

## Salivary magnesium during pregnancy and labor and its relation to gingivitis

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### Summary:

**Background:** Changes in the level of salivary magnesium could be of great clinical interest not only because of its relation with oral health but also with the physiological alteration occurring during pregnancy. The aim of this study was to investigate the effect of pregnancy on the salivary magnesium level and their relations to gingivitis.

**Materials and methods:** Salivary samples were taken from 24 pregnant women, 17 non pregnant and 14 lactating women. Flow rate was calculated. The supernatant salivary samples were assayed using atomic absorption spectrophotometer. Gingival Index was applied for the assessment of gingival inflammation.

**Results:** Salivary magnesium concentration was significantly the lowest mean value during pregnancy, with decrease in concentration in the third trimester followed by a marked increase after labor reaching the normal level. Pregnant women had a significantly highest Gingival Index mean than other control groups. Very weak correlations were found between flow rate and (pregnancy and salivary magnesium). A positive correlation was recorded between gingivitis and pregnancy and a negative correlation between gingivitis and salivary magnesium. However, statistically all correlations were not significant.

**Conclusion:** The salivary magnesium is influenced by female sex hormone during pregnancy. Analysis of saliva may be applicable as an investigation means of the physiological alterations that occur during and after pregnancy.

**Keywords:** Salivary magnesium, pregnancy, gingivitis.

### Introduction:

Pregnancy is a physiologic process in which every organ system is altered to some degree<sup>(1)</sup>. Most of the changes return to pre-pregnancy status six weeks postpartum<sup>(2)</sup>. Hormonal fluctuation during pregnancy influence women salivary electrolyte balance<sup>(3)</sup>. It has been observed that the level of tissue magnesium changed during pregnancy and labor<sup>(4)</sup>.

Magnesium nutritional status may be involved in several disorders that can occur during pregnancy, including hypertension, vasospasm<sup>(5)</sup> premature delivery<sup>(6)</sup> and intrauterine growth retardation<sup>(5,6)</sup>. Also it was reported that magnesium may relate to dental caries<sup>(7)</sup>. Although dietary magnesium deficiency can adversely affect the periodontal structure<sup>(8)</sup>, investigations concerning magnesium concentration in relation to gingival health were scanty<sup>(9,10,11)</sup>. In Iraq, few investigations were conducted to estimate the salivary changes during pregnancy<sup>(12,13)</sup>. However, still there is no information about salivary magnesium and its relation to gingivitis. Therefore this study was conducted.

### Materials And Methods

The salivary magnesium of 55 healthy women with an age range 20-35 years old was analyzed. The sample was distributed into three groups: 24 pregnant women, 17 non pregnant women and 14 lactating women; 1-4 months postpartum. Paraffin stimulated whole saliva was collected with 4 minutes in plastic test tubes. The volume of each saliva sample was measured and the flow rate was calculated per minute. The salivary samples were centrifuged at 3000 r.p.m for 40 minutes. Volume and weight of supernatant saliva were recorded. Then freezing at -20°C until assessment was conducted. The magnesium estimation was done using atomic absorption spectrophotometer. Mean and standard deviations were calculated. Clinical examination of gingivitis was done using Gingival Index<sup>(14)</sup>. Spearman's correlation coefficient and Student's t-test were used for statistical analysis, at level of significance 0.05.

### Results

Table 1 illustrates the mean ages, salivary magnesium level (mg/100ml), gingivitis and salivary flow rate among the three groups. No statistically significant differences were found in concentrations of magnesium level and gingivitis between non pregnant and labor groups (P>0.05). While significant differences were recorded between pregnant women and other groups. Although the salivary flow rate was highest

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among non pregnant women, the differences were statistically not significant ( $P>0.05$ ). Salivary magnesium value according to the trimester was shown in Table 2. The lower mean value was found in the last trimester. Table 3 demonstrates magnesium value 4 months postpartum. Statistically, no significant difference was recorded between the two groups ( $P>0.05$ ).

The correlation coefficients among the variables are illustrated in Table 4. Negative correlations were seen between the salivary magnesium concentration and (salivary flow rate and gingivitis). While positive correlations were recorded among the other variables. All the relations were weak and statistically not significant ( $P>0.05$ ).

**Table 1: Salivary Magnesium Level, Gingivitis and Salivary Flow Rate among the Three Groups**

Groups	No.	Age Mean $\pm$ SD	Mg(mg/100ml) Mean $\pm$ SD	t-test	GI Mean $\pm$ SD	t-test	Flow rate Mean $\pm$ SD
Non pregnant	17	28.3 7.1	0.45 0.14	3.9*	0.96 0.31	2.4 <sup>#</sup>	1.57 0.6
Pregnant	24	26.7 5.3	0.31 0.07		1.29 0.50		1.35 0.5
Lactating	14	28.7 7.2	0.43 0.08	4.3**	0.97 0.41	2.1 <sup>##</sup>	1.17 0.5

\*  $P<0.001$   $d.f = 39$ , #  $P<0.05$   $d.f = 39$   
 \*\*  $P<0.001$   $d.f = 36$ , ##  $P<0.05$   $d.f = 36$

**Table 2: Salivary Magnesium Level According to the Trimester**

Trimester	No.	Mg (mg/100ml) Mean $\pm$ SD	t-test
First	8	0.37 0.02	2.6*
Second	10	0.33 0.03	
Third	6	0.21 0.05	5.3**

\*  $P<0.05$   $d.f = 16$   
 \*\*  $P<0.001$   $d.f = 14$

**Table 3: Salivary Magnesium According to Four Months Postpartum**

Month	No.	Mg (mg/100ml) Mean $\pm$ SD
First	4	0.42 0.02
Second	10	0.43 0.09
Third		
Fourth		

**Table 4: Correlation Coefficient among the Variables**

Variables	Mg (mg/100ml)	Pregnancy
Frequency of Pregnancy	$r = 0.12$ $P = 0.57$ $n = 24$	
Salivary Flow Rate	$r = - 0.07$ $P = 0.71$ $n = 24$	$r = 0.05$ $P = 0.78$ $n = 24$
Gingivitis	$r = - 0.15$ $P = 0.26$ $n = 24$	$r = 0.14$ $P = 0.50$ $n = 24$

#### Discussion:

The magnesium value showed a lower concentration in the pregnant women saliva. The differences in mean values between pregnant

women and (non pregnant and lactating) groups were statistically significant. This result is in accordance with Guidozi et al study<sup>(15)</sup> and in contrast with Kayavis and Papanay study<sup>(16)</sup>. They

postulated that because of the association between magnesium and alkaline phosphates that the latter increases in the saliva of pregnant women. It is well known that estrogen level increases during pregnancy which is normally secreted<sup>(17, 18)</sup>. Magnesium metabolism is accurately controlled by estrogen<sup>(19)</sup> through enhancing magnesium utilization and uptake by soft tissue and bone<sup>(17)</sup>. It was reported that tissue magnesium was higher during pregnancy<sup>(4,17)</sup> and dropped significantly after labor<sup>(4)</sup>. While level of plasma magnesium is decreased by estrogen<sup>(17)</sup>. So that it can be postulated that salivary magnesium reflects low serum value. That is why pregnancy increases the need for magnesium<sup>(20)</sup>.

Pregnant women had a significantly higher gingival inflammation than that of control groups. This result is in accordance with previous studies<sup>(12,21,22)</sup>. The significantly higher Gingival Index mean among pregnant women may be explained by a significant low salivary magnesium, since magnesium dietary deficiency can adversely affected the periodontal structure by producing a lower rate of alveolar bone formation, widening of the periodontal ligament and gingival hyperplasia<sup>(8)</sup>. This result disagrees with Zaichk and Bagirov study<sup>(9)</sup> and agrees with other studies reported that increase serum magnesium was significantly associated with more remaining teeth and less attachment loss<sup>(10)</sup> as well as a low magnesium concentration in dental plaque was associated with gingivitis<sup>(11)</sup>.

In the present study significant differences were found in the magnesium concentrations among the three trimesters. The lowest mean value was at the third trimester. This result is in disagreement with Kayavis and Papanay study<sup>(16)</sup>. The declination of magnesium level among the three trimesters may reflect the increase in estrogen to the end of gestation and may explain negative and positive relations between gingival inflammation and salivary magnesium and pregnancy respectively. Magnesium showed a significant higher mean value among lactating women, reach nearly normal value among non pregnant women. However, statistically there was no significant difference between the first month of labor and the other three months, which indicates that change in the salivary magnesium level is similar to the other pregnancy changes return to pregnancy status within one month postpartum<sup>(23)</sup>. This result may explain the non significant difference in salivary magnesium and gingival inflammation between the non pregnant and lactating women. Changes in the salivary flow rate were calculated and it was found that there were no significant differences among the three groups and among the three trimesters. This result is in accordance with D'Alessandro et al study<sup>(24)</sup>, and in contrast with Sulaiman study<sup>(12)</sup>. It could be

conducted that flow rate was not responsible for magnesium changes<sup>(15)</sup>. This may explain the non significant very weak correlation between flow rate and (pregnancy and magnesium concentration).

A positive weak correlation was recorded between salivary magnesium and frequency of pregnancy. However, statistically it was not significant. This may be attributed to the continuous changing of magnesium nutritional status in which hormonal changes during pregnancy increase the need for magnesium, it returns to the normal after labor<sup>(4, 15)</sup>. Therefore, nutritional magnesium supplementation may improve periodontal health as well as general health.

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