significantly alters the pathogenesis of respiratory disorders.

Objective. To evaluate the impact of immune status on the clinical course of bronchopulmonary diseases in young children within the Aral Sea region and to assess the effectiveness of an environmentally tailored, optimized treatment strategy.

Materials and Methods. A comprehensive clinical and laboratory study was conducted on a cohort of young children aged up to three years presenting with recurrent bronchopulmonary pathologies. The cohorts were divided into the Main Group from the ecologically unfavorable Aral Sea zone (Karakalpakstan and Khorezm) and the Control Group from environmentally stable regions. Immunological parameters, including secretory Immunoglobulin A (sIgA), Surfactant Protein A (SP-A), and pro-inflammatory cytokines (IL-8, TNF-α), were evaluated. The Main Group was further randomized into two subgroups to receive either standard conventional therapy or an optimized regimen containing targeted antioxidants and mucosal membrane stabilizers.

Results. Children in the Main Group demonstrated a significantly higher prevalence of atypical and latent disease forms compared to controls. Laboratory screening revealed severe mucosal barrier exhaustion in ecologically stressed children, characterized by a critical reduction in local sIgA and a marked drop in pulmonary SP-A, along with a concomitant, significant rise in induced sputum pro-inflammatory cytokines (IL-8 and TNF-α) compared to the Control Group. The introduction of the optimized regimen significantly accelerated clinical recovery, leading to earlier resolution of main symptoms, shorter hospital stays, and a substantial decrease in the long-term recurrence rate of obstructive episodes.

Conclusion. Chronic environmental stress in the Aral Sea region induces a state of persistent, subclinical localized inflammation and mucosal defense exhaustion, altering the classical progression of pediatric respiratory diseases. Non-invasive molecular screening of sIgA and SP-A is crucial for early pre-clinical diagnosis. Incorporating targeted antioxidants and mucosal stabilizers into the therapeutic protocol successfully mitigates the regional environmental burden and substantially improves treatment effectiveness.

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