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RELATIONSHIP BETWEEN SYSTEMIC IMMUNE STATUS AND DISEASE TRAJECTORY IN CHRONIC RHINOSINUSITIS

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Abstract:
Chronic rhinosinusitis (CRS) remains a widespread chronic inflammatory condition of the sinonasal mucosa lasting at least 12 weeks

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INTRODUCTION

Chronic rhinosinusitis (CRS) remains a widespread chronic inflammatory condition of the sinonasal mucosa lasting at least 12 weeks [2, 8, 19]. Affecting approximately 5–12% of the global population [6, 7, 9, 20], CRS presents a significant burden to public health systems. Traditionally categorized into chronic rhinosinusitis with nasal polyps (CRSwNP) and without polyps (CRSsNP), contemporary clinical research increasingly emphasizes molecular endotyping rather than macro-anatomical classification alone [1, 17, 18].

Inflammatory Endotype	Primary Cytokine Signaling	Predominant Cellular Infiltrate	Typical Clinical Features
Type 2 (Th2-driven)	IL-4, IL-5, IL-13, IgE, TSLP	Eosinophils, mast cells, ILC2	Recurrent polyposis, loss of smell, association with asthma
Non-Type 2 (Th1/Th17-driven)	IFN-γ, TNF-α, IL-17A, IL-8	Neutrophils, macrophages	Mucosal fibrosis, purulent rhinorrhea, persistent obstruction

While sinonasal epithelial barrier disruption and localized mucosal inflammation are well-documented, the role of systemic immunity in driving disease persistent severity and post-surgical recurrence remains under investigation [3, 10, 11, 14]. Systemic immune status—reflected in lymphocyte subpopulation balance, immunoglobulin synthesis, and circulating cytokine networks—influences whether inflammatory responses remain localized or progress into recalcitrant forms [4, 15, 16]. This study aims to clarify the relationship between systemic immune markers and objective clinical parameters to support individualized diagnostic and therapeutic approaches [5, 12, 13].

MATERIAL AND METHODS

The prospective investigation included 120 adult CRS patients (64 CRSwNP, 56 CRSsNP) and 30 healthy control subjects. Diagnostics followed EPOS guidelines, utilizing nasal endoscopy and CT scans. Patients with primary immunodeficiencies, systemic vasculitis, cystic fibrosis, or recent systemic corticosteroid exposure were excluded.

Symptom severity was quantified using the SNOT-22 questionnaire.

Endoscopic features were scored using the Lund-Kennedy scale.

Paranasal sinus opacification was graded via the Lund-Mackay CT scoring system.

Peripheral blood samples were drawn prior to therapy initiation. Flow cytometry measured CD3+, CD3+CD4+, CD3+CD8+, CD19+, and CD3-CD16+56+ cell percentages. Serum IgA, IgG, IgM, and total IgE were measured turbidimetrically and via ELISA. Cytokine concentrations (IL-4, IL-5, IL-10, IL-13, IFN-γ, TNF-α) were quantified using standard ELISA kits.

Data normality was evaluated using the Shapiro-Wilk test. Differences across groups were tested using ANOVA or Kruskal-Wallis tests, followed by appropriate post-hoc analysis. Correlations were computed using Spearman's rank coefficient (r), with $p<0.05$ indicating statistical significance.

RESULTS

Patients with CRSwNP demonstrated higher clinical disease severity than those with CRSsNP across

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all objective metrics: SNOT-22 (58.4±8.2 vs. 42.1±6.5), Lund-Mackay CT score (16.8±3.1 vs. 9.4±2.2), and Lund-Kennedy endoscopic score (8.2±1.4 vs. 4.1±0.9).

Systemic Inflammatory Markers Profile

Th2-Cytokines (CRSwNP dominant):

- IL-5: CRSwNP (38.6 pg/ml) >> CRSsNP (4.2 pg/ml) | Control (1.8 pg/ml)
- IL-13: CRSwNP (29.4 pg/ml) >> CRSsNP (5.8 pg/ml) | Control (2.1 pg/ml)

Th1/Th17-Cytokines (CRSsNP dominant):

- TNF-α: CRSsNP (34.2 pg/ml) >> CRSwNP (8.1 pg/ml) | Control (3.9 pg/ml)
- IFN-γ: CRSsNP (26.8 pg/ml) >> CRSwNP (6.2 pg/ml) | Control (9.8 pg/ml)

Systemic cellular analysis revealed a decrease in CD3+CD4+ T-helpers in CRSwNP (34.2±3.8% vs. 43.5±4.1% in controls, p<0.001), resulting in an inverted immunoregulatory ratio (1.21±0.14 vs. 1.82±0.18). Additionally, CRSwNP patients showed reduced serum IgA (1.42±0.28 g/L vs. 2.38±0.31 g/L) and markedly elevated serum IgE (median 245.4 IU/mL).

Parameter	CRSwNP (n=64)	CRSsNP (n=56)	Control (n=30)	p-value
CD3+ (%)	64.5±5.1	69.8±4.8	71.2±4.5	<0.01
CD3+CD4+ (%)	34.2±3.8	41.1±3.9	43.5±4.1	<0.001
CD4+/CD8+ Ratio	1.21±0.14	1.64±0.16	1.82±0.18	<0.001
IgA (g/L)	1.42±0.28	2.15±0.34	2.38±0.31	<0.01
Total IgE (IU/mL)	245.4 [112; 480]	48.2 [22; 95]	32.1 [15; 64]	<0.001

Correlation analysis indicated that in CRSwNP, serum IL-5 levels strongly correlated with Lund-Mackay CT scores (r=0.68, p<0.001). In CRSsNP, serum TNF-α correlated with total SNOT-22 scores (r=0.59, p<0.001).

DISCUSSION

These findings demonstrate that CRS involves systemic immunological involvement alongside localized sinonasal inflammation. The divergence in systemic cytokine profiles confirms that CRSwNP is predominantly driven by Type 2 inflammatory mechanisms (elevated IL-4, IL-5, IL-13, and IgE), whereas CRSsNP exhibits non-Type 2 characteristics marked by Th1/Th17 activation (TNF-α, IFN-γ).

Circulating IgA deficiency in CRSwNP suggests impaired mucosal mucosal defense, potentially favoring persistent bacterial colonization and superantigen-driven inflammation. Identifying systemic immune signatures offers value for endotype-driven therapy, supporting the targeted use of monoclonal antibodies (such as anti-IL-4Rα, anti-IL-5, or anti-IgE therapies) in severe Type 2 disease, while immunomodulatory support may benefit non-Type 2 phenotypes prone to recurrent exacerbations.

CONCLUSION

Systemic immune alterations closely correspond to the clinical phenotype and endotype of chronic rhinosinusitis.

CRSwNP is associated with a systemic Type 2 cytokine pattern, reduced helper T-cell ratios, lower serum IgA, and elevated IgE levels.

CRSsNP displays elevated systemic Th1/Th17 inflammatory markers, particularly TNF-α and IFN-γ.

Systemic cytokine concentrations correlate with radiological opacification and clinical symptom burden, highlighting their utility as non-invasive biomarker candidates for personalized management.

REFERENCES

1. Abdullayev X., Ismatova K. Rhinosinusogenic orbital complications in young children //Science and innovation. – 2024. – T. 3. – №. D7. – C. 103-106.
2. Alimova D. D., Amonov A. S. Prediction of development of chronic rhinosinusitis with nasal polyps in children taking into account the geometric characteristics of the ethmoid labyrinth. – 2023.
3. Alimova D., Amonov A. Chronic rhinosinusitis with nasal polyps: risk factors, diagnosis and prospects for therapy //Science and innovation. – 2024. – T. 3. – №. D10. – C. 121-124.
4. Alimova D. D., Sagidullaeva D. B. The clinical characteristics of patients and treatment of chronic polypous rhinosinusitis //Central Asian Journal of Medicine.–2025. – 2025. – T. 2. – C. 32-41.
5. Alimova D. D. Therapeutic-diagnostic algorithm in different phenotypes of polypous rhinosinusitis. – 2023.
6. Alimova D. D. CHANGES OF NASAL MUCOSA IN ALLERGIC RHINITIS : дис. – O'zbekiston,

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Toshkent "НЕВРОЛОГИЯ" научно-практический журнал 4 (96), 2023.
7. Alimova D. D., Amonov S. E. The morphological characteristic of the mucous membrane at polypous rhinosinusitis //International Journal of Pharmaceutical Research (09752366). – 2020. – Т. 12. – №. 3. – С. 1696.
8. Amonov S. E., Abdukayumov A. A., Sultanova D. The condition of mucous membranes of nose and paranasal sinuses in patients with chronic kidney disease-an experimental model //Folia Otorhinolaryngologiae et Pathologiae Respiratoriae. – 2012. – Т. 18. – №. 2. – С. 10-11.
9. Amonov S. E., Alimov D. D., Akromovich G. A. Clinical And Immunological Features Of Allergic Rhinitis In Children //World Bulletin of Public Health. – 2022. – Т. 17. – С. 87-89.
10. AMONOV S. et al. Treatment optimization of chronic odontogenic maxillary sinusitis //European Journal of Molecular & Clinical Medicine. – 2020. – Т. 7. – №. 2. – С. 2419-2422.
11. Dilmuratovna S. D. The role of immunologic values in the pathogenesis of chronic rhinosinusitis in children //European science review. – 2014. – №. 3-4. – С. 64-66.
12. Durdona Dilmuratovna S. The role of immunologic values in the pathogenesis of chronic rhinosinusitis in children //European Science Review. – 2014. – №. 2. – С. 64.
13. Ergashev J. et al. Clinical picture of vestibular schwannomas in a series of 106 patients managed with different treatment methods //Новый день в медицине. – 2019. – №. 4. – С. 369-373.
14. Gulyamov S. B. et al. SURGICAL MANAGEMENT OF CHRONIC DACRYOCYSTITIS ASSOCIATED WITH CHRONIC DISEASES OF THE NASAL CAVITY AND PARANASAL SINUSES: MODERN DIAGNOSTIC AND THERAPEUTIC APPROACHE.
15. Gulyamov S. B. et al. CONGENITAL ISOLATED MIDDLE EAR ANOMALIES: MODERN ASPECTS OF DIAGNOSIS AND SURGICAL TREATMENT.
16. Ismatova K. A. et al. The new coronavirus infection in otolaryngological practice: clinical features in different age groups //Science and innovation. – 2023. – Т. 2. – №. Special Issue 8. – С. 813-816.
17. Mamatova S. Orbital complications in rhinosinusitis in young children //Science and innovation. – 2024. – Т. 3. – №. D7. – С. 78-82.
18. Muxitdinov U. B. et al. Analysis of clinical results of the hospitalized patients with chronic otitis media //The Eighth International Conference on Eurasian scientific development. – 2016. – С. 65-67.
19. Rasulova N. A., Alimova D. D., Bazarbaev M. M. DIAGNOSIS AND IMPROVING THE EFFECTIVENESS OF TREATMENT OF PSYCHOSOMATIC DISORDERS IN CHILDREN WITH ADENOID HYPERTROPHY //Central Asian Journal of Medicine. – 2025. – №. 9. – С. 150-153.
20. Sultanovà D. D. Morphological characteristics mucosal polyps on the background rhinosinusitis //Central Asian Journal of Pediatrics. – 2019. – Т. 2. – №. 3. – С. 38-43.