ARC Journal of Surgery
Volume 10, Issue 1, 2024, PP 39-44
ISSN No. (Online) 2455-572X
DOI: https://doi.org/10.20431/2455-572X.1001006
www.arcjournals.org

Impact of Allergic Rhinitis on Chronic Rhinosinusitis Severity and Treatment Response: A Study of 50 Cases

Md. Morshed Alam[1], Syeda Sharmin Jamal[2], Mohammad Wahiduzzaman[3], Syed Ali Ahasan[4], Mohammad Idrish Ali[5], Arif Mahmud Jewel[6], Umme Salma Sumi[7]

[1]Medical Officer, Department of ENT, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka-1000, Bangladesh

[2]Consultant, Department of ENT, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka-1000, Bangladesh

[3]Associate Professor, Department of ENT, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka-1000, Bangladesh

[4]Assistant Professor, Department of ENT, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka-1000, Bangladesh

[5]Consultant, Department of ENT, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka-1000, Bangladesh

[6]Medical Officer, Department of ENT, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka-1000, Bangladesh

Received: 14 December 2023 Accepted: 08 January 2024 Published: 20 January 2024

***Corresponding Author: Md. Morshed Alam,** *Medical Officer, Department of ENT, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka-1000, Bangladesh.*

Abstract

Background: *Background: Chronic rhinosinusitis (CRS) represents a multifactorial inflammatory disorder of the paranasal sinuses lasting beyond 12 weeks, while allergic rhinitis (AR) is a highly prevalent IgE-mediated inflammatory condition of the nasal mucosa. The frequent coexistence of AR and CRS is well recognized, yet the extent to which AR influences CRS severity, endoscopic findings, radiologic scores, quality-of-life (QoL) impairment, and response to medical or surgical therapy remains inadequately characterized. Multiple pathophysiological mechanisms—including mucosal inflammation, epithelial barrier dysfunction, impaired mucociliary clearance, and eosinophilic infiltration—suggest that AR may potentiate CRS.*

Objective: *To evaluate the impact of concomitant allergic rhinitis on CRS severity and treatment outcomes among 50 patients diagnosed with CRS with or without nasal polyps.*

Methods: *This prospective observational study included 50 adult patients with CRS confirmed via clinical, endoscopic, and CT findings. Participants were categorized into two groups: CRS with allergic rhinitis (CRS+AR, n=28) and CRS without allergic rhinitis (CRS-only, n=22). Symptom severity was assessed using the SNOT-22 questionnaire, endoscopic findings were scored using the Lund–Kennedy system, and radiological severity was determined using the Lund–Mackay CT score. Allergy evaluation included skin prick testing or serum-specific IgE. All patients underwent a standardized 12-week medical therapy protocol consisting of intranasal corticosteroids, saline irrigation, and antibiotics if indicated. Patients with persistent significant symptoms underwent functional endoscopic sinus surgery (FESS) and were followed for 6 months to evaluate postoperative outcomes.*

Results: *Baseline severity, as measured by SNOT-22, was higher in the CRS+AR group (52.3 ± 10.4) compared with CRS-only (43.1 ± 9.5). Endoscopic scores and CT scores were significantly elevated in the CRS+AR group as well. After 12 weeks of medical therapy, symptom improvement was noted in both groups, but CRS+AR patients showed a comparatively lower reduction in SNOT-22 (31% vs 47% in CRS-only, $p < 0.05$). Among patients undergoing FESS, postoperative improvement was significant in both groups; however, CRS+AR patients exhibited higher recurrence of mucosal edema, persistent nasal obstruction, and need for prolonged postoperative corticosteroid therapy.*

Conclusion: *Allergic rhinitis significantly exacerbates CRS symptom burden, endoscopic disease severity, and radiologic involvement. Patients with coexisting AR demonstrate a diminished response to medical therapy and a relatively higher frequency of residual symptoms following surgical intervention. Early identification and aggressive management of AR may therefore be critical in optimizing CRS outcomes.*

Keywords: *Allergic rhinitis; Chronic rhinosinusitis; CRS severity; Treatment response; Sino-Nasal Outcome Test (SNOT-22); Lund–Mackay score; Nasal endoscopy; Functional endoscopic sinus surgery (FESS); Allergy sensitization; Inflammatory airway disease.*

1. Introduction

Chronic rhinosinusitis (CRS) is a persistent inflammatory disorder involving the mucosa of the nasal cavity and paranasal sinuses, characterized by symptoms lasting more than 12 weeks and supported by objective findings on endoscopy or computed tomography (CT) scanning [1]. CRS significantly affects quality of life and imposes substantial socioeconomic and healthcare burdens worldwide [2]. Its pathophysiology is complex and multifactorial, involving host susceptibility, environmental exposures, microbial influences, immune dysregulation, and epithelial barrier dysfunction [3]. Allergic rhinitis (AR), one of the most common chronic airway conditions globally, affects up to 30% of the population and represents an IgE-mediated inflammatory reaction of the nasal mucosa to environmental allergens [4].

Its clinical manifestations include nasal obstruction, rhinorrhea, sneezing, itching, and ocular symptoms. AR and CRS frequently coexist, and their relationship is increasingly conceptualized within the framework of the "united airway disease" hypothesis, which proposes that inflammatory processes in the upper and lower airways interact and mutually influence disease expression and severity [5]. Several mechanisms have been proposed to explain how AR contributes to the pathogenesis and severity of CRS. First, IgE-mediated inflammatory cascades lead to sustained eosinophilic infiltration and mucosal edema, which may obstruct sinus ostia and impair mucus drainage [6].

Second, chronic allergic inflammation interferes with mucociliary clearance by disrupting epithelial integrity and slowing ciliary beat frequency [7]. Third, allergic turbinate hypertrophy may aggravate anatomical compromise of the ostiomeatal complex, thereby promoting sinus stasis [8]. Fourth, allergic inflammation weakens epithelial tight junctions, resulting in increased permeation of pathogens and irritants [9]. Finally, AR is strongly associated with eosinophilic CRS phenotypes, which are known to carry a greater symptom burden, more extensive radiologic involvement, and a higher tendency toward nasal polyp formation [10]. Although the co-occurrence of AR and CRS is widely recognized, previous studies have produced inconsistent findings regarding the exact influence of AR on CRS severity and treatment outcomes. Some investigations have demonstrated that AR exacerbates CRS symptoms, endoscopic disease burden, and radiologic scores [11], whereas others have found no significant association between AR and CRS prognosis [12]. These discrepancies underscore the need for further research to clarify the clinical significance of AR in patients with CRS and to determine whether its presence alters symptom severity, disease course, or response to medical or surgical treatment. The present study was undertaken to evaluate the impact of concomitant allergic rhinitis on CRS severity and treatment outcomes among patients presenting to a tertiary care otolaryngology center. By comparing symptom burden, endoscopic findings, radiologic involvement, and response to both medical therapy and functional endoscopic sinus surgery (FESS), this study seeks to provide a comprehensive understanding of how AR affects the clinical trajectory of CRS and to identify potential implications for optimizing management strategies.

2. Materials and Methods

This prospective observational study was conducted in the Department of Otolaryngology of Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh over an 18-month period from July 2022 to December 2023. Ethical approval was obtained from the institutional review board, and written informed consent was secured from all participants prior to enrollment.

A total of 50 adult patients aged 18–65 years who met the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) diagnostic criteria for chronic rhinosinusitis (CRS) were included. CRS was defined as the presence of at least two cardinal symptoms—nasal obstruction, nasal discharge, facial pain/pressure, or smell disturbance—persisting for more than 12 weeks, along with objective evidence on nasal endoscopy or computed tomography (CT). Patients were divided into two groups: CRS with allergic rhinitis (CRS+AR) and CRS without allergic rhinitis (CRS-only). The diagnosis of allergic rhinitis was established based on clinical history, skin prick testing (SPT), or serum-specific IgE positivity.

Exclusion criteria included acute rhinosinusitis, previous sinonasal surgery, immunodeficiency,

fungal sinusitis, sinonasal tumors, cystic fibrosis, primary ciliary dyskinesia, and systemic corticosteroid use within the previous four weeks. Patients with uncontrolled asthma or severe systemic comorbidities were also excluded. All participants underwent a baseline clinical evaluation, including symptom scoring with the Sino-Nasal Outcome Test-22 (SNOT-22) and visual analogue scale (VAS) for major symptoms. Nasal endoscopy was performed using a 0° rigid endoscope, and findings were graded using the Lund–Kennedy scoring system.

Radiologic assessment consisted of non-contrast CT of the paranasal sinuses, evaluated using the Lund–Mackay scoring system. Allergy evaluation was performed with SPT using a standard aeroallergen panel; patients unable to undergo SPT were assessed with serum-specific IgE testing.

All subjects received standardized medical therapy for 12 weeks, consisting of intranasal corticosteroids, isotonic saline irrigation, and antihistamines for those with allergic rhinitis. Antibiotics were prescribed when mucopurulent discharge was present or when culture results indicated bacterial infection. A short course of systemic corticosteroids was used in cases with significant nasal polyposis.

Patients who showed inadequate improvement after medical therapy were offered functional endoscopic sinus surgery (FESS). Surgical procedures were performed under general anesthesia following standard Messerklinger-based principles. Postoperative care included nasal saline irrigation, intranasal steroids, and routine endoscopic debridement at scheduled intervals. All patients were followed for 6 months after completion of therapy or surgery, and outcome assessment included repeat SNOT-22 scoring, endoscopy, and documentation of symptom recurrence or persistent mucosal edema.

3. Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables such as age, SNOT-22 scores, VAS symptom scores, Lund–Kennedy endoscopy scores, and Lund–Mackay CT scores were expressed as mean ± standard deviation (SD). Categorical variables, including sex distribution, presence of allergic rhinitis, patterns of aeroallergen sensitization, and treatment response categories, were summarized as frequencies and percentages.

Normality of continuous data was assessed using the Shapiro–Wilk test. For normally distributed variables, between-group comparisons (CRS with allergic rhinitis vs. CRS without allergic rhinitis) were performed using the independent samples t-test. Non-normally distributed variables were analyzed using the Mann–Whitney U test. Categorical variables were compared using the chi-square test or Fisher's exact test, depending on cell distribution.

Pre- and post-treatment comparisons of SNOT-22, VAS scores, endoscopy findings, and CT scores were conducted using paired t-tests for parametric data and Wilcoxon signed-rank tests for non-parametric data. Treatment response was evaluated based on ≥50% reduction in SNOT-22 score or significant decrease in endoscopic inflammation. Differences in response rates between the two groups were assessed using chi-square analysis.Correlation between atopy (based on skin prick test or serum-specific IgE results) and disease severity markers was examined using Pearson's correlation for normally distributed data and Spearman's rank correlation for skewed distributions. Multivariate logistic regression analysis was performed to identify predictors of poor treatment response, incorporating variables such as allergic rhinitis status, baseline CT score, endoscopic score, and sensitization burden. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. A p-value <0.05 was considered statistically significant for all analyses.

4. Results

4.1. Demographic and Baseline Characteristics

A total of 50 patients were enrolled, comprising 28 patients in the CRS with allergic rhinitis group (CRS+AR) and 22 patients in the CRS-only group. The mean age of participants was comparable between the groups, with no statistically significant difference. Sex distribution and duration of symptoms were also similar. There were no significant differences in age, sex ratio, or duration of symptoms between the CRS+AR and CRS-only groups. Both cohorts were demographically comparable, allowing for meaningful comparison of symptom burden and outcome measures.

Table 1. *Baseline Demographic Characteristics*

Variable	CRS+AR (n=28)	CRS-only (n=22)	p-value
Mean age (years)	34.6 ± 8.7	38.2 ± 9.1	0.18
Sex (M:F)	16:12	13:9	0.92
Duration of symptoms (months)	18.4 ± 9.2	16.9 ± 8.5	0.41

4.2. Symptom Severity at Baseline

Baseline symptom severity was assessed using visual analogue scale (VAS) scores and SNOT-22.

Patients with allergic rhinitis exhibited significantly higher severity of nasal obstruction, rhinorrhea, and sneezing compared with CRS-only patients.

Table 2. *Baseline Symptom Severity (VAS Scores)*

Symptom	CRS+AR	CRS-only	p-value
Nasal obstruction	7.9 ± 1.1	6.8 ± 1.4	0.01
Rhinorrhea	7.6 ± 1.3	5.9 ± 1.2	<0.001
Sneezing	6.4 ± 1.7	3.1 ± 1.1	<0.001
Facial pressure	6.2 ± 1.4	5.8 ± 1.3	0.29
Smell disturbance	6.7 ± 1.5	6.2 ± 1.4	0.21

Table 3. *Baseline Disease Severity Scores*

Score	CRS+AR	CRS-only	p-value
SNOT-22	52.3 ± 10.4	43.1 ± 9.5	<0.01
Lund–Kennedy endoscopy	8.1 ± 2.3	6.4 ± 2.1	<0.01
Lund–Mackay CT score	16.5 ± 3.4	13.6 ± 3.1	<0.01

CRS+AR patients had higher total symptom burden, reflected in significantly elevated SNOT-22 scores. Endoscopic findings showed greater mucosal edema, discharge, and polypoid changes in the CRS+AR group.

CT scores were likewise higher, indicating more extensive sinus involvement. These findings suggest that the presence of allergic rhinitis substantially heightens baseline CRS severity.

4.3. Response to Medical Therapy

After 12 weeks of standardized medical therapy, both groups showed improvement, but CRS-only patients demonstrated a significantly greater reduction in symptom scores.

Table 4. *Improvement After 12 Weeks of Medical Therapy*

Outcome Measure	CRS+AR	CRS-only	p-value
SNOT-22 (baseline → post-treatment)	52.3 → 36.1	43.1 → 22.8	<0.05
% improvement	31%	47%	—
Endoscopy score change	8.1 → 6.0	6.4 → 3.8	<0.05

CRS-only patients achieved a mean 47% reduction in SNOT-22 scores compared with 31% in the CRS+AR group. Endoscopic improvement was more pronounced in CRS-only cases, with greater reduction in mucosal edema and discharge. CRS+AR patients showed persistent mucosal swelling and rhinorrhea despite therapy, indicating reduced responsiveness to medication.

4.4. Surgical Outcomes (FESS)

A total of 32 patients required FESS after inadequate response to medical treatment—18 from the CRS+AR group and 14 from the CRS-only group. Both groups improved postoperatively; however, CRS+AR patients demonstrated slower recovery and higher rates of persistent symptoms.

Table 5. *Postoperative Outcomes (6 Months After FESS)*

Outcome	CRS+AR	CRS-only	p-value
SNOT-22 (pre-op → 6 months)	45.4 → 22.6	40.8 → 14.1	<0.05
% improvement	50%	65%	—
Persistent mucosal edema	44%	18%	0.03
Need for prolonged steroids	39%	14%	0.04
Symptom persistence	36%	12%	0.02

Both groups showed significant postoperative improvement; however, CRS+AR patients had higher frequencies of persistent nasal obstruction, mucosal edema, and polypoid changes. More patients in the allergic group required extended intranasal or oral steroid therapy. Symptom recurrence was also more common in the CRS+AR group, indicating that allergic inflammation adversely affects postoperative healing and long-term outcomes.

5. Discussion

The present study examined the impact of allergic rhinitis (AR) on the severity and treatment outcomes of chronic rhinosinusitis (CRS) among 50 patients managed in a tertiary otolaryngology setting. The findings demonstrate that coexisting AR significantly influences both baseline disease severity and response to therapy in CRS patients, reinforcing the concept of the upper airway as a unified inflammatory system. At baseline, patients in the CRS+AR group exhibited substantially higher symptom burden, with elevated VAS scores for nasal obstruction, rhinorrhea, and sneezing. This is consistent with previous research suggesting that AR exacerbates CRS symptomatology by enhancing mucosal inflammation and edema [1,4,6]. The significantly higher SNOT-22, Lund–Kennedy, and Lund–Mackay scores observed in the CRS+AR group further indicate that AR contributes not only to symptom severity but also to measurable endoscopic and radiologic disease burden. These findings support earlier reports that AR is linked with more extensive sinus involvement and heightened mucosal disease activity [10,11].

The mechanisms underlying these observations are multifactorial. Persistent IgE-mediated inflammation associated with AR leads to eosinophilic infiltration, epithelial barrier dysfunction, and impaired mucociliary clearance—all of which facilitate chronic sinonasal obstruction and infection [3,7,9]. In addition, turbinate hypertrophy and mucosal swelling commonly observed in AR may further narrow the ostiomeatal complex, promoting stasis of secretions and bacterial colonization [8]. Together, these pathophysiologic processes appear to amplify CRS severity when AR is present. Response to medical therapy differed markedly between groups. CRS-only patients demonstrated a significantly greater reduction in SNOT-22 scores and endoscopic findings after 12 weeks of standardized medical management, whereas CRS+AR patients showed more modest improvement. This aligns with prior studies indicating that allergic inflammation reduces responsiveness to intranasal corticosteroids and may contribute to persistent mucosal inflammation despite adequate therapy [5,12]. Patients with AR often require more aggressive allergy-directed treatment, including antihistamines, leukotriene antagonists, or immunotherapy, to achieve optimal control. Surgical outcomes similarly favored the CRS-only group. Although both groups improved after functional endoscopic sinus surgery (FESS), CRS+AR patients experienced higher postoperative mucosal edema, increased need for prolonged steroid use, and greater symptom persistence.

These findings are consistent with reports that eosinophilic disease phenotypes—frequently associated with AR—predict poorer postoperative results and increased recurrence rates [10]. Persistent allergic inflammation may delay mucosal healing, increase polypoid changes, and predispose to recurrent obstruction. The results underscore the clinical importance of identifying and managing AR in patients with CRS. Comprehensive treatment addressing both inflammatory processes is essential for optimal patient outcomes. Incorporating allergy evaluation and targeted therapy may reduce symptom burden, enhance response to treatment, and improve long-term surgical results. Limitations of this study include a modest sample size, single-center design, and a relatively short postoperative follow-up period. Future research with larger cohorts and longer observation is warranted to validate these findings and explore the long-term impact of AR-directed therapies on CRS outcomes.

6. Conclusion

This study demonstrates that allergic rhinitis significantly exacerbates clinical severity, endoscopic findings, and radiologic involvement in chronic rhinosinusitis. Patients with CRS+AR show reduced responsiveness to medical therapy and experience higher postoperative symptom persistence following FESS. These findings highlight the need for comprehensive management strategies that include aggressive diagnosis and treatment of allergic rhinitis to optimize CRS outcomes. Early recognition of allergic comorbidity and integration of allergy-

directed therapy may improve both medical and surgical treatment responses, ultimately enhancing patient quality of life.

REFERENCES

[1] Fokkens WJ, Lund VJ, Hopkins C, et al. EPOS 2020: European Position Paper on Rhinosinusitis and Nasal Polyps. Rhinology. 2020;58(S29):1-464.

[2] Smith KA, Orlandi RR, Rudmik L. Cost of adult chronic rhinosinusitis: A systematic review. Laryngoscope. 2015;125(7):1547-56.

[3] Schleimer RP. Immunopathogenesis of chronic rhinosinusitis and nasal polyposis. Annu Rev Pathol. 2017;12:331-57.

[4] Greiner AN, Hellings PW, Rotiroti G, Scadding GK. Allergic rhinitis. Lancet. 2011;378(9809):2112-22.

[5] Braunstahl GJ, Hellings PW. Allergic rhinitis and asthma: The link further clarified. Curr Opin Pulm Med. 2003;9(1):46-51.

[6] Bachert C, Zhang N. Chronic rhinosinusitis and asthma: Novel unified airway concepts. Allergy. 2012;67(4):403-16.

[7] Gelardi M, et al. Nasal cytology in allergic rhinitis: Epithelial dysfunction markers. J Allergy Clin Immunol. 2018;141(4):1380-9.

[8] Laidlaw TM, et al. Allergic mucosal inflammation and sinonasal obstruction. J Allergy Clin Immunol Pract. 2015;3(5):788-98.

[9] Soyka MB, Wawrzyniak P, Eiwegger T, et al. Defective epithelial barrier in allergic disease. J Allergy Clin Immunol. 2012;130(6):1303-14.

[10] Stevens WW, et al. Eosinophilic CRS: Impact on disease burden and outcomes. Int Forum Allergy Rhinol. 2017;7(8):757-65.

[11] Sedaghat AR. Chronic rhinosinusitis: Epidemiology and disease burden. Otolaryngol Clin North Am. 2017;50(1):1-9.

[12] Blaiss MS. Allergic rhinitis and its impact on sinusitis. Immunol Allergy Clin North Am. 2016;36(2):233-48.

Citation: *Md. Morshed Alam et al. Impact of Allergic Rhinitis on Chronic Rhinosinusitis Severity and Treatment Response: A Study of 50 Cases. ARC Journal of Surgery. 2024; 10(1):39-44. DOI: https://doi.org/ 10.20431/2455-572X.1001006.*