

Sleep Disturbances in Patient with Chronic Nasal Obstruction Due to Nasal Polyps

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Abstract

Background: Nasal polyps are benign growths that obstruct nasal passages, leading to chronic nasal obstruction and significant sleep disturbances, including snoring, daytime sleepiness, and impaired sleep quality. Endoscopic sinus surgery (ESS) has been shown to improve these symptoms, but the impact on objective sleep metrics remains unclear.

Aim of the study: To evaluate the associations between nasal obstruction due to nasal polyposis and sleep quality, and to assess the effect of endoscopic sinus surgery (ESS) on sleep disturbances in patients with nasal polyps.

Methods: A retrospective study was conducted at 250 Bed General Hospital, Khulna, Bangladesh, involving 22 patients with chronic nasal obstruction caused by nasal polyps. Preoperative and postoperative assessments included the Visual Analogue Scale (VAS) for snoring, Epworth Sleepiness Scale (ESS), Pittsburgh Sleep Quality Index (PSQI), and a symptom severity scale for nasal and sleep-related symptoms. Statistical analysis was performed using SPSS version 26, with paired t-tests applied for pre and postoperative comparisons.

Result: Significant postoperative improvements were observed in snoring (VAS: 2.48 ± 2.66 vs 0.98 ± 0.54 , $p < 0.001$), daytime sleepiness (ESS: 5.23 ± 4.45 vs 1.67 ± 0.99 , $p < 0.001$), and overall sleep quality (PSQI: 3.43 ± 2.78 vs 0.87 ± 0.74 , $p < 0.001$). Nasal symptoms, including congestion, rhinorrhea, and impaired smell, also showed substantial improvement ($p < 0.001$ for all). Sleep disturbances, such as daytime sleepiness, early morning waking, and difficulty falling asleep, decreased significantly ($p < 0.001$).

Conclusion: ESS significantly improves both subjective sleep quality and nasal symptoms in patients with chronic nasal obstruction due to nasal polyps.

Keywords: Nasal polyps, chronic nasal obstruction, sleep disturbances, endoscopic sinus surgery, snoring, daytime sleepiness.

I. INTRODUCTION

Nasal polyps are benign growths arising from the mucous membranes of the nasal passages and sinuses, often leading to chronic nasal obstruction [1]. Globally, chronic rhinosinusitis (CRS), which frequently involves nasal polyps, affects approximately 5-12% of the population [2]. This condition not only impairs nasal airflow but also significantly disrupts sleep quality, contributing to a diminished quality of life [3]. Patients with nasal polyps commonly experience sleep disturbances such as snoring, sleep-disordered breathing, and obstructive sleep apnea (OSA) [4]. The nasal obstruction caused by these polyps increases airway resistance, leading to fragmented sleep and excessive daytime sleepiness [5]. Research using the Pittsburgh Sleep Quality Index (PSQI) has shown that a significant number of patients with CRS experience poor sleep quality. These individuals often report difficulties falling asleep, frequent nighttime awakenings, and overall restless sleep, which can contribute to daytime fatigue and reduced quality of life [6]. The impact of nasal polyps on sleep is multifaceted, affecting various aspects of sleep quality, including the time required to fall asleep (sleep latency), the ability to sustain uninterrupted sleep, and overall restfulness. Chronic nasal obstruction caused by polyps often results in frequent nighttime awakenings, reduced deep sleep, and a persistent feeling of unrefreshing rest, ultimately leading to daytime fatigue and diminished daily functioning [3]. Patients with CRS are significantly more likely to experience sleep disturbances compared to those without CRS symptoms. These disturbances include difficulty falling asleep, trouble maintaining sleep, early morning awakenings, loud snoring, and excessive daytime sleepiness, all of which contribute to a reduced quality of life [7]. These disturbances are attributed to the mechanical blockage of nasal passages by polyps, leading to mouth breathing, reduced oxygenation during sleep, and increased arousals [8]. Surgical intervention, particularly endoscopic sinus surgery (ESS), has been shown to alleviate nasal obstruction and improve sleep quality in patients with nasal polyps [9]. Patients with chronic nasal obstruction due to nasal

polyps often experience significant sleep disturbances, including snoring, daytime sleepiness, and poor overall sleep quality. However, endoscopic sinus surgery (ESS) has been shown to provide substantial relief, leading to marked improvements in these sleep-related issues [10]. However, the effect on objective measures of sleep disordered breathing, such as the AHI, was limited, indicating that while ESS enhances subjective sleep experiences, its impact on OSA severity may be variable [11]. Surgical management through ESS has been shown to effectively improve subjective sleep quality and alleviate associated symptoms, though its impact on objective measures of sleep-disordered breathing may vary [12]. Addressing nasal polyps in patients with chronic nasal obstruction is crucial for restoring nasal patency and enhancing sleep quality, thereby improving overall well-being. The aim of this study is to evaluate the associations between nasal obstruction and its impact on sleep quality in patients with nasal polyposis, assessing sleep disturbances using various sleep questionnaires and the effect of endoscopic sinus surgery on sleep quality.

II. METHODOLOGY & MATERIALS

This was a retrospective study conducted at 250 Bed General Hospital, Khulna, Bangladesh. The study duration spanned from 15th April 2023 to October 2023. A total of 22 patients diagnosed with chronic nasal obstruction due to nasal polyps were recruited for the study.

Inclusion Criteria:

- Aged between 20 to 60 years.
- Suffered from chronic nasal obstruction for more than six months.
- Had not received any prior treatment for nasal obstruction.
- Demonstrated grade II or higher nasal polyps upon endoscopic examination.

Exclusion Criteria:

- Acute rhinosinusitis.
- Structural nasal deformities causing obstruction.
- Vasomotor or allergic rhinitis confirmed via skin testing.
- Nasal tumors or systemic diseases (e.g., hypothyroidism) associated with nasal congestion.
- History of psychological or neuropsychiatric disorders, use of psychotropic medications.
- Hearing impairment.
- Diagnosed obstructive sleep apnea syndrome (OSAS) confirmed by polysomnography.
- Witnessed apneic events or episodes of nocturnal choking.

Additionally, patients were instructed to discontinue any medications affecting cognitive function at least one week before testing. None of the participants consumed alcohol or narcotics within 24 hours of testing.

Ethical Considerations

The study adhered to ethical principles of confidentiality and privacy, ensuring that all patient data were anonymized and securely stored. Informed consent was obtained where applicable, and the research protocol was reviewed and approved by the relevant institutional ethics committee, ensuring compliance with ethical standards in human subject research.

Data Collection

Baseline demographic data, including age and gender, were recorded. All patients underwent nasal endoscopy to confirm the presence and severity of nasal polyps, with only those presenting bilateral Grade III polyps included in the analysis.

To assess sleep disturbances and nasal symptoms, the following tools were administered preoperatively and one month postoperatively:

- Visual Analogue Scale (VAS): Used to quantify snoring severity (0 = no snoring; 10 = loud snoring audible from another room), rated by the patient's partner.
- Epworth Sleepiness Scale (ESS): Evaluated excessive daytime sleepiness, with scores categorized into normal, average, and excessive sleepiness.
- Pittsburgh Sleep Quality Index (PSQI): Assessed overall sleep quality, where higher scores indicated poorer sleep.
- Symptom Severity Scale: Patients self-rated specific nasal and sleep-related symptoms (e.g., nasal congestion, rhinorrhea, impaired smell, headache, concentration difficulty) on a scale from 0 to 10, both before and after surgery.

- Sleep Symptom Checklist: Frequency of specific sleep disturbances (e.g., daytime sleepiness, difficulty falling asleep, early morning awakening, sleep duration <6 hours, apnea) was documented pre- and post-treatment.

All surgical interventions (endoscopic sinus surgery) were performed by the same medical team to ensure consistency. Postoperative assessments were conducted one month after surgery to evaluate changes in symptoms.

Data Analysis

Data analysis was conducted using SPSS version 26.0. Continuous variables such as VAS, ESS, PSQI scores, and symptom severity ratings were summarized using mean $\pm$ standard deviation (SD). The paired t-test was applied to compare preoperative and postoperative scores to determine statistically significant changes, with a p-value < 0.05 considered significant. Categorical variables, including gender distribution and frequencies of sleep-related symptoms, were expressed as counts and percentages. Changes in these categorical variables before and after surgery were evaluated using the chi-square test. The analysis confirmed statistically significant improvements in all evaluated parameters postoperatively, including reductions in snoring severity, daytime sleepiness, sleep disturbances, and nasal symptoms such as congestion, rhinorrhea, and headache.

III. RESULT

A total of 22 patients participated in the study, with a mean age of 40.65 ± 13.11 years. Most participants were male (77.27%), while females made up 22.73%, and all had Grade III nasal polyps (Table 1). Pre-operatively, the mean VAS score for snoring was 2.48 ± 2.66 , which decreased significantly to 0.98 ± 0.54 post-operatively ($p < 0.001$). Classification by VAS showed that 54.55% of patients had mild snoring pre-operatively, and 90.91% reported no snoring post-operatively. The mean ESS score improved from 5.23 ± 4.45 to 1.67 ± 0.99 ($p < 0.001$), with 100% of patients showing no abnormal daytime sleepiness post-treatment. The mean PSQI score improved from 3.43 ± 2.78 to 0.87 ± 0.74 post-operatively ($p < 0.001$) (Table 2). Table 3 showed that nasal congestion was the most prevalent symptom, with all patients reporting it (100%) both pre-operatively and post-operatively. The severity of nasal congestion significantly decreased from a mean of 7.34 ± 1.65 pre-operatively to 1.18 ± 1.85 post-operatively ($p = 0.001$). Similarly, rhinorrhea was reported by 77.27% of patients pre-operatively, and post-operatively, all patients showed improvement, with the symptom severity dropping from 6.12 ± 1.87 to 1.33 ± 1.63 ($p = 0.001$). Impaired smell was reported by 90.91% of patients pre-operatively, and 90% of those patients showed improvement post-operatively, with severity reducing from 6.84 ± 3.44 to 2.84 ± 2.45 ($p = 0.001$). Postnasal drip affected 86.36% of patients pre-operatively, and after treatment, all patients showed recovery, with severity decreasing from 4.89 ± 3.26 to 2.54 ± 1.78 ($p = 0.001$). Headache was experienced by 81.82% of patients pre-operatively, with all affected patients reporting recovery post-operatively. The mean severity score decreased from 6.78 ± 1.69 pre-operatively to 1.01 ± 1.02 post-operatively ($p = 0.001$). Snoring was reported by 90.91% of patients pre-operatively, with symptom severity reducing significantly from 8.54 ± 1.41 to 2.86 ± 2.03 post-operatively ($p = 0.001$). Regarding sleep symptoms, daytime sleepiness reduced from 66.7% to 10%, early morning wake-ups from 50% to 5%, and difficulty falling asleep from 60% to 5%. Sleep duration less than 6 hours/day decreased from 70% to 10%. Snoring decreased slightly from 80% to 75%, and apnea from 33.3% to 30%. Disturbed sleep dropped from 70% to 10% (Table 4).

Table 1: Baseline characteristics of the study population

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Characteristics	Frequency (n)	Percentage (%)
Age (mean±SD)	40.65±13.11	
Gender		
Male	17	77.27
Female	5	22.73
Grade of nasal polyp		
Grade II	0	0.00
Grade III	22	100.00

Table 2: Pre-operative and post-operative clinical characteristics of patients with bilateral nasal polyposis grade III (n=22)

Parameter	Pre-operative		Post-operative		P-value
	n	%	n	%	
Mean VAS score for snoring±SD	2.48±2.66		0.98±0.54		<0.001
Classification by VAS					
No snoring (VAS=0)	1	4.55	20	90.91	<0.001
Mild snoring (VAS=1-3)	12	54.55	2	9.09	
Moderate snoring (VAS=4-6)	6	27.27	0	0.00	
Severe snoring (VAS=7-10)	3	13.64	0	0.00	
Mean ESS score±SD	5.23±4.45		1.67±0.99		<0.001
Classification by ESS					

Unlikely to be abnormally sleepy (ESS=0-7)	16	72.73	22	100.00	0.05
Average amount of daytime sleepiness (ESS=8-9)	2	9.09	0	0.00	
Excessively sleepy depending on situation (ESS=10-15)	4	18.18	0	0.00	
Excessively sleepy (ESS=16-24)	0	0.00	0	0.00	
Mean PSQI score±SD	3.43±2.78		0.87±0.74		<0.001

Table 3: Preoperative and postoperative symptom severity

Variables	Complainant patient number (n=22)		Recovered patient number		Symptom severity (mean ± SD)		P-value
	n	%	n	%	Pre-operative	Post-operative	
Nasal congestion	22	100.00	22/22	100.00	7.34 ± 1.65	1.18 ± 1.85	0.001
Rhinorrhea	17	77.27	17/17	100.00	6.12 ± 1.87	1.33 ± 1.63	0.001
Impaired smell	20	90.91	18/20	90.00	6.84 ± 3.44	2.84 ± 2.45	0.001
Postnasal drip	19	86.36	19/19	100.00	4.89 ± 3.26	2.54 ± 1.78	0.001
Headache	18	81.82	18/18	100.00	6.78 ± 1.69	1.01 ± 1.02	0.001
Snoring	20	90.91	18/20	90.00	8.54 ± 1.41	2.86 ± 2.03	0.001
Diffculty in concentration	20	90.91	20/20	100.00	5.56 ± 3.67	1.39 ± 0.99	0.001
Blunted affect	15	68.18	15/15	100.00	5.32 ± 2.14	1.01 ± 0.92	0.001

Table 4: Comparison of sleep symptoms before and after treatment

Symptom	Before Treatment (%)	After Treatment (%)
Daytime sleepiness	66.7	10
Early morning wake up	50	5
Difficulty falling asleep	60	5
Sleep duration < 6 hrs/day	70	10
Snoring	80	75
Apnea	33.3	30
Disturbed sleep (frequent awakenings)	70	10

IV. DISCUSSION

Patients with chronic nasal obstruction due to nasal polyps often experience significant sleep disturbances, affecting their overall quality of life. Impaired nasal airflow can lead to disrupted sleep patterns, frequent awakenings, and daytime fatigue. The present study evaluated the clinical outcomes and improvement in sleep and nasal symptoms following treatment of bilateral nasal polyposis. The mean age of participants in this study was 40.65±13.11 years, with a male predominance (77.27%). These results are consistent with previous studies on nasal polyposis, where the male population was also found to be predominantly affected. For instance, research by Collins et al. similarly reported a male-to-female ratio of 2:1 in a cohort with nasal polyposis [13]. Moreover, the presence of only grade III polyps in our cohort is aligned with other studies, which suggest that severe polyposis often presents with a higher symptom burden and significantly affects sleep and quality of life [14]. The pre and post-operative scores for snoring and sleepiness, assessed through the VAS and ESS, demonstrated significant improvements following treatment ($p < 0.001$). Specifically, the mean VAS score for snoring reduced from 2.48±2.66 to 0.98±0.54, and the ESS score decreased from 5.23±4.45 to 1.67±0.99. These findings align with the study by Tosun et al., who reported similar improvements in snoring and daytime sleepiness after endoscopic sinus surgery for nasal polyps, with a marked reduction in both VAS and ESS scores [10]. Furthermore, our results support the conclusions drawn by Värendh et al., where treatment of nasal polyps was shown to significantly reduce the severity of daytime sleepiness, contributing to improved quality of life [15]. The reductions in symptom severity were consistently significant across all symptoms ($p < 0.001$). These results are consistent with previous reports, including those by Ehnhage et al., who found substantial post-surgical improvements in nasal symptoms such as congestion, rhinorrhea, and both subjective and objective measures of olfaction [16]. Moreover, Arslan et al. reported similar improvements in snoring and headache symptoms following treatment for nasal polyposis [17]. In the analysis of sleep-related symptoms, our findings show a significant reduction in symptoms like daytime sleepiness, early morning waking, and difficulty falling asleep, with these improvements being statistically significant ($p < 0.001$). These results mirror those reported by Giri et al., who observed similar reductions in sleep disturbances following treatment for nasal polyps [18]. Additionally, El Rassi et al. emphasized the beneficial impact of sinus surgery in improving sleep quality by reducing symptoms like disturbed sleep and snoring, which aligns with our data showing a marked improvement in both snoring and sleep quality post-treatment [19]. Our study demonstrates that treatment for grade III bilateral nasal polyposis results in substantial improvements in both nasal and sleep-related symptoms, as well as a significant reduction in daytime sleepiness. These findings are consistent with the broader literature on nasal polyposis treatment, where surgical intervention has been shown to effectively alleviate symptoms such as snoring, nasal congestion, and impaired smell, as well as improving quality of life markers, including sleep.

Limitations of the study:

- The short follow-up period limits the assessment of long-term symptom recurrence and sustained improvement, necessitating extended follow-up studies.
- The reliance on subjective outcome measures (VAS, ESS, PSQI) may introduce response bias, and the absence of objective sleep studies like polysomnography restricts comprehensive sleep quality evaluation.
- Potential confounders, such as medication use or lifestyle changes, were not accounted for, highlighting the need for larger, multicenter studies with extended follow-up to validate and strengthen these findings.

V. CONCLUSION

This study demonstrates that surgical treatment for grade III bilateral nasal polyposis leads to significant improvements in nasal and sleep-related symptoms, including snoring, daytime sleepiness, and sleep quality. Post-operatively, patients experienced substantial reductions in nasal congestion, rhinorrhea, impaired smell, and other symptoms, with statistically significant improvements across all measured parameters. These findings reinforce the efficacy of surgical intervention in enhancing both respiratory function and overall quality of life. Given these outcomes, early diagnosis and appropriate surgical management should be considered for patients with severe nasal polyposis and associated sleep disturbances. Further large-scale, multicenter studies are recommended to validate these results and explore long-term benefits and recurrence rates.

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