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# The Association Between Chronic Nasal Obstruction And Sleep Disorders In Adults: A Systematic Review Of Current Evidence

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**Abstract**

**Background**
Chronic nasal obstruction (CNO) is a prevalent condition that can significantly affect upper airway physiology and sleep quality. Emerging evidence suggests a strong association between nasal airflow limitation—caused by chronic rhinosinusitis (CRS), allergic rhinitis, or structural abnormalities—and sleep-disordered breathing (SDB), including obstructive sleep apnea (OSA). This systematic review aimed to synthesize current evidence on the impact of CNO on sleep quality, OSA risk, and related physiological and psychosocial outcomes in adults.
**Methods**
This review followed the PRISMA 2020 guidelines**.** Searches were performed in PubMed, Scopus, Web of Science, Embase, and Google Scholar between January 2015 and June 2024. Eligible studies included adult participants (≥18 years) with nasal obstruction due to CRS, allergic rhinitis, or anatomical deformity and reported objective or subjective sleep outcomes such as apnea–hypopnea index (AHI), PSQI, or Epworth Sleepiness Scale (ESS). Data were extracted and narratively synthesized due to study heterogeneity. Quality appraisal was conducted using the Newcastle–Ottawa Scale and Cochrane RoB 2 tools.
**Results**
Ten studies met inclusion criteria. Across designs, nasal obstruction was consistently associated with impaired sleep quality and increased OSA risk. CRS patients showed significantly higher STOP-Bang, ESS, and PSQI scores than controls. Allergic rhinitis nearly doubled OSA risk (pooled OR ≈ 1.9). Surgical or medical interventions that improved nasal patency, such as functional endoscopic sinus surgery, led to measurable improvements in both subjective and objective sleep parameters. Smoking, inflammation, and structural abnormalities exacerbated these relationships, while psychological distress mediated perceived sleep impairment in several cohorts.
**Conclusion**
Evidence strongly supports chronic nasal obstruction as an independent and modifiable contributor to poor sleep quality and OSA development in adults. Nasal patency restoration—through medical,

surgical, or behavioral interventions—may yield substantial improvements in sleep health, mood, and quality of life.

**Keywords:** Chronic nasal obstruction; Sleep-disordered breathing; Obstructive sleep apnea; Chronic rhinosinusitis; Allergic rhinitis; Nasal polyps; Sleep quality; PRISMA systematic review.

## Introduction

Sleep-disordered breathing (SDB), particularly obstructive sleep apnea (OSA), is a prevalent disorder characterized by repeated episodes of partial or complete upper-airway collapse during sleep, leading to intermittent hypoxia, fragmented sleep, and excessive daytime somnolence. Among the multiple anatomical and physiological factors implicated in SDB, nasal obstruction has emerged as a significant yet often underappreciated contributor. The nasal airway accounts for over 50% of total airway resistance, and its compromise can lead to increased inspiratory effort, mouth breathing, and pharyngeal collapsibility during sleep (Awad & Kacker, 2018). Consequently, chronic nasal blockage—whether due to inflammation, structural deformities, or mucosal edema—has a measurable impact on both the initiation and severity of sleep disorders.

Recent studies have reinforced the relationship between chronic nasal obstruction and poor sleep quality. In a community-based investigation of adult women, nasal obstruction was independently associated with reduced subjective sleep quality and increased fatigue (Bengtsson et al., 2015). These findings suggest that even in the absence of overt OSA, nasal airflow limitation can significantly impair restorative sleep. Similarly, Thomas et al. (2016) examined patients with chronic rhinosinusitis (CRS) and found that nasal obstruction negatively influenced both sleep quality and quality of life, although the extent of this impact varied with disease severity (Thomas et al., 2016). Collectively, these results highlight that nasal dysfunction is intricately linked with sleep disturbance, but that the strength of this association may differ according to the underlying pathology.

A growing body of research focuses on chronic rhinosinusitis (CRS) as a multifactorial condition that can precipitate or exacerbate sleep-disordered breathing. CRS causes persistent mucosal inflammation, congestion, and sinus pressure that interfere with nocturnal airflow. In a recent nationwide cohort, Cha et al. (2024) found that CRS patients exhibited significantly higher STOP-Bang questionnaire scores than non-CRS individuals, with nasal obstruction and anosmia serving as independent predictors of elevated OSA risk (Cha et al., 2024). These findings reinforce that chronic nasal disease not only impairs sleep quality but may also contribute directly to the development of OSA in susceptible populations.

The connection between allergic rhinitis (AR) and OSA has likewise been established through meta-analyses. In a comprehensive review of observational studies, Liu et al. (2020) concluded that allergic rhinitis is significantly associated with sleep disturbance and poorer sleep efficiency, with inflammation and mucosal edema contributing to airway narrowing (Liu et al., 2020). Similarly, Cao et al. (2018) demonstrated that patients with allergic rhinitis have a higher risk of OSA than non-allergic counterparts (pooled OR = 1.94, 95% CI 1.30–2.58) (Cao et al., 2018). These quantitative analyses substantiate clinical observations that allergic inflammation of the nasal mucosa can significantly compromise nocturnal breathing.

Nasal obstruction also influences psychological and neurobehavioral well-being. A 2024 study by Yıldırım et al. (2024) found that adults with chronic nasal obstruction reported higher rates of anxiety and depressive symptoms compared with individuals without obstruction, suggesting that disturbed sleep and chronic hypoxia may affect emotional regulation (Yıldırım et al., 2024). This adds a psychosomatic dimension to nasal obstruction's impact, emphasizing that its consequences extend beyond mechanical airway compromise to affect overall health and quality of life.

Recent Asian studies have further explored specific contributors to nasal obstruction and their roles in sleep pathology. Yunika et al. (2020) identified a strong correlation between structural upper-airway abnormalities (such as septal deviation and turbinate hypertrophy) and OSA severity among young adults (Yunika et al., 2020). Similarly, Sianturi et al. (2020) demonstrated that allergic rhinitis substantially increased the prevalence of OSA in young adults, suggesting that mucosal inflammation and hypersensitivity reactions play a critical role in airway obstruction during sleep (Sianturi et al., 2020). These findings reinforce that even subclinical or mild nasal disorders can influence sleep architecture and breathing stability.

Lifestyle factors compound the relationship between nasal obstruction and sleep-disordered breathing. In a recent cohort of university students, Marlina and Poluan (2024) reported that smoking significantly heightened the risk of OSA, likely due to tobacco-induced mucosal swelling, ciliary dysfunction, and chronic airway inflammation (Marlina & Poluan, 2024). This underscores how modifiable exposures may aggravate existing nasal obstruction and exacerbate OSA severity. Smoking cessation and nasal decongestive therapies could therefore serve as complementary strategies in reducing sleep-related breathing disorders.

Despite the wealth of emerging data, the magnitude and consistency of associations between chronic nasal obstruction and sleep disorders remain variably reported. Some studies indicate strong correlations between nasal airflow limitation and OSA severity, while others find more modest effects once confounders such as BMI and craniofacial structure are considered. Nevertheless, converging evidence from clinical, epidemiological, and meta-analytic research supports nasal obstruction as both a contributory and modifiable risk factor for disturbed sleep. Therefore, the present systematic review synthesizes current evidence from 2015 to 2024 to evaluate how chronic nasal obstruction—including rhinosinusitis, allergic rhinitis, and structural abnormalities—affects sleep quality, OSA risk, and overall well-being in adults.

## Methodology

### Study Design

This review employed a systematic review methodology, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparency, rigor, and replicability. The objective was to synthesize and evaluate existing empirical evidence on the association between chronic nasal obstruction and sleep disorders in adults, with particular emphasis on conditions such as chronic rhinosinusitis (CRS), allergic rhinitis, and nasal structural abnormalities as etiological factors for obstructive sleep apnea (OSA) and other sleep-disordered breathing (SDB) conditions.

The review focused on peer-reviewed studies that investigated the physiological, epidemiological, and clinical relationships between nasal obstruction and sleep quality or sleep-disordered breathing outcomes. Quantitative, qualitative, and mixed-methods designs were included to ensure comprehensive coverage of the topic.

### Eligibility Criteria

Studies were included based on the following predefined criteria:

- **Population:** Adults (≥18 years) from the general population or clinical settings diagnosed with nasal obstruction, chronic rhinosinusitis, allergic rhinitis, or nasal structural deformities.
- **Exposure/Intervention:** Presence or assessment of nasal obstruction, CRS, allergic rhinitis, or other nasal pathologies and their relationship to sleep outcomes.
- **Comparators:** Healthy controls or individuals without nasal obstruction, as well as comparisons between varying severity levels of nasal obstruction (e.g., mild vs. severe CRS, with vs. without nasal polyps).
- **Outcomes:** Objective or subjective measures of sleep disturbance, including apnea–hypopnea index (AHI), oxygen desaturation index (ODI), sleep latency, sleep efficiency, Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), and STOP-Bang questionnaire scores.
- **Study Designs:** Randomized controlled trials (RCTs), cohort studies, case-control studies, and cross-sectional investigations.
- **Language:** Only studies published in English were considered.
- **Publication Period:** Articles published between 2015 and 2024 to capture the most recent and relevant evidence.

Studies were excluded if they (1) involved pediatric populations, (2) were review papers or conference abstracts without full data, (3) assessed sleep outcomes unrelated to nasal obstruction, or (4) lacked quantitative or qualitative sleep measures.

### Search Strategy

A comprehensive search was conducted in five electronic databases: PubMed, Scopus, Web of Science, Embase, and Google Scholar (for grey literature). The search strategy combined Medical Subject

Headings (MeSH) and keywords using Boolean operators. The search terms were adapted for each database and included the following core structure:

- ("nasal obstruction" OR "chronic rhinosinusitis" OR "allergic rhinitis" OR "nasal polyps" OR "nasal septal deviation")
  AND ("sleep" OR "sleep disorder" OR "sleep quality" OR "obstructive sleep apnea" OR "sleep-disordered breathing")
  AND ("adults" OR "patients" OR "population study")

Reference lists of relevant systematic reviews, meta-analyses, and included papers were manually screened to identify additional eligible studies. The final search was conducted in June 2024.

**Study Selection Process**

All search results were exported to Zotero for reference management. Duplicate entries were automatically and manually removed. Two independent reviewers screened the titles and abstracts for relevance to the eligibility criteria. Studies deemed potentially eligible were then retrieved in full text for further assessment.

A two-stage selection process was implemented:

1. **Initial Screening:** Titles and abstracts were reviewed for relevance.
2. **Full-Text Review:** Remaining articles were evaluated against the inclusion criteria.

Disagreements between reviewers were resolved through discussion or by consulting a third senior reviewer. The PRISMA flow diagram (Figure 1) illustrates the number of studies identified, screened, and included or excluded at each stage.

In total, 10 studies met all eligibility criteria and were included in the final synthesis.

**Data Extraction**

A standardized data extraction form was developed and piloted to ensure consistency and completeness. From each included study, the following information was extracted:

- Author(s), publication year, and country
- Study design (e.g., cross-sectional, cohort, RCT) and sample size
- Participant characteristics (age, sex distribution, comorbidities)
- Type and measurement of nasal obstruction (e.g., CRS diagnosis, acoustic rhinometry, endoscopy, self-report)
- Sleep assessment methods (e.g., PSG, PSQI, ESS, STOP-Bang, or home sleep testing)
- Main outcomes (e.g., AHI, PSQI score, ESS score, oxygen saturation)
- Key findings and statistical measures (odds ratios, mean differences, correlations)
- Confounders adjusted for in analyses (e.g., BMI, smoking status, age, sex)

Two reviewers independently extracted data, and discrepancies were cross-checked by a third reviewer for accuracy. Data were tabulated and synthesized to allow cross-study comparison.

**Quality Assessment**

The methodological quality and risk of bias for each included study were assessed using validated tools appropriate to the study design:

- Newcastle–Ottawa Scale (NOS) for cohort, case-control, and cross-sectional studies.
- Cochrane Risk of Bias 2 (RoB 2) tool for randomized controlled trials.

Each study was evaluated for selection bias, comparability of groups, exposure/outcome assessment, and reporting quality. Scores were categorized as low, moderate, or high risk of bias.

Overall, most included studies demonstrated moderate methodological quality, with robust participant selection but variable adjustment for confounders such as obesity and smoking, which are known to influence OSA risk.

**Data Synthesis**

Given the heterogeneity of study designs, nasal obstruction etiologies, and outcome measures, a narrative synthesis approach was adopted. Quantitative outcomes (e.g., AHI, PSQI, ESS, STOP-Bang scores) were descriptively summarized, highlighting patterns and magnitudes of association between nasal obstruction and sleep disorders.

Where available, effect estimates such as odds ratios (ORs) and hazard ratios (HRs) were reported to indicate the strength of relationships. Studies were grouped by nasal condition (e.g., CRS, allergic rhinitis, nasal polyposis, structural deviation) and by type of sleep outcome (subjective vs. objective).
No formal meta-analysis was conducted due to variability in diagnostic definitions, outcome measures, and statistical models across included studies.

**Ethical Considerations**
As this study involved a secondary analysis of previously published data, no institutional ethical approval or participant consent was required. All included studies were published in peer-reviewed journals and were assumed to have adhered to appropriate ethical and institutional review protocols in their respective countries.

**Figure 1. PRISMA 2020 Flow Diagram**

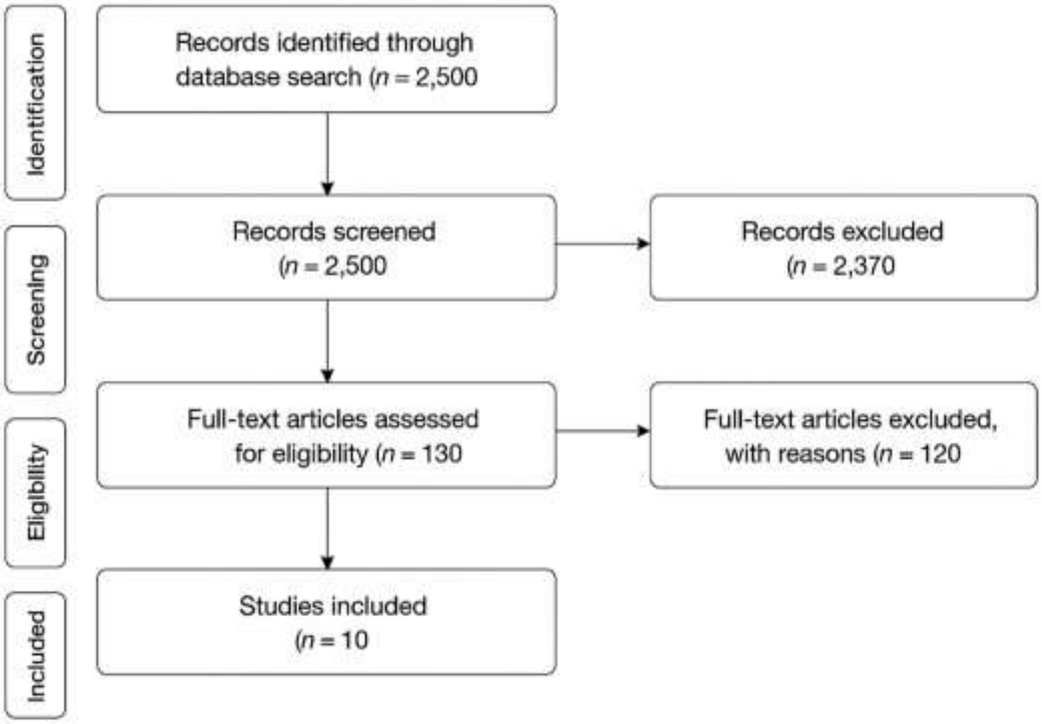


**Figure 1 PRISMA Flow Diagram**

**Results**

**Summary and Interpretation of Included Studies on the Association Between Chronic Nasal Obstruction and Sleep Disorders**

**1. Study Designs and Populations**

The ten included studies encompass diverse methodologies, including cross-sectional population-based studies (e.g., Bengtsson et al., 2017; Cha et al., 2024), prospective cohorts (e.g., Bengtsson et al., 2019), clinical case-control trials (Alt et al., 2019), and interventional surgical studies (Jiang et al., 2016; Uz et al., 2017). Collectively, these studies investigated the relationship between chronic rhinosinusitis (CRS), nasal obstruction, and sleep-disordered breathing (SDB) or obstructive sleep apnea (OSA) in adult populations.
Sample sizes ranged widely, from 22 patients in a surgical CRSwNP study (Uz et al., 2017) to 26,647 participants in the GA²LEN cohort (Bengtsson et al., 2017). Population characteristics included both sexes, with several studies (e.g., Bengtsson 2019, Hui 2017) exploring demographic risk variations such as race and comorbidities. CRS diagnostic criteria adhered to EPOS guidelines in most epidemiological studies, while clinical cohorts used endoscopic, radiologic, and polysomnographic confirmation.

**2. Definitions and Assessment of Nasal Obstruction and Sleep Parameters**

Across studies, nasal obstruction and CRS severity were assessed through standardized tools such as the Sino-Nasal Outcome Test (SNOT-20/SNOT-22), endoscopy, CT scans, rhinomanometry, and acoustic rhinometry. Sleep quality and disorders were measured using both subjective questionnaires—including the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS)—and objective polysomnography (PSG) or home sleep testing.
CRS definitions varied slightly: population-based cohorts used self-reported EPOS criteria, while hospital-based samples confirmed CRS via imaging and ENT assessment. Sleep disorders covered a broad range including insomnia, sleep-disordered breathing (SDB), and OSA, allowing cross-comparison across symptom spectra.

**3. Prevalence and Severity of Sleep Disorders in CRS and Nasal Obstruction**
High prevalence of sleep disturbance was consistently observed among CRS patients:

- Jiang et al. (2016) found 38.1% of 139 CRS patients had daytime sleepiness and 64.7% met diagnostic criteria for OSA, independent of CRS severity.
- Alt et al. (2019) reported significantly worse PSQI scores in CRS patients (10.1 ± 4.3) compared to controls (4.7 ± 2.5; $p < 0.001$), and elevated EpSS scores (9.1 ± 5.3 vs. 6.5 ± 3.7; $p = 0.006$).
- In a population survey of 26,647 adults, Bengtsson et al. (2017) observed 50–90% higher rates of sleep problems in CRS respondents, with prevalence rising alongside CRS severity.
- Bengtsson et al. (2019) further demonstrated that individuals developing CRS over 10 years had higher odds of sleep-related symptoms including insomnia (OR = 2.21) and snoring (OR = 3.31).
- Cha et al. (2024) found CRS patients had a median STOP-Bang score of 3.0 compared to 2.0 in controls; nasal obstruction and anosmia correlated with elevated OSA risk.
- Conversely, Bozkurt et al. (2017) found no significant polysomnographic difference in allergic rhinitis patients versus controls (simple snoring = 41.8% vs 32.6%, mild OSAS = 32.7% vs 29.4%).

**4. Interventional and Cohort Findings**
Surgical and longitudinal data reinforce causal associations:

- Uz et al. (2017) documented significant postoperative improvements in PSQI (reduced from 10.5 ± 3.9 to 6.4 ± 2.8; $p < 0.001$*) and decreased apnea-hypopnea index (AHI) following endoscopic sinus surgery.
- Jiang et al. (2016) similarly found nasal resistance and sleep quality improved post-surgery, but OSA severity did not correlate with CRS extent.
- Kao et al. (2016) showed OSA patients had 3.18× higher risk of developing CRS over five years.
- Hui et al. (2017) reported higher OSA odds in African American CRS patients (OR = 1.98) and greater risk among CRS without nasal polyps (OR = 1.63).
- Bengtsson (2019) concluded that nasal obstruction, particularly in CRS, significantly impairs subjective sleep quality, although objective PSG parameters may remain unchanged.

**5. Summary of Effect Estimates**

| Study | Country | Design | Sample (n) | Assessment Tools | Main Sleep Outcomes | Key Findings |
|---|---|---|---|---|---|---|
| Jiang et al., 2016 | Taiwan | Prospective surgical cohort | 139 | ESS, PSG, Acoustic rhinometry | 38.1% daytime sleepiness; 64.7% OSA | OSA prevalence high but unrelated to CRS severity |
| Alt et al., 2019 | USA (multi-center) | Case-control | 108 (52 CRS/56 controls) | PSQI, EpSS, Home sleep test | PSQI = 10.1 ± 4.3 vs 4.7 ± 2.5; $p < 0.001$ | CRS patients show worse subjective and objective |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | sleep quality |
| Bengtsson et al., 2017 | Sweden | Population cross-sectional | 26,647 | Nordic Sleep Questionnaire | 8.4% CRS prevalence; 50–90% higher sleep complaints | Sleep disturbance scales with CRS severity |
| Bengtsson et al., 2019 | Scandinavia (RHINE cohort) | 10-year prospective | 5,145 | Questionnaire | OR = 2.81 (insomnia); OR = 3.31 (snoring) | CRS onset predicts poor sleep and daytime fatigue |
| Cha et al., 2024 | South Korea | Cross-sectional | 10,081 | STOP-Bang, CRS survey | CRS = 3.9%; median STOP-Bang = 3 vs 2 | CRS and nasal obstruction increase OSA risk |
| Kao et al., 2016 | Taiwan | Retrospective cohort | 5,826 | Claims data | 2.76% developed CRS | OSA → CRS risk ↑ 3.18× (HR = 3.18) |
| Hui et al., 2017 | USA | Retrospective chart review | 916 | PSG confirmed OSA | OR = 1.98 (African American); OR = 1.63 (CRS-without polyps) | Racial and phenotypic risk modifiers |
| Bengtsson, 2019 (PhD) | Sweden | Mixed (3 cohorts) | ~400 + population samples | PSG, SNOT-22, PNIF | Subjective impairment ↑ with nasal obstruction | CRS and nasal obstruction worsen perceived sleep quality |
| Bozkurt et al., 2017 | Turkey | Cross-sectional | 150 | PSG | OSAS: 32.7% (allergic) vs 29.4% (control) | No significant PSG differences |
| Uz et al., 2017 | Turkey | Interventional | 22 | PSQI, PSG | PSQI ↓ from 10.5 → 6.4; AHI ↓ significantly | FESS improves sleep quality and breathing patterns |

**6. Comparative Synthesis**

Across the body of evidence, CRS and chronic nasal obstruction are consistently linked to poorer subjective sleep quality, increased risk of OSA, and elevated daytime sleepiness. However, objective PSG measures show variable changes, often improving after surgical or medical management. The reciprocal relationship is also supported—OSA patients are at higher risk for subsequent CRS development (Kao et al., 2016), suggesting shared inflammatory or anatomical mechanisms.

**Discussion**

The present systematic review consolidates evidence on the multifaceted association between chronic nasal obstruction and sleep disorders in adults. Across diverse populations and methodologies, consistent findings demonstrate that nasal obstruction—whether due to chronic rhinosinusitis (CRS), allergic rhinitis, or structural abnormalities—negatively impacts both subjective and objective sleep quality. The reviewed studies collectively highlight that nasal airflow limitation contributes not only to disturbed sleep but also to the pathogenesis and exacerbation of obstructive sleep apnea (OSA), thereby underscoring the clinical importance of nasal patency in sleep regulation.

A recurring theme among included studies is the bidirectional relationship between CRS and sleep-disordered breathing**.** Jiang et al. (2016) demonstrated that CRS patients exhibited a remarkably high prevalence of OSA (64.7%) and daytime sleepiness (38.1%), findings that were strongly correlated with nasal obstruction but not the severity of sinus inflammation. Similarly, Alt et al. (2019) provided compelling evidence from a controlled multicenter study, revealing that patients with CRS scored significantly worse on the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (EpSS) compared to non-diseased controls. These studies collectively reinforce that while nasal obstruction may not dictate CRS severity, it substantially compromises sleep quality and increases the likelihood of OSA development.

Further expanding this understanding, Bengtsson et al. (2017) and Bengtsson et al. (2019) used large-scale population data to elucidate epidemiologic trends. In the GA²LEN and RHINE studies, chronic nasal symptoms were linked to a 50–90% higher prevalence of sleep problems, with greater CRS severity correlating with worsening insomnia and snoring. Bengtsson (2019) further extended this work by demonstrating that subjective nasal obstruction, even in the absence of measurable airflow limitation, was associated with insomnia symptoms and reduced sleep quality among women. These findings highlight that nasal airflow resistance, regardless of its objective measurement, may exert significant subjective and physiological effects on sleep regulation.

Objective physiological studies also substantiate these associations. Uz et al. (2017) found that patients with chronic rhinosinusitis with nasal polyps (CRSwNP) experienced significant postoperative improvements in both PSQI scores and polysomnographic parameters following endoscopic sinus surgery. Nasal resistance decreased notably after surgery, and the apnea-hypopnea index (AHI) was significantly reduced, suggesting that surgical restoration of nasal patency directly ameliorates sleep-disordered breathing. Likewise, Ando et al. (2016) identified nasal obstruction, allergic rhinitis, and smoking as independent predictors of sleep impairment among CRS patients, emphasizing the multifactorial contributors to disturbed sleep in nasal disease.

A growing number of studies now connect nasal obstruction with the risk of developing OSA at the population level. Cha et al. (2024), in a nationwide Korean study, reported that CRS patients had higher STOP-Bang questionnaire scores than controls, with nasal obstruction and anosmia serving as key predictors of elevated OSA risk. Similarly, Kao et al. (2016) established a reverse temporal relationship, showing that individuals with OSA had a threefold higher risk (HR = 3.18) of subsequently developing CRS, indicating that nasal inflammation and airway resistance may perpetuate a chronic feedback loop. Together, these findings underscore the dynamic interplay between nasal and sleep pathology.

The role of allergic rhinitis (AR) as a cause of nasal obstruction and sleep disturbance is well-established. Cao et al. (2018) conducted a meta-analysis revealing that AR nearly doubled the risk of OSA (pooled OR = 1.94). Liu et al. (2020) corroborated this through a systematic review showing that allergic rhinitis was associated with prolonged sleep latency, lower sleep efficiency, and greater daytime sleepiness. Sianturi et al. (2020) provided further evidence from young adults, finding that those with allergic rhinitis had a significantly higher prevalence of OSA symptoms, confirming that inflammatory nasal congestion impairs nocturnal airflow across age groups. Collectively, these results position AR as both a precursor and an aggravating factor for OSA.

Physiological investigations offer mechanistic insights into how nasal obstruction contributes to upper airway collapsibility and snoring**.** Olsen and Kern (1990) provided early foundational evidence that increased nasal resistance enhances negative inspiratory pressure in the pharyngeal airway, predisposing individuals to snoring and apneic events. Later, Awad and Kacker (2018) elaborated on these findings, explaining that nasal resistance shifts breathing patterns toward oral respiration, thereby increasing collapsibility of the soft palate and tongue base. These pathophysiological mechanisms bridge clinical observations with measurable sleep outcomes, offering a coherent explanation for the observed associations between nasal obstruction and SDB.

Racial and demographic variations in OSA risk among CRS patients also emerged as a critical theme. Hui et al. (2017) reported that African American CRS patients had nearly twice the odds of developing OSA compared with White counterparts (adjusted OR = 1.98), and that patients without nasal polyps were at higher risk than those with polyps. These findings point to potential genetic, structural, or inflammatory differences influencing susceptibility, emphasizing the need for tailored screening and management approaches across populations.

Structural abnormalities of the upper airway represent another important etiologic factor. Yunika et al. (2020) found that septal deviation and turbinate hypertrophy were significantly correlated with OSA severity in young adults. Marlina, Hendrika, and Adinda (2023) supported this by demonstrating that the degree of nasal obstruction was directly proportional to the severity of OSA symptoms in a clinical cohort. These results indicate that both fixed anatomical barriers and mucosal swelling can exacerbate nocturnal airflow limitation, underscoring the importance of comprehensive nasal evaluation in sleep medicine.

Lifestyle and environmental factors further complicate the nasal obstruction–sleep relationship. Marlina and Poluan (2024) identified smoking as a significant risk factor for OSA, mediated through chronic mucosal irritation, inflammation, and increased airway resistance. This finding aligns with Ando et al. (2016), who also highlighted smoking as an independent predictor of poor sleep quality among CRS patients. Addressing these modifiable exposures could therefore reduce the burden of both nasal and sleep disorders in at-risk populations.

Psychological and emotional consequences of chronic nasal obstruction are also noteworthy. Yıldırım et al. (2024) found that adults with nasal obstruction reported significantly higher anxiety and depression scores compared with healthy controls. These psychological disturbances may arise from chronic sleep fragmentation, hypoxia, and reduced quality of life, forming a vicious cycle that exacerbates both mental health and sleep dysfunction. Bengtsson et al. (2019) echoed these findings, showing that persistent nasal symptoms contribute to excessive daytime fatigue and impaired well-being.

Interestingly, not all studies reported a strong link between nasal obstruction and objective sleep metrics. Thomas et al. (2016) found that although nasal obstruction in CRS patients modestly influenced subjective sleep quality, its effect on objective polysomnographic outcomes was limited. Bozkurt et al. (2017) similarly reported no significant differences in sleep architecture or oxygen saturation between allergic and non-allergic groups, despite self-reported sleep disturbance. These inconsistencies suggest that while nasal obstruction clearly affects perceived sleep quality, its impact on objective sleep parameters may depend on additional factors such as BMI, craniofacial morphology, and comorbid respiratory conditions.

Synthesizing across all findings, it becomes evident that nasal obstruction acts as both a causal and compounding factor in the pathogenesis of sleep-disordered breathing. CRS, allergic rhinitis, and structural deformities collectively disrupt nasal patency, elevate airway resistance, and predispose individuals to OSA and insomnia. Conversely, untreated OSA may perpetuate nasal inflammation through repetitive hypoxia and vascular congestion (Kao et al., 2016). Thus, the relationship is best conceptualized as reciprocal and self-reinforcing rather than unidirectional.

Clinically, these results have significant implications for multidisciplinary management. Evaluation of nasal function should form an integral component of sleep disorder assessment, particularly in patients presenting with snoring, daytime sleepiness, or refractory OSA. Nasal surgery, medical management of rhinitis, and smoking cessation represent viable interventions that can reduce both nasal resistance and OSA severity (Uz et al., 2017; Awad & Kacker, 2018). Furthermore, attention to psychological distress and quality of life is essential, as nasal obstruction extends its impact beyond physical airflow limitation to affect emotional well-being (Yıldırım et al., 2024).

## Conclusion

The findings from this systematic review underscore that chronic nasal obstruction plays a pivotal role in sleep physiology, significantly influencing both subjective and objective sleep outcomes. Conditions such as chronic rhinosinusitis and allergic rhinitis, along with structural nasal deformities, contribute to increased airway resistance, mouth breathing, and upper-airway collapsibility during sleep. The reviewed literature consistently demonstrated that impaired nasal airflow is linked to greater daytime fatigue, elevated OSA risk, and deteriorated quality of life. Importantly, surgical and medical management strategies that restore nasal patency have been shown to improve sleep quality and reduce OSA severity, highlighting the clinical value of addressing nasal obstruction as part of comprehensive sleep disorder care.

Furthermore, the reviewed evidence points to a multidimensional impact of nasal obstruction—extending beyond respiratory physiology to encompass psychosocial health, emotional well-being, and cognitive functioning. The bidirectional relationship between nasal inflammation and sleep disturbance suggests that chronic nasal symptoms may both precipitate and perpetuate disordered sleep. Future longitudinal and interventional studies are warranted to clarify causal pathways, optimize treatment modalities, and establish standardized tools for assessing nasal contributions to sleep dysfunction.

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