

“Correlation between Periodontitis with Pre-Term Birth and Low Birth Weight and Effect of Non-Surgical Supportive Periodontal Therapy on Pregnancy Outcome in a Rural set up in India.”

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Abstract:

Back Ground: Strong evidences suggest that maternal infection is a crucial risk factor for preterm Low Birth weight (PTLBW). Like other maternal infection, periodontitis shares common pathogenic mechanism leading to adverse pregnancy outcome. The present study was planned to correlate periodontitis with pregnancy outcomes and evaluate effect of non surgical periodontal therapy on reducing adverse pregnancy outcomes.

Material & Methods: 100 pregnant women with periodontitis were randomly assigned to experimental and control groups.

Results: There were 20 PTBs in the experimental group and 34 PTBs in the control group. There were 17 cases of LBW in the experimental group and 26 in the control group. The mean birth weight was 2644.44 ± 450.53 grams in the experimental group and 2447.82 ± 368.02 grams in the control group with the difference being statistically significant at $p < 0.05$. The Mean gestational age in the experimental group was 35.57 ± 2.40 weeks and 34.17 ± 2.92 weeks in the control group. ($p < 0.05$)

Conclusion: Non-surgical supportive periodontal therapy may reduce the risk for preterm births and Low Birth Weight in mothers who are affected by periodontitis.

Key Words: Preterm Birth (PTB), Low Birth Weight (LBW), Periodontitis.

Key Message: Healthy Mouth renders healthy baby.

INTRODUCTION:

Periodontal diseases are chronic infections related to Gram-negative bacteria, which in turn, lead to a loss of connective attachment tissue and tooth support ^[1]. The concept that periodontal disease might influence systemic health is well known. Miller ^[2] originally published his “focal infection theory” in 1981 suggesting that “microorganisms or their waste products may enter the parts of the body adjacent or remote from the mouth”.

Several studies ^[3, 4] and systematic review ^[6] have suggested that periodontal infection may serve as a reservoir of bacteria, endotoxins, and inflammatory mediators like IL-1 β (interleukin-1 β), IL-6 (interleukin

-1 β), IL-6 (interleukin 6), PGE2 (prostaglandin E2) and TNF- α (tumor necrosis factor), providing the hematogenic translocation of these products to the fetal-placental unit leading to adverse event such as preeclampsia, preterm birth and low birth weight, but their methods are heterogeneous and their results inconsistent. Controlling the periodontal disease could prevent this hematogenous spread of microorganism and inflammatory mediators to the fetal-placental unit, thus precluding the chances of adverse pregnancy outcomes is still debated. ^[6-9]

In view of the implication of periodontal infection as one of the risk factor in PTLBW, this study was performed at sought to determine whether the control of periodontal infection could reduce incidence of preterm birth and low

birth weight infants. The present study was planned to correlate periodontitis with pregnancy outcomes and evaluate effect of non surgical periodontal therapy on reducing adverse pregnancy outcomes.

Study design: The study population consisted of 100 pregnant women affected with periodontitis visiting the Department of Gynecology in our hospital. After obtaining the Ethical clearance, institutional approval and consent of the subjects, a Randomized controlled clinical trial was performed on 100 pregnant women and they were randomly assigned to experimental and control groups.

Inclusion criteria: Healthy pregnant women aged 18 – 35 years; single gestation between 11- 20 weeks; subject with ≥ 20 erupted teeth, excluding third molars; and subjects with ≥ 2 mm of clinical attachment loss at $\geq 50\%$ examine sites.

Exclusion criteria: H/o congenital heart disease, Current use of corticosteroids, diabetes, asthmatics, glomerulonephritis, hyperthyroidism, multiple gestation, Positive Rh factor, systemic infection, tobacco chewers, smokers, alcoholic, current antibiotic or antifungal users and one with H/o periodontal therapy in last 6 months.

Prenatal care: The women in present study had free access to a well-designed prenatal care program 'Reproductive and Child Health and Safe' to control many of the known risk factors for PLBW and to meet the total health needs of both the mother and the child.

DATA COLLECTION: Obstetric and Maternal Data: Demographic factors such as marital status, age, and educational level as well as detailed data about current and previous pregnancies were obtained from the medical records and interview. The Pregnancy history included number carried to full term, number of previous preterm deliveries, number of low birth weight deliveries, and number of previous pregnancies aborted

and number of live births.

Onset of prenatal care was categorized as beginning routine care prior to 20 weeks of gestational age, after 25 weeks of gestational age or no routine care. The adequacy of prenatal care was assessed as adequate or inadequate being less than 6 prenatal visits. However, mothers with inadequate prenatal care were excluded from the study.

Socio economic status was classified according to the pregnant woman's husband's occupation as follows: Class I (Professionals), Class II (Intermediate), Class III (Skilled worker), Class IV (Partly skilled worker), and Class V (Unskilled worker).

Clinical Examination: The clinical examination included intra-oral examinations. The gingiva was assessed for changes in colour, consistency, size, position, contour, surface texture, bleeding on probing and presence of exudation. Plaque Index (PI)^[10], Gingival Index^[11] (GI) and Oral Hygiene Index-Simplified^[12] (OHIS) were recorded.

Measurement of Periodontal Status: Parameters such as Probing Depth, Clinical attachment loss were recorded with William's periodontal probe, using cemento-enamel junction as a reference point.

Periodontal therapy: 50 patients were randomly assigned to the experimental group and received periodontal therapy during the gestational period and remaining 50 in control group received periodontal treatment after their delivery. Periodontal therapy included plaque control instructions, scaling and root planning performed under local anesthesia. At the beginning of treatment, patients were instructed to rinse once a day with 0.2% chlorhexidine. Periodontal therapy was completed before 28 weeks of gestation and maintenance therapy was provided.

Assessment of pregnancy outcomes: Primary outcomes measured were preterm birth and low birth weight.

RESULTS: The mean age of the women in the experimental group was 23.3 ± 3.34 years, and the mean age in the control group was 23.4 ± 3.89 years. There were 22 (44%) primiparous individuals in the experimental group and 20 (40%) in the control group. There was no significant difference in the distribution by age, socioeconomic status, and number of previous pregnancies between the two groups.

Mean Values of each periodontal characteristic in the experimental and control group are shown in Table No. 1. Women in both groups had mild to moderate periodontitis with a mean CAL of 2.02 ± 0.62 mm in the control group and a mean CAL of 2.04 ± 0.68 mm in the experimental group; the difference was not significant. Mean PD in experimental group was 1.67 ± 0.52 and in control group it was 1.69 ± 0.52 , no significant difference was found in mean PD between the two groups.

Periodontal characteristics were compared in the experimental and control group in relation to birth weight of the infants. (Table No. 3). OHI-S did not vary significantly between the LBW and NBW groups among the both groups. However, PI, GI, PD and CAL did not vary significantly between the LBW and NBW neonates-mothers in the experimental group but showed significant difference ($P < 0.05$) between the LBW and NBW neonates-mothers in the control group (Table No.3).

Pearson correlation co-efficient was used to find the significant relationship between birth weight and gestational age with periodontal characteristics. The Table No.2 shows the correlation between birth weight and periodontal characteristics. There was negative correlation between birth weight with OHI-S, PI, GI & PD both in the study and control groups. There was a positive correlation between CAL and birth weight in the study group and a negative correlation in control group. The Table No.4 shows correlation between Gestational

age and periodontal characteristics. There was inverse correlation between gestational age and periodontal characteristics both in study and control groups but the negativity was less in study group than in the control group.

DISCUSSION:

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 included 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 documented. ^[13]

In Indian women, the prevalence of smoking, one of the known risk factors for PLBW, is low; however, the use of tobacco as an ingredient in pan chewing and use of burned tobacco for tooth cleansing (Mishri) is common. The use of alcohol is not uncommon among groups with a low socioeconomic status. ^[14] Thus, subjects with a history of or current use of tobacco chewing &/ or smoking and alcohol were excluded from the study.

Strong evidence exists confirming the association of PTB with infection, especially genitourinary tract infections, which seem to be an important risk factor in the premature rupture of membranes. ^[15] 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. ^[16] 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.

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. [17] Several studies showed that adequate prenatal care is associated with improved birth weights and a lower risk for PTB. [17] The women enrolled in the study had adequate prenatal care and adequate weight gain throughout their pregnancy. They had free access to well designed prenatal care program, Reproductive and Child Health and Safe (RCH), which is administered by the government of India.

Severe anemia is one of the known risk factors for PTB. [18] Subjects enrolled in the present study were evaluated periodically for hematocrit, and those with any significant decrease in hemoglobin levels were administered iron supplements in department of Gynecology.

There was no significant difference in the mean values of periodontal characteristics OHI-S, PI, GI, PD & CAL between the experimental and control groups at baseline. Thus, the distribution of severity of periodontitis was similar in experimental and control group. Thus, study had characteristically matched experimental and controls.

Non-surgical mechanical debridement was provided to the subjects in the experimental 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. Studies¹⁹ showed that non-surgical periodontal therapy decreases the incidence of PTB & LBW, and levels of pro-inflammatory cytokines PGE2 in GCF. Outcome measures considered in our study were gestational age and the weight of the infant at delivery. The birth outcome which occurred after 37 completed weeks of gestation or, birth of an infant with a weight ≥ 2500 grams was defined as normal. Estimation of

gestational age was based on the last menstrual period, ultrasound examination, sequential physical examinations and post-natal examination. All examinations were done under the supervision of Gynecologist.

Among the 50 subjects in the control group, 1 did not follow up and 3 had spontaneous abortion with 46 available to analysis. In the experimental group, 3 patients were lost to follow up and 2 patients had spontaneous abortion with 45 available to analysis. The total incidence of PTB was 54% (54/100 cases) with 44.4% in the treatment group and 73.19% in the control group. The total incidence of LBW (<2500gms) was 43% (43/100) with the incidence being 37.77% (17/46) in the experimental group and 56.53% (26/45) in the control group. The decrease in the incidence of preterm and low birth weight infants in the experimental group could be attributed to periodontal intervention.

The results are in agreement with those of a study conducted by Fouzia T. et al [19] which included 200 patients among whom 100 received periodontal therapy during their pregnancy. They found a significant reduction in incidence of PTB & LBW in women who received periodontal therapy. The incidence of LBW was 35.16% in experimental group and 58.43% in control group and incidence of PTB was 67.03% in experimental group and 83.15% in control group.

Mean gestational age and birth weight were significantly higher in the experimental group (35.57 ± 2.40 weeks and 2644.44 ± 450.53 grams) than control group (34.17 ± 2.9 weeks and 2447.82 ± 368.02 grams) (Table No. 5) A study by Lopez [20] 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.

Relationship between birth weight and periodontal

characteristics was also analyzed. OHI-S was not significantly different between the LBW and NBW mothers in the experimental and control group. However, Plaque Index, Gingival Index, Probing depth, Clinical attachment loss did not vary significantly between the LBW and NBW mothers in the experimental group ($P > 0.05$) but showed significant difference between the LBW and NBW mothers in the control group ($P < 0.05$) (Table No.3). (Plaque Index in controls - LBW - 1.66 ± 0.46 , NBW - 1.44 ± 0.57), (Gingival Index in controls - LBW - 1.32 ± 0.45 , NBW - 1.05 ± 0.58), (probing depth (PD) in controls- LBW - 1.86 ± 0.48 mm & NBW - 1.32 ± 0.25 mm) & (CAL in controls - LBW - 2.20 ± 0.61 mm & NBW - 1.61 ± 0.36 mm).

The results are in agreement with a study conducted by Offenbacher et al.^[3] 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 results were also comparable to results of similar study by Fouzia et al.^[19] which showed that CAL was significantly higher in LBW mothers (2.00 ± 0.50 mm) than NBW mothers (1.67 ± 0.28 mm) in control group, and showed no significant difference between CAL of LBW & NBW mothers in study group.

Our study showed an inverse correlation between gestational age and each periodontal characteristic (PI, GI, OHI-S, PD & CAL) in the treatment and control groups. However, the correlation coefficient was significantly higher in the treatment group. (Table No 4) But when Correlation coefficient was drawn between Birth Weight and each periodontal characteristic, results differed between correlation of gestational age and birth weight with periodontal characteristics.

In the control group, there was inverse correlation between birth weight and CAL and birth weight and other periodontal characteristics. An inverse correlation in the control group suggested that higher CAL values were associated with lower birth weights. However, in the experimental group there was a positive correlation between birth weight and CAL and inverse correlation between birth weight and other periodontal characteristics. (Table No. 2)

The positive correlation between birth weight and CAL can be attributed to the non-surgical therapy provided to the subjects in the treatment group.

Study Limitations:

- 1) classification of socioeconomic status was based only on occupation;
- 2) Since study was carried in rural areas of India, higher Socioeconomic Status women were not enrolled in the study. Only low socioeconomic status women participated study.
- 3) The exclusion of subjects with systemic infections was based on clinical presentation; hence, subjects with subclinical infection must have been included;
- 4) 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 in rural areas.

CONCLUSION: From present work we may conclude that Non-surgical supportive periodontal therapy may reduce the risk for preterm births and Low Birth Weight in mothers who are affected by periodontitis.

Table No.1: Periodontal characteristics in Experimental and Control group.

| Periodontal characteristics | Experimental group (n=50) | Control group (n=50) | Unpaired 't' test value | 'p' value | Significance |
|-----------------------------|---------------------------|----------------------|-------------------------|-----------|-----------------|
| | Mean ± SD | Mean ± SD | | | |
| OHI-S | 2.96±0.61 | 2.99±0.63 | 0.33 | p>0.05 | Not significant |
| PI | 1.62±0.58 | 1.62±0.49 | 0 | p>0.05 | Not significant |
| GI | 1.36±0.54 | 1.26±0.50 | 1.0 | p>0.05 | Not significant |
| PD | 1.67±0.52 | 1.69±0.52 | 0.19 | p>0.05 | Not significant |
| CAL | 2.04±0.68 | 2.02±0.62 | 0.21 | p>0.05 | Not significant |

Table No.2: Karl Pearson's Correlation Coefficient between Birth Weight and Periodontal characteristics in experimental and control group.

| Correlation between | KARL PEARSON'S CORRELATION COEFFICIENT (r) | |
|-------------------------------|--|-----------------|
| | EXPERIMENTAL GROUP | CONTROL GROUP |
| Birth weight and OHI-S | - 0.1683 | - 0.0607 |
| Birth weight and PI | - 0.1925 | - 0.2646 |
| Birth weight and GI | -0.0566 | - 0.3731 |
| Birth weight and PD | - 0.08280 | - 0.4662 |
| Birth weight and CAL | + 0.1597 | - 0.5152 |

Table No.3: Periodontal characteristics in relation to Birth weight in Experimental and Control group.

| Periodontal characteristics | Comparison group | Birth weight < 2500 gm | Birth weight > 2500 gm | Student's unpaired 't' test value | 'p' value | Significance |
|-----------------------------|------------------|------------------------|------------------------|-----------------------------------|-----------|-----------------|
| | | Mean ± SD | Mean ± SD | | | |
| OHIS | Experimental | 3.04±0.66 | 2.96±0.61 | 0.40 | p>0.05 | Not significant |
| | Control | 2.99±0.57 | 2.88±0.70 | 0.23 | p>0.05 | Not significant |
| PI | Experimental | 1.69±0.60 | 1.61±0.55 | 0.45 | p>0.05 | Not significant |
| | Control | 1.66±0.46 | 1.44±0.57 | 1.59 | p<0.05 | Significant |
| GI | Experimental | 1.27±0.71 | 1.41±0.44 | 0.81 | p>0.05 | Not significant |
| | Control | 1.32±0.45 | 1.05±0.58 | 1.78 | p<0.05 | Significant |
| PD | Experimental | 1.71±0.55 | 1.65±0.49 | 0.65 | p>0.05 | Not significant |
| | Control | 1.86±0.48 | 1.32±0.25 | 1.99 | p<0.05 | Significant |
| CAL | Experimental | 2.17±0.89 | 1.97±0.50 | 0.92 | p>0.05 | Not significant |
| | Control | 2.20±0.61 | 1.61±0.36 | 4.21 | p<0.05 | Significant |

Table No. 4: Karl Pearson correlation coefficient between Gestational age and periodontal characteristics in experimental and control group

| Correlation between | KARL PEARSON'S CORRELATION COEFFICIENT (r) | |
|---------------------------|--|---------------|
| | EXPERIMENTAL GROUP | CONTROL GROUP |
| Gestational age and OHI-S | -0.0454 | -0.1712 |
| Gestational age and PI | -0.2076 | -0.3297 |
| Gestational age and GI | -0.0517 | -0.4271 |
| Gestational age and PD | -0.1004 | -0.4924 |
| Gestational age and CAL | -0.04742 | -0.5443 |

Table No 5. Mean Gestational age and Birth weight in Experimental and Control Group.

| Outcome measures | Experimental group (n=50) | Control group (n=50) | Unpaired 't' test value | 'p' value | Significance |
|-------------------------|---------------------------|----------------------|-------------------------|-----------|--------------|
| | Mean ± SD | Mean ± SD | | | |
| Gestational age (weeks) | 35.57±2.40 | 34.17±2.92 | 4.13 | p<0.05 | Significant |
| Birth weight (gm) | 2644.44±450.53 | 2447.82±368.02 | 2.39 | p<0.05 | Significant |

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