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ASSOCIATION OF LARYNGOPHARYNGEAL REFLUX AND CHRONIC RHINOSINUSITIS

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ABSTRACT
Chronic rhinosinusitis (CRS) is a common inflammatory disease of the sinonasal mucosa with significant morbidity. Laryngopharyngeal reflux (LPR) has been suggested as a contributing factor in CRS pathogenesis through direct mucosal irritation and neurogenic inflammation. This study aims to determine the relationship between laryngopharyngeal reflux and chronic rhinosinusitis. This study was an analytic observational study with a cross-sectional design. The subjects were adult patients presenting with nasal symptoms at Haji Adam Malik General Hospital and Prof. Dr. Chairuddin P. Lubis Hospital, Universitas Sumatera Utara. Chronic rhinosinusitis (CRS) was diagnosed based on clinical symptoms and nasoendoscopic findings according to the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) 2020 criteria. Laryngopharyngeal reflux (LPR) was assessed using the Reflux Symptom Index (RSI) and Reflux Finding Score (RFS). A total of 44 patients who met the inclusion and exclusion criteria were enrolled in this study using a non-probability consecutive sampling technique and provided written informed consent to participate. Data were analyzed using the Chi-square test, with statistical significance set at $p < 0.05$. A total of 44 subjects meeting the inclusion criteria were analyzed. The prevalence of CRS was 61.4% and LPR was 50%. Patients with LPR showed a higher proportion of CRS compared to those without LPR. However, statistical analysis demonstrated no significant association between LPR and CRS ($p = 0.353$). There is no statistically significant relationship between laryngopharyngeal reflux and chronic rhinosinusitis. However, LPR may still play a role as a contributing factor in CRS based on descriptive findings.

Keywords: chronic rhinosinusitis; laryngopharyngeal reflux; nasoendoscopy; RFS; RSI

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INTRODUCTION

Chronic rhinosinusitis (CRS) is a common inflammatory disease affecting the nasal cavity and paranasal sinuses, with a global prevalence ranging from 5.5% to 28%. It represents a significant health burden due to its chronic nature and impact on quality of life. Epidemiological studies report that approximately 12% of the population is affected by CRS, with higher prevalence rates observed in Western countries and varying rates across Asia. In Indonesia, although nationwide epidemiological data are limited, hospitalbased studies have reported a high proportion of CRS cases among patients presenting with nasal complaints (Weinberger M., 2018; Kwah et al., 2019; Chee et al., 2023).

CRS is defined as inflammation of the sinonasal mucosa persisting for more than 12 weeks and is characterized by symptoms such as nasal obstruction, nasal discharge, facial pain or pressure, and reduced sense of smell. The pathogenesis of CRS is multifactorial, involving complex interactions

between host immunity, environmental factors, and microbial agents. Although intranasal corticosteroids and functional endoscopic sinus surgery (FESS) are considered standard treatments, a subset of patients continues to experience persistent or recurrent symptoms despite appropriate management (Fokkens et al., 2020). Laryngopharyngeal reflux (LPR) is defined as the retrograde flow of gastric contents, including acid and pepsin, into the larynx and pharynx. This condition has been increasingly recognized as a potential contributing factor to upper airway inflammatory diseases. Exposure of the nasopharyngeal and sinonasal mucosa to gastric refluxate may result in mucosal inflammation, impaired mucociliary clearance, and obstruction of sinus ostia, which can predispose to or exacerbate CRS (Manpreet et al., 2018; Brown et al., 2020).

The relationship between CRS and LPR has been explored in several studies, suggesting a possible association between the two conditions. The proposed mechanisms include direct mucosal injury from acidic refluxate and indirect neurogenic inflammation mediated through vagal reflex pathways. These processes may contribute to persistent sinonasal inflammation and reduced treatment response in CRS patients. Previous studies have reported that up to 45% of CRS patients exhibit symptoms of LPR, while objective evidence of pharyngeal acid reflux has been detected in up to 88% of CRS cases (Nanda et al., 2018; Ozmen et al., 2008). Despite growing evidence, the association between LPR and CRS remains incompletely understood, particularly in the Indonesian population. Furthermore, variability in diagnostic methods, including the use of symptom-based indices such as the Reflux Symptom Index (RSI) and objective findings like the Reflux Finding Score (RFS), contributes to ongoing debate regarding their relationship. Therefore, this study aims to evaluate the relationship between laryngopharyngeal reflux and chronic rhinosinusitis in patients treated at Haji Adam Malik General Hospital and Prof. Dr. Chairuddin P. Lubis Hospital, Universitas Sumatera Utara. Understanding this relationship may provide additional insight into the pathophysiology of CRS and contribute to improved management strategies for affected patients.

METHOD

This study was an analytic observational study with a cross-sectional design. The research was conducted at the Rhinology, Broncho-esophagology, and Laryngopharyngeal Division of the Department of Otorhinolaryngology–Head and Neck Surgery, Faculty of Medicine, Universitas Sumatera Utara/Haji Adam Malik General Hospital Medan and Prof. Dr. Chairuddin P. Lubis Hospital, Universitas Sumatera Utara.

The study population consisted of adult patients presenting with nasal symptoms such as nasal obstruction or rhinorrhea. A total of 44 patients who met the inclusion and exclusion criteria were recruited using a non-probability consecutive sampling method. Subjects who met the inclusion criteria were patients aged >18 years and willing to participate by signing informed consent. Exclusion criteria included patients with secondary chronic rhinosinusitis, pregnancy, and malignancy in the nasal cavity, nasopharynx, oropharynx, hypopharynx, or larynx. Diagnosis of chronic rhinosinusitis (CRS) was established based on clinical symptoms persisting for more than 12 weeks, supported by findings from physical examination and nasoendoscopy according to EPOS 2020 criteria. Diagnosis of laryngopharyngeal reflux (LPR) was determined using the Reflux Symptom Index (RSI) questionnaire, with a score >13 indicating LPR, and Reflux Finding Score (RFS) obtained through fiberoptic nasopharyngolaryngoscopy, with a score >7 considered positive for LPR.

Additional variables assessed included age, sex, history of allergic rhinitis (measured using the SFAR questionnaire), and smoking status obtained through interviews. Data were processed using SPSS (Statistical Package for the Social Sciences). Univariate analysis was performed to describe the frequency distribution of categorical variables and the characteristics of the study population. Bivariate analysis was conducted to assess the relationship between independent and dependent variables using the Chi-square test. A p-value of <0.05 was considered statistically significant. This

study was conducted after obtaining ethical approval from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Sumatera Utara, Medan, with approval number 1448/KEPK/USU/2025.

RESULT

Baseline Characteristics

A total of 44 subjects presenting with nasal obstruction or rhinorrhea were enrolled in this study. Males accounted for 52.3% of the participants, with a mean age of 43.45 ± 18.14 years. A history of allergy was present in 65.9% of subjects, while 43.2% were active smokers. Chronic rhinosinusitis and laryngopharyngeal reflux were identified in 61.4% and 50.0% of subjects, respectively.

Table 1.
Demographic and clinical characteristics of subjects

Demographic and Clinical Characteristics	n = 44
Gender	
Male	23 (52.3)
Female	21 (47.7)
Age, years	
Average (SD)	43.45 (18.14)
Median (Min–Max)	46.5 (18–73)
Smoking Habit	
Yes	19 (43.2)
No	25 (56.8)
Allergy History	
Yes	29 (65.9)
No	15 (34.1)
Chronic Rhinosinusitis (CRS)	
Yes	27 (61.4)
No	17 (38.6)
Laryngopharyngeal Reflux (LPR)	
Yes	22 (50)
No	22 (50)

RSI and RFS Findings

The mean RSI score of all subjects in this study was 12.09 (SD = 4.48), with the lowest score being 0 and the highest 19. Based on the cut-off value, 24 subjects (54.5%) had RSI >13, indicating symptoms suggestive of LPR. RFS examination was performed in subjects with RSI >13. The mean RFS score was 8 (SD = 1.59), with a range of 4–10. Among these subjects, 18 (75%) had RFS >7, confirming LPR.

Table 2.
RSI and RFS Examination Results

Variables	Mean ± SD	Median (Min–Max)	n (%)
RSI	12.09 ± 4.48	13.5 (0–19)	
> 13			24 (54.5)
≤ 13			20 (45.5)
RFS	8 ± 1.59	8 (4–10)	
> 7			18 (75)
≤ 7			6 (25)

Relationship Between Subject Characteristics and CRS

The relationship between demographic and clinical characteristics with CRS is shown in Table 3. There was no statistically significant association between gender and CRS (p = 0.944). CRS was found in 60.9% of males and 61.9% of females. Age was also not significantly associated with CRS (p = 0.399). The mean age in the CRS group was 41.33 (SD = 16.31), while in the non-CRS group it was 46.82 (SD = 20.81). Smoking habit was not significantly associated with CRS (p = 0.402), although a higher proportion of smokers was observed in the CRS group (68.4%). A history of

allergy showed no statistically significant relationship with CRS (p = 0.105), although a higher proportion was observed in the CRS group (69%).

Table 3.
Relationship between subject characteristics and CRS

Variables	CRS (+)	CRS (-)	p
Gender			
Male	14 (60.9)	9 (39.1)	0.944*
Female	13 (61.9)	8 (38.1)	
Age (years)			
Mean (SD)	41.33 (16.31)	46.82 (20.81)	0.399**
Median (Min–Max)	39 (18–69)	53 (18–73)	
Smoking Habit			
Yes	13 (68.4)	6 (31.6)	0.402*
No	14 (56)	11 (44)	
Allergy History			
Yes	20 (69)	9 (31)	0.105*
No	7 (46.7)	8 (53.3)	

*Chi-square test
**Mann-Whitney test

Relationship Between LPR and CRS

The relationship between LPR and CRS is shown in Table 4. Among subjects with LPR, 15 (68.2%) had CRS, while 7 (31.8%) did not. In contrast, among subjects without LPR, 12 (54.5%) had CRS and 10 (45.5%) did not. Although there was a higher proportion of CRS in the LPR group, the difference was not statistically significant (p = 0.353).

Table 4.
Relationship between LPR and CRS

Variables	CRS (+)	CRS (-)	p
LPR			
Yes	15 (68.2)	7 (31.8)	0.353*
No	12 (54.5)	10 (45.5)	

*Chi-square test

DISCUSSION

In this study, there was no significant relationship between laryngopharyngeal reflux (LPR) and chronic rhinosinusitis (CRS). However, descriptively, patients with CRS tended to have higher LPR prevalence compared to non-CRS patients. This finding is partially consistent with previous studies such as Nanda et al. (2018), which reported that approximately 45% of CRS patients had LPR symptoms. Similarly, Ozmen et al. (2008) demonstrated the presence of pharyngeal acid reflux in up to 88% of CRS patients. The discrepancy in statistical significance in this study may be influenced by sample size, population characteristics, and diagnostic criteria used.

Pathophysiologically, LPR is thought to contribute to CRS through both direct and indirect mechanisms. Direct exposure of gastric refluxate, including acid and pepsin, to the nasopharyngeal mucosa may induce inflammation, impair mucociliary clearance, and lead to obstruction of sinus ostia, thereby predisposing to chronic infection and inflammation. Indirectly, reflux may activate a neurogenic reflex via the vagus nerve, resulting in inflammatory changes along the upper airway mucosa. These mechanisms have been described in previous studies (Ratunanda et al., 2019; Brown et al., 2020), supporting a potential association between LPR and CRS.

In this study, there was also no significant relationship between demographic characteristics such as age and sex with CRS. This finding is in line with several epidemiological studies indicating that CRS can occur across a wide range of age groups and affects both genders without a strong predominance. However, some studies suggest a slightly higher prevalence in adults due to cumulative environmental exposure and chronic inflammatory processes (Fokkens et al., 2020).

Although no statistically significant association was found between smoking status and chronic rhinosinusitis (CRS) in the present study, several studies have demonstrated that smoking may still play a role in worsening the clinical manifestations of the disease. Hutson et al. reported that patients with CRS who smoked had poorer sinonasal quality of life than non-smokers, as reflected by higher SNOT-22 scores. These findings suggest that tobacco smoke exposure may aggravate symptom burden and negatively affect disease-related quality of life in patients with CRS. (Hutson et al., 2021)

Similarly, allergic rhinitis did not show a significant relationship with CRS in this study. This finding differs from some literature suggesting that allergic inflammation may contribute to CRS pathogenesis, particularly in certain phenotypes such as allergic fungal rhinosinusitis. However, recent studies indicate that the relationship between allergy and CRS is complex and varies depending on the inflammatory endotype and phenotype (Marcus et al., 2019). Assessment of LPR in this study was performed using Reflux Symptom Index (RSI) and Reflux Finding Score (RFS). Patients with RSI >13 and RFS >7 were considered to have LPR. Although these tools are widely used and validated, they still have limitations due to their subjective nature and interobserver variability. This may contribute to variability in diagnosing LPR and affect the strength of association with CRS. Overall, although no statistically significant relationship was found, the biological plausibility and trends observed suggest that LPR may still play a role as a contributing or aggravating factor in CRS. Further studies with larger sample sizes, objective diagnostic modalities such as pH monitoring, and longitudinal designs are needed to better elucidate this relationship.

CONCLUSION

Based on the results of this study, there was no statistically significant relationship between laryngopharyngeal reflux and chronic rhinosinusitis. Additionally, there were no significant associations between age, sex, smoking status, and allergic rhinitis with the incidence of chronic rhinosinusitis. However, descriptively, laryngopharyngeal reflux tended to be more common in patients with chronic rhinosinusitis, suggesting a possible clinical association. Therefore, although not statistically proven, laryngopharyngeal reflux may still be considered as a contributing factor in the pathogenesis or persistence of chronic rhinosinusitis.

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