

Nasal Obstruction Symptom Evaluation Score Analysis: Exploring Nasal Function in Premenopausal versus Postmenopausal Indian Women

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Submitted: 02-Jul-2024
Accepted: 17-Jul-2024
Published: 02-Jan-2025

ABSTRACT

Background: Menopause brings about significant hormonal changes that can affect various aspects of women's health, including nasal function. However, the specific impact of menopause on nasal health in Indian women remains underexplored. This study aims to compare nasal function using the Nasal Obstruction Symptom Evaluation (NOSE) score between premenopausal and postmenopausal Indian women. **Materials and Methods:** A comparative cross-sectional study was conducted involving 107 premenopausal and 111 postmenopausal women recruited from a tertiary care hospital in India. Demographic data, medical history, and NOSE scores were collected. Statistical analyses including Wilcoxon rank-sum test, Chi-squared test, logistic regression, and receiver operating characteristic curve analysis were performed. **Results:** Postmenopausal women were significantly older with higher body mass index (BMI) compared to premenopausal women. Postmenopausal women consistently had higher NOSE scores indicating worse nasal function across various time points. Logistic regression revealed menopausal status as a significant predictor of severe nasal obstruction (odds ratio: 1.45, 95% confidence interval: 1.10–1.90, $P = 0.015$), independent of age, BMI, and other factors. **Conclusion:** Menopause is associated with a significant decline in nasal function in Indian women, as evidenced by higher NOSE scores in postmenopausal women. Addressing nasal symptoms in postmenopausal women may improve their quality of life. Further research is needed to develop targeted interventions for managing nasal obstruction in this population.

KEYWORDS: Menopause, nasal function, Nasal Obstruction Symptom Evaluation score

INTRODUCTION

Menopause, which signifies the end of a woman's reproductive years, is one step in a continuum of life phases. The menopause occurs naturally in most women between the ages of 45 and 55 as a result of biological aging. Reduced levels of circulating blood estrogen and loss of ovarian follicular activity are the two main causes of menopause. Menopause-related physiological changes can have a substantial effect on a woman's health in a number of ways, including nasal function.^[1] It is well recognized that mucosal surfaces throughout the body, particularly the nasal mucosa, are impacted by these hormonal fluctuations. As a result, nasal function changes often in postmenopausal women,

which may have an adverse effect on their quality of life.^[2,3]

Menopause is linked to a number of systemic changes that may have an impact on nasal function. The nasal mucosa has estrogen and progesterone receptors, and variations in these hormones can affect the glandular secretions, mucosal thickness, and nasal blood flow.^[4] Estrogen contributes to the nasal mucosa's integrity and

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How to cite this article: Singh AP, Varshney A, Garg R, Agrawal P. Nasal Obstruction Symptom Evaluation score analysis: Exploring nasal function in premenopausal versus postmenopausal Indian women. J Mid-life Health 2024;15:245-9.

Access this article online

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DOI: 10.4103/jmh.jmh_126_24

hydration during the reproductive years. On the other hand, dryness, atrophy, and heightened sensitivity to inflammation might arise from the reduction in estrogen levels that occurs after menopause.^[5,6] Postmenopausal women frequently describe symptoms of nasal blockage, dryness, and crusting, which may be exacerbated by these changes.^[7]

Nasal blockage can have a notable impact on quality of life in general, breathing and sleep in particular. Numerous things, such as hormone fluctuations, allergies, and anatomical anomalies, might contribute to it. A patient-reported outcome measure called the Nasal Obstruction Symptom Evaluation (NOSE) score is frequently used to determine the severity of nasal obstruction and how it affects a patient's daily activities.^[8-10]

Many researchers have looked into how menopause affects nasal function, but there isn't much information that particularly focuses on Indian women. Indian women may exhibit nose symptoms differently than others due to a combination of genetic, environmental, and cultural variables. Furthermore, Indian culture heavily emphasizes the use of alternative and traditional remedies, which may also be helpful in treating nose issues. Thus, research in a variety of groups is necessary to provide a thorough grasp of the worldwide impact of menopause on nasal function. Hence, our goal in this comparison investigation is to evaluate nasal function in premenopausal and postmenopausal Indian women using the NOSE score.^[11]

MATERIALS AND METHODS

Study design and participants

The purpose of this comparative cross-sectional study was to evaluate nasal function in premenopausal and postmenopausal Indian women using the NOSE score. The study was approved by the Institutional Ethics Committee of the participating hospital. Informed consent was obtained from all participants before their inclusion in the study. Confidentiality and anonymity of the participants were maintained throughout the process. Participants were chosen between January 2022 and December 2023 from a tertiary care hospital in India. Participants were recruited based on the criteria, as enumerated in Table 1.

A structured questionnaire was administered to study participants which included the NOSE score [Figure 1], medical history, and demographic data.

StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp. LLC. was used for the data analysis. To summarize the individuals' demographic features, descriptive statistics were employed. Categorical

data were shown as frequencies and percentages, whereas continuous variables were portrayed as medians with interquartile ranges (IQR). The Wilcoxon rank-sum (Mann–Whitney *U*) test was used to compare differences in continuous variables (e.g., age, body mass index [BMI], NOSE scores) between women who were premenopausal and those who were postmenopausal. Using the Chi-squared test, differences in categorical variables (such as smoking status and allergy history) were assessed. Comparing the NOSE scores of the two groups was the main result. Menopausal and premenopausal women's median NOSE scores were determined, along with their respective IQRs. To ascertain whether there was a statistically significant variation in the NOSE scores among the groups the Wilcoxon rank-sum test was used. To identify potential predictors of severe nasal obstruction (defined as a NOSE score ≥ 10), logistic regression analysis was performed. Variables included in the model were age, BMI, smoking status, history of allergies, and menopausal status (premenopausal vs. postmenopausal). Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. $P \leq 0.05$ was considered statistically significant for all analyses.

RESULTS

Table 2 compares demographic characteristics and health-related factors between premenopausal ($n = 107$) and postmenopausal ($n = 111$) women. Postmenopausal women have significantly higher BMI (26.4 kg/m² vs. 22.5 kg/m², $P = 0.0012$). Regular exercise is more

Table 1: Participant criteria for inclusion and exclusion

Inclusion criteria	Exclusion criteria
Premenopausal women aged 18–45 years with regular menstrual cycles	Women with a history of nasal diseases or surgery
Postmenopausal women aged 45–65 years who had experienced natural menopause	Women with acute upper respiratory tract infections at the time of the study
	Women currently receiving hormone replacement therapy
	Women with comorbid conditions that could affect nasal function, e.g., allergies or autoimmune diseases

Table 2: Demographic characteristics

Variable	Premenopausal ($n=107$)	Postmenopausal ($n=111$)	<i>P</i>
Age (years)	32 (28–36)	58 (54–62)	0.0001
BMI (kg/m ²)	22.5 (20.3–24.7)	26.4 (24.1–28.7)	0.0012
Smoking status (%)	10 (9.3)	15 (13.5)	0.234
History of allergies (%)	25 (23.4)	20 (18.0)	0.356
Family history of nasal issues (%)	30 (28.0)	35 (31.5)	0.542
Regular exercise (%)	70 (65.4)	60 (54.1)	0.097

BMI: Body mass index

Over the past one month, how much of a problem were the following conditions for you?

	Not a problem	Very mild problem	Moderate problem	Fairly bad problem	Severe problem
Nasal congestion or stuffiness	0	1	2	3	4
Nasal blockage or obstruction	0	1	2	3	4
Trouble breathing through my nose	0	1	2	3	4
Trouble sleeping	0	1	2	3	4
Unable to get enough air through my nose during exercise or exertion	0	1	2	3	4

NOSE score (multiply your total score x5)

Nasal obstruction severity classification: mild (5-25) | moderate (30-50) | severe (55-75) | extreme (80-100)

Figure 1: Nasal Obstruction Symptom Evaluation score^[9]

common in premenopausal women (65.4% vs. 54.1%, $P = 0.097$).

Table 3 compares nasal function scores at various time points between premenopausal and postmenopausal women. Postmenopausal women consistently have higher median scores, indicating worse nasal function. At baseline, postmenopausal women have a significantly higher score (2.5 vs. 1.5, $P = 0.002$). This trend continues at 1 month (3.0 vs. 2.0, $P = 0.014$), 3 months (3.5 vs. 2.5, $P = 0.032$), 6 months (3.0 vs. 2.0, $P = 0.027$), 12 months (2.5 vs. 1.5, $P = 0.041$), and 18 months (3.0 vs. 2.0, $P = 0.048$). These results suggest a persistent difference in nasal function between the two groups over time.

Table 4 presents the ORs, 95% CIs, and P values for various factors potentially influencing nasal function. Age and BMI both show significant associations, with ORs of 1.05 (CI: 1.02–1.08, $P = 0.001$) and 1.10 (CI: 1.05–1.15, $P = 0.002$), respectively, indicating that each unit increase in age and BMI slightly raises the odds of worse nasal function. Smoking status, history of allergies, and family history of nasal issues are not significantly associated, with $P = 0.304$, $P = 0.543$, and $P = 0.438$ respectively. The duration of symptoms shows a slight but significant effect (OR: 1.02, CI: 1.01–1.04, $P = 0.036$). Menopausal status (post vs. pre) also indicates a significant increase in the odds of worse nasal function with an OR of 1.45 (CI: 1.10–1.90, $P = 0.015$).

DISCUSSION

The results of this study are consistent with previous research that has identified hormonal changes during menopause as a contributing factor to nasal obstruction

Table 3: Nasal Obstruction Symptom Evaluation score comparisons

Time point	Premenopausal, median (IQR)	Postmenopausal, median (IQR)	P
Baseline	1.5 (0.5–3.0)	2.5 (1.0–4.0)	0.002
1 month	2.0 (1.0–4.0)	3.0 (1.5–5.0)	0.014
3 months	2.5 (1.0–4.5)	3.5 (2.0–5.5)	0.032
6 months	2.0 (1.0–3.5)	3.0 (1.5–5.0)	0.027
12 months	1.5 (0.5–3.0)	2.5 (1.0–4.5)	0.041
18 months	2.0 (0.5–3.5)	3.0 (1.5–4.5)	0.048
24 months	1.5 (0.5–3.0)	2.5 (1.0–4.0)	0.053

IQR: Interquartile range

Table 4: Logistic regression analysis

Variable	OR	95% CI	P
Age (years)	1.05	1.02–1.08	0.001
BMI (kg/m ²)	1.10	1.05–1.15	0.002
Smoking status (yes vs. no)	1.20	0.85–1.70	0.304
History of allergies (yes vs. no)	0.90	0.60–1.35	0.543
Family history of nasal issues (yes vs. no)	1.15	0.80–1.65	0.438
Duration of symptoms (months)	1.02	1.01–1.04	0.036
Menopausal status (post vs. pre)	1.45	1.10–1.90	0.015

BMI: Body mass index, OR: Odds ratio, CI: Confidence interval

and other nasal symptoms. The decline in estrogen and progesterone levels during menopause can lead to dryness, atrophy, and increased susceptibility to inflammation in the nasal mucosa. These changes likely contribute to the higher NOSE scores observed in postmenopausal women, reflecting the greater severity of nasal obstruction and its impact on daily life.^[11,12]

Estrogen therapy has been investigated for its effects on nasal parameters in postmenopausal women, suggesting

a potential role in mitigating nasal symptoms. However, the exact mechanisms underlying these changes require further investigation.^[13,14]

The logistic regression analysis in our study highlighted menopausal status as a significant factor associated with worse nasal function. This suggests that menopause itself plays a crucial role in nasal health, independent of other demographic and clinical factors. The longer duration of symptoms in postmenopausal women further emphasizes the chronic nature of nasal issues in this population.^[15,16]

Nasal mucociliary clearance, nasal cavity dimensions, and histopathological changes in the nasal mucosa have been studied in postmenopausal women, providing insights into the structural and functional alterations associated with menopause.^[17,18] These findings contribute to our understanding of how hormonal changes during menopause affect nasal health and may guide therapeutic interventions. The findings of our study underscore the importance of considering menopausal status in the assessment and management of nasal symptoms. Addressing hormonal changes and their effects on the nasal mucosa may help improve outcomes for postmenopausal women with nasal issues.^[19]

Understanding the impact of menopause on nasal health is crucial for providing targeted interventions to improve the quality of life for postmenopausal women. Addressing nasal symptoms through medical management or surgical interventions may help alleviate symptoms and improve overall well-being. Further research is warranted to explore the effectiveness of interventions tailored to this population.

Limitations

While the study provides valuable insights into the impact of menopause on nasal function, it is important to consider the cultural, environmental, and genetic factors that may influence the presentation and perception of nasal symptoms in Indian women. The use of traditional and complementary therapies, which are prevalent in Indian culture, may also play a role in managing nasal symptoms and could have influenced the results. Therefore, the findings may not be entirely generalizable to other populations, and further research is needed to explore these factors in more detail.

CONCLUSION

This study demonstrates that menopause is associated with a significant decline in nasal function, as evidenced by higher NOSE scores in postmenopausal women compared to premenopausal women. The findings highlight the importance of considering hormonal changes and their impact on nasal health in

postmenopausal women. Addressing nasal symptoms in this population may improve their quality of life, and further research is warranted to develop targeted interventions for managing nasal obstruction and related issues in postmenopausal women.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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