

Evaluation of the effect of menopause on saliva and dental health

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Abstract

Background & Objective: Menopause leads to physiological changes that take place due to decreased production of estrogen by ovary in women. The study was carried out to know the effect of menopause on saliva by evaluating the salivary flow rate and pH of stimulated saliva and to assess relation among oral diseases and the regularly menstruating women and post-menopausal women.

Method: The study was conducted on 40 healthy post-menopausal women and pre-menopausal women (controls) respectively, who attended private clinic. Data were collected through a questionnaire and oral examination. Samples of the saliva from control group were collected within the first 3 days of menstruation. A standard size paraffin wax was chewed by participants. The salivary secretion during the first one min was swallowed; and next five minute secretion was spat into graduated test tubes. Electrometrically, digital pH meter (Model me 962-P) and pH electrode was used to measure salivary pH and salivary flow rate was measured as ml/min.

Results: A notable decrease in the salivary pH and salivary flow rate, which could be credited to the high values of DMFT and OHI-S in both groups. Our study also shows significant difference in physiological changes and DMFT, OHI-S, PI and GI score in premenopausal women and postmenopausal women.

Interpretation & Conclusion: Our result reveals that there is a distinct decrease in the salivary pH and flow rate in postmenopausal women which gives route to poor oral hygiene and more susceptibility to oral physiological changes. Therefore, with aging in females, substance of preventive dentistry increases.

Keywords: Post menopause, Salivary flow rate, Salivary pH, Oral changes

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Introduction

The World Health Organization defines menopause as “the permanent cessation of menstruation due to loss of ovarian follicular activity.”¹ During the 5th decade of women life, a physiological process ‘Menopause’ occurs, which demands permanent cessation of menstruation. These physiological changes take place due to declining estrogen production by ovaries in women advancing towards menopause.² Women experience an increase in oral changes that may be caused by calcium and vitamin deficiency, endocrine disturbances and many psychological factors.^{2,4} Some previous studies show decreased salivary flow may result in increased oral discomfort, incidence of root caries, periodontal disease and taste alterations post menopause.^{5,6} The hormonal changes occurring prior to menopause affects teeth and gums and decreases body immunity.⁷ Taking everything into account,

understanding oral health of patients approaching menopause or experiencing these changes is important to avoid complications.

Saliva is essential for maintaining and preserving the good health of oral tissues and it is a non-invasive source of metabolism investigation. However, it draws attention when its quantity drops off or its quality is altered.⁸⁻¹¹ Accordingly, aim of the study was to investigate the effect of menopause on saliva by evaluating the salivary pH and flow rate of stimulated saliva and to assess relation among oral diseases and the regularly menstruating women and post-menopausal women.

Material and Method

The study was carried out on 40 healthy post-menopausal women and pre-menopausal women (as controls) respectively, who attended private clinic. Written Consent was taken from the individuals selected.

Inclusion Criteria

- Healthy women aged above 35 years.
- Pre-menopausal women having regular menstrual cycles.
- Post-menopausal women with history of menopause for more than one year.
- Patients without any deleterious habits such as smoking, chewing tobacco, alcohol etc.

Exclusion Criteria

- Individual who have systemic disease.
- Individuals on hormone replacement therapy
- Individual using any medicine on a regular basis that affects the salivary flow.

Data were collected through a questionnaire including demographics, systemic diseases, monthly menstruation, various oral symptoms (dry mouth, taste, breath changes and eating disorders) and oral examination.

The women were told not to eat, drink or wash their teeth for at least one hour before saliva collection. Salivary samples of the control group were collected within the first three days of menstruation. Participants chewed a piece of paraffin of standardized size. The saliva secreted during the first 1 min was swallowed; that secreted during the next 5 min was spat into graduated test tubes. The flow rate was measured as ml/min. Salivary pH was measured electrometrically by digital pH meter (Model me 962-P) and pH electrode.

Oral Hygiene Index Simplified (OHI-S), Decayed, Missing and Filled teeth (DMFT Index), Gingival Index and Plaque Index were determined clinically.

Discussion

The wavering hormonal levels in menopausal women are among the fundamental factors that cause alterations within the oral cavity.¹²

Saliva is essential for maintaining and preserving the good health of oral tissues and it is a non-invasive source of investigating metabolism and getting rid of many drugs.¹³

Salivary fluid consists of exocrine secretion, of which 99% is water, rest there are variety of electrolytes (sodium, potassium, magnesium, calcium, chloride, phosphate, bicarbonate) and proteins, in form of immunoglobulins, enzymes, mucosal glycoproteins, albumin and some polypeptides and oligopeptides and antimicrobial factors important to oral health. It also consists of glucose and nitrogenous products (ammonia and urea). The interactions within these components are responsible for various characteristics of saliva.¹³

Around 80% to 90% of our daily salivary production is done by gustatory, olfactory, mechanical, or pharmacological stimulus.

Individuals with reduced saliva report higher incidences of dental caries, oral infections, oral mucositis, dysphagia and altered taste.¹²

Burning mouth syndrome (BMS) which is also known as stomatodynia, stomatopyrosis, glossopyrosis, glossodynia, glossalgia, primarily bilateral and affects the tongue, lips, palate, gingival, and areas of denture support. It is a common oral abnormality that reflects as intense pain and spontaneous burning sensation in the absence of any observable organic abnormalities.⁶ As per a study conducted by Wardropa and co-workers, in 33% of postmenopausal women oral discomfort was reported without other oral changes. Moreover,

peri/postmenopausal women reported considerably higher prevalence of oral discomfort than in premenopausal women (43% vs. 6%).¹⁴ Also, dysgeusia, dysphagia, dry mouth, and oro-facial/dental pain coexisted.^{5,6}

Xerostomia, Hyposialia or dryness of mouth is yet another symptom often manifested by women after menopause.^{5,14,15} Few studies conducted report that increasing levels of IgA and total protein are responsible for decreasing salivary flow.⁵ Others associate declining salivary flow rate with increased incidence of oral discomfort, root caries, taste alterations, periodontal disease and oral candidiasis in menopausal women.^{5,6,14,16}

Psychological distress can cause eating disorders. Certain oral changes observed are perimolysis, erythema, smooth erosion of enamel, enlarged parotid glands, oral mucous membrane and pharynx trauma resulting from use of fingers, pen and combs to induce vomiting, angular cheilitis and dehydration. Self-induced vomiting leading to regurgitation of gastric contents is also responsible for oral changes.¹⁵

Our study also revealed a remarkable decrease in the salivary pH and salivary flow rate, which could be attributed to the high values of OHI-S and DMFT indices in both groups. Our study also shows significant difference in DMFT, OHI-S, PI and GI score in premenopausal women and postmenopausal women. Our study shows that DMFT, Plaque Index and Gingival Index, BMS and dry mouth had positive significant correlation with salivary flow whereas for pH only Gingival Index had positive significant correlation. And OHI-S had no correlation with salivary flow and pH in premenopausal women. Furthermore, for postmenopausal women DMFT, Plaque Index and Gingival Index and BMS, dry mouth and taste alteration had positive significant correlation with salivary flow whereas for pH, Plaque Index and Gingival Index and all the physiological parameters had positive significant correlation. These changes may be credited to wavering hormonal levels in women after menopause.

Minicucci EM et al¹⁷ in a study found that the salivary flow showed reduction in menopause group but without clinical symptoms of dry mouth. Similar results were observed by Pulin Saluja et al¹⁸ were taste perception intensity for sucrose and salivary pH in post menopausal women was low when compared to other group. Previous studies done by Dural S et al¹⁹, Suraksha Bhat et al²⁰ also revealed similar results.

Laine and Virtanen reported higher value of DMFT in menopausal women, on examining the oral health status according to World Health Organization criteria.²¹ Kullander, Sonesson, Laine and Virtanen reported declining rate of secretion in menopausal women.²¹ Yalcin et al have reported lower DMFT values in menstruating women.²²

These may cause changes in the periodontium like burning sensation in the oral mucosa, xerostomia, bleeding on probing and brushing, breathe changes and taste alterations.²³ Similar results were found in our

study in which number of women experiencing these changes was more in menopausal group but difference was statistically not significant. Similar results were obtained by Santosh P et al²⁴ in their study.

Results

Table 1: Mean age in both the groups

Group	N	Mean age (in years)	Std. Deviation
Premenopausal	40	39.78	2.99
Post Menopausal	40	56.90	4.19

Table 1 shows that mean age in premenopausal women was 39.78 + 2.9 and post menopausal women 56.9 +4.19

Table 2: Comparison of mean DMFT of both the groups using student't' test

Group	N	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		p value
					Lower	Upper	
Premenopausal	40	2.45	0.81	0.13	2.19	2.71	0.0001
Post Menopausal	40	5.10	2.02	0.32	4.45	5.75	

Table 2 shows that mean DMFT score in premenopausal women was 2.45 + 0.81 and in post menopausal women it was 5.10 + 2.02 and this difference was statistically significant (p<0.05).

Table 3: Comparison of mean OHI-S of both the groups using student't' test

Group	N	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		p value
					Lower	Upper	
Premenopausal	40	1.43	0.50	0.08	1.26	1.59	0.0001
Post Menopausal	40	1.90	0.55	0.09	1.73	2.07	

Table 3 shows that mean OHI-S score in premenopausal women was fair (1.43 + 0.50) and in post menopausal women it was fair with little higher scores, 1.90 + 0.55 and this difference was statistically significant (p<0.05).

Table 4: Comparison of mean GI of both the groups using student't' test

Group	N	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		p value
					Lower	Upper	
Premenopausal	40	1.75	0.44	0.07	1.61	1.89	0.0001
Post Menopausal	40	1.55	0.50	0.08	1.39	1.71	

Table 4 shows that mean GI score in premenopausal women was 1.75 + 0.44 and in post menopausal women it was 1.55+ 0.50 and this difference was statistically significant (p<0.05).

Table 5: Comparison of mean PI of both the groups using student 't' test

Group	N	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		p value
					Lower	Upper	
Premenopausal	40	1.65	0.48	0.08	1.50	1.80	0.0001
Post Menopausal	40	1.45	0.50	0.08	1.29	1.61	

Table 5 shows that mean PI score in premenopausal women was 1.65 + 0.48 and in postmenopausal women it was 1.45 + 0.50 and this difference was statistically significant (p<0.05).

Table 6: Comparison of mean pH of both the groups using student 't' test

Group	N	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		p value
					Lower	Upper	
Premenopausal	40	7.10	0.19	0.03	7.04	7.16	0.0001
Post Menopausal	40	5.77	0.37	0.06	5.65	5.89	

Table 6 shows that mean pH score in premenopausal women was 7.10 + 0.19 and in post menopausal women it was 5.77 + 0.37 and this difference was statistically significant ($p < 0.05$).

Table 7: Comparison of mean salivary flow of both the groups using student 't' test

Group	N	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		p value
					Lower	Upper	
Premenopausal	40	8.69	0.82	0.13	8.43	8.95	0.0001
Post Menopausal	40	4.38	0.98	0.15	4.06	4.69	

Table 7 shows that mean salivary flow score in premenopausal women was 8.69 + 0.82 and in post menopausal women it was 4.38 + 0.98 and this difference was statistically significant ($p < 0.05$).

Table 8: Comparison of BMS in both the groups

	Premenopausal	Post Menopausal	p-value
Absent	36(90%)	26(65%)	0.122
Present	4(10%)	14(35%)	

Table 8 shows that 4 patients in premenopausal group and 14 patients in postmenopausal group had BMS and this difference was statistically not significant ($p > 0.05$).

Table 9: Comparison of dry mouth in both the groups

	Premenopausal	Post Menopausal	p-value
Absent	34(85%)	20(50%)	0.376
Present	6(15%)	20(50%)	

Table 9 shows that 6 patients in premenopausal group and 20 patients in postmenopausal group had dry mouth symptoms present and this difference was statistically not significant ($p > 0.05$).

Table 10: Comparison of taste alteration in both the groups

	Premenopausal	Post Menopausal	p-value
Absent	38(95%)	32(80%)	0.485
Present	2(5%)	8(20%)	

Table 10 shows that 2 patients in premenopausal group and 8 patients in postmenopausal group had taste alteration and this difference was statistically not significant ($p > 0.05$).

Table 11: Comparison of breath changes in both the groups

	Premenopausal	Post Menopausal	p-value
Absent	30(75%)	17(42%)	0.853
Present	10(25%)	23(58%)	

Table 11 shows that 10 patients in premenopausal group and 23 patients in postmenopausal group had breath changes and this difference was statistically not significant ($p > 0.05$).

Table 12: Correlation analysis of indices with salivary flow and pH in premenopausal women by using chi-square test

Demographic variables	Salivary flow		pH	
	χ^2 value	p- value	χ^2 value	p- value
DMFT	68.677	0.002*	29.048	0.113
OHI-S	19.540	0.107	11.867	0.105
PI	28.278	0.008*	13.626	0.058
GI	25.778	0.018*	15.111	0.035*

* $p < 0.05$ (significant)

Table 12 shows that DMFT, Plaque Index(PI) and Gingival Index(GI) had positive significant correlation with salivary flow whereas for pH only Gingival Index had positive significant correlation. And OHI-S had no correlation with salivary flow and pH in premenopausal women.

Table 13: Correlation analysis of physiological changes with salivary flow and pH in premenopausal women by using chi-square test

Demographic variables	Salivary flow		pH	
	χ^2 value	p- value	χ^2 value	p- value
BMS	25.185	0.022*	4.815	0.683
Dry Mouth	29.542	0.005*	3.399	0.846
Taste	11.930	0.533	4.912	0.671
Breath	10.222	0.676	7.111	0.417

*p<0.05(significant)

Table 13 shows that pH in premenopausal women BMS and dry mouth had positive significant correlation with salivary flow whereas no correlation was seen in any other parameter and pH.

Table 14: Correlation analysis of indices with salivary flow and pH in menopausal women by using chi-square test

Demographic variables	Salivary flow		pH	
	χ^2 value	p- value	χ^2 value	p- value
DMFT	113.833	0.001*	175.500	0.001
OHI-S	46.548	0.001	50.357	0.001
PI	23.165	0.006*	24.512	0.011*
GI	23.165	0.006*	24.512	0.011*

*p<0.05(significant)

Table 14 shows that in postmenopausal women DMFT, Plaque Index(PI) and Gingival Index(GI) had positive significant correlation with salivary flow whereas for pH only Plaque Index and Gingival Index had positive significant correlation.

Table 15: Correlation analysis of physiological changes with salivary flow and pH in premenopausal women by using chi-square test

Demographic variables	Salivary flow		pH	
	χ^2 value	p- value	χ^2 value	p- value
BMS	22.418	0.008*	20.952	0.034*
Dry Mouth	29.333	0.001*	22.667	0.020*
Taste	17.083	0.047*	30.625	0.001*
Breath	12.208	0.202	22.609	0.020*

*p<0.05(significant)

Table 15 shows that in postmenopausal women BMS, dry mouth and taste had positive significant correlation with salivary flow whereas for pH all the parameters had positive significant correlation.

Conflict of interest: None

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