Effect of Periodontitis and Role of Periodontal Therapy in Pregnancy Outcome
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Citation

Abstract
Aim: This interventional study was designed to assess the role of periodontal therapy in pregnancy outcome after excluding the known risk factors for Preterm low birth weight (PLBW). Method: After screening 976 patients, 500 patients meeting the inclusion criteria were enrolled for the study, patients were divided into three groups Gp-1, without Periodontitis (n=200) Gp-2, with Periodontitis not willing for treatment during pregnancy(n=150), Gp-3, with Periodontitis willing to receive treatment in the form of scaling and root planing before delivery(n=150). The analysis of variables was done by ANOVA (analysis of variance) followed by Post-Hoc comparison by Duncan’s Test at 95% confidence interval. Critical ratio (CR) was calculated to compare the significance of incidence of PLBW between groups. Results: The healthy group (Gp.1) had a mean birth weight of 2.91 kg, the Periodontitis group (Gp.2) had 2.71 kg while the birth weight of treated group (Gp.3) was 2.88 kg. There was significant difference in mean birth weight (F=10.76, df=2, 434) at p < 0.01 level of significance. Comparison of CR for PLBW between healthy and Periodontitis group also came out to be significant at p > 0.05 level, (CR=6.48). Conclusion: Periodontal therapy administered to the treatment group significantly changed the periodontal status and improved the birth weight.

INTRODUCTION
For many years Periodontitis has been considered an infectious disease confined to the oral cavity. However, a number of research reports, in the past one decade, have suggested that periodontal infection may play a significant role in the systemic health of humans. The influences of periodontal infection have been documented in relation to cardiovascular disease, diabetes, pulmonary disease and adverse pregnancy outcome i.e. preterm delivery and low birth weight1,2.

Preterm delivery and low birth weight (PLBW) 3 defined as delivery before 37 weeks of gestation and birth weight less than 2500 gm, are major public health problems in the world. Infant mortality and morbidity sharply increases as birth weight decreases4.

Many risk factors have been proposed for premature rupture of membrane and preterm labor, including infection and inflammation5. Various factors have been found responsible for PLBW. The traditional risk factors being the smoking, alcohol, drug abuse, inadequate prenatal care, genetics, low socioeconomic status, hypertension, diabetes, high or low maternal age and genitourinary tract infection. However these risk factors have not been found in approximately 25% of cases, leading to continued search for other causes6.

In India the incidence of preterm birth lies between 10-15% (ICMR 1990)7. Premature low birth accounts for more than 60% of infant mortality, not attributable to anatomic or chromosomal congenital defects8. The emotional, psychological and financial burden on families who experience PLBW babies can have profound and long term consequences on society9.

The present study was designed to assess the role of periodontal therapy in pregnancy outcome in northern part of India (Haryana).

MATERIAL & METHODS
The present study was conducted in the Department of Periodontics Govt. Dental College Rohtak (Haryana) India, in collaboration with the Department of Obstetrics & Gynecology, Post Graduate Institute of Medical Sciences Rohtak (Haryana) India. Medical records of the patients were thoroughly examined to extract the relevant data, which was utilized to determine the eligibility for study. Study population consisted of healthy, primiparous women with singleton gestation, in their second trimester of
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pregnancy, having not less than 18 natural teeth and with the intention to deliver at hospital. After screening 976 primiparous women, 500 patients fulfilling the selection criteria were enrolled for the study. All enrolled subjects received a full mouth examination and data recorded included: Plaque index (PI), Gingival Index (GI), Probing Pocket Depth (PPD), Clinical attachment level (CAL) and Bleeding on probing (BOP). The presence of 4 or more teeth with one or more sites with PPD>4 mm and with clinical attachment loss > 3 mm at the same site was diagnosed as chronic periodontal disease. Patients enrolled for the study were divided into three groups based on the above mentioned parameters:

Group1 (Healthy Group): Consisted of subjects without periodontal involvement.

Group2 (Periodontitis Group): consisted of subjects with periodontal involvement, who were not willing for required treatment during pregnancy due to some social taboos attached to dental treatment during pregnancy. They were motivated for treatment after delivery.

Group3 (Treatment Group):consisted of the subjects with periodontal disease, who willingly received periodontal treatment (scaling and root planing), before 28 weeks of gestation.

Group 1 subjects were educated about periodontal disease and were instructed for plaque control measures. Routine oral prophylaxis was provided to them and their periodontal characteristics were recorded before 28 weeks of gestation. They were monitored every 4-6 weeks till delivery. Group 2 subjects received no treatment during pregnancy and their periodontal characteristics were recorded before 28 weeks of gestation. They were also monitored for any change in their periodontal status every 4-6 weeks till delivery. Group 3 subjects received treatment i.e. scaling and root planing and their periodontal characteristics were recorded at the time of entry into the study (2nd Trimester of pregnancy) and after treatment, but before 28 weeks of gestation.

Assessment of Pregnancy Outcome:Primary outcomes measured were preterm birth (PTB) and low birth weight (LBW), preterm birth was defined as spontaneous delivery at less than 37 completed weeks of gestation. Low birth weight was assessed as positive when the infant had a birth weight under 2,500 gm. Labor and delivery management decisions were made by attending obstetrician. They had no knowledge that patients were participating in a research study.

Statistical Analysis:Women who delivered before 37 weeks of gestation (PTB) or had a low birth weight infant (LBW) were grouped in the preterm low birth weight group (PLBW) for the analysis of data to identify the risk factors. The analysis of variables was done by ANOVA (analysis of variance) followed by Post-Hoc comparison by Duncan’s Test at 95% confidence interval. Critical ratio was calculated to compare the significance of incidence of PLBW between groups.

RESULTS
Treatment of Periodontitis group resulted in improved Clinical parameters comparable to that of healthy group. (Table I)
**Figure 2**
Table No. I: Mean and standard deviation of clinical parameters of Healthy group (Gp 1), Periodontitis group (Gp 2) and Treatment group (Gp 3), before 28 weeks of Gestation.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Variable</th>
<th>Healthy Group (Gp 1)</th>
<th>Periodontitis Group (Gp 2)</th>
<th>Treatment Group (Gp 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>1</td>
<td>PI</td>
<td>28</td>
<td>1-54</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>GI</td>
<td>24</td>
<td>1-62</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>PPD</td>
<td>1-08</td>
<td>22-82</td>
<td>10-34</td>
</tr>
<tr>
<td>4</td>
<td>CAL</td>
<td>6-06</td>
<td>16-64</td>
<td>6-80</td>
</tr>
<tr>
<td>5</td>
<td>BOP</td>
<td>9-05</td>
<td>24-98</td>
<td>10-48</td>
</tr>
</tbody>
</table>

**Figure 3**
Table No. II: Mean and standard deviation of Birth Weight of New Born in Healthy (Gp 1), Periodontitis (Gp 2) and Treatment group (Gp 3).

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Variable</th>
<th>Healthy Group (Gp 1)</th>
<th>Periodontitis Group (Gp 2)</th>
<th>Treatment Group (Gp 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>1</td>
<td>Weight</td>
<td>2-91</td>
<td>2-61</td>
<td>2-71</td>
</tr>
</tbody>
</table>

**Figure 4**
Table No. III: Summary of ANOVA for Birth Weight

<table>
<thead>
<tr>
<th>Sources of variance</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>136-52</td>
<td>2</td>
<td>68-26</td>
<td>419-26</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>Within groups</td>
<td>70-66</td>
<td>434</td>
<td>-16</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>207-18</td>
<td>436</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Figure 5**
Table No. IV: Post Hoc Comparison of Birth Weight by Duncan’s Test

Mean Birth Weight of children born to mothers of treated group (Gp3) was comparable to that of Healthy (Gp1) and significant difference (F=10-76, df=2, 434 at p < 0.01 level of significance) was found when the same was compared within the groups and between the groups (Table II, III, IV).

**Figure 6**
Table No. V: Summary of ANOVA for PI

<table>
<thead>
<tr>
<th>Sources of variance</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>3-13</td>
<td>2</td>
<td>1-57</td>
<td>10-76</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>Within groups</td>
<td>63-21</td>
<td>434</td>
<td>-15</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>66-34</td>
<td>436</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Figure 7**
Table No. VI: Post Hoc comparison of PI by Duncan’s Test

Values of plaque index, when compared between groups and within groups was found to be significantly different (F=419-26, df=2, 434) at 0.05 degree of confidence interval. (Table V, VI)
While comparing the gingival index in all the three groups by applying ANOVA, it was found that the value differed significantly between groups and within groups ($F=1209.92$, $df=2, 434$) at $\alpha=0.05$ degree of confidence interval. (Table VII, VIII)

The mean number of surfaces showing pocket depth $>4$ mm, differed significantly in all the three groups ($F=658.17$, $df=2, 434$) and this difference was significant at $p>0.05$ level. (Table IX, X)

Mean of the number of surfaces showing clinical attachment loss (CAL), compared by ANOVA followed by Post Hoc analysis by Duncan’s test were found to differ significantly ($F=807.73$, $df=2, 434$).
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Figure 14
Table XIII: Summary of ANOVA for BOP

<table>
<thead>
<tr>
<th>Sources of variance</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>55783.93</td>
<td>2</td>
<td>27894.47</td>
<td>856.78</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>Within groups</td>
<td>14129.96</td>
<td>434</td>
<td>32.56</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>69918.89</td>
<td>436</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 15
Table XIV: Post Hoc comparison of BOP by Duncan’s Test

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Subset for alpha = 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Gp 1</td>
<td>176</td>
<td>0.0056</td>
</tr>
<tr>
<td>Treatment Gp 3</td>
<td>132</td>
<td>-</td>
</tr>
<tr>
<td>Periodontitis Gp 2</td>
<td>129</td>
<td>24.98</td>
</tr>
</tbody>
</table>

Sites showing bleeding on probing differed significantly, when comparison was done in the groups and between the groups (F=856.78, df=2, 434)

Figure 16
Table XV: Incidence of Pre-term Low Birth Weight

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>PLBW</th>
<th>% (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Gp 1</td>
<td>176</td>
<td>7</td>
<td>3.98</td>
</tr>
<tr>
<td>Periodontitis Gp 2</td>
<td>129</td>
<td>10</td>
<td>7.75</td>
</tr>
<tr>
<td>Treatment Gp 3</td>
<td>132</td>
<td>10</td>
<td>4.54</td>
</tr>
<tr>
<td>Total</td>
<td>437</td>
<td>23</td>
<td>5.42</td>
</tr>
</tbody>
</table>

Figure 17
Table No. XVI: Critical Ratio

<table>
<thead>
<tr>
<th>Comparison</th>
<th>C.R.</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Gp 1 &amp; Gp 2</td>
<td>6.48</td>
<td>Significant</td>
</tr>
<tr>
<td>Between Gp 2 &amp; Gp 3</td>
<td>4.65</td>
<td>Significant</td>
</tr>
<tr>
<td>Between Gp 1 &amp; Gp 3</td>
<td>0.56</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

The critical ratios for PLBW between healthy and Periodontitis group came out to be significant at p > .05 level, (CR=6.48) and the same was the case when comparison was done between treatment and Periodontitis group (CR=4.65). While it was found to be non-significant when the same was compared between healthy and treatment groups (CR=0.56). (Table XV, XVI)

DISCUSSION
To validate the relationship between periodontal infection and adverse pregnancy outcome various types of studies/trials had been carried out throughout the world, which included experimental, epidemiological, biochemical, immunological, histological, microbiological and interventional. A review of case control studies found this association controversial. The present study was an interventional trial in an attempt to see the influence of periodontal therapy on pregnancy outcome on the lines of earlier intervention studies with a different methodology.

The method used in this study attempted to exclude several known risk factors for PLBW, like high or low maternal age, maternal smoking, history of previous LBW, multiple gestation, systemic diseases, genitourinary tract infection.

After receiving periodontal therapy the women in the treatment group showed periodontal parameters comparable with the periodontally healthy women. Participation in the study positively affected subjects’ oral hygiene practices. The potential strength of present study was the presence of “exposure variable” (periodontal status) prior to the onset of the “disease” (LBW) and was in active state, allowing for evaluation of the temporal sequence between exposure and disease of interest.

In this study mean birth weight of infants was compared in all the three groups and it was found that mothers who have been treated during pregnancy had babies with higher mean birth weight (2.88 kg) as compared to mothers with periodontal disease who had a mean birth weight of 2.71 kg. This was found to be statistically significant. While mothers with healthy status had a mean birth weight (2.91kg) comparable to birth weight of infants, born to mothers in treatment group (2.88 kg).

The prevalence of LBW is found to be around 15% in Asia, while in India the incidence of pre-term labor lies between 10-15%. The overall incidence in the present study was found to be 5.42% which was in accordance with the earlier
study by Lopez et al23 (6-26%), and is quite low than the global range of 10-15%. This can be because of the exclusion of patients with well known risk factors for PLBW. When the incidence of PLBW was compared in different groups, it was found to be 3.98% in healthy group (n=176), 4.54% in treatment group (n=132) and 7.75% in the Periodontitis group (n=129). When critical ratio of incidence was compared, statistically significant difference was found between group 1 and Group 2, CR being 6.48 (P<0.05), between group 2 and group 3, CR being 4.65 (P<0.05). While the difference was not significant when healthy and treated groups were compared (CR=0.56).

Although results from our preliminary intervention study have suggested that the treatment for Periodontitis in pregnant mothers may reduce the risk of PLBW babies in the population studied, this study does not elucidate whether the association is causal in nature or not. However there are several lines of biochemical, immunological and histological evidences which support the hypothesis that periodontal disease is not a mere association, but is contributing to low birth weight.7, 24, 25, 26, 27 Thus the potential mechanisms that may explain the relationship between periodontal disease and PLBW bear comment.

As periodontal medicine is still in its infancy here in Asia, there is a compelling need to determine the possible association between adverse pregnancy outcome and periodontal infections. It is well documented that periodontal disease is a treatable and preventable condition. In the event of causal association of periodontal infection with PLBW, this will have potential applications in preventive oral health program as an integral component of prenatal care for pregnant mothers.

CONCLUSION

Within the limitations of the study (small sample size and study conducted at one center) it can be said that periodontal disease was associated with adverse pregnancy outcome. Periodontal therapy administered to the treatment group significantly changed the periodontal status and the same was comparable to that of the healthy group. This may be the reason for reduced number of preterm deliveries as well as improved birth weight in the treatment group as compared to the Periodontitis group.

The limited scope of this intervention study does not enable broad generalization regarding potential health care impact of these findings. Caution must be taken in interpreting the applicability of current data, till the findings are confirmed by large prospective multiple center investigations.

References

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