ISSN 2786-6661
eISSN 2786-667X

**UDC: 616.211–002.2–08:616.248–056.7:616.98:578.834–036.22**
**https://doi.org/10.32345/USMYJ.3(157).2025.82-88**

Received: January 28, 2025
Accepted: June 01, 2025

# The Impact of Transferred COVID-19 on Sinonasal Symptoms in Patients with Chronic Polyposis Rhinosinusitis and Aspirin-Exacerbated Respiratory Disease

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***Abstract:*** *chronic rhinosinusitis (CRS) is a prevalent disease affecting 5-15% of the population, characterized by prolonged inflammation of the mucosa of the paranasal sinuses. Chronic rhinosinusitis with nasal polyps (CRSwNP) accounts for approximately 18-20% of all CRS cases and has a more severe clinical course compared to CRS without nasal polyps (CRSsNP). A particular group of patients includes those with CRSwNP associated with aspirin-exacerbated respiratory disease (AERD), which comprises asthma, rhinosinusitis with polyps, and intolerance to nonsteroidal anti-inflammatory drugs (NSAIDs). This study aimed to evaluate the impact of a past COVID-19 infection on sinonasal symptoms and quality of life in patients with chronic polypous rhinosinusitis and aspirin triad based on the analysis of SNOT-22 questionnaire scores and endoscopic assessment results using the Lund-Kennedy scale. The study was conducted among outpatients at the clinic of the State Institution " O.S. Kolomiychenko Institute of Otolaryngology of National Academy of Sciences of Ukraine." Sixty patients aged 18 to 75 years with a diagnosis of chronic polypous rhinosinusitis with NSAID intolerance were selected and divided into two groups: Group 1 (17 patients) who did not have COVID-19 and Group 2 (43 patients) who had a history of COVID-19. Group 2 was further divided into two subgroups: Subgroup 2A (18 patients, who reported no impact of COVID-19 on the course of CRS) and Subgroup 2B (25 patients, who reported a subjective worsening of CRS after COVID-19). A survey was conducted using the SNOT-22 questionnaire, and endoscopic examination of the nasal cavity was performed with assessment using the Lund-Kennedy scale. The analysis of the SNOT-22 results showed that the mean scores in Group 1 were 41.9 ± 17.94, and in Group 2, they were 43.62 ± 20.12, with no statistically significant differences (p=0.812). The mean scores in Subgroups 2A and 2B were 44.3 ± 19.4 and 43.0 ± 21.2, respectively, also with no statistically significant differences (p=0.874). The endoscopic assessment using the Lund-Kennedy scale did not reveal significant differences between the groups (p=0.588). The study results indicate that a past COVID-19 infection did not have a statistically significant impact on sinonasal symptoms in patients with chronic polypous rhinosinusitis and aspirin triad. COVID-19 did not lead to a significant worsening of the clinical course of the disease, warranting further studies to explore the virus's impact on other aspects of respiratory health in patients with AERD.*

**Key words:** Asthma; COVID-19; Nasal Polyps; Respiratory Tract Diseases; Rhinosinusitis; Aspirin-Induced; Sino-Nasal Outcome Test.

ISSN 2786-6661
eISSN 2786-667X

## Introduction

Chronic rhinosinusitis (CRS) is a complex disease with multiple etiological factors, characterized by prolonged inflammation of the mucous membrane of the paranasal sinuses. This pathology affects approximately 5-15% of the population [1]. Based on nasal endoscopy findings, CRS is generally classified into two main categories: with polyps (CRSwNP) and without polyps (CRSsNP) [1]. CRSwNP accounts for approximately 18-20% of all CRS cases and has a more pronounced clinical course and higher morbidity compared to CRSsNP [2]. The prevalence of CRSwNP is estimated at 2-4% of the general population, with symptoms such as nasal glandular rhinorrhea, nasal congestion, loss of smell, and facial pain or pressure persisting for more than 12 weeks [1].

Depending on the degree of eosinophilic infiltration in the nasal mucosa, CRSwNP can be divided into two variants: eosinophilic and non-eosinophilic, each with distinct inflammatory characteristics. In Europe and North America, eosinophilic CRSwNP is primarily associated with type II inflammation, whereas in East Asian countries, type I inflammation predominates. Type II inflammation is characterized by high levels of cytokines released by Th2 cells, such as IL-4, IL-5, and IL-13, as well as ILC2 cells, eosinophils, and mast cells [3]. This type of inflammation leads to more treatment-resistant conditions and more frequent recurrences. Non-eosinophilic CRSwNP is associated with Th1/Th17 immune responses, dominated by cytokines released by TH cells (IL-17A, IL-8, and IL-22, IFN-gamma, TNF-α), along with inflammation in which neutrophils predominate [4]. Patients diagnosed with eosinophilic CRSwNP have a higher degree of olfactory loss, which positively correlates with the severity of nasal mucosal inflammation [1]. Additionally, an increased frequency and severity of nasal dysfunction have been observed in cases where CRSwNP is accompanied by asthma or respiratory disease exacerbated by aspirin or nonsteroidal anti-inflammatory drugs (AERD) [5].

AERD (Aspirin-exacerbated respiratory disease) is a pathological condition that develops in adults and is characterized by a triad of symptoms, including asthma, eosinophilic chronic rhinosinusitis with nasal polyps (CRSwNP), and respiratory reactions to cyclooxygenase-1 (COX-1) inhibitors [6,7]. Symptoms affecting both the upper and lower respiratory tracts are often difficult to manage, and many patients experience frequent asthma exacerbations and require repeated endoscopic sinus surgeries, even with appropriate medical treatment, including intranasal and oral corticosteroids [8].

Since March 2020, the COVID-19 outbreak has significantly altered daily clinical practice in the field of ear, nose, and throat diseases [9]. As the nasal cavity serves as the entry point for the respiratory tract, its physiological and pathological conditions can significantly influence the development of both upper and lower respiratory diseases. However, the impact of COVID-19 on the course of CRSwNP associated with NSAID intolerance remains poorly understood [10].

Currently, the SNOT-22 questionnaire is widely used to assess the quality of life in CRS patients [11]. This questionnaire has already proven its effectiveness, reliability, and, most importantly, ease of use. SNOT-22 consists of 22 questions, each rated on a 5-point scale, where 0 indicates the absence of symptoms and 5 represents the most severe symptoms [12]. The questionnaire has also been adapted for use in Ukraine [13]. In addition to the SNOT-22 questionnaire, CRS severity can be assessed using endoscopic evaluation methods [14]. Several scoring systems exist, but the most widely used is the one described by Lund and Kennedy (Table 1).

The Lund-Kennedy endoscopic assessment system describes visual pathological conditions in the nasal cavity and paranasal sinuses, including the presence of polyps, discharge, edema, scarring, and crusting. This system is most relevant for evaluating CRSwNP, particularly for comparing pre- and post-endoscopic sinus surgery findings [15].

## Aim

The aim of this study was to determine the impact of past COVID-19 infection on sinonasal symptoms and quality of life in patients with

ISSN 2786-6661
eISSN 2786-667X

**Table 1.** Endoscopic assessment using the Lund-Kennedy scoring system, with each nasal cavity evaluated separately.

| Criteria and evaluation of endoscopic examination | Points | | |
|---|---|---|---|
| | 0 | 1 | 2 |
| Polyps in the middle nasal passage | None | Are limited to the middle nasal passage | In the nasal cavity |
| Discharge in the middle nasal passage | None | Liquid and transparent | Thick and purulent |
| Swelling of the middle nasal passage | None | Light-moderate | Medium-heavy |
| Score for each half of the nose separately | | | |

chronic polypous rhinosinusitis and aspirin triad, based on the analysis of SNOT-22 questionnaire scores and endoscopic evaluation using the Lund-Kennedy scale.

**Materials and Methods**

The study was conducted during 2022–2024 among outpatients at the clinic of the State Institution "O.S. Kolomiychenko Institute of Otolaryngology of the National Academy of Medical Sciences of Ukraine." A total of 60 patients aged 18 to 75 years diagnosed with chronic polypous rhinosinusitis with NSAID intolerance were selected. Patients were surveyed using the SNOT-22 questionnaire and underwent endonasal endoscopic examination with evaluation using the Lund-Kennedy scale. Inclusion criteria:

- Patients diagnosed with chronic rhinosinusitis with nasal polyps associated with NSAID intolerance, aged 18 to 75 years.

Exclusion criteria:

- Patients with a history of nasal surgery.
- Patients with nasal cavity neoplasms.
- Patients with psychiatric disorders.
- Patients with severe COVID-19 requiring ICU admission or mechanical ventilation.

According to medical records, all patients were vaccinated against COVID-19, and 72.2% (43 patients) had a history of COVID-19 infection between 2020 and 2022. Patients were divided into two groups:

- Group 1: 17 patients who had never had COVID-19.
- Group 2: 43 patients with a history of COVID-19.

Group 2 was further subdivided into two subgroups:

- Subgroup 2A: 18 patients who reported that past COVID-19 infection had no impact on the course of chronic polypous rhinosinusitis with aspirin triad.
- Subgroup 2B: 25 patients who subjectively reported a worsening of chronic polypous rhinosinusitis with aspirin triad following COVID-19 infection.

For statistical analysis, Student's t-test for two independent samples, the φ-test using Fisher's angular transformation method, and the Wilcoxon rank-sum test with a two-tailed critical region were used to compare the central tendencies of two independent samples in evaluating endoscopic findings based on the Lund-Kennedy scale. Statistical data analysis was performed using MedStat v.5.2.

**Results**

A survey was conducted among patients with chronic polypous rhinosinusitis and AERD using the SNOT-22 questionnaire. According to the results of the SNOT-22 assessment, the total scores in the study and control groups were distributed as follows:

- Group I (17 patients): Mean score 41.9 ± 17.94
- Group II (43 patients): Mean score 43.62 ± 20.12

The obtained results are presented in Figure 1.

Statistical analysis was performed using Student's t-test for two independent samples. The result was $t = 0.24$, indicating that the difference in mean scores was not statistically significant ($p = 0.812$, $p > 0.05$).

A further comparison was conducted between the SNOT-22 scores of Subgroups 2A and 2B within Group 2 (patients with CRSwNP, AERD, and a history of COVID-19). The results were as follows:

- Subgroup 2A (18 patients): Mean score 44.3 ± 19.4

ISSN 2786-6661
eISSN 2786-667X

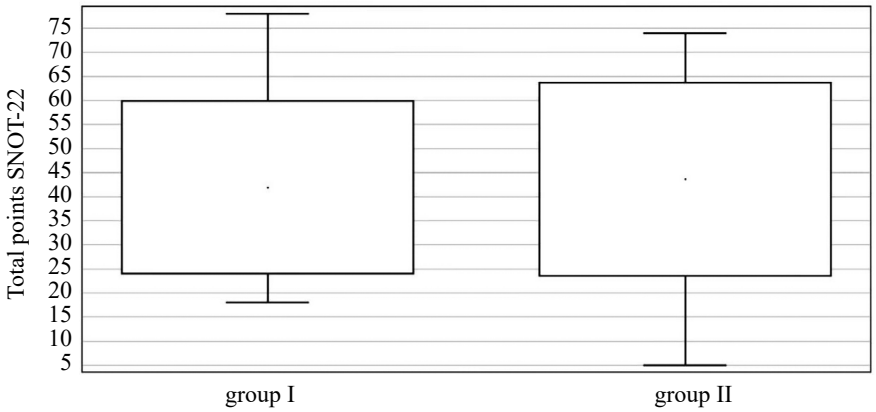


**Figure 1.** Distribution of patients in Groups 1 and 2 based on SNOT-22 questionnaire results.

- Subgroup 2B (25 patients): Mean score 43.0 ± 21.2

Student's t-test for two independent samples was used for statistical analysis, yielding t = 0.16. The difference between the means was not statistically significant (p = 0.874, p > 0.05), as illustrated in Figure 2.

Endonasal endoscopic examinations were performed on patients from both Groups I and II, with evaluations conducted using the Lund-Kennedy scoring system. The distribution of patients from Groups I and II according to the Lund-Kennedy endoscopic assessment is presented in Figure 3.

Statistical analysis was performed using the Wilcoxon rank-sum test with a two-tailed critical region to compare central tendencies between two independent samples. The result was W = 170.0,

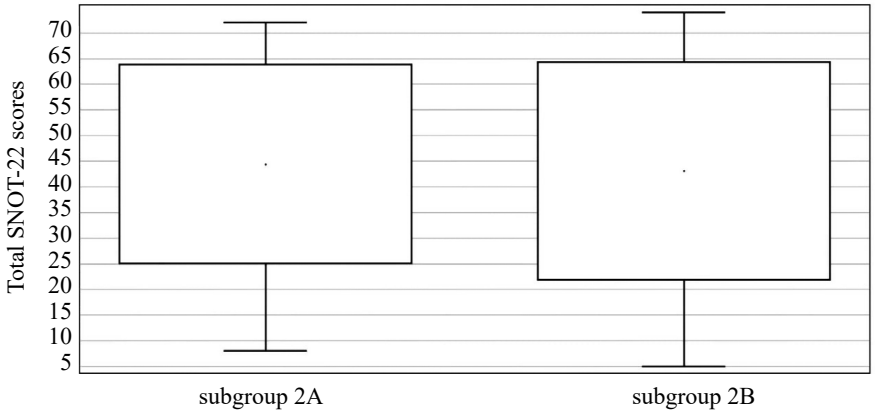


**Figure 2.** Distribution of patients in Group II based on SNOT-22 questionnaire results

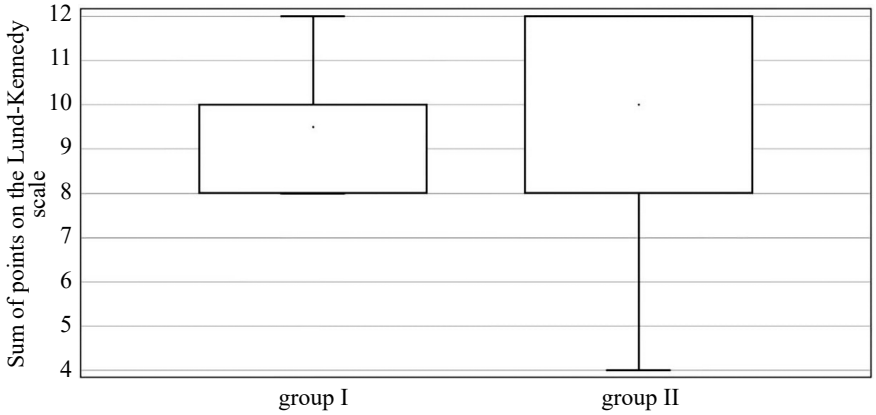


**Figure 3.** Distribution of scores based on endoscopic examination using the Lund-Kennedy scale

ISSN 2786-6661
eISSN 2786-667X

indicating that the difference was not statistically significant ($p = 0.588$, $p > 0.05$).

**Discussion**

A detailed analysis of all SNOT-22 questionnaire items was conducted, comparing Group I with both subgroups. No significant differences were found across most SNOT-22 parameters among the examined patients. Fisher's angular transformation method was used for statistical analysis, showing that disturbances in taste and smell in Subgroup 2B slightly differed from the control group. However, these differences were not statistically significant ($\varphi = 1.501$, $p > 0.05$).

These findings suggest that while some patients with CRSwNP and AERD who had COVID-19 may have experienced taste and smell disturbances, these symptoms were not significantly pronounced or widespread compared to CRSwNP and AERD patients without a history of COVID-19.

Overall, the data indicate no clear association between prior COVID-19 infection and an impact on sinonasal symptoms in patients with CRSwNP and AERD. The subjective worsening of CRSwNP and AERD symptoms following COVID-19 infection could not be statistically confirmed. Additionally, the endoscopic findings in the nasal cavity of patients with a history of COVID-19 did not significantly differ from those of patients with CRSwNP and AERD who had not contracted COVID-19.

**Conclusions**

The analysis of SNOT-22 results in both groups and their subgroups revealed no correlation between the worsening of chronic rhinosinusitis with nasal polyps (CRSwNP) and aspirin-exacerbated respiratory disease (AERD) in patients with a history of COVID-19. The obtained results suggest that COVID-19 does not significantly affect sinonasal symptoms. This finding is scientifically valuable, as it helps to exclude the hypothesis of a pronounced negative impact of SARS-CoV-2 infection on the course of CRSwNP with AERD and confirms the relative stability of the disease. For clinicians, this provides practical reassurance that disease management in such patients does not require major modifications in the post-COVID-19 period.

It is important to note that this study did not examine the impact of COVID-19 on pulmonary symptoms, which are a leading component of CRSwNP with AERD. Future research involving allergists and pulmonologists will allow for a more comprehensive assessment of COVID-19's role in the progression of respiratory diseases associated with aspirin/non-steroidal anti-inflammatory drug intolerance. Finally, given the variability of viral infections, it remains difficult to predict the long-term consequences of COVID-19 in this patient population, underscoring the importance of continued observation and multidisciplinary investigation.

**Ethical Approval**

The study was approved by the Ethics Committee of the State Institution "O.S. Kolomiychenko Institute of Otolaryngology of the National Academy of Medical Sciences of Ukraine," Kyiv, Ukraine. All participants provided written informed consent for participation in the study, including consent for the publication of the study materials.

**Funding**

This study has no external funding sources.

**Conflicts of Interest**

No conflicts of interest exist among the authors in preparing and writing this article.

**Consent for Publication**

The author has read and approved the final version of the manuscript. All authors consented to the publication of this manuscript.

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A – Research concept and design, B – Collection and/or assembly of data, C – Writing the article, D – Critical revision of the article, E – Final approval of article

ISSN 2786-6661
eISSN 2786-667X

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# Вплив перенесеного COVID-19 на синоназальну симптоматику у пацієнтів з хронічним поліпозним риносинуситом та аспірин асоційованим респіраторним захворюванням

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ISSN 2786-6661
eISSN 2786-667X

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***Анотація:*** *хронічний риносинусит є поширеним захворюванням, що вражає 5-15% населення та характеризується тривалим запаленням слизової оболонки навколоносових пазух. Хронічний риносинусит з поліпами становить приблизно 18-20% усіх випадків хронічного риносинуситу та має тяжчий клінічний перебіг порівняно з хронічним риносинуситом без поліпів. Особливу групу пацієнтів складають хворі на хронічний риносинусит з поліпами, асоційований з аспірин-експербованою респіраторною хворобою, яка включає астму, риносинусит з поліпами та непереносимість нестероїдних протизапальних препаратів. Це дослідження спрямоване на оцінку впливу перенесеного COVID-19 на синоназальну симптоматику та якість життя у пацієнтів з хронічним поліпозним риносинуситом та аспіриновою тріадою на основі аналізу показників опитувальника SNOT-22 та ендоскопічної оцінки за шкалою Lund-Kennedy. Дослідження проводилося протягом 2022-2024 років, серед амбулаторних пацієнтів клініки ДУ «Інститут отоларингології ім. проф. О.С. Коломійченка НАМН України». Було відібрано 60 пацієнтів віком від 18 до 75 років з діагнозом хронічний поліпозний риносинусит з непереносимістю нестероїдних протизапальних препаратів, яких розподілили на дві групи: перша група (17 пацієнтів) не хворіла на COVID-19, друга група (43 пацієнтів) мала підтверджений анамнез COVID-19. Пацієнти другої групи були додатково поділені на дві підгрупи: підгрупа 2А (18 пацієнтів), які не відзначили впливу COVID-19 на перебіг хронічного риносинуситу, та підгрупа 2Б (25 пацієнтів), які повідомили про суб'єктивне погіршення стану після COVID-19. Було проведено анкетування за допомогою SNOT-22 та ендоскопічне дослідження з оцінкою за шкалою Lund-Kennedy. Аналіз отриманих результатів показав, що середні значення у першій групі становили 41,9 ± 17,94, у другій групі — 43,62 ± 20,12, без статистично значущих відмінностей (p=0,812). У підгрупах 2А та 2Б середні бали становили відповідно 44,3 ± 19,4 та 43,0 ± 21,2, також без статистично значущих відмінностей (p=0,874). Ендоскопічна оцінка за шкалою Lund-Kennedy не виявила значних відмінностей між групами (p=0,588). Результати дослідження вказують на те, що перенесений COVID-19 не мав статистично значущого впливу на синоназальну симптоматику у пацієнтів із хронічним поліпозним риносинуситом та аспіриновою тріадою. COVID-19 не спричинив значного погіршення клінічного перебігу захворювання, що потребує подальших досліджень для вивчення його впливу на інші аспекти респіраторного здоров'я у пацієнтів з аспірин-експербованою респіраторною хворобою.*

**Ключові слова:** Аспірин-індукована астма; COVID-19; захворювання дихальних шляхів; назальні поліпи; риносинусит; тест оцінки синоназальних симптомів.