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Original Research Article

Risk Factors for Recurrence after Functional Endoscopic Sinus Surgery in Chronic Rhinosinusitis

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Abstract

Background: Chronic rhinosinusitis (CRS) is a persistent inflammatory disorder of the sinonasal mucosa. Although Functional Endoscopic Sinus Surgery (FESS) effectively improves symptoms in medically refractory cases, postoperative recurrence remains a significant clinical concern.

Aim/Objectives: To identify the risk factors associated with recurrence after Functional Endoscopic Sinus Surgery in patients with chronic rhinosinusitis.

Materials and Methods: A prospective observational study was conducted in the Department of ENT at Sri Chamundeshwari Medical College Hospital and Research Institute over one year. Fifty adult patients with CRS undergoing FESS were enrolled and followed postoperatively. Demographic, clinical, radiological, and laboratory parameters were analyzed to determine factors associated with disease recurrence.

Results: Recurrence occurred in 14 (28.0%) patients. Nasal polyps, allergic rhinitis, bronchial asthma, smoking, peripheral eosinophilia, and a high Lund–Mackay CT score were significantly associated with recurrence ($p<0.05$). Multivariate analysis identified a high Lund–Mackay score and nasal polyps as the strongest independent predictors.

Conclusion: Disease severity and inflammatory comorbidities are major determinants of recurrence after FESS. Careful preoperative risk assessment and individualized postoperative follow-up may improve long-term outcomes and reduce recurrence.

Keywords: Allergic Rhinitis; Chronic Rhinosinusitis; Functional Endoscopic Sinus Surgery; Nasal Polyps; Recurrence; Risk Factors.

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Introduction

Chronic rhinosinusitis (CRS) is a common inflammatory disorder of the nose and paranasal sinuses characterized by persistent symptoms lasting for at least 12 weeks despite appropriate medical therapy. According to the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS 2020), the diagnosis requires the presence of at least two symptoms, one of which should be either nasal obstruction or nasal discharge, with or without facial pain, pressure, or reduction in the sense of smell, supported by endoscopic or radiological findings [1].

CRS significantly impairs quality of life by affecting sleep, work productivity, and daily functioning while imposing a considerable economic burden on healthcare systems worldwide. Functional Endoscopic Sinus Surgery (FESS) is the standard surgical treatment for patients with CRS who fail to respond to optimal medical management. The procedure restores ventilation and drainage of the paranasal sinuses while preserving normal mucosal function, resulting in significant symptomatic improvement for most patients [2,3]. However, despite advances in surgical techniques and postoperative care, disease recurrence remains an

important clinical challenge. A proportion of patients experience persistent or recurrent symptoms requiring prolonged medical therapy or revision surgery, indicating that surgery alone cannot eliminate the underlying inflammatory process.

Recent studies have demonstrated that recurrence after FESS is influenced by several patient- and disease-related factors, including nasal polyposis, asthma, allergic rhinitis, aspirin-exacerbated respiratory disease, eosinophilic inflammation, smoking, high preoperative disease burden, and poor adherence to postoperative treatment [4-6]. Identification of these predictors allows clinicians to stratify patients according to recurrence risk, optimize perioperative management, and plan closer postoperative surveillance.

Considering the limited Indian data regarding recurrence following FESS, the present study, conducted in the Department of ENT at Sri Chamundeshwari Medical College Hospital and Research Institute, aims to evaluate the risk factors associated with recurrence after Functional Endoscopic Sinus Surgery in patients with chronic rhinosinusitis. The findings are expected to facilitate individualized treatment strategies and improve long-term surgical outcomes.

The aim of this study is to identify the risk factors associated with recurrence following Functional Endoscopic Sinus Surgery (FESS) in patients with chronic rhinosinusitis. The objectives are to evaluate demographic, clinical, endoscopic, radiological, and comorbid factors influencing disease recurrence, assess postoperative outcomes during the follow-up period, and identify predictors that may help optimize patient selection, improve postoperative management, and reduce the likelihood of recurrent disease.

Materials and Methods

Study Design: Hospital-based prospective observational study.

Study Population: Adult patients diagnosed with chronic rhinosinusitis who underwent Functional Endoscopic Sinus Surgery (FESS) in the Department of ENT and were followed postoperatively for evidence of disease recurrence.

Sample Size: A total of 50 patients were included in the study.

Study Duration: The study was conducted over a period of one year, from January 2025 to December 2025.

Study Setting/Location: The study was carried out in the Department of ENT, Sri Chamundeshwari Medical College Hospital and Research Institute.

Inclusion Criteria:

- Patients aged 18 years and above diagnosed with chronic rhinosinusitis according to established clinical, endoscopic, and radiological criteria.
- Patients who underwent Functional Endoscopic Sinus Surgery after failure of adequate medical management.
- Patients willing to participate in the study and provide written informed consent.
- Patients available for regular postoperative follow-up during the study period.

Exclusion Criteria:

- Patients with sinonasal malignancies or benign sinonasal tumors.
- Patients with fungal rhinosinusitis requiring specialized surgical management.
- Patients with craniofacial anomalies or previous major sinonasal surgeries other than FESS.
- Patients with severe systemic illnesses preventing regular follow-up.
- Patients who declined consent or were lost to follow-up during the study period.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 27.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage. The association between categorical variables was assessed using the Chi-square test or Fisher's exact test, as appropriate. Differences in continuous variables between groups were evaluated using the independent Student's t-test.

Variables showing statistical significance in univariate analysis were included in a multivariate logistic regression model to identify independent predictors of recurrence after Functional Endoscopic Sinus Surgery. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated. A p-value <0.05 was considered statistically significant for all analyses.

Result

Table 1: Baseline Demographic Characteristics of the Study Population

Variable		Frequency (n)	Percentage (%)	p-value
Age Group (Years)	<40	6	12	**0.032**
	41–50	10	20	
	51–60	18	36	
	61–70	12	24	
	>70	4	8	
	Total	**50**	**100**	
Gender	Male	31	62	**0.418**
	Female	19	38	
	Total	**50**	**100**	

Table 2: Clinical Characteristics and Risk Factors among Study Participants

Variable	Frequency (n)	Percentage (%)	p-value
Nasal polyps	28	56	0.001
Allergic rhinitis	24	48	0.021
Bronchial asthma	14	28	0.008
Smoking history	16	32	0.037
Diabetes mellitus	12	24	0.219
Deviated nasal septum	20	40	0.154
High Lund–Mackay CT score (≥18)	19	38	0.004
Peripheral eosinophilia	17	34	0.012

Table 3: Comparison of Patients with and Without Recurrence after FESS

Variable	Recurrence (n=14)	No Recurrence (n=36)	p-value
Mean age (Years)	57.8 ± 9.2	52.6 ± 10.4	0.086
Male gender	10 (71.4%)	21 (58.3%)	0.392
Nasal polyps	12 (85.7%)	16 (44.4%)	0.008
Allergic rhinitis	10 (71.4%)	14 (38.9%)	0.041
Bronchial asthma	8 (57.1%)	6 (16.7%)	0.006
Smoking	8 (57.1%)	8 (22.2%)	0.025
Diabetes mellitus	5 (35.7%)	7 (19.4%)	0.241
High Lund–Mackay score (≥18)	10 (71.4%)	9 (25.0%)	0.003
Peripheral eosinophilia	9 (64.3%)	8 (22.2%)	0.007

Table 4. Multivariate Analysis of Predictors of Recurrence Following FESS

Risk Factor	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Nasal polyps	4.62	1.38–15.43	0.011
Bronchial asthma	3.81	1.19–12.24	0.024
Allergic rhinitis	2.97	1.01–8.76	0.047
Smoking	2.68	1.02–7.06	0.044
High Lund–Mackay score (≥18)	5.14	1.61–16.42	0.005
Peripheral eosinophilia	3.26	1.12–9.48	0.029

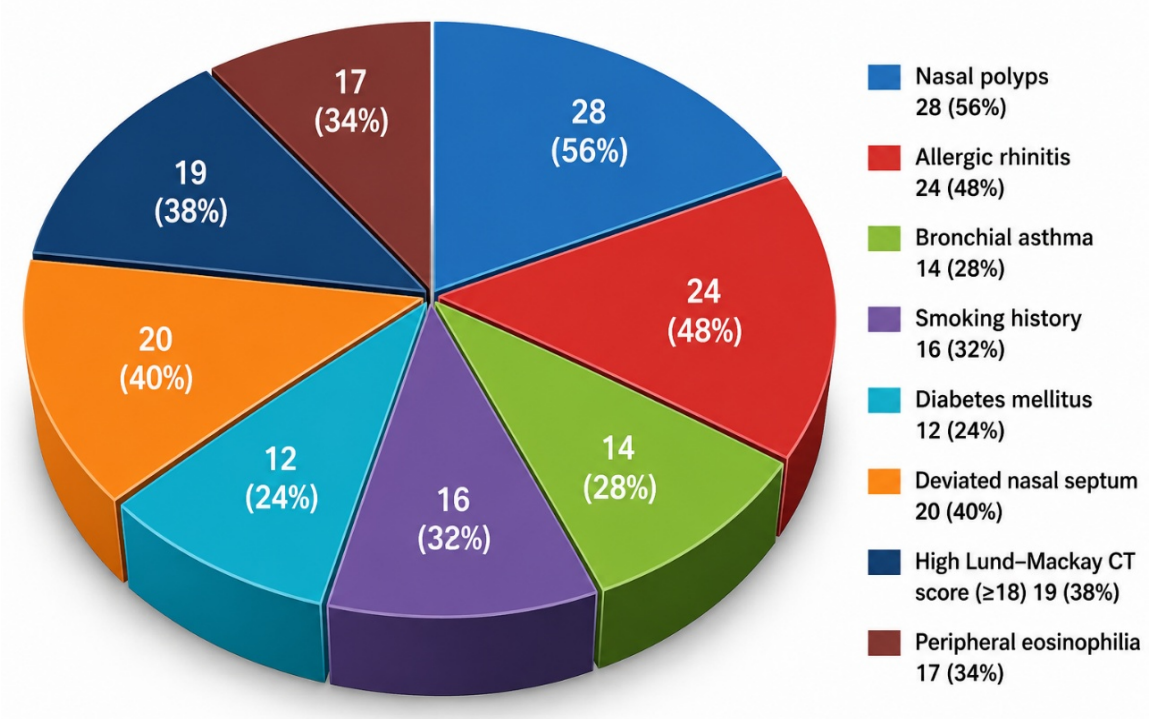

Figure 1: Distribution of Clinical Risk Factors among Patients with Chronic Rhinosinusitis

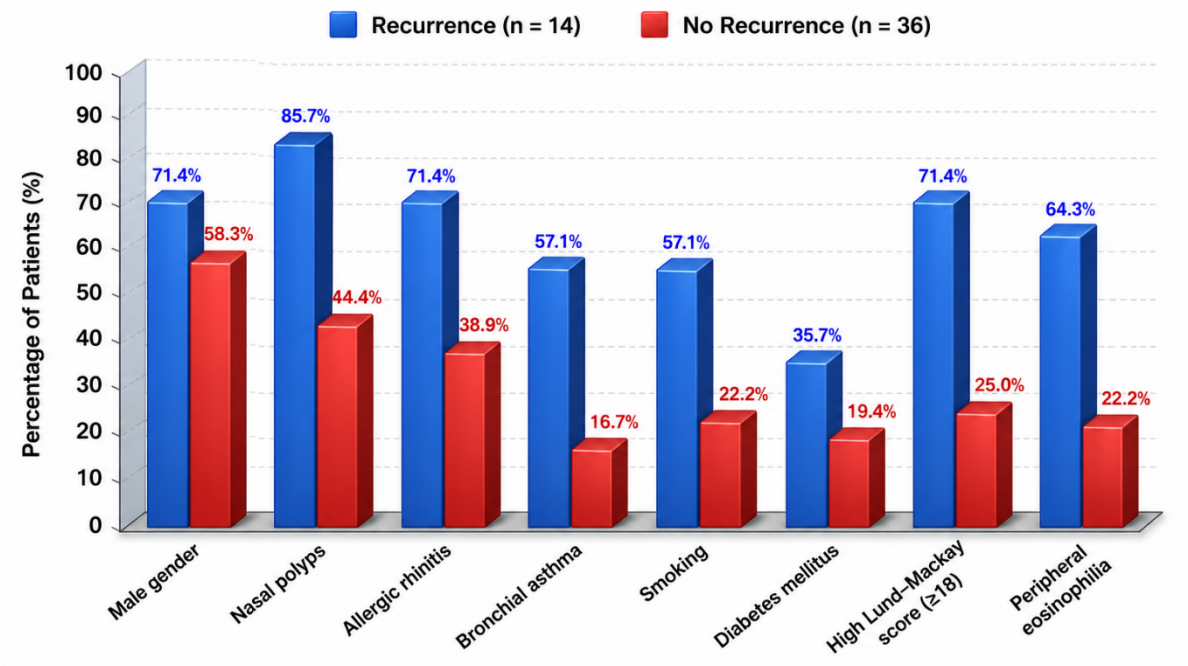

Figure 2: Comparison of Clinical Risk Factors between Patients with and Without Recurrence Following Functional Endoscopic Sinus Surgery

A total of 50 patients with chronic rhinosinusitis who underwent Functional Endoscopic Sinus Surgery (FESS) were included. The majority were aged 51–60 years (18, 36.0%), followed by 61–70 years (12, 24.0%), 41–50 years (10, 20.0%), <40 years (6, 12.0%), and >70 years (4, 8.0%). Age distribution was statistically significant (p = 0.032). There were 31 males (62.0%) and 19 females (38.0%), with no significant gender difference (p = 0.418).

Among the evaluated risk factors, nasal polyps were the most frequent (28, 56.0%) and showed a significant association with recurrence (p = 0.001). Significant associations were also observed for allergic rhinitis (24, 48.0%; p = 0.021), bronchial asthma (14, 28.0%; p = 0.008), smoking (16, 32.0%; p = 0.037), high Lund–Mackay CT score ≥18 (19, 38.0%; p = 0.004), and peripheral eosinophilia (17, 34.0%; p = 0.012). Deviated nasal septum (20,

40.0%; p = 0.154) and diabetes mellitus (12, 24.0%; p = 0.219) were not significantly associated with recurrence.

During follow-up, 14 patients (28.0%) developed recurrence, whereas 36 (72.0%) remained recurrence-free. Patients with recurrence had significantly higher rates of nasal polyps (85.7% vs. 44.4%; p = 0.008), allergic rhinitis (71.4% vs. 38.9%; p = 0.041), bronchial asthma (57.1% vs. 16.7%; p = 0.006), smoking (57.1% vs. 22.2%; p = 0.025), high Lund–Mackay CT score (71.4% vs. 25.0%; p = 0.003), and peripheral eosinophilia (64.3% vs. 22.2%; p = 0.007). Mean age (57.8 ± 9.2 vs. 52.6 ± 10.4 years; p = 0.086), gender (p = 0.392), and diabetes mellitus (p = 0.241) were not significantly different.

Multivariate logistic regression identified high Lund–Mackay CT score (AOR 5.14; 95% CI: 1.61–16.42; p = 0.005) as the strongest independent predictor of recurrence, followed by nasal polyps (AOR 4.62; p = 0.011), bronchial asthma (AOR 3.81; p = 0.024), peripheral eosinophilia (AOR 3.26; p = 0.029), allergic rhinitis (AOR 2.97; p = 0.047), and smoking (AOR 2.68; p = 0.044).

Discussion

The present study evaluated the risk factors associated with recurrence after Functional Endoscopic Sinus Surgery (FESS) in patients with chronic rhinosinusitis (CRS). Most patients belonged to the 51–60-year age group (36.0%), with males accounting for 62.0% of the study population. Although middle-aged individuals were more frequently affected, neither age nor gender showed a significant association with postoperative recurrence. Similar observations have been reported in recent studies, where demographic characteristics had limited predictive value, suggesting that recurrence is more closely related to disease phenotype and inflammatory status than to age or sex alone [7,8].

Among the evaluated clinical characteristics, nasal polyps (56.0%), allergic rhinitis (48.0%), bronchial asthma (28.0%), smoking (32.0%), high Lund–Mackay CT score (38.0%), and peripheral eosinophilia (34.0%) demonstrated significant associations with recurrence. These findings support the concept that persistent mucosal inflammation and type-2 immune responses continue even after technically successful surgery. Recent systematic reviews have similarly concluded that nasal polyposis, asthma, eosinophilic inflammation, and extensive radiological disease are among the strongest determinants of postoperative recurrence [9,10].

In the present study, the recurrence rate was 28.0%, and patients with recurrence exhibited significantly higher frequencies of nasal polyps, allergic rhinitis, asthma, smoking, elevated Lund–Mackay scores, and peripheral eosinophilia compared with patients without recurrence. Diabetes mellitus and gender were not significantly associated with recurrence. These findings are consistent with contemporary cohort studies demonstrating that patients with coexisting airway allergy, asthma, eosinophilia, and severe CT involvement experience a substantially greater risk of relapse after FESS. The concept of the "united airway disease" further explains the close relationship between sinonasal inflammation and lower airway disorders in influencing long-term surgical outcomes [11,12].

Multivariate analysis identified high Lund–Mackay CT score, nasal polyps, bronchial asthma, peripheral eosinophilia, allergic rhinitis, and smoking as independent predictors of recurrence. The strongest predictor was a high Lund–Mackay score, indicating that greater radiological disease burden is associated with poorer postoperative prognosis. Similarly, recent predictive models have shown that imaging severity, eosinophilic biomarkers, and asthma substantially improve recurrence prediction after endoscopic sinus surgery. Emerging evidence also supports incorporating these variables into risk-stratification models to guide individualized postoperative surveillance and adjunctive medical therapy, including biologics in selected high-risk patients [13,14].

Conclusion

The present study demonstrates that recurrence following Functional Endoscopic Sinus Surgery in patients with chronic rhinosinusitis is primarily influenced by disease severity and underlying inflammatory comorbidities rather than demographic characteristics. Nasal polyps, bronchial asthma, allergic rhinitis, smoking, peripheral eosinophilia, and a high Lund–Mackay CT score were identified as significant independent predictors of recurrence. These findings emphasize the importance of comprehensive preoperative risk assessment, meticulous surgical management, and structured postoperative follow-up in high-risk patients. Early identification and targeted management of modifiable risk factors may reduce recurrence rates, improve long-term symptom control, enhance quality of life, and optimize overall surgical outcomes.

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