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# Evaluation of Chronic Rhinosinusitis and Its Correlation with Gastroesophageal Reflux Disease (GERD)

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## ABSTRACT

**Background:** Chronic rhinosinusitis (CRS) is a persistent inflammatory disorder of the paranasal sinuses that significantly impairs quality of life. Gastroesophageal reflux disease (GERD) is a common gastrointestinal disorder increasingly recognized for its extraesophageal manifestations, including upper airway conditions. The potential relationship between CRS and GERD remains under investigation, with overlapping symptoms complicating diagnosis and management.

**Objective:** To evaluate the prevalence of GERD among patients with CRS and to assess the correlation between CRS severity and reflux symptom burden.

**Methods:** A cross-sectional study was conducted from March 2024 to March 2025 at two tertiary care centers in Punjab, Pakistan. A total of 120 adult patients fulfilling the EPOS 2020 diagnostic criteria for CRS were enrolled. Patients were divided into two groups: Group A (CRS with GERD, n = 48) and Group B (CRS without GERD, n = 72). GERD was identified using the Reflux Symptom Index (RSI > 13), and in selected cases, 24-hour pH monitoring was performed. All participants underwent demographic profiling, clinical assessment, and rigid nasal endoscopy. Data were analyzed using SPSS version 26.0.

**Results:** GERD was present in 40% of CRS patients. Group A patients were more often overweight/obese and reported significantly higher rates of nasal obstruction (91.7% vs. 77.8%, $p = 0.04$), postnasal drip (81.3% vs. 70.8%, $p = 0.03$), and chronic cough (54.2% vs. 33.3%, $p = 0.01$) compared to Group B. Endoscopy showed increased mucosal edema (70.8% vs. 52.8%, $p = 0.03$) and posterior nasal discharge (68.8% vs. 45.8%, $p = 0.01$) in CRS with GERD. Correlation analysis revealed a moderate positive association between CRS severity and RSI scores ($r = 0.39$, $p < 0.001$).

**Conclusion:** GERD is a significant comorbidity in CRS and appears to exacerbate sinonasal symptoms and mucosal findings. Routine screening for GERD in CRS patients, especially those with persistent cough and postnasal drip, may enhance clinical outcomes through integrated management.

**Keywords:** Chronic rhinosinusitis, Gastroesophageal reflux disease, Reflux Symptom Index, Sinonasal inflammation, Upper airway comorbidity



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## INTRODUCTION

Chronic rhinosinusitis (CRS) is one of the most prevalent chronic inflammatory conditions of the upper airway, defined as inflammation of the paranasal sinus mucosa persisting for at least 12 weeks, accompanied by characteristic symptoms such as nasal obstruction, anterior or posterior nasal discharge, facial pain or pressure, and reduced sense of smell [1]. According to the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS 2020), CRS can be further classified into CRS with nasal polyps (CRSwNP) and CRS without nasal polyps (CRSsNP), reflecting underlying differences in pathophysiology and treatment response. Epidemiological studies suggest that CRS affects approximately 10–15% of the general population worldwide, with considerable impact on quality of life, healthcare utilization, and economic productivity. Persistent symptoms, poor sleeping, poor performance at work, excessive comorbid conditions like asthma and allergic rhinitis are common in patients. Although medical and surgical procedures have improved, CRS often presents with a refractory course, and this creates the potential of other systemic or extranasal factors in the disease persistence [2,3].

Another disease of extreme prevalence is the Gastroesophageal reflux disease (GERD), which is present in up to 20% of the population in the Western world, but increasing in Asian and other developing areas [4]. GERD is characterized by retrograde release of gastric contents into the esophagus, which causes unpleasant symptoms and/or negative results like esophagitis, strictures, and Barretts esophagus. GERD has historically been viewed as an esophagus disease, and its key symptoms are heartburn and regurgitation. Nevertheless, in recent 20 years, GERD has been also noted to have extraesophageal manifestations that can include larynx, pharynx, airways, and even sinonasal passages. The theory of laryngopharyngeal reflux (LPR) has allowed the broadening of the spectrum of clinical manifestations of reflux disease, which refers to the presence of gastric components, including hydrochloric acid, bile salts, and pepsin, to cause inflammation and tissue damage outside the esophagus [5].

The relationship between GERD and CRS has raised a lot of attention since the disorders have common symptoms of chronic cough, throat clearing, post nasal drip and nasal congestion making it difficult to diagnose and treat. A number of mechanisms have been put forward in explaining this relationship [6]. Direct mucosal injury hypothesis postulates that refluxate, which has acid and pepsin, can extend to the nasopharynx and paranasal sinuses directly irritating the mucosa, damaging epithelial integrity, and interfering with mucociliary clearance. Such damage has the ability to facilitate colonization by bacteria and chronic inflammation. Also, the vagal reflex theory suggests that the exposure of the distal esophagus to acids can provoke the activity of vagally mediated reflexes that result in neurogenic inflammation, a rise in nasal secretions, and the edema of the mucosa of the upper airway. Both of the mechanisms underline the plausible biological links between GERD and CRS [7,8].

This association has been supported by mixed clinical studies, although support is growing. Certain studies reveal that GERD is more prevalent in CRS patients especially those who do not respond to standard treatment, and hence, reflux could be a disease-modifying factor. Pepsin is one of the biomarkers of refluxate and has been also found in sinonasal secretions of CRS patients supporting the hypothesis of direct exposure [9]. In addition, anti-reflux therapy (proton pump inhibitors (PPIs) and lifestyle change) to some groups of

patients partially improved sinonasal symptoms. On the other hand, the few studies are of the view that GERD may not always result in CRS but instead causes the muscles to increase the existing inflammation. These conflicting outcomes lead to the need to perform more potent clinical evaluations and standardized diagnosis procedures [10].

The association between CRS and GERD is clinically significant to know. CRS is a major system issue in healthcare, and it normally prolongs the medical care and surgical procedures as compared to the GERD, which is one of the most common cases of gastrointestinal issues in medical practice [11]. The treatment outcomes, the rate of recurrence, and the healthcare costs of GERD in CRS patients could improve in case of close relations, as the screening and management procedures would increase. Moreover, the clarification of this relationship can be pertinent when developing consistent and multidisciplinary strategies comprising of otolaryngologists, gastroenterologists and pulmonologists to obtain holistic control of patients [12].

The current study aims to evaluate patients with chronic rhinosinusitis in terms of the existence of the gastroesophageal reflux disease, consider the correlations between the severity of the reflux and CRS symptoms as well as potential clinical consequences of such an aberrant association. Through researching the relationship in a systematic and methodical way, current study will contribute information that could potentially inform early diagnosis, bespoke treatment programs, and enhanced patient outcomes in patients with these common overlapping conditions [13].

## MATERIALS AND METHODS

The study is a cross-sectional observational study that will be carried out in two tertiary care centres in Punjab, Pakistan, and a one-year duration between March 2024 and March 2025. Beforehand, the Institutional Review Boards of both participating institutions gave their approval and written informed consent was obtained on all patients who were enrolled in the study.

Non-probability consecutive sampling was used to recruit one hundred and twenty patients with chronic rhinosinusitis (CRS). The sample size was calculated on the prior prevalence reported in CRS of gastroesophageal reflux disease (GERD) of 30 -40, 95 percent level of confidence and 8 percent level of error. Judging by the criteria, the recruited patients were divided into two groups, Group A (CRS with GERD) and Group B (CRS without GERD). Groups were allocated using clinic assessment and GERD screening audio instruments. The Reflux Symptom Index (RSI) was used to determine GERD with a result of more than 13 positive. A confirmatory test of 24-hour ambulatory pH monitoring was used in a small group of patients whose suggestive symptoms were present.

The inclusion criteria were adults (1865 years old), who met the diagnostic criteria of CRS based on the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS 2020). Patients were required to have two or more symptoms, one of them being nasal obstruction or nasal discharge and either with facial pain/pressure or loss of smell and evidence of endoscopic mucosal disease that had persisted beyond 12 weeks. Exclusion criteria were a prior sinonasal surgery, sinonasal neoplasia, systemic immunodeficiency, cystic fibrosis or the use of antibiotics or corticosteroids during the last four weeks.

The patients were thoroughly clinically assessed (demographic profiling: age, gender, occupation, smoking history, and body mass index) and the presence of comorbid conditions such as asthma or allergic rhinitis was recorded. Every patient was given a full ear, nose and

throat examination. Rigid nasal endoscopy was done to determine the mucosal edema, nasal polyps, and mucopurulent secretions. Computer tomography (CT) of the sinuses of the paranasal sinuses was prescribed in limited cases, where additional clarification or stage was needed on the anatomy.

Data were entered and analyzed using SPSS version 26.0. Descriptive statistics were used to summarize demographic and clinical characteristics. Means and standard deviations were calculated for continuous variables, while frequencies and percentages were reported for categorical variables. Comparative analysis between the two groups (Group A: CRS with GERD, and Group B: CRS without GERD) was performed using the chi-square test for categorical data, while Pearson correlation was applied to evaluate the relationship between CRS severity scores and RSI scores. A p-value of less than 0.05 was considered statistically significant.

## RESULTS

A total of 120 patients with chronic rhinosinusitis (CRS) were enrolled during the study period from March 2024 to March 2025. Of these, 48 patients (40%) were found to have gastroesophageal reflux disease (GERD) and were categorized as Group A (CRS with GERD), while 72 patients (60%) had CRS without GERD and were placed in Group B.

**Demographic Characteristics:**

The overall mean age of the study population was 38.9 ± 11.2 years (range: 18–65 years). Patients in Group A were slightly older than those in Group B (40.7 ± 10.6 vs. 37.6 ± 11.6 years), although this difference was not statistically significant ($p = 0.11$). Gender distribution revealed that Group A had a higher proportion of males (58.3%) compared to Group B (47.2%), while females were slightly more represented in Group B (52.8%).

Body mass index (BMI) showed a significant difference between the two groups. Overweight and obesity (BMI ≥ 25 kg/m²) were more frequent among CRS patients with GERD (66.7%) compared to those without GERD (41.7%) ($p = 0.01$). Smoking history was more common in Group A (25.0%) than Group B (15.3%), though the difference was not statistically significant ($p = 0.09$). Comorbidities such as asthma and allergic rhinitis were present in both groups without significant differences. As shown in Table 1, obesity was significantly associated with the coexistence of CRS and GERD.

**Table-1:** Demographic and baseline clinical characteristics of CRS patients with and without GERD

| Variable | Group A (CRS + GERD) n=48 | Group B (CRS – GERD) n=72 | p-value |
|---|---|---|---|
| **Mean age (years)** | 40.7 ± 10.6 | 37.6 ± 11.6 | 0.11 |
| **Male sex (%)** | 28 (58.3%) | 34 (47.2%) | 0.24 |
| **Female sex (%)** | 20 (41.7%) | 38 (52.8%) | |
| **BMI ≥ 25 kg/m² (%)** | 32 (66.7%) | 30 (41.7%) | 0.01* |
| **Smoking history (%)** | 12 (25.0%) | 11 (15.3%) | 0.09 |
| **Asthma (%)** | 6 (12.5%) | 8 (11.1%) | 0.82 |
| **Allergic rhinitis (%)** | 10 (20.8%) | 13 (18.1%) | 0.72 |

**p < 0.05 statistically significant*

**Symptom Distribution:**

Nasal obstruction was the most frequently reported symptom overall, affecting 83.3% of patients. It was significantly more common in Group A compared to Group B (91.7% vs. 77.8%, p = 0.04). Postnasal drip was reported by 75.0% of the cohort, with higher prevalence in CRS patients with GERD (81.3%) compared to those without GERD (70.8%, p = 0.03).

Chronic cough, often linked to reflux disease, was markedly more frequent in Group A (54.2%) than Group B (33.3%), with a statistically significant difference (p = 0.01). Other symptoms, including facial pain/pressure and hyposmia/anosmia, were reported at similar rates in both groups without significant differences. As shown in Table 2, nasal obstruction, postnasal drip, and chronic cough were significantly more common in CRS patients with GERD.

**Table-2:** Symptom distribution among CRS patients with and without GERD

| Symptom | Group A (CRS + GERD) n=48 | Group B (CRS – GERD) n=72 | p-value |
|---|---|---|---|
| **Nasal obstruction (%)** | 44 (91.7%) | 56 (77.8%) | 0.04* |
| **Postnasal drip (%)** | 39 (81.3%) | 51 (70.8%) | 0.03* |
| **Chronic cough (%)** | 26 (54.2%) | 24 (33.3%) | 0.01* |
| **Facial pain/pressure (%)** | 28 (58.3%) | 40 (55.6%) | 0.78 |
| **Hyposmia/anosmia (%)** | 15 (31.3%) | 23 (31.9%) | 0.94 |

**p < 0.05 statistically significant*

**Endoscopic Findings:**

Nasal endoscopy demonstrated more severe mucosal changes among CRS patients with GERD. Mucosal edema was present in 70.8% of patients in Group A compared to 52.8% in Group B (p = 0.03). Posterior nasal discharge was also more common in Group A (68.8%) compared to Group B (45.8%) (p = 0.01). The presence of nasal polyps was slightly higher in CRS patients with GERD (20.8%) compared to those without (15.3%), but this difference was not statistically significant (p = 0.42). As summarized in Table 3, posterior nasal discharge and mucosal edema were significantly associated with CRS patients who also had GERD.

**Table-3:** Endoscopic findings in CRS patients with and without GERD

| Endoscopic finding | Group A (CRS + GERD) n=48 | Group B (CRS – GERD) n=72 | p-value |
|---|---|---|---|
| **Mucosal edema (%)** | 34 (70.8%) | 38 (52.8%) | 0.03* |
| **Posterior nasal discharge (%)** | 33 (68.8%) | 33 (45.8%) | 0.01* |
| **Nasal polyps (%)** | 10 (20.8%) | 11 (15.3%) | 0.42 |

**p < 0.05 statistically significant*

**Correlation Between CRS Severity and GERD Scores:**

Pearson correlation analysis revealed a moderate positive correlation between CRS symptom severity scores and Reflux Symptom

Index (RSI) scores ($r = 0.39$, $p < 0.001$). This indicates that patients with more severe reflux symptoms tended to have higher CRS symptom severity. As shown in Table 4, CRS severity was strongly influenced by reflux symptom burden, suggesting a synergistic relationship between the two conditions. As shown in Table 4, CRS severity was strongly influenced by reflux symptom burden, suggesting a synergistic relationship between the two conditions.

**Table-4:** Correlation between CRS severity scores and GERD (RSI) scores

| Variable Pair | Correlation Coefficient (r) | p-value | Strength of Correlation |
|---|---|---|---|
| **CRS symptom severity vs. RSI scores** | 0.39 | <0.001* | Moderate positive |

**p < 0.05 statistically significant*

This study demonstrated that 40% of CRS patients had coexisting GERD. CRS patients with GERD tended to be older, more frequently male, and significantly more overweight or obese compared to CRS patients without GERD. Clinically, nasal obstruction, postnasal drip, and chronic cough were significantly more common in CRS with GERD. Endoscopic findings revealed that mucosal edema and posterior nasal discharge were markedly higher in the CRS with GERD group. Finally, correlation analysis showed that higher RSI scores were moderately but significantly associated with increased CRS severity, highlighting GERD as an important comorbidity that may exacerbate sinonasal disease burden.

## DISCUSSION

The present study demonstrates a significant correlation between chronic rhinosinusitis (CRS) and gastroesophageal reflux disease (GERD), with 40% of patients diagnosed with CRS also exhibiting features of GERD [13]. This finding supports the growing body of evidence that reflux disease contributes not only to esophageal morbidity but also to upper airway pathology. Our results align with earlier studies reporting GERD prevalence rates of 30–50% among CRS populations, suggesting a consistent overlap between these conditions [11,14].

From a demographic perspective, CRS patients with GERD in this study were slightly older, more frequently male, and significantly more likely to be overweight or obese compared to CRS patients without GERD [15]. Obesity is a well-established risk factor for GERD due to increased intra-abdominal pressure and impaired lower esophageal sphincter function, and its association with CRS suggests that metabolic influences may exacerbate mucosal inflammation in both systems. This observation highlights the importance of addressing lifestyle factors, particularly weight management, in patients presenting with combined CRS and GERD [16].

In CRS patients, GERD had significantly better clinical characteristics in nasal obstruction, postnasal drip and chronic cough. These symptoms demonstrate the presence of local inflammation of the sinones in the nose as well as an extraesophageal reflux manifestation [17]. Chronic cough especially is a characteristic of reflux disease and it has been documented in up to 30 per cent of the patients who have LPR (laryngopharyngeal reflux). This symptom is more common in our CRS-GERD group, which supports the notion that reflux could be a precipitant and a perpetuator of sinonasal inflammation [18].

This association is further confirmed by endoscopy. CRS and GERD patients had more mucosal edema and posterior nasal discharge

than patients without GERD [19]. These results are also in line with the direct mucosal injury theory, in which the gastric acid and pepsin reach the nasopharynx, leading to epithelial damage and inflammation. The fact that pepsin could be detected in sinonasal secretions as reported by other studies also gives this mechanism further biological plausibility. The other possible cause is the vagally mediated reflex pathway where exposure to esophageal acid causes neurogenic responses that result in nasal congestion and secretions. These mechanisms cannot be differentiated in our findings but are probably operated in a synergistic manner [20].

Notably, the correlation analysis showed that CRS severity scores and RSI scores were moderately associated with each other, indicating that an increased reflux burden is associated with more severe sinonasal disease [7-11]. Although correlation does not imply causation, the given relationship highlights the necessity to consider GERD as a potential disease-modifying factor in CRS. Targeted reflux evaluation and treatment can be used in patients with refractory CRS particularly in those with persistent cough or postnasal drip [21].

These findings carry significant clinical implications. CRS is a common chronic condition that often proves resistant to standard medical and surgical treatments [6]. GERD, on the other hand, is highly prevalent and amenable to lifestyle and pharmacological interventions such as proton pump inhibitors (PPIs). Recognizing GERD in CRS patients may therefore open avenues for adjunctive therapy that improves symptom control and reduces recurrence after sinus surgery. Multidisciplinary collaboration between otolaryngologists and gastroenterologists is essential in optimizing care for this subset of patients [22].

However, certain limitations must be acknowledged. This was a single-region, two-center study with a relatively modest sample size, which may limit generalizability. GERD diagnosis was based primarily on the Reflux Symptom Index, with only a subset undergoing 24-hour pH monitoring [18]. Although RSI is a validated tool, objective measures such as impedance-pH monitoring would strengthen diagnostic accuracy. Additionally, this cross-sectional design cannot establish causality, and prospective longitudinal studies are warranted to determine whether GERD treatment improves CRS outcomes in a sustained manner [23].

Despite these limitations, the current study adds meaningful evidence to the understanding of CRS-GERD interaction [24]. By documenting demographic associations, symptom overlap, endoscopic differences, and a statistically significant correlation between severity scores, our results underscore the importance of integrated evaluation of reflux disease in CRS management [25].

## CONCLUSION

This study demonstrates a strong clinical association between chronic rhinosinusitis and gastroesophageal reflux disease, with GERD identified in 40% of CRS patients. Individuals with both conditions were more likely to be overweight or obese and presented with significantly higher rates of nasal obstruction, postnasal drip, and chronic cough, alongside more severe mucosal changes on nasal endoscopy. A moderate positive correlation between CRS severity and reflux symptom burden suggests that GERD exacerbates sinonasal disease expression. Screening for GERD in CRS patients, particularly those with refractory symptoms, may improve diagnosis and enable more effective, multidisciplinary management strategies.

**Conflict of Interest:**
The authors report no conflicts of interest.
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**Authors' contributions:**
MAR: Conceptualization, Data Collection
MMM: Methodology, Analysis
MFA: Literature Review, Drafting
MAI: Supervision, Critical Revision, Final Approval
**Data Availability Statement:**
The data used in this study are available upon reasonable request from the corresponding author, subject to ethical and institutional guidelines.

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