PERIODONTAL HEALTH AND ORAL HYGIENE STATUS DURING THE SECOND TRIMESTER AND ITS EFFECTS ON PREGNANCY OUTCOMES – PRETERM & LOW BIRTH WEIGHT

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ABSTRACT

Periodontal disease is one of the most prevalent chronic diseases known to mankind. Recently there have been studies that suggest a possible inter-relationship between periodontal disease and systemic diseases including, cardiovascular disease, diabetes, and adverse pregnancy outcomes including pre-term and low birth weight deliveries. However, most of these studies are carried out in the western part of the world and the results may not be directly applicable to the population in Pakistan.

This research is an exploratory study that aims to find the relationship between periodontal disease and adverse pregnancy outcomes including preterm and low-birth weight in Pakistani population. The periodontal status in forty-five medically healthy pregnant females aged less than 35 years during the second trimester of pregnancy were assessed. A detailed periodontal examination, including plaque score, bleeding score, probing pocket depth and clinical attachment loss were recorded. Postpartum data was collected and the outcomes were recorded as pre-term (<32 weeks of gestation), term (on or >37 weeks), post term (>40 weeks) and low birth weight (< 2.5 kg).

Pregnant females in the second trimester had an average plaque score of 84% (95% C.I. 51.1-87), average bleeding on probing score of 66.3% (95% C.I. = 60.4-72.2), and average clinical attachment loss of 2.5 mm (95% C.I. = 2.35-2.6). Thirty-four participants delivered on or term (>37 weeks) and 8 participants delivered pre-term (<32 weeks of gestation). Only one patient delivered post term (>40 weeks).

This exploratory study highlights that the oral hygiene and periodontal status of these female patients in the second trimester of pregnancy is poor. These patients had high plaque scores, marked gingival inflammation as evidenced by high gingival bleeding score, and were diagnosed with mild generalized periodontitis. None of the periodontal variables had a significant correlation with pre-term or post-term pregnancy outcomes (p>0.05).

Key Words: Periodontitis, adverse pregnancy outcomes.

INTRODUCTION

Periodontal disease is one of the most common infectious chronic disorders known to humans. Depending on the diagnostic criteria, a worldwide prevalence varying between 10 and 60% in adults has been reported.1-4 The periodontal infection is initiated and sustained by several bacteria, predominantly gram negative, anaerobic, and microaerophilic bacteria that colonize the subgingival area. Host defense mechanisms play an integral role in the pathogenesis of periodontal disease.5 Tissue destruction in periodontitis is mainly due to the activation of immune cells initiated by the certain component of the cell walls of the microorganisms, such as lipopolysaccharide (LPS). This is a potent stimulant for the production of host-derived enzymes including, cytokines and other pro-inflammatory mediators that result in connective tissue destruction.6-9

Oral health and its relationship to systemic health is important to the society. Up to 90% of the worldwide population is affected by periodontal disease, either by gingivitis or periodontitis.10 Data on the prevalence of
Periodontal disease in India suggests a 100% prevalence of destructive periodontitis after the age of 40 years.\textsuperscript{11} In this context, it is important to highlight that adequate control of periodontal disease is imperative for the control of critical systemic ailments, including, adverse pregnancy outcomes, diabetes and coronary heart disease.\textsuperscript{11}

Research as early as 1931 found that periodontal diseases in the mother may have harmful effects on the developing fetus.

Periodontal infections may constitute remote maternal infections that may adversely influence the birth outcome was raised for the first time in the late 1980s.\textsuperscript{9,10}

A study conducted in 1996 by Offenbacher and colleagues suggested maternal periodontal disease could lead to a seven fold increased risk of Preterm Low Birth Weight (PLBW) infants.\textsuperscript{11} In another study Dasanayake et al. studied 55 pairs of women; logistic regression indicated mothers with healthy gingiva were at lower risk for LBW infants (odds ratio=0.3).\textsuperscript{12}

Efforts to understand the underlying mechanism involved resulted in multiple studies conducted in humans and a direct and/or indirect effect via the blood stream to the foetal-placental unit has been considered. Low exposure of biological markers may induce hyper contractility of the uterus cervical dilation and loss of membrane integrity leading to pre-term delivery, whereas higher exposures may lead to abortion, late miscarriage and stillbirth.

The adverse pregnancy outcomes, which have been assessed, include low birth weight (<2.5Kg), pre-term birth (<37 weeks), growth restriction, pre-eclampsia, miscarriage and/or stillbirth.

The exact mechanism of the interaction between periodontal disease and adverse pregnancy outcomes in not known, but periodontitis in a pregnant woman may directly and/or indirectly cause adverse pregnancy outcomes. During pregnancy, there are hormonal changes that increase the vascular permeability in the gingiva. This can facilitate periodontal pathogens/byproducts to enter the blood stream and reach the placenta.\textsuperscript{8}

Recent studies have demonstrated the presence of Porphyromonas Gingivalis (a known periodontal pathogen) in the placental tissues, and this has been described as a direct potential cause for preterm labor.\textsuperscript{6} Combined effects of oral infections including periodontal infections and oral ulcers were also found to be significantly associated with preterm birth.\textsuperscript{12} Circulating inflammatory mediators as a result of periodontitis may act indirectly and have also been associated with higher risks for adverse pregnancy outcomes.\textsuperscript{13} Low birth weight, pre-term birth and pre-eclampsia have all been associated with maternal periodontitis exposure.\textsuperscript{14} However, the association between maternal periodontitis and adverse pregnancy outcomes does not appear to be well established due to differences in the populations studied and the periodontal parameters assessed.\textsuperscript{15}

Although periodontal therapy has been shown to be safe and leads to improved periodontal conditions in pregnant women, case-related periodontal therapy, with or without systemic antibiotics does not reduce overall rates of pre-term birth and low birthweight.\textsuperscript{16}

Limited research data is available on the interaction of periodontal disease and pregnancy outcomes in Pakistan. However, a recent prospective study demonstrated a poor periodontal health status in pregnant females in the second trimester.\textsuperscript{17} The said cohort of patients had a high prevalence of caries of 47%, and more than 90% patients had no dental care in the past year. The study failed to demonstrate a strong relationship between periodontal disease and preterm and low birth weight deliveries. However, a significant association of periodontal disease was noted with stillbirth, and neonatal and perinatal death. The authors noted that the rates of mortality and stillbirth in the United States are 5 per 1000, but in their study on Pakistani population, it was more than 30 per 1000.

The current study was carried out as a small-scale exploratory study to acquire baseline data for future studies to find relationship between periodontal disease and adverse pregnancy outcomes including pre term and low birth weight.

The secondary objectives were to study the different demographic variables that affect periodontal status during pregnancy, awareness regarding oral hygiene maintenance and oral healthcare among pregnant women.

**METHODOLOGY**

Forty-five otherwise medically healthy pregnant women were randomly recruited from the Obstetric Ward of the Fatima Memorial Hospital, Lahore, Pakistan. They were then seen at the Gynecology Out Patient Department and research clinic to confirm eligibility.

All the patients with following characteristics were included in the study:

1. Twenty to twenty-six weeks of gestation (second trimester of pregnancy), which was confirmed by performing an ultrasound examination.
2 Age of the patients was between 18-35 years.
3 Single fetus.
4 At least 14 teeth in both arches must be present.
5 These patients were permanent residents who planned to deliver in the defined catchment area.

Every patient signed a written informed consent. In addition, a questionnaire was used to identify demographic factors, awareness about periodontal health and oral hygiene practices. The demographic variables noted in the questionnaire included: age, educational level and monthly per capita income. A history of past dental treatment and oral hygiene practices were also documented. The exclusion criteria included systemic ailments, including chronic diseases, hematological problems obesity, metabolic syndrome and diabetes etc.

To avoid any inter-examiner discrepancy a single examiner who is a consultant Periodontist performed the clinical periodontal examination, which included the following parameters:

1 Number of teeth (excluding 3rd molars).
2 Probing Pocket Depth (PPD) (excluding 3rd molars).
3 Gingival Recession (GR).
4 Clinical Attachment Loss (CAL = GR + PPD)
5 Plaque Score (%age) (assessed by palpation with a periodontal probe).
6 Bleeding Score (%age). Gingival bleeding was recorded after 30 seconds of probing.

Periodontal probing was performed at six points around each tooth and probing depths and gingival recession was measured with a Michigan ‘O’ probe with William’s markings.

DATA MANAGEMENT & ANALYSIS

Data was entered centrally using the Microsoft Excel software, which was later, transferred into SPSS version 17 was used for statistical analysis. A descriptive analysis was calculated (frequencies, percentages, means, and standard deviations) to describe the data obtained from the clinical examination. Fisher’s exact tests were completed, and relative ratios were calculated for the measures of periodontal disease and pregnancy outcomes. Significance level was set at p<0.05.

RESULTS

A total of 45 patients were recruited at the baseline. One patient dropped out due to relocation. In total, 44 patients were followed till the end of the study. Thirty-four participants delivered on or term (>37 weeks) and 8 participants delivered pre-term (<32 weeks of gestation). Only one patient delivered post term (>40 weeks).

<table>
<thead>
<tr>
<th>Periodontal variable</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque</td>
<td>84.1%</td>
<td>10.0%</td>
<td>59.5%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Bleeding score</td>
<td>66.3%</td>
<td>20.0%</td>
<td>27.4%</td>
<td>1.7</td>
</tr>
<tr>
<td>Clinical Attachment Loss</td>
<td>2.5</td>
<td>0.4</td>
<td>100.0%</td>
<td>3.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Periodontal Variable</th>
<th>Pre-term (N=8)</th>
<th>Term/Post term (N=35)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque Score</td>
<td>81.3% (SD 10.5%)</td>
<td>84.3% (SD 10.0%)</td>
<td>0.45</td>
</tr>
<tr>
<td>Bleeding Score</td>
<td>71.4% (SD 14.0%)</td>
<td>66.3% (SD 20.4%)</td>
<td>0.51</td>
</tr>
<tr>
<td>Clinical Attachment Loss</td>
<td>2.6mm (SD 0.2mm)</td>
<td>2.5mm (SD 0.5mm)</td>
<td>0.54</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Birth Weight</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleeding Score</td>
<td>Normal Birth Weight (2.5+ kg)</td>
<td>37</td>
<td>68.0%</td>
<td>20.1%</td>
</tr>
<tr>
<td></td>
<td>Low Birth weight (&lt;2.5 kg)</td>
<td>6</td>
<td>62.3%</td>
<td>13.8%</td>
</tr>
<tr>
<td>Plaque Score</td>
<td>Normal Birth Weight (2.5+ kg)</td>
<td>37</td>
<td>84.0%</td>
<td>9.8%</td>
</tr>
<tr>
<td></td>
<td>Low Birth Weight (&lt;2.5 kg)</td>
<td>6</td>
<td>82.3%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Clinical Attachment Loss</td>
<td>Normal Birth Weight (2.5+ kg)</td>
<td>37</td>
<td>2.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Low Birth Weight (&lt;2.5 kg)</td>
<td>6</td>
<td>2.5</td>
<td>0.2</td>
</tr>
</tbody>
</table>
The average number of teeth present was found to be 27 and the average age of the patients was 26 years. Pregnant females in the second trimester had an average plaque score of 84% (SD 10.0%), average bleeding on probing score of 66.3% (SD 20.0%), and average clinical attachment loss of 2.5 mm (SD 0.4) (Table 1). The data was fairly well distributed as shown in Fig 1-3. The data was then divided into two groups on the basis of pre and post-term delivery. None of the periodontal variables had a significant correlation with pre-term or post-term delivery (p>0.05) as shown in (Table 2 and Table 3).

DISCUSSION

The acceptable plaque score in a population is suggested to be 25% where as in this study we have a significant plaque score of 85% suggesting poor oral hygiene of the patients. This shows a general lack of awareness about oral hygiene control on part of the patient and the obstetrician. The causative effect of poor oral hygiene and plaque in periodontal disease is well established, hence there is a need to undertake measures to improve awareness regarding oral hygiene so as to reduce the incidence of periodontal disease in pregnant females. Interventional studies aimed at attaining acceptable bleeding scores of upto 15%, whereas bleeding score of 66.3% is seen in this study and it is clear that this is much higher than the acceptable standards.

The entire dentition of the selected patients were probed and assessed for measuring the periodontal parameters to avoid underestimation or overestimation of the extent and severity of the disease. However, despite this comprehensive examination, the study failed to find any significant correlation between poor oral hygiene and compromised periodontal health. It is noteworthy though that the current study was carried out on a very small cohort of patients and the results may not be the true representation of the population by large. A larger scale study may need to be carried out to reach a definitive conclusion. The results of this study are comparable to the results studies carried out in East London and this may suggest a genetic influence on interplay of periodontal disease and adverse pregnancy outcomes.

CONCLUSION

Within the limitations of this exploratory study, the following conclusions may be drawn:

- The oral hygiene status of patients in their second trimester of pregnancy from Lahore, Pakistan is very poor.
- The lack of plaque control reflects as marked gingival inflammation as evident by a very high gingival bleeding score and mild generalized periodontitis.
• This study failed to demonstrate significant relationship between poor periodontal health and poor pregnancy outcomes.

• Additional epidemiological studies are needed including a larger number and wider spectrum of participants from different hospitals in different areas of the country.

• The use of the Decayed, Missing or Filled Teeth Index (DMFT) as an extra measure to indicate the total number of decayed, missing and filled teeth as a result of dental caries needs to be incorporated in further studies.

• Further studies are needed to assess the role of periodontal disease in preterm low birth weight in the Pakistani population.

REFERENCES