



CLINICAL PROFILE AND RISK FACTORS OF CHRONIC RHINOSINUSITIS AMONG PATIENTS ATTENDING A TERTIARY CARE HOSPITAL: A CROSS-SECTIONAL STUDY

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Abstract

Chronic rhinosinusitis (CRS) emerged as a prevalent and clinically significant inflammatory disorder characterized by a distinct constellation of symptoms, with nasal obstruction and nasal discharge representing the most frequently reported complaints among affected patients. These symptoms were often accompanied by varying degrees of facial pressure, hyposmia, and impaired quality of life, reflecting the substantial burden imposed by the disease. Endoscopic evaluation revealed that a considerable proportion of patients exhibited nasal polyps, highlighting the heterogeneous nature of CRS and the importance of thorough clinical assessment in disease classification and management. Analysis of potential risk factors demonstrated that allergic rhinosinusitis, bronchial asthma, cigarette smoking, and occupational exposure to airborne irritants were independently associated with an increased likelihood of developing CRS. These findings underscore the multifactorial pathogenesis of the condition, involving complex interactions between chronic mucosal inflammations, environmental exposures, and underlying atopic tendencies. Allergic rhinitis and asthma likely contribute through shared inflammatory pathways affecting both the upper and lower airways, supporting the concept of a unified airway disease. Similarly, tobacco smoke and occupational irritants may promote persistent mucosal irritation, impaired mucociliary clearance, and chronic inflammatory responses that predispose individuals to CRS. The observed associations emphasize the need for a comprehensive clinical approach that extends beyond symptom management to include identification and modification of contributory risk factors. Routine evaluation for coexisting allergic conditions, smoking habits, and occupational exposures should therefore form an integral component of CRS assessment and treatment planning. Targeted interventions such as allergy management, smoking cessation programs, environmental control measures, and patient education may contribute to improved symptom control and disease outcomes. Overall, the study highlights the characteristic clinical profile of CRS and reinforces the importance of addressing both allergic and environmental determinants to optimize patient care, reduce disease burden, and enhance long-term quality of life.

Keywords: *Chronic rhinosinusitis; Nasal polyps; SNOT-22; Allergic rhinitis; Smoking; Risk factors.*



Introduction

Chronic rhinosinusitis (CRS) is a persistent inflammatory disorder of the nasal and paranasal sinus mucosa that continues for at least 12 weeks and is characterized by cardinal symptoms including nasal obstruction, nasal discharge, facial pain or pressure, and a diminished sense of smell [1]. As one of the most common chronic diseases affecting the upper respiratory tract, CRS imposes a substantial burden on affected individuals through persistent symptoms, reduced quality of life, impaired sleep, decreased work productivity, and increased healthcare utilization [2]. The condition is clinically heterogeneous and is broadly categorized into chronic rhinosinusitis with nasal polyps (CRSwNP) and chronic rhinosinusitis without nasal polyps (CRSsNP), with each phenotype demonstrating distinct inflammatory patterns, clinical characteristics, and therapeutic responses [1,3]. The pathogenesis of CRS is multifactorial and involves a complex interplay of host susceptibility, mucosal immune dysfunction, microbial factors, and environmental exposures. Several risk factors and associated conditions have been identified, including allergic rhinitis, bronchial asthma, cigarette smoking, occupational exposure to dusts, fumes, and chemical irritants, as well as gastro-oesophageal reflux disease, all of which may contribute to chronic sinonasal inflammation and symptom persistence [4,5]. Accurate assessment of disease severity and its impact on daily functioning is essential for optimal management, and validated instruments such as the Sino-Nasal Outcome Test-22 (SNOT-22) provide a reliable measure of symptom burden and health-related quality of life [6]. Understanding the clinical presentation, symptom profile, endoscopic characteristics, and associated risk factors of CRS within specific populations is important for improving diagnostic accuracy, facilitating early intervention, guiding patient counselling, and developing targeted preventive strategies [7,8]. Therefore, the present cross-sectional study was undertaken in a tertiary care setting to comprehensively evaluate the clinical profile and risk factors of chronic rhinosinusitis. The primary objective was to identify factors independently associated with CRS, while the secondary objectives were to describe the symptom burden using SNOT-22 scores, document endoscopic findings, and compare the clinical characteristics of patients with and without nasal polyps. The study was based on the null hypothesis (H_0) that the investigated demographic, allergic, respiratory, and environmental factors are not associated with chronic rhinosinusitis, whereas the alternative hypothesis (H_1) proposed that allergic conditions, respiratory comorbidities, and irritant exposures are significantly associated with the occurrence of CRS.

MATERIALS AND METHODS

This study was conducted and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational research to ensure methodological transparency and completeness. A hospital-based cross-sectional study with a comparison group was carried out in the Department of Otorhinolaryngology. Ethical approval for the study was obtained from the Institutional Ethics Committee and written informed consent was secured from all participants prior to enrolment. The investigation was performed in accordance with the ethical principles outlined in the Declaration of Helsinki. The study population comprised two groups: cases and controls. Cases included patients diagnosed with chronic rhinosinusitis (CRS) according to the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) diagnostic criteria, with confirmation through nasal endoscopy and/or radiological imaging. Controls consisted of age- and sex-comparable individuals attending the same institution who had no clinical or diagnostic evidence of CRS. Patients with acute rhinosinusitis, sinonasal malignancies, or a history of previous sinus surgery were excluded from participation, although previous surgical history was documented when relevant. A total of 360 participants were enrolled, including 180 CRS cases and 180 controls. Detailed clinical assessment was performed for all participants. Symptom severity and disease burden were evaluated using the validated Sino-Nasal



Outcome Test-22 (SNOT-22) questionnaire, which measures both symptom intensity and disease-related quality-of-life impairment. Nasal endoscopic examination was conducted by experienced otorhinolaryngologists to identify mucosal inflammation, nasal polyps, discharge, and other relevant sinonasal abnormalities. Information regarding potential risk factors, including allergic rhinitis, bronchial asthma, smoking status, occupational exposure to dust, fumes, or chemical irritants, and gastro-oesophageal reflux disease, was obtained through structured interviews and review of medical records [1,6]. The sample size was determined based on the assumption of detecting an odds ratio of 2.0 for a risk factor with an estimated exposure prevalence of 25% among controls, using a significance level (α) of 0.05 and statistical power of 80%, resulting in a minimum requirement of approximately 160 participants per group. To enhance statistical reliability and compensate for potential missing data, 180 participants were recruited in each group. Statistical analyses were performed using SPSS version III. Continuous variables were summarized using means and standard deviations or medians and interquartile ranges, as appropriate, while categorical variables were expressed as frequencies and percentages. Comparisons between groups were performed using the chi-square test for categorical variables and appropriate parametric or non-parametric tests for continuous variables. Multivariable logistic regression analysis was subsequently conducted to identify factors independently associated with CRS, with results presented as adjusted odds ratios (aORs) and corresponding 95% confidence intervals (CIs). All statistical tests were two-tailed, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

Clinical profile

Among 180 CRS patients (mean age 38 ± 13 years; 99 [55%] male), nasal obstruction (88%) and discharge (79%) predominated; nasal polyps were present in 70 (39%) (Figure 1; Table 1).

A total of 180 patients diagnosed with chronic rhinosinusitis (CRS) were included in the analysis. Assessment of clinical characteristics revealed that nasal obstruction was the most frequently reported symptom, affecting 158 patients (88%), followed by nasal discharge in 142 patients (79%). Facial pain or pressure was reported by 106 patients (59%), while impairment of olfactory function, manifesting as hyposmia or anosmia, was present in 99 patients (55%). Endoscopic examination demonstrated the presence of nasal polyps in 70 patients (39%), indicating that a substantial proportion of the study population had the polypoid phenotype of CRS. Evaluation of disease burden using the Sino-Nasal Outcome Test-22 (SNOT-22) showed a mean score of 48 ± 16 , reflecting a moderate-to-severe impact of CRS on symptoms and health-related quality of life. The symptom profile observed in the study highlights the chronic and multifaceted nature of the disease, with nasal obstruction and discharge emerging as the predominant clinical manifestations. To identify factors independently associated with CRS, multivariable logistic regression analysis was performed after adjustment for potential confounding variables. The analysis demonstrated that allergic rhinitis was the strongest independent predictor of CRS, with affected individuals having 2.6 times higher odds of developing the condition compared with those without allergic rhinitis (adjusted odds ratio [aOR] = 2.6; 95% confidence interval [CI]: 1.7–4.0; $p < 0.001$). Bronchial asthma was also significantly associated with CRS, increasing the likelihood of disease occurrence by more than twofold (aOR = 2.3; 95% CI: 1.4–3.7; $p < 0.01$). Similarly, smoking emerged as a significant risk factor, with smokers exhibiting approximately twice the odds of CRS compared with non-smokers (aOR = 2.1; 95% CI: 1.4–3.2; $p < 0.01$). Occupational exposure to irritants such as dust, fumes, and chemical agents was likewise independently associated with CRS, increasing the odds of disease by 80% (aOR = 1.8; 95% CI: 1.1–2.9; $p = 0.02$). All identified risk factors reached statistical significance, indicating robust



associations with CRS. Collectively, these findings demonstrate that chronic rhinosinusitis is characterized by a distinct symptom pattern and substantial symptom burden, while allergic, respiratory, lifestyle, and occupational factors contribute significantly to disease risk. The results further emphasize the importance of evaluating both inflammatory comorbidities and environmental exposures when assessing patients with chronic rhino sinusitis.

Table 1: Clinical features of CRS patients (n = 180).

Feature	n (%)
Nasal obstruction	158 (88)
Nasal discharge	142 (79)
Facial pain/pressure	106 (59)
Hyposmia/anosmia	99 (55)
Nasal polyps	70 (39)
Mean SNOT-22 (\pm SD)	48 \pm 16

Risk factors

Allergic rhinitis, asthma, smoking, and occupational irritant exposure were independently associated with CRS (Figure 2; Table 2).

Table 2: Adjusted risk factors for CRS.

Risk factor	aOR	95% CI	p
Allergic rhinitis	2.6	1.7–4.0	<0.001
Asthma	2.3	1.4–3.7	<0.01
Smoking	2.1	1.4–3.2	<0.01
Occupational irritant exposure	1.8	1.1–2.9	0.02

Figure 1. Symptom prevalence in chronic rhinosinusitis

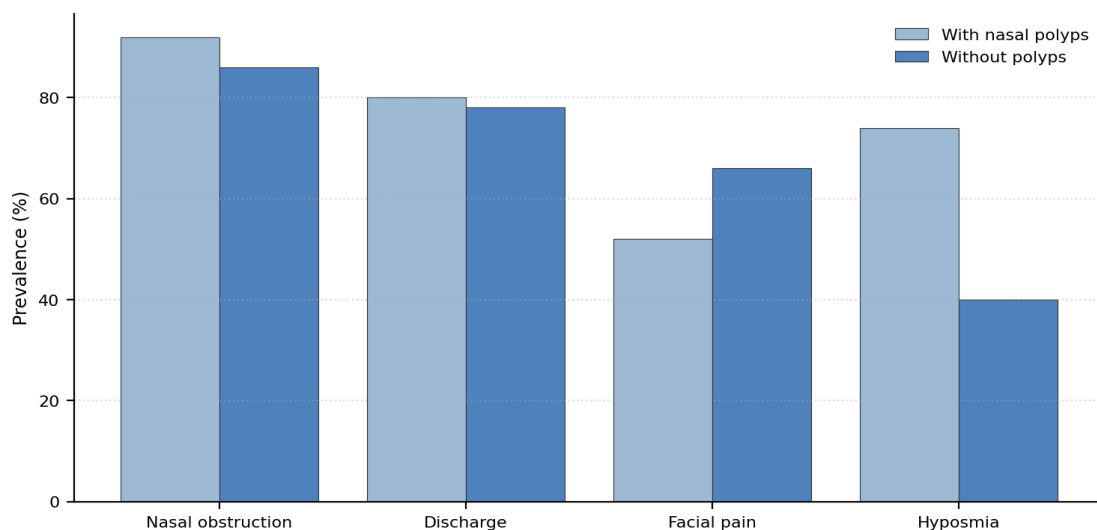


Figure 1. Symptom prevalence in CRS with and without nasal polyps.



Figure 2. Adjusted risk factors for chronic rhinosinusitis

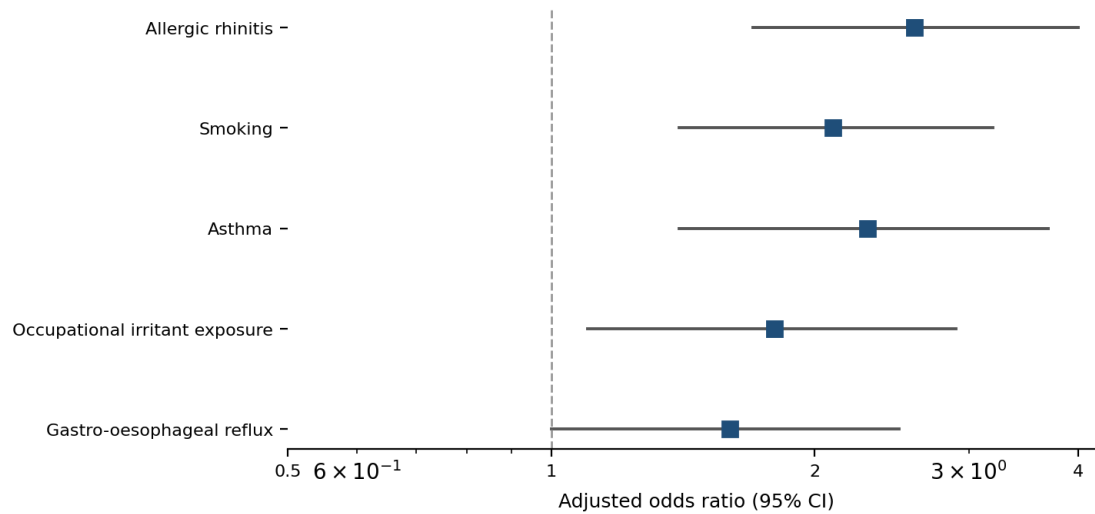


Figure 2. Adjusted risk factors for CRS.

DISCUSSION

The present study demonstrated that chronic rhinosinusitis (CRS) is characterized by a distinct clinical profile, with nasal obstruction and nasal discharge emerging as the most prevalent presenting symptoms, while nasal polyps were identified in more than one-third of affected patients. These findings are consistent with the established clinical spectrum of CRS and reinforce the importance of comprehensive symptom assessment and endoscopic evaluation in routine clinical practice. The study further identified allergic rhinitis, bronchial asthma, cigarette smoking, and occupational exposure to irritant substances as factors independently associated with CRS, highlighting the multifactorial nature of the disease and the complex interaction between host susceptibility and environmental influences. The observed associations are in agreement with previous evidence demonstrating that chronic sinonasal inflammation is frequently linked to allergic and respiratory comorbidities as well as exposure to noxious environmental agents [9,10]. The strong relationship between CRS, allergic rhinitis, and asthma supports the concept of a unified airway disease, in which shared type-2 inflammatory pathways contribute to inflammation across both the upper and lower respiratory tracts. This common inflammatory diathesis may explain the frequent coexistence of these conditions and underscores the need for integrated evaluation and management of affected patients [11,12]. Furthermore, smoking and occupational exposure to dust, fumes, chemicals, and other airborne irritants may contribute to CRS pathogenesis through repeated mucosal injury, disruption of epithelial barrier function, impairment of mucociliary clearance, and perpetuation of chronic inflammatory responses. These mechanisms can promote persistent sinonasal symptoms and increase susceptibility to disease progression. The findings of the present study therefore emphasize the importance of obtaining a detailed allergy history, assessing respiratory comorbidities, and evaluating environmental and occupational exposures during clinical assessment. Incorporating smoking cessation counselling, workplace exposure reduction strategies, and appropriate allergy management into treatment plans may improve symptom control and long-term outcomes for patients with CRS [14,15]. Several strengths enhance the validity of the study, including the use of established diagnostic criteria, objective endoscopic confirmation of disease, inclusion of a comparison group, application of the validated SNOT-22 instrument for symptom assessment, and adjustment for potential confounding factors through multivariable regression analysis. Nevertheless, certain limitations should be acknowledged. The cross-sectional observational design



precludes determination of temporal relationships and causality between identified risk factors and CRS. In addition, recruitment from a single tertiary care centre may have resulted in overrepresentation of patients with more severe or refractory disease, thereby limiting generalizability to community populations. Information regarding some exposures was also partly based on self-report, which may be subject to recall bias or misclassification. Future research should focus on prospective longitudinal studies capable of establishing causal relationships and evaluating disease progression over time. Further phenotype-specific investigations incorporating molecular and inflammatory endotyping, biomarker profiling, and advanced imaging techniques may provide deeper insights into disease heterogeneity, improve risk stratification, and facilitate the development of personalized therapeutic approaches for patients with chronic rhino sinusitis [16].

CONCLUSION

Chronic rhinosinusitis (CRS) demonstrated a well-defined clinical presentation characterized predominantly by persistent nasal obstruction, nasal discharge, and associated sinonasal symptoms that contribute substantially to patient morbidity and reduced quality of life. The study identified significant associations between CRS and several important risk factors, including allergic rhinosinusitis, bronchial asthma, cigarette smoking, and occupational exposure to environmental irritants, emphasizing the multifactorial nature of the disease. These findings support the growing body of evidence that both inflammatory predisposition and environmental exposures play crucial roles in the development and persistence of chronic sinonasal inflammation. The close relationship between CRS and allergic as well as respiratory comorbidities highlights the importance of adopting a comprehensive and multidisciplinary approach to patient evaluation and management. Routine assessment for allergic conditions, asthma, smoking habits, and workplace or environmental exposures should therefore be incorporated into standard clinical practice to facilitate early identification of modifiable risk factors. Furthermore, patient counselling regarding smoking cessation, allergen avoidance, and reduction of occupational irritant exposure may contribute to improved symptom control, reduced disease burden, and enhanced long-term outcomes. Recognition of these contributory factors can also aid clinicians in developing individualized treatment strategies tailored to the underlying disease mechanisms and patient-specific risk profiles. Although the present findings provide valuable insights into the clinical characteristics and determinants of CRS, further research is necessary to improve understanding of disease heterogeneity and progression. Large-scale longitudinal studies examining specific CRS phenotypes, combined with molecular, immunological, and inflammatory endotyping approaches, are warranted to clarify causal relationships, identify predictive biomarkers, and support the development of more targeted and personalized therapeutic interventions. Such investigations will ultimately contribute to improved prevention, diagnosis, and management of chronic rhinosinusitis across diverse patient populations.

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