# Oral hygiene status in relation to salivary estradiol hormone level among pre-menopausal and postmenopausal Iraqi women

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# ABSTRACT

**Background:** The menopause is physiological changes in women that give rise to adaptive changes at both systemic and oral level. During menopause, ovarian function declines and the production of sex steroid hormones reduces significantly affecting the oral tissues and periodontal structures leading to chronic inflammation of the gingiva, increased risk of tooth loss.

Aim of study: The present study was designed to estimate the oral hygiene status in relation to salivary estradiol level among pre and post-menopausal women.

**Materials and Methods:** Ninety 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 gingival index, plaque index and calculus index. Unstimulated saliva was collected from all women to analyze estradiol hormone level.

**Results:** the mean rank of the gingival index, plaque index and calculus index were higher in post-menopause than that of pre-menopause group with lower level of salivary estradiol hormone (E2). These oral hygiene indices have a negative relation with estradiol (E2) hormone level in both test groups.

**Conclusion:** Oral hygiene status affected by salivary estradiol hormone level in women. Oral hygiene status was worse among post-menopausal women and correlated negatively with salivary Estradiol hormone level.

Keywords: Salivary estradiol hormone, menopause, oral hygiene. (Received: 10/1/2018; Accepted: 17/2/2018)

# **INTRODUCTION**

Menopause is a normal, natural event, defined as the final menstrual period (FMP). It represents the permanent cessation of menses resulting from loss of ovarian follicular function, usually due to aging. Menopause can occur naturally (spontaneously) on average around age 51 or be induced through a medical intervention (surgery, chemotherapy, or pelvic radiation therapy)  $^{(1,2)}$ . In a woman's life at middle age, through the climacteric course, circulating sex hormone levels change and this as expected results in several clinical effects that has a potential effect on the individuals psychological status and quality of life. Additionally, there are several hormonal changes takes place during menopause, as a result the gums become more susceptible to plaque and thus leading to a much higher risk for gingivitis and advanced periodontitis<sup>(3,4)</sup>. Menopause can also affect bones throughout the body, reducing the relative anchorage that the jaw has on one's teeth $^{(5)}$ .

Pre-menopause refers to the period prior to menopause, while post-menopause refers to the period after menopause and perimenopause to the period around menopause (40-55y)<sup>(6)</sup>, 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<sup>(7)</sup>.

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 <sup>(8)</sup>. 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 <sup>(9.10)</sup>.

Estrogen can affect oral mucosa directly or through neural mechanism thus altering the periodontal health in menopausal women <sup>(11)</sup>. 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<sup>(12)</sup>. The three major forms naturally occurring estrogen in women are estrone (E1), estradiol (E2), and estriol (E3). Another type of estrogen called estetrol (E4) that is formed only during pregnancy course <sup>(13,14)</sup>.

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In pre-menopause, salivary estradiol (E2) concentrations vary significantly throughout the

menstrual cycle, with the lowest levels occurring during menstruation <sup>(15)</sup>.

After menopause, estradiol (E2) synthesis normally decreases (16, 17). This result in atrophy and diminished lubrication of vaginal epithelium, resulting from decreased genital vasocongestion. <sup>(17)</sup>. This study was conducted among a group of post-menopausal women and compare with premenopausal women aged to assess the oral health condition including: a) Oral cleanliness (dental plaque and calculus). b) Gingival health condition and assess the level of salivary Estradiol (E2) hormone and its' relationship with oral variables as there is no previous Iraqi study concerning this subject.

# **MATERIAL AND METHOD**

The total sample consisted of ninety women aged 48-52. Their age was recorded according to the last birthday<sup>(18)</sup>. 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 and College of Dentistry/ University of Baghdad. 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.

participants Each received complete examination of all teeth except 3rd molar and on all four surfaces mesial, distal, buccal/labial and lingual/palatal by using periodontal probe (William's probe) to estimate plaque index<sup>(19)</sup>, gingival index <sup>(20)</sup>, and six ramfjord teeth on two surfaces buccal/labial and lingual/palatal to estimate calculus index (21)

## Saliva collection

Unstimulated whole saliva samples were collected at a fixed collection time 9-11 a.m. .The woman was advised to guit 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 $^{(22)}$ .

## 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). Estradiol free in saliva ELISA kit, Demeditic,Germany(according to instruction author ).

Data processing and statistical analysis: Using Shapiro-wilk test to test the normality distribution of quantitative variables.Statistical analysis was done by using correlation test: Wilcoxon-sum rank test and T test, by the aid of the SPSS version 21 (Statistical Package for Social Sciences).

## RESULTS

Concerning the plaque and gingival indices as shown in table 1 & 2, the median of postmenopausal group were statistically higher than those of pre-menopausal group with no significant difference, while there is a significant difference between the two groups in the median of the Cal I as revealed in table 3

**Table 1: Comparison of median plaque index** between study and control groups

Groups	Median	**Z	<b>P-value</b>
Post-	1 337		
menopause	1.557	0.806	0.370
Pre-	1 250	0.890	
menopause	1.230		

\*\*Using Wilcoxon-sum rank test

Table 2: Comparison of median gingival index between study and control groups

Groups	Median	**Z	Р-
			value
Post-	1.330	0.963	0.335
menopause			
Pre-	1.220		
menopause			

\*\*Using Wilcoxon-sum rank test

Table3: Comparison of median calculus index between study and control groups

Groups	Median	**Z	Р-
			value
Post-	.976	4.553	*0.000
menopause			
Pre-menopause	.601		

\*\* Wilcoxon-sum rank test \* Significant at (p≤0.01)

The distribution of the sample, study and control groups, according to severity of gingival inflammation is illustrated in table 4. In the study group, the moderate type of gingival inflammation 82.22% was higher than that recorded for the control group, on the other hand, the mild type of gingival inflammation was higher in the control group 22.22% in comparison with that in the study group 17.78%.

On the other hand, the healthy and sever types were absent in the two groups.

Table 4: Gingival health condition severityamong pre and post-menopausal groups

CLeonority		Groups		Total	
GI severity		Pre Post		10141	
0(Haalthy)	Number	0	0	0	
O(Healthy)	%	0	0	0	
0 1 1(MCLI)	number	10	8	18	
0.1-1(WIIId)	%	22.22	17.78	20.00	
1.1.2(Moderate)	number	35	37	72	
1.1-2(Moderate)	%	77.78	82.22	80.00	
$S_{ayana} (2 1 2)$	number	0	0	0	
Severe (2.1-5)	%	0	0	0	

Regarding salivary estradiol (E2), the present study was found that salivary Estradiol (E2) in premenopausal group is higher than study group with significant difference between the two groups (p $\leq$ 0.05), table 5.

Table 5: Descriptive and statistical test ofEstradiol level among groups.

	Groups	Mean	±SD	p- value	
	Post-	2 887	1 2 5 9	0.000*	
	menopause	2.007	1.257	0.000	
	Pre-	5.221	1.703		
	menopause	0.221	11/00		
* S	Significant at	(p≤0.05)	J**	Jsing T te	est

The correlation for salivary estradiol (E2) with oral indices: plaque index, gingival index, calculus index between two groups revealed negative no significant correlation (p>0.05), as shown in the table 6.

Table 6: Correlation between salivaryestradiol (E2) and oral indices

Cround	Variables	Estrogen	
Groups	variables	r	P-value
	Plaque Index	143	.349
Post- menopause	Gingival Index	147	.334
	Calculus Index	136	.374
	Plaque Index	244	.106
Pre-	Gingival Index	120	.433
menopause	Calculus Index	177	.244

# DISCUSSION

Menopause associated with significant adverse changes in the oro-facial complex, in which women appear to experience an increase in oral symptoms that may result from endocrine disturbances (reduced estrogen)<sup>(23)</sup>.

In the current study, the plaque index and gingival index and calculus index were higher among post-menopausal group. This agree with previous studies that showed the oral hygiene of the postmenopausal women was worse than that of the menstruating women<sup>(24-26)</sup>.

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<sup>(27)</sup>.

The present study revealed a lower level of Estradiol hormone in postmenopausal group than pre-menopausal group, this is agree with previous study that showed a same results with decrease in salivary flow rate in post-menopausal women<sup>(28)</sup>.

The hormone change (hypo-estrogenism) that take place in menopausal women are responsible for the alterations observed within the oral cavity <sup>(8)</sup> the result of the present study showed negative correlation for oral hygiene condition with salivary estradiol hormone (E2). As the female hormone estrogen influences many physiological and psychological functions<sup>(29)</sup>, as a rule hyposalivation, oral dryness or xerostomia is one of the symptoms associated with menopause<sup>(30)</sup>, and xerostomia may in fact be a process associated with low estrogen levels<sup>(31)</sup>.

On conclusion menopause affect a woman's oral health, this alteration includes gingival inflammation and calculus accumulation, and they are negatively related to the salivary estradiol hormone (E2) in postmenopausal women.

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#### الخلاصه:

الخلفيه: سن البأس هو التغيرات الفسلجيه في النساء التي تسبب ارتفاع في التغيرات التكيفيه على مستوى الجسم والفم. كلما تقدم العمر أصبحت صحة الفم والاسنان اكثر اهميه. الغشاء المخاطي المبطن للفم مشابه للمهيلي نسيجيا وكذلك في تفاعله مع الاستروجين. أكتشف وجود مستلمات الهرمونات الجنسيه في الغشاء المخاطي الفموي والغدد اللعابيه.

والعد التعبيم. هدف الدراسة: الدراسه الحاليه صممت لتحديد حالة الفم الصحيه و علاقتها بمستويات هرمون الاستروجين بين عينه من النساء قبل وبعد سن الياس مواد وطرق العمل: تسعون امرأه مشاركه ادرجوا في هذه الدراسه تتراوح أعمار هم بين( 48-52), صنفوا الى مجموعتين. المجموعه الأولى الضابطه تضم (45) امرأه قبل سن اليأس والمجموعه الثانيه مجموعة الدراسه تضم (45) امراه بعد سن الياس. تم فحصبهم وتقييم حاله الفم من خلال تقدير مؤشرات: مؤشر التهاب اللثه, مؤشر الصفيحه الجرثوميه ومؤشر الترسبات الصليه (القلح), بالأضافه الى الحذ عينات لعابيه غير محفزه لتقدير مستوى هرمون الاستروجين في اللعاب.

النتائج: أظهرت النتائج ارتفاع قيمة المؤشرات الثلاث في مجموعة الدراسة للنساء بعد سن الياس مقارنة مع المجموعه الضابطه مع انخفاض مستوى هرمون الاستروجين في مجموعة الدراسة. هذه المؤشرات تتناسب مع مستوى هرمون الاستروجين في اللعاب عكسيا في كلا المجموعتين.

الاستنتاج: حالة الفم الصحيه تتأثر بمستويات هرمون الاستروجين اللعابي في النساء. ان التهاب اللثه وتجمع التكلسات القلحيه تتأثر عكسيا بمستويات هرمون الاستروجين اللعابي في النساء بعد سن الياس