

## Correlation between Subjective Symptoms and Objective Findings in Patients with Deviated Nasal Septum

Seyad Mohamed Ibrahim<sup>1</sup>, Ritesh Surana<sup>2</sup>, Harun Khan<sup>3</sup>, Falguni Tyagi<sup>4</sup>, Anil Saini<sup>5</sup>

<sup>1</sup>3rd Year PG Resident, Dept. of ENT, National Institute of Medical Sciences and Research, Jaipur

<sup>2</sup>Associate Professor, Dept. of ENT, National Institute of Medical Sciences and Research, Jaipur

<sup>3</sup>3rd Year PG Resident, Dept. of ENT, National Institute of Medical Sciences and Research, Jaipur

<sup>4</sup>3rd Year PG Resident, Dept. of ENT, National Institute of Medical Sciences and Research, Jaipur

<sup>5</sup>Assistant Professor, Dept. of ENT, National Institute of Medical Sciences and Research, Jaipur

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Corresponding Author: Dr. Ritesh Surana

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### Abstract:

**Introduction:** Deviated nasal septum (DNS) significantly impacts quality of life, with symptoms ranging from nasal obstruction to headaches. Despite the use of clinical exams and imaging for diagnosis, there's often a disconnect between subjective complaints and objective findings. Various classification systems and measurement techniques, like rhinomanometry and acoustic rhinometry, aim to better correlate these aspects for improved diagnosis and treatment.

**Aims and Objective:** To correlate between the subjective symptoms and objective findings in deviated nasal septum

**Methods:** This prospective research aimed to determine the impact of deviated nasal septum (DNS) on nasal obstruction. The study involved clinical evaluations, diagnostic procedures, and both subjective and objective assessments of nasal blockage using anterior nasal rhinomanometry and a nose scale questionnaire. Patients meeting specific inclusion criteria were analyzed, with data statistically processed using SPSS and Excel, focusing on objective-subjective correlations with a significance threshold of  $p < 0.05$ .

**Results:** The study included 127 men and 129 women, ensuring gender parity. Nasal obstruction/snoring was reported by 196 patients (76.56%), nasal discharge by 225 patients (87.89%), and sneezing by 197 patients (76.95%). Average vital signs showed systolic blood pressure at 134.53 mmHg and diastolic at 94.64 mmHg. Physical exams revealed 100% nasal septum asymmetry and 83.98% vestibule narrowing. The NOSE score highlighted varying severity levels of nasal symptoms across the sample.

**Conclusion:** The study has concluded that a considerable number of the patients have shown significant nasal and respiratory health issues, with widespread abnormalities in nasal structure and function, as evidenced by high rates of nasal septum asymmetry, vestibule narrowing, and positive nasal airflow tests.

**Keywords:** Deviated Nasal Symptom, Nasal Septum, Headache, Rhinomanometry.

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### Introduction

Deviated nasal septum is an anatomic variation whereby the partition, separating both halves of the cavity of the nose, is offset away from its midline position. This can result in a very variable clinical spectrum, from simple nasal obstruction to headaches, epistaxis, and recurring sinusitis, significantly decreasing the patient's quality of life. Although clinical examination and imaging studies have been widely used to confirm the diagnosis of DNS, it is argued that the objective findings of clinicians are still not strongly correlated with the subjective complaints of patients [1]. Indeed, several classification systems were developed due to the anatomical variation, diversity of symptoms, and different accompanying diseases related to nasal septum deviation. One system classifies the deviated nasal

septum according to the degree of deviation in relation to the inferior turbinate, which ranges from mild to severe. Another categorizes DNS according to common patterns of deviation, such as "C-shaped" and "S-shaped." Mladina's classification, using rhinoscopy or cone-beam computed tomography, CBCT, identifies seven types, I-VII, of deviated nasal septum according to the characteristic of the nasal septum [2].

Studies have shown that application of camphor, eucalyptus, or menthol to the nasal or palatal mucosa can induce a profound perception of improved nasal airflow without producing any measurable change in nasal resistance, as recorded by rhinomanometry. [13–17]. Conversely, application of local anesthetics in the nasal vestibule or injury to tri-

geminal sensory nerve endings can produce a diminished perception of nasal patency, also without changing nasal resistance. These findings suggest that perception of nasal airflow is modulated by specific sensory nerve endings and may occur independent of objective measurements of nasal resistance [16,18–20].

Implications for the link between subjective symptoms and objective findings in patients with DNS are provided below for accurate diagnosis and effective treatment. The patients complain of such subjective symptoms as nasal congestion and bleeding, hyposmia, headache and facial pain, breathing difficulties [3]. Septoplasty is often more useful in the group of patients with symptoms of obstruction. Satisfaction rate varies from 50% to 100%. Patient satisfaction in septoplasty is often measured by subjective questionnaires, for example, the Nasal Obstruction Symptom Evaluation scale with five items related to nasal obstruction [4]. These findings are objective, obtained via physical examination, imaging studies, or endoscopic evaluation including septal deviation, nasal mucosal swelling measurements, and airway patency measurements [5]. measurement techniques such as acoustic rhinomanometry, optical coherence tomography, and computed tomography imaging of the paranasal sinuses are employed to measure or grade the severity of nasal obstruction [6]. Rhinomanometry does this by measuring the transnasal pressure with corresponding airflow that generates flow-pressure curves for assessing nasal airway resistance. There are several types of rhinomanometry: active anterior, passive anterior, and active posterior, which differ by the way pressure is recorded in the nasal cavities [7]. Acoustic rhinometry, on the other hand, uses reflection of sound waves from the nasal cavity to construct a two-dimensional image that aids in identifying the narrowest part of the nasal cavity. [8]. Though subjective perceptions of nasal airflow are difficult to quantify, the objective measures correlate well with these perceptions in order to improve diagnosis and treatment evaluation [9]. This research therefore has the aim of achieving a better correlation between the subjective experiences and the objective measures to improve diagnosis and treatment for deviated nasal septum.

### Materials and Methods

**Research Design:** The purpose of this prospective research is to determine whether or not individuals with nasal obstruction symptoms were affected by a deviated nasal septum (DNS). Inclusion and exclusion criteria were used to recruit individuals who were representative of the target community. Following enrollment, a full clinical evaluation was performed on each patient. This involved taking a complete medical history and doing a physical exam. The primary goal of this first stage was to

collect essential information about the patient's health histories and the severity of their nasal obstruction symptoms. Following enrollment, all patients undergo standard diagnostic procedures including a complete blood count (CBC), erythrocyte sedimentation rate (ESR), renal function tests (RFT), liver function tests (LFT), bleeding time (BT), clotting time (CT), and viral indicators. These studies were essential because they provided a full picture of the patient's health and helped rule out any confounding variables. Anterior nasal rhinomanometry was performed on each person to evaluate both the subjective and objective features of nasal blockage. This objective measuring approach assessed nasal airflow and resistance. In addition, a nose scale questionnaire was used to assess participants' subjective symptoms, enabling them to self-report their own experiences with nasal blockage. The influence of DNS on nasal obstruction was better understood by combining objective and subjective data, which could then guide treatment approaches for better patient outcomes.

### Inclusion and exclusion criteria

#### Inclusion Criteria

- Patients with nasal blockage and Deviated Nasal Septum at National Institute of Medical Sciences and Hospital OPD.
- The study included only cognitively healthy people with maintained reading abilities.
- Patients with nasal obstruction symptoms for at least three months and persisting symptoms following a 4-week trial with topical nasal steroids, topical or oral decongestants, or oral antihistamine and decongestant combos.

#### Exclusion Criteria

- Age less than eighteen years old.
- Malignancy of the sinuses and nasal passages.
- Head and neck radiation treatment.
- Previous nasal surgery history.
- Evidence of chronic sinusitis, either anecdotally or clinically.
- Perforation of the Septum.
- Injuries to or breaks in the nose during the last three months.
- Hypertrophy of the Adenoid.

**Statistical Analysis:** This research used SPSS and Excel for statistical analysis. Patient demographics, clinical features, and investigation findings were summarised using descriptive statistics. The study has used Bivariate Correlation between the variables. Correlation studies examine objective-subjective links. A significance threshold of  $p < 0.05$  was used. This author used SPSS 27 and Excel to analyse data for a thorough statistical analysis.

**Results and Findings:** Table 1 presents the distribution of patients across different age groups. The majority of patients are aged 41 years and older, accounting for 71 individuals. The age groups 31-35 and 36-40 also have significant

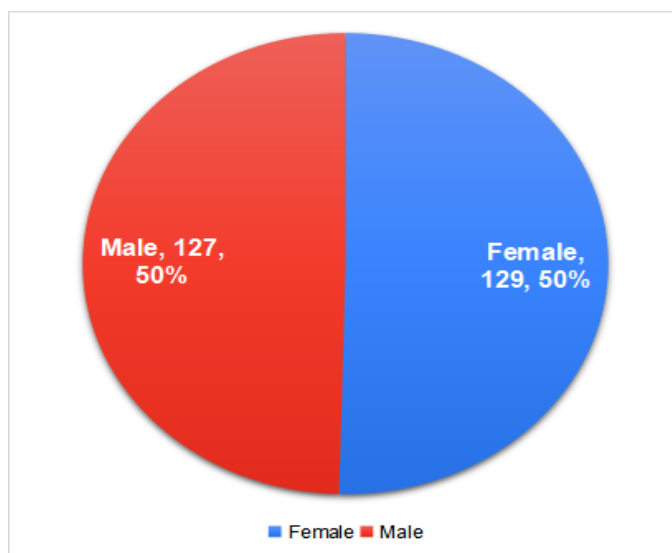
representation, with 48 and 43 patients respectively. The age groups 21-25 and 26-30 each include 39 patients, while the youngest age group, those aged 20 or below, has the fewest patients at 16.

**Table 1: Number of patients in each age group**

Age Group	Number of patients
≤ 20	16
21-25	39
26-30	39
31-35	48
36-40	43
≥ 41	71

Figure 1 shows that there were 127 men and 129 females among the patients. The study population seems to have a fairly balanced distribution of genders, as shown by the nearly equal count. Ensuring that the research does not favour one gender over the other is essential for drawing

generalizable results, which is why gender parity is so important. This research takes a holistic view of nasal health parameters by including an equal number of male and female participants, which reduces the possibility of gender bias in the results.



**Figure 1: Sex distribution among the patients**

Figure 2 presents data on chief complaints from a group of individuals, indicating the number (N) and percentage (%) of respondents reporting each complaint. The most prevalent chief complaints include nasal obstruction/snoring, with 196 individuals accounting for 76.56% of the total. Nasal discharge is also common, reported by 225

individuals, representing 87.89% of the surveyed population. Sneezing is another frequently reported issue, with 197 individuals making up 76.95% of the sample. These findings suggest that nasal obstruction/snoring, nasal discharge, and sneezing are prominent concerns among the study participants.

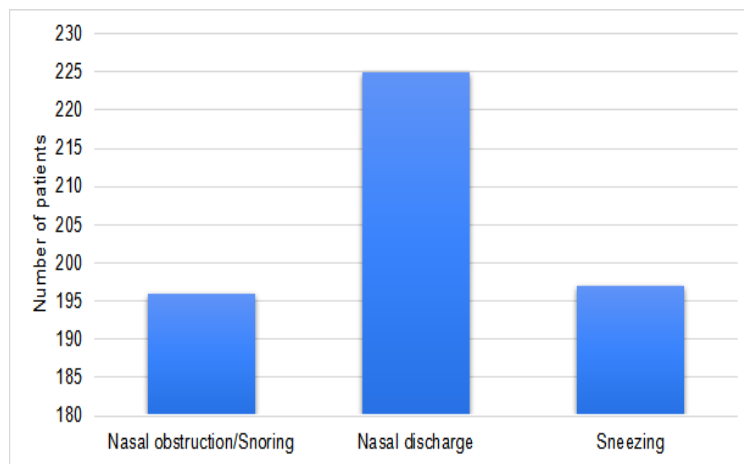


Figure 2: Number of patients with each chief complaints

Table 2 shows the average vital signs measured across the patient group. The average systolic blood pressure is recorded at 134.53 mmHg, while the average diastolic blood pressure is 94.64 mmHg, indicating a higher-than-normal range. The respiratory rate averages at 19.92 breaths per

minute, which is within the normal range. The average pulse rate is 82.48 beats per minute, which is also within the typical range for adults. Lastly, the average body temperature of the patients is 37.41°C, which is within the normal range.

Table 2: Average vital measurements of the patients in this study

Vital Measurement	Average Value
Blood Pressure (Systole)	134.53
Blood Pressure (Diastole)	94.64
Respiratory rate	19.92
Pulse	82.48
Temperature	37.41

Figure 3 illustrates the prevalence of various underlying conditions among the patients in the study. Anemia is the most frequently reported condition, affecting 30 individuals. Clubbing is the second most prevalent condition, observed in 11 patients. Pallor is reported in 8 individuals, and lymphadenopathy is the least common condition,

affecting 3 patients. These findings suggest a range of health issues among the study participants, with anemia being the most prominent, followed by clubbing, pallor, and lymphadenopathy. The figure provides valuable insights into the distribution of these specific underlying conditions within the patient population under investigation.

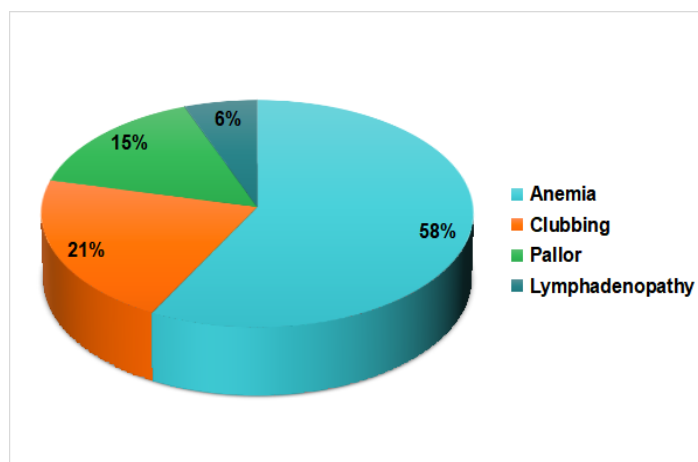


Figure 3: Patients with underlying conditions as found in this study

Table 3 details the results of physical examinations conducted on the patients. All 256 patients (100%) exhibited abnormalities in their external framework

and asymmetry in the nasal septum. A significant majority, 215 patients (83.98%), had a narrowing of the nasal vestibule, while 41 patients (16.01%)

showed an altered shape. The cold spatula test and cotton wool test were both positive in 224 patients (87.5%), indicating respiratory or nasal airflow issues. Additionally, the Cottels test was positive in

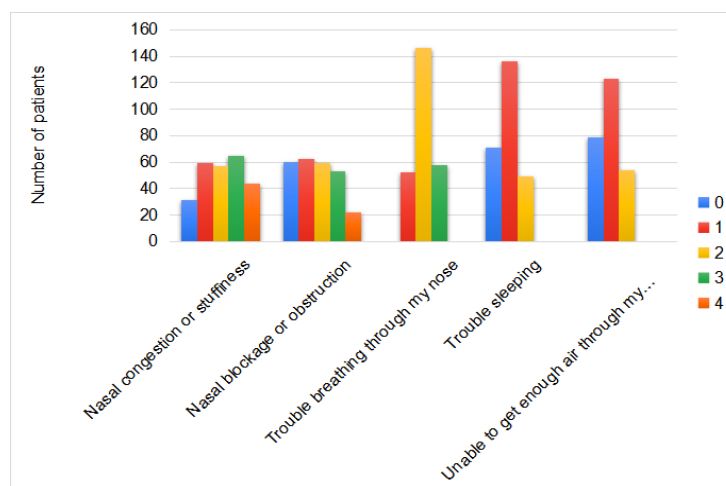
226 patients, representing 88.28% of the total group, further confirming nasal obstructions or similar issues in the majority of the patients.

**Table 3: Findings of the physical examinations of the patients**

Physical Examination	N	%
Abnormal External framework	256	100
Asymmetry Nasal Septum	256	100
<i>Nasal vestibule</i>		
Altered shape	41	16.01
Narrowing	215	83.98
Positive Cold spatula test	224	87.5
Positive Cotton wool test	224	87.5
Cottels test	226	88.28

The distribution of the parameters of the NOSE score across patients is shown in Figure 4. Each column represents a parameter level, from 0 to 4, and the numbers in the cells indicate the proportion of patients that fall into that level. As an example, "Nasal congestion or stuffiness" was rated 0 by 31 patients, and "Nasal blockage or obstruction" by 60

patients. Giving important insights into the frequency and severity of certain nasal problems within the research sample, the figure gives a comprehensive overview of how patients are dispersed across severity levels of different nose symptoms (Figure 4).



**Figure 4: Findings of each parameter of NOSE score with respective number of patients**

**Discussion**

In deviated nasal septum, the relationship between subjective symptoms and objective findings is very important to be understood for differential diagnosis and further treatment planning. However, this may differ since the degree of symptoms does not always comply with the degree of septal deviation.

The subjective evaluations were based on the self-reported condition of patients by visual analogue scales (VAS) or by questionnaires. The development of validated tools specific to the evaluation of nasal symptoms including perceived obstruction has recently been accomplished with instruments such as the Sino-Nasal Outcome Test-22 and NOSE. However many studies did not report use of these validated questionnaires; this is likely due to the fact these studies were performed prior to wide

availability of these tools [10,11]. Objective assessments evaluate the pressure–flow relationship in the nasal cavity. There is no simple linear relationship between pressure and airflow for the nasal cavity is complex in shape and the flow is usually turbulent, so the objective measures alone cannot easily be used to interpret nasal patency [12].

The validity of these objective tests like rhinomanometry and acoustic rhinometry is often questioned in the clinical practice because of the frequent discrepancies between the objective measurements and the subjective complaints of the patients. Literature review revealed very few studies that have tried correlating these objective tests with subjective nasal patency, usually with conflicting results. Some showed a correlation between subjective symptoms of nasal obstruction and an objective measure such as nasal airway resistance (NAR)



or minimal cross-sectional area (MCA), which was mainly in symptomatic patients. Correlation in non-symptomatic individuals was more difficult to find [21–23].

If objective tests reflect subjective symptoms rather well, then their value added to clinical practice is little because subjective sensations could be taken as a reliable indication of nasal airway status. Conversely, if the correlation is weak, reliance on objective tests for therapeutic decisions should be done with great caution. Notwithstanding these limitations, objective measurements may still prove helpful in assessing the outcome of nasal surgery performed for improving patency.

The relationship between subjective symptoms of nasal obstruction and objective measurements has been reported to be mixed. Jones et al. and Kim et al., did not find any correlation [24,25], while others, such as Sipila et al., Numminem et al. and Ng et al., reported mild correlations [23,26,27]. A review by André et al. concluded that there is still uncertainty regarding the relationship between objective and subjective assessments of nasal patency, which therefore puts a question mark on the routine use of objective measurements like rhinomanometry in clinical practice [9]. Such inconsistencies may be partly due to the subjective assessment tools used in these previous studies, many of which did not use validated questionnaires. However, very few studies measured the relationship of the subjective NOSE scores with any objective measure that yielded controversial results. Some of these studies showed no significant relation [5,28], while others reported a significant correlation [29]. The divergent nature of these results can be explained by the fact that these studies were usually small, performed in less than 60 patients. Recently, in view of obtaining robust evidence, a larger study conducted an analysis with respect to rhinomanometry and NOSE scores in a larger patient population with nasal obstruction. The results support the notion that the combination of subjective and objective measurements could give appropriate understanding to nasal obstruction, helping clinicians in counseling both before and after treatment. This should, however, be taken into consideration when treatment results are looked at; the weaker relationship between some symptoms and their objective measures, especially those related to sleep and exercise [30].

The relation of subjective symptoms to objective findings in patients with a deviated nasal septum is complex and multi-factorial. Much as the objective assessments are requisite to identify the extent of the deviation and associated anatomical defects, subjective symptoms offer important clues regarding the patient's experience of the condition. Our finding suggested that only an integrated approach that considers subjective and objective data is nec-

essary for effective diagnosis, treatment, and satisfaction of patients in the management of DNS.

## Conclusion

The study has concluded that a considerable number of the patients have shown significant nasal and respiratory health issues, with widespread abnormalities in nasal structure and function, as evidenced by high rates of nasal septum asymmetry, vestibule narrowing, and positive nasal airflow tests. The study also highlights the prevalence of elevated blood pressure among the patients, coupled with underlying conditions such as anemia, further indicating the complex health challenges faced by this group. These findings underscore the importance of targeted medical interventions and the need for comprehensive diagnostic approaches to effectively address the nasal and overall health concerns identified in this population. Vital measurements reveal that the patient group generally exhibits slightly elevated blood pressure levels, while other vital signs like respiratory rate, pulse, and temperature remain within normal ranges. The presence of underlying conditions, particularly anemia, further emphasizes the complex health challenges faced by the patients, with conditions like clubbing and pallor also being noteworthy.

The physical examination findings are particularly striking, with all patients displaying abnormalities in the external framework and asymmetry in the nasal septum. The majority also showed nasal vestibule narrowing, with many patients testing positive for cold spatula and cotton wool tests, indicating widespread nasal obstructions. The distribution of NOSE score parameters provides additional insights into the severity of nasal symptoms experienced by the patients, offering a detailed view of how these symptoms vary in intensity across the sample. Overall, the study highlights a significant burden of nasal and related health issues in the patient population, with important implications for diagnosis and treatment strategies.

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