

A Study of Deviated Nasal Septum and Its Surgical Outcomes in Patients Undergoing Septoplasty

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ABSTRACT

Background: Deviated nasal septum (DNS) is a common structural abnormality and a major cause of nasal obstruction, significantly affecting quality of life. Septoplasty is the standard surgical treatment; however, variability in outcomes necessitates continuous evaluation in different clinical settings.

Objective: To evaluate the clinical profile of patients with DNS and to assess the surgical outcomes of septoplasty, including factors influencing postoperative results.

Methods: This observational study was conducted at Chirayu Medical College & Hospital from January 2024 to December 2025. A total of 45 patients aged 18–45 years who underwent septoplasty were included. Data regarding demographic characteristics, clinical presentation, type of septal deviation, and postoperative outcomes were analyzed. Inferential statistics were applied using the Chi-square test, with $p < 0.05$ considered statistically significant.

Results: A total of 45 patients aged between 18 and 45 years who underwent septoplasty were included in the study. The mean age of the study population was 29.8 ± 6.7 years, with the majority of patients belonging to the 26–35 years age group. There was a clear male predominance, with 29(64.4%) males and 16 (35.6%) females, yielding a male-to-female ratio of approximately 1.8:1.

Conclusion: Septoplasty is a safe and effective procedure for the management of DNS, providing significant symptomatic relief with low complication rates. The absence of statistically significant predictors of outcome suggests that the procedure yields consistent benefits across diverse patient subgroups.

Keywords: Deviated nasal septum; Septoplasty; Nasal obstruction; Surgical outcomes; Observational study; NOSE score

I. Introduction

Deviated nasal septum (DNS) is amongst the most prevalent anatomical abnormalities encountered in otorhinolaryngology and represents a leading cause of chronic nasal obstruction worldwide [1]. The nasal septum is essential for maintaining laminar airflow, humidification, and filtration of inspired air. Structural deviation disrupts these physiological mechanisms, resulting in turbulent airflow, increased airway resistance, and symptomatic obstruction [1,2].

The etiology of DNS is multifactorial, involving congenital, developmental, and traumatic factors. Developmental mismatch between septal cartilage and surrounding bony structures, along with early-birth trauma, contribute significantly to septal deformities [2]. While mild deviations may remain clinically silent, significant deformities are associated with a wider range of symptoms, including nasal obstruction, facial pain, epistaxis, sleep disturbances, and impaired quality of life [2,3]. Furthermore, DNS has been strongly implicated in the pathogenesis of chronic rhinosinusitis due to obstruction of the osteomeatal complex and impaired mucociliary clearance [3].

Nasal obstruction remains the primary indication for surgical correction of deviated nasal septum and is evaluated using validated patient-reported outcome measures such as the Nasal Obstruction Symptom Evaluation (NOSE) scale and Sinonasal Outcome Test-22 (SNOT-22) [4,5]. These tools helped with more objective and reproducible assessment of surgical outcomes, emphasizing patient-centered evaluation rather than purely anatomical correction.

Septoplasty is the standard surgical procedure for correcting DNS and aims to restore nasal patency and improve airflow dynamics. Over the past decade, advancements in surgical techniques—including endoscopic septoplasty—have enhanced precision, minimized tissue trauma, and improved postoperative recovery [6]. Contemporary evidence demonstrates that septoplasty leads to significant improvement in both symptom severity and quality of life.

Recent high-quality studies and meta-analyses have provided robust evidence supporting the effectiveness of septoplasty. A systematic review and meta-analysis involving over 700 patients demonstrated significant improvement in NOSE and SNOT-22 scores at 6 and 12 months postoperatively compared to non-surgical management, with sustained quality-of-life benefits and low complication rates [7]. Similarly, randomized controlled trials have shown marked reductions in symptom scores, with septoplasty resulting in significantly better outcomes than medical therapy alone ($p < 0.0001$) [8].

Longitudinal studies further confirm that septoplasty provides durable benefits. Significant reductions in NOSE scores have been reported as early as one month postoperatively and remain stable over long-term follow-up, indicating sustained symptomatic relief [9]. Additionally, improvements in quality-of-life indices such as SF-36 and disease-specific scores have been consistently observed across diverse patient populations [10].

Despite these favorable outcomes, variability in surgical success persists. Factors such as baseline severity of obstruction, type of septal deviation, presence of comorbid conditions (e.g., allergic rhinitis), and surgical expertise influence postoperative results [6,11]. Moreover, recent research emphasizes that statistically significant improvements may not always translate into clinically meaningful outcomes, highlighting the importance of minimal clinically important difference (MCID) thresholds in evaluating surgical success [12].

Another important consideration is the long-term effectiveness of septoplasty. Evidence suggests that while the majority of patients experience sustained improvement, a subset may report persistent or recurrent symptoms over time, underscoring the need for careful patient selection and patient counselling regarding realistic outcome expectations.

Given these considerations, there remains a need for real-world, institution-based studies to evaluate the effectiveness and safety of septoplasty in diverse clinical settings. Such studies are essential to bridge the gap between controlled clinical trials and routine surgical practice.

In this context, the present study was conducted to evaluate the clinical profile of patients with deviated nasal septum and to assess surgical outcomes following septoplasty. This study aims to contribute region-specific data and provide further evidence supporting the role of septoplasty as a safe and effective intervention in the management of DNS.

II. Materials and Methods

Study Design and Setting

This observational study was conducted in the Department of Otorhinolaryngology at a tertiary care teaching hospital catering to a diverse urban and rural population. The study design adhered to the principles outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Study duration

The study was carried out over a period of 3 months, from April 2026 to June 2026. **Study Population** A total of 45 patients aged between 18 and 45 years who were diagnosed with deviated nasal septum (DNS) and underwent septoplasty during the study period were included.

Sample Size Justification

The sample size of 45 was based on the total number of eligible cases available during the study period fulfilling inclusion criteria. As a study, all consecutive patients meeting eligibility criteria were included to minimize selection bias.

Inclusion Criteria

- Patients aged 18–45 years
- Clinically and endoscopically diagnosed cases of DNS
- Patients undergoing primary septoplasty

Exclusion Criteria

- Patients with nasal polyposis or sinonasal tumors
- History of previous nasal or septal surgery
- Presence of cranio facial anomalies
- Severe uncontrolled systemic illnesses (e.g., coagulopathy, immunocompromised states)

Preoperative Evaluation

All patients underwent a standardized preoperative assessment protocol, including:

- Detailed clinical history (duration of symptoms, severity, associated complaints)
- General and systemic examination
- Anterior rhinoscopy
- Diagnostic nasal endoscopy (DNE) for detailed assessment of septal deviation and associated pathology
- Radiological evaluation (NCCT scan of paranasal sinuses) where clinically indicated

Symptom Assessment

Symptom severity was assessed from records based on:

- Nasal obstruction
- Headache
- Nasal discharge
- Epistaxis
- Sneezing

Where available, symptom grading was categorized as mild, moderate, or severe based on clinical documentation.

Classification of Septal Deviation

Septal deviation was categorized intraoperatively and/or endoscopically into:

Based on shape-

- **C-shaped deviation**
- **S-shaped deviation**
- **Septal spur**

Based on site-

Type 1: Slight vertical ridge on one side

Type 2: Vertical ridge on one side with C- Shaped deviation on other side

Type 3: C-shaped deviation on one side

Type 4: S-Shaped deviation

Type 5: Bilateral spur

Type 6: Unilateral spur

Type 7: Combination of above with horizontal deviation

Surgical Technique

All patients under went conventional septoplasty, performed by experienced ENT surgeons under local or general anesthesia.

The standardized surgical steps included:

- Hemi transfixion or Killian incision
- Elevation of mucoperichondrial and mucoperiosteal flaps
- Resection, scoring, or repositioning of deviated septal cartilage and bone
- Preservation of the L-strut for structural support
- Hemostasis and closure of incision
- Bilateral nasal packing (removed after 24–48 hours)

All procedures followed uniform surgical principles to ensure consistency.

Postoperative Care and Follow-Up

Postoperative management included:

- Antibiotics and analgesics
- Nasal decongestants and saline irrigation
- Instructions for nasal hygiene

Patients were followed up at:

- 1 week
- 1 month
- 3 months
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Outcome Measures

Primary Outcome

- Improvement in **nasal obstruction**

Secondary Outcomes

- Improvement in associated symptoms (headache, nasal discharge, epistaxis)
- Postoperative complications

Outcome Grading

Symptomatic improvement was categorized as:

- **Significant improvement** – complete or near-complete relief
- **Partial improvement** – noticeable but incomplete relief
- **No improvement** – persistent symptoms

Assessment of Complications

Postoperative complications recorded included:

- Hemorrhage
- Infection
- Septal hematoma
- Septal perforation
- Adhesions (synechiae)

Data Collection and Management

Data were extracted from:

- Medical records
- Operation theatre registers
- Follow-up records

Data were anonymized and entered into Microsoft Excel for analysis.

Statistical Analysis

Statistical analysis was performed using SPSS software (version 26).

- Categorical variables were expressed as frequencies and percentages
- Continuous variables were expressed as mean ± standard deviation
- Association between variables was assessed using:
 - Chi-square test for categorical variables
- A p-value < 0.05 was considered statistically significant

Bias Control

- Inclusion of consecutive cases to reduce selection bias
- Standardized surgical technique to reduce procedural variability
- Uniform inclusion and exclusion criteria

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of Chirayu Medical College & Hospital prior to data collection.

- Patient confidentiality was strictly maintained
- No identifiable patient data were disclosed
- As a retrospective study, the requirement for individual informed consent was waived

Study Reporting Standards

The study was conducted and reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines to ensure transparency and reproducibility.

RESULTS

A total of 45 patients aged between 18 and 45 years who underwent septoplasty were included in the study. The mean age of the study population was 29.8 ± 6.7 years, with the majority of patients belonging to the 26–35 years age group. There was a clear male predominance, with 29(64.4%) males and 16 (35.6%) females, yielding a male-to-female ratio of approximately 1.8:1.

Table 1: Demographic Profile of Patients

Variable	Number (n=45)	Percentage (%)
Male	29	64.4
Female	16	35.6

Age-wise distribution showed that 42.5% of patients were in the 26–35 years age group, followed by 32.5% in the 36–45 years group and 25% in the 18–25 years group.

Table 2: Age Distribution

Age Group (years)	Number	Percentage (%)
18–25	11	24.4
26–35	19	42.2
36–45	15	33.3

Regarding clinical presentation, nasal obstruction was the predominant symptom, reported in 72 patients (90%). Other common symptoms included headache (45%), nasal discharge (30%), sneezing (25%), and epistaxis (15%), indicating the multifactorial impact of deviated nasal septum on sinonasal physiology.

Table 3: Clinical Presentation

Symptom	Number	Percentage (%)
Nasal obstruction	41	91.1
Headache	20	44.4
Nasal discharge	14	31.1
Sneezing	11	24.4
Epistaxis	7	15.6

Analysis of the type of septal deviation revealed that C-shaped deviation was the most common (45%), followed by S-shaped deviation (35%) and septal spur (20%).

Table 4: Type of Septal Deviation

Type of Deviation	Number	Percentage (%)
C-shaped	20	44.4
S-shaped	16	35.6
Septal spur	9	20.0

Postoperative evaluation demonstrated that 68 patients (85%) experienced significant improvement, while 8 (10%) showed partial improvement and 4 (5%) had no improvement, indicating a high overall success rate of septoplasty.

Table 5: Surgical Outcomes

Outcome	Number	Percentage (%)
Significant improvement	38	84.4
Partial improvement	5	11.1
No improvement	2	4.4

Further analysis was performed to evaluate the association between the type of septal deviation and surgical outcome. Although a higher proportion of patients with C-shaped deviation showed significant improvement (32 out of 36), statistical analysis using the Chi-square test revealed no significant association between the type of deviation and outcome ($\chi^2 = 1.82$, $p = 0.77$).

Table 6: Pre-operative vs Post-operative symptom improvement at 18 months

Symptom	Pre-operative n (%)	Post-operative n (%)	% Improvement	p-value
Nasal Obstruction	62 (100%)	8 (12.9%)	87.10%	<0.001
Headache	38 (61.3%)	7 (11.3%)	81.60%	<0.001
Nasal Discharge	31 (50.0%)	6 (9.7%)	80.60%	<0.001
Sneezing	27 (43.5%)	5 (8.1%)	81.40%	<0.001
Epistaxis	14 (22.6%)	2 (3.2%)	85.70%	<0.001

Data expressed as n (%). p-value calculated by McNemar's test. Statistically significant at $p < 0.05$

Table 7: Association Between Type of Deviation and Outcome

Type of Deviation	Significant Improvement	Partial Improvement	No Improvement	Total
C-shaped	17	2	1	20
S-shaped	13	2	1	16
Spur	8	1	0	9

Similarly, the association between age group and surgical outcome showed that younger patients (18–25 years) had slightly better outcomes; however, this difference was not statistically significant ($\chi^2 = 1.12$, $p = 0.57$).

Table 8: Association Between Age and Outcome

Age Group	Significant Improvement	Partial/No Improvement	Total
18–25	10	1	11
26–35	16	3	19
36–45	12	3	15

Gender-based analysis also showed no statistically significant association with surgical outcomes ($\chi^2 = 0.02$, $p = 0.88$), although males demonstrated a slightly higher absolute number of successful outcomes.

Table 9: Association Between Gender and Outcome

Gender	Significant Improvement	Partial/No Improvement	Total
Male	24	5	29
Female	14	2	16

Symptom-specific analysis revealed that nasal obstruction improved in 88.9% of patients, while improvement in headache and nasal discharge was observed in 77.8% and 75% of cases, respectively, indicating substantial postoperative symptomatic relief.

Postoperative complications were minimal, with bleeding observed in 5% and infection in 2.5% of patients. No cases of septal perforation or major complications were reported.

Table 10: Postoperative Complications

Complication	Number	Percentage (%)
Bleeding	2	4.4
Infection	1	2.2
Septal perforation	0	0.0

Overall, the findings of this study demonstrate that septoplasty is associated with high success rates, significant symptomatic improvement, and low complication rates, with no statistically significant influence of age, gender, or type of deviation on surgical outcomes.

Discussion

The present Data expressed as n (%). p-value calculated by McNemar's test. Statistically significant at $p < 0.05$ study evaluated the clinical profile and surgical outcomes of septoplasty in patients with deviated nasal septum (DNS) at Chirayu Medical College & Hospital. The findings demonstrate a high rate of symptomatic improvement with minimal complications, supporting septoplasty as an effective intervention for DNS.

A male predominance (64.4%) was observed in this study, which is consistent with earlier epidemiological studies reporting higher prevalence of symptomatic DNS among males, possibly due to increased exposure to trauma and healthcare-seeking behavior [1]. The majority of patients belonged to the 26–35 years age group, reflecting the functional and social impact of nasal obstruction in the most active years of life. Similar age distribution has been reported in previous observational studies and large cohort analyses [2].

Nasal obstruction was the most common presenting symptom (91.1%), aligning with existing literature that identifies it as the primary indication for septoplasty [3]. Associated symptoms such as headache and nasal discharge were also frequently observed, suggesting the broader impact of DNS on sinonasal physiology and its role in predisposing patients to chronic rhinosinusitis [3,4].

In the present study, C-shaped deviation was the most common anatomical pattern (44.4%), followed by S-shaped deviation and septal spur. This distribution is consistent with anatomical classification studies, which report that simple deviations are more prevalent than complex deformities [2]. Importantly, although patients with C-shaped deviations demonstrated slightly better outcomes, the association between type of deviation and surgical success was not statistically significant ($p = 0.77$). This finding suggests that septoplasty is effective across different types of septal deformities and that anatomical variation alone may not be a strong predictor of outcome. Similar observations have been reported in recent studies where no significant correlation was found between deviation type and postoperative improvement [5].

The overall success rate in this study was 95.5%, which is comparable to previously reported success rates ranging from 70% to 90% in the literature [3,6]. A recent systematic review and meta-analysis reported significant improvement in patient-reported outcomes following septoplasty, with substantial reductions in NOSE and SNOT-22 scores at both short-term and long-term follow-up [6]. These findings corroborate the high success rate observed in the present study.

Randomized controlled trials comparing septoplasty with medical management have also demonstrated superior outcomes in the surgical group, with statistically significant improvements in symptom scores ($p < 0.001$) [7]. Although the present study did not include a control group, the high proportion of patients experiencing significant improvement supports the effectiveness of surgical intervention.

Age-wise analysis in the present study showed no statistically significant association between age and surgical outcome ($p = 0.57$), although younger patients demonstrated a slightly higher rate of improvement. This lack of statistical significance indicates that septoplasty is equally effective across the studied age groups. Similar findings have been reported in previous studies, suggesting that age is not a major determinant of surgical success [8].

Similarly, gender was not significantly associated with surgical outcome ($p = 0.88$), indicating that both males and females benefit equally from septoplasty. This is consistent with earlier studies that have found no gender-based differences in postoperative outcomes [5].

Symptom-specific analysis revealed that nasal obstruction improved in nearly 87.1% of patients, which is in agreement with studies using validated outcome measures such as the NOSE scale [6,9]. Improvement in associated symptoms such as headache and nasal discharge further supports the functional benefits of septoplasty beyond simple anatomical correction.

The complication rate observed in this study was low, with only minor complications such as bleeding (4.4%) and infection (2.2%), and no major complications like septal perforation. These findings are consistent with contemporary literature, where septoplasty is regarded as a safe procedure with complication rates typically below 10% [10]. Advances in surgical techniques and improved perioperative care have contributed to reduced complication rates in recent years.

An important aspect of the present study is the interpretation of statistical findings. Although no statistically significant associations were found between demographic or anatomical variables and surgical outcomes, this does not imply lack of clinical effectiveness. Rather, it suggests that septoplasty provides consistently favorable outcomes across diverse patient subgroups, reinforcing its reliability as a treatment modality. Additionally, the absence of statistically significant predictors may indicate that outcomes are influenced by multifactorial elements, including patient expectations, mucosal factors, and coexisting nasal conditions.

The findings of this study align well with current evidence from meta-analyses and randomized trials, which consistently demonstrate significant improvement in patient-reported outcomes following septoplasty [6,7]. However, it is important to note that some studies have highlighted variability in long-term outcomes, with a subset of patients reporting persistent symptoms. This underscores the importance of careful patient selection and comprehensive preoperative evaluation [11].

Strengths of the Study

- Real-world data from a tertiary care center
- Inclusion of inferential statistical analysis
- Consistent surgical technique across patients
- Clinically relevant outcome assessment

Limitations

Despite its strengths, the study has certain limitations. The retrospective design may introduce information bias. The relatively small sample size limits generalizability. Additionally, the absence of objective outcome measures such as NOSE or SNOT-22 scores may restrict comparability with contemporary studies. The follow-up duration was also limited to short-term outcomes.

Clinical Implications

The findings of this study reinforce that septoplasty is a safe, effective, and reliable procedure for the management of DNS, with high success rates and minimal complications. The lack of significant association between demographic variables and outcomes suggests that the procedure can be broadly applied across different patient groups without major concern for variability in results.

Conclusion

The present study demonstrates that septoplasty is a safe, effective, and reliable surgical intervention for the management of deviated nasal septum. A high rate of symptomatic improvement (85%) was observed, particularly in nasal obstruction, with additional benefits seen in associated symptoms such as headache and nasal discharge. The procedure was associated with a low complication rate, limited to minor and manageable postoperative events.

Importantly, inferential statistical analysis revealed no significant association between surgical outcomes and patient-related factors such as age, gender, or type of septal deviation. This suggests that septoplasty provides consistent and favorable outcomes across diverse patient subgroups, reinforcing its applicability in routine clinical practice.

The findings are in concordance with recent high-quality studies and meta-analyses, supporting septoplasty as an intervention that offers meaningful improvement in patient-reported outcomes and quality of life. Although statistical significance was not observed in subgroup analyses, the overall clinical effectiveness of the procedure remains substantial.

In conclusion, septoplasty should be considered the treatment of choice for symptomatic DNS, with predictable outcomes and minimal risk when performed with appropriate patient selection and surgical expertise. Future prospective studies incorporating objective outcome measures and long-term follow-up are recommended to further validate these findings and enhance evidence-based practice.

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