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# Evaluation of nasal obstruction in nasal septum deviations using objective and subjective methods

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**Ethics Committee Approval**
The study was approved by the Ethics Committee of University of Health Sciences, Sancaktepe Sehit Prof. Dr. Ilhan Varank Hospital (Approval No: 218629386, Date: June 23, 2023).
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

**Conflict of Interest**
No conflict of interest was declared by the authors.

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## Abstract

**Background/Aim:** Nasal septum deviation (NSD) is a prevalent cause of nasal obstruction, significantly impairing quality of life. Although various subjective and objective assessment tools exist, the correlation between these methods remains insufficiently investigated. This study aimed to evaluate the relationship between septal deviation morphology and peak nasal inspiratory flow (PNIF) measurements, and to determine the correlation between objective PNIF values and subjective Nasal Obstruction Symptom Evaluation (NOSE) scores.
**Methods:** Between July and September 2023, 52 patients diagnosed with NSD and nasal obstruction, along with 20 healthy controls, were enrolled. Patients were classified into three groups (A, B, and C) based on the degree of nasal obstruction. PNIF measurements and NOSE scores were obtained from all participants.
**Results:** The mean NOSE score and PNIF value in the study group were 59.33 (27.19) and 76.73 (38.76) l/min, respectively, while the mean PNIF value in the control group was 145.5 (17.01) l/min. Statistically significant differences were found in PNIF and NOSE scores between groups. A strong correlation was observed between PNIF and NOSE scores ($P$=0.004).
**Conclusion:** The combined use of objective PNIF measurements and subjective NOSE assessments offers a comprehensive evaluation of nasal obstruction due to septal deviation, improving diagnostic accuracy and clinical decision-making.

**Keywords:** nasal, septum, deviation, inspiratory, flow

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## Introduction

The nose plays a critical role in warming, humidifying, and filtering inspired air, while also acting as a protective barrier for the lower respiratory tract. It significantly contributes to respiratory resistance by influencing nasal airflow dynamics. The airflow characteristics within the nasal cavity vary depending on the respiratory phase and activity level. At rest, inspiration typically demonstrates laminar flow, whereas expiration tends to be more turbulent. During physical exertion, turbulence increases substantially [1].

Nasal obstruction has a considerable impact on quality of life and can result from various anatomical and environmental factors. The nasal septum is integral to airflow regulation, and its deviation is a leading cause of nasal obstruction [2]. Multiple diagnostic tools, both subjective and objective, are available for its evaluation.

It is widely utilized in both clinical and research settings to assess nasal obstruction severity and monitor treatment outcomes [3-7]. This study aimed to assess the impact of septal deviation morphology on PNIF measurements and to investigate the correlation between PNIF and NOSE scores. PNIF measures the maximum inspiratory airflow through the nasal passages, providing an objective evaluation of nasal patency.

## Materials and methods

This prospective controlled study was conducted between July and September 2023. Fifty-two patients presenting with nasal obstruction symptoms and diagnosed with NSD were included. The study group comprised 21 females and 31 males, with a mean age of 33.36 (10.69) years (range: 18–64). The control group consisted of 11 females and 9 males, with a mean age of 36.9 (11.3) years (range: 20–64). Exclusion criteria included respiratory infections, bronchial asthma, chronic lung diseases, acute or chronic sinusitis, nasal polyposis, allergic rhinitis, and smoking.

Informed consent was obtained from all participants in accordance with the 1996 Helsinki Declaration. Ethical approval was granted by SBU Sancaktepe Sehit Prof. Dr. Ilhan Varank SUAM (Approval No: 218629386, Date: June 23, 2023).

Nasal obstruction was subjectively assessed using the NOSE scale (Table 1), a validated five-item questionnaire scored on a five-point Likert scale, yielding a total score of 0–100 [8]. The Turkish version, validated in 2018, is reliable for assessing patients with NSD. PNIF measurements were performed in a room maintained at 20–22°C and 25–35% humidity, repeated three times in the sitting position, with the highest value recorded (Figure 1). Disinfected masks were used. The control group comprised age- and gender-matched healthy volunteers. Nasal examinations included anterior rhinoscopy and nasal endoscopy with a 0° telescope. Patients were classified by septal deviation type (Figure 2) [9]:

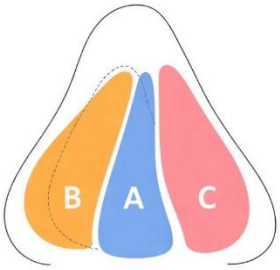
Group A: Obstruction of one-third of the nasal cavity.
Group B: Obstruction of two-thirds.
Group C: Complete obstruction.

**Statistical analysis**

Statistical analysis performed using statistical package SPSS software (Version 25.0, SPSS Inc., Chicago, IL, USA). The normal distribution for each continuous variable was checked with Kolmogorov Smirnov and Histograms, and all numerical data expressed as a median (minimum-maximum) or rate. The categorical variables between the groups were analyzed using the Chi-Square test. One Way ANOVA test used for normally distributed data and the Kruskal Wallis test for non-normally distributed data. As the variance analysis was significant, comparisons made using the Post-hoc Tukey test or the Mann-Whitney U test. Correlations tested with Spearman's correlation test.

**Figure 1: PNIF measurement methodology**

**Figure 2: Classification of septal deviation types**




## Results

The study group had mean NOSE and PNIF values of 59.33 (27.19) and 76.73 (38.76) l/min, respectively. The control group's mean PNIF was 145.5 (17.01) l/min (Table 2). The difference in PNIF values between the groups was statistically significant ($P$=0.004) (Figure 3, 4).

Significant differences were also found among Groups A, B, and C in PNIF values: $P$=0.004 (A vs. B), $P$=0.003 (A vs. C), and $P$=0.002 (B vs. C). A strong correlation was identified between PNIF and NOSE scores ($P$=0.004). Statistically significant differences in NOSE scores were also observed between Groups A and C, and between Groups B and C (Table 3, Figure 5).

**Table 1: NOSE scale**

| Over the past month, how much of a problem was: | Not a problem | Very mild problem | Moderate problem | Fairly bad problem | Severe problem |
|---|---|---|---|---|---|
| 1. Nasal congestion or stuffiness | 0 | 1 | 2 | 3 | 4 |
| 2. Nasal blockage or obstruction | 0 | 1 | 2 | 3 | 4 |
| 3. Trouble breathing through my nose | 0 | 1 | 2 | 3 | 4 |
| 4. Trouble sleeping | 0 | 1 | 2 | 3 | 4 |
| 5. Unable to get enough air through my nose during exercise or exertion | 0 | 1 | 2 | 3 | 4 |

**Figure 3: PNIF values for Groups A, B, and C.**

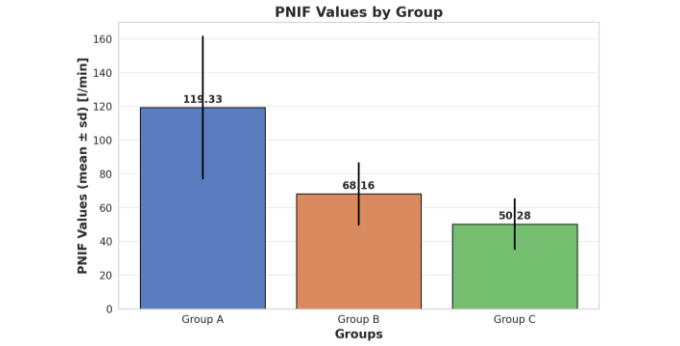



**Figure 4: NOSE scores for Groups A, B, and C.**

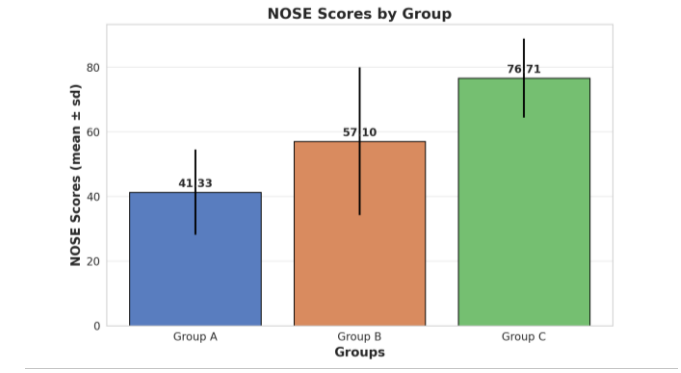



**Figure 5: Grouped bar chart showing NOSE scores and PNIF values by deviation types.**

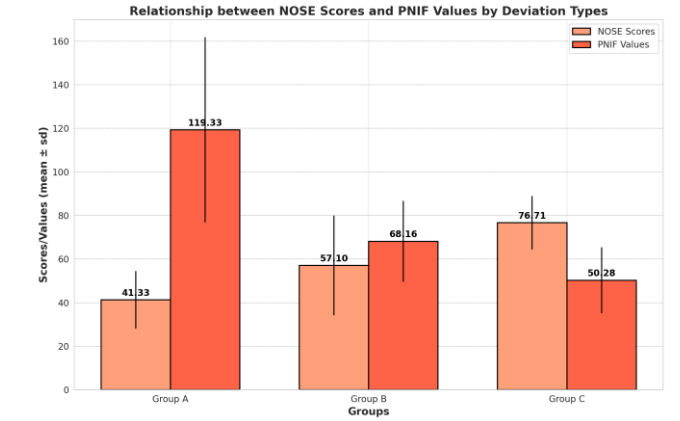



**Table 2: Demographics and NOSE/PNIF scores**

| Group | Gender (F/M) | *P*-value | Age mean (SD) | *P*-value | NOSE mean (SD) | PNIF mean (SD) | *P*-value |
|---|---|---|---|---|---|---|---|
| **Study Group** | 21/31 | >0.05 | 33.36 (10.69) | >0.05 | 59.33 (27.19) | 76.73 (38.76) | 0.007 |
| **Control Group** | 11/9 | >0.05 | 36.9 (11.3) | >0.05 | - | 145.5 (17.01) | - |

**Table 3: NOSE and PNIF scores by deviation types**

| Group | NOSE mean (SD) | *P*-value (NOSE) | PNIF mean (SD) [l/min] | *P*-value (PNIF) |
|---|---|---|---|---|
| **A (n=15)** | 41.33 (13.19) | Ref | 119.33 (42.5) | Ref |
| **B (n=19)** | 57.10 (22.87) | 0.004 (A vs B) | 68.16 (18.64) | <0.05 |
| **C (n=18)** | 76.71 (12.2) | 0.003 (A vs C) | 50.28 (15.1) | 0.002 (A vs C) |

## Discussion

Nasal obstruction is one of the most common complaints encountered in ENT practice, with NSD being the most frequent underlying pathology. Traumas during intrauterine development, birth, or early childhood can affect septal growth and lead to deviations, while genetic factors may also play a role [4, 5].

Assessment of nasal obstruction involves both subjective scales and objective techniques. PNIF is recognized for its low cost, portability, and ease of use, making it an attractive option in clinical practice [9, 10]. Previous studies on the correlation between objective and subjective assessments have yielded conflicting results [11, 12]. Some report weak correlations, suggesting that each method measures different aspects of obstruction [13, 14]. Our findings demonstrate a significant correlation between PNIF and NOSE scores, supporting their complementary use for a more comprehensive assessment.

### Conclusion

The combined use of PNIF and NOSE provides a thorough evaluation of nasal obstruction severity in patients with NSD. This approach facilitates more precise diagnosis, enhances treatment monitoring, and improves overall patient care. Future research should involve larger populations and investigate the integration of PNIF with advanced imaging modalities.

## References


1. Özcan M. Anatomy and Physiology of the Nose. In: Koç C, ed. Diseases of the Ear, Nose, Throat, and Head and Neck Surgery. 3rd ed. Ankara: Güneş Tıp Kitabevleri; 2019:459-64.
2. Valero A, Navarro AM, Del Cuvillo A, et al. Position paper on nasal obstruction: evaluation and treatment. J Investig Allergol Clin Immunol. 2018;28:67-90.
3. Marro M, Mondina M, Stoll D, de Gabory L. French validation of the NOSE and RhinoQOL questionnaires in the management of nasal obstruction. Otolaryngol Head Neck Surg. 2011;144:988-93.
4. Mozzanica F, Urbani E, Atac M, et al. Reliability and validity of the Italian nose obstruction symptom evaluation (I-NOSE) scale. Eur Arch Otorhinolaryngol. 2013;270:3087-94.
5. Oktay MF, Ege SS. Nasal obstructions. Clin Dev. 2012;25:37-9.
6. Ottaviano G, et al. Peak Nasal Inspiratory Flow and Peak Expiratory Flow. Allergy. 2006;61(4):537-41.
7. Salihoglu M, Cekin E, Altundag A, Cesmeci E. Examination versus subjective nasal obstruction in the evaluation of the nasal septal deviation. Rhinology. 52nd ed. Istanbul: Otolaryngology Department of GATA Haydarpasa Training Hospital, Istanbul Surgery Hospital; 2014:122-6. doi: 10.4193/Rhino13.057.
8. Stewart MG, Witsell DL, Smith TL, et al. Development and validation of the Nasal Obstruction Symptom Evaluation (NOSE) Scale. Otolaryngol Head Neck Surg. 2004;130(2):157-63.
9. Onerci Celebi O, Araz Server E, Yigit O, Longur ES. Adaptation and validation of the Turkish version of the Nasal Obstruction Symptom Evaluation scale. Int Forum Allergy Rhinol. 2018;8(1):72-6.
10. Ottaviano G, Fokkens WJ. Measurements of nasal airflow and patency: A critical review with emphasis on the use of peak nasal inspiratory flow in daily practice. Allergy. 2016;71(2):162-74.
11. Comparison of rhinometric measurements methods in intranasal pathology. 2003;41(2):65-8.
12. Cuddihy PJ, Eccles R. The use of nasal spirometry as an objective measure of nasal septal deviation and the effectiveness of septal surgery. Clin Otolaryngol Allied Sci. 2003;28(4):325-30.
13. Xavier R, Azeredo-Lopes S, Menger DJ, de Carvalho HC, Spratley J. Objective measurement and patient-reported evaluation of the nasal airway: Is correlation dependent on symptoms or on nasal airflow? Clin Otolaryngol. 2021 Jul;46(4):744-51. doi: 10.1111/coa.13726.
14. Yepes-Nuñez JJ, Bartra J, Muñoz-Cano R, et al. Assessment of nasal obstruction: correlation between subjective and objective techniques. Allergol Immunopathol (Madr). 2013;41(6):397-401.