Effect of Periodontal Therapy on Pregnancy Outcome in Women Affected by Periodontitis

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Background: There is convincing evidence to suggest that infections affecting the mother during pregnancy may produce alterations in the normal cytokine- and hormone-regulated gestation, which could result in preterm labor, premature rupture of membranes, and preterm birth (PTB). Studies in the late 1990s associated periodontitis with preterm low birth weight (PLBW) deliveries, and this may have similar pathogenic mechanisms as other maternal infections. This study determined the effect of non-surgical periodontal therapy on pregnancy outcome.

Methods: A total of 200 pregnant women with periodontitis were randomly assigned to treatment and control groups. Detailed data about previous and current pregnancies were obtained. All women received a full-mouth periodontal examination, including oral hygiene index-simplified, bleeding index, and clinical attachment level. The women in the treatment group received non-surgical periodontal therapy during the gestational period, and those in the control group received periodontal treatment after delivery. Periodontal therapy included plaque control instructions and scaling and root planing performed under local anesthesia. The outcome measures assessed were gestational age and birth weight of the infant. PTB was recorded when delivery occurred at <37 weeks of gestation, and low birth weight (LBW) was recorded when the infant weighed <2,500 g.

Results: There were 53 PTBs in the treatment group and 68 PTBs in the control group. Twenty-six LBW infants were recorded in the treatment group, and 48 LBW infants were noted in the control group. The mean gestational ages were 33.8 ± 2.8 weeks and 32.7 ± 2.8 weeks in the treatment and control groups, respectively. The difference was statistically significant at P <0.006. The mean birth weight was 2,565.3 ± 331.2 g in the treatment group and 2,459.6 ± 380.7 g in the control group, with the difference being statistically significant at P <0.044. A multiple regression model showed a significant effect of periodontal treatment on birth outcomes.

Conclusions: Non-surgical periodontal therapy can reduce the risk for preterm births in mothers who are affected by periodontitis. Additional multicentered, randomized, controlled clinical trials are required to confirm this link between periodontitis and PLBW. *J Periodontol 2007;78:2095-2103.*

KEY WORDS

Low birth weight; periodontitis; preterm; randomized controlled clinical trial.

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Preterm birth (PTB) is a major medical, social, and economic problem that accounts for a large proportion of maternal, and especially neonatal, mortality and acute morbidity.[1,2] Preterm low birth weight (PLBW) infants have a tremendous impact on the health care systems and affected families in developed and developing countries. Thus, there is a continuous search for risk factors for PLBW deliveries that are amenable to prevention.

Various factors have been associated with the delivery of preterm and/or low birth weight (LBW) infants. Maternal risk factors include age, height, weight, socioeconomic status, ethnicity, smoking, alcohol consumption, nutritional status, and stress.[3,4] In addition, parity, birth interval, previous complications, pre- and antenatal care, maternal hypertension, infections, and cervical incompetence also may be important.[5,6]

In recent years, infection has received attention as a risk factor for preterm deliveries. PLBW may be an indirect result of infection as a consequence of the production of increased level of inflammatory mediators, which shorten gestational age. The

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hypothesis that infection remote from the fetal–placental unit may influence PLBW has led to an increased awareness of the potential role of chronic bacterial infections elsewhere in the body.[7-9]

Periodontitis is an infectious disease caused by predominantly Gram-negative anaerobic and microaerophilic bacteria that colonize the subgingival area. This results in long-term local elevation of proinflammatory mediators such as prostaglandins, interleukin-1β and -6, and tumor necrosis factor-alpha. This local elevation can influence the systemic levels of some of these mediators.[10,11] The above facts suggest that periodontitis has the potential to influence PLBW through an indirect mechanism, involving inflammatory mediators, or a direct bacterial assault on the amnion.

Offenbacher et al.[12] suggested that maternal periodontal disease could lead to PLBW infants. It has been observed in animal models that infection with Gram-negative periodontitis-associated microorganisms may adversely affect pregnancy outcomes. Collins et al.[13] reported a 25% reduction in birth weight in pregnant hamsters challenged subcutaneously in the dorsal region with the periodontal pathogen *Porphyromonas gingivalis* compared to normal, healthy, pregnant hamsters.

Results of a case-control study and a concurrent cohort study showed that periodontitis may be an independent risk factor for PTB and LBW after adjusting for several known risk factors.[14,15]

In a randomized controlled trial, Lopez et al.[16] suggested that non-surgical periodontal therapy significantly reduced the rate of PLBW in women with periodontitis. In light of the findings cited above, the present study was designed to assess the relationship between periodontal disease and PLBW and to evaluate the effect of non-surgical periodontal therapy on pregnancy outcomes.

MATERIALS AND METHODS

A randomized, controlled clinical trial was performed on 200 pregnant women with periodontitis selected from outpatients at the Department of Obstetrics and Gynecology, Dr. B.R. Ambedkar Medical College and Hospital, Bangalore, Karnataka, India. The subjects were enrolled in the study from August 2004 to August 2005. After obtaining institutional approval and consent of the subjects, they were assigned randomly to treatment and control groups. Ethical clearance was obtained from the ethical committee for periodontal intervention.

Inclusion criteria were: healthy pregnant women aged 18 to 35 years; single gestation between 9 and 21 weeks; subjects with ≥20 completely erupted teeth, excluding the third molars; and subjects with ≥2 mm attachment loss at ≥50% of examined sites.

Exclusion criteria were: current use of tobacco (smoking/smokeless) or alcohol; history of congenital heart disease; current use of corticosteroids; diabetes, asthma, glomerulonephritis, or hyperthyroidism; mothers with twin pregnancy and Rh factor isoimmunity; current antibiotic treatment; and clinically evident systemic infection.

Obstetric and Maternal Data

Demographic factors such as age, marital status, and educational level as well as detailed data about previous and current pregnancies were obtained from the subjects' medical records and from interviews during prenatal visits. The information regarding pregnancy history included number carried to full term, number of previous preterm deliveries, number of LBW deliveries, number of previous pregnancies aborted, and number of live births. Maternal age at the time of entry into the study, onset of prenatal care, number of prenatal visits, intrauterine growth restriction, fetal death, gestational age, and birth weight were recorded.

Prenatal care included blood pressure measurements, routine urine and blood investigations, recording of maternal weight, and physical and pelvic examinations. Blood investigations for hepatitis B, HIV, and hematocrit were done. All women underwent ultrasonographic examination between 9 and 32 weeks for gestational age determination and to rule out congenital anomalies. Prenatal care was assessed as adequate or inadequate; fewer than six prenatal visits were considered inadequate. Mothers with inadequate prenatal care were excluded from the study.

Because all subjects included in the study were housewives, the socioeconomic status was classified according to the husband's occupation[3] as follows: class I (professionals), class II (intermediate), class III (skilled worker), class IV (partly skilled worker), and class V (unskilled worker). Information about alcohol consumption, tobacco use (smoking/non-smoking), and pan chewing was obtained through personal interview.

Prenatal Care

The women in our study had free access to a well-designed prenatal care program, Reproductive and Child Health and Safe (RCH), which is administered by the government of India. Neonatal care is emphasized in the RCH program. The following are undertaken in the program: immunization against tetanus, anemia prophylaxis and oral therapy, antenatal checkup at least three times during pregnancy, referral of those with complications, care at birth – promotion of clean delivery, and pregnancy planning.

Measurement of Periodontal Status

Information regarding oral hygiene practices was recorded. All women received a full-mouth periodontal examination. Oral hygiene index-simplified (OHI-S)[17] and bleeding index (BI)[18] were recorded. Probing depth and clinical attachment level (CAL) were measured at six sites per tooth with a manual probe (UNC-15 graduated probe), using the cemento-enamel junction as a reference point.

Periodontal Therapy

A total of 100 subjects were assigned randomly, by the flip of a coin, to the treatment group. Women in the treatment group received non-surgical periodontal therapy by the periodontist during the gestational period, whereas those in the control group received plaque-control (brushing) instructions only. The subjects in the control group received periodontal therapy after the delivery but had regular checkups at 4- to 5-week intervals. Periodontal therapy included plaque control instructions (rinsing twice daily with 0.2% chlorhexidine until periodontal therapy was completed) and scaling and root planing performed under local anesthesia. Full-mouth scaling and root planing was performed by the periodontist over four to five appointments, with a 1-week interval between each appointment. Periodontal therapy was completed before 28 weeks of gestation, and maintenance therapy was provided. Maintenance therapy, which included oral prophylaxis and reinforcement of oral hygiene instructions, was provided every 3 to 4 weeks until delivery.

Assessment of Pregnancy Outcomes

Primary outcome measures recorded were PTB and LBW. PTB was defined as spontaneous delivery at less than 37 completed weeks of gestation that followed spontaneous labor or spontaneous rupture of membranes. LBW was recorded when the infant weighed <2,500 g. Birth outcome that occurred after 37 weeks of gestation or the birth of an infant with a weight ≥2,500 g was defined as normal. Estimation of gestational age was based on the last menstrual period, ultrasound examinations, sequential physical examinations, and postnatal examinations.

Statistical Methods

The chi-square test was used to evaluate the significance of differences in percentages. The Student *t* test (two tailed) was used to find the significance of periodontal characteristics between the study and control groups and between LBW and normal birth weight (NBW). Methods to determine the difference between birth outcomes in the treatment and control groups included the intention-to-treat analysis and the protocol analysis. The intention-to-treat analysis involved all of the subjects who were assigned randomly to the treatment group, even if they did not undergo the prescribed treatment. Pearson correlation coefficient was used to find the association between the periodontal characteristics (OHI and CAL) and the birth outcomes. OHI and CAL follow the interval scale, and BI does not follow the interval scale; hence, the Spearman rank correlation was used for BI. The difference between the correlation coefficient of treatment and the control group was evaluated using the Fisher r-to-z transformation of the coefficient. Multiple linear regression was used to identify the significance of the linear relationship between birth outcomes and the other variables.

RESULTS

Among the 100 subjects in the control group, nine were excluded because they did not follow up and two had spontaneous abortion. In the treatment group, two subjects had spontaneous abortion and seven were lost to follow-up. Eight subjects from the treatment group refused to undergo intervention but were followed up until their delivery. These eight subjects were included in the treatment group as per intent-to-treat analysis. Figure 1 shows the consort flow chart of the progress through the phases of the study.

The mean age of the women in the treatment group was 23 ± 3.3 years, and the mean age in the control group was 22.9 ± 3.6 years (Table 1). The socioeconomic status of the individuals is shown in Table 2. There were 42 (42%) primiparous individuals in the treatment group and 41 (41%) primiparous individuals in the control group. The number of previous pregnancies varied from zero to four (Table 3). There was no significant difference in the distribution by age, socioeconomic status, and number of previous pregnancies between the two groups.

Periodontal characteristics of the treatment and control groups are shown in Table 4. Women in both groups had mild to moderate periodontitis with a mean CAL of 1.99 ± 0.61 mm in the control group and a mean CAL of 1.99 ± 0.51 mm in the treatment group; the difference was not significant. Mean BI and mean OHI-S did not differ significantly between the control and treatment groups.

The outcome measures were gestational age and birth weight of the infant. The prevalence of PTB and LBW is shown in Table 5 using the intention-to-treat analysis and per-protocol analysis. Both analyses showed that the prevalence of PTB and LBW was higher in the control group. There were 53 PTBs in the treatment group and 68 PTBs in the control group. There were 26 cases of LBW in the treatment group and 48 in the control group. The overall prevalence of PTB was 64.4% (53.5% in the treatment group and 76.4% in the control group). The overall prevalence of LBW was 39.4% (26.3% in the treatment group and 53.9% in the control group). The difference between the treatment and control groups was statistically significant at $P<0.001$ for PTB and at $P<0.002$

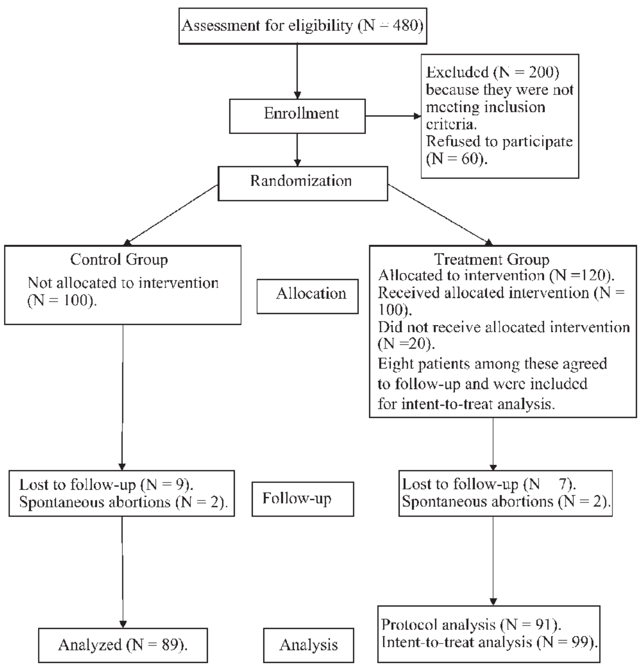

Figure 1.
Consort flow chart.

Table 1.

Age Distribution Among Treatment and Control Group

Age (years)	Treatment Group (N)	Control Group (N)
≤20	25	27
21 to 25	54	55
26 to 30	20	16
31 to 35	1	2
Mean ± SD	23 ± 3.3	22.9 ± 3.6
Inference	Distribution of age is similar in the two groups	

$P = 0.935$ for differences between the groups by the χ^2 test.

for LBW. The mean gestational age and birth weight for the treatment and control groups are shown in Table 6 for intention-to-treat analysis and per-protocol analysis. Infants in the treatment group had a higher mean gestational age and a higher mean birth weight. Mean gestational age was 33.8 ± 2.8 weeks in the treatment group and 32.7 ± 2.8 weeks in the control group. The difference was statistically significant at $P<0.006$. Mean birth weight was 2,565.3 ± 331.2 g in the treatment group and 2,459.6 ± 380.7 g in the control group, with the difference being statistically significant at $P<0.044$.

Table 2.

Socioeconomic Status of the Mothers

Socioeconomic Status	Treatment Group	Control Group
Class I	0%	0%
Class II	0%	3.0%
Class III	12.0%	13.0%
Class IV	47.0%	42.0%
Class V	41.0%	42.0%
Inference	Socioeconomic status distribution is similar for the two groups	

$P>0.05$ for differences between the groups by the χ^2 test.

Table 3.

Distribution of Previous Deliveries

Previous Deliveries (N)	Treatment Group	Control Group
0	42.0%	41.0%
1	48.0%	42.0%
2	9.0%	10.0%
3	1.0%	7.0%
Inference	Number of previous deliveries is statistically similar between the two groups	

$P>0.05$ for differences between the groups by the χ^2 test.

The periodontal characteristics were compared in the treatment and control groups in relation to the birth weight of the infant (Table 7). OHI-S did not vary significantly between the LBW and NBW groups among the controls, but showed a significant difference ($P<0.004$) in the treatment group (LBW: 3.23 ± 0.64; NBW: 2.56 ± 0.55). BI did not vary significantly, as related to LBW and NBW, between the treatment and control groups. CAL showed no significant difference in the treatment group between subjects who delivered LBW infants (2.00 ± 0.46 mm) and those who delivered NBW infants (2.00 ± 0.33 mm). In the control group, CAL was 2.09 ± 0.531 mm among women who delivered LBW infants and 1.67 ± 0.28 mm among those who delivered NBW infants.

Pearson correlation coefficient was used to find an association between birth outcomes and periodontal characteristics (OHI and CAL). OHI and CAL follow the interval scale, and BI does not follow the interval scale; hence, the Spearman rank correlation was used for BI. The Fisher r-to-z transformation of coefficient was used to evaluate the significance of the difference for the correlation coefficient for the treatment and

Table 4.

Periodontal Characteristics at Baseline

Periodontal Characteristic (mean ± SD)	Treatment Group	Control Group	*P* Value*
BI (% [range])	81.54 ± 19.38 (37.50 to 100.0)	83.63 ± 16.64 (40.60 to 100.0)	0.436
CAL (mm [range])	1.99 ± 0.61 (0.90 to 4.65)	1.99 ± 0.51 (1.19 to 4.15)	0.911
OHI-S (range)	2.81 ± 0.61 (1.82 to 4.50)	2.89 ± 0.68 (1.82 to 4.90)	0.383

* For difference between groups by Student *t* test.

Table 5.

Occurrence of PTB and LBW

	Treatment Group	Control Group	*P* Value*
Intention-to-treat analysis	n = 99	n = 89	
PTB (N [%])	53 (53.5)	68 (74.4)	<0.001
LBW (N [%])	26 (26.3)	48 (53.9)	<0.002
Protocol analysis	n = 91	n = 89	
PTB (N [%])	45 (49.45)	68 (76.4)	<0.001
LBW (N [%])	19 (20.9)	48 (53.9)	<0.001

* For difference between groups by χ^2 test.

Table 6.

Outcome Measures (mean ± SD)

Outcome	Treatment Group	Control Group	*P* Value
Per-protocol analysis			
Gestational age (weeks)	34 ± 2.7	32.7 ± 2.8	0.001*
Birth weight (g)	2,593.3 ± 324.6	2,459.6 ± 380.7	0.012†
Intent-to-treat analysis			
Gestational age (weeks)	33.8 ± 2.8	32.7 ± 2.8	0.006*
Birth weight (g)	2,565.3 ± 331.2	2,459.6 ± 380.7	0.044†

P values of the differences between gestational age and birth weight in the treatment and control groups by the Student *t* test.
* Highly significant (*P* <0.005).
† Significant (*P* <0.05).

control groups. The coefficients were calculated using per-protocol analysis and intention-to-treat analysis. Table 8 shows the coefficients for the correlation between birth weight and periodontal characteristics and the *P* value for the Fisher test. There was an inverse correlation between birth weight and BI and OHI-S in the treatment and control groups. The correlation coefficient was significantly different between the treatment and control groups for OHI. There was a positive correlation between CAL and birth weight in the treatment group, but an inverse correlation in

Table 7.

Periodontal Characteristics (mean ± SD) in Relation to Birth Weight of Infant (intention-to-treat analysis)

Periodontal Characteristic	Group	Birth Weight <2.5 kg	Birth Weight >2.5 kg	*P* Value
BI (%)	Treatment	86.47 ± 16.30	79.56 ± 20.44	0.098
	Control	83.99 ± 18.89	81.46 ± 18.39	0.485
CAL (mm)	Treatment	2.00 ± 0.46	2.00 ± 0.33	0.954
	Control	2.09 ± 0.53	1.67 ± 0.28	0.000*
OHI-S	Treatment	3.23 ± 0.64	2.56 ± 0.55	0.004*
	Control	2.97 ± 0.73	2.88 ± 0.61	0.580

P values of the differences in periodontal characteristics of the mothers in relation to LBW and NBW using the Student *t* test.
* Highly significant (*P* <0.005).

Table 8.

Correlation of Birth Weight With Periodontal Characteristics

Comparison	Treatment Group	Control Group	*P* Value
Per-protocol analysis			
OHI versus BW	–0.338	–0.053	0.037*
BI versus BW	–0.138	–0.060	0.583
CAL versus BW	0.044	–0.335	0.006†
Intent-to-treat analysis			
OHI versus BW	–0.369	–0.053	0.0176*
BI versus BW	–0.092	–0.060	0.9182
CAL versus BW	–0.012	–0.335	0.0169*

Spearman correlation used for BI; Pearson correlation used for OHI and CAL. Fisher r-to-z transformation of the coefficients.
* Significant (*P* <0.05).
† Highly significant (*P* <0.005).

the control group; the difference in coefficients between the treatment and control groups was significant (P <0.0169). An inverse correlation in the control group suggested that higher CAL values were associated with lower birth weights. Table 9 shows the coefficients for the correlation between gestational age and periodontal characteristics and P value for the Fisher test. There was an inverse correlation between gestational age and periodontal characteristics in both groups, which suggested that shorter gestational ages were associated with higher values among periodontal parameters. The difference in the correlation coefficients between the treatment and control groups was significant for the association between CAL and gestational age (P<0.0114).

Multiple linear regression was used to evaluate the joint effects of the variables on the birth outcomes per intention-to-treat analysis. Table 10 shows the P values for multiple linear regression of the gestational age in relation to other variables (age, OHI, BI, and CAL) in the treatment and control groups. Table 11 shows multiple linear regression of the birth weight in relation to other variables (age, OHI, BI, and CAL) in the treatment and control groups. There was a significant linear relationship between birth outcomes and OHI in the presence of other variables in the treatment group. The linear relationship between CAL and birth outcomes was significant in the control group.

Table 12 shows a single multiple regression model including both groups. This model included the two-factor interaction terms for each main effect with group. This provides a way to specifically test whether the effect of each variable differs by group.

Multiple linear regression was carried out to assess the treatment effect for gestational age. Two-factor interaction terms for OHI, BI, and CAL with treatment

Table 9.

Correlation of Gestational Age With Periodontal Characteristics

Comparison	Treatment Group	Control Group	P Value
Per-protocol analysis			
OHI versus term	–0.239	–0.021	0.121
BI versus term	–0.103	–0.030	0.609
CAL versus term	–0.047	–0.439	<0.001*
Intent-to-treat analysis			
OHI versus term	–0.247	–0.021	0.0975
BI versus term	–0.082	–0.030	0.7110
CAL versus term	–0.114	–0.439	0.0114†

Spearman correlation used for BI; Pearson correlation used for OHI and CAL. Fisher r-to-z transformation of the coefficients.
* Highly significant (P<0.005).
† Significant (P<0.05).

Table 10.

Multiple Linear Regression of Gestational Age in Association With Other Variables (intent-to-treat analysis)

	Treatment Group			Control Group		
Variable	β	Student t	P Value	β	Student t	P Value
Age	0.028	0.271	0.787	0.047	0.627	0.532
OHI	–0.976	–2.070	0.041*	0.370	0.900	0.371
BI	–0.007	–0.492	0.624	–0.004	0.235	0.815
CAL	–0.263	–0.556	0.579	–2.620	–4.599	<0.001†

* Significant (P<0.05).
† Highly significant (P<0.005).

Table 11.

Multiple Linear Regression of Birth Weight in Association With Other Variables (intent-to-treat analysis)

	Treatment Group			Control Group		
Variable	β	Student t	P Value	β	Student t	P Value
Age	4.830	0.500	0.615	4.125	0.381	0.704
OHI	–0.204	–3.810	<0.001*	19.030	0.324	0.747
BI	–0.786	–0.460	0.649	–1.180	–0.480	0.632
CAL	0.460	0.850	0.395	–2.630	–3.220	0.002†

* Significant (P<0.05).
† Highly significant (P<0.005).

Table 12.

Single Multiple Linear Regression Model of Outcomes

Regression Interaction	Gestational Age			Birth Weight		
Terms	β	Student t	P Value	β	Student t	P Value
Treatment effect	5.007	2.782	0.006	652.583	2.887	0.004
OHI	–0.975	–2.055	0.041	–204.844	–3.436	0.001
BI	0.007	–0.472	0.637	–0.730	–0.383	0.702
CAL	–0.249	–0.526	0.599	48.952	0.824	0.411

effect were included in the regression model. There was a significant treatment effect on gestational age (P = 0.006), and the interaction of OHI and treatment effect correlated inversely with the outcome (P = 0.041). This indicated that OHI had a negative influence on the gestational age, whereas BI and CAL did not influence the gestational age significantly in the treatment group.

Multiple linear regression was carried out to assess the treatment effect for birth weight. Two-factor interaction terms for OHI, BI, and CAL with treatment effect were included in the regression model. There was a significant treatment effect on birth weight (P = 0.004), and the interaction of OHI and treatment effect was related inversely to the outcome (P = 0.001). This indicated that OHI had a negative influence on the birth weight, whereas BI and CAL did not influence the birth weight significantly in the treatment group.

DISCUSSION

Maternal infections have been associated with pregnancy complications for many years.[19] There is increasing evidence to suggest that the presence of periodontal infection may present a systemic challenge sufficient to initiate the onset of premature labor as a source of lipopolysaccharide and/or through stimulation of inflammatory mediators such as prostaglandin E_2 (PGE_2).[20] A randomized, controlled clinical trial is the best method by which to establish a cause-and-effect relationship between exposure and disease. The present study was designed to determine whether non-surgical periodontal therapy reduced the risk for PLBW infants in women affected by periodontitis.

Subjects in our study were relatively homogenous based on the social and demographic factors reported as related to PLBW. The distribution of known risk factors for PLBW was similar in the experimental and control groups. Women aged 18 to 35 years were selected because maternal age <18 years or >35 years is a risk factor for PLBW. Subjects with only singleton gestation were included because the relationship between multiple gestations and preterm labor is well established.[21] The study population was drawn from a community pool belonging to the same socioeconomic stratum; subjects had a similar education level and similar oral hygiene practices and awareness. In Indian women, the prevalence of smoking, one of the known risk factors for PLBW,[22] is low; however, the use of tobacco as an ingredient in pan chewing is common. The use of alcohol is not uncommon among groups with a low socioeconomic status. Particular attention was paid to this aspect in the present investigation, and subjects with a history of or current use of tobacco (smoking and non-smoking) and alcohol were excluded from the study.

Convincing evidence has associated PTB with infection, especially genitourinary tract infections, which seem to be an important factor in the premature rupture of membranes.[6] Thus, to have control over this important risk factor, subjects who developed symptoms of any systemic infection or who were on any antibiotic administration during the pregnancy were excluded from the study.

An increase in parity is associated with an increased risk for PTB.[23] In our study, there was no significant difference in the distribution of parity between the treatment and control groups. Low maternal weight gain and inadequate prenatal care are reported to be associated weakly with PTB.[24] Inadequate prenatal care is cited often as a risk factor for poor pregnancy outcomes among women with a low socioeconomic status or those who are poorly educated. Several studies[5,24] showed that adequate prenatal care is associated with improved birth weights and a lower risk for PTB.

The women enrolled in the study had adequate prenatal care and adequate weight gain through their pregnancy. Severe anemia is one of the known risk factors for PTB.[25] Subjects enrolled in the present study were evaluated periodically for hematocrit, and those with any significant decrease in hemoglobin levels were administered iron supplements.

There was no significant difference in the periodontal characteristics between the treatment and control groups at baseline. Non-surgical mechanical debridement was provided to the subjects in the treatment group. Periodontal treatment included plaque control instructions and scaling and root planing. PTB caused by periodontal disease may result from an increase in systemic levels of inflammatory mediators. Studies[26] showed that non-surgical periodontal therapy decreases the levels of proinflammatory cytokines. There is evidence that PGE_2 levels also decrease in gingival crevicular fluid after scaling and root planing.[27]

The prevalence of PTB was 53.5% in the treatment group and 76.4% in the control group. The prevalence of LBW (<2,500 g) was 26.3% in the treatment group and 53.9% in the control group. The lower prevalence of preterm and LBW infants in the treatment group could be attributed to periodontal intervention. The results of our study are in agreement with those of a study conducted by Mitchell-Lewis et al.,[28] which included 164 subjects, 74 of whom received periodontal therapy during their pregnancy. They found that the prevalence of PLBW was 13.5% in the treatment group and 18.9% in the control group.

The prevalence of PLBW in the Indian population is estimated to be around 40%, and about 76% of these are PTBs.[29] The prevalence of PLBW was higher in our study, and this can be attributed to various factors. The study population belonged to lower socioeconomic strata and had lower literacy levels. Women who reported physical, sexual, or emotional abuse during pregnancy were more likely than non-abused women to give birth to a baby with PLBW,[30] and the prevalence of abuse is higher in lower socioeconomic groups.

Mean gestational age and birth weight were significantly higher in the treatment group (33.8 ± 2.8 weeks, 2,565.3 ± 331.2 g) compared to the control group (32.7 ± 2.8 weeks, 2,459.6 ± 380.7 g). A study by Lopez[16] also showed increases in gestational age (34.4 ± 2.4 weeks versus 33.6 ± 4 weeks) and birth weight (2,353 ± 112 g versus 2,156 ± 562 g) in the treatment group compared to the control group.

Our study showed an inverse correlation between gestational age and periodontal characteristics in the treatment and control groups. The correlation coefficient was significantly higher in the treatment group. There was a positive correlation between birth weight and CAL in the treatment group, but the correlation was inverse in the control group. This can be attributed to the non-surgical therapy provided to the subjects in the treatment group.

The relationship between birth weight and periodontal characteristics also was analyzed. BI was not significantly different in the treatment and control group between NBW and LBW groups. OHI-S was significantly different between LBW and NBW in the treatment group but was not different in the control group. However, CAL exhibited a significant difference in the control group between NBW (1.67 ± 0.28 mm) and LBW mothers (2.09 ± 0.53 mm). The results are in agreement with those from a study conducted by Offenbacher et al.[12] which showed that CAL was significantly worse in mothers of PLBW (3.10 ± 0.74) infants compared to mothers of NBW (2.80 ± 0.61 mm) infants.

The mechanism by which periodontitis causes PLBW is still unclear. There is some evidence that women with severe periodontitis during pregnancy are more prone to experience a PTB, even after considering shared risk factors. Periodontitis and preterm delivery have been associated with certain characteristic polymorphisms in genes that code for cytokines.[31] One hypothesis is that persons with the mutant or polymorphic genotypes produce more of the inflammatory cytokines in the presence of inflammatory stimuli, such as the bacteria associated with periodontitis and preterm labor. This suggests that the enhanced host response may mediate and link both conditions. The role of prostaglandins in human labor has been well documented. Amniotic fluid levels of PGE_2 increase steadily throughout pregnancy until a critical threshold level is reached to induce labor. There are studies regarding preterm delivery caused by a premature increase in PGE_2. It has been suggested that periodontal infections, which serve as a reservoir of inflammatory mediators, including PGE_2, may pose a threat to the fetal–placental unit.[15]

The limitations of our study include: 1) classification of socioeconomic status was based only on occupation; 2) the exclusion of subjects with systemic infections was based on clinical presentation; hence, subjects with subclinical infection must have been included; and 3) subjects with a history of alcohol/tobacco use were excluded from the study. Hence, the results of the study do not apply to the entire Indian population.

Our study provides further evidence that non-surgical periodontal therapy can reduce the risk for PLBW significantly. From the results of this study, it seems likely that periodontitis can influence pregnancy outcomes adversely. Non-surgical periodontal therapy aimed at reducing the microbial load, and thereby decreasing the inflammatory response, may help to reduce the risk for adverse pregnancy outcomes. The potential relationship between periodontitis and birth outcomes, if proven to be causative, could be significant for public health improvement, given that periodontitis affects a considerable proportion of the general population and is preventable and treatable. Multicenter, randomized, controlled clinical trials are required to confirm this link between periodontitis and PLBW and to determine whether non-surgical periodontal therapy can reduce this risk.

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