

**RESEARCH ARTICLE****Effect of turbinate reduction surgery on allergic rhinitis symptoms in hospitalized patients**Yusuf Kusuma Dewa^{1*}, Andriana Tjitria Widi Wardani Sardjana², Moch. Agus Suprijono³¹ Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Central Java, Indonesia² Department of Ear, Nose, and Throat (Otolaryngology) - Head and Neck Surgery, Faculty of Medicine, Universitas Islam Sultan Agung – Sultan Agung Islamic Teaching Hospital, Semarang, Central Java, Indonesia³ Department of Anatomical Pathology, Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Central Java, Indonesia

*Correspondence: Yusuf Kusuma Dewa; Address: Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Central Java, Indonesia; Email address: yusufkusuma999@gmail.com

ARTICLE INFO**ABSTRACT****Keywords:**Turbinate reduction surgery
Total Nasal Symptom Score
Allergic rhinitis

Allergic rhinitis is characterized by nasal congestion, rhinorrhea, sneezing, and itching, significantly impacting patients' quality of life. Turbinate reduction surgery is a therapeutic option for allergic rhinitis refractory to pharmacological treatments. This study aimed to evaluate the effectiveness of turbinate reduction surgery in alleviating allergic rhinitis symptoms. An experimental one-group pretest-posttest design was employed, utilizing primary data collected from 19 patients diagnosed with allergic rhinitis (SFAR ≥ 7) who underwent turbinate reduction surgery at the ENT Clinic, Sultan Agung Islamic Teaching Hospital, Semarang, from April to July 2023. Participants aged 18–55 years were included after providing informed consent. Allergic rhinitis was diagnosed using the Score for Allergic Rhinitis (SFAR), and symptom severity was assessed using the Total Nasal Symptom Score (TNSS). Results showed a significant reduction in the mean TNSS score from 7.79 ± 2.070 pre-surgery to 1.00 ± 0.745 post-surgery ($p = 0.000$). Scores for allergic rhinitis symptoms also decreased significantly ($p < 0.05$). These findings suggest that turbinate reduction surgery effectively alleviates allergic rhinitis symptoms in hospitalized patients. Future research should consider larger sample sizes, extended study periods, inclusion of comparison groups, and evaluation of potential surgical complications.

1. Introduction

Allergic rhinitis is an inflammatory condition of the nasal mucosa triggered by exposure to allergens and mediated by immunoglobulin E (IgE), presenting with symptoms such as nasal congestion, rhinorrhea, sneezing, and an itchy nose (Klimek *et al.*, 2019). Chronic allergic rhinitis can lead to turbinate hypertrophy in children and adults (Ciprandi *et al.*, 2020). The turbinates play a crucial role in regulating the respiratory pathway, and their hypertrophy can cause nasal obstruction, significantly impairing airflow (Dikici

& Durgut, 2024). Persistent symptoms, including nasal congestion, rhinorrhea, sneezing, and itching, are often due to a failure to manage allergens effectively and inadequate response to pharmacological therapies. These symptoms can disrupt sleep, impair cognitive function, and lower quality of life, ultimately reducing productivity in daily activities (Nuhi *et al.*, 2024).

Globally, allergic rhinitis affects approximately 400 million individuals (Alnahas *et al.*, 2023). In Indonesia, the prevalence ranges from 1.5% to 12.4% and continues to increase (Afriana *et al.*, 2023)—a study conducted at RSUP dr. Hasan Sadikin Bandung

<https://doi.org/10.30659/sainsmed.v15i2.35561>

found that most cases occurred in the age groups 10–19 years and 20–29 years, each comprising 24% of cases (Wibowo *et al.*, 2022). Furthermore, 36.5% of children aged 13–14 years in Semarang City were reported to suffer from allergic rhinitis (Nurhutami *et al.*, 2020).

Inhalant allergens such as pollen, house dust mites, pet dander, cockroach debris, and skin epithelial fragments are common triggers for allergic rhinitis (Husna *et al.*, 2022). Surgical intervention, specifically turbinate reduction surgery, is indicated when allergen avoidance and pharmacological treatments fail. This procedure reduces the volume of hypertrophied turbinates caused by allergic reactions, alleviating nasal congestion and improving airflow (Maniaci *et al.*, 2021). Additionally, turbinate reduction surgery has been shown to restore the nasal mucosal epithelium, as evidenced by histopathological improvements, including normalization of cilia and goblet cell distribution, reduction of thickened basement membranes, and restoration of submucosal gland and venous sinusoid architecture (Abdullah & Singh, 2021).

This study evaluated the effects of turbinate reduction surgery on allergic rhinitis symptoms, including nasal congestion, rhinorrhea, sneezing, and itching, among patients at Sultan Agung Islamic Teaching Hospital Semarang. The primary objective was to assess the effectiveness of this surgical intervention in reducing the severity of allergic rhinitis symptoms.

2. Materials and Methods

2.1 Study design

This experimental study employed a one-group pretest-posttest design to evaluate the effects of turbinate reduction surgery on allergic rhinitis symptoms. The

independent variable was turbinate reduction surgery, while the dependent variable represented the severity of allergic rhinitis symptoms. ENT specialists performed the surgical procedures at Sultan Agung Islamic Teaching Hospital in Semarang. Ethical approval for the study was provided by the Health Research Ethics Committee of Sultan Agung Islamic Teaching Hospital (Certificate No. 92/KEPK-RSISA/IV/2023).

2.2. Population and sample

A total sampling technique was employed to recruit participants using a consort diagram (Figure 1). Inclusion criteria were patients diagnosed with allergic rhinitis (SFAR ≥ 7 , Attachment 1) at the ENT Clinic of Sultan Agung Islamic Teaching Hospital from April 2023 to July 2023; aged 18 to 55 years; and willing to participate by signing informed consent. Exclusion criteria included smoking, obesity, acute respiratory infections (ARI), acute or chronic sinusitis, and nasal septal deviation.

2.3 Data collection

Allergic rhinitis was diagnosed using the Score for Allergic Rhinitis (SFAR). Symptom severity was assessed using the Total Nasal Symptom Score (TNSS) questionnaire, which evaluates nasal congestion, rhinorrhea, sneezing, and itching. Each symptom was scored as follows: 0 (No symptom); 1 (Mild, clearly present but easily tolerated), 2 (Moderate, bothersome but tolerable), and 3 (Severe, difficult to accept and interferes with activities). Symptoms were categorized as “decreased” if the score ranged from 0–1 and “fixed” if the score was 2–3. Overall, allergic rhinitis symptoms were classified as “decreased” with a TNSS value of 0–4

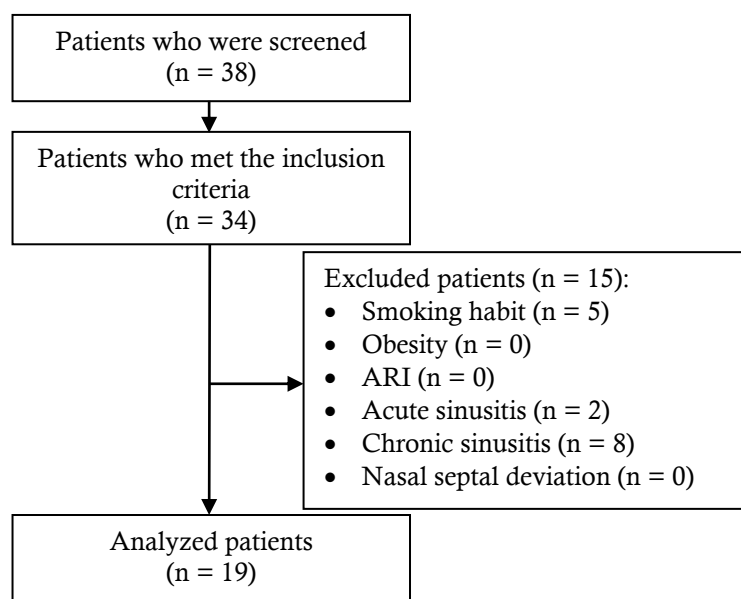


Figure 1. Consort diagram of this study

and “fixed” with a TNSS value of 5–12. TNSS severity categories were defined as Mild (0–5), Moderate (6–9), Severe (10–12)

Patients meeting the inclusion and exclusion criteria underwent a pretest evaluation of allergic rhinitis symptoms using the TNSS questionnaire. Subsequently, they underwent turbinate reduction surgery using the bipolar cautery technique, a minimally invasive procedure that uses electrical energy to shrink hypertrophied turbinate tissue without direct cutting or removal. The bipolar cautery tool employs two electrodes (active and return) for precise tissue reduction.

Three weeks after surgery, patients underwent a posttest evaluation of allergic rhinitis symptoms using the TNSS questionnaire. The total population size during the study period was 38 patients, of whom 19 met the inclusion criteria and were included in the sample.

2.4. Data Analysis

To evaluate changes in TNSS scores before and after surgery, statistical analysis was performed using the Wilcoxon Signed Rank Test in SPSS version 25.0.

3. Results

Table 1 shows the study included 19 patients, predominantly female (63.2%). The largest age groups were 18–25 years and 26–35 years, each comprising 31.6% of the sample, while the smallest age group was 36–45 years (15.8%).

Table 2 depicts the TNSS pre- and postoperative of turbinate reduction surgery. The preoperative Total Nasal Symptom Score (TNSS) revealed nasal congestion as the most severe symptom, with a mean score of 2.47

Table 1. Characteristics of the Study Sample

Characteristics	n (%)
Gender	7 (36.8)
• Male	12(63.2)
• Female	
Age	
• 18–25	6 (31.6)
• 26–35	6 (31.6)
• 36–45	3 (15.8)
• 46–55	4 (21.1)

Table 2. TNSS pre- and postoperative turbinate reduction surgery

Nasal Symptom Score	Mean Score±SD		p value
	Before	After	
Nasal congestion	2.47±0.61	0.00±0.00	0.000
Rhinorrhea	2.00±0.882	0.26±0.45	0.000
Sneezing	1.84±0.898	0.53±0.61	0.001
Itchy nose	1.47±1.073	0.21±0.41	0.000
Total	7.79±2.070	1.00±0.74	0.000

± 0.612, while an itchy nose had the lowest mean score (1.47 ± 1.073). Three weeks postoperative, the mean TNSS value for all symptoms decreased significantly, with an overall mean TNSS of 1.00 ± 0.745, categorized as “decreased.” Nasal congestion showed the most significant improvement, with a mean postoperative score of 0.00 ± 0.000. The Wilcoxon Signed Rank Test indicated substantial reductions in TNSS values for nasal congestion, rhinorrhea, sneezing, and itchy nose (p < 0.05). The overall TNSS value also significantly improved (p = 0.000).

Figure 1 illustrates the interpretation of TNSS severity, indicating a significant improvement. Preoperatively, patients were categorized as mild (15.8%), moderate (68.4%), and severe (15.8%). Postoperatively, all patients were classified as mild (100%). These findings demonstrate that turbinate reduction surgery significantly alleviates allergic rhinitis symptoms, supporting its effectiveness in treating patients with refractory cases.

4. Discussion

This study demonstrated that turbinate reduction surgery significantly alleviated the severity of allergic rhinitis symptoms in patients at the ENT Clinic of Sultan Agung Islamic Teaching Hospital in Semarang. The findings highlight the effectiveness of surgical intervention in improving nasal airflow and relieving

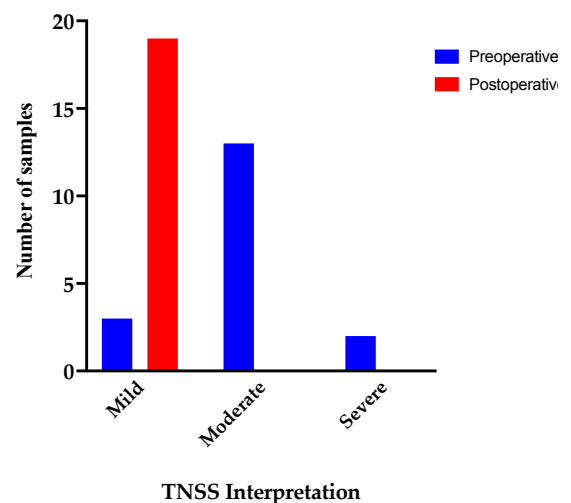


Figure 1. Interpretation of TNSS Severity Pre- and post-operative turbinate surgery

symptoms such as nasal congestion, rhinorrhea, sneezing, and itchiness nose. The demographic distribution of the study participants showed a predominance of female patients (63.2%) and a high proportion of younger adults, with the age groups 18–25 years and 26–35 years representing 31.6% of the sample. These findings are consistent with previous studies indicating that allergic rhinitis is common among young adults and that women may seek medical treatment more frequently than men (Wibowo *et al.*, 2022). Including these demographic data provides a foundation for understanding allergic rhinitis patients' prevalence and treatment-seeking behavior.

The preoperative TNSS results revealed that nasal congestion was the most severe symptom (2.47 ± 0.61), aligning with the understanding that turbinate hypertrophy is a hallmark of allergic rhinitis and significantly contributes to nasal obstruction (Dikici & Durgut, 2024). The itchy nose was the least severe symptom (1.47 ± 1.07), but its presence, along with rhinorrhea and sneezing, underscores the multifaceted nature of allergic rhinitis symptoms.

Three weeks after surgery, all TNSS components showed significant reductions, with the overall mean TNSS decreasing to 1.00 ± 0.745 . Nasal congestion improved the most, with a postoperative mean score of 0.00 ± 0.000 , indicating complete resolution of this symptom in all participants. This finding emphasizes the effectiveness of turbinate reduction surgery in addressing turbinate hypertrophy, a critical factor in nasal congestion (Maniaci *et al.*, 2021). The preoperative TNSS interpretation categorized patients into mild (15.8%), moderate (68.4%), and severe (15.8%) groups. Postoperatively, all patients were categorized as mild (100%), reflecting a substantial improvement in symptom severity. This result supports the hypothesis that turbinate reduction surgery restores nasal airflow and reduces allergic rhinitis symptoms to a tolerable level, consistent with findings from previous studies (Abdullah & Singh, 2021).

The Wilcoxon Signed Rank Test revealed significant reductions in TNSS values for all symptoms ($p < 0.05$), with an overall TNSS p-value of 0.000. These results provide strong statistical evidence for the efficacy of turbinate reduction surgery in alleviating allergic rhinitis symptoms. The absence of ties in nasal congestion scores further underscores the uniform improvement in this critical symptom across all participants. This study highlights the utility of turbinate reduction surgery as a viable treatment option for patients with persistent allergic rhinitis symptoms refractory to pharmacological therapy. The consistent improvement in TNSS scores, particularly for nasal congestion, suggests that this intervention directly addresses the underlying anatomical and physiological

changes caused by allergic rhinitis (Ciprandi *et al.*, 2020).

While the study provides valuable insights, the small sample size and short follow-up period limit the generalizability of the findings. Future research with larger, more diverse populations and longer follow-up durations is necessary to confirm these results and assess the long-term outcomes of turbinate reduction surgery. Additionally, comparative studies with alternative treatments could further elucidate the relative benefits of this surgical approach. This study demonstrates that turbinate reduction surgery is highly effective in significantly reducing the severity of allergic rhinitis symptoms, particularly nasal congestion. The findings support its use as a therapeutic option for patients unresponsive to conventional treatments, thereby improving their quality of life and productivity.

5. Conclusions

In conclusion, turbinate reduction surgery had a significant effect on reducing the rhinitis allergic symptoms in Sultan Agung Islamic Teaching Hospital Semarang. Reviewed from each symptom, the turbinate reduction surgery had a significant effect on reducing nasal congestion, rhinorrhea, sneezing, and itchy nose in allergic rhinitis patients in Sultan Agung Islamic Teaching Hospital Semarang. In further research, the authors suggested increasing the period and number of research samples, adding comparison groups with different interventions, and evaluating the possible complications of turbinate reduction surgery.

Conflict of interest

All authors have no conflict of interest in this article.

References

- Abdullah, B., & Singh, S. (2021). Surgical interventions for inferior turbinate hypertrophy: A comprehensive review of current techniques and technologies. *International Journal of Environmental Research and Public Health*, 18(7): 1–15. <https://doi.org/10.3390/ijerph18073441>
- Afriana, A., Syabriansyah, S., & Dita, D. A. A. (2023). Profile of allergic rhinitis and its association with chronic suppurative otitis media. *Muhammadiyah Medical Journal*, 4(2): 64–71. <https://doi.org/10.24853/mmj.4.2.64-71>
- Alnahas, S., Abouammoh, N., Althagafi, W., & Abd-Ellatif, E. E. (2023). Prevalence, severity, and risk factors of allergic rhinitis among schoolchildren in Saudi Arabia: A national cross-sectional study, 2019. *World Allergy Organization Journal*, 16(10):1-15. <https://doi.org/10.1016/j.waojou.2023.100824>

- Bonds, R. S., & Midoro-Horiuti, T. (2013). Estrogen effects in allergy and asthma. *Current Opinion in Allergy and Clinical Immunology*, 13(1), 92–99. <https://doi.org/10.1097/ACI.0b013e32835a6dd6>
- Ciprandi, G., Tosca, M. A., Gallo, F., Passali, G. C., & Ameli, F. (2020). Turbinate hypertrophy in children with allergic rhinitis: *Clinical relevance. Acta Biomedica*, 91(S1): 43–47. <https://doi.org/10.23750/abm.v91i1-S.9254>
- Dikici, O., & Durgut, O. (2024). Impact of septal deviation and turbinate hypertrophy on nasal airway obstruction: insights from imaging and the NOSE scale: a retrospective study. *Egyptian Journal of Otolaryngology*, 40(1):1-8. <https://doi.org/10.1186/s43163-024-00650-0>
- Gera, N. M. M. S., Yudanto, D., Sahidu, M. G., & Hunaifi, I. (2021). *Korelasi Total Nasal Symptom Score (TNSS) dengan kualitas tidur penderita rhinitis alergi mahasiswa Fakultas Kedokteran Universitas Mataram*. 12(1): 83–87. <https://doi.org/10.15562/ism.v12i1.877>
- Hong, S. N., Won, J. Y., Nam, E. C., Kim, T. S., Ryu, Y. J., Kwon, J. W., & Lee, W. H. (2020). Clinical Manifestations of allergic rhinitis by age and gender: A 12-year single-center study. *Annals of Otolaryngology, Rhinology and Laryngology*, 129(9): 910–917. <https://doi.org/10.1177/0003489420921197>
- Husna, S. M. N., Tan, H.-T. T., Shukri, N. M., Ashari, N. S. M., & Wong, K. K. (2022). Allergic rhinitis: a clinical and pathophysiological overview. *Frontiers in Medicine*, 9(April): 1–10. <https://doi.org/10.3389/fmed.2022.874114>
- Irawati, N., Bashiruddin, J., Rengganis, I., Lisnawati, L., Dharma, R., Harahap, A., & Wardhani, R. S. (2023). The effect of early radiofrequency turbinate reduction, intranasal steroid, and antihistamine H-1 on persistent allergic rhinitis: a randomized clinical trial. *Brazilian Journal of Otorhinolaryngology*, 89(2): 235–243. <https://doi.org/10.1016/j.bjorl.2022.04.001>
- Janson, C. (2024). Does allergy decrease with age? *Revue Francaise d'Allergologie*, 64(103789): . <https://doi.org/10.1016/j.reval.2024.103789>
- Kasim, M. (2020). *Jurnal Ilmiah Kesehatan Sandi Husada Hubungan Rinosinusitis Kronik Dengan Rinitis Alergi Pendahuluan*. 11(1): 271–277. <https://doi.org/10.35816/jiskh.v10i2.266>
- Kim, D. K., Park, S. C., Kim, D. H., Jun, Y. J., Kim, S. W., Yang, H. J., Yang, S. I., & Kim, H. J. (2023). Long-term Outcomes of turbinate surgery in patients with allergic rhinitis: A systematic review and meta-analysis. *JAMA Otolaryngology–Head & Neck Surgery*, 149(1): 15–23. <https://doi.org/10.1001/jamaoto.2022.3567>
- Klimek, L., Bachert, C., Pfaar, O., Becker, S., Bieber, T., Brehler, R., Buhl, R., Casper, I., Chaker, A., Czech, W., Fischer, J., Fuchs, T., Gerstlauer, M., Hörmann, K., Jakob, T., Jung, K., Kopp, M. V., Mahler, V., Merk, H., ... Bousquet, J. (2019). ARIA Guideline 2019: Treatment of Allergic Rhinitis in the German Health System. *Allergologie Select*, 3(01): 22–50. <https://doi.org/10.5414/alx02120e>
- Maniaci, A., Di Luca, M., La Mantia, I., Grillo, C., Grillo, C. M., Privitera, E., Vicini, C., Iannella, G., Renna, C., Bannò, V., Migliore, F., & Cocuzza, S. (2021). Surgical treatment for the refractory allergic rhinitis: State of the Art. *Allergies*, 1(1): 48–62. <https://doi.org/10.3390/allergies1010005>
- Neri, G., Cazzato, F., Vestrini, E., Torre, P. La, Quaternato, G., & Neri, L. (2019). Turbinate Surgery in chronic rhinosinusitis : Techniques and ultrastructural outcomes. *Rhinosinusitis*, 1–20. <https://doi.org/10.5772/intechopen.84506>
- Nuhi, A., Jintu, A., Amresh, K., & Harinderjit, S. (2024). Allergic rhinitis: Impact on Quality of life. *Annals of Pulmonary & Respiratory Medicine Allergic Rhinitis : Impact on Quality of Life*. 2(1), 2–5. <https://www.remedypublications.com/open-access/allergic-rhinitis-impact-on-quality-of-life-10136.pdf>
- Nurhutami, A. D., Marliyawati, D., & Dewi, A. M. K. (2020). Faktor Risiko rinitis alergi pada anak usia 13-14 tahun di Semarang. *Diponegoro Medical Journal*, 9(2): 154-160. <https://doi.org/10.14710/dmj.v9i2.27096>
- Scadding, G. K., Smith, P. K., Blaiss, M., Roberts, G., Hellings, P. W., Gevaert, P., Mc Donald, M., Sih, T., Halken, S., Ziegelmayer, P. U., Schmid-Grendelmeier, P., Valovirta, E., Pawankar, R., & Wahn, U. (2021). Allergic Rhinitis in childhood and the New EUFOREA Algorithm. *Frontiers in Allergy*, 2(July): 1–12. <https://doi.org/10.3389/falgy.2021.706589>
- Wibowo, E. B., Dermawan, A., & Sudiro, M. (2022). Clinical signs in allergic rhinitis patients at Dr. Hasan Sadikin General Hospital Bandung 2017-2021. *Althea Medical Journal*, 9(3): 168–173. <https://doi.org/10.15850/amj.v9n3.2682>