

Systematic Review

Factors Associated with Oral Discomfort at The Menopausal Stage: A Systematic Review

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ABSTRACT

Introduction: Menopause is a physiological process that all women experience and is often regarded as a sign of aging in women. The signs and symptoms of menopause are very diverse, and oral discomfort is one of the symptoms. Oral discomfort can interfere with oral cavity function, indirectly affecting nutrient intake. This study aims to evaluate factors associated with oral discomfort and oral manifestations of the menopausal stage.

Review: This review is based on the PRISMA statement. A literature review incorporated observational studies from the last five years and across 5 databases. An investigative question was formulated using the PEOS model, studies were selected, and a quality analysis was performed in accordance with the STROBE guidelines. The bibliometric analysis was performed, and the data were qualitatively analyzed. A total of 19 articles met the inclusion criteria, with the majority of oral manifestations at the menopausal stage being xerostomia, burning sensation, taste disturbances, and periodontitis. Duration of menopause, bad oral hygiene, lower salivary flow rate, higher calcium saliva concentration, and salivary estrogen level were found to be associated factors for oral discomfort at the menopausal stage.

Conclusions: The menopausal stage may increase the risk of oral discomfort due to decreased estrogen levels in saliva. Since the estrogen receptor was found in the oral cavity, especially in the mucosa, salivary gland, and periodontium, it can directly affect the oral cavity.

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INTRODUCTION

Menopause is a physiological process preceded by changes in the ovaries and cessation of estrogen hormone production. Menopause is often used as a sign of aging in women. According to the World Health Organization, the average age of women experiencing menopause is 45-54 years old, with the sign of menopause being the absence of menstruation for the last 6-12 months. The number of menopausal women worldwide will reach 1.2 billion in 2030 due to the increasing life expectancy of women, resulting in women experiencing menopause in a third of their lives.^{1,2}

Although menopause is a physiological process, this condition affects women's physical, psychological, and social lives. Menopause symptoms can be experienced widely, and these stages affect the overall systemic condition, such as hot flushes, cardiovascular issues, vaginal atrophy, sex disorders, and psychological conditions.^{3,4} The cessation of estrogen production also affects the oral cavity since estrogen receptors are found in the oral mucosa, periodontal tissue, and salivary glands.^{5,6}

Menopause increases the risk of oral discomfort. Based on previous studies, as many as 43% of menopausal women experience oral discomfort.⁷ Oral discomfort is a general term for uncomfortable sensations in the oral cavity. Chronic and complex conditions interfere with oral cavity functions, including speech, mastication, taste, and swallowing.⁸⁻¹⁰

The most common symptoms of oral discomfort include xerostomia and a burning sensation. These symptoms mostly occur during the climacteric stage.

Oral discomfort affects the quality of life. Although the general symptoms that occur in women during menopause are well documented, the level of awareness of the fact that oral discomfort in patients at this time is also an element of menopause complaints is still low.¹¹ Therefore, this systematic review aimed to incorporate all published articles to determine the oral manifestations of menopausal symptoms and the factors associated with oral discomfort during this stage.

REVIEW

This systematic review was conducted following PRISMA 2020 guidelines and was registered with the International Prospective Register of Systematic Reviews and registration number CRD4202510275333. The model used to formulate research questions was Population, Exposure, Outcome, Studies (PEOS). The PEOs include: (P: women; E: menopause; O: oral discomfort and oral manifestations; S: observational studies (cross-sectional, cohort, or case-control)). The search strategy, study selection process, data extraction, and quality assessment (risk of bias assessment) were performed by two independent investigators. In case of doubt, a third investigator was consulted.

The search strategy was conducted in February 2025 across five electronic databases (PubMed, EBSCOhost, ProQuest, ScienceDirect, SpringerLink), and the search was limited to articles published between January 2020 and February 2025, using the Boolean operators "OR" and "AND". (Table1)

Table 1. Search strategy

Field 1	(((menopause[MeSH Terms]) OR (climacterics[MeSH Terms])) AND (oral discomfort[Text Word])) OR ((oral manifestations[MeSH Terms]) OR (oral manifestation[MeSH Terms])) OR ((oral health[MeSH Terms]) OR (health, oral[MeSH Terms]))
Field 2	((Menopause OR Climacteric) AND ((Oral Discomfort) OR (Oral Manifestations OR Oral Manifestation) OR (Oral Health OR Health, Oral)))

Table 2. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Articles studied oral discomfort, oral manifestation, or oral alteration during the menopausal stage	Articles that did not include women in the menopausal stage or articles that did not study oral alteration, oral manifestation, or oral discomfort
Articles in English	Articles in a language other than English
Observational Studies (case-control, cohort, cross-sectional, longitudinal, pilot study)	Clinical cases, systematic reviews, and meta-analyses
Studies conducted in humans	In vitro or animal studies
Articles published within the last 5 years	Articles published more than 5 years ago

The bibliographic references obtained through the search strategy were exported to the citation manager Mendeley Desktop to remove potential duplicates. A screening process was conducted by reviewing the titles and subsequently the abstracts based on the inclusion and exclusion criteria. Next, the articles that met these criteria were assessed for eligibility and qualitative synthesis through a full-text screening.

For the bibliometric analysis, the following information is summarized in a table: author and year, country, study design, age at menopause, oral manifestations or oral discomfort, and associated conditions.

To assess the risk of bias in the selected articles, a modified version of STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) analysis was used (Table 3).¹² This analysis consisted of 13 criteria. During the evaluation, compliance with each criterion was indicated with a check mark (√), while non-compliance was marked with a cross (x). Articles were categorized based on their scores: those with 8 to 12 points were considered to have a low risk, those with 4 to 7 points were considered to have a moderate risk, and those with scores below 4 points were considered to have a high risk of bias. We also calculated the Kappa agreement for both two independent investigators

Table 3. List of criteria used to evaluate the quality of observational studies based on the adapted version of the STROBE guidelines¹³

Methods		
Configuration	1	Describe the environment, locations, and relevant dates, including the periods of recruitment, exposure, follow-up, and data collection
Participants	2	Specify the eligibility criteria (inclusion and exclusion), including matched groups or control if applicable
	3	Provide the history of menopausal
Variables	4	Clearly define the oral manifestation and oral discomfort
Data sources/measurement	5	Provide a detailed explanation of the evaluation methods (measurement) of the oral discomfort and oral manifestation
Study Size	6	Explain how the study size was determined
Statistical methods	7	Describe all statistical methods, including those used to control confounding factors
	8	Describe any methods used to examine subgroups and interactions
Bias	9	Describe any method used to control bias
Descriptive Data	10	Provide the characteristics of the study participants (e.g. demographic, clinical, social) and report on exposures and potential confounding factors
	11	Indicate the number of participants with missing data and explain how it was addressed
Outcome data	12	Report the numbers in each exposure category or summary measures of exposure

The literature search yielded a total of 1028. Specifically, 35 from ProQuest, 110 from PubMed, 236 from Springer Link, 575 from Science Direct, and 53 from EBSCOhost. These results were obtained by discarding 0 duplicate articles, with 998 articles unmatched with PEOS excluded, and an additional 10 articles were excluded because it was a systematic reviews; then 1 article was also excluded because not be found. The next 19 remaining articles were assessed through full-text reading. The organization of selected articles

based on the year of publication is presented in Figure 1.

The quality analysis used for this systematic review was based on a modified version of the STROBE guidelines for observational studies. Eleven studies (57.89%) were considered to have a low risk, and eight studies (42.10%) were considered to have a moderate risk, respectively (Table 5). The Kappa score for both independent investigators is 0.45, which means it is considered that agreement has been reached.

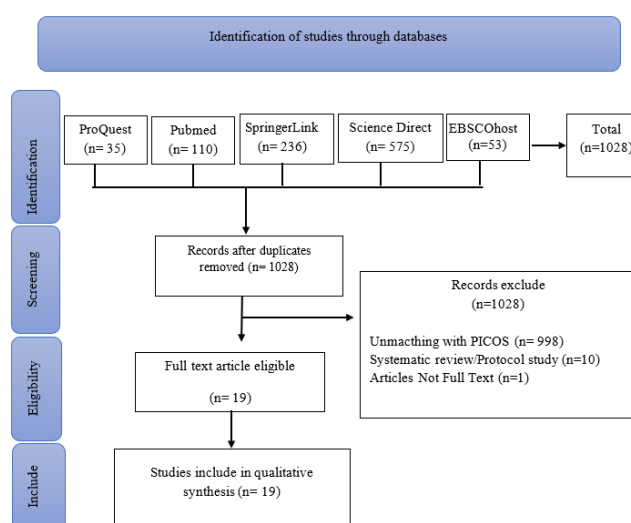


Figure 1. Flow diagram based on the PRISMA 2020 statement representing the study selection process for this systematic review

The main characteristics of the selected study are described in Table 4. Among the oral manifestations listed in Table 4, the most prevalent at the menopausal stage was xerostomia, reported in 42.1% (8 articles).^{13–20} Then, 36.8% had periodontitis (7 articles).^{14,17,21–25} Altered taste was 31.57% (6 articles)^{10,13,14,18,26,27}. Burning mouth syndrome was 36.84% (7 articles)^{9,13,14,17,18,26,28}, 0.05% found increased DMFT (1 article)¹³ 10.5% (2 articles)^{29,23} found tooth loss associated with menopause, and 10.5% (2 articles)^{14,17} found mucosal lesions or mucosal injury at the menopausal stage. Among

the articles, 15.78% (3 articles)^{16,19,28} found a correlation between lower salivary estradiol and oral complaints at the menopausal stage, lower salivary flow rate 31.57% (6 articles),^{10,11,13–15,27} higher salivary calcium 10.52% (2 articles)^{11,17}, changes in saliva composition 26.31% (5 articles)^{11,17,19,27,30} were found with oral complaints at the menopausal stage. 10.5% (2 articles)^{21,23} found a correlation between body mass index and oral complaints, and 0.05% (1 article)²² found that immune modulation was associated with oral complaints at the menopausal stage.

Table 4. Main characteristics of the study included:

Author (Year)	Country	Study Design	Age of menopause	Oral Manifestations or Oral Discomfort	Associated factors with the condition	Conclusion
Zovari F et al. (2020) ³⁰	Iran	Case Control	40-74 years	No mention	Lower serum TAC and MDA levels were higher in post-menopausal women. However, the level of TAC & MDA in saliva does not change	The increase in MDA levels and reduction of TAC suggest no balance between the production of oxidants and the activity level of antioxidants in post menopause, resulting in increased ROS levels in biological fluids
Cydejko A et al. (2020) ¹¹	Poland	Cross Sectional	48-55 years	No mention	Lower concentration of salivary flow rate, lysozyme, and immunoglobulin A. However, Ionized calcium is higher in menopausal women	The physicochemical properties of saliva (lysozyme, immunoglobulin A) have a role in defense mechanisms in the oral cavity. Higher Ionized salivary concentration due to decreased concentration of estrogen levels and an impact on increased remineralization potential of saliva.
Kim JI et al. (2021) ²⁹	Korean	Cross Sectional	40-79 years	The association between the number of remaining teeth less than 20 in post menopause with chewing difficulty was 31.1%, speaking difficulty 11.7%, and metabolic syndrome with OR 1.82 (1.49-2.22)	Metabolic syndrome, such as abdominal obesity, hypertension, diabetes, dyslipidemia, and oral hygiene practice, correlated with oral discomfort at the menopause stage	Metabolic syndromes (abdominal obesity, hypertension, diabetes, dyslipidemia) may affect the number of remaining teeth in postmenopausal women
Agrawal R et al (2021) ³¹	India	Cross Sectional	40-60 years	Periodontal disease is higher in post menopause women. (plaque index 1.94 ± 0.46 , gingival index 1.78 ± 0.44 , calculus index 0.78 ± 0.34 , probing depth 4.36 ± 1.34 , clinical attachment loss 5.08 ± 1.45)	Estrogen deficiency results in upregulation of immune response and osteoclasts, which are liable to produce more bone-resorbing cytokines such as IL-1, IL-6, and TNF-1 and 2	Menopause affects the periodontal tissue, and postmenopausal women are more susceptible to periodontal infection
Wang L et al. (2021) ²⁸	China	Case Control	Mean age 55.60 ± 5.29 years	Dry mouth 86.3%, difficulty swallowing food 50%, feel dry mouth at night 93.8%, feel dry mouth during the day 83.3%, burning sensation on tongue 6.7%	Salivary estrogen level was lower, 0.97 ± 0.73 , in the postmenopausal group before hormone replacement therapy	Salivary estradiol levels were reduced in post-menopausal women with the complaint of xerostomia

Author (Year)	Country	Study Design	Age of menopause	Oral Manifestations or Oral Discomfort	Associated factors with the condition	Conclusion
Kim JI et al. (2021) ²¹	Korea	Cross Sectional	40-79 years	Prevalence of periodontitis among post menopause women: 44.3% felt chewing discomfort, 41.4% had speaking difficulty, OR periodontitis 1.34(95%CI: 1.12-1.60) in metabolic syndrome	The prevalence of periodontitis was 1.36 and 1.34 times higher in abdominal obesity; however, it was not significant after adjustment	Metabolic syndrome, such as predictors of periodontitis in menopausal women
Yakar N et al. (2021) ²³	Turkey	Cross-sectional Cohort	Mean age of menopause 46±4	39.3% periodontitis, 57.1% gingivitis, 17.8% severe periodontitis The mean number of missing teeth was significantly higher in postmenopausal women, 3.88±2.41	Women after menopause experience more tooth loss and higher BMI. The presence of periodontitis is associated with a higher depressive mood score but not with osteoporotic changes	An association between the number of missing teeth, poor emotional well-being, and menopause
Soundarya B et al. (2022) ¹⁹	India	Case Control	46-60 years	Mean salivary estradiol was lower, 3.22±2.87, and mean salivary calcium levels were higher, 5.91±3.47 Mean xerostomia score was 35.80 (p=0.00)	Salivary estradiol level decreased. Increased salivary calcium level is related to the increased occurrence of periodontal disease among postmenopausal women	Declining estradiol levels are responsible for various systemic and oral manifestations during menopause
Ozasa K et al. (2022) ⁹	Japan	Case Control	Mean age of early menopause (53.2±2.7 years), late menopause (70.1±5.0 years)	Burning mouth syndrome; quantitative sensory testing showed postmenopause with BMS were more sensitive to heat pain and cold pain threshold at the tongue	Menopausal changes significantly reduce neuroprotective steroids. Neuroactive steroids may directly or indirectly affect cold sensitivity in postmenopausal patients	Changes in sex hormones may directly or indirectly affect trigeminal somatosensory function during the postmenopause stage in patients with BMS
Lee Y et al. (2022) ²⁴	Korea	Cross Sectional	45-60 years	Post menopausal women with osteoporosis are at risk of periodontal disease, with an adjusted OR of 1.25 (95% CI: 1.00-1.56)	Duration after menopause (years) '0-4 years' in osteoporosis is associated with an increased risk of periodontal disease (adjusted OR, 2.08; 95% CI: 1.15-3.77)	Osteoporosis is associated with periodontal disease and mostly affects women in the menopausal transition stage, which is 0-4 years after menopause.

Author (Year)	Country	Study Design	Age of menopause	Oral Manifestations or Oral Discomfort	Associated factors with the condition	Conclusion
Yasuda M et al. (2022) ¹⁸	Japan	Cross Sectional	40-79 years	39.4% xerostomia, 16.2% taste disturbance, 9.2% burning sensation, 5.1% multiple oral complaints	Psychological stress due to menopausal symptoms may lead to xerostomia, taste disturbance (especially phantogeusia), and burning sensation	Menopausal symptoms may be related to multiple oral complaints
Ruchi G et al. (2022) ¹⁷	India	Cross Sectional	45-70 years	Periodontitis with xerostomia (90.32%), periodontitis without xerostomia (88.75%), mucosal injury (38.73%), burning mouth (23.03%)	Poor oral hygiene is higher in xerostomia, attributed to a higher concentration of ionized calcium in saliva. Xerostomia suggests a significant role in postmenopausal advancing periodontitis	Impairs calcium phosphate regulation mechanism, resulting in higher levels of calcium in saliva, triggering calculus formation
Gupta A et al. (2022) ¹⁶	India	Case-control prospective	Mean age 56.17±5.66	Post menopause with oral dryness, mean salivary estrogen levels 1.00±0.42. Postmenopause without oral dryness, mean salivary estrogen levels 4.01 ±1.41	Reduced levels of estrogen hormone after menopause are associated with the complaint of oral dryness	Estrogen deficiency can be considered a possible cause of oral discomfort in some postmenopausal women
Rafie M et al. (2022) ²⁵	Iran	Case Control	Mean age 53.98±7.58	Periodontitis 53.23%, 46.77% did not have periodontitis	No significant association between incidence of periodontitis and type and age of menopause	No correlation between hormonal fluctuations and periodontal status
Poudel K et al. (2023) ¹⁵	India	Case Control	44-76 years	76.67% oral discomfort, 43.33% dry mouth, 16.67% burning sensation, 16.67% taste disorder Whole unstimulated saliva in 5 minutes in post menopause 0.94±0.44 ml/l	Significant association between symptoms of oral discomfort and unstimulated salivary flow rate in postmenopausal women	Saliva collected without any masticatory or gustatory stimulus more reliable indicator of reduced salivary flow rate
Muneshwar SS et al. (2023) ¹⁴	India	Cross Sectional	50-70 years	76.6% showed oral mucosal changes, 20.2% xerostomia, 15.9% periodontitis, 13% altered taste, 8.6% lichen	Salivary flow rate, atrophic mucosa, influences host immune-inflammatory responses	Hormonal changes have a substantial impact on the female oral cavity, either directly or indirectly through neural mechanisms. During menopause, oral mucosa

Author (Year)	Country	Study Design	Age of menopause	Oral Manifestations or Oral Discomfort	Associated factors with the condition	Conclusion
				planus, 7.2% oral candidiasis		is more susceptible to many infections
Ekhtiari A et al. (2024) ²⁷	Iran	Cross Sectional	45-55 years	Altered taste: postmenopausal women had a higher threshold for sweet taste and umami, and lower threshold for sourness	Decreased non-stimulated saliva, xerostomia, and pH affect altered taste in postmenopausal women	Complex relationship between estrogen metabolism and the autonomic nervous system regulates salivary secretion and volume of stimulated saliva. Decreased estrogen reduces the sensitivity to salty and sweet taste, leading to an increase in consumption of products containing salt and sugar
Harika PD et al (2024) ¹⁰	India	Cross Sectional	30-60 years	Mean perceptions of sucrose, salt, sour, and bitter are lower in postmenopausal women (0.70±0.20, 0.95±0.10, 0.99±0.03, 0.88±0.15, respectively), with slightly higher zinc levels	Salivary flow rate is slightly lower in post menopausal	Zinc levels did not significantly influence perception among postmenopausal women, suggesting taste impairment is a multifactorial phenomenon
Sumit K et al (2024) ¹³	India	Cross Sectional	38-64 years	Higher DMFT score 5.4±3.8, 23% no significant difference in bleeding gum (p=0.27), bad breath (0.28), burning sensation (p=0.84), oral dryness (p=0.78). 23% altered taste	No significant differences in either subjective measure of oral dryness or objective measure of saliva secretion	Menopause does not appear to affect oral health or taste perception. It suggests oral health and taste perception are associated with the gradual aging process that may or may not be affected by menopause

TAC: Total antioxidant capacity, MDA: Malondialdehyde, ROS: Reactive Oxygen Stress, OR: Odds Ratio, IL: Interleukin, TNF: Tumor Necrosis Factor, DMFT: Decay Missing Filling Tooth

Table 5. The quality assessment was conducted with adapted STROBE guidelines^{13,14}

Study	1	2	3	4	5	6	7	8	9	10	11	12	Total score	Risk of bias
Zowawi F et al.	✓	✓	✓	✓	✓	✓	✓	✓	×	×	✓	✓	10	Low
Cydelko et al.	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	✓	9	Low
Kim JI et al.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Low
Agrawal R et al.	✓	✓	✓	✓	✓	×	✓	✓	×	×	×	✓	8	Low
Wang L et al.	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	✓	9	Low
Kim JI et al.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Low
Yakar N et al.	✓	✓	✓	×	×	×	✓	✓	×	✓	×	✓	7	Moderate
Soundariya B et al.	✓	✓	✓	✓	✓	×	✓	✓	×	×	×	✓	8	Low
Ozassa K et al.	✓	✓	✓	✓	✓	×	✓	×	×	×	×	✓	7	Moderate
Lee Y et al.	✓	✓	✓	×	×	✓	✓	✓	✓	✓	×	✓	9	Low
Yasuda M et al.	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	11	Low
Ruchi G et al.	✓	✓	✓	✓	✓	×	×	×	×	×	×	✓	6	Moderate
Gupta A et al.	✓	✓	✓	✓	✓	×	×	×	×	×	×	✓	6	Moderate

Study	1	2	3	4	5	6	7	8	9	10	11	12	Total score	Risk of bias
Rafie M et al.	✓	✓	✓	×	×	×	✓	✓	×	×	×	✓	6	Moderate
Poudel K et al.	✓	✓	✓	✓	✓	×	✓	✓	×	×	×	✓	8	Low
Mungeshwar SS et al.	✓	✓	✓	✓	✓	✓	×	×	×	✓	×	✓	8	Low
Rikhitani A et al.	✓	✓	✓	✓	✓	×	×	×	×	×	×	✓	6	Moderate
Harika PD et al.	✓	✓	✓	✓	✓	×	×	×	×	×	×	✓	6	Moderate
Sumit K et al.	✓	✓	✓	✓	✓	×	×	✓	×	✓	×	✓	8	Moderate

Assessment criteria are numbered 1–12. ✓ = criterion fulfilled; × = criterion not fulfilled; Risk of bias was categorized as low or moderate according to the adapted assessment criteria.

Eight articles included in this review focused on salivary alterations during the menopausal stage. Xerostomia is the perception of dry mouth associated with or without diminution of salivary flow. This condition mostly affects menopausal women. Oral dryness can profoundly affect quality of life and interfere with basic daily functions such as chewing, swallowing, and speaking.^{13,14,16–18,26–28} Hyposalivation is a condition caused by reduced salivary flow rate. Lower salivary flow rate at the menopausal stage suggests abnormalities or a blockage of salivary gland function, which may be caused by age-related physiologic and/or hormone level changes, as shown by the detection of estrogen receptors in the salivary gland.^{10,11,13–15,27}

Although some studies indicate that xerostomia might be related to lower salivary flow rates, it may in fact be associated with low estrogen levels.³² Another study showed that salivary estradiol was correlated with xerostomia. A study conducted by Agha-Hosseini et al shows that stimulated salivary estradiol decreased their increasing xerostomia levels. Likewise, unstimulated salivary estradiol levels decreased; there was an increase in xerostomia score.^{33,34} Wang L et al found that xerostomia is associated with lower salivary estradiol that occurs in women with menopause.²⁹

Saliva contains calcium, phosphate, immunoglobulin A, and mucin. In postmenopausal women, salivary estradiol levels decrease, and osteoclasts trigger the mobilization of calcium from bones to the serum, resulting in the rise of serum calcium levels. This

calcium diffuses into the salivary gland through its vasculature and is secreted in saliva.¹⁹

The physicochemical properties of saliva (lysozyme, immunoglobulin A) have a role in defense mechanisms in the oral cavity. Estrogen deficiency results in upregulation of immune response, and osteoclasts are liable to produce bone-resorbing cytokines such as IL-1, IL-6, and TNF-1 and 2. Higher Ionized salivary concentration impacts increased remineralization potential of saliva; menopausal women may be at high risk of developing periodontitis, but may have more intact teeth.^{11,22}

Seven articles included in this review focused on periodontal issues. A study by Agrawal R et al found that periodontal disease is higher in post menopause women. This is due to the estrogen receptor found in the gingiva and periodontium. Estrogen deficiency may upregulate the immune response and osteoclasts, which are liable to produce more bone-resorbing cytokines such as IL-1, IL-6, TNF-1, and TNF-2.²² Meanwhile, a study from Kim Ji et al in Korea found that metabolic syndrome, such as abdominal obesity, hypertension, diabetes, and dyslipidemia, is a predictive factor for periodontitis in menopausal women.²¹ Lee Y et al.²⁴ found that postmenopausal women with osteoporosis are at risk of periodontal disease, mostly 4 years after menopause.²⁴

Poor oral hygiene is higher in xerostomia, attributed to a higher concentration of ionized calcium in saliva. Xerostomia suggests a significant role in postmenopausal advanced periodontitis. Impairs calcium

phosphate regulation mechanism, resulting in higher levels of calcium in saliva that trigger calculus formation.¹⁷ Yakar et al.²³ found that mostly women with menopause experience gingivitis and severe periodontitis, which affects tooth loss and is associated with higher depressive mood.²³ Soundarya B et al.¹⁹ found that decreasing salivary estradiol levels may induce the salivary calcium level increase, and this occurrence is associated with periodontal disease among postmenopausal women.¹⁹

A study by Kim JI showed that the number of remaining teeth less than 20 in post menopause women showed an association between chewing and speaking difficulty, and this condition correlated with oral discomfort during menopause.²⁹ Furthermore, these conditions are at a higher risk of developing dementia in postmenopausal women.²³

Six articles included in this study review were focused on altered taste during the menopausal stage. Altered taste may be a troublesome condition that causes subjective discomfort in the oral cavity, impaired appetite, and food intake, and may require discontinuation of drug administration. Taste disturbance may be associated with hormonal changes. Previous studies have shown that menopausal women revealed a substantial decrease in taste perception of sweet (sucrose) and its palatal sensitivity in postmenopausal women.²⁷ Ekhtiari A et al.²⁷ found that decreased non-stimulated saliva, xerostomia, and PH affect altered taste in postmenopausal women. Decreased estrogen reduces the sensitivity to salty and sweet taste, leading to an increase in consumption of products containing salt and sugar.³⁴ Meanwhile, a study from Sumit K et al showed that menopause does not appear to affect oral health or taste perception; it suggested that these conditions are associated with the gradual aging process that may or may not be affected by menopause.¹³

Seven articles included in this review also explained burning mouth syndrome during menopause. Many studies suggest that menopause is correlated with

the incidence of burning mouth syndrome. Burning mouth syndrome manifests as intense pain and spontaneous burning sensations affecting various areas of the oral cavity in the absence of any identifiable abnormalities.^{9,17,18,26,28} The underlying etiology remains ambiguous, with hormonal changes and small sensory neuropathy of the oral mucosa suggested as probable underlying causes. Ozasa K et al.⁹ found that menopausal changes significantly reduce neuroprotective steroids that may directly or indirectly affect cold sensitivity in postmenopausal patients.⁹

Most studies found that estrogen receptor beta (ER- β) is found in the oral cavity, especially in epithelium, gingiva, periodontal, and salivary glands. So, the oral cavity responds to the menopause process.³⁵ Identification of ER- β in the oral epithelium shows that estrogen plays an important role in the maturation process of oral epithelial cells. When women experience menopause, they are very susceptible to developing oral mucosal atrophy and increasing the risk of mechanical trauma, changes in pain tolerance, and difficulty when using dentures. The oral mucosa becomes vulnerable to infections, especially candidiasis, recurrent aphthous stomatitis, and oral lichen planus.^{16,17}

CONCLUSION

Menopause is a physiological phase experienced by every woman, resulting from a decline in estrogen levels. Unfortunately, this condition often receives insufficient attention from healthcare providers. The drop in estrogen can lead to various systemic and oral changes; while oral manifestations may be less distinct than systemic symptoms, they are nonetheless observable. Common complaints include reduced saliva production and altered salivary composition, factors that significantly impact the health of the oral mucosa, teeth, and periodontal tissues, while also increasing susceptibility to infections and mechanical trauma. Long-term consequences often manifest as persistent oral discomfort. Given the diverse range of

oral symptoms and complaints, menopausal women represent a crucial group requiring specialized preventive and therapeutic care from both physicians and dentists during this stage of life. This study has shown that the importance of preventive dentistry increases with aging in females.

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