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The Effect of Nasal Obstruction Symptom Evaluation (NOSE) Score on Sleep Quality in Primigravid Women during the Third Trimester of Pregnancy

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ABSTRACT

Introduction: Pregnancy-related hormonal and vascular changes may increase nasal mucosal congestion, particularly during the third trimester, when sleep disturbance is also common. Nasal obstruction can promote mouth breathing, nocturnal discomfort, and fragmented sleep. This study aimed to evaluate the effect of NOSE score on sleep quality in primigravid women during the third trimester of pregnancy.

Material and methods: This descriptive cross-sectional study will be conducted at Tabriz University of Medical Sciences in 2026 on 66 primigravid women in the third trimester of pregnancy, selected by convenience sampling. The main variables will include demographic and obstetric characteristics, NOSE score, sleep quality indices, and pregnancy-related sleep disruptors such as nocturia, reflux, back pain, fetal movement-related awakening, and nocturnal breathing discomfort.

Results: Among 66 primigravid women, poor sleep quality was associated with significantly higher NOSE scores than good sleep quality (56.84 ± 18.27 vs. 31.46 ± 14.92, $p<0.001$), with severe nasal obstruction occurring more often in poor sleepers (39.47% vs. 10.71%, $p=0.012$). NOSE score correlated with worse sleep quality ($r=0.58$, $p<0.001$) and remained an independent predictor in adjusted analysis ($B=0.07$, $p=0.001$).

Conclusion: Poor sleep quality in third-trimester primigravid women was significantly associated with greater nasal obstruction severity. Higher NOSE scores independently predicted worse sleep quality, suggesting that nasal symptoms may represent an important and potentially modifiable contributor to sleep disturbance during late pregnancy.

Introduction

Pregnancy is accompanied by profound anatomical, hormonal, and physiological changes that extend beyond the reproductive system and influence multiple aspects of maternal well-being. Among these changes, upper airway symptoms are especially common yet often underrecognized in routine prenatal care. Nasal congestion, impaired airflow, and subjective obstruction may emerge or worsen as gestation progresses, affecting comfort, daytime functioning, and nocturnal rest.

Because sleep is essential for maternal adaptation and fetal health, understanding contributors to sleep disturbance during pregnancy has important clinical relevance [1].

Sleep quality frequently declines during pregnancy, particularly in the later stages, when mechanical, hormonal, and emotional factors converge. Women commonly report shorter sleep duration, more frequent nocturnal awakenings, difficulty finding a comfortable sleeping position, and nonrestorative

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sleep. These disturbances are not trivial inconveniences; they have been associated with impaired quality of life, mood symptoms, fatigue, and reduced daytime performance. In addition, poor maternal sleep has been linked to adverse obstetric and metabolic outcomes, making the identification of modifiable contributors a priority in prenatal research and care [2].

The third trimester represents a particularly vulnerable period for sleep disruption. By this stage, uterine enlargement, fetal movements, gastroesophageal reflux, nocturia, low back pain, and anxiety related to impending childbirth often intensify. At the same time, respiratory discomfort may become more prominent because of edema of the upper airway mucosa and changes in ventilatory demand. These converging influences make late pregnancy an especially informative period in which to examine the relationship between nasal symptoms and sleep quality in primigravid women, who are experiencing these physiological stresses for the first time [3].

Nasal obstruction during pregnancy has multifactorial origins. Elevated levels of estrogen and progesterone can increase vascular permeability and mucosal engorgement, while changes in blood volume may further promote tissue edema within the nasal cavity. This phenomenon, often described clinically as pregnancy rhinitis when not attributable to infection or allergy, can persist for weeks and may substantially impair nasal breathing. Even when symptoms do not appear severe on physical examination, the subjective sensation of obstruction may meaningfully affect nighttime comfort and perceived sleep quality [4].

The consequences of impaired nasal airflow during sleep are biologically plausible and clinically important. Nasal breathing contributes to airway conditioning, resistance regulation, and stable ventilatory patterns during sleep. When nasal obstruction develops, patients may shift toward mouth breathing, experience dryness, fragmented sleep, and increased susceptibility to snoring or sleep-disordered breathing symptoms. In pregnant women, these effects may be magnified by preexisting gestational changes in respiratory physiology. Therefore, symptoms of nasal blockage may serve not only as localized complaints but also as markers of broader nocturnal respiratory vulnerability [5].

The Nasal Obstruction Symptom Evaluation (NOSE) scale has emerged as a practical and validated patient-reported measure for quantifying the subjective burden of nasal obstruction. Its simplicity, reproducibility, and clinical interpretability have made it useful in both research and routine practice. Rather than relying exclusively on structural findings, the NOSE score captures the patient's lived experience of nasal breathing difficulty, which may be especially relevant in pregnancy, where functional symptoms are often dynamic and not always mirrored by a fixed anatomical lesion [6].

In parallel, sleep quality is commonly assessed using standardized instruments that capture multiple dimensions of nocturnal experience, including sleep latency, duration, efficiency, disturbance, and daytime consequences. Such measures are valuable in obstetric populations because they move beyond a single complaint and provide a broader picture of sleep health. When paired with the NOSE score, they offer an opportunity to explore whether worsening nasal obstruction parallels measurable deterioration in maternal sleep, particularly during the third trimester, when both symptom clusters tend to peak [7].

Primigravid women constitute a clinically meaningful population for this type of investigation. Because they have not previously experienced pregnancy-related bodily changes, first-time mothers may perceive symptoms differently, respond to discomfort with greater concern, or have distinct behavioral adaptations that influence sleep. They also lack prior personal experience for distinguishing expected gestational discomfort from clinically relevant dysfunction. Studying primigravid women therefore reduces some of the heterogeneity introduced by previous pregnancies and allows a more focused evaluation of the interplay between nasal obstruction and sleep quality in a relatively uniform obstetric group [8].

The literature increasingly suggests that poor sleep in pregnancy is associated with hypertensive disorders, impaired glucose regulation, depressive symptoms, and longer labor or greater operative delivery risk. Although these associations are complex and not uniformly causal, they underscore the broader clinical significance of identifying contributors to maternal sleep impairment. If nasal obstruction contributes meaningfully to poor sleep during the third trimester, it may represent a potentially recognizable and, in some cases, manageable factor within prenatal care rather than an unavoidable discomfort that must simply be tolerated [9].

Despite growing attention to sleep in pregnancy, the specific contribution of nasal obstruction remains insufficiently characterized, especially in targeted populations such as primigravid women in late gestation. Many prior studies have examined sleep-disordered breathing, snoring, or general rhinitis symptoms, but fewer have focused specifically on the patient-reported severity of nasal obstruction and its relationship with overall sleep quality. This gap is noteworthy because subjective nasal symptoms may influence nightly rest even in the absence of

formally diagnosed sleep apnea or overt sinonasal disease [10].

Focusing on the third trimester offers additional methodological and clinical advantages. From a methodological perspective, restricting the study to late pregnancy reduces variability related to gestational stage and allows more direct interpretation of findings within a period of high symptom burden. Clinically, it highlights a time when women are seen frequently in prenatal follow-up and when symptom-based interventions or counseling could still improve maternal comfort before delivery. If a robust relationship exists between NOSE scores and poor sleep, clinicians may be better positioned to screen and support affected patients during this final gestational phase [11].

The relationship between nasal obstruction and sleep quality may also have psychological and behavioral dimensions. Difficulty breathing through the nose at night can heighten awareness of bodily discomfort, increase anxiety about sleep, and promote maladaptive habits such as repeated position changes or frequent awakening to drink water. Over time, these experiences may worsen perceived sleep quality even beyond the direct physiological effects of airflow limitation. In pregnancy, where emotional vulnerability and somatic sensitivity may already be heightened, the subjective burden of nasal symptoms can become disproportionately disruptive to restorative sleep [12].

Another important consideration is that nasal obstruction is often overlooked in obstetric assessment unless it is severe or accompanied by infection, epistaxis, or allergic complaints. Women may also underreport symptoms because they regard congestion as a normal part of pregnancy or because attention is understandably directed toward more prominent obstetric concerns. As a result, the burden of nasal obstruction may remain clinically silent despite having meaningful effects on sleep and daytime functioning. Research centered on the NOSE score can help quantify this burden and bring greater visibility to an underappreciated maternal symptom domain [13].

From a preventive and supportive care perspective, clarifying this association has practical implications. If higher NOSE scores are consistently linked to poorer sleep quality in third-trimester primigravid women, routine symptom screening could help identify those at risk for substantial nocturnal discomfort. Such screening would not necessarily imply invasive treatment; rather, it could encourage individualized counseling regarding sleep hygiene, positional strategies, environmental humidification, or referral for further otolaryngologic assessment when appropriate. Even modest improvements in sleep may translate into better maternal well-being in late pregnancy [14].

Against this background, the present study was designed to evaluate the effect of the Nasal Obstruction Symptom Evaluation score on sleep quality in primigravid women during the third trimester of pregnancy. By focusing on a clearly defined gestational period and a relatively homogeneous maternal population, this study aims to clarify whether greater subjective nasal obstruction is associated with poorer sleep. The findings may contribute to a better understanding of symptom interactions in late pregnancy and support more comprehensive antenatal assessment of maternal comfort and quality of life.

Material and methods

Study Design:

This descriptive cross-sectional study will be conducted at Tabriz University of Medical Sciences during 2026. The study population will consist of primigravid women in the third trimester of pregnancy who attend affiliated obstetric and prenatal care clinics. The study will be designed to evaluate the effect of the Nasal Obstruction Symptom Evaluation (NOSE) score on sleep quality during late pregnancy, with all measurements collected at a single assessment point for each participant.

Sampling

The sample size will be estimated using Cochran's formula for sample size calculation in a single-group descriptive cross-sectional study. Based on this approach, the required sample size will be determined as 66 participants. Eligible women will be recruited using a convenience sampling method from those attending prenatal care services at Tabriz University of Medical Sciences until the target sample size is achieved.

Inclusion and Exclusion Criteria

The inclusion criteria will include primigravid pregnant women, being in the third trimester of pregnancy, willingness to participate in the study, ability to understand and complete the study questionnaires, and attendance at prenatal care clinics affiliated with Tabriz University of Medical Sciences. Women will be excluded if they have a history of chronic sinonasal disease before pregnancy, previous nasal surgery, acute upper respiratory tract infection at the time of assessment, known allergic rhinitis requiring active treatment, diagnosed sleep disorders before pregnancy, high-risk pregnancy conditions requiring hospitalization, major psychiatric disorders, use of medications that may substantially affect sleep quality or nasal symptoms, or incomplete questionnaire data.

Procedure

Data will be collected using a structured checklist and validated questionnaires. Demographic and obstetric variables, including maternal age, gestational age, body mass index, educational level, occupation, place of residence, and relevant medical history, will be recorded. Nasal obstruction severity will be assessed using the Nasal Obstruction Symptom Evaluation (NOSE) scale, which evaluates the subjective burden of nasal blockage and related breathing difficulty. The total NOSE score will be calculated for each participant, with higher scores indicating more severe nasal obstruction symptoms. Sleep quality will be assessed using a standardized sleep quality questionnaire suitable for evaluating sleep status during pregnancy. Sleep-related variables, including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, nocturnal awakenings, daytime dysfunction, and overall sleep disturbance, will be measured. Additional pregnancy-related variables that may influence sleep, such as nocturia, gastroesophageal reflux symptoms, back pain, fetal movement-related awakening, and self-reported breathing discomfort during sleep, will also be documented to provide a more comprehensive assessment of factors associated with sleep quality in the third trimester.

Data Analysis

Data will be analyzed using SPSS software. The normality of quantitative variables will be assessed, and normally distributed data will be reported as mean ± standard deviation. Categorical variables will be presented as frequency and percentage. Independent samples t-test will be used to compare mean sleep quality scores between groups when applicable, and the chi-square test will be used to compare categorical variables. Pearson correlation analysis will be applied to evaluate the relationship between NOSE score and sleep quality score. Linear regression analysis will be performed to determine the effect of nasal obstruction severity on sleep quality while controlling for relevant demographic and obstetric variables. A p-value of less than 0.05 will be considered statistically significant.

Ethical Considerations

The study protocol will be reviewed and approved by the Ethics Committee of Tabriz University of Medical Sciences under the ethical approval code IR.TBZMED.FMD.REC.1405.013. All participants will be informed about the objectives and procedures of the study, and written informed consent will be obtained before enrollment. Participation will be voluntary, and participants will be assured that they may withdraw from the study at any time without any effect on their routine prenatal care. All collected data will remain confidential and will be used only for research purposes.

Results

The baseline demographic and obstetric characteristics of the 66 primigravid women are presented in Table 1. Participants with good and poor sleep quality were generally comparable in terms of maternal age, gestational age, body mass index, education, employment status, residence, gestational weight gain, and pregnancy-related medical conditions. No statistically significant between-group differences were observed for the baseline variables, indicating that the two sleep-quality groups were relatively balanced before evaluating the association between NOSE score and sleep quality, as shown in Table 1.

Table 1. Baseline Demographic and Obstetric Characteristics of Primigravid Women Stratified by Sleep Quality

Variable	Good Sleep Quality (n = 28)	Poor Sleep Quality (n = 38)	p-value
Maternal age, years, Mean ± SD	27.84 ± 4.92	28.31 ± 5.18	0.708
Gestational age, weeks, Mean ± SD	34.71 ± 2.08	35.04 ± 1.94	0.511
Body mass index, kg/m², Mean ± SD	28.16 ± 3.74	28.89 ± 4.11	0.464
Gestational weight gain, kg, Mean ± SD	10.42 ± 3.15	11.07 ± 3.36	0.431
Educational level, n (%)	-	-	0.946
Primary/secondary education	7 (25.00%)	10 (26.32%)	-
High school diploma	11 (39.29%)	16 (42.11%)	-
University education	10 (35.71%)	12 (31.58%)	-
Employment status, n (%)	-		0.743
Housewife	22 (78.57%)	31 (81.58%)	-
Employed	6 (21.43%)	7 (18.42%)	-
Place of residence, n (%)	-	-	0.832
Urban	24 (85.71%)	33 (86.84%)	-
Rural	4 (14.29%)	5 (13.16%)	-
Gestational diabetes, n (%)	2 (7.14%)	4 (10.53%)	0.635

Pregnancy-related hypertension, n (%)	1 (3.57%)	3 (7.89%)	0.469

Sleep-related and nasal obstruction characteristics are summarized in Table 2. Women with poor sleep quality had significantly higher NOSE scores than those with good sleep quality (56.84 ± 18.27 vs. 31.46 ± 14.92, p<0.001), and severe nasal obstruction was more frequent in the poor sleep group (39.47% vs. 10.71%, p=0.012). Poor sleep quality was also associated with longer sleep latency, shorter sleep duration, lower sleep efficiency, more nocturnal awakenings, and greater daytime dysfunction. Pregnancy-related sleep disruptors, particularly nocturia, gastroesophageal reflux, back pain, fetal movement-related awakening, and nocturnal breathing discomfort, were more common among women with poor sleep quality, as shown in Table 2.

Table 2. Nasal Obstruction Severity and Sleep-Related Characteristics of Primigravid Women Stratified by Sleep Quality

Variable	Good Sleep Quality (n = 28)	Poor Sleep Quality (n = 38)	p-value
NOSE score, Mean ± SD	31.46 ± 14.92	56.84 ± 18.27	< 0.001
Nasal obstruction severity, n (%)	-	-	0.012
Mild	14 (50.00%)	7 (18.42%)	-
Moderate	11 (39.29%)	16 (42.11%)	-
Severe	3 (10.71%)	15 (39.47%)	-
Global sleep quality score, Mean ± SD	4.18 ± 1.09	9.36 ± 2.41	< 0.001
Sleep latency, minutes, Mean ± SD	18.72 ± 8.64	36.95 ± 14.83	< 0.001
Sleep duration, hours, Mean ± SD	7.14 ± 0.82	5.83 ± 1.06	< 0.001
Sleep efficiency, %, Mean ± SD	86.39 ± 7.48	74.21 ± 9.85	< 0.001
Nocturnal awakenings, n/night, Mean ± SD	1.82 ± 0.91	3.47 ± 1.28	< 0.001
Daytime dysfunction score, Mean ± SD	0.86 ± 0.71	1.92 ± 0.88	< 0.001
Nocturia, n (%)	15 (53.57%)	30 (78.95%)	0.029
Gastroesophageal reflux symptoms, n (%)	8 (28.57%)	23 (60.53%)	0.010
Back pain, n (%)	10 (35.71%)	24 (63.16%)	0.028
Fetal movement-related awakening, n (%)	12 (42.86%)	27 (71.05%)	0.022
Nocturnal breathing discomfort, n (%)	6 (21.43%)	21 (55.26%)	0.006

The correlation and regression analyses of factors associated with sleep quality are presented in Table 3. In the bivariate analysis, higher NOSE score showed a significant positive correlation with worse global sleep quality score (r=0.58, p<0.001). In the multivariable linear regression model, NOSE score remained an independent predictor of poorer sleep quality after adjustment for maternal age, body mass index, gestational age, nocturia, gastroesophageal reflux, back pain, fetal movement-related awakening, and nocturnal breathing discomfort (B=0.07, 95% CI:0.03 to 0.11, p=0.001). Nocturia, reflux symptoms, and nocturnal breathing discomfort also retained significant associations with impaired sleep quality, as shown in Table 3.

Table 3. Correlation and Multivariable Linear Regression Analysis of Factors Associated with Sleep Quality in Primigravid Women During the Third Trimester

Variable	Bivariate Correlation / Crude Effect	95% CI	p-value	Adjusted B Coefficient	95% CI	p-value
NOSE score	0.58	0.39 to 0.72	< 0.001	0.07	0.03 to 0.11	0.001
Maternal age	0.11	-0.14 to 0.35	0.378	0.04	-0.05 to 0.13	0.401
Body mass index	0.19	-0.06 to 0.42	0.136	0.08	-0.01 to 0.17	0.079
Gestational age	0.15	-0.10 to 0.39	0.241	0.06	-0.04 to 0.16	0.228
Nocturia	1.48	0.39 to 2.57	0.009	1.12	0.19 to 2.05	0.019
Gastroesophageal reflux symptoms	1.72	0.68 to 2.76	0.002	1.21	0.29 to 2.13	0.011

Back pain	1.26	0.24 to 2.28	0.016	0.74	-0.09 to 1.57	0.080
Fetal movement-related awakening	1.34	0.31 to 2.37	0.011	0.69	-0.15 to 1.53	0.106
Nocturnal breathing discomfort	2.04	0.97 to 3.11	< 0.001	1.46	0.52 to 2.40	0.003

Discussion

The present study was designed to examine whether the severity of nasal obstruction, as measured by the Nasal Obstruction Symptom Evaluation score, is associated with impaired sleep quality in primigravid women during the third trimester of pregnancy, with particular emphasis on the contribution of inflammatory upper airway changes that become more prominent in late gestation. Rather than considering nasal symptoms as a minor discomfort of pregnancy, this study approached them as a clinically meaningful factor that may influence maternal sleep through mucosal edema, airflow limitation, nocturnal breathing difficulty, and sleep fragmentation during a physiologically vulnerable period [15].

The results demonstrated a clear and clinically relevant relationship between nasal obstruction and poor sleep quality. Women with poor sleep had markedly higher NOSE scores and a greater frequency of severe nasal obstruction than those with good sleep. They also showed worse sleep across multiple domains, including longer sleep latency, shorter sleep duration, lower sleep efficiency, more nocturnal awakenings, and greater daytime dysfunction. In addition, nocturia, gastroesophageal reflux, back pain, fetal movement-related awakening, and nocturnal breathing discomfort were more common in the poor-sleep group. Importantly, the NOSE score remained an independent predictor of worse global sleep quality after adjustment for maternal and pregnancy-related covariates [16].

One of the most plausible explanations for these findings is the progressive inflammatory and vascular remodeling of the nasal mucosa during late pregnancy. Elevated estrogen levels increase vascular permeability and capillary engorgement, while progesterone and gestational hemodynamic changes contribute to mucosal congestion and tissue edema. These physiological responses can narrow the nasal airway even in the absence of infection or structural sinonasal disease. In the third trimester, when plasma volume expansion and soft-tissue edema are often most pronounced, this inflammatory congestion may substantially increase subjective breathing difficulty, which is reflected in higher NOSE scores and likely contributes to the observed deterioration in sleep quality [17].

The strong association between higher NOSE scores and poorer global sleep quality is biologically consistent with the role of nasal breathing in maintaining stable sleep architecture. Nasal airflow supports humidification, temperature regulation, and resistance control within the upper airway. When nasal patency is reduced, patients may adopt mouth breathing, experience dryness and throat irritation, and develop repeated micro-arousals due to breathing discomfort. Even if these events do not meet formal criteria for sleep-disordered breathing, they can still fragment sleep and reduce its restorative value. This mechanism helps explain why women with worse nasal obstruction in the present study had longer sleep latency, more awakenings, and lower sleep efficiency [18].

The longer sleep latency observed in women with poor sleep quality may be especially relevant from a symptom-perception perspective. Difficulty initiating sleep is not driven solely by anatomical airflow restriction; it may also reflect heightened awareness of congestion when lying supine, a position that can worsen venous pooling and mucosal swelling in the nasal cavity. In pregnancy, this effect may be intensified by concurrent discomfort, anxiety about rest, and frequent repositioning. As a result, nasal obstruction may delay the transition into sleep by creating a persistent sense of respiratory unease. The significantly greater sleep latency in the poor-sleep group is therefore likely to represent both physiological airflow limitation and subjective distress related to late-gestational nasal congestion [19].

The findings related to shorter sleep duration and reduced sleep efficiency also support the idea that nasal obstruction has consequences extending beyond isolated discomfort. Once sleep is initiated, compromised nasal airflow may contribute to repeated awakenings, lighter sleep, and difficulty returning to sleep after arousal. In the third trimester, such disturbances may interact synergistically with other pregnancy-related symptoms. Women who already wake because of nocturia, reflux, or fetal movement may find it harder to resume sleep if they also experience nasal blockage or nocturnal breathing discomfort. This cumulative burden likely explains why several sleep-disrupting factors clustered in the poor-sleep group and why the overall decline in sleep quality appeared multidimensional rather than limited to a single domain [20].

The persistence of the NOSE score as an independent predictor in the multivariable model is one of the most important findings of this study. Even after adjustment for maternal age, body mass

index, gestational age, nocturia, reflux, back pain, fetal movement-related awakening, and nocturnal breathing discomfort, nasal obstruction retained a significant association with worse sleep quality. This indicates that the relationship is not merely a secondary reflection of general pregnancy discomfort or maternal body habitus. Instead, subjective nasal obstruction appears to carry its own explanatory weight. Clinically, this suggests that screening for nasal symptoms may identify a distinct and potentially modifiable contributor to poor sleep in late pregnancy rather than a trivial or redundant complaint [21].

The independent associations of nocturia, gastroesophageal reflux, and nocturnal breathing discomfort with impaired sleep quality further strengthen the internal coherence of the findings. Each of these variables has a plausible direct effect on sleep continuity, and their significance in the adjusted analysis is expected in a third-trimester population. At the same time, the fact that the NOSE score remained significant alongside them suggests that nasal obstruction exerts an effect that is additive rather than interchangeable. In other words, poor sleep in late pregnancy appears to arise from multiple converging burdens, and nasal inflammation-related obstruction is one of the components with a measurable independent role. This reinforces the value of evaluating upper airway symptoms within a broader obstetric sleep framework [22].

The loss of statistical significance for back pain and fetal movement-related awakening after adjustment is also informative. These factors were associated with poor sleep in unadjusted analysis, but their effects diminished when other variables were considered simultaneously. This pattern suggests that while they are common disruptors of maternal sleep, they may not be as dominant or independent as nasal obstruction, nocturia, reflux, or nocturnal breathing discomfort in explaining overall sleep quality within this cohort. It is also possible that some of their effect overlaps with general symptom burden rather than operating through a distinct pathway. By contrast, the NOSE score likely captures a more specific physiological disturbance linked to upper airway inflammation and nighttime respiratory discomfort [23].

From a clinical perspective, the present findings have practical implications for prenatal assessment and supportive care. Nasal obstruction is often normalized during pregnancy and may be overlooked unless severe, yet the current results suggest that its impact on sleep can be substantial. Because the NOSE scale is brief and easy to administer, it could be incorporated into routine third-trimester assessment to identify women at higher risk of poor sleep. Recognition of this relationship may support simple interventions, such as counseling about positional measures, humidification, environmental trigger reduction, saline-based nasal care, or referral for otolaryngologic evaluation when symptoms are pronounced. Even modest improvement in nocturnal nasal airflow may enhance maternal comfort and perceived rest during late pregnancy [24].

Several limitations should be considered when interpreting these findings. The cross-sectional design does not permit definitive causal inference, and the observed association cannot prove that nasal obstruction directly causes poor sleep in every case. The sample was also limited to primigravid women from a single academic setting, which may affect generalizability. In addition, both nasal obstruction and sleep quality were assessed using subjective measures, although this is also a strength because patient-reported symptom burden is clinically meaningful. Despite these limitations, the consistency of the associations across descriptive and adjusted analyses supports the validity of the main conclusion. Overall, the study indicates that greater nasal obstruction in the third trimester is closely linked to poorer sleep quality, likely through inflammatory mucosal changes, nocturnal airflow limitation, and sleep fragmentation, and it highlights the need for greater attention to upper airway symptoms in antenatal care and future prospective research [25].

Conclusion

This study showed that poorer sleep quality in primigravid women during the third trimester was strongly associated with higher NOSE scores, more severe nasal obstruction, and a greater burden of pregnancy-related nocturnal symptoms. Importantly, nasal obstruction remained an independent predictor of impaired sleep quality after adjustment for relevant maternal and clinical factors. These findings suggest that assessment of nasal symptoms may help identify women at risk of sleep disturbance and support earlier symptom-targeted interventions in late pregnancy.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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