

# The Impact of Periodontitis in the Preterm Birth and Body Size of Newborns

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## ORIGINAL PAPER

### SUMMARY

**Background:** Increasing evidence suggests that maternal gingivitis and periodontitis may be a risk factor for preterm birth and other adverse pregnancy outcomes. **Objective:** To assess the relationship between periodontitis and preterm birth. **Methods:** A retrospective study which included 230 pregnant women, and the delivery follow up to determine the correlation between periodontitis and preterm birth. **Results:** The study indicates that periodontal infection can lead to placental-fetal exposure and, when coupled with a fetal inflammatory response, can lead to preterm delivery. Periodontitis is correlated with preterm birth, so early diagnosis and a careful treatment are very important issues. **Conclusion:** Periodontitis is one of the main causes of preterm-premature rupture of membranes and a proper treatment is the best solution for this pathology.

**Keywords:** Periodontitis, preterm birth, preterm-premature rupture of amniotic membranes, neonatal morbidity, risk faktor.

## 1. INTRODUCTION

Periodontal disease represents an infectious disease affecting more than 23 percent of women between the ages of 30 and 54 years. In the absence of adequate oral hygiene, periodontal bacteria accumulate in the gingival crevice of the teeth and form an organized structure known as a “bacterial biofilm.” In mature biofilms, the bacteria possess a plethora of virulence factors, including lipopolysaccharide (LPS), that may cause direct destruction to the periodontal tissues or stimulate the host to activate a local inflammatory response that, although intended to eliminate the infection, also may lead to further loss of periodontal structures. Moreover, bacteria and/or their shed virulence factors may enter the bloodstream, disseminate throughout the body and trigger the induction of systemic inflammatory responses and/or ectopic infections. Collins and colleagues hypothesized that oral infection, such as periodontitis, could act as a source of bacteria and inflammatory mediators that could disseminate systemically to the fetal-placental unit, via the blood circulation, and induce pregnancy complications.(1,2)

Collins and colleagues (3) found that infection led to smaller fetuses (approximately 20 percent reduction in weight) and to an increase of inflammatory mediators (TNF- and PGE<sub>2</sub>) at the site of infection and in the amniotic fluid. Maternal infection with periodontal pathogens has a deleterious effect on fetal growth and viability.

Preterm birth remains the main cause of perinatal

morbidity and mortality. The smaller babies weight is accompanied with higher risk(4,5,6). These premature births account for over 50% of all neonatal illness and deaths.

Preterm birth and low birth weight are worldwide leading perinatal problems and have evident public health implications, due to the fact that their incidence doesn't decrease in spite of the many attempts at their prevention. Both intrauterine infections and bacterial vaginosis of the mother are well known risk factors, but distant infections, even subclinicals, may also produce preterm births.(7,8) Periodontitis is a chronic infection by anaerobic gram-negative organisms and may produce local and systemic infection, so a possible association between periodontitis and adverse pregnancy outcomes has been suggested. It may have

the potential to influence on pregnancy. During the second trimester of pregnancy, the proportion of Gram-negative anaerobic bacteria in dental plaque increases respect to aerobic bacteria (5,9). *Fusobacterium nucleatum* and other subspecies coming from the oral flora, have been found in the amniotic fluid of women with preterm births. The Gram-negative bacteria associated with progressive disease can produce a variety of bioactive molecules that may directly affect the host (10,11). The blood stream and cross over the placental barrier, the physiological levels of PGE<sub>2</sub> and TNF- $\alpha$  in the amniotic fluid may increase and induce a preterm birth (5). Periodontitis shares some risk factors with preterm births and low birth weight. Recent

studies have shown an association between these conditions, however it remains unclear whether or not there is a causal relationship between them(12,13,14). In any case, it has been shown that inflammatory mediators produced in periodontal diseases also play an important role in labour onset, and it is plausible that biological mechanisms may link both conditions. Some maternal factors, such as a short cervix, are more closely associated with preterm births when the woman has also bacterial vaginosis(15). It's probable that maternal periodontitis may interact synergically with other maternal risk factors to induce preterm births (16,)

Bogges et al. (12) suggested that prematurity risk may increase when the foetus is exposed to periodontal bacteria and an inflammatory response is generated.

## 2. THE AIM

To analyze the correlation between periodontitis and preterm birth and perinatal morbidity. We made a comparison between a group with well-treated periodontitis and a placebo group. There were evidences that indicated that, for women with a history of premature births, the treatment of periodontitis could prevent subsequent preterm birth.

## 3. METHODS

We conducted the present observational retrospective cohort study among 230 pregnant women.

Clinical measures of periodontal health were determined in all subjects, including sulcus/probing depth (PD), gingival recession, and periodontal clinical attachment loss (CAL). Women which have other known prematurity risk factors such as women younger than 18 years old, negative rhesus factor, multiple gravidance, diabetes mellitus, arterial hypertension, chronic renal or cardiac pathology, corticosteroide use before our study were left out of our study.

Women which have other known prematurity risk factors such as women younger than 18 years old, negative rhesus factor, multiple gravidance, diabetes mellitus, arterial hypertension, chronic renal or cardiac pathology, corticosteroide use before our study were left out of our study. A premature birth was defined as a newborn with less than 37 weeks of gestation. Maternal morbidity was considered to be present if there was the presence of endometritis and/or infection of a surgical wound that required hospital admission.

## 4. RESULTS

Our study showed a significant correlation between periodontitis and preterm births, 15/57 women with periodontitis had premature rupture of membranes vs. 6/173 pregnant women with normal oral flora, which means 3 time more frequent in women with periodontitis.

Incidence of prematurity in Albania varies 6-11.7%. The mayor cause of preterm birth is infection, but lifestyle and stress had influence too. Neonatal death varies from 0.7 to 2.4%. The use of H-square test to determine periodontitis and premature birth correlation was 8.1 which means a high statistical significance  $p = 0.004$ . Periodontitis is a

frequent pathology, it is present in 10-36% of pregnant women, in our study 26%. We studied the correlation between periodontitis frequency, woman's age and their education level.

The obstetrical aim of periodontitis manage should include early diagnosis as preterm birth risk factor, this can reduce morbidity, mortality and financial costs due to prematurity. This is especially important because antibiotic use may eliminate periodontitis and modify gravidance prognosis.

| Woman's age | Woman with perodontitis | %     |
|-------------|-------------------------|-------|
| 18-20       | 7                       | 3.2%  |
| 20-25       | 19                      | 8.7%  |
| 25-30       | 16                      | 7.4%  |
| 30-35       | 11                      | 5%    |
| >35         | 4                       | 1.85% |
| Total 57    |                         | 26.3% |

Table 1. Correlation between periodontitis and woman's age:

There were no statistical correlation between periodontitis and the above variables  $p > 0.05$ .

| Education   | Woman with perodontitis | %     |
|-------------|-------------------------|-------|
| University  | 7                       | 3.2%  |
| High school | 14                      | 6.4%  |
| Elementary  | 36                      | 16.6% |
| Total       | 57                      | 26.3% |

Table 2. Correlation between periodontitis and level of education

| No. of births during 2009                      | No. of preterm birth caused by periodontitis | %     |
|--|--|-------|
| Total no. of births                            | 230  | 15    |
| No. of preterm births                          | 21   | 15    |
| No. of mothers in our study with periodontosis | 57   | 15    |
|  |  | 26.3% |

Table 3. Preterm birth caused by periodontitis, in correlation with total number of births, the number of preterm births and those with periodontosis.

Than we have screened periodically women for periodontitis by oral examination. Preterm birth prevalence in women with periodontitis is 15% vs. 5% in healthy women.

On initial periodontitis 12 children had signs of hypotrophia, as result 17.9% of newborns had hypotrophia. On the other hand the children from mothers that had established periodontitis were hypotrophic in 82% of cases. The children born on time which had hypotrophia were 16 cases (38%). With the establishment of periodontitis augment the number of hypotrophic children  $P < 0.01$ . At the same time we noticed that the women with established periodontitis had smaller children that those with initial periodontitis  $P < 0.001$ . (Table 1, Table 2, Table 3, Table 4, Table 5, Table 6, Table 7).

## 5. DISCUSSION

Periodontitis is not a rare finding, it is present in 10-36% of pregnant women. Preterm birth prevalence in women

| Mother's periodontal condition  | Birth weight   | Height     | Head circumference | Chest circumference | Abdominal circumference |
|---------------------------------|----------------|------------|--------------------|---------------------|-------------------------|
| Normal (N=6)                    | 3400.0 ± 279.3 | 49.5 ± 0.8 | 36.5 ± 5.5         | 33.2 ± 1.3          | 32.3 ± 2.1              |
| Simple gingivitis (N=3)         | 2858.3 ± 137.9 | 48.4 ± 0.8 | 34.1 ± 1.0         | 31.1 ± 1.1          | 30.8 ± 1.0              |
| Initial Periodontitis (N=12)    | 2464.3 ± 171.1 | 45.4 ± 1.6 | 32.6 ± 1.4         | 29.9 ± 1.2          | 28.7 ± 1.2              |
| Established Periodontitis (N=5) | 1634.6 ± 415.5 | 40.2 ± 5.3 | 29.5 ± 3.2         | 25.7 ± 3.1          | 25.5 ± 3.4              |
| P value (ANOVA)                 | 0.000***       | 0.000***   | 0.000***           | 0.000***            | 0.000***                |

Table 4. Infant body size based on mother's periodontal condition (Means ± DS), Premature births (21 cases) \*\*\*Asterisk indicates statistical significance based on P<0.001

| Mother's periodontal condition  | Birth weight   | Height     | Head circumference | Chest circumference | Abdominal circumference |
|---------------------------------|----------------|------------|--------------------|---------------------|-------------------------|
| Normal (N=167)                  | 3512.2 ± 137.0 | 50.0 ± 3.1 | 35.1 ± 2.1         | 33.8 ± 1.87         | 33.9 ± 2.97             |
| Simple gingivitis (N=20)        | 3103.5 ± 98.4  | 48.7 ± 1.7 | 34.4 ± 0.88        | 33.1 ± 0.98         | 32.2 ± 1.05             |
| Initial Periodontitis (N=16)    | 2776.2 ± 95.7  | 47.1 ± 1.2 | 33.4 ± 0.98        | 31.3 ± 1.2          | 30.8 ± 1.45             |
| Established Periodontitis (N=1) | 1927.7 ± 645.7 | 44.6 ± 1.9 | 33.4 ± 2.3         | 29.7 ± 3.4          | 29.0 ± 4.3              |
| P value (ANOVA)                 | 0.000***       | 0.000***   | 0.000***           | 0.000***            | 0.000***                |

Table 5. Infant body size based on mother's periodontal condition (Means ± DS) normal birth (209 cases)

| Mother's periodontal condition  | Birth weight   | Age        |
|---------------------------------|----------------|------------|
| Normal (N=173)                  | 3490.1 ± 176.7 | 37.8 ± 1.3 |
| Simple gingivitis (N=23)        | 3050.0 ± 147.8 | 37.6 ± 1.3 |
| Initial Periodontitis (N=28)    | 2620.2 ± 208.9 | 36.5 ± 1.5 |
| Established Periodontitis (N=6) | 1754.5 ± 528.4 | 33.0 ± 3.8 |
| P value (ANOVA)                 | 0.000***       | 0.000***   |

Table 6. Infant body size based on mother's periodontal condition (Means ± DS), Total, 230 cases. \*\*\*Asterisk indicates statistical significance based on P<0.001

|                           | Number of cases | Birth weight | P value                      |
|---------------------------|-----------------|--------------|------------------------------|
| Simple gingivitis         | 23              | 3079.5       | P > 0.05 (low significance)  |
|                           |                 | ¶ = 563.33   |                              |
| Initial periodontitis     | 28              | 3016.9       | P > 0.05 (high significance) |
|                           |                 | ¶ = 638.4    |                              |
| Established periodontitis | 6               | 2315         |                              |
|                           |                 | ¶ = 676.24   |                              |

Table 7. Average weight related with the grade of periodontitis.

with periodontitis is 26.3% vs. 3.4% in healthy women. In our clinic during 2009 were 21 preterm births, 9% of total births (209 normal births). No. of preterm birth caused by periodontitis were 15 (26.3%). There were 17 hypotrophic children, 7.39% of total births. In 1996, Offenbacher et al (3), conducted a case control study in which they hypothesized that periodontal infections may have some kind of relationship with preterm births. 18.2% of the incidence of preterm low birth weight could be attributed to periodontitis, making this an important risk factor not previously recognized.

Offenbacher et al.(3,14) there was an increased interest in identifying the potential association between periodontitis and pregnancy outcomes. This review of the literature regarding the relationship between the peri-

odontitis in pregnant women and prematurity and/or low birth weight will be based on the intervention studies and the systematic reviews.

López et al(15), found a reduction in the rate of preterm births and/or low birth weight in women that have received periodontal treatment before the 28<sup>th</sup> gestation week when they were compared with women that have not received any treatment. This reduction was significant for healthy periodontal women compared with women with gingivitis and with periodontitis. Jeffcoat et al.(13), in a pilot study, studied 366 women with periodontitis between the 21st and 25th gestation weeks in three intervention groups. They conclude that performing scaling and root planning in pregnant women with periodontitis may reduce preterm births in that population, but adjunctive metronidazole therapy did not improve pregnancy outcome.

## 6. CONCLUSION


Periodontitis that could be associated with an increased risk of prematurity and low birth weight. However, this association does not imply causality, as some underlying mechanism may cause predisposition to both conditions. Therefore, more studies with better methodological quality will be necessary to confirm that periodontitis in pregnant women is an independent risk factor for adverse pregnancy outcomes.


This study shows that treating Periodontitis during pregnancy could significantly reduce preterm delivery. This positive effect was also demonstrated among pregnant woman without history of premature birth so it must be treated in the best possible way. The best strategy is to prevent the development of periodontal disease. For women who are planning to get pregnant, a thorough periodontal exam and appropriate treatment should begin prior to pregnancy. For women who are already pregnant, meticulous oral hygiene and frequent professional cleanings may be helpful.

**Conflict of interest: none declared.**

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