



# **A Study of Nasal Septal Deviation, External Nasal Deformities, and their Correlation with the Severity of Sino-Nasal Symptoms Using Sino Nasal Symptoms Score Questionnaire**

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## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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**Study Protocol**

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## **ABSTRACT**

**Background/Rationale:** The human nose is structurally complex and this complexity results in nasal shape and shape variations. Midline deformities such as hump nose, saddle nose, tip deformities and lateral nasal deformities such as crooked nose, deviated nose, alar depression are common forms of deformity affecting the external nose. Internal nasal valve (INV) is a key anatomical landmark of nasal cavity. Any obstructions in this region have tremendous effects on inspiratory and expiratory currents. This study aims to assess the nasal septal deviation and external nasal deformities and correlate the severity of sino nasal symptoms.

**Methods:** This Prospective observational study will include total 50 patients with nasal septal deviation. Patients will undertake Sino Nasal Test -22 questionnaire. Investigations like Diagnostic nasal endoscopy with 30 degree nasal endoscope, X-ray PNS Water's view and complete blood count including absolute eosinophilic count will be carried out. Data will be analysed using appropriate statistical tests.

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**Expected Results:** A significant correlation is expected between Nasal Septal Deviation, External Nasal Deformities, and Severity of Sino-nasal Symptoms.

**Conclusion:** This study will reflect on internal nasal valve and its correlation with etiopathological process of upper respiratory tract. It will also guide clinicians in choosing appropriate surgical approach.

*Keywords: Nasal cavity; internal nasal valve; nasal endoscopy; deviated nasal septum; sino-nasal symptoms; water's view.*

## 1. INTRODUCTION

One of the most fragile organs in our body is the nose, the central structure of face. The outer nose serves the cosmetic purpose by improving an individual's personality and attractiveness [1].

The nose is the primary mammalian breathing route and serves important functions, including nasal respiration, defence of the lower respiratory tract by inspired air filtration, air conditioning, mucociliary function, sneeze reflex and humidification, vocal resonance, olfactory resonance and an outlet to lacrimation [2].

The nasal cavity is divided by nasal septum into two air filled spaces. Each side of the cavity is divided by three conchae, or turbinates [3]. In both the appearance and function of the nose, the nasal septum plays an important role. Deviation of the cartilage and/or bony structure of the nasal septum from the midline can cause various nasal symptoms, such as nasal obstruction. Deviated nasal septum (DNS) incidence is due to numerous causes, including ethnic factors, septum birth moulding during parturition, trauma and septum developmental deformities [1].

The internal nasal valve (INV) is a major anatomical landmark and is the circumscribed region in the nares. It is a cross sectional area defined medially by the dorsal septum, laterally by caudal part of the upper lateral cartilage, and inferiorly by the head of inferior concha. A triangle's area is  $\frac{1}{2}$  per base per height. Therefore a decrease in any sides, the area would be decreased by almost 25-30% of the total space of the triangle. Hence any decrease in this already crowded area will have a noticeable impact on the inspiratory and expiratory currents [3].

The human nose is structurally complex and this complexity results in nasal shape and shape variation. Midline deformities such as hump nose, saddle nose, tip deformities and lateral

nasal deformities such as crooked nose, deviated nose, alar depression are common forms of deformity affecting the external nose [2]. External nasal deformities was categorised by YongJo Jang's into five types. It was focused on the bony pyramid orientation with the cartilaginous vault [4].

Type 1: Straight tilted bony pyramid with, tilted cartilaginous vault in the opposite direction.

Type 2: Straight tilted bony pyramid with concavely / convexly bent cartilaginous vault.

Type 3: Straight bony pyramid with tilted cartilaginous vault.

Type 4: Straight bony pyramid with bent cartilaginous vault.

Type 5: Straight tilted bony pyramid & tilted cartilaginous dorsum in the same direction.

One of the most mundane symptoms observed in the primary care and specialty centers is nasal obstruction. Nasal obstruction pathophysiology, best explained as perceived sense of decreased airflow through nose or a feeling of fullness of face. One of the most frequently encountered structural causes of nasal obstruction include septal deviation. Of course, septal variance often causes decreased airflow and nasal obstruction symptoms/perceptions. There is however, considerable anatomical variation among individuals; most of the impact on the airflow is on the anterior deflections affecting the nasal valve, while in the middle and lower portion of the nares has no impact on resistance to airflow [5].

Nasal obstruction is well known to be a common and highly subjective complaint, but information obtained from objective observation does not always correspond with the symptoms of patients. Several studies have been used to substantiate clinical, qualitative & instrumental questionnaires to determine nasal obstruction levels. In this regard, the American Academy of Otolaryngology's Declaration of clinical consensus stated that the INV plays a legitimate part in nasal obstruction, segregated from other

anatomical problems and/or disorders, including allergies [6].

Internal nasal valve constitute an important anatomical land mark and is the circumscribed region of the nares. Any decline in this already crowded region would have a conspicuous impact on the inspiratory and expiratory currents [3].The internal nasal valve is endoscopically accessed in various nasal septal deviations with or without external nasal deformities in this research.

## 1.1 Aim and Objectives

### 1.1.1 Aim

To study endoscopically the internal nasal valve in various nasal septal deviations with/ without external nasal deformities.

### 1.1.2 Objectives

- 1) To study profile, degree, site and type of nasal septal deviation and external nasal deformities.
- 2) To correlate severity of sino nasal symptoms in patients of nasal septal deviations with or without external nasal deformities by using Sino Nasal Symptoms score questionnaires.
- 3) To grade endoscopically the Internal Nasal Valve (INV) and measure the angle made by the INV, in various types of nasal septal deviations with / without external nasal deformities.
- 4) To study the status of PNS radiologically by X ray PNS in patients of nasal septal deviations with or without external nasal deformities.

## 2. METHODS

**Study Design:** Cross sectional study.

**Study Setting:** All the patients having nasal septal deviation with or without external nasal deformity in ENT out patient department, ENT ward and casualty of AVBRH Sawangi (M), Wardha from November 2020 to November 2023.

**Participants:**

**Inclusion criteria:**

1. All the patients of nasal septal deviation and external nasal deformities with or without allergy in the age group of 15-60 years.

### Exclusion Criteria

1. All the patients of nasal septal deformity with or without external nasal deformities below 15 years and above 60 years of age.
2. Patients with other obstructive lesions of upper and lower airway.
3. Patients with other granulomatous and malignant lesions of nasal cavity.
4. Patients with cardiovascular, neurological and respiratory disorder.

Those patients included in this study will be evaluated as follows:

- 1) Comprehensive clinical examination of ear, nose and throat.
- 2) Patients symptoms are rated with Sino Nasal Test -22 questionnaire [7].
  - Diagnostic nasal endoscopy with 30 degree nasal endoscope to measure the angle of internal nasal valve with the nasal septum before surgery.
  - X-ray PNS Water's view.
  - Complete blood count including absolute eosinophilic count.

Based on the above pre-operative work up with the result will be used to access the effect of different types of nasal septal deviation and external nasal deformities on internal nasal valve.

**Study Size:** For the purpose of the study we are including 50 patients in the study during this period.

**Statistical Methods:** Statistical analysis will be done with the help of Chi square test.

## 3. EXPECTED RESULTS

**Descriptive Data:** It is a cross-sectional study involving 50 patients with or without external nasal deformity with nasal septal deviation who were referred to the ENT department of AVBRH Sawangi (M), Wardha from November 2020 to November 2022.

**Outcome Data:**

- 1) Findings thus obtained will be entered in the proforma.
- 2) Photographic documentation of some interesting cases will be done wherever needed.
- 3) Data will be analyzed and subjected to statistical analysis.

**Table 1. Demographic survey results**

<b>Contemplating the seriousness of the trouble as you encounter it and how recurrently it occurs, kindly rate the below symptoms for how "bad" it is by ticking the numerical that is consonant to how you feel:</b>	<b>No Trouble</b>	<b>Very Mild Trouble</b>	<b>Mild or slight Trouble</b>	<b>Moderate Trouble</b>	<b>Severe Trouble</b>	<b>Trouble as bad as it can be</b>	<b>Most significant items (tick)</b>
a)Wanting to blow your nose	ZERO	ONE	TWO	THREE	FOUR	FIVE	
b)Blocked nose	ZERO	ONE	TWO	THREE	FOUR	FIVE	
c)Sneezing	ZERO	ONE	TWO	THREE	FOUR	FIVE	
d)Running nose	ZERO	ONE	TWO	THREE	FOUR	FIVE	
e)Cough	ZERO	ONE	TWO	THREE	FOUR	FIVE	
f)Post nasal discharge	ZERO	ONE	TWO	THREE	FOUR	FIVE	
g)Nasal discharge: Thick	ZERO	ONE	TWO	THREE	FOUR	FIVE	
h)Ear fullness	ZERO	ONE	TWO	THREE	FOUR	FIVE	
i)Dizziness	ZERO	ONE	TWO	THREE	FOUR	FIVE	
j)Ear ache	ZERO	ONE	TWO	THREE	FOUR	FIVE	
k)Facial pain or pressure	ZERO	ONE	TWO	THREE	FOUR	FIVE	
l)Reduced sense of smell or Taste	ZERO	ONE	TWO	THREE	FOUR	FIVE	
m)Difficulty to fall asleep	ZERO	ONE	TWO	THREE	FOUR	FIVE	
n)Wakeup at night	ZERO	ONE	TWO	THREE	FOUR	FIVE	
o)Reduced sleep at night	ZERO	ONE	TWO	THREE	FOUR	FIVE	
p)Tired on waking up	ZERO	ONE	TWO	THREE	FOUR	FIVE	
q)Fatigueness	ZERO	ONE	TWO	THREE	FOUR	FIVE	
r)Reduction in productivity	ZERO	ONE	TWO	THREE	FOUR	FIVE	
s)Difficult to concentrate	ZERO	ONE	TWO	THREE	FOUR	FIVE	
t)Frustrated or restlessness or irritability	ZERO	ONE	TWO	THREE	FOUR	FIVE	
u)Feeling unhappy	ZERO	ONE	TWO	THREE	FOUR	FIVE	
v)Feeling Embarrassed	ZERO	ONE	TWO	THREE	FOUR	FIVE	

#### 4. DISCUSSION

The area of nasal valve has a paramount part in nasal respiration. Physiological studies show that both nasal airflow and nasal resistance are substantially regulated by this complex region [2]. In fact, seventy percent of nasal respiratory resistance & forty four percent of total inspiratory resistance are due to the nasal valve. Even small deformities in this region may transform into significant increases in inspiratory resistance, thereby compromising the subject's efficiency especially during physical effort, and sometimes causing sleep disturbances [6].

The anatomical outlining of the external & internal element of the nasal valve is the cross-sectional portion of the nares which except pronounced all in all resistance to the flow of air, serving as one of the prime most factor of nasal inspiration. The INV or ostium internum nasi is situated roughly 1.3 cm from the nares & refers to the location below the upper lateral cartilages [7]. It is constrained by dorsal septum medially, inferior concha head inferiorly, & upper lateral cartilage laterally [8]. In a Caucasian, the average angle of the INV varies from 9° to 15° and due to the scale of the inferior turbinate, inter-racial variation is well known [9].

Acceleration occurs when air reaches these narrow parts, which leads to a decline in the pressure intra-luminally (The principle of Bernoulli). This conduce the lateral wall of nares to collapse, whereas slight septal variations, malformed lateral crura / damaged soft tissues can have a major effect on the airflow of nasal cavity [8].

Most of the fundamental configuration of nasal septum must be a straight plane which separates nose into 2 cavities, but the fact is it is seldom straight. It is common for 62 per cent of people [2]. Numerous authors have attempted to define nasal septal deformity on the basis of location and type, helping to recognise their role in associated pathologies and patient management.

In 1987, Mladina proposed the classification of nasal septal deformities into vertical and horizontal forms. The vertical deformities was further divided into four types (types 1,2,3 and 4) and horizontal deformities into two types (type v,vi) [10,11]

*Type 1* : Midline septum / mild deviations in vertical/horizontal plane, which do not extend throughout the vertical length of the septum.

*Type 2*: Anterior vertical deviation.

*Type 3*: Posterior vertical deviation .

*Type 4*: 'S' septum – posterior to one side and anterior to other side.

*Type 5*: Horizontal spur on one side with or without high deviation to the opposite side.

*Type 6*: Type 5 with a deep groove on the concave side.

*Type 7*: Combination of more than one type.

In type 2- 6 the side of the deviation is marked L (Left) / R (Right). In type 4 whichever side is anterior deviation is marked L / R.

Various techniques have been identified in international literature to correct nasal obstruction caused by impaired nasal valve function, but there are no randomised trials to study endoscopically the internal nasal valve in various septal deviations and external nasal deformities. This association is studied by measuring the internal nasal valve angle with the nasal septum, in patients with different nasal septal deformities and external nasal deformities during diagnostic nasal endoscopy preoperatively. Few of the related studies were reviewed [12-16].

In 2017, a prospective study was performed in regard with nasal obstruction by the Royal National Throat Nose & Ear Hospital, London, and a static INV rating was established for the visibility of the middle turbinate. INV is determined in the anterior rhinoscopy, on the basis of a horizontal line at the head of inferior concha [7].

Grade 0: the head of the middle concha is visible easily.

Grade i: the middle concha is partially obscured.

Grade ii: the middle concha is not visible.

The research investigated and evaluated the validity of the grading system and compared it with objective and subjective rhinological results as calculated by the Nasal Obstruction Symptom Evaluation Score(NOSE) & Sinonasal Outcome Tool (SNOT-23) both pre-and post-operatively [7].

However the investigation has not been expanded to correlate the various causes of structural nasal obstruction such as DNS, INV obstruction, etc [7]. So this research aims to broaden the investigation of, the association between INV and various nasal septal deviations with or without external nasal deformities.

**Interpretation:** In order to research the connection between the internal nasal valve and the deviated nasal septum with / without external nasal deformities, statistical analysis results of the measurements achieved by endoscopic, radiological and various other measurements will be used [17-25].

## 5. CONCLUSION

Conclusion will be drawn from the outcome of the study

## CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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