

The relationship of gingival inflammation and salivary pH to hormonal variation during menstruation.

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Abstract:

The normal female life cycle is associated with a number of hormonal milestones: menarche, pregnancy, contraceptive use, menopause, and the use of replacement sex hormones. The menstrual cycle is the result of a carefully orchestrated sequence of interactions among the hypothalamus, pituitary, ovary glands, and endometrium, with the sex hormones acting as modulators and effectors at each level. Gingivitis is Inflammation of the gingiva as a response to bacterial plaque on adjacent teeth; characterized by erythema, edema, and fibrous enlargement of the gingiva without resorption of the underlying alveolar bone. The gingiva is a target tissue for the actions of steroid hormones, clinical changes in the tissues of the periodontium have been identified during periods of hormonal fluctuation' Women have lower flow rates and seem to have more variation in salivary pH than men. Hormonal fluctuations during events like puberty, menstruation, pregnancy and menopause could explain those differences.

the aim of this study is to find the relationship between plaque accumulation, gingival inflammation, and salivary pH with the female hormone level during menstruation. The study includes 25 volunteer young female with regular menstrual cycle, all the volunteers underwent periodontal examination by record plaque index (PLI) and gingival index (GI) and measurement of salivary pH in the 2nd day of menstrual cycle (first reading) and in the 20th day of menstruation (second reading) then we analyze the differences among the two readings.

Results of this study revealed that the plaque accumulation and gingival inflammation increase significantly with increasing level of female hormones and decrease when these hormones decline. As well as the salivary pH decrease slightly during increase level of female hormones and the saliva become more alkaline when the level of hormones decreased.

Keyword: *gingival inflammation, salivary, menstruation, hormonal variation*

Introduction:

Gingivitis is Inflammation of the gingiva as a response to bacterial plaque on adjacent teeth; characterized by erythema, edema, and fibrous enlargement of the gingiva without resorption of the underlying alveolar bone¹.

Gingival redness and swelling occurred during the menstrual cycle, although the patient maintained good oral hygiene during periodontal treatment².

The gingiva is a target tissue for the actions of steroid hormones, clinical changes in the tissues of the periodontium have been identified during periods of hormonal fluctuation³.

pre-existing plaque-induced gingivitis may be an important factor in detecting hormone-induced changes during menstrual cycle⁴.

Changes in the sex steroid hormones during menstrual cycles might have a limited effect on the inflammatory status of gingiva⁵.

Most female patients are not aware of any changes in their gingivae during the menstrual cycle⁶.

Many women report an increase in gingival inflammation and discomfort associated with their menstrual cycle⁷.

Women have lower flow rates and seem to have more variation in salivary pH than men.

Hormonal fluctuations during events like puberty, menstruation, pregnancy and menopause could explain those differences⁸

The normal female life cycle is associated with a number of hormonal milestones: menarche, pregnancy, contraceptive use, menopause, and the use of replacement sex hormones. The menstrual cycle is the result of a carefully orchestrated sequence of interactions among the hypothalamus, pituitary, ovary glands and endometrium, with the sex hormones acting as modulators and effectors at each level⁹.

Aim of the study:

Our study was to find if there is any changes in gingivitis severity and acidity of saliva in female in relation to their sex hormone changes during the month.

Material and method:

Twenty five (25) female dental students volunteered to with age range from 18-22 year, no previous hormonal problems and regular menstrual cycle (about 28-30 days), in the 2nd day of the menstrual cycle where the estrogen and progesterone hormones were too low; a saliva sample was taken after stimulated by chewing rough gum (sugar free and taste free) the salivary pH were measured by WTW series inolab machine, at the same day their teeth and gingiva has been examined and recording the GI and PLI.

The second record for the salivary pH, GI and PLI were taken on the 20th day of the menstrual cycle where the level of estrogen and progesterone hormones were too high.

After collecting all data, we had done a comparison between them.

Results:

At the 2nd day of menstruation, the mean PLI was 0.248, and the mean GI was 0.251 (Table-1, Figure-1), while 68% of the salivary pH was between 7.7-8.2 (alkaline), 28% was between 7.2-7.6, and only 4% was between 6-6.5 (Table-2, figure-2).

At the 20th day of menstruation, the mean PLI was 0.581, and the mean GI was 0.890 (Table-1, Figure-1), while 64% of the salivary pH was between 7.2-7.6, 28% was between 7.7-8.2, 4% was between 6.6-7.1, and only 4% was between 6-6.5 (Table-2, figure-2).

Statistical analysis comparing between the PLI of the two readings (2nd day and 20th day of menstruation) using t-test revealed a significant difference ($P < 0.012$).

Statistical analysis comparing between the GI of the two readings using t-test revealed a high significant difference ($p < 0.0003$).

Statistical analysis comparing the salivary pH between the two readings using the

chi-square test revealed a significant difference ($p < 0.0147$).

Discussion:

Our study concerning the relation of dental plaque accumulation on teeth, gingival inflammation, and the changes in the pH of saliva to the hormonal fluctuation in female during menstruation.

From the statistical analysis we can see that there is a significant difference in PLI between the 2nd and 20th day of menstruation, as we notice the p-value: < 0.012 , that is mean the amount of plaque accumulated in the 20th day of menstruation is more than that in the 2nd day.

Otherwise we noticed a high significant difference in GI between the first and second readings ($p < 0.0003$), these results agreed with grant et. al. 1988¹⁰, the interaction of estrogen and progesterone with inflammatory mediators may help to explain the increased levels of inflammation seen during periods of hormonal fluctuation³.

From the statistical analysis we can notice that there is a decrease in the salivary pH in the days preceding the menstrual cycle while it will increase when the menses begin.

Conclusion:

From this study we concluded that the plaque accumulation and gingival inflammation increase significantly with increasing level of female hormones and decrease when these hormones decline.

As well as the salivary pH decrease slightly during increase level of female hormones and the saliva become more alkaline when the level of hormones decreased.

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Table-1: Mean PLI and mean GI in relation to menstrual days

Index	2 nd day (first reading)	20 th day (second reading)
Mean PLI	0.248	0.581
Mean GI	0.251	0.890

2nd day of
menstruation

20th day of
menstruation

Table-2: Salivary pH in relation to menstrual days in female				
Day	G1	G2	G3	G4
	6-6.5	6.6-7.1	7.2-7.6	7.7-8.2
2 nd day of menstruation	1 4%	0	7 28%	17 68%
20 th day of menstruation	1 4%	1 4%	16 64%	7 28%

$$X^2 = 8.688^*$$

$$P\text{-value} = 0.0147$$

Figure -1 PLI and GI in relation to menstrual days

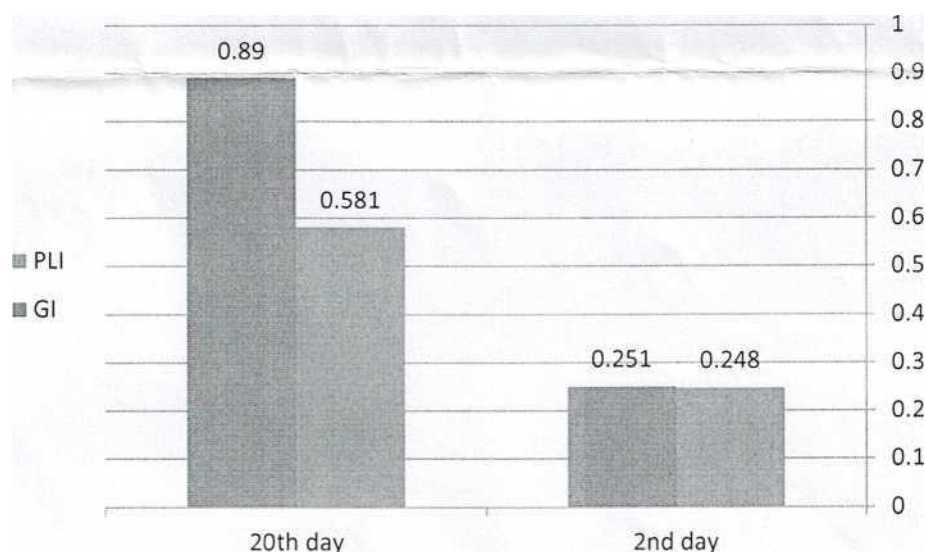


Figure -2: salivary Ph in relation to menstrual days

