

Trajectories of Salivary Hormones in Pregnant Women with Anxiety and there Effect on Gingival Health Condition

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Abstract

Background: Hormonal fluctuations during pregnancy caused several of the physiological changes designed for promoting growth and delivery of a healthy child. A delicate balance between immune tolerance to fetal antigens and immunity against infectious pathogens needs to be maintained.

Aim: Assessing salivary cortisol and progesterone hormones in anxious pregnant women and their impact on gingival health status.

Subjects and Method: A sample of 80 women with healthy pregnancy divided into two groups including 40 pregnant women with high anxiety level match in age with 40 pregnant women have a low level of anxiety in Baghdad Teaching Hospital of Baghdad city in Iraq were participated in this study. Plaque index was used for assessing dental plaque accumulations. The gingival condition was measured by the gingival index. Unstimulated saliva sample was collected for measuring salivary cortisol and progesterone.

Result: The strong validity and reliability of Beck Anxiety Inventory (BAI) Arabic translation scale make it a good indicator for measuring anxiety in Iraqi pregnant women. Data analysis of this study revealed high anxiety group has an elevated level of salivary cortisol, decrease salivary progesterone with significant differences. The correlations coefficients between salivary cortisol and progesterone among the high anxiety group was negative strong significant correlation while non-significant correlation in low anxiety group. The plaque index was higher among the high anxiety group with significant differences. Concerning the gingival index; there is no significant differences among two groups. Positive strong significant correlation between plaque and gingival indices in high anxiety group. Regarding the correlation between gingival index and salivary progesterone in low anxiety group, it was positive strong significant. While a positive significant correlation between plaque index and salivary cortisol in both groups.

Conclusion: This study reported increase stress-hormone cortisol among a high anxiety pregnant women which has an effect on gingival health subsequently. Gingival inflammation in the high anxiety group was a plaque induce gingivitis, while a pregnancy gingivitis was found among the low anxiety group.

Key words: *Cortisol, progesterone, gingivitis.*

Introduction

Pregnancy is one of the most important events in a life of women, since it involves both biological and psychological changes. While this period is full of pleasant emotions for many women, others feel a considerable lot of unpleasant and negative feelings⁽¹⁾. Although anxiety is common during pregnancy, it may become severe and have a detrimental influence on behavior, caused significant harm to pregnant ant child⁽²⁾. Gestational period is not a state of disease but it is a healthy sign. Alterations in hormonal levels of pregnant women have a direct impact on oral diseases⁽³⁾. Cortisol is a steroid hormone with catabolic effect arise from the adrenal cortex of the kidney⁽⁴⁾. Several studies have found a link between maternal cortisol levels and anxiety levels during pregnancy⁽⁵⁾. Cortisol levels were positively associated to progesterone⁽⁶⁾, the later measured in saliva of pregnant women at the end of pregnancy. Dental plaque is the main cause of the oral diseases which are the main problem of public health⁽⁷⁾. The prevalence of gingivitis during pregnancy varies among studies from 30% to 100%⁽⁸⁾. Pregnancy-related periodontal disease usually appears in the third trimester and resolves three months following birth⁽⁹⁾.

Subject and Method

This study conducted among primigravida pregnant women age (20-29) in third trimester at 29-40 weeks with a healthy baby, without any illness or threaten abortion, medication intake included psychological treatment. This study was approved by the scientific committee in College of Dentistry/ University of Baghdad (number: 313). Pregnant women who recruited in this study distributed according to demographic factors which included age,

educational level from (illiteracy to college) based on WHO, 2013 classification after some modifications to compensate the study population, and the week of gestation from 29-40 divided them into three groups from (29-32), (33-36) and (37-40 week). Beck Anxiety Inventory (BAI) by Aaron T. Beck in 1988⁽¹⁰⁾ in Arabic version was employed for assessing anxiety during the gestational period. Validity and reliability was measured for this scale (cronbachs alpha is 0.939). Standardization for scale was performed and two items was dropped when measures validity by psychologist's committees in Psychological Research Center/ University of Baghdad to accommodate the present study. It was applicable for current study participants. Unstimulated saliva sample was collected in 9-11 A.M (to avoid circadian rhythm of hormones), for assessing salivary cortisol and progesterone by drooling passively method. Plaque index by Silness and Loe (1964) was used to assess plaque thickness⁽¹¹⁾. The gingival index by Loe and Silness, 1963 was used for assessing the gingival condition⁽¹²⁾.

Statistical analysis used as statistical package for social science (SPSS version 21, Chicago, Illinois, USA); descriptive statistics as mean and standard deviation, frequency and percentage. Inferential statistics as chi square, fisher exact, independent sample T test and person correlation.

Result

After measuring the items validity of BAI scale, it showed strong significant correlation between each item and the total score (p -value < 0.05).

The distribution of study participants based on the demographic variables is illustrated in table 1.

Table (1): Distribution of subjects based on demographic variables

Variables		Number	Percentage
The age (years)	20-24	38	47.50
	25-29	42	52.50
Education level	Illiteracy	7	8.75
	Primary	17	21.25
	Secondary	21	26.25
	High school	9	11.25
	College	26	32.50
Gestational week	29-32	2	2.50
	33-36	4	5.00
	73-40	74	92.50

Chi-square was used to verify whether there is a significant association between anxiety groups with age factor, the results was not significant (Chi square=0.201, p value=0.654). While fisher exact was used to show any significant association between anxiety groups and educational level, the finding was not significant (Fisher exact=1.924, p value=0.784).

Linear by linear association was 3.174, p-value 0.144 and the result was no significant association between anxiety groups and gestational week.

The table 2 demonstrated the plaque index (mean and standard deviation) among anxiety groups. High anxiety group has a high mean value of plaque index than low anxiety group with significant differences.

Table (2): Plaque index among anxiety groups

	Anxiety				T- test	P-value
	Low		High			
	The mean	Standard deviation	The mean	Standard deviation		
PII	1.077	0.384	1.518	0.385	5.134	0.000Sig.

Df=78

Concerning the gingival index which is illustrated in table 3; a higher gingival index in low anxiety group than in high anxiety group with no significant differences.

Table (3): Gingival index among anxiety groups

	Anxiety				T test	P-value
	Low		High			
	The mean	Standard deviation	The mean	The mean		
GI	1.296	0.277	1.241	0.246	0.929	0.356 NS

Df=78

The mean value of salivary cortisol and progesterone was illustrated in table (4). The salivary cortisol was higher in high than low anxiety group with significant differences, while salivary progesterone was higher in low than high anxiety group with significant differences.

Table (4): Salivary hormones among anxiety group

Salivary hormones	Anxiety				T	P value
	Low		High			
	Mean	SD	Mean	SD		
Cortisol (ng/ml)	9.985	4.642	20.438	10.474	5.771	0.000 Sig.
Progesterone (pg/ml)	1243.372	667.397	870.603	235.244	3.332	0.001 Sig.

Df=78

Regarding the correlations coefficients between the plaque and gingival indices in anxious subjects, it was a positive strong significant correlation in the high anxiety group (p=0.001), while non-significant correlation in the low anxiety group.

Table 5 shows the correlations coefficients between salivary hormones among anxiety groups. A negative strong significant correlation was existed in high anxiety group, while non-significant correlation in low the anxiety group.

Table (5): Correlations coefficients between salivary hormones among anxiety groups

Anxiety		s-Prog (pg/ml)	
		r	p value
Low	Cortisol (ng/ml)	0.200	0.215
High	Cortisol (ng/ml)	-0.869	0.000

The correlation between salivary hormones with plaque and gingival inflammation is illustrated in table 6. In the low anxiety group, the only significant correlation was found between salivary cortisol with plaque index; salivary progesterone with gingival

index which was a positive significant correlation and strong positive significant correlation, respectively. While in the high anxiety group, the only significant correlation was found between salivary cortisol with plaque index which was a strong positive significant correlation.

Table (6): Correlation between salivary hormones with plaque and gingival indices

Anxiety		mean PII		mean GI	
		r	p value	r	p value
Low	Cortisol(ng/ml)	0.441	0.004	-0.228	0.157
	Prog (pg/ml)	-0.038	0.815	0.51	0.0008
High	Cortisol/ (ng/ml)	0.534	0.0004	0.256	0.110
	Prog (pg/ml)	-0.038	0.816	-0.159	0.327

Discussion

Among the most effective diagnostic tools for assessing anxiety during pregnancy are the questionnaires of Beck Anxiety Inventory scale⁽¹³⁾. Age, gestational week, and level of education were not considered as troubling variables. Plaque index was more in high than low anxiety group with significant differences, It's possible related to increasing negligence of oral hygiene and reduced propensity for healthier behaviors due to exhaustion with restless condition resulted from anxiety, this was agree with a study⁽¹⁴⁾ found a negative correlation between total distress scores and brushing frequency, while disagreeing with a study which found low values of plaque in women during pregnancy⁽¹⁵⁾. The finding of current study revealed that both groups have gingival inflammation but not a significant difference, it disagree with the other study⁽¹⁶⁾ which was explored

that did not confirm each of the depression, stress and anxiety are associated to periodontal disease. Positive significant correlation between plaque and gingival indices in high anxiety group which supported by the study which revealed the gingivitis was respond for elevating dental plaque around the gingival margin⁽¹⁷⁾ and this caused by increased level of salivary cortisol due to anxiety, which was directly association with the plaque accumulation in pregnancy⁽¹⁸⁾, that lined the positive strong significant correlation between salivary cortisol and dental plaque in high anxiety group. Because of positive strong significant correlation between plaque and gingival indices, furthermore, no significant correlation between salivary progesterone and gingival index, so this illustrated that gingivitis in high anxiety group mostly was a plaque induced gingivitis. While no significant correlation was found between plaque and gingivitis in low anxiety subjects because of dental plaque may not be the only causative

factor for gingival inflammation in pregnant women. The hormonal effect on the periodontal cells includes changing the effectiveness of the epithelial barrier to bacterial insult and affecting maintenance and repair of collagen fibers resulting in elevated the risk of gingival inflammation⁽¹⁹⁾. With increasing ovarian hormones, compromised defense mechanisms and certain bacteria harmful to the oral environment increase during the third trimester⁽²⁰⁾, that could be explain the positive strong significant correlation between the salivary progesterone and gingival index in low anxiety group. The immune-inflammatory process alterations by hormonal imbalance suggest that ovarian hormones are potential determinants and responsible for the development of pregnancy gingivitis⁽²¹⁾, this could be explained the gingivitis in low anxiety group could be a pregnancy related gingivitis. The elevated level of salivary cortisol and decrease progesterone in the high anxiety group with significant differences, agree with a study⁽²²⁾ revealed the cortisol is a hormone of anxiety and stress due to its responsiveness to stress stimulation. An inverse curvilinear relation between anxiety and progesterone⁽²³⁾ that lined with the present study finding, but not support by a study reveals a positive association between elevated progesterone and anxiety⁽²⁴⁾. Negative strong significant correlation between salivary cortisol and progesterone. Anxiety reduces progesterone during pregnancy⁽²⁵⁾. This might be due to ovarian steroidogenesis being impaired; resulting from increased glucocorticoid synthesis in response to elevated stressors this lined the result of high anxiety group. Positive significant correlation between salivary cortisol and plaque in high anxiety group, this explained by study showed the anxious situations within pregnancy caused increased levels of cortisol and lead to decreased number of immunoglobulin A and IgG and other antimicrobial proteins, which caused growth of oral bacteria in dental plaque and consequence of local inflammation⁽²⁶⁾. Strong significant correlation between salivary

progesterone and gingival index in low anxiety group, which could be explained as the progesterone increases vascular dilation, permeability which caused accumulation of inflammatory cells; increased bleeding tendency; increased catabolic effect of folate that caused inhibition of tissue repair⁽¹⁹⁾, and cause gingival inflammation. In low anxiety group of the current study showed the periodontium was a focus tissue for ovarian hormones effects, this was disagree with a study suggested no progesterone receptor (PgR) expression in human periodontal ligament cell (HPDLC)⁽²⁷⁾, but agree with a China study which expressed the PgR in this cells at the gene and protein levels⁽²⁸⁾. Non-significant correlation between salivary cortisol with gingival index in high anxiety group, this result may not be correlated directly to the gingival inflammation, but rather it may be contributed to other local factor as cortisol caused increase mean value of dental plaque that could be a major factor for gingival inflammation in this group and that explained by a study showed elevation of cortisol by stressors from psychological domains serve as risk factor for developing periodontal disease⁽²⁹⁾.

Conclusion

In general, salivary hormones altered during pregnancy, but anxiety has aggravated effects. In turn affected cortisol hormone and caused plaque building resulting in gingival inflammation in high anxiety group.

Acknowledgment: Sincerely thank Dr. Saif Mohammed Radeef (specialist in the University of Baghdad's Psychological Research Center) for his statistical advices and Dr. Mohammad Ghalib for his effort and work on the study's statistical analysis.

Conflict of Interest: No

Source of Funding: Self funded

Ethical Clearance: Not Required

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