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ORIGINAL RESEARCH

ASSOCIATION OF ANAEMIA AND XEROSTOMIA IN POST-MENOPAUSAL WOMEN: A RETROSPECTIVE STUDY

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ABSTRACT

Background: Natural menopause is attained by 12 months of amenorrhea with no pathologic association. Xerostomia, Anaemia has been linked to unfavourable orofacial complications in menopause. Aim was to analyse the correlation between xerostomia and anaemia in menopausal women in a private dental hospital.

Materials and Methods: A retrospective study was conducted in a Private Dental College and Hospital, Chennai from the year of January 2019 to July 2024. The population was randomly selected that included females of age 40 years and above. Haemoglobin values, xerostomia grading were done. Chi-square was done to determine the association of anaemia with xerostomia in menopausal women. Level of significance was set at $p<0.05$.

Result: Out of the total population it was seen that the highest 42% of females were under post-menopausal stage followed by 22% in peri-menopausal stage, 21% in menopausal stage and 15% in pre-menopausal stage. Haemoglobin levels categorized as critical (21.82%), mild (20.00%), moderate (32.73%), and severe (25.45%). Xerostomia across different menopausal stages, with the highest prevalence in post-menopausal women (41.25%), peri-menopausal and menopausal women each account for 21.25%. Association between stages of menopause and haemoglobin value in post-menopausal women showed Pearson Chi-Square value of 16.775 with 9 degrees of freedom (p = 0.052), indicating it is significant (<0.05). Likelihood Ratio was statistically significant (19.073, p = 0.025).

Conclusion: The study reveals a notable prevalence of anemia and xerostomia, particularly among post-menopausal women, who also exhibit the highest rates of critical anemia. Given the observed overlap of anemia and xerostomia, further research is essential to better understand their relationship in post-menopausal women, which could lead to more effective, integrated treatment strategies.

Keywords**:** Anaemia, Xerostomia, Post Menopausal Women, Menopause, Osteoporosis

INTRODUCTION

Menopause is a physiological process occurring in women due to decrease in oestrogen production characterised by permanent cessation of menstrual cycles [1]. Natural menopause is attained by 12 months of amenorrhea with no pathologic association [2]. This milestone transition occurs in 45-55 years of age [3]. 65-85% of women face menopausal complications [4]. Early complications are insomnia, hot flashes, anxiety, genital changes and late complications are osteoporosis and cardiovascular manifestations.

In addition to these changes, menopause has been linked to unfavourable orofacial complications [5]. Oral manifestation in postmenopausal women includes burning mouth syndrome, xerostomia, mucosal changes, periodontal diseases, osteoporosis, and neurological disorders [6].

Burning mouth syndrome has etiological factors such as xerostomia, anaemia, diabetes mellitus, and nutritional disorders [7]. Xerostomia or dry mouth, is the perception of oral dryness often caused by reduced saliva production [8]. Menopause causes changes in the levels of electrolytes in saliva as well as a decrease in salivary

flow rate [9]. Insufficient salivary flow can lead to various symptoms including dry mouth, burning sensation, difficulty in swallowing, and altered or diminished taste perception [10].

During menopause, nutritional status is extremely crucial as it directly impacts chemosensory function, which might change eating habits [11]. A person's quality of life may further be reduced by major and long-lasting oral and pharyngeal problems, such as greater susceptibility to infections that develop due to persistent xerostomia and oral disorders associated with anaemia. It is linked to changes in physical and mental health as a result of exercising infrequently, gastrointestinal loss, nutritional deficiency, and malabsorption [12].

There are sparse studies done in this research, hence the current study was set out to examine the correlation between xerostomia and anaemia, two potential oral consequences in menopausal women in a private dental hospital.

MATERIALS AND METHODS

A retrospective study was conducted in a Private Dental College and Hospital, Chennai from the year of January 2019 to May 2025. The population was randomly selected that included females of age 40 years and above. They were divided into age groups of: 40-45 years-Early menopause, 46-50 years-Peri Menopause, 51-55 years-Menopause, and <56 years-Post Menopause.

The data was extracted from an electronic database-Dental Information Archiving System (DIAS). The Institutional Human Ethical Committee of SDCH (IHEC/SDC/OMED- 2304/24/167) granted ethical approval for this study.

Inclusion criteria were patients having signs or symptoms of xerostomia (dry mouth).

Exclusion criteria were patients in menstruating age, with multiple comorbidities, incomplete and censored data.

The internal validity of study of xerostomia was set by history and clinical appearance.

Data Collection

Data were collected based on Age, Haemoglobin values, Xerostomia based on gradings. Excel tabulation of Data collection was performed. Cross verification was done with referring case sheets and photographs. Details of the patient age, xerostomia, and haemoglobin values were obtained.

Haemoglobin levels were divided according to:
Critical: < 6 g/dL
Severe: 6-7.9 g/dL
Moderate: 8-9.9 g/dL
Mild: 10-12 g/dL

Xerostomia was graded according to the Challacombe Scale:
Grade 1: Mirror sticks to buccal mucosa
Grade 2: Mirror sticks to tongue
Grade 3: Saliva frothy
Grade 4: No saliva pooling in floor of mouth
Grade 5: Tongue shows generalised shortened papillae
Grade 6: Altered gingival architecture
Grade 7: Glassy appearance of oral mucosa
Grade 8: Tongue lobulated/fissured
Grade 9: Cervical caries
Grade 10: Debris on palate or sticking to teeth

Statistical Analysis

The data was imported to an Excel sheet (Microsoft® Excel® for Microsoft 365 MSO, Version 2307, Microsoft corporation, Washington, DC, USA) for descriptive analysis. All statistical analyses were performed using IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, NY, USA). Chi-square was done to determine the association of Anaemia with Xerostomia in menopausal women. Pearson correlation test was done to analyse the correlation of anaemia with xerostomia. Level of significance was set at $p<0.05$. The independent variables in the study are age, haemoglobin values, and xerostomia. The dependent variables in the study are menopausal groups of women.

RESULT

In this study, out of 100 female patients it was noted that only 20% had anemia, 45% had xerostomia, and 35% had anemia associated with xerostomia.

Out of the total population it was seen that the highest 42% of females were under post-menopausal stage followed by 22% in peri-menopausal stage, 21% in menopausal stage and 15% in pre-menopausal stage (Figure 1).

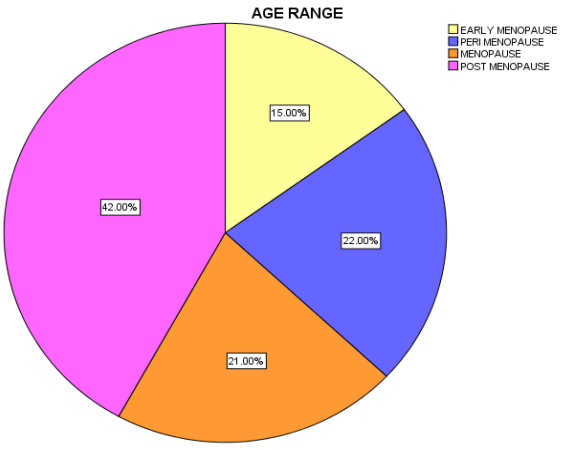

Figure 1. This pie chart represents the distribution of different stages of menopause in females.

The pie chart illustrates the distribution of patients based on their haemoglobin levels, categorized as critical (21.82%), mild (20.00%), moderate (32.73%), and severe (25.45%) (Figure 2).

The bar chart shows the prevalence of xerostomia across different menopausal stages, with the highest prevalence of grade 4 seen in 10 patients, followed by

grade 3 and 5 in 7 patients and grade 9 being the least prevalent stage; each indicating that xerostomia is also a common issue during the menopausal transition. (Figure 3).

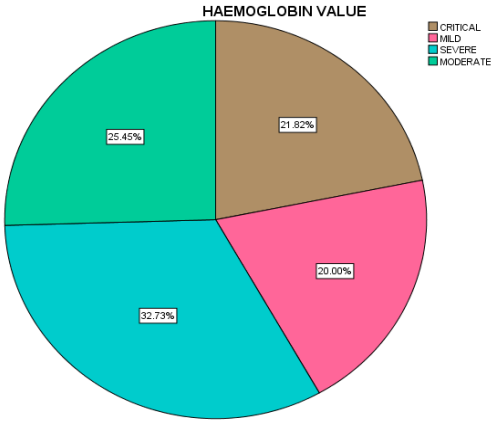

Figure 2. This pie chart represents the distribution of different levels of haemoglobin in females.

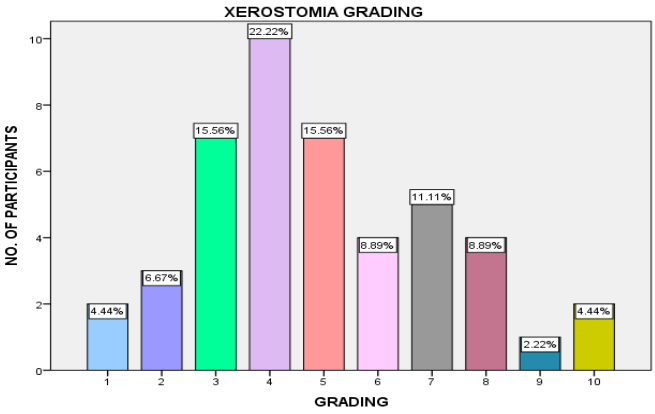

Figure 3. This bar chart represents the prevalence of xerostomia in the study population.

The bar chart illustrates the distribution of haemoglobin levels across different menopausal stages, highlighting that critical and severe anemia were more prominent in the post-menopausal groups at 16.36% and 14.55% respectively, menopausal women have the highest occurrences of severe anemia at 5.45%, peri and early menopausal groups had moderate anemia at 9.09%. (Figure 4).

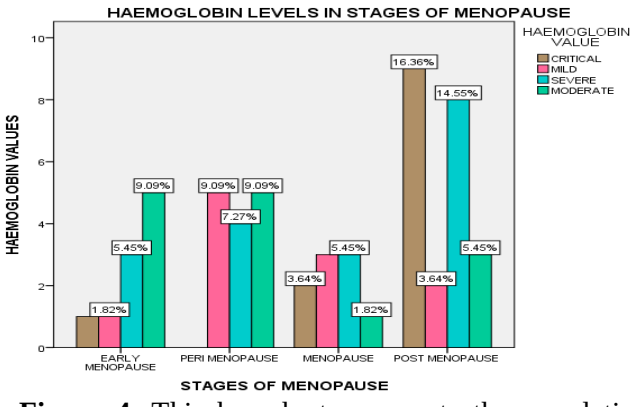

Figure 4. This bar chart represents the correlation of different levels of haemoglobin with different stages of menopause.

This bar chart shows the distribution of xerostomia severity among anaemic post-menopausal women by varied grading across different haemoglobin levels. Patients with mild anemia demonstrated the highest frequency of xerostomia grade 4 (8.57%), suggesting that even relatively less severe anemia can be significantly associated with oral dryness. In moderate and severe anemia, xerostomia grades 1, 2, 3, and 7 were more common, each contributing up to 5.71% of patients within those groups. Interestingly, critical anemia cases showed xerostomia across multiple grades, with grade 5 being the most prevalent (5.7). (Figure 5).

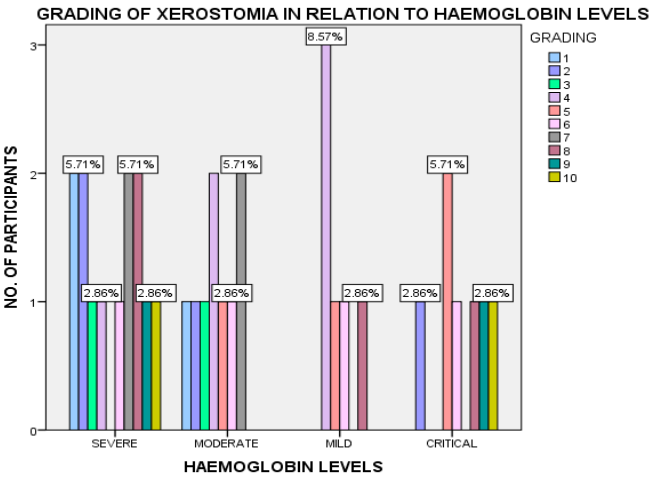

Figure 5. This bar chart represents the number of patients in each grading of xerostomia when compared to Hb levels.

The table reveals the association between stages of menopause and haemoglobin value in post-menopausal women was analysed using the Chi-Square test. The Pearson Chi-Square value was 16.775 with 9 degrees of freedom ($p = 0.052$), indicating it is significant (<0.05). The Likelihood Ratio was statistically significant (19.073, $p = 0.025$) (Table 1).

Table 1. This table represents the correlation between anemia and xerostomia.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.775[a]	9	.052
Likelihood Ratio	19.073	9	.025
N of Valid Cases	55		
14 cells (87.5%) have expected count less than 5. The minimum expected count is 1.80.			

The present retrospective study highlights a significant association between anemia and xerostomia in postmenopausal women, underlining an often-overlooked aspect of oral health in this demographic. Our findings revealed that 35% of women in the sample population exhibited both anemia and xerostomia, with the highest prevalence occurring in the post-menopausal group. These results underscore the impact of systemic changes following menopause and reinforce the importance of comprehensive health evaluations that include both hematologic and oral assessments [13]. Our data show a substantial proportion of women had moderate to severe anemia, particularly in the post-menopausal group.

From the total sample, it was found that the highest 42% of females were under post-menopausal stage followed by 22% in peri-menopausal stage, 21% in menopausal stage and 15% in pre-menopausal stage. Similarly in a study by Pallikadavath et al, in 22.1% of women between the ages of 35 -39 years were in menopause in Andhra Pradesh [14].

Distribution of post-menopausal patients based on their haemoglobin levels, categorized as critical (21.82%), mild (20.00%), moderate (32.73%), and severe (25.45%). Largest group falls under moderate anemia, indicating that a significant portion of the population has moderately low haemoglobin levels. The presence of severe anemia in 25.45% of the population underscores the need for timely intervention before further complications. Similarly, a study by Rana et al, patients with abdominal Tuberculosis had severe (18.6%), moderate (41.3%), and mild (27.3%) [15].

Prevalence of xerostomia across different menopausal stages, with highest prevalence of grade 4 seen in 22.22% patients, followed by grade 3 and 5 in 15.56% patients and grade 9 being the least prevalent stage with 2.22%; each indicating that xerostomia is also a common issue during menopausal transition. In a study by Adolfsson, mild xerostomia (12–22 points), moderate xerostomia (23–33 points), and severe xerostomia (34–49 points) were evident in adults in primary health care [16].

Xerostomia is a common complaint among postmenopausal women, with Massler et al. (1951) noting that 93% of dry mouth cases were in this age group [17]. Ziskin and Moulton first highlighted dry mouth as an oral symptom of menopause in 1946 [18]. Despite limited research since, recent studies by Sema Dural et al. found reduced salivary pH and poor oral hygiene as key risk factors for oral health issues in postmenopausal women, while they also reported higher DMFT scores, indicating greater dental caries risk [19]. Wardrop et al. (1989) observed xerostomia in 43% of their participants, but the present study shows an even higher prevalence [20]. Additionally, Shezadi Sabah et al. found a strong link between anemia and lower socioeconomic status in this population [21].

Association between stages of menopause and haemoglobin value in post-menopausal women was analysed using Chi-Square test. Pearson Chi-Square value was 16.775 with 9 degrees of freedom ($p = 0.052$), indicating it is significant (<0.05). Likelihood Ratio was statistically significant (19.073, $p = 0.025$)

Distribution of haemoglobin levels across different menopausal stages, highlighting that critical and severe anemia were more prominent in the post-menopausal groups at 16.36% and 14.55% respectively indicating increased vulnerability during these stages; menopausal women have the highest occurrences of severe anemia at 5.45%, peri and early menopausal groups had moderate anemia at 9.09%. In contrast, early menopause shows relatively lower occurrences of anemia. These patterns suggest that as women progress through menopause, there is a significant risk of anemia, particularly in the post-menopausal phase, underscoring the need for proactive monitoring and intervention to manage anemia in pre-menopausal and menopausal women.

Distribution of xerostomia severity among anemic post-menopausal women varied by grading across different haemoglobin levels. Patients with mild anemia demonstrated the highest frequency of xerostomia grade 4 (8.57%), suggesting that even relatively less severe anemia can be significantly associated with oral dryness. In moderate and severe anemia, xerostomia grades 1, 2, 3, and 7 were more common, each contributing up to 5.71% of patients within those groups. Interestingly, critical anemia cases showed xerostomia across multiple grades, with grade 5 being the most prevalent (5.71%), indicating that the severity of xerostomia may not linearly correlate with the depth of anemia.

However, a noteworthy correlation between anemia and xerostomia was also confirmed (p = 0.04), in the findings of Ramya et al. The elevated occurrence of anemia in these individuals may be attributed to factors such as inadequate nutrition and substandard living conditions.

This supports a positive association between anemia and xerostomia, potentially mediated by both menopausal changes and socioeconomic influences. These insights underscore the importance for dental professionals to recognize the broader systemic implications of menopause, particularly the interplay between anemia and oral dryness, in order to optimize both oral and overall health outcomes in this vulnerable population.

FUTURE SCOPE AND LIMITATIONS

As a retrospective design, it is inherently limited by potential data incompleteness and lack of control over confounding variables such as diet, medication history,

and systemic illnesses. Additionally, xerostomia was diagnosed based on clinical grading and history rather than objective salivary flow measurements, which might have introduced subjective bias.

Future research should adopt prospective, longitudinal designs and incorporate biochemical parameters, salivary biomarkers, and standardized xerostomia indices to establish a clearer causal relationship.

The implications of our findings are twofold. Firstly, routine oral examinations in postmenopausal women should include xerostomia screening and nutritional counselling. Secondly, anemia screening should be considered a component of dental assessments in menopausal women presenting with oral dryness or burning sensations. Early detection and interdisciplinary management may significantly improve the quality of life for this vulnerable group.

CONCLUSION

The study reveals a notable prevalence of anemia and xerostomia, particularly among post-menopausal women, who also exhibit the highest rates of severe and moderate anemia. These findings underscore the necessity for early detection and targeted interventions across various stages of menopause, with a specific focus on the post-menopausal phase. Distribution of xerostomia severity among anaemic post-menopausal women varied by grading across different haemoglobin levels. Given the observed overlap of anemia and xerostomia, further research is essential to better understand their relationship in post-menopausal women, which could lead to more effective, integrated trea

DECLARATION

Conflict of Interest

There are no conflicts of interest.

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Competing Interests

The authors have no competing interests to declare tment strategies.

REFERENCES

1. McNeil, M. A., & Merriam, S. B. (2021). Menopause. *Annals of internal medicine*, *174*(7), ITC97–ITC112. https://doi.org/10.7326/AITC202107200

2. Hambire C, Hambire U. Oral Health Care and reatment Needs in Postmenopausal Women. J Oral Health Comm Dent 2021;15(1):24–29.

3. US Preventive Services Task Force, Mangione, C. M., Barry, M. J., Nicholson, W. K., Cabana, M., Caughey, A. B., Chelmow, D., Coker, T. R., Davis, E. M., Donahue, K. E., Jaén, C. R., Kubik, M., Li, L., Ogedegbe, G., Pbert, L., Ruiz, J. M., Stevermer, J., & Wong, J. B. (2022). Hormone Therapy for the Primary Prevention of Chronic Conditions in Postmenopausal Persons: US Preventive Services Task Force Recommendation Statement. *JAMA*, *328*(17), 1740–1746. https://doi.org/10.1001/jama.2022.18625

4. M AbedzadehKalahroudi, M Taebi, Z Sadat, F Saberi, Z Karimian. Prevalence and Severity of Menopausal Symptoms and Related Factors Among Women 40-60 Years in Kashan, Iran. Nursing and Midwifery Studies. 2012 ; 1(2): 8893

5. Zakrzewska J. M. (1996). Women as dental patients: are there any gender differences?. *International dental journal*, *46*(6), 548–557

6. Modoodi M, Jalilvand F, Zare S, Ataei M, Saeieh SE, Mirzaei M. Investigating the prevalence of menopausal complications and its related factors in women referred to Shahroud Health Centers in 2014. Revista Latinoamericana de Hipertension. 2020;15(2).

7. Tirupathi SP, Malothu S, Allaparthi U, Velvaluri S, Afnan L, Budia S, Sachdev M. Burning measure for burning mouth syndrome: a systematic review. Journal of the Korean Association of Oral and Maxillofacial Surgeons. 2024 Apr 1;50(2):63-9. WOS

8. Ramadoss R, Krishnan R, Raman S, Padmanaban R, Anbuelangovan N, Eswaramoorthy R. Salivary stimulatory effect of novel low level transcutaneous electro neurostimulator in geriatric patients with xerostomia. BMC Oral Health. 2023 May 28;23(1):334.WOS

9. Ojo KO, Eweka OM, Ayanbadejo PO, Oshodi TA, Owotade FJ. Oral Disorders and Serum Oestrogen Levels in Postmenopausal Women in Lagos, Nigeria. *West Afr J Med*. 2023;40(8):820-825.

10. Tanasiewicz, M., Hildebrandt, T., & Obersztyn, I. (2016). Xerostomia of Various Etiologies: A Review of the Literature. *Advances in clinical and experimental medicine: official organ Wroclaw Medical University*, *25*(1), 199–206. https://doi.org/10.17219/acem/29375

11. Lim SY, Chan YM, Chin YS, Zalilah MS, Ramachandran V, Arumugam M. Combined Effect of Dietary Acid Load and Cardiometabolic Syndrome on Bone Resorption Marker among Post-Menopausal Women in Malaysia. The Malaysian Journal of Medical Sciences: MJMS. 2024 Apr 23;31(2):113.Scopus

12. Rajasekaran K, Renu K, Sankaran K, Veeraraghavan VP, Rengasamy G, Ronsivalle V, Cicciù M, Minervini G. Determination of red blood cell parameters for signs of iron deficiency anemia in patients with oral diseases. Minerva dental and oral science. Scopus

13. Dhayanithi J, Rajasekar A. Comparison of Alveolar Bone Level around Osseointegrated Dental Implants among Premenopausal and Postmenopausal Women: A 2-Year Study. Journal of Long-Term Effects of Medical Implants. 2024;34(2). Scopus
14. Pallikadavath S, Ogollah R, Singh A, Dean T, Dewey A, Stones W. Natural menopause among women below 50 years in India: A population-based study. Indian Journal of Medical Research. 2016 ;144(3):366-77.
15. Rana S, Farooqui MR, Rana S, Anees A, Ahmad Z, Jairajpuri ZS. The role of laboratory investigations in evaluating abdominal tuberculosis. Journal of Family and Community Medicine. 2015 Sep 1;22(3):152-7.
16. Adolfsson A, Lenér F, Marklund B, Mossberg K, Çevik-Aras H. Prevalence of dry mouth in adult patients in primary health care. Acta Odontologica Scandinavica. 2022 Nov 17;80(8):605-10.
17. Massler M. Oral manifestations during the female climacteric (the postmenopausal syndrome. Oral Surg Oral Mad Oral Pathol 1951;4:1234-1243.
18. Ziskin DE, Moulton R. A comparison of oral and vaginal epithelial smears. J Clin Endocrinol Metab 1948;8:146-165.
19. Dural S, Hatipoglu MG, Cagirankaya B. Evaluation of the effect of menopause on saliva and dental health. Hacettepe University, Faculty of Dentistry 2006;30(6):15-18.
20. Wardrop RW, Hailes J, Burger H, Reade PC. Oral discomfort at menopause. Oral Surg Oral Med Oral Pathol 1989;67(5):535-540.
21. Sabah S, Fatima I, Ramzan M. Iron deficiency anemia; role of nutritional deprivation among female patients of reproductive age group. Professional Medi J 2010;17(4):686-690