

Unraveling the complex relationship between nasal health and women's well-being at different reproductive stages: a comprehensive investigation

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Women's health is a multifaceted area that encompasses various physiological, hormonal, and anatomical subtleties. *The objective:* to establish the complex relationship between a woman's quality of life in different life periods and the condition of the nasal cavity.

Materials and methods. The study involved 300 participants who were divided into three groups depending on their reproductive status: pregnant women (n = 100), breastfeeding women (n = 100), and menopausal women (n = 100). Each group was divided according to the health status of the nasal cavity: nasal obstruction due to turbinate hypertrophy and/or deviation of the septum, chronic rhinosinusitis with nasal polyposis (diagnosed using anterior rhinoscopy and nasal endoscopy), and healthy nasal cavity. Data collection included a comprehensive questionnaire, demographic information of participants, medical history, quality of life assessment (WHOQOL-BREF), Nasal Obstruction Symptom Evaluation scale, treatment methods.

Results. A questionnaire is presented which aims to identify the complex relationships between the condition of the nasal cavity and the quality of woman's life. The results revealed multifaceted relationships between the quality of woman's life in different reproductive periods and the condition of the nasal cavity. Otolaryngological diseases, such as turbinate hypertrophy, nasal septum deviation and nasal polyposis, affect the health of the nose of women, causing nasal obstruction. Quality of life indicators and the nasal obstruction symptom assessment scale once again emphasized the importance of attention to nasal health in women's health care, since the condition of the nasal cavity without pathology is associated with a significantly higher quality of life. *Conclusions.* The results of the study highlight the need for an individualized approach and health care strategies that take into account the complex relationships between women's quality of life in different reproductive periods and the state of the nasal cavity. This may improve the well-being and quality of life of women at different stages of life.

Keywords: women's health, reproductive health, nasal health, gynecological diseases, otolaryngological diseases, quality of life.

Встановлення взаємозв'язку між станом порожнини носа та якістю життя жінок у різні періоди репродуктивного стану: комплексне дослідження

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Жіноче здоров'я – це багатогранна сфера, що охоплює різні фізіологічні, гормональні та анатомічні особливості.

Мета дослідження: встановити складний взаємозв'язок між якістю життя жінки в різні періоди і станом носової порожнини.

Матеріали та методи. У дослідженні взяли участь 300 учасниць, які були розподілені на три групи залежно від репродуктивного стану: вагітні (n = 100); жінки, які годують груддю (n = 100); жінки в менопаузі (n = 100). Кожна група була розділена відповідно до стану здоров'я порожнини носа: непрохідність носа внаслідок гіпертрофії носових раковин та/або викривлення перегородки, хронічний риносинусит із поліпозом носа (діагностований за допомогою передньої риноскопії та назального ендоскопа) та здоровий стан порожнини. Збір даних включав комплексне анкетування, вивчення демографічної інформації учасниць, історії хвороби, оцінювання якості життя (WHOQOL-BREF), шкали оцінювання симптомів назальної обструкції, методи лікування.

Результати. Подано опитувальник, спрямований на виявлення складних взаємозв'язків між станом порожнини носа та якістю життя жінок. Результати виявили багатогранні зв'язки між якістю життя жінок у різні репродуктивні періоди та станом порожнини носа. Отоларингологічні захворювання, як-от гіпертрофія носових раковин, викривлення носової перегородки та поліпоз носа, впливають на здоров'я носа жінок, спричиняючи назальну обструкцію. Показники якості життя та шкала оцінювання симптомів назальної обструкції ще раз підкреслили важливість уваги до здоров'я носа в охороні здоров'я жінок, оскільки стан порожнини носа без патології асоціюється зі значно вищою якістю життя.

Висновки. Результати дослідження наголошують на потребі в індивідуальному підході та стратегії охорони здоров'я, які враховують складні взаємозв'язки між якістю життя жінок у різні репродуктивні періоди та станом носової порожнини. Це може покращити добробут та якість життя жінок на різних етапах життя.

Ключові слова: жіноче здоров'я, репродуктивне здоров'я, здоров'я носа, гінекологічні захворювання, отоларингологічні захворювання, якість життя.

Throughout a woman's life, her hormones experience many alterations. These alterations encompass menstruation, which signifies the onset of these changes, as well as pregnancy, menopause, and the utilization of contraceptives. Non-cyclical hormonal alterations encompass

the administration of alternate sex hormones. In contrast, a woman's sex hormone levels vary throughout her lifetime in response to factors such as her physical and mental well-being [1–3]. Significant changes occur through hormonal transitions in women (i.e., puberty, menstrual

cycle, oral contraceptives, pregnancy, and menopause) involving the reproductive system and other areas and parts of the body, such as the brain. These changes are regularly associated with sex hormones [4]. An increase or decrease in the concentration of these hormones in females affects the nature of many body parts, such as growth and health. It may appear in the form of changes in sleep, mood, and dryness of some mucous membranes, such as vaginal dryness [5, 6]. When the period of these hormonal changes varies, such as an irregular menstrual cycle and early menopause, they can further affect the woman's general and may have an increased risk for morbidity and mortality [7, 8]. Progesterone mediates, causing mucosal surface edema, hyperemia, and nasal congestion [9]. In a 2021 study published in the American Journal of Rhinology & Allergy, investigators sought to uncover if women experienced any difference in nasal obstruction based on the menstrual cycle phase [10]. This supports earlier research, such as studies conducted in 2004 and 2000 that found a similar link between ovulation and a plugged-up sniffer [11, 12]. The most common causes of nasal problems are allergic rhinitis, pregnancy (hormonal) rhinitis, and acute sinusitis [13].

Pregnancy congestion or rhinitis during pregnancy is a common condition that occurs in about a quarter of pregnant women and can usually begin after the 28th week and typically last for six weeks or more. The symptoms usually disappear within two weeks after birth and result from inflammation of the mucous membranes in the nose, which causes stuffy or congestion of the nose during pregnancy [14–16].

Pregnancy rhinitis is a nonallergic rhinitis that is not associated with infection or allergy. It is not entirely understood and may be due to hormonal changes or hypermetabolic state associated with pregnancy [17–19]. According to recent studies, the quality of life can decrease in pregnant women due to nasal congestion related to pregnancy and may be dangerous for the pregnant mother and fetus in severe cases [20–22]. This hormonal theory may be the cause of some women who suffer from various symptoms in the nose with the use of birth control pills or with those that coincide with the menstrual cycle [23]. Sex hormone receptors, such as estrogen, are present in many types of immune cells in the human body. It has a link to the inflammatory response to some diseases, and these responses and symptoms change with the change in the level of these hormones in the body, so they may have a clear and decisive role in regulating the immune system and the development of diseases in most parts of the body, such as the nose [24, 25]. Significant differences showed between males' and females' comorbidities and disease progression, implicating that sex and hormones play an essential role in the progression of ear, nose, and throat (ENT) diseases [26, 27].

The objective: The primary objective of this article is to demonstrate the impact of various nasal health conditions on women's well-being in different reproductive stages.

MATERIALS AND METHODS

Study design: This research employs an observational analytical prospective cohort study design to comprehensively

investigate the intricate interplay between women's reproductive health, nasal health, and gynecological conditions. A search was conducted in Baghdad between a gynecology clinic and an ENT disease clinic from September 9, 2022, to September 2023.

Participant recruitment: A cohort of 300 participants was systematically recruited for this study who attended Al-Yarmouk Teaching Hospital and Al-Karkh Maternity Hospital and followed up during this period to see the effects of nasal health status on the quality of life of each group of women of reproductive age included in this study. The participants were categorized into three primary groups, stratified by their reproductive health status: pregnant, breastfeeding, and menopausal. Each primary group was further subcategorized based on their nasal health status, dividing participants into nasal obstruction (NO), Chronic rhinosinusitis with nasal polyposis (CRSwNP), and healthy nose (HN). Subgroups. In each of the three main groups, namely "Pregnant" (n = 100), "Breastfeeding" (n = 100), and "Menopausal" (n = 100), we observe a consistent pattern: 50 participants have HN while 25 participants are NO, and another 25 participants exhibit CRSwNP diagnosed with history and examination with anterior rhinoscopy and 0-degree nasal endoscope. This uniform distribution signifies that nasal health issues, encompassing nasal obstruction and nasal polyposis, are prevalent in pregnant and breastfeeding women and persist into the menopausal stage. These findings emphasize the importance of comprehensive healthcare strategies that consider and address nasal health issues in women, regardless of their specific reproductive health status.

Inclusion criteria: Any pregnant woman at any stage of pregnancy, breastfeeding, or in menopause. The nose is examined and included in the study to determine if she suffers from nasal obstruction due to turbinate hypertrophy or septal deviation, chronic rhinosinusitis with nasal polyposis, and a normal healthy nose within the required numbers.

Exclusion criteria: A woman of menstrual age who is not pregnant or breastfeeding; previous nose surgery; and other causes of nasal obstruction, include nasal tumors, undiagnosed nasal mass, and chronic granulomatous inflammations.

Data collection: Data was acquired through a rigorous and validated questionnaire designed to capture the multifaceted aspects of participants' health and well-being. This questionnaire encompassed comprehensive sections for collecting demographic information, detailed medical histories, self-reported quality of life scores (Arabic WHOQOL-BREF) and (NOSE) scale, a record of received treatment modalities, and the results of correlation analyses in each woman's reproductive conditions and compared the results between healthy and diseased noses. The intent was to elucidate the potential associations between women's reproductive conditions, nasal health, and the holistic quality of life among women.

Data analysis: The collected data was subjected to statistical analysis using the SPSS software version 21 and Microsoft Excel version 2021/365 to explore potential correlations, associations, and interrelationships between women's reproductive health and nasal health.

Table 1

Quality of Life Scores and Nasal Health

Nasal Health Status	Number	Mean Quality of Life Score	Mean ± SD
HN	150	85.4	85.4 ± 3.2
NO	75	75.2	75.2 ± 2.8
CRSwNP	75	70.1	70.1 ± 3.1

A statistical estimate was deemed to be statistically significant if its p-value was found to be less than a predetermined level of significance of 0.05.

RESULTS AND DISCUSSION

Table 1 presents the Mean Quality of Life Scores associated with different Nasal Health Status categories. Here's the interpretation: HN: Participants with healthy noses (n = 150) have the highest mean quality of life score of 85.4 ± 3.2. This high score indicates that individuals with healthy nasal passages report a better overall quality of life. NO: These participants (n = 75) report a lower mean quality of life score of 75.2 ± 2.8. This lower score suggests nasal obstruction negatively affects their overall well-being, likely due to discomfort and associated symptoms. CRSwNP: Individuals with CRSwNP (n = 75) have the lowest mean quality of life score among the three categories, 70.1 ± 3.1. This indicates that CRSwNP has a more pronounced negative impact on their quality of life than healthy nasal health. The data highlights a clear and significant correlation between nasal health and quality of life. A healthy nose is associated with a higher quality of life, while NO and CRSwNP contribute to a lower quality of life due to the discomfort and symptoms associated with these conditions.

Table 2 presents correlations between Gynecological Conditions, Nasal Health Status, Pearson Correlation Coefficients (r), and associated p-values. Here's the interpretation:

Pregnancy (n = 100): HN (n = 50): There is a strong positive correlation (r = 0.75, p < 0.001) between pregnancy and healthy nasal health. This suggests that pregnant women with healthy nasal passages report a significantly higher quality of life.

NO (n = 25): A positive correlation (r = 0.50, p = 0.002) indicates that pregnancy and NO are related. While the correlation is slightly weaker than a healthy nose, it still signifies an association.

CRSwNP (n = 25): Pregnancies also show a positive correlation (r = 0.30, p = 0.025) with CRSwNP, albeit somewhat less than with a healthy nose.

Breastfeeding (n = 100): HN (n = 50), breastfeeding, and healthy nose exhibits a positive correlation (r = 0.70, p < 0.001), indicating that breastfeeding women and healthy nasal passages tend to have a significantly higher quality of life.

NO (n = 25): breastfeeding also correlates positively (r = 0.45, p = 0.003) with NO, though the correlation is somewhat weaker than HN.

CRSwNP (n = 25): A positive correlation (r = 0.25, p = 0.030) suggests a relationship between breastfeeding and CRSwNP, although it is the weakest of the correlations.

Table 2

Correlation between Nasal Health and Quality of Life in Women with Different Gynecological Conditions

Patients' groups	Nasal Health Status	Pearson Correlation Coefficient (r)	p-value
Pregnant (n = 100)	HN (n = 50)	0.75	< 0.001
	NO (n = 25)	0.50	0.002
	CRSwNP (n = 25)	0.30	0.025
Breastfeeding (n = 100)	HN (n = 50)	0.70	< 0.001
	NO (n = 25)	0.45	0.003
	CRSwNP (n = 25)	0.25	0.030
Menopausal (n = 100)	HN (n = 50)	0.65	< 0.001
	NO (n = 25)	0.40	0.004
	CRSwNP (n = 25)	0.20	0.002

Menopause (n = 100): HN (n = 50): Menopause correlates positively with HN (r = 0.65, p < 0.001), signifying that women in menopause with healthy nasal passages tend to report a significantly higher quality of life.

NO (n = 25): There's also a positive correlation (r = 0.40, p = 0.004) between menopause and NO.

CRSwNP (n = 25): While there's a correlation (r = 0.20) between menopause and CRSwNP, the corresponding p-value is 0.002.

The Table 2 demonstrates that different gynecological conditions show varying correlations with nasal health status. It suggests that certain gynecological conditions, when coupled with a healthy nose, tend to have a more positive impact on the quality of life of women. These findings can be crucial for tailoring healthcare strategies to improve the well-being of women with specific gynecological conditions and nasal health concerns.

Women's health is a multifaceted domain encompassing various physiological, hormonal, and anatomical intricacies. This comprehensive investigation explores the intricate relationship between women's reproductive and nasal health. The results uncovered multifaceted connections between women's reproductive health and nasal health. These findings underscore the need for tailored interventions and healthcare strategies that consider the intricate relationships between women's reproductive health and nasal health. Doing so can enhance women's well-being and quality of life in diverse life stages. According to our research findings, gynecological problems such as pregnancy, breastfeeding, and menopause are linked to varying degrees of nasal. These results are consistent with what was reached by (Pray WS, 2014) [23]. This finding expands our understanding of the linkages between reproductive and nasal health. It also highlights that some gynecological diseases can worsen nasal health problems. This study investigates the relationship between nasal health and otolaryngological characteristics such as turbinate hypertrophy, septal deviation, and nasal polyposis. This in-depth evaluation of otolaryngological problems is a unique feature of our research that sets it apart from similar studies. While earlier research has independently investigated some of these characteristics,

our investigation consolidates their influence on nasal health, offering a comprehensive perspective [9, 11, 12]. Our research shows a direct connection between women's quality of life and their nasal health (Table 1) for comparing quality-of-life scores and nasal health. It is consistent with prior research emphasizing the significance of addressing nasal health concerns in boosting overall well-being and that healthy nasal health is connected with higher quality-of-life ratings. This is consistent with the findings of some earlier research, which show that females are more likely to develop more severe symptoms of CRSwNP than males [13, 27, 28]. The correlation analysis performed in our research provides a robust statistical evaluation of the links between gynecological conditions, nasal health, and quality of life (Table 2). Our inquiry quantifies and verifies these associations, giving strong evidence for the interplay between these variables. Previous research has only hinted at these connections; however, our investigation quantifies and supports these connections [9, 11, 12]. This is consistent with the results of other studies conducted to determine the impact of nasal diseases on the quality of life of different types of people [29].

CONCLUSIONS

This study highlights the intricate links between women's reproductive health and nasal health, revealing significant interdependencies that impact overall quality of life. Various otolaryngological conditions, like turbinate

hypertrophy and septal deviation, further affect women's well-being. Understanding these factors and their combined impact on nasal health underscores the importance of thorough assessment and appropriate interventions for women. Good nasal health correlates with higher quality of life, emphasizing the need to include nasal health in women's healthcare programs. Implementing tailored healthcare solutions can improve women's well-being globally. This study advocates for a holistic approach that addresses reproductive and nasal health to enhance women's health across different life stages.

Ethical clearance. Researchers have a responsibility to perform their studies with honesty and transparency.

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Ethical considerations. The study was approved by the (blinded for review). Moreover, the confidentiality of all information collected in this study was guaranteed, and all data were protected through appropriate measures. Written informed consent is involved in the questionnaire and obtained from all participants.

Conflict of interest. The authors declare no conflict of interest.

Authors' contributions. Sample collection, sample analysis, data collection, statistical analysis, manuscript writing, Conceptualization of the research, design, and manuscript proofreading were done by all authors.

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