

Caries Experience and Severity in Relation to Salivary Estradiol Hormone Level among Pre-menopausal and Postmenopausal Iraqi Women in Baghdad City-Iraq

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Abstract: Background: Menopause affects the oral tissues in the same way as it alters the other systems. Alterations in the oral cavity are due to aging as well as hypo-estrogenism. Oral mucosa resembles vaginal mucosa in its histology as well as its response to estrogens. Sex hormone receptors have been detected in the oral mucosa and salivary glands. Aim of study: The present study was designed to estimate the caries experience and severity in relation to salivary estradiol level among pre and post-menopausal women. Materials and Methods: Ninety (90) women aged 48-52 years old, the control group consisted of 45 pre-menopausal women and the study group consisted of 45 post-menopause were examined for caries experience according to WHO, (1997) and caries severity according to Manjie et al., (1989). Unstimulated saliva was collected from all subjects to analyze estradiol hormone level. Results: the mean value of the DS, MS, DMFS were higher in post-menopause than that of pre-menopause group with lower level of salivary estradiol hormone (E2). The caries severity for D3 and D4 was higher in post-menopausal group than pre-menopausal group and have a negative relation with estradiol (E2) hormone level. Conclusion: Caries experience and severity negatively related to salivary estradiol hormone level in post-menopausal women.

Keywords: Caries, Salivary estradiol hormone, pre and postmenopausal women

1. Introduction

Menopause means permanent cessation of menstruation at the end of reproductive life due to loss of ovarian follicular activity.^[1] Menopause should be considered as the date of the last menstruation and as such it represents a brief and defined period of time (an interruption of 12 months)^[2]. It is the result of irreversible changes in the hormonal and reproductive functions of the ovaries.^[3] Premenopause refers to the period prior to menopause, while postmenopause refers to the period after menopause and perimenopause to the period around menopause (40-55)^[1] while climacterium implies a much longer period involving a series of events such as the loss of female reproductive capacity and the occurrence of important changes in sex hormone secretion. These events induce major modifications in the genital apparatus as well as in other areas of the body.^[2]

In addition to the more general manifestations of menopause however, oral symptoms are also found. Along with the physiological aging of the oral tissues, the hormone changes that take place in menopausal women are responsible for the alterations observed within the oral cavity. Menopause affects the oral tissues in the same way as it alters the other systems. Alterations in the oral cavity are due to aging as well as hypoestrogenism^[4]. Oral mucosa resembles vaginal mucosa in its histology as well as its response to estrogens. Sex hormone receptors have been detected in the oral mucosa and salivary glands.^[5,6]

Estrogen can affect oral mucosa directly or through neural mechanism thus altering the periodontal health in

menopausal women.^[7] The oral problems may include a paucity of saliva leading to xerostomia, burning mouth syndrome, increase in incidence of dental caries, taste alterations, atrophic gingivitis, periodontitis, and osteoporotic jaws.⁸ The three major forms naturally occurring estrogen in women are estrone (E1), estradiol (E2), and estrin (E3). Another type of estrogen called estetrol (E4) that is formed only during pregnancy course.^[9,10] In women, E2 is produced by testosterone in the ovarian follicles, while in men, it is secreted by testes and conversion of androgens in the extra glandular sites.^{11,12} In premenopause, salivary estradiol (E2) concentrations vary significantly throughout the menstrual cycle, with the lowest levels occurring during menstruation.¹²

After menopause, estradiol (E2) synthesis normally decreases.^[13,14] This result in atrophy and diminished lubrication of vaginal epithelium, resulting from decreased genital vasocongestion.^[14]

2. Material and Method

The total sample consisted of ninety (90) women aged 48-52. Their age was recorded according to the last birthday (WHO, 1997)^[15] they were carefully informed about the aim of the investigation and they were freely allowed to accept examination. Informed consent and ethical approval had been obtained.

In the present study, the control group included 45 premenopausal women and the study group included 45 post-menopausal women who attending Health care Centers

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and Collage of Dentistry/ Baghdad University. Bio-chemical laboratory works were done in Poisoning Consultation Center at Gazi Al-Hariri hospital.

Inclusion criteria:

- 1) For control group, all healthy women aged 48-52 with regular menstrual cycle in the last year.
- 2) For study group, all healthy women aged 48-52 with one year amenorrhea

All women are healthy with no history of systemic disease (diabetic mellitus, thyroid malfunction, Auto immune diseases, hysterectomy, ovarian cystic lesion and early menopause for other cause) or under medication. This information will obtain from their medical records. Each participants received complete examination of all teeth except 3rd molar and on all four surfaces (mesial, distal, buccal/labial and lingual/palatal) by using dental probe(WHO,1997)^[15].

Dentition status

Caries experience was recorded depending on (DMFT and DMFS indices and its fractions DS, MS, FS for permanent teeth), decayed, missing, filled index (WHO,1997)^[15] and the severity of dental caries was done according to the criteria of (Manjie et al., 1989)^[16] This allow recording decay lesion according to severity, and the criteria for coding D₁₋₄ MFS.

Saliva collection

Unstimulated whole saliva samples were collected at a fixed collection time (8-11 a.m.).The patient was advised to quit the intake of any food or beverage (water excluded) one hour before the test time. The subjects should be seated on a chair, then irrigate her mouth with distilled water and relaxed for at least five minutes and fix her head above and the test tube kept beneath it and to keep her mouth opened to allow the drooling of saliva into the tube for five minutes (Navazesh and Kumar, 2008).¹⁷

Salivary biochemical analysis:

Salivary estradiol(E2) analysis:

The concentration of salivary estradiol hormone was determined by using the supernatant salivary samples with mean of Enzyme Linked Immune-Sorbent Assay (ELISA).The DEMEDITEC Salivary Estradiol ELISA kit (96-wells). Data processing and statistical analysis:

Entering the data was done by personal computer. Statistical analysis was done by using correlation test by the aid of the SPSS version 21 (Statistical Package for Social Sciences).

3. Results

Caries experience and most of its fraction (DS, MS, DMFS, and DMFT)of pre-menopausal and post-menopause group are shown in the table (1).From the table, it was found that the mean value of the DS, MS, DMFS were higher in post-menopause than that of pre-menopause group with statically

highly significant difference for DS (p< 0.01) and non-significant difference for MS and DMFS (p>0.05)

The mean value of DMFT was higher in pre-menopause group with statically non-significant difference (p>0.05).

Table 1: Caries experience among pre and post-menopausal women (DS, MS, DMFS, DMFT)

Variables		Mean	±SD	Median	Mean Rank	Z	P-value
DS	Pre	5.289	2.222	5.000	37.99	2.751	.006**
	Post	6.489	2.139	7.000	53.01		
	Total	5.889	2.251	6.000			
MS	Pre	31.822	9.439	33.000	44.72	.283	.777
	Post	32.556	9.137	33.000	46.28		
	Total	32.189	9.244	33.000			
DMFS	Pre	43.156	9.551	44.000	45.88	.137	.891
	Post	43.311	9.800	44.000	45.12		
	Total	43.233	9.622	44.000			
DMFT	Pre	13.800	3.130	14.000	45.56	.020	.984
	Post	13.711	3.628	14.000	45.44		
	Total	13.756	3.370	14.000			

*Significant at(p<0.05),**Highly significant at(p<0.01)

Regarding FS fraction for pre-menopausal and post-menopausal women is statically analyzed by T-test and shown in the table (2), the mean value of FS is higher in pre-menopausal group with highly significant difference (p<0.01).

Table 2: Caries experience among pre and post-menopausal group (FS)

Variables		Mean	±SD	T	df	P-value
FS	Pre	6.111	2.347	3.836	88	.000**
	Post	4.244	2.268			
	Total	5.178	2.479			

*Significant at(p<0.05),**Highly significant at(p<0.01)

Caries severity (D₁, D₂, D₃ and D₄) of pre-menopausal group and post-menopausal group with statical analysis by using mann whitney Z-test are listed in table(3), caries severity for D₁ and D₂ was higher in pre-menopausal group than post-menopausal group with statically non- significant difference in D₁ (p>0.05)and significant difference in D₂ (p<0.05)

Whereas, the severity for D₃ and D₄ was higher in post-menopausal group than pre-menopausal group with statically highly significant difference (p<0.01)

Table 3: Caries severity (D₁-D₄) among pre and post-menopausal group

Variables	Menopause	Mean	±SD	Median	Mean Rank	Z	P-value
D1	Pre	.444	.624	.000	48.96	1.566	.117
	Post	.267	.539	.000	42.04		
	Total	.356	.587	.000			
D2	Pre	1.911	1.184	2.000	51.19	2.125	.034*
	Post	1.378	1.193	1.000	39.81		
	Total	1.644	1.211	2.000			
D3	Pre	1.600	1.643	1.000	37.56	2.960	.003**
	Post	2.778	1.882	3.000	53.44		
	Total	2.189	1.854	2.000			
D4	Pre	1.378	1.683	1.000	37.28	3.057	.002**
	Post	2.111	1.191	2.000	53.72		
	Total	1.744	1.496	2.000			

*Significant at(p<0.05),**Highly significant at(p<0.01)

Regarding salivary estradiol (E2), the present study was found that Estradiol(E2) in pre-menopausal group is higher than study group with highly significant difference between the two groups (p<0.01), table (4).

Table 4: Descriptive and statistical test of Estrogen level among groups

Menopause	Mean	±SD	T	Df	Sig.
Post	2.887	1.259	-7.389	88	.000**
Pre	5.221	1.703			

**Highly significant at (p<0.01)

The correlation for salivary (E2)with caries experience(DS, MS & FS)between two groups revealed negative correlation with no significance difference (p>0.05). Table (5)

Table 5: Correlation between salivary E2 and caries experience by groups using Spearman correlation

Menopause	Variables	Estrogen	
		r	P-value
Post	DS	-.281	.061
	MS	-.178	.242
	FS	-.003	.985
	DMFS	-.149	.328
	DMFT	.096	.532
Pre	DS	-.147	.337
	MS	-.059	.701
	FS	-.063	.680
	DMFS	-.083	.588
	DMFT	.164	.282

On the other hand, correlation between salivary estradiol (E2) level and caries severity was illustrated in table (6). In study group, a positive correlation was recorded between D₁ and estradiol (E2) with highly significant difference (p<0.01) and a negative relation was recorded between estradiol(E2) and D₂, D₃ and D₄ with no significance (p>0.05) for D₂ and D₄, and a highly significance for D₃. Beside that, in control group, a positive correlation was recored between estradiol(E2) and D₁ and D₂ with no significance difference(P>0.05) and a negative relation was recorded between estradiol (E2) and D₃ and D₄ with no significance (p>0.05)

Table 6: Correlation between Salivary E2 level and caries severity by groups

Menopause	Variables	Estrogen	
		r	P-value
Post	D1	.398	.007**
	D2	-.006	.967
	D3	-.421	.004**
	D4	-.061	.690
Pre	D1	.156	.306
	D2	.016	.916
	D3	-.214	.158
	D4	-.116	.447

4. Discussion

The menopause is physiological changes in women that give rise to adaptive changes at both systemic and oral level. As we all begin to reach an older age, dental health and hygiene

becomes a major concern. The dentist is often the first person to appreciate numerous changes that are experienced throughout the body during menopause. The teeth and gums are extremely susceptible to any hormonal changes that take place just before menopause and readily decrease body's ability to fight off minor infections or maintain a healthy balance of useful and harmful bacteria within the oral environment.^[18]

The present study revealed a higher decayed, missed surfaces and DMFS in postmenopausal group than pre-menopausal group with increasing in the severity of decay (D₁_D₄) in postmenopausal group.

Few studies have been published on the effect of menopause on dental status. (Yalçın et al.,2005)^[19] have reported lower DMFT values in menstruating women and (Dural et al.,2005)^[20] also reported that oral status of the postmenopausal women, as determined with DMFT, was worse than those of the menstruating women, which could be due to change in oral symptoms which may result from endocrine disturbances, calcium and vitamin deficiency and various psychological factors during menopausal period that increase incidence of dental caries.^[21]

In addition to more general manifestation of menopause, the hormone change (hypoestrogenism) that take place in menopausal women are responsible for the alterations observed within the oral cavity.^[4] The result of the present study showed negative correlation for caries experience and severity for D₃ and D₄ with salivary estradiol hormone (E2). As the female hormone estrogen influences many physiological and psychological functions.^[22], as a rule hypostivation, oral dryness or xerostomia is one of the symptoms associated with menopause(Agha-Hosseini 2009)^[23],and xerostomia might be unrelated to lower salivary flow rates, it may infact be a process associated with low estrogen levels.^[21]

The susceptibility to dental caries increase with dry mouth(xerostomia).^[23]

On conclusion menopause affect a woman's dental health, this alteration includes both caries experience and severity are negatively related to the salivary estradiol hormone (E2) in postmenopausal women.

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