

Original Research Article

Association of periodontal health with physical and emotional well-being among pre and postmenopausal women in Bangalore: a cross sectional study

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ABSTRACT

Background: Menopausal transition is frequently accompanied by physical, emotional as well as periodontal health changes in pre and postmenopausal women due to the decline in circulating blood oestrogen levels. Aim was to investigate the association of periodontal health with physical and emotional well-being among pre and postmenopausal women aged 35-65 years.

Methods: A cross sectional study was conducted among 150 pre and 150 postmenopausal women in Bangalore urban district. Women Health Questionnaire was used to assess physical and emotional well-being. WHO Oral Health Assessment form for adults 2013 along with plaque and gingival indexes were used to assess the periodontal health status. Descriptive, bivariate, multiple linear regression analysis were carried out. A $p < 0.05$ was considered statistically significant.

Results: The mean age among pre and postmenopausal women were 40.09 ± 2.24 years and 55.42 ± 5.7 ($p < 0.001$). The mean scores of depression/anxiety mood; somatic symptoms; memory/concentration; vasomotor symptoms; sleep problem was significantly higher in postmenopausal compared to premenopausal group ($p < 0.001$). The mean number of teeth with gingival bleeding (12.93 ± 8.0 and 6.94 ± 5.68); deep periodontal pocket (2.05 ± 1.61 and 0.44 ± 0.97) were higher in postmenopausal group in comparison to the other group respectively ($p < 0.001$). Depression was significantly associated with periodontal health of women in both the groups.

Conclusions: Women after menopause experienced more physical and emotional changes. Periodontal health status was found to be poor among postmenopausal women compared to premenopausal women.

Keywords: Depression, Dental plaque index, Menopause, Periodontal pocket, Women

INTRODUCTION

Women undergo various hormonal changes in their lifetime such as during puberty, menstruation, pregnancy and menopause which make them more susceptible to oral diseases.¹ Menopause is the cessation of menstruation as a result of the loss of ovarian follicular activity, which start declining in the late 30's with

complete loss in the early 50's.² The average age of menopause is approximately 51 years in the western world, while in India it is around 46.2 years.^{3,4} The menopause may result in physical symptoms such as atrophy of vaginal mucosa, genitourinary atrophy and recurrent urinary tract infections. During this phase, women also deal with vasomotor symptoms such as hot flushes and night sweats. Due to reduced oestrogen

levels, the menopausal women has to combat with fatigue, weight gain and emotional changes such as anxiety, sorrow, fear of illness, hypersensitivity and irritability.² In addition to this, the menopausal transition puts women at greater risk for depression.¹ Overall, these unpleasant physical and emotional symptoms affect the quality of life (QOL) in these women. Therefore, understanding the impact of menopause on the QOL is important to suggest interventions and preventive strategies for mid-aged and older women.⁵

Menopausal changes also have an impact on intraoral tissues such as atrophy of the oral mucosa, changes in the oral microflora and reduction of alveolar bone mineral density. Hormonal changes and decreased bone mineral density are proposed to increase predisposition towards alveolar bone loss in menopausal women.¹ Studies conducted across the countries have reported a relationship between menopause and periodontal health, while such studies are limited in India.^{1,6-10-12} Few research in women have reported risk of developing destructive periodontal disease and poor quality of life after menopause.^{1,7,11,12} On the contrary, in three studies authors stated that menopause did not appear to significantly influence the severity of periodontal disease and tooth loss.⁸⁻¹⁰ So far, there is no consensus for an increased risk of periodontitis after menopause.¹ Hence, this study was conducted to assess the association of periodontal health with physical and emotional wellbeing in pre and postmenopausal women.

METHODS

Study design and subjects

A cross-sectional study was conducted among women aged 35- 65 years attending the outpatient department in Government hospitals of Bangalore urban district from April to August 2022. A stratified cluster sampling method was used to select the desired sample. The study protocol was approved by Institutional Ethics Committee and review board. This study conforms to (STROBE) guidelines for cross-sectional studies. The study was carried out in accordance with the ethical standards of World Medical Association for human experimentation 2013 version of Helsinki Declaration.¹³

Selection criteria

Subjects were included who had at least at 10 functional teeth. Women with major systemic illness, cognitive impairment, under medication (antipsychotics, antidepressants), with substance abuse or tobacco usage, undergone oral prophylaxis in the last 6 months were excluded from the study. The premenopausal group consisted of women with history of regular menstruation cycle in the past 12 months, while the postmenopausal group was with history of spontaneous amenorrhea within the last 12 months.

Sample size calculation

The sample size was calculated using G*Power software 3.1.9.4, based on the depressed mood score in pre (0.28±0.18) and postmenopausal women (0.29±0.15) with periodontitis.^{1,14} Considering, $\alpha=0.05$, effect size=0.4 and $1-\beta=95\%$, the sample size was estimated as 150 in each group.

Data collection

A structured proforma was used to gather data. The general information of the women consisting of age, socioeconomic status, marital status; dental history and oral hygiene practices were collected through an interview.¹⁵

Women health questionnaire

A Women Health Questionnaire developed by Hunter et al contain questions organized into 6 domains to assess the physical and emotional well-being changes: Anxiety/depression mood, wellbeing, somatic symptoms, memory concentration, vasomotor symptoms and sleep problem.⁵ The questions elicit the frequency of such events in the last few days. The response options were graded on a 4-point Likert scale (1-Not at all, 2- No not much, 3- Yes sometimes, 4-Yes definitely). The calculation is based on binary scoring as 0 or 1. The sum of the scores in the related section was divided by the number of questions and each section was scored between 0-1. The cross-cultural validation of this questionnaire was performed using the back-translation from English to Kannada language and back from Kannada to English language with help of linguistic experts. A written informed consent was obtained from the subjects after duly explaining the study objectives, risks and benefits and voluntary nature of participation. Each filled questionnaire was checked for the completeness. The subjects were requested further to complete the questionnaire if missing values were encountered.

Intra oral examination

ADA type III oral examination was carried out by a single calibrated examiner (kappa value=0.9). Four areas of each tooth (buccal, mesial, distal and lingual) were recorded as per gingival index by Loe and Silness and plaque index by Silness and Loe.¹⁶ Periodontal status and loss of attachment were assessed as per WHO Oral Health Assessment form for adults 2013.¹⁷

Statistical analysis

SPSS software (version 26.0; IBM, Armonk, NY, USA) was used for the data analysis. Data was subjected to Kolmogorov Smirnov test to assess the normality. Association between variables were determined using Chi square test. Intergroup differences of means were

compared using independent t test. Multiple linear regression analysis was performed and all independent variables that reached a $p < 0.2$ were used in the adjusted analysis. Mediation analysis was done using PROCESS macro version 4.1 by Andrew F Hayes. The statistical significance level was set at $p < 0.05$ (95% confidence interval) for all analyses.

RESULTS

A total of 150 pre and 150 postmenopausal women participated in this study. The mean age of the subjects among pre and postmenopausal groups were 40.09 ± 2.24 and 55.42 ± 5.7 years respectively.

Table 1: Intergroup comparison of sociodemographic information, dental history, oral hygiene behaviour and practices.

Characteristics	Premenopausal group, N (%)	Postmenopausal group, N (%)	P value
Age			
(Mean±SD) (years)	40.09±2.24	55.42±5.7	0.001*
SES			
Upper (I)	0 (0)	0 (0)	0.19
Upper middle (II)	31 (20.7)	12 (8.0)	
Lower middle (III)	45 (30.0)	53 (35.3)	
Upper lower (IV)	68 (45.3)	77 (51.3)	
Lower (V)	6 (4.0)	8 (5.3)	
Duration of visit			
<6 months	0 (0)	9 (15.25)	0.009*
6 months to 1 year	32 (68.0)	28 (47.5)	
>1 year	15 (31.9)	22 (37.3)	
Frequency of brushing			0.029*
Once	9 (5.6)	12 (7.5)	
Twice	132 (82.5)	133 (83.1)	
Thrice	19 (11.9)	15 (9.4)	

* $p < 0.05$, SD: Standard deviation

Table 2: Domain-wise mean of women health questionnaire among the subjects.

Domains	Premenopausal group Mean±SD	Postmenopausal group Mean±SD	P value
Anxiety/Depression mood	0.45±0.49	0.54±0.49	0.001*
Wellbeing	0.77±0.42	0.50±0.50	<0.001*
Somatic symptoms	0.03±0.18	0.49±0.50	<0.001*
Memory/Concentration	0.15±0.36	1.44±0.50	<0.001*
Vasomotor symptoms	0.01±0.00	0.48±0.44	<0.001*
Sleep problem	0.12±0.32	0.29±0.50	<0.001*

* $p < 0.05$, SD: Standard deviation

Table 3: Intergroup comparison of periodontal health status among the subjects.

Periodontal health status	Premenopausal group Mean±SD	Postmenopausal group Mean±SD	P value
Bleeding on probing	6.94±5.68	12.93±8.0	<0.001*
Periodontal pocket			
Shallow pocket (4-5 mm)	0.70±1.70	0.77±1.22	0.06
Deep pocket (>6 mm)	0.44±0.97	2.05±1.61	<0.001*
Loss of attachment (sextants)			
Code 0	2.29±2.58	1.36±2.52	<0.001*
Code 1	1.72±2.72	0.54±1.56	
Code 2	0.44±1.73	0.76±2.00	
Code 3	0.87±1.94	0.44±1.56	
Code 4	0.09±0.69	1.60±2.66	
Code X	0.55±1.70	1.24±2.43	

* $p < 0.05$, SD: Standard deviation

There was a statistically significant difference between the groups for age, duration of visit and frequency of

brushing ($p < 0.001$) (Table 1). Majority of the women in both the groups were married with (96.0%) in pre and (93.3%) in postmenopausal group ($p > 0.05$).

Table 4: Association between depression and periodontal health indicators among the subjects.

Periodontal health indicators	Premenopausal group N (%)		Postmenopausal group N (%)	
	No	Yes	No	Yes
Anxiety/ depression mood domain				
Bleeding on probing				
Absent	8 (5.3)	51 (34.0)	5 (3.3)	46 (30.7)
Present	6 (4.0)	85 (56.6)	0 (0)	99 (66.0)
P value	0.152		0.002*	
Periodontal pocket				
Absent	42 (28.0)	17 (11.3)	25 (16.6)	26 (17.3)
Present	29 (19.3)	62 (41.3)	18 (12.0)	81 (54.0)
P value	<0.001*		<0.001*	
Loss of attachment				
Absent	36 (24.0)	23 (15.3)	10 (6.6)	70 (46.6)
Present	54 (36.0)	37 (24.7)	41 (27.3)	29 (19.3)
P value	0.83		<0.001*	
Plaque index scores				
1	49 (32.7)	59 (39.3)	22 (14.7)	24 (16.0)
2	5 (3.3)	24 (16.0)	9 (6.0)	17 (11.3)
3	3 (2.0)	6 (4.0)	20 (13.3)	58 (38.7)
P value	0.04*		0.042*	
Gingival index scores				
1	49 (32.7)	59 (39.3)	22 (14.7)	24 (16.0)
2	5 (3.3)	24 (16.0)	9 (6.0)	17 (11.3)
3	3 (2.0)	6 (4.0)	20 (13.3)	58 (38.7)
P value	0.04*		0.042*	

* $p < 0.05$

More than half of the subjects changed their toothbrush with frequency of greater than 6 months in both the groups. ($p < 0.05$). Mean scores of the six domains in the WHQ are summarized in (Table 2).

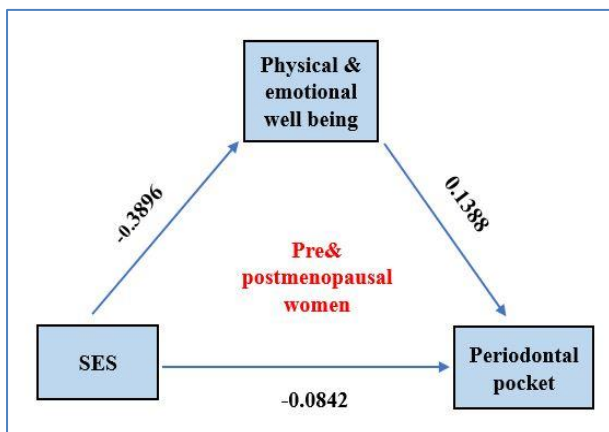


Figure 1: Mediation analysis: physical and emotional well-being as a mediator for the effect of SES on periodontal pocket.

Scores for anxiety/ depression mood, somatic symptoms, memory concentration, vasomotor symptoms and sleep problem were significantly higher in postmenopausal women compared to the other group. The well-being scores was higher in premenopausal group ($p < 0.05$). Intergroup comparisons of periodontal health status on the basis of mean±SD scores are shown in (Table 3). Significant differences were found between the groups regarding bleeding on probing, deep pocket >6 mm and loss of attachment ($p < 0.05$). The study reported higher proportion of gingival index score (severe gingivitis) in postmenopausal (50.7%) than the premenopausal group (5.3%). Similarly, poor plaque score was higher in postmenopausal (52.0%) compared to the other group (6%). There was no significant differences on association between domains of WHQ and periodontal health indicators except depression/anxiety in both the groups. The results of the association between anxiety/ depression domain of the WHQ and periodontal parameters in pre and postmenopausal group are displayed in (Table 4).

Multiple linear regression analysis was used to determine the variables associated with periodontal

pocket in the study groups. Socioeconomic status was found to be a significant predictor of periodontal pocket in premenopausal group explaining 14.9% variance of the model ($R^2=0.149$). In postmenopausal group it was found that age, education & occupation of head of the family, SES, frequency of changing toothbrush and somatic symptoms domain of WHQ were significant predictors of periodontal pocket in postmenopausal group explaining 25.6% variance of the model ($R^2=0.256$). The mediation analysis was performed among the study groups with SES as an independent variable, periodontal pocket as a dependent variable and domains of WHQ (physical and emotional well-being changes) as a mediator. The total effect (-0.138, $p<0.001$) of socioeconomic status on periodontal pocket was statistically significant. Physical and emotional well-being as a mediator; direct effect (-0.0842, $p<0.001$) and indirect effect; -0.0541, CI (-0.0785 to -0.0344) of socioeconomic status on periodontal pocket were statistically significant (Figure 1).

DISCUSSION

The homeostasis of the periodontium involves complex multifactorial relationships, in which the endocrine system plays an important role. Changes in the circulating sex hormone levels at the middle age of women results in several clinical effects that have a potential impact on the individual's quality of life.¹² A number of studies have related menopause with some periodontal conditions.^{1,6-9,11,12,18,19} In the present study, pre and postmenopausal women were compared. First, the present findings indicate that women after menopause experienced more physical and emotional changes. A previous study have found that scores of somatic & vasomotor symptoms, sleep problems were significantly higher in post compared to premenopausal group.¹ Second, the presence of periodontal pocket and plaque scores is associated with depressive mood scores in women regardless of the groups. This was in line with Hunter et al¹ study, where an association was found between postmenopause and depression scores. They described that women with periodontitis had significantly higher "depressive mood" scores in both groups.¹ In addition, a study conducted among Japanese women reported that depression scores during menopause are more common among women with oral health problems.²⁰ Besides, somatic symptoms was also found to be a significant predictor of periodontal pocket among postmenopausal women in the present study. Third, this study compared the periodontal health indicators between the study groups. Bleeding on probing, mean pocket depth (>6mm), the mean number of sextants for loss of attachment score; 6-8 mm (code=2), 12 mm or more (code=4) were significantly higher in postmenopause compared to premenopausal women. Notably, these results are in line with the earlier studies for bleeding on probing, pocket depth and clinical loss of attachment.^{8-11,18} Finally, socioeconomic status was found to be a significant predictor of

periodontal pocket in both the groups. To better understand, mediation analysis was performed. The mediating role of each physical and emotional well-being domains (mediator) in the association between SES (exposure) and periodontal pocket (outcome) were significant.

The study has a range of limitations. The cross-sectional study design does not allow assessment of causality between study variables. Despite assuring the confidentiality of the data, biases common to questionnaire research, such as response and social desirability bias may be present in the study. Periodontal problems share a common risk factor such as age, socioeconomic status, smoking, hormonal changes, oral hygiene behaviour and practices. In addition, assessing the problems which are in chronic in nature, such as emotional changes and periodontal health at a shorter period of time is an inherent limitation. Since the studies were conducted in Government hospitals that are attended by the subjects from lower middle to upper lower socioeconomic strata of the society, the results of the study should be interpreted within this context. Further multi-centred, follow up studies are recommended in order to confirm or refute the role of menopause on poor oral health. Routine dental check-ups should be suggested in various stages of a woman's life including menopause to reduce the risk of oral diseases. Interdisciplinary approach among psychologists, gynaecologists and dentists may help women to improve their quality of life and oral health status. Community programs should be considered and developed for women in order to raise awareness about physical & emotional symptoms due to various hormonal changes which might help them to cope up with the daily activities.

CONCLUSION

The research was intended to identify the association of periodontal health with physical and emotional well-being in pre and postmenopausal women. The study adds to the literature that the influence of sociodemographic variables such as age, socioeconomic status, oral hygiene practices; physical and emotional changes may contribute to poor periodontal health in women. This could explain that, relationship between menopause and periodontitis is complex due to number of factors involved.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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