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Evaluation and comparison of oral & periodontal health status in post-menopausal females with and without xerostomia: An observational study

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Abstract---Background & Objective - Menopause is the permanent cessation of menstrual periods, whether occurs naturally or induced by surgery, chemotherapy, or radiation. It is accompanied by hormonal changes, predominantly decrease in estrogen and androgen levels. Females experience varying oral symptoms that may result

from endocrine disturbances, multiple vitamin and mineral deficiencies and psychological dynamics during their menopausal years. Main oral symptoms associated during menopause include xerostomia, burning mouth and altered taste perception. Xerostomia leads to change in salivary pH thereby increasing the risk for oral diseases including periodontal diseases. Saliva contributes to maintenance of the oral pH by neutralizing acids from food and beverages, as well as from bacterial activity, thereby reducing the risk of periodontal disease. After menopause, reduced salivary flow rate and low pH may make females prone to oral health problems. Hence, the main goal of this study is to evaluate and compare the periodontal health status in post-menopausal females with and without xerostomia. Methodology-A total of 204 post-menopausal have been observed and their oral & periodontal status data was analyzed & interpreted. Result & Conclusion- Post-menopausal females with xerostomia were observed to have poor oral hygiene and severe periodontitis in comparison to non- xerostomia group. Also, other oral manifestations like mucosal injury and burning mouth syndrome were significant in xerostomia group in comparison to non-xerostomia group.

Keywords---burning mouth syndrome, estrogen, menopause, mucosal injury, periodontitis, salivary pH, xerostomia.

Introduction

Periodontal diseases is a multifactorial disease encompassing several factors namely- bacterial, systemic, environmental, socioeconomic and genetic factors. Periodontal manifestations in females predominantly occurs due to hormonal imbalance/ changes in various phases of female's life cycle.¹ Female's life cycle undergoes countless physiological changes in puberty, menstruation, pregnancy, and menopause; menopause being the significant and crucial physiological state in female's life cycle. Natural menopause refers to spontaneous termination of menstruation for 12 successive months, which results due to the loss of ovarian follicular activity frequently around the age of 45-55 years.^{2,3} It occurs naturally; however, may be artificially induced by surgery, chemotherapy, and radiotherapy.³ It is accompanied by hormonal changes, predominantly decrease in estrogen and androgen levels, which manifests systemically as hot flashes; decreased bone density; vasomotor symptoms; profuse perspiration; atrophic vaginitis; as well as various changes in oral cavity.⁴

The oral cavity contains receptors for androgens, so, any change in the hormone levels leads to alteration in ecology and health of oral tissues.⁵ Likewise, salivary glands also exhibit the receptors for estrogen and hence, the secretion of saliva is influenced by the status of estrogen level. Oral manifestations of menopause includes xerostomia, burning mouth, altered taste perception, dysesthesia, increased carious activity, osteoporotic jaws, mucositis, atrophic gingivitis, and periodontitis.^{6,7} Histologically, thinning, desquamation, alteration in keratinization

and inflammatory changes of oral mucosa in post-menopausal females are observed.⁸The variation in the sex hormone levels influences vascular permeability, lead to changes in inflammatory mediators, and modulates differentiation of fibroblasts.⁹⁻¹¹

The physiological alterations/shifts in the oral and periodontal tissues can be attributed to decreased salivary secretion and alterations in saliva & GCF composition.⁸ Saliva helps in maintaining the oral pH by neutralizing acids from food and beverages, as well as from bacterial activity. Xerostomia leads to change in salivary pH thereby increasing the risk for oral diseases including periodontal diseases. *Hence, reduced salivary flow rate and low pH in menopause may make females prone to oral health problems.*¹²

In spite of the accessibility to various preventive, interceptive and effective treatment methods, merely any significant gains have been made in terms of female's oral health. So, it is imperative that the dental clinicians and other health care providers understand their role in the promotion of oral health awareness, its impact on the health of women, and the importance of integrating the oral examination into health care across the various life span of females. To get the better understanding of the effect of menopause on oral health, the present study was planned and conducted with an objective to evaluate and compare the periodontal health status in post-menopausal females with and without xerostomia.

Material and Method

The study was single centered, cross-sectional observational study which was conducted on post-menopausal females who reported to the Department of Periodontology, Government College of Dentistry, Indore, Madhya Pradesh. Subject selection- Of all the old aged females who reported to the department in the span of three month, 250 females fulfilled the inclusion and exclusion criteria mentioned for the study. Out of 250 post-menopausal females only 204 were willing to participate in the study and provide written signed consent. So the data collected from two hundred four (204) post-menopausal females is used for the present study. Their oral status including periodontal health status was examined.

Inclusion Criteria for subjects taking part in the study-

1. Cessation of menstruation for 12 months (Post- menopausal)
2. Aged between 45-70 years
3. Systemically healthy (with no chronic disease- Diabetes, Hypertension, Thyroid disorder etc)

Exclusion Criteria for subjects taking part in the study-

1. Dehydration
2. Focal infection and fibrosis of major salivary gland
3. Sjogren syndrome
4. Mikulicz syndrome

5. Autoimmune diseases
6. Post- radiotherapy changes
7. Chemotherapy
8. Patient on specific medication (Antihistamines, Anticholinergics, Diuretics, Beta blockers, Tricyclic antidepressants, Anticonvulsants and Antipsychotics.)
9. Habits like -Betel nut chewer, Tobacco in any form (Smoke & Smokeless)

Oral Examination parameters

All of the participants had undergone a thorough oral & periodontal examination. The following variables were assessed:

- 1) Simplified *oral hygiene status*, determined according to the criteria given by Silness&Loe, Simplified Oral Hygiene index (OHI-S);
- 2) *Russel's Periodontal Index* (RPI);
- 3) *Presence of mucosal injury* demonstrated as mucositis, stomatitis, erythema or ulcer with the history of ≥ 2 weeks;
- 4) *Burning mouth syndrome*- when no apparent cause for burning mouth can be determined; and
- 5) *Oral pH*, measured by using pH indicator strips that were placed on the floor of the mouth; and 6) *xerostomia* determined by using a specific questionnaire and performing the test of the mirror (sticking of a dental mirror to the buccal mucosa was taken as a positive result for xerostomia)

Diagnosis of Periodontitis

Females were considered to have periodontitis if they met the criteria established by the American Academy of Periodontology, which states that the patient must have at least one site with Periodontal Probing Depth (PPD) and Clinical Attachment Level (CAL) ≥ 4 mm, calibrated using WHO probe.

Statistical analysis

The relevant data and the general characteristics variables regarding the oral & the periodontal health status of the 204 post-menopausal females who participated in the study was calibrated and the data was analyzed using IBM SPSS software, results were considered significant with p-value <0.5 . Out of 204 post-menopausal females which were analyzed, 124 were found xerostomic and only 80 were normal (non-xerostomic).

Result and Discussion

The oral and the periodontal parameters comparison between xerostomia (PMX) and non-xerostomia (PMNX) group are mentioned in the tables individually. The OHI-S index for xerostomia and non-xerostomia group are compared using student't-unpaired' test. The mean score of OHI-S for xerostomia group and non-xerostomia group is 3.481 and 3.159 respectively, the difference of mean score is found to be statistically significant ($p=0.036$), which infers that Oral Hygiene

Index is high in xerostomia patients in comparison to non-xerostomia patients in the given sample (Table I).

Table I: Comparison Of OHI-S & Its Interpretation Between Xerostomia (PMX) & Non-Xerostomia (PMNX) Group

Simplified Oral Hygiene Index (OHI-S), n (%)	With Xerostomia (PMX) (124 females)	Without Xerostomia (PMNX) (80 females)	p-value
OHI-S (Mean) (Range 0-6)	3.481	3.159	0.036
Good, n (%)	00 (0%)	08 (10%)	
Fair	48 (38.70%)	20 (25%)	
Poor	76 (61.29%)	52 (65%)	

The difference of means of RPI scores between both the groups is also calculated using t-unpaired test, and the difference is found to be statistically significant with p value 0.013 ($p=0.013$). The difference of periodontitis between xerostomic and non-xerostomic group was calculated using chi square test, it was found to be non-significant with p value 0.813 ($p= 0.813$) (Table II).

Table II: Comparison Of Periodontitis & Mean RPI Score Between Xerostomia (PMX) & Non-Xerostomia (PMNX) Group

Parameter	With Xerostomia (PMX) (124 females)	Without Xerostomia (PMNX) (80 females)	p-value
Age in years (mean)	53.645	53.6	
Periodontitis, n (%) [*]			
Positive	112	71	0.813
Negative	12	09	
Russell's Periodontal Index	5.115	4.497	0.013

Chi square (Fisher's Exact test) was used to find out the significance of difference for nominal parameters- Mucosal injury and Burning mouth syndrome. The difference of frequency of mucosal injury in xerostomia and non-xerostomic group was found to be highly significant $p=0.0012$ (Table 3). There was difference in the frequency of burning mouth syndrome between xerostomia and non-xerostomic group, but the difference was slightly statistically significant ($p=0.04$) (Table 3). Of all the post-menopausal females studied 38.73% females were observed to have mucosal injury with 47.58% in xerostomia & 25% in non-xerostomia group. 23% of total post-menopausal females had burning mouth syndrome with 28.23% in xerostomia and 15% in non-xerostomia group.

The frequency of salivary pH range (acidic, neutral, & basic) of different individuals between xerostomia and non-xerostomic group has also been mentioned in the table (Table III).

Table III: Comparison Of Mucosal Injury, Burning Mouth Syndrome & pH Xerostomia (PMX) & Non-Xerostomia (PMNX) Group

Parameter	With Xerostomia (PMX) (124 females)	Without Xerostomia (PMNX) (80 females)	p-value
Mucosal injury n (%) [*]			
Yes (38.73%)	59 (47.58%)	20 (25%)	0.0012 [*]
No (61.27%)	65 (52.42%)	60 (75%)	
Burning Mouth			
Yes (23.03%)	35 (28.23%)	12 (15%)	0.04
No (76.96%)	89 (71.77%)	68 (85%)	
pH, n (%) [*]			
Basic (>7)	06 (4.83%)	20 (25%)	
Neutral (6.5 to 7)	77 (62.09%)	52 (65%)	
Acid (<6.5)	41 (33.06%)	08 (10%)	

The present study was planned and conducted with an objective to evaluate and compare the oral & periodontal health status in post-menopausal females with and without xerostomia. After successful fulfillment of inclusion and exclusion criteria, data from 204 post-menopausal females have been interpreted and conversed.

The Oral hygiene score (OHI-S) was found significantly higher ($p=0.036$) in xerostomia (PMX) group in comparison to non xerostomic group (PMNX), which indicates a poor oral hygiene status in the PMX group. This may be attributed to higher concentration of ionized calcium in saliva & thereby leading to increased calcification of dental plaque.¹³ Studies by different researchers have found increased calcium levels in saliva of post-menopausal females. Decrease in steroid hormone levels causes reduced intestinal absorption of calcium and consequently increased parathyroid activity. This impairs the calcium phosphate regulation mechanism, resulting in higher levels of calcium in saliva triggering faster calculus formation.¹³⁻¹⁵

In the present study the mean RPI score of xerostomic females (PMX RPI=5.115) was found significantly greater than non-xerostomic females (PMNX=4.497), this indicates higher percentage of post-menopausal females affected by periodontitis in xerostomia group (PMX). Therefore xerostomia can be suggested to play a significant role in post-menopausal females in advancing periodontitis. Dental plaque is considered as main etiologic factor in the periodontal diseases. Dental plaque, increased calculus formation, change in salivary pH & flow rate, altered microbiologic response, changes in inflammatory mediators, vascular permeability, and the growth & differentiation of periodontal fibroblasts poses increased risk for periodontal diseases.¹⁴⁻¹⁷ Hence cumulative effects of all these factors leads to gingivitis and periodontitis in post-menopausal females.

Findings of present study reflects that 33.06% of the females were found to have acidic saliva in xerostomia group (PMX), whereas only 10% of the females had acidic saliva in non-xerostomia (PMNX) group. The study conducted by Dural et

al. has compared pH of saliva between postmenopausal and healthy menstruating females and found higher percentage of acidic pH of saliva in post-menopausal females in comparison to healthy menstruating females. They had compared saliva flow rate, buffering capacity, pH of stimulated saliva. They found no statistically significant difference in the flow rate and buffering capacity between the two groups, but the pH was found to be significantly acidic in postmenopausal women.¹⁸In our study though both the groups comprised post-menopausal females, but a higher percentage of acidic saliva was found in xerostomia group.

On examination of oral mucosa, mucosal injuries were found to be statistically significantly higher in PMX group than PMNX group (p value=0.0012). 47.58% of females were observed to have mucosal injury in PMX group. On the contrary only 25% of females had mucosal injury in PMNX group. Reduction in hydration of oral mucosa due to reduced salivary levels, thin & atrophic mucosa due to reduced re-epithelialization, decreased elasticity of connective tissue increases the risk of mechanical injuries of oral mucosa. Srebrzyn'ska-Witek et al and Petkowicz, B et al have suggested higher rate of mucosal injuries in PM females, however literature regarding the correlation of xerostomia with mucosal injuries is very scarce.^{19,20} Our observation in the present study suggests xerostomia as an important factor in precipitating mucosal injuries in post-menopausal females.

Burning mouth syndrome is characterized by burning, numbness or pain of the oral mucosa of varying severity with no obvious clinical symptoms.^{21,22}Several authors have suggested the prevalence of burning mouth syndrome among the menopausal women ranges between 10% to 40%.^{23,24}In our study a total of 23.03% post-menopausal females reported to have BMS among entire sample, in PMX group the percentage of BMS was 28.23% whereas, in PMNS group it was only 15%. Findings of our study suggests that xerostomia might be a contributing element for BMS in post-menopausal females.

Therefore, we recommend xerostomia condition as significant contributing factor in poor oral hygiene, periodontitis, mucosal injuries and BMS in PM females. Hence all the dental clinicians and medical practitioners must also address xerostomia during diagnosis and management of oral diseases in post-menopausal females.

Conclusion

Within the limits of the present study we conclude that, xerostomia was observed in 60.78% of post-menopausal females. Periodontitis was present in 92.64% of examined post-menopausal female subjects with high significant difference between xerostomic and non-xerostomic group. OHI-S was also significantly higher for xerostomia as compared to non-xerostomic group. Other oral conditions like burning mouth and mucosal injury were significantly present in xerostomic group. Therefore, we conclude that xerostomia is significantly associated with periodontitis, mucosal injury and burning mouth syndrome in post-menopausal females. However, as present study is a single center study conducted on small sample. Therefore, further multi-centered studies on large sample size has to be carried out for validating the results on general population.

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