

# Risk Assessment of Caries in Pregnancy

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**Objective:** The purpose of this study was to evaluate the effects of salivary testing in dental caries assessment and to determine a possible relationship between oral hygiene, diet, salivary cariogenic flora, saliva secretion rate, buffer capacity of saliva, salivary pH and caries incidence during pregnancy. Another objective is to introduce a prevention program in teaching institutions.

**Material and methods:** The longitudinal and descriptive study was conducted from January 2010 to September 2011. Thirty-five pregnant women, aged between 20–35 years, were examined during the three trimesters of pregnancy in order to evaluate the caries risk factors. The study investigated the *Streptococcus Mutans* and *Lactobacilli* count in saliva; the salivary pH and the buffer capacity of saliva by using a salivary testing kit (CRT Bacteria and Buffer). These tests were non-invasive and well-accepted by all women.

**Results:** The results showed an increase in the number of *Streptococcus Mutans* and *Lactobacilli* in the second part of pregnancy (>105 CFU/ml saliva). An exception is the 20–24 years age group, where we observed a decrease in the third trimester. Also, their frequency increases with parity and women's age. In terms of pH, we observed a decrease in the first trimester (6.35), but in the third trimester the pH was less acid (6.85).

**Conclusions:** Microbiological evaluations suggest that pregnant women present a high caries risk, but the implementation of preventive measures such as a rigorous hygiene and balanced diet prevent the appearance of new carious lesions.

**Keywords:** pregnancy, *Streptococcus Mutans*, *Lactobacilli*, salivary pH

## Introduction

From the ancient dictum „Every child costs the mother one tooth” to which we add the pregnant women's fear of going to the dentist, we tried to assess the caries risk of pregnant women, in order to evaluate the cario-activity status.

Pregnancy represents a particular physiological state, characterized by hormonal and metabolic changes with transient nature, which can influence the oro-dental status with repercussions in terms of increasing the number of caries and their accelerated evolution. However, we need to take into consideration several exogenous factors involved during the three trimesters of pregnancy [1].

The purpose of this study is to assess the individual caries risk of pregnant women by determining the incidence of tooth decays during pregnancy related to oral hygiene, daily cleaning methods, evaluation of saliva parameters (salivary secretion rate, buffer capacity of saliva, salivary pH), the occurrence of vomiting and the eating habits. We determined the caries risk factors during the first, second and third trimester of pregnancy in order to detect the appearance of new carious lesions and also we aimed to establish which are the predominant factors in each trimester. In order to evaluate the risk of tooth decay in pregnant women, we need to determinate the density of *Mutans Streptococcus* and *Lactobacillus*, to limit the level of microbiological flora through appropriate therapeutic measures, to implement the correct and rigorous measures of oral hygiene and to reduce the consumption of cariogenic foods.

Salivary testing kit CRT Bacteria are used to estimate the level of cariogenic bacteria in order to evaluate them as a predictor of dental decays [2,3,4].

The main purpose of the study is to evaluate the cariogenic risk of pregnant women expressed by the chance to avoid new decays or the loss of another tooth according to the dictum.

## Materials and methods

In order to evaluate the level of individual caries risk, we included in the study an initial group of 50 pregnant women, but after we applied the inclusion and exclusion criteria the group has been reduced to 35 women.

The inclusion criteria were as follows:

1. We added in the study pregnant women aged between 20–35 years old, with ongoing singleton or multiple pregnancies, confirmed by ultrasound examinations in the first trimester, and monitored in the second and third trimester in a private ambulatory.
2. We had the consent of our patients after we informed them about the non-invasive dental procedures concerning the mother and the fetus health status and about the lack of payment.
3. Pregnancies which evolved until fetal viability and ended with delivery (premature, term, postmature).
4. The pregnant women were willing to fill out the questionnaire made by the investigator in order to provide additional information about oral health.
5. They were given vitamins during this period.
6. The pregnant women had no orthodontic braces of any kind and went regularly to the dentist for check-ups before the pregnancy.
7. We investigated women who had no contraindications regarding the test, such as: the administration of anti-

iotics for at least 2 weeks before the evaluation, the use of an antibacterial mouthrinse for at least 12 hours before the test was taken.

The exclusion criteria were as follows:

1. We excluded from the study unwanted pregnancies, miscarriages and therapeutic abortions.
2. We excluded women with pre-existing affections (metabolic, hepatic, cardiac, pulmonary, endocrine, infectious disease, tumors and genital malformations) and conditions associated with ovular causes (genetic and placental abnormalities) and mixed ones (praevia placenta, Rhesus izoimmunization, DPPNI, preeclamsia, RPM under 26 weeks of amenorrhea, severe fetal malformations incompatible with life).
3. Pregnant women with a low educational level and with familial and job risk factors (hazards occupations) were not taken into consideration.
4. Women who had contraindications for testing were also excluded.

During the three trimesters, we evaluated the pregnant women's caries risk. Taking into consideration the multifactorial etiology of dental decays, the evaluation of a single factor is insufficient to establish a prognosis. It is not mandatory for new caries to appear under a large number of cariogenic bacteria, if the protective factors are strong enough. Microbiological tests have a prognostic value, which represents a useful diagnostic method in correlation with clinical examination.

After the ultrasound examination carried out in the three trimesters (11–12 weeks of amenorrhea for the first trimester, 20–22 weeks of amenorrhea for the second trimester, 34–35 weeks of amenorrhea for the third trimester), we also analyzed the following dental parameters:

1. The presence of vomiting (during the morning, common or every day).
2. The presence or absence of salivation.
3. The salivary pH.
4. The buffer capacity of saliva (low, medium, high).
5. The oral hygiene (the type of the toothbrush, the frequency of brushing, the appropriate way of brushing, the type of the toothpaste).
6. The pregnant women's eating habits (a poor alimentation, the consume of sodas, a predominantly cariogenic diet).
7. Vitamin therapy associated or not with the pregnancy.
8. The number of colonies for Mutans Streptococcus ( $<10^5$  CFU/ml saliva with level 0 and 1,  $>10^5$  CFU/ml saliva with level 2 and 3) using rapid tests.
9. The number of colonies for Lactobacillus ( $<10^5$  CFU/ml saliva with level 0 and 1, or  $>10^5$  CFU/ml saliva with level 2 and 3) using rapid tests (Fig. 1).
10. The number of cavities and fillings.

The pregnancy's history data, the clinical examination

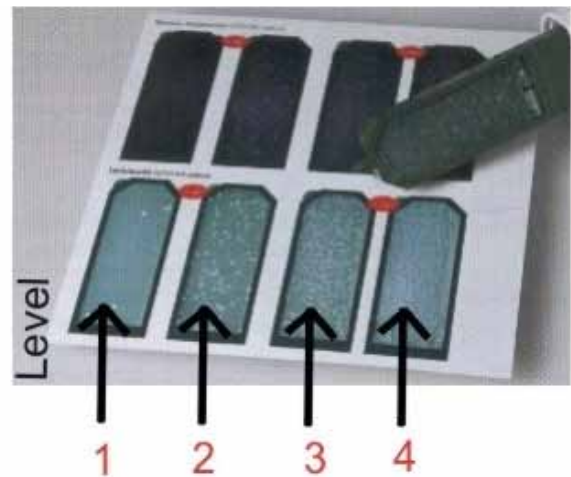


Fig. 1. The Lactobacilli's colonies ( $>10^5$  CFU/ml saliva)

and the interpretation of the information were noted in the pregnant woman's record. The subjects agreed to participate in this study and signed consent forms. Using the "CRT Buffer" test was determined the buffering capacity of saliva. "CRT Bacteria" was used to determine the Mutans Streptococci and Lactobacilli count in saliva by means of selective culture media (bright agar surface for determination of Lactobacilli count in saliva and blue agar surface for Mutans Streptococci). The determination of salivary pH was made in the morning after 5 minutes the woman consumed a glass of plain water (to avoid variations in pH). Every woman had to chew an enclosed paraffin bullet to stimulate saliva and to ensure the transfer of bacteria from tooth surface in saliva. The saliva was collected in a suitable sterile container. We take this opportunity to measure the salivation rate and the buffer capacity of saliva with CRT Buffer. After this procedure we determined the salivary microorganisms. For this, we had to remove the agar carrier from the test vial, to place a  $\text{NaHCO}_3$  tablet at the bottom of the vial and to carefully remove the protective foils from the two agar surfaces. After that, we thoroughly wet both agar surfaces with saliva using a pipette. The excess of saliva had to be dropped off. The agar carrier was slide back into the vial and was tightly closed. The test vial was placed upright into the incubator for 48 hours at  $37^\circ\text{C}$ . When the vial was removed from the incubator we compare the density of the Mutans Streptococci and Lactobacilli colonies with the corresponding evaluation pictures in the enclosed model chart. We classified CFU levels into 0, 1, 2, 3, according the number of colonies (Fig. 1).

Graphical representation of the results was performed using the programs SPSS the 19<sup>th</sup> version and GraphPad Prisma. By applying  $\chi^2$  statistical test we compare the colony distribution of Streptococcus Mutans, respectively Lactobacilli, over the three trimesters of pregnancy. For salivary pH we applied ANOVA test in order to observe a statistical difference between pH values in the three trimesters ( $p < 0.0004$  significance level). The groups were compared with non-parametric Wilcoxon test ( $p < 0.05$ ).

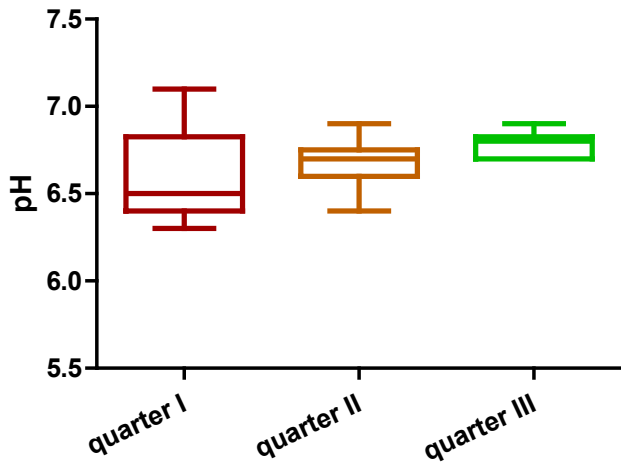


Fig. 2. Salivary pH values in the three trimesters

**Results**

The salivary pH ranged between 6.35–6.85. As the pregnancy has been progressing we observed an increase of salivary pH. We also correlated the salivary pH with the experienced of vomiting during the first quarter of pregnancy. As a result the pH was 6.35 for women who experienced vomiting in the first term and 6.70 for women without this kind of symptoms (Fig. 2). Also, the women

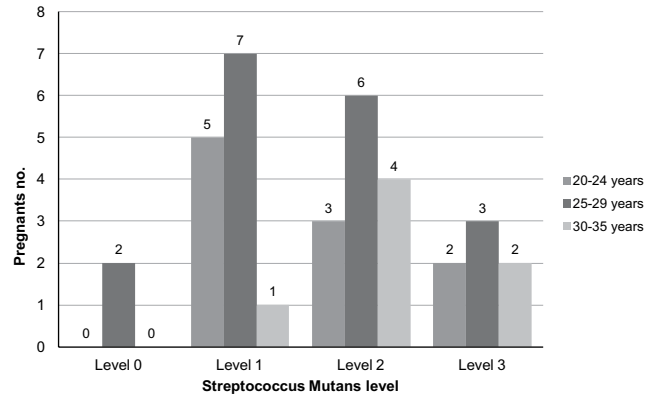


Fig. 3. The level of Streptococcus Mutans in the first trimester

who presented hypersalivation during pregnancy, had similar pH values with ones who had normal salivary flow (>1 ml saliva). None of pregnant women had a dry mouth.

For the Mutans Streptococcus determination we obtained the following values: in the first trimester the density of colonies were under  $10^5$  CFU/ml saliva (which represents level 0, 1), but in the second and third trimester we discovered a huge number of colonies which suggest a high caries risk ( $>10^5$  CFU/ml saliva which is level 2 or 3) (Fig. 3, 4, 5).

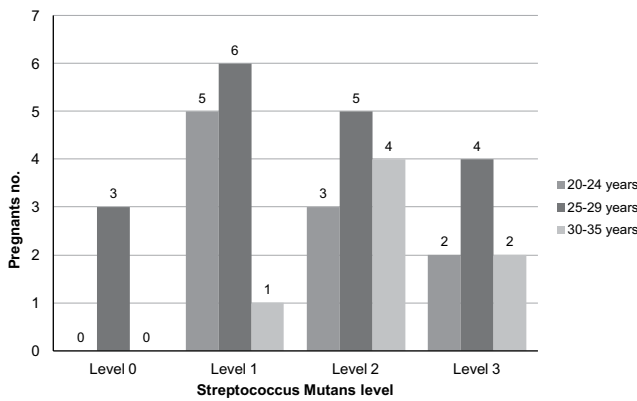


Fig. 4. The level of Streptococcus Mutans in the second trimester

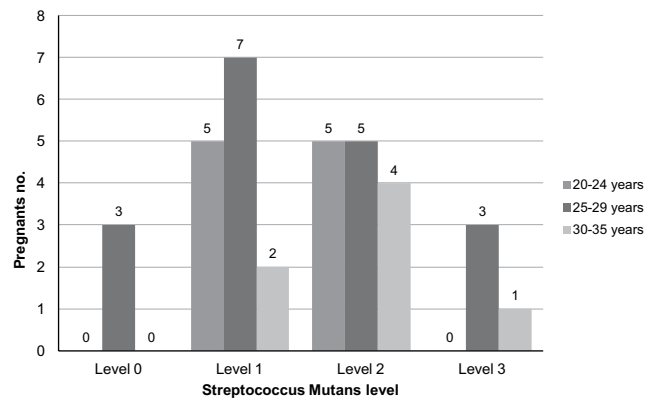


Fig. 5. The level of Streptococcus Mutans in the third trimester

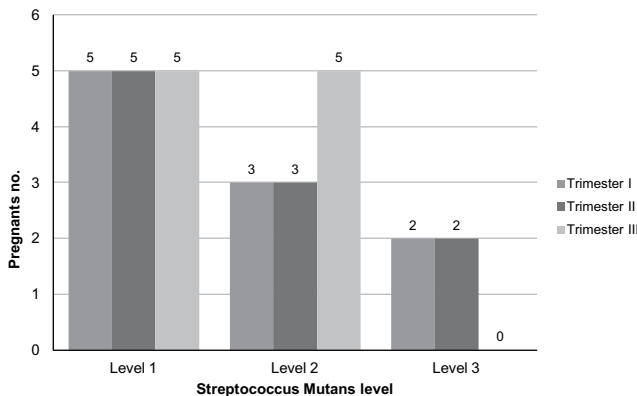


Fig. 6. Streptococcus Mutans count for age group 20–24 years in the three trimesters

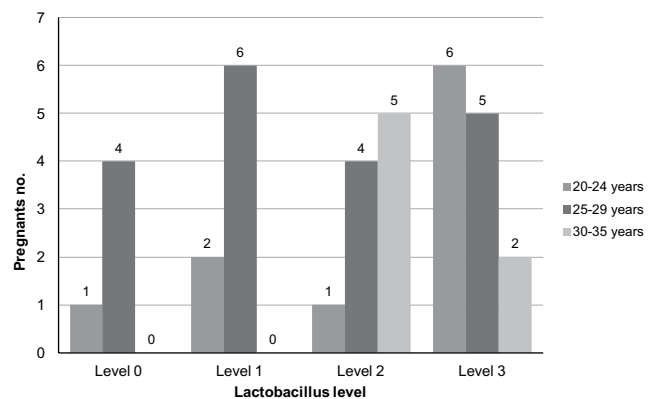


Fig. 7. The level of Lactobacilli in the first trimester

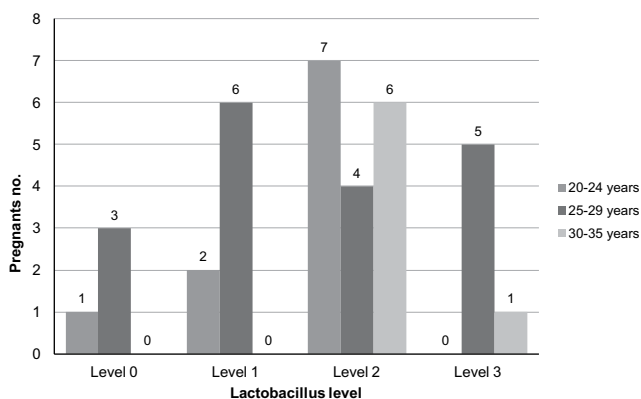


Fig. 8. The level of Lactobacilli in the second trimester

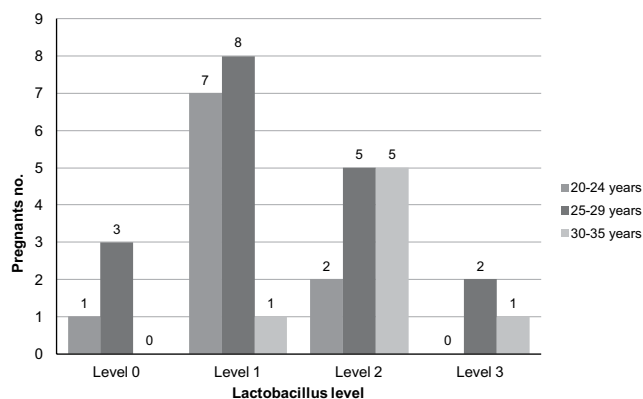


Fig. 9. The level of Lactobacilli in the third trimester

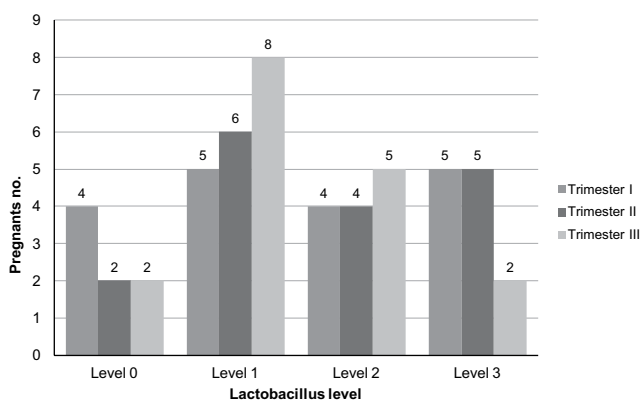


Fig. 10. Lactobacillus levels in pregnancy at age group 25-29 years

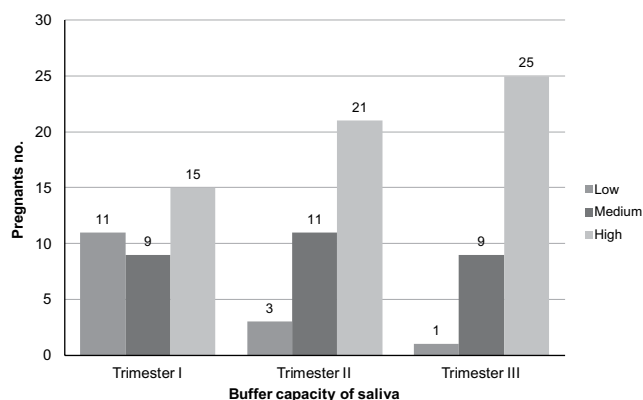


Fig. 11. Salivary buffering capacity

An exception is age group 20-35 years old, where we observed a decrease in number of colonies for *Streptococcus Mutans* in the third trimester (Fig. 6, 10).

Regarding the count of Lactobacilli, we also observed an increase in the second part of pregnancy (Fig. 7, 8, 9). An exception is age group 25-35 years old, where we observed a decrease in number of colonies of Lactobacillus in the third trimester (Fig. 10).

Speaking about the oral hygiene, we can say that women perform brushing twice a day using fluoride toothpaste with normal fluoride content. Only three of them received a professional brushing during pregnancy and another three used dental floss. Almost all women improved their oral hygiene during pregnancy.

The assessment of oral health revealed: the presence of microbiological plaque and tartar, the incidence of cavities and fillings, bleeding during the brushing period and gingivitis. When necessary, we established a therapeutic training to improve the oro-dental status.

The buffer capacity of saliva of pregnant women is influenced by the salivary pH, salivary secretion rate, the type of alimentation and the presence or absence of vomiting during the pregnancy, especially in the first trimester. We observed that in the first trimester the buffer capacity of saliva has a low level (31.4% of pregnant women) or a medium level (25.7% of pregnant women), because

of the high acidity of saliva. But on the other way, in the third trimester the buffer capacity of saliva was increased at 71.4% of women. Only for 2.9% of all pregnant women, we obtained a low level in terms of buffer capacity of saliva (Fig. 11).

The diet of the majority of women (87%) was balanced without any excess of cariogenic food or sodas, but 13% of them frequently consumed sweets, refined sugar and carbonated drinks. Also, 3 women had a lacto-vegetarian diet. The pregnant women hadn't modified their diet during pregnancy.

### Discussions

Pregnancy, as an etiological endogenous factor, doesn't produce by itself the appearance of dental caries, the exogenous factor involved during this period has an important role [1,7]. That's way it is observed higher frequency of cavities at this category of women. In the literature it is recorded that women who gave birth to more children show a higher percentage of decays compared to women with only one child [1,3,4]. In our study, pregnant women aged 25-29 years old represented 51.42% from all patients. Taking into consideration the conditions described above, we had to apply effective preventive methods in order to reduce the number of colonies for *Streptococcus Mutans* and *Lactobacilli* [5,7,8].

A special situation observed at pregnant women, was the spontaneous appearance of enamel cracks especially in patients with dyskinesia or morning vomiting [5,6].

### Conclusions

1. The microbiological exam, in association with clinical examination represents a useful method for assessing the caries risk at pregnant women, besides the number of oral screening examination, general medical disorders and living conditions.
2. It is known the fact that the pregnancy doesn't especially promote tooth decay. But on the other way, there was an increase in the number of Mutans Streptococci and Lactobacilli in the second part of pregnancy. As well, their frequency increases with parity and women's age.
3. The appearance of decays in terms of large numbers of bacteria (Mutans Streptococci  $>10^5$  CFU/ml saliva and Lactobacillus  $>10^5$  CFU/ml saliva) is not required, if protective factors are strong enough (buffer capacity of saliva is at a medium or higher level).
4. In the first trimester it was a decrease in salivary pH, but in the third one the pH was less acid (6.85).
5. In the group of pregnant women studied (n=35), the risk factors (cariogenic bacteria  $>10^5$  CFU/ml saliva and improper eating habits) were matched by salivary factors (the salivary pH, the buffer capacity of saliva and the constantly use of mouthrinse).
6. Caries risk assessment includes two phases: specific indicators to determine the risk factor and specific indicators to determine de protective factors. Together they provide the balance between the progress and reduction in the evolution of tooth decay.
7. These non-invasive investigations are ideal to prevent the appearance of caries. Likewise no recommendations from the dentist in terms of achieving these tests may have a significant impact on the state of oral health.
8. Reducing the number of cariogenic foods and beverages or avoiding them between meals, in correlation with health education, can help everyone to prevent tooth decay.
9. The achievement of a quarter dental screening synchronized with an ultrasound obstetrical one, is a chance to avoid the appearance of new decays during this period full of hormonal and metabolic changes. Thus, in the near future these methods could be applied as a therapeutic way of caries prevention. These tests could serve as a prototype for motivating and educating pregnant women.
10. It's important to explain to pregnant women the risk of caries appearance, the mechanism of decay production, the causing factors and the treatment guidelines and also is very useful to reassess the caries risk during the confinement period.

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