

## **Assessment of Treatment Effectiveness of Allergic Conjunctivitis in Children and its Impact on Quality of Life**

**Tukhtayeva Matlab Ashurovna**

**Abstract:** This article presents the results of a comprehensive study of the clinical and immunological features of allergic conjunctivitis in children and an assessment of the effectiveness of treatment, taking into account the impact of therapy on patients' quality of life. One hundred and fifty children aged 6 to 17 years, observed at the Bukhara branch of the Republican Scientific Specialized Center of Allergology and the Republican Specialized Center for Eye Microsurgery, were examined. The study included an assessment of clinical symptoms, immunoglobulin ( IgA , IgM , IgG , IgE ) and cytokine (IL-6, IL-10) levels, and a quality of life analysis using the Pediatric Quality of Life Inventory ( PedsQL ) scale. The results demonstrate that complex treatment with immunomodulatory elements provides a lasting therapeutic effect, reduces the frequency of relapses, and significantly improves the quality of life of children with allergic conjunctivitis.

**Keywords:** allergic conjunctivitis, children, immunological parameters, IgE, IL-6, IL-10, treatment, quality of life.

### **Introduction**

Allergic conjunctivitis (AC) is one of the most common manifestations of allergic diseases in children and is often accompanied by lesions of the skin, respiratory tract, and mucous membranes. According to various authors, between 20% and 40% of the child population suffers from some form of allergic eye inflammation. Allergic conjunctivitis significantly impacts patients' quality of life, limiting physical activity, social adaptation, and academic performance[2,3,6,8].

The immunopathogenesis of the disease is associated with hyperreactivity of the ocular mucosa in response to allergens and activation of the IgE -dependent mechanism. A cascade of mediator reactions involving histamine, cytokines (IL-4, IL-6, IL-10, TNF- $\alpha$ ), and chemokines develops, leading to chronic conjunctival inflammation[1,4].

Modern therapeutic approaches are aimed not only at relieving symptoms but also at restoring immune balance and preventing relapses. However, few studies have analyzed how treatment impacts children's quality of life , which is an important criterion for assessing treatment effectiveness[5,7].

### **Purpose of the study**

To evaluate the clinical and immunological characteristics of allergic conjunctivitis in children and determine the effectiveness of treatment based on an analysis of the dynamics of clinical indicators and the quality of life of patients.

## **Materials and methods of research**

The study was conducted in 2023–2025 at the Bukhara branch of the Republican Scientific and Specialized Center for Allergology and the Republican Scientific and Practical Medical Center for Eye Microsurgery.

A total of 150 children aged 6 to 17 years with various forms of allergic conjunctivitis were examined.

Patients are divided into four groups:

1. The first main group (n=45) included children with chronic allergic conjunctivitis (disease duration more than 2 years).
2. The second main group (n=40) included children with newly diagnosed allergic conjunctivitis.
3. The comparison group (n=35) included children who had allergic conjunctivitis combined with other eye diseases (blepharitis, keratoconjunctivitis ).
4. The control group (n=30) included practically healthy children without allergic pathology.

### **Research methods**

1. Clinical methods:
  - Assessment of the severity of hyperemia, itching, lacrimation, and conjunctival edema.
  - The period from the onset of the disease to treatment is on average  $6.8 \pm 0.24$  days.
  - The average age of patients was  $10.8 \pm 0.45$  years.
2. Immunological studies:
  - Determination of levels of IgA , IgM , IgG , IgE , IL-6, IL-10 and procalcitonin by ELISA.
  - Study of the dynamics of indicators before and after treatment.
3. Quality of life assessment:
  - It was carried out using the adapted Pediatric Quality of Life Inventory ( PedsQL ) scale.
  - The child's emotional, physical, and social functioning were assessed before and after therapy.
4. Therapy:
  - A combination regimen was used: antihistamines, mast cell membrane stabilizers, and topical anti-inflammatory agents.
  - In the main group, immunomodulators (polyoxidonium, licopid ) were additionally used.
5. Statistical processing:
  - The methods of variation statistics ( $M \pm m$ ), Student's t-test, significance level  $p < 0.05$  were used.

## **Research results**

Before treatment, children with allergic conjunctivitis showed pronounced clinical and immunological changes characterized by increased humoral immune activity and typical signs of an inflammatory process. The average immunoglobulin E level was  $224.1 \pm 3.1$  IU/ml, exceeding normal values (70–216 IU/ml) and reflecting a high level of sensitization. The concentration of the proinflammatory cytokine IL-6 reached  $43.1 \pm 2.2$  pg /ml, and the level of the anti-inflammatory cytokine IL-10 was  $89.4 \pm 2.6$  pg /ml, indicating the presence of an active inflammatory process with the formation of a compensatory immune response. IgA ( $1.80 \pm 0.09$  g/L) and IgM ( $1.67 \pm 0.08$  g/L) levels remained within the physiological norm, while IgG was

moderately elevated ( $20.03 \pm 0.65$  g/L), indicating a chronic course of the disease and the presence of persistent antigenic irritation. Clinically, all patients examined experienced itching and conjunctival hyperemia (100%), and 82.2% had swelling of the mucous membrane of the eye, which is typical of allergic inflammation.

Following the course of therapy, significant positive dynamics were recorded in both clinical and immunological parameters. IgE levels decreased to  $175.3 \pm 2.8$  IU/ml ( $p < 0.05$ ), IL-6 concentrations decreased to  $21.7 \pm 1.8$  pg/ml, and IL-10 to  $45.9 \pm 2.1$  pg/ml, indicating a decrease in the activity of the inflammatory process and normalization of the cytokine profile. The clinical condition of the patients improved significantly: itching and redness of the eyes disappeared in 90% of children, conjunctival edema regressed in 85%, and the relapse rate over 6 months of observation decreased by more than half. These data confirm the high efficacy of the treatment aimed at stabilizing the immune response and restoring clinical well-being in children with allergic conjunctivitis.

**Table 1. Changes in quality of life (according to the PedsQL scale )**

Indicator	Before treatment	After treatment	Growth, %
Physical condition	$58.2 \pm 2.3$	$78.5 \pm 2.1$	+35%
Emotional state	$52.6 \pm 2.5$	$74.3 \pm 2.2$	+41%
Social activity	$61.4 \pm 2.1$	$83.7 \pm 2.0$	+36%
Overall quality of life indicator	$57.4 \pm 2.4$	$78.8 \pm 2.1$	+37%

Thus, the improvement in immunological parameters was accompanied by a significant increase in the level of physical and emotional well-being of children.

The study results showed that allergic conjunctivitis in children is accompanied by significant disturbances in both local and systemic immune responses. High levels of IgE and IL-6 confirm the role of Th2 immune hyperreactivity in the pathogenesis of the disease. Combination therapy including immunomodulators not only alleviated symptoms but also normalized the cytokine profile, confirming the effectiveness of the chosen regimen.

A quality-of-life scale became an important component of treatment effectiveness assessment, demonstrating significant improvements in patients' physical, emotional, and social well-being. This underscores the need to incorporate quality-of-life assessment into standard treatment effectiveness criteria for allergic eye diseases in children.

## Conclusions

Thus, allergic conjunctivitis in children is characterized by pronounced IgE -dependent inflammation with activation of IL-6 and IL-10. Combination therapy with immunomodulators helps normalize immunological parameters and reduce the frequency of relapses. Improved immune status is accompanied by an increase in patients' quality of life, confirming the need for a comprehensive approach to treatment. Assessing the effectiveness of therapy using the **PedsQL scale** allows for an objective determination of not only the clinical but also the psychoemotional effects of treatment. The obtained results demonstrate that complex treatment with immunomodulatory elements provides a lasting therapeutic effect, reduces the frequency of relapses and significantly improves the quality of life of children with allergic conjunctivitis.

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