Original Article

Prevalence of Oral Manifestations in Menopausal and Postmenopausal Women: A Systematic Review and Meta-Analysis

Abstract

Introduction: The majority of women live one-third of their lives in a menopausal state. Biological and endocrine changes in women's bodies during menopause affect various aspects of their health including systemic as well as oral. The present systematic review aims to assess the prevalence of oral manifestations in menopausal and postmenopausal women, which may help dentists to recognize and manage the condition better. **Materials and Methods:** A comprehensive literature search was made on PubMed, Cochrane, and EBSCO databases from January 2000 to December 2023 using keywords "Menopause," "Postmenopause," "Oral conditions," "Oral manifestations," "Periodontitis," "Burning mouth syndrome," "Xerostomia," etc. The full-text articles were analyzed, and 19 articles were included. The risk of bias was assessed by the Joanna Briggs Institute appraisal tool. **Results:** Periodontitis was the most common oral manifestation, with a pooled prevalence of 55%. On subgroup analysis, the pooled prevalence of mild, moderate, and severe periodontitis was 26%, 59%, and 14%, respectively. The pooled prevalence for xerostomia was 50% and was 25% for tooth loss. Altered taste, facial pain, oral candidiasis, leukoplakia, tobacco pouch keratosis, and fissured tongue were other inconsistently reported oral manifestations in postmenopausal women. **Conclusion:** Many systemic processes occur in the women's body during menopause, causing unwanted systemic or oral symptoms. They also suffer psychological problems like anxiety, sadness, irritability, etc. It is imperative for dentists to be aware of the potential changes related to menopause and work collaboratively with other healthcare professionals to prevent serious health issues and for better treatment outcomes.

Keywords: *Menopause, postmenopause, oral manifestations, oral lesions, systematic reviews, meta-analysis*

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Introduction

Human longevity has risen dramatically as a result of modern medicine, and the majority of women live one-third of their lives in menopausal state after the end of their reproductive years. Three age stages have been defined by the World Health Organization during the midlife age for women: Menopause refers to the year of the final physiological menstrual cycle retrospectively designated as 1 year without flow (unrelated to pregnancy or treatment) in women who are 40 years of age or older. The period of years right before menopause and the 1st year after menopause is referred to as perimenopause. Period irregularities until menopause are known as perimenopause.[1] Menopause is an inevitable condition that every woman will eventually experience.

It is a physiological event in women occurring due to failure of ovarian follicular function which leads to reduced secretion of ovarian hormones—estrogen and progesterone. Biological and endocrine changes in women's bodies during menopause affect various aspects of their health, most notably the production of sex hormones.[2]

The compensation for the deficiency of estrogen is done by the androgens with the production of estrone from peripheral fat or adipose tissue which results in an increase in the total fat, visceral and subcutaneous abdominal fat. Total and peripheral lean body mass is reduced. This leads to altered glucose metabolism by decreasing insulin production and increasing insulin

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resistance. Postmenopausal women are more susceptible to diabetes, cardiovascular, urological, and other metabolic diseases.[3]

Menopause also causes other changes in the skin, such as thinning of the epidermis, atrophy of the skin linked to a decrease in collagen, and decreased activity of the sweat and sebaceous glands.[4]

Oral discomfort affects about 43% of postmenopausal women, according to certain researches.[5] It has also been demonstrated that estrogens play a role in the differentiation, growth, and proliferation of keratinocytes and fibroblasts.[6] The maturation process of the oral mucosal epithelium is also affected by estrogen deficiency leading to its thinning and atrophy, making it more vulnerable to local mechanical injuries, altering the pain tolerance and causing problems in use of removable prosthetic restorations, idiopathic neuropathy, oral lichen planus (OLP), xerostomia/dryness (a feeling of decreased salivation), dysgeusia, burning mouth syndrome (BMS), infections and candidiasis, variations in salivary production and consistency.[5]

Considering that systematic reviews are an essential tool for synthesizing available scientific information and identifying areas of uncertainty where research is crucial, the present systematic review and meta-analysis (SRMA) aimed to investigate the prevalence of oral manifestations in menopausal women, which may help dentists to recognize and manage the condition better.

Materials and Methods

This SRMA was performed in accordance with Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA 2020) statement guidelines, the Cochrane Handbook for Systematic Reviews of Interventions version 5.1.0. The Cochrane Collaboration is registered at PROSPERO under the registration code CRD42024 499004. A comprehensive literature search was made on PubMed, Cochrane, and EBSCO databases from January 2000 to December 2023 using keywords "Menopause," "Postmenopause," "Oral conditions," "Oral manifestations," "Oral lesions," "Periodontitis," "Burning mouth syndrome," "Xerostomia," etc. The keywords for population, exposure, outcome, and the combined search strategy are depicted in [Table 1]. Inclusion criteria: The review included studies published between 1/1/2000 and 31/12/2023 and studies published in any language where English translation is possible. Studies assessing oral manifestations in premenopausal, perimenopausal, menopausal, and postmenopausal women were included. Only full-text articles of cross-sectional, cohort, case–control, prospective, retrospective studies, case series, and case reports were included. Exclusion criteria: Studies not fully available in the database. In-vitro and animal studies were

Table 1: Keywords for Population, Exposure, Outcome, and the Combined Search.

Population	"Perimenopause" OR "Perimenopausal period" OR "Menopause" OR "Menopausal period" OR "Postmenopause" OR "Postmenopausal period" OR "Climacteric"
Exposure	"Oral manifestations" OR "Oral health" OR "Oral lichen planus" OR "Sjogren's syndrome" OR "Xerostomia" OR "Periodontitis" OR "Pemphigoid, benign mucous membrane" OR "Candidiasis, oral" OR "Deglutition" OR "Mouth mucosa" OR "Mouth diseases" OR "Saliva" OR "Salivary glands" OR "Burning mouth syndrome" OR "Taste" OR "Tooth loss" OR "Periodontal diseases" OR "Oral lesion" OR "Mucosal manifestation" OR "Mucosal lesion" OR "Dental health" OR "Dental diseases" OR "Oral diseases" OR "Oral complaints" OR "Salivary flow" OR "Pemphigus vulgaris" OR "Gingivostomatitis" OR "Oral condition" OR "Dental condition" OR "Periodontal condition" OR "Glossodynia" OR "Swallowing" OR "Saliva composition" OR "Dysphagia" OR "Hyposalivation" OR "Mouth dryness" OR "Oral mucosa" OR "Burning mouth" OR "Oral discomfort" OR "Dry mouth" OR "Periodontal health" OR "Tooth decay" OR "Stomatodynia" OR "Oral dryness" OR "Oral changes" OR "Dental discomfort" OR "Oral infection" OR "Dental disorders" OR "Periodontal damage"
Outcome	"Epidemiology" OR "Prevalence" OR "Incidence" OR "Prevalent" OR "Frequency" OR "Occurrence"
Combined search	"Perimenopause" OR "Perimenopausal period" OR "Menopause" OR "Menopausal period" OR "Postmenopause" OR "Postmenopausal period" OR "Climacteric" AND "Oral manifestations" OR "Oral health" OR "Oral lichen planus" OR "Sjogren's syndrome" OR "Xerostomia" OR "Periodontitis" OR "Pemphigoid, benign mucous membrane" OR "Candidiasis, oral" OR "Deglutition" OR "Mouth mucosa" OR "Mouth diseases" OR "Saliva" OR "Salivary glands" OR "Burning mouth syndrome" OR "Taste" OR "Tooth loss" OR "Periodontal diseases" OR "Oral lesion" OR "Mucosal manifestation" OR "Mucosal lesion" OR "Dental health" OR "Dental diseases" OR "Oral diseases" OR "Oral complaints" OR "Salivary flow" OR "Pemphigus vulgaris" OR "Gingivostomatitis" OR "Oral condition" OR "Dental condition" OR "Periodontal condition" OR "Glossodynia" OR "Swallowing" OR "Saliva composition" OR "Dysphagia" OR "Hyposalivation" OR "Mouth dryness" OR "Oral mucosa" OR "Burning mouth" OR "Oral discomfort" OR "Dry mouth" OR "Periodontal health" OR "Tooth decay" OR "Stomatodynia" OR "Oral dryness" OR "Oral changes" OR "Dental discomfort" OR "Oral infection" OR "Dental disorders" OR "Periodontal damage" AND "Epidemiology" OR "Prevalence" OR "Incidence" OR "Prevalent" OR "Frequency" OR "Occurrence"

excluded. Studies including women who have undergone surgical menopause were excluded from the review. Literature reviews, review reports, and survey reports were not included in the review. A comprehensive search generated 1241 articles. This included 182 from PubMed, 977 from Cochrane, and 82 from EBSCO databases. After removing the duplicates, 14 studies were eliminated, and 1227 studies were selected. Two reviewers independently screened the Title and Abstract. They subsequently consented that 59 studies should be retrieved for detailed review, of which 01 study was not retrieved. Nineteen relevant studies were eligible for inclusion after full text evaluation and applying strict inclusion and exclusion criteria. A descriptive summary of data selection has been put forth in the PRISMA flowchart, that is, the PRISMA 2020 flow diagram.[7] [Figure 1]. The quality of the selected studies was assessed using Joanna Briggs Institute Critical Appraisal Checklist.[8] [Table 2] Only nine studies were considered to be of low risk of bias. Other studies were considered as high risk.

Statistical Analysis and Results

When analyzing the published studies, we observed the most common oral manifestations reported in menopausal and postmenopausal women, such as periodontitis, xerostomia, and tooth loss. Women were in the age range of 30–85.1 years. The details, including the author's name, year, study type, study setting, prevalence/incidence, age group, menopausal status, sample size, and oral manifestations, were noted. The details are summarized in [Table 3].

Pooled estimates of the prevalence of oral diseases among postmenopausal women in population-based studies were calculated using the random-effects meta-analysis model due to the anticipated heterogeneity that results from the difference in methodological approach, geographical location, diagnostic criteria, data sources, and geographic settings. Statistical analyses were performed using n Meta XL version 5.1 (add-in for Microsoft XL, copyright of Epigear International Pvt. Ltd.) with 95% confidence intervals (CI) and 95% prediction intervals for future prevalence estimates.

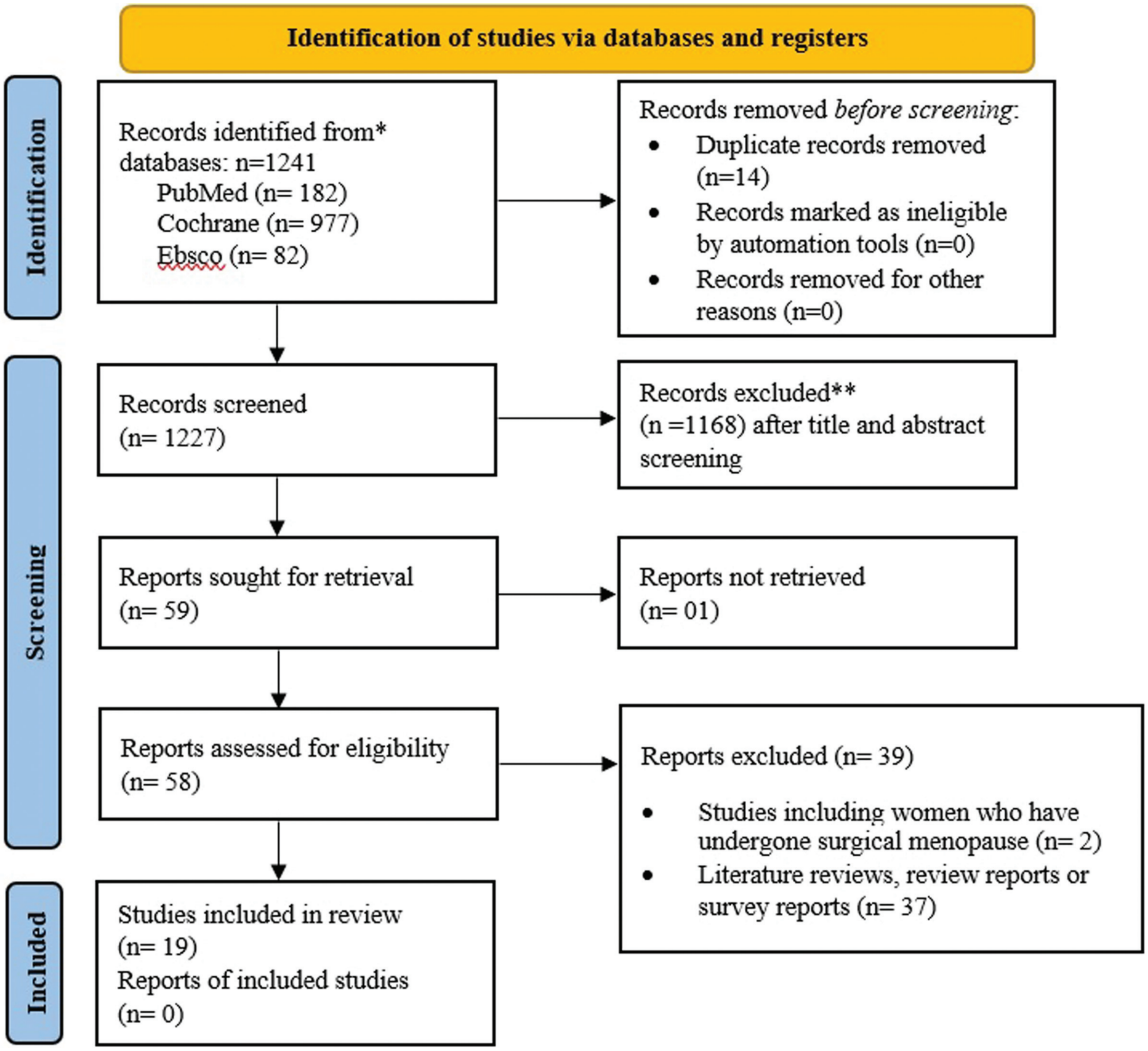

Figure 1: PRISMA 2020 flow diagram.

Table 2: Detailed Analysis of Studies That Were Assessed for Risk of Bias Using the Joanna Briggs Institute Critical Appraisal Tool.

Studies	Was the Sample Frame Appropriate to Address the Target Population?	Were Study Participants Sampled in an Appropriate Way?	Was the Sample Size Adequate?	Were the Study Subjects and the Setting Described in Detail?	Was the Data Analysis Conducted with Sufficient Coverage of the Identified Sample?	Were Valid Methods Used For the Identification of the Condition?	Was the Condition Measured in a Standard, Reliable Way for All Participants?	Was There Appropriate Statistical Analysis?	Was the Response Rate Adequate, and If Not, Was the Low Response Rate Managed Appropriately?
Asplund (2005)	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes	NA
Tezal (2005)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Yalcin (2006)	Yes	Yes	Unclear	Yes	Yes	Unclear	Yes	Yes	NA
Haas (2009)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Bole (2010)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
LaMonte (2013)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Santosh (2013)	Yes	Unclear	Unclear	Unclear	Yes	Unclear	Unclear	Yes	NA
Baharvand (2014)	Yes	Yes	Unclear	Unclear	Yes	Unclear	Yes	Yes	NA
LaMonte (2014)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Pavlesen (2016)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Mohan (2017)	Yes	Yes	Unclear	Unclear	Yes	Unclear	Yes	Yes	NA
Genco (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Thanakun (2019)	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	NA
Romandini (2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Venkatesh (2020)	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear	NA
Yakar (2021)	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	NA
Rafiei (2022)	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear	NA
Park (2023)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Muneshwar (2023)	Yes	Unclear	Yes	Yes	Unclear	Yes	Unclear	Unclear	NA

Table 3: Summary of the Extracted Data.

Sr. No.	Author	Year	Study Type	Study Setting	Prevalence/ Incidence	Age Group	Menopausal Status	Sample Size	Oral Manifestations
1.	Asplund *et al.*[9]	2005	Questionnaire study	County of Jamtland, Sweden	Occurrence	50–54, 55–59, 60–64 years	Postmenopausal	Total sample size-6000, of which 3600 are postmenopausal, and out of those, 2160 responded to the questionnaire.	Xerostomia First 5 years after menopause (50–54)—23.3% 5–9 years after menopause (55–59)—29.2% 10 or more years after menopause (60–64)—34.5%
2.	Tezal *et al*[10]	2005	Cohort study	University of Buffalo, New York	Incidence	45 years or older	Postmenopausal	106	Tooth loss—57.5%
3.	Yalcin *et al*[11]	2009	Not mentioned	Turkey	Prevalence	44–65 (mean 52.17 ± 4.67) years	Postmenopausal	348 (out of 348, 268 were nonhormone users)	Xerostomia/dry mouth—68.3% (183) Discolored tongue—33.5% (90) Halitosis—30.5% (82) Burning mouth—29.1% (78) Ulceration—24.3% (65) Unpleasant taste—16.8% (45)
4.	Haas *et al*[12]	2009	Not mentioned	South Brazil	Prevalence	40–69 years	Postmenopausal	Postmenopausal women not receiving hormone replacement therapy = 135	Periodontitis/periodontal disease—64.4% (n = 87)
5.	Bole *et al.*[13]	2010	Prospective study	University of Buffalo, New York	Incidence	65.88 years	Postmenopausal	1021	Tooth loss—293 in 1021 women (28.7%)
6.	LaMonte *et al.*[14]	2013	Observational study	Buffalo, New York	Prevalence	50–79 years	Postmenopausal	1025	Periodontal disease: None/mild = 274 Moderate = 586 Severe = 156 Tooth loss No = 732 Yes = 293
7.	Santosh *et al.*[15]	2013	Cross-sectional, descriptive-analytic study	Jodhpur, India	Incidence	54–70 years; Postmenopausal females: mean age = 62.73 ± 4.73 years Age-matched males: mean age = 62.23 ± 4.27 years	Postmenopausal	730 (case group of 365 post-menopausal females and control group of 365 age-matched males)	Case group (postmenopausal females): Xerostomia/dry mouth—(99) 27.1% Burning sensation—(94) 25.8% Breath change—(23) 6.3% Taste change—13 (3.6%) Facial pain—13 (3.6%) Ulcerative lesion—13 (3.6%) White lesion—7 (1.9%) OSMF—7 (1.9%)

(*Continued*)

Table 3 (*Continued*)

Sr. No.	Author	Year	Study Type	Study Setting	Prevalence/ Incidence	Age Group	Menopausal Status	Sample Size	Oral Manifestations
									Red lesion—0 (0%) Control group (age-matched males): OSMF—20 (5.5%) Xerostomia/dry mouth—(19) 5.2% Burning sensation—(19) 5.2% White lesion—15 (4.1%) Ulcerative lesion—15 (4.1%) Taste change—5 (1.4%) Breath change—3 (0.8%) Facial pain—0 (0%) Red lesion—0 (0%)
8.	Baharvand *et al.*[16]	2014	Cross-sectional study	Iran	Prevalence	30–60 (average 44.7 ±7.6) years	Menopausal	450 (225 menopausal women)	Burning mouth syndrome—22.7% (51)
9.	LaMonte *et al.*[17]	2014	Observational study	Buffalo, New York	Prevalence	53–82 years	Postmenopausal	972	Periodontitis: Mild—14.4% Moderate—27.4% Severe—60.6%
10.	Pavlesen *et al.*[18]	2016	Observational study	Buffalo, New York	Prevalence and incidence	53.2–85.1, mean age of 66.7 ± SD 7.0 years	Postmenopausal	780	Tooth loss Due to periodontal disease, $n = 70$ Due to caries $n = 558$ No history $n = 152$
11.	Mohan *et al.*[1]	2017	Cross-sectional study	Uttar Pradesh, India	Incidence	44.69 ± 3.79 years	Perimenopausal	1576	Oral lichen planus (10.91%)
12.	Genco *et al.*[19]	2019	Observational study	Buffalo, New York	Prevalence	50–79, average age 66 years	Postmenopausal	1342 (1206 were postmenopausal)	Periodontal disease/periodontitis None/mild—25.1% Moderate—58.3% Severe—16.6% (none/mild, $n = 303$, moderate, $n = 703$, severe, $n = 200$)
13.	Thanakun *et al.*[20]	2019	Not mentioned	Bangkok, Thailand	Prevalence	55 (51–62) years	Postmenopausal	92 (42 were postmenopausal)	Xerostomia/oral dryness: Clinical score in postmenopausal women: Score 0 in 8 Score 1–3 in 30 Score ≥4 in 4 Periodontitis:Moderate periodontitis (alveolar bone loss <25%)—31 Severe periodontitis (alveolar bone loss >25%)—9

(*Continued*)

Table 3 (*Continued*)

Sr. No.	Author	Year	Study Type	Study Setting	Prevalence/ Incidence	Age Group	Menopausal Status	Sample Size	Oral Manifestations
									Tooth loss: Postmenopausal women—6 Premenopausal women—1
14.	Romandini *et al.*[21]	2020	Cross-sectional study	South Korea	Prevalence	62.53 years(mean age)	Postmenopausal	10273	Periodontitis—3973, severe periodontitis—913
15.	Venkatesh *et al.*[22]	2020	Not mentioned	Karnataka, India	Prevalence	Premenopausal mean age: 39.36 yearsPostmenopausal	Postmenopausal mean age: 53.12 years	160 (80 premenopausal women and 80 postmenopausal women)	62 out of 80 postmenopausal women have oral dryness
16.	Yakar *et al.*[23]	2021	Cross-sectional cohort study	Turkey	Prevalence	54 ± 5 years	Postmenopausal	115 (56 were postmenopausal)	Periodontitis: 39.2% (22 women) Moderate: 21.4%, 12 women Severe: 17.8%, 10 women
17.	Rafiei *et al.*[6]	2022	Cross-sectional study	Iran	Prevalence	35–70 years	Postmenopausal	928	Periodontitis—(494 women) 53.23%
18.	Park *et al.*[24]	2023	Cohort longitudinal study	Seoul, Korea	Incidence	40–69 years	Postmenopausal	5396 (2039 postmenopausal)	Periodontitis–(94 women) 6.25%
19.	Muneshwar *et al.*[2]	2023	Not mentioned	Maharashtra, India	Prevalence	50 years and above	Postmenopausal	90	Xerostomia—(14) 20.2% Periodontitis—(11) 15.9% Altered taste—(9) 13% Oral lichen planus—(6) 8.6% Oral candidiasis—(5) 7.2% Space infections—(5) 7.2% Malignancy—(5) 7.2% Leukoplakia—(3) 4.3% Burning mouth syndrome—(2) 2.8% Lichenoid reaction—(2) 2.8% Tobacco pouch keratosis—(2) 2.8% Radicular cyst—(2) 2.8% Osteoarthritis—(1) 1.4% Fissured tongue—(1) 1.4% Hairy tongue—(1) 1.4%

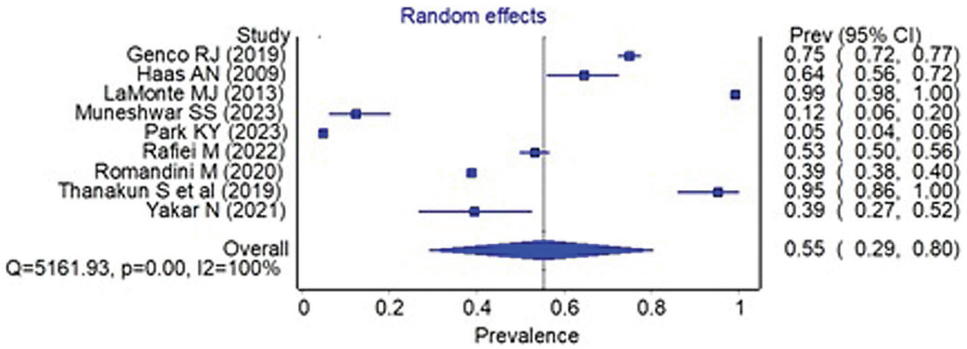

Figure 2: Forest plot of periodontitis irrespective of the stages for postmenopausal women.

The Freeman–Tukey double-arcsine transformation was used for variance stabilization of proportions before pooling the data with the random-effects model. Chi-square and Tau-square were used to assess whether the observed difference was homogeneous or heterogeneous among the studies. Heterogeneity was assessed using I^2 with thresholds of ≥25%, ≥50%, and ≥75% indicating low, moderate, and high heterogeneity, respectively. Subgroup analysis was carried out to determine the pooled prevalence for each group (mild, moderate, severe periodontitis) and look for potential explanations for the heterogeneity in periodontitis among the postmenopausal group.

Forest plots of the three most prevalent oral manifestations for postmenopausal women showed rectangles representing point estimates of each study and diamonds representing the pooled estimate from the studies using a random effect model. The pooled prevalence of periodontitis among postmenopausal women was 55% (*P*, 55%, 95% CI = 29%–80%, I^2—100%) [Figure 2]. On subgroup analysis, the pooled prevalence of mild periodontitis among postmenopausal women was 26% (*P*, 26%, 95% CI = 24%–28%, I^2—0%) [Figure 3], whereas it was 59% (*P*, 59%, 95% CI = 55%–62%, I^2—58%) for moderate periodontitis [Figure 4] and 14% (*P*, 14%, 95% CI = 9%–20%, I^2—97%) for severe periodontitis [Figure 5].

The forest plot of xerostomia showed pooled prevalence of 50% (*P*, 50%, 95% CI = 33%–67%, I^2—98%) among postmenopausal women [Figure 6] and that of tooth loss showed pooled prevalence of 25% (*P*, 25%, 95% CI = 9%–45%, I^2—98%) [Figure 7].

Discussion

Menopause, which literally translates as "without estrogen," is the term used to describe the end of ovarian cyclic function

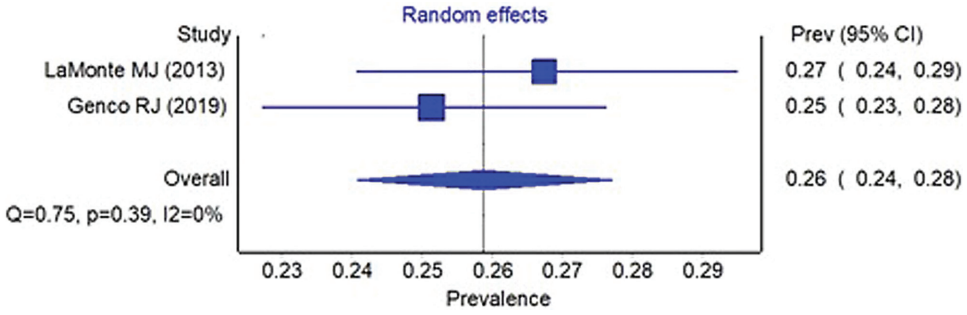

Figure 3: Forest plot of mild periodontitis for postmenopausal women.

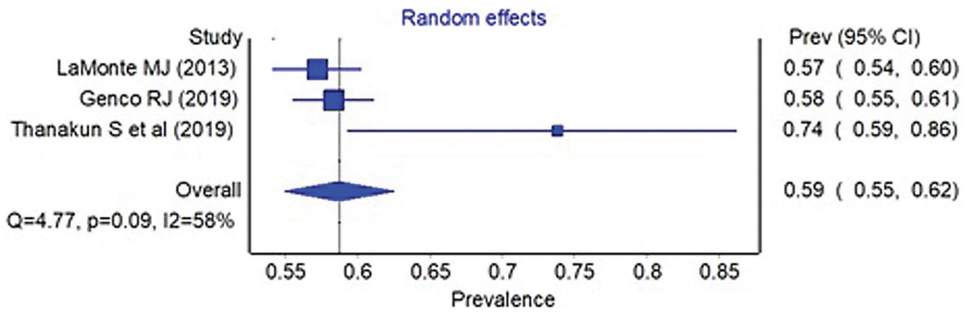

Figure 4: Forest plot of moderate periodontitis for postmenopausal women.

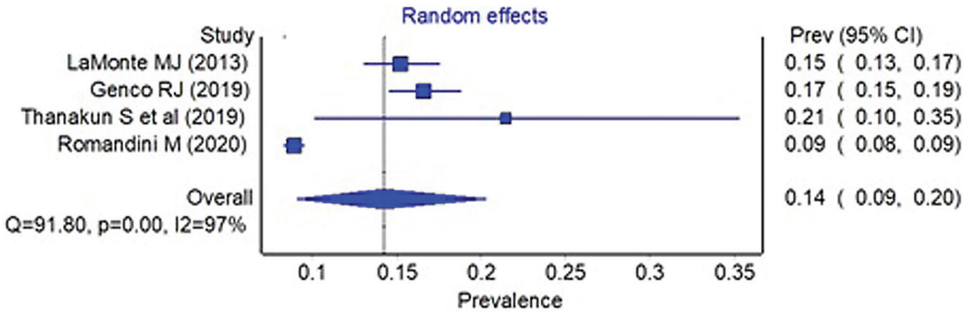

Figure 5: Forest plot of severe periodontitis for postmenopausal women.

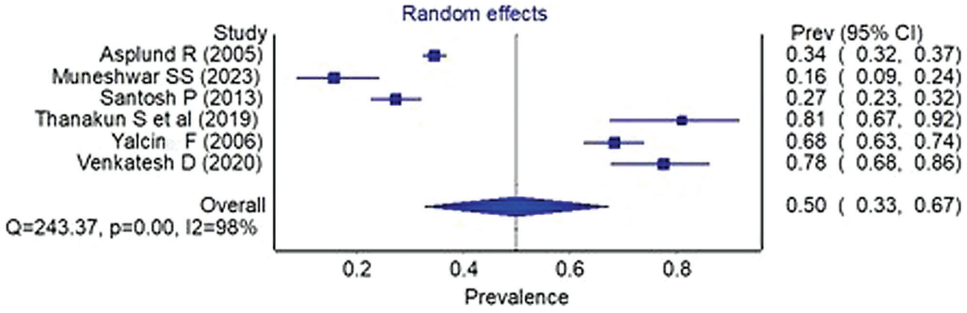

Figure 6: Forest plot of xerostomia for postmenopausal women.

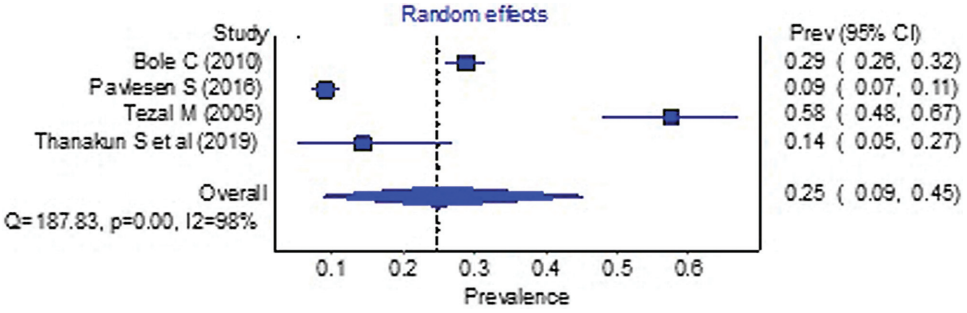

Figure 7: Forest plot of tooth loss for postmenopausal women.

as seen in menstruation.[15] Although a lot of systemic processes occur in the women's body during this period, generating the unwanted symptoms reported by women, the influence of a drop in estrogenic hormone concentration is due to the stopped endocrine activity of the ovaries. Ailments like hot flashes, osteoporosis, nocturnal sweats, cholesterol problems, and a higher risk of coronary artery disease arise from the loss of the protective impact of estrogen hormones on the blood vessel wall. They also suffer from psychological and physical illnesses, including anxiety, sadness, irritability, and disturbed sleep.[5]

Like other systems, changes in hormone levels rapidly affect the oral cavity as the oral mucosa contains estrogen receptors. Each patient may experience different oral symptoms such as xerostomia, periodontitis, oral candidiasis, taste alterations, BMS, etc.[2]

Periodontal disease/periodontitis is an inflammatory process that gradually progresses and results in tooth loss.[5] In this systematic review, periodontitis was the most frequent oral manifestation observed among postmenopausal women, with a pooled prevalence of 55%. Haas *et al.*[12] conducted a study to see the association among menopause, hormone replacement therapy, and periodontal attachment loss, where it was found that the prevalence of periodontitis in postmenopausal women not receiving hormone replacement therapy was greater compared to postmenopausal women receiving hormone replacement therapy. Similar results were obtained in the study done by Park *et al.*[24]. This was in contrast to a cross-sectional study conducted in Iran based on a self-reported questionnaire.[6]

On subgroup analysis, the pooled prevalence of mild periodontitis among postmenopausal women was 26%, for moderate periodontitis was 59%, and for severe periodontitis was 14%.

The evidence suggests that the periodontium is negatively impacted by the decline in estrogen levels occurring in menopause affecting the vascular permeability, the development and differentiation of fibroblasts, and

inflammatory mediators. This results in the accumulation of dental plaque, or biofilm, with bacterial dysbiosis, periodontal pocket formation, and tissue deterioration, including loss of alveolar bone, increasing the chance of developing advanced periodontitis.[5]

Saliva production might vary throughout the menopausal stage in terms of both volume and composition. Xerostomia is one of the most typical menopausal symptoms and is more common in perimenopausal and postmenopausal women.

It is a subjective sensation of dryness that is typically brought on by decreased salivation or by normal salivary factor levels but with a lower concentration of its constituent parts.[5]

The pooled prevalence of xerostomia among postmenopausal women was 50%. Questionnaire and interview-based studies were conducted by numerous authors, which reported varying prevalence of xerostomia in menopausal and postmenopausal women.[2,9,11,15,20,22] Reduced salivation can cause a variety of issues, including an increased risk of dental caries, oral infections, dysphagia, taste disturbances, and an increased sensitivity of the mucosa to mechanical trauma.[5]

The pooled prevalence of tooth loss among postmenopausal women was 25%. Tezal *et al.*[10] in their follow-up examination found, 57.5% of 106 postmenopausal women had tooth loss. Pavlesen *et al.*[18] found that out of 780 postmenopausal women, 70 had tooth loss due to periodontal disease, 558 due to caries, and 152 had no history. In postmenopausal women, periodontal disease (indicated by the loss of alveolar bone) is a reliable and significant predictor of incident tooth loss.[10]

It has been demonstrated that a lower level of estrogen following menopause and the resulting reduction of bone mineral density is linked to a higher incidence of tooth loss.[10] Women experience tooth loss more frequently than males, even though they have better oral health.[13]

These three major manifestations are interrelated as xerostomia can lead to changes in the periodontium, leading to periodontal disease, which may subsequently result in alveolar bone loss leading to tooth loss.

Literature also supports the fact that BMS is 18%–38% prevalent in menopause.[16] BMS is one of the important issues affecting the quality of life in menopausal and postmenopausal women. In BMS, a typical complaint from the affected person is a bilateral, moderate-to-severe burning or cutting sensation of the lips, tongue, or other oral mucosal surfaces.[25] Also, in this systematic review, Baharvand *et al.*[16] observed that out of 225 menopausal women, 51 women had BMS (22.5%).

Other oral manifestations in menopausal women include OLP and autoimmune diseases like rheumatoid arthritis, systemic lupus erythematosus, and multiple sclerosis, although a direct association of these manifestations with sex steroid hormones has not been demonstrated.[1]

Altered taste, facial pain, oral candidiasis, leukoplakia, tobacco pouch keratosis, and fissured tongue in postmenopausal women were also reported inconsistently with varying prevalence.[2]

Conclusion

Many systemic processes occur in the women's body during menopause, causing unwanted systemic or oral symptoms. The most prevalent oral manifestations in the menopausal and postmenopausal women in descending order included periodontitis, xerostomia, and tooth loss. The variation in prevalence maybe due to diverse demographic data and inconsistent data collection and synthesis. Also, the studies included are not broadly representative as they come from a small number of countries and sometimes from the same set of populations. Hence, studies from various regions are needed to gain a deeper comprehension of the oral symptoms and their frequency.

It is crucial for dentists to be aware of the potential changes related to menopause and work collaboratively with other healthcare professionals to prevent serious health issues and for better treatment outcomes.

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