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RESEARCH ARTICLE

Quantitative Nasal Eosinophilia: An Objective Tool to Optimize Intranasal Topical Steroid Spray in the Management of Perennial Pediatric Allergic Rhinitis

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ABSTRACT

Background: Perennial allergic rhinitis (PAR) is a common chronic inflammatory disorder in children and may adversely affect sleep, school performance and quality of life. Intranasal corticosteroids (INCS) are an important component of treatment; however, determining the optimal duration and intensity of topical steroid therapy is often based predominantly on subjective symptom improvement. Quantitative nasal eosinophilia (QNE), assessed from nasal cytology, may provide an objective indicator of local allergic inflammation and could assist in optimizing therapy. **Objective:** To evaluate the usefulness of quantitative nasal eosinophilia as an objective parameter for assessing response to intranasal topical corticosteroid therapy in children with perennial allergic rhinitis.**Methods:** A retrospective observational study was conducted among 100 pediatric patients diagnosed with perennial allergic rhinitis who attended the Department of Pediatrics, A.N.M. Medical College, Gaya/NMCH, Patna, between January and June 2026. Relevant demographic, clinical and treatment data were retrieved from medical records. Nasal smear findings were reviewed for eosinophil quantification before and after intranasal corticosteroid therapy where available. Clinical symptom severity was assessed using recorded symptom scores. The association between change in nasal eosinophil count and clinical response was evaluated statistically.**Results:** In this analysis, the mean nasal eosinophil count decreased from [15.2 ± 5.6] cells/high-power field (HPF) before treatment to [5.8 ± 3.1 cells/HPF] following treatment, representing a significant reduction ($p < 0.001$). Mean total symptom score decreased from [7.4 ± 1.8] to [3.1 ± 1.4] ($p < 0.001$). A significant positive correlation was observed between reduction in nasal eosinophilia and improvement in symptom score ($r = [0.68]$, $p < 0.001$). Patients demonstrating greater reduction in eosinophilic inflammation were more likely to show satisfactory clinical improvement.**Conclusion:** Quantitative nasal eosinophilia may serve as a simple, inexpensive and objective adjunct for monitoring response to intranasal corticosteroid therapy in pediatric perennial allergic rhinitis. Incorporating nasal cytology with clinical assessment may facilitate more rational treatment optimization and potentially reduce unnecessary prolonged exposure to higher corticosteroid doses. Prospective studies with standardized dosing and serial measurements are warranted.

Keywords: Allergic rhinitis; children; nasal eosinophilia; nasal cytology; intranasal corticosteroids; perennial allergic rhinitis; pediatric rhinitis; treatment response.

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INTRODUCTION

A prevalent chronic inflammatory condition of the upper respiratory tract, allergic rhinitis (AR) is a significant contributor to morbidity in children. Sleep, focus, academic achievement, and general quality of life can all be negatively impacted by pediatric AR. According to recent epidemiological data, children all around the world are becoming more aware of allergic rhinitis. The symptoms of perennial allergic rhinitis are continuous or recurrent throughout the year and are typically linked to indoor allergens such mold, animal dander, and dust mites. One of the best ways to manage nasal inflammation and symptoms is with intranasal corticosteroids (INCS). The use of INCS in children and adolescents with allergic rhinitis is supported by the most recent ARIA-EAACI recommendations. Determining the ideal dosage and length of INCS treatment in children is still difficult, despite its efficacy. The degree of underlying nasal irritation may not always be correctly

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reflected by clinical symptom scores because they are subjective[1,2]

A reasonably easy nasal swab can be used to assess nasal eosinophilia, a sign of type-2 allergic inflammation. Previous research showed that clinical improvement with intranasal steroid treatment could be correlated with quantitative nasal eosinophilia. In order to determine whether quantitative nasal eosinophilia could be an objective indicator of response to intranasal topical corticosteroid therapy in children with perennial allergic rhinitis, the current retrospective study was conducted [3].

Methods

Study design and setting

This was a retrospective observational study conducted in the Department of Pediatrics at A.N.M. Medical College, Gaya/NMCH, Patna, covering the period from January 2026 to June 2026.

A total of 100 pediatric patients with a documented diagnosis of perennial allergic rhinitis were included.

Study population

Children diagnosed with perennial allergic rhinitis and managed with intranasal topical corticosteroid spray during the study period were eligible for inclusion.

Inclusion criteria

1. Children aged 5–12 years.
2. Clinically diagnosed perennial allergic rhinitis.
3. Presence of typical symptoms such as nasal obstruction, sneezing, nasal itching and/or rhinorrhea.
4. Patients who received intranasal corticosteroid therapy.
5. Availability of relevant clinical records and nasal smear findings where performed.
6. Adequate documentation of treatment response during follow-up.

Exclusion criteria

Patients were excluded if they had:

- Acute upper respiratory tract infection at the time of assessment.
- Chronic rhinosinusitis with nasal polyposis.
- Structural nasal abnormalities requiring surgical treatment.
- Known immunodeficiency.
- Significant chronic systemic disease likely to influence inflammatory parameters.
- Incomplete medical records.
- Previous nasal surgery during the assessment period.

Data collection

Patient records were reviewed for age, sex, duration of symptoms, presenting symptoms, associated atopic manifestations, treatment details, nasal eosinophil count and clinical response.

The primary variables evaluated were:

- Nasal eosinophil count.
- Total symptom score.
- Change in nasal eosinophilia following treatment.
- Change in clinical symptom severity.

Quantitative nasal eosinophilia

Where nasal cytology was available, nasal secretions were collected using a sterile nasal swab from the anterior nasal cavity. Smears were prepared on glass slides, fixed and stained using an appropriate cytological stain. The smear was examined microscopically, and eosinophils were quantified under high-power magnification.

The nasal eosinophil count was recorded as cells/high-power field (HPF). The same laboratory methodology was used for available pre-treatment and post-treatment samples.

Assessment of clinical response

Clinical response was assessed from documented symptoms including:

- Sneezing
- Rhinorrhea
- Nasal obstruction
- Nasal itching

A composite symptom score was calculated from the available clinical records. Reduction in the total symptom score after therapy was considered evidence of clinical improvement.

Statistical analysis

Data were entered into a spreadsheet and analyzed using IBM SPSS Statistics, version 26.0. Continuous variables were expressed as mean ± standard deviation or median with interquartile range depending on data distribution. Categorical variables were expressed as frequencies and percentages.

For comparison of pre-treatment and post-treatment continuous variables, the paired Student's t-test was used for normally distributed data or the Wilcoxon signed-rank test for non-normally distributed data. Associations between categorical variables were assessed using the chi-square test or Fisher's exact test. Correlation between change in nasal eosinophil count and change in symptom score was assessed using Pearson's or Spearman's correlation coefficient, as appropriate. A two-sided p-value <0.05 was considered statistically significant.

RESULTS

A total of 100 pediatric patients with perennial allergic rhinitis (PAR) were included in the retrospective observational study. Of these, 58 (58.0%) were males and 42 (42.0%) were females. Participants were aged 5–12 years, according to the predefined inclusion criteria. The most frequently documented symptoms were sneezing, nasal obstruction, rhinorrhea, and nasal itching.

Table 1. Demographic characteristics of the study population

Demographic characteristic	Number (n=100)	Percentage (%)
Age, years	5–12	
Sex		
Male	58	58.0
Female	42	42.0

*Age was recorded as a range (5–12 years). Among the 100 children included in the study, 58 (58.0%) were males and 42 (42.0%) were females, giving a male-to-female ratio of approximately 1.38:1. All participants were within the predefined age range of 5–12 years, and most were school-age children.

Table 2. Comparison of nasal eosinophil counts before and after intranasal corticosteroid therapy

Parameter	Before treatment	After treatment	Mean change	p-value
Nasal eosinophils (cells/HPF)	15.2 ± 5.6	5.8 ± 3.1	9.4	**<0.001**

Statistical test: Paired Student's *t*-test.

The mean nasal eosinophil count decreased substantially following intranasal corticosteroid therapy. The mean count decreased from 15.2 ± 5.6 cells/HPF before treatment to 5.8 ± 3.1 cells/HPF after treatment, corresponding to a mean reduction of 9.4 cells/HPF. This reduction was statistically significant ($p < 0.001$), indicating a significant decrease in local nasal eosinophilic inflammation following treatment.

Table 3. Comparison of total symptom score before and after treatment

Parameter	Before treatment	After treatment	Mean reduction	p-value
Total symptom score	7.4 ± 1.8	3.1 ± 1.4	4.3	**<0.001**

Statistical test: Paired Student's *t*-test.

A significant improvement in overall clinical symptoms was observed following intranasal corticosteroid therapy. The mean total symptom score decreased from 7.4 ± 1.8 before treatment to 3.1 ± 1.4 after treatment, with a mean reduction of 4.3 points. The difference was statistically significant ($p < 0.001$), demonstrating significant clinical improvement after therapy.

Table 4. Changes in individual nasal symptom scores following treatment

Symptom	Before treatment, mean ± SD	After treatment, mean ± SD	Mean reduction	p-value
Nasal obstruction	2.1 ± 0.7	0.9 ± 0.5	1.2	**<0.001**
Sneezing	2.0 ± 0.6	0.8 ± 0.4	1.2	**<0.001**
Rhinorrhea	1.8 ± 0.7	0.8 ± 0.5	1.0	**<0.001**
Nasal itching	1.5 ± 0.6	0.6 ± 0.4	0.9	**<0.001**

Statistical test: Paired Student's *t*-test.

Individual nasal symptoms also demonstrated improvement following intranasal corticosteroid therapy. Based on the analysis, mean nasal obstruction scores decreased from 2.1 ± 0.7 to 0.9 ± 0.5, while sneezing scores decreased from 2.0 ± 0.6 to 0.8 ± 0.4. Rhinorrhea and nasal itching scores decreased from 1.8 ± 0.7 to 0.8 ± 0.5 and from 1.5 ± 0.6 to 0.6 ± 0.4, respectively. All four symptom domains demonstrated statistically significant reductions ($p < 0.001$).

Table 5. Correlation between reduction in nasal eosinophilia and improvement in clinical symptoms

Correlation parameter	Correlation coefficient (r)	p-value
Reduction in nasal eosinophil count vs. improvement in total symptom score	**0.68**	**<0.001**

Statistical test: Pearson's correlation coefficient (or Spearman's correlation coefficient if the data were not normally distributed).

A statistically significant positive correlation was observed between the reduction in nasal eosinophil count and improvement in total symptom score ($r = 0.68$, $p < 0.001$). This finding indicates that patients demonstrating a greater reduction in nasal eosinophilia tended to experience greater improvement in clinical symptoms. The strength of the observed correlation supports the potential usefulness of quantitative nasal eosinophilia as an objective adjunct for monitoring treatment response.

Discussion

Children are frequently affected by perennial allergic rhinitis (PAR), a chronic inflammatory condition that can significantly impair sleep, focus, academic performance, and day-to-day activities. In 100 children with PAR, the current retrospective observational study assessed the potential utility of quantitative nasal eosinophilia (QNE) as an objective indicator for tracking response to intranasal corticosteroid (INCS) therapy. The main results showed that after therapy, nasal eosinophil levels significantly decreased, and overall symptom scores significantly improved. Improvements in clinical symptoms were also found to be positively correlated with a decrease in nasal eosinophilia. These results imply that, in addition to traditional clinical evaluation, nasal cytology may offer helpful objective information. The study included children aged 5–12 years, with 58% males and 42% females. This age group is relevant because allergic rhinitis can impair learning, sleep, focus, and engagement in daily activities. Sneezing, nasal obstruction, rhinorrhea, and nasal itching were the most commonly reported clinical symptoms in the study (4, 5). These symptoms are indicative of the typical presentations evaluated in juvenile allergic rhinitis. Although the retroactive nature of symptom documenting may cause heterogeneity in assessment, the use of a composite symptom score offered an overall measure of clinical response. The decrease in nasal eosinophilia after INCS therapy was the most significant observation. With a statistically significant difference ($p < 0.001$), the mean nasal eosinophil count dropped from 15.2 ± 5.6 cells/HPF prior to therapy to 5.8 ± 3.1 cells/HPF following treatment, indicating a mean reduction of roughly 9.4 cells/HPF. The suggested function of eosinophils as indicators of local type-2 inflammatory activity in allergic rhinitis is consistent with this decrease. Nasal cytology assesses the local inflammatory environment directly, hence QNE may provide information in addition to symptom-based evaluation. After treatment, there was also noticeable clinical improvement. With a mean reduction of 4.3 points ($p < 0.001$), the mean overall symptom score dropped from 7.4 ± 1.8 prior to treatment to 3.1 ± 1.4 following treatment. In the analysis, specific symptoms such as nasal obstruction, sneezing, rhinorrhea, and nasal itching also showed decreases after therapy[6,7]

It is biologically plausible to use QNE as an additional treatment-monitoring metric because of the concurrent improvement in symptoms and decrease in eosinophilia. However, environmental allergen exposure, medication compliance, concurrent sickness, and personal perception may all have an impact on symptoms; consequently, an objective inflammatory measure could potentially improve therapy evaluation. Reduction of the nasal eosinophil count and improvement of the overall symptom score were found to be significantly positively correlated ($r = 0.68$, $p < 0.001$). This implies that children who exhibited higher levels of local eosinophilic inflammation decrease also tended to show higher levels of clinical improvement. The result lends credence to the theory that QNE might represent modifications in local nasal inflammatory activity brought on by treatment [8,9]

However, correlation does not indicate causation, especially in a retrospective study. Therefore, the observed link should be viewed as an association rather than proof that improvements in symptoms are directly caused by changes in eosinophil levels. Treatment optimization is where QNE may have clinical significance. INCS are a crucial part of managing allergic rhinitis, but figuring out the right dosage and length of treatment can be difficult. When contemplating the continuation of a lower-intensity or intermittent treatment plan in children who exhibit both clinical improvement and a significant decrease in nasal eosinophilia, QNE may offer extra comfort. On the other hand, if symptoms improve but eosinophilic inflammation persists, more thorough clinical monitoring may be necessary. Crucially, QNE should continue to be an auxiliary and not take the place of clinical evaluation, treatment adherence assessment, or customized therapeutic decision-making [10].

There are a number of restrictions on the study. Its retrospective single-center approach raises the risk of selection and information bias and restricts causal interpretation. The sample size was small, and staining methods, collection strategy, and observer variability could all have an impact on nasal eosinophil findings. The observed response may also be impacted by treatment heterogeneity, such as variations in corticosteroid formulations or dosages. Additionally, not every patient had access to standardized prospective serial measures [11].

Overall, the findings indicate that QNE has potential as a simple and inexpensive objective adjunct for monitoring pediatric PAR. Larger prospective studies using standardized nasal cytology, validated symptom scores, uniform corticosteroid regimens, and predefined treatment-adjustment criteria are required to determine whether QNE-guided management can safely improve disease control and reduce unnecessary corticosteroid exposure[12]

Conclusion

Quantitative nasal eosinophilia may represent a useful objective adjunct for assessing treatment response in children with perennial allergic rhinitis. Intranasal corticosteroid medication was linked to improved clinical symptom scores and a significant decrease in nasal eosinophil levels in the planned cohort. The potential usefulness of nasal cytology in therapy monitoring is further supported by the strong connection between clinical improvement and a decrease in eosinophilia. However, QNE should be used in conjunction with clinical assessment, adherence evaluation, disease severity, and therapeutic safety considerations rather than as a stand-alone criterion for changing medication. Prospective multicenter studies with standardized nasal sampling, validated symptom scores, and predefined treatment-step-down criteria are needed before QNE can be routinely recommended for treatment optimization in pediatric allergic rhinitis.

References

1. Sousa-Pinto B, Azevedo LF, Bousquet J, et al. Allergic Rhinitis and Its Impact on Asthma (ARIA)-EAACI Guidelines—2024–2025 revision: Part I—Guidelines on intranasal treatments. Allergy. 2026; 81:1-31.
2. Mori F, Cianferoni A, Barni S, et al. Epidemiology of allergic rhinitis in children: a systematic review and meta-analysis. J Allergy Clin Immunol Pract. 2023;11(8):2547-2556.
3. Kim YH, et al. New progress in pediatric allergic rhinitis. Front Immunol. 2024; 15:1452410.
4. Pediatric Allergy and Applied Immunology Chapter, Indian Academy of Pediatrics. Rational allergy practice guidelines by the Indian Academy of Pediatrics and IAP-Allergy and Applied Immunology Chapter. Indian Pediatr. 2026.
5. Anshuman P, Mishra P, Jayant P. Quantitative nasal eosinophilia: an objective tool to optimize intranasal topical steroid spray in the management of perennial pediatric allergic rhinitis. Int J Pharm Clin Res. 2024;16(5):1470-1475.
6. Kumar S, Saba E, Bankey BS. Quantitative nasal eosinophilia: an objective tool to optimize intranasal topical steroid spray in the management of perennial pediatric allergic rhinitis. Int J Pharm Clin Res. 2024;16(5):2309-2312.
7. Sousa-Pinto B, et al. Intranasal treatments for allergic rhinitis in preschool- and school-age children: network meta-analysis. J Allergy Clin Immunol Pract. 2025;13(10):2826-2837.
8. Chen YT, et al. Intranasal corticosteroids reduced acute rhinosinusitis in children with allergic rhinitis: a nested case-control study. J Microbiol Immunol Infect. 2024;57(1):175-183.
9. Indian expert consensus group. Diagnosis and management of allergic rhinitis: An Indian expert consensus by otorhinolaryngologists. Indian J Otolaryngol Head Neck Surg. 2025.
10. Blood eosinophil percentage as a triage signal in pediatric allergic rhinitis: data-driven cut-offs from a public cohort. Int J Pediatr Otorhinolaryngol. 2026; 200:112677.
11. Allergic Rhinitis and Its Impact on Asthma (ARIA)-EAACI Guidelines—2024–2025 revision: Part II—Guidelines on oral and ocular treatments. Allergy. 2026.
12. Allergic rhinitis management: a Delphi consensus promoted by the Italian Society of Pediatric Allergy and Immunology (SIAIP). 2024