Periodontitis as a risk factor for preterm delivery of babies among pregnant women

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Abstract
Aim: To determine if periodontitis of the pregnant women is a risk factor for delivery of preterm babies. Methods: The total number of subjects in the present longitudinal study was 98 pregnant women. The study participants were chosen from the outpatients of Gynecology department of the People’s Hospital, Bhopal over a period of one month. After obtaining informed consent from the patient, a self administered questionnaire covering the patient’s oral hygiene and dietary patterns was recorded. A modified World Health Organization (WHO) Oral Health Assessment form, 1997 was used for the clinical examination. Results: Tooth brush and toothpaste was the material of choice for majority of the participants. Caries prevalence of the study population accounted to 87.8%. It was observed that significantly greater proportion (28.6%) of subjects with deep pockets delivered a preterm baby in contrast to 12.2% delivering fullterm babies. The loss of attachment and preterm delivery was significantly related. Subjects with shallow pockets were very less likely to have preterm babies than those with deep periodontal pockets (OR=0.12, p=0.0001). Conclusion: This study concludes that periodontitis is associated with delivery of preterm babies.

Key words: Pregnancy; Periodontitis; Preterm delivery; Public health.

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Introduction

Risk is a term commonly used, yet rarely defined. Risk is almost invariably discussed in the context of negative outcomes, or harm, rarely is it applied in the sense of beneficial outcome. The concept of risk carries with it three key factors: the fear of harm, the gravity of the perceived harm, and the perceived probability of harm (1, 2). Science addresses risk by searching for metrics or descriptions of the causes of an outcome, and in reducing uncertainty by evaluating the probabilities of an event. What science cannot solve is how a risk is perceived because this is embedded in the cultural norms of a society. The gravity of increased infant mortality and the fear associated with it are not necessarily constant across all societies. However, the implied cost to all societies of pre-term infants is omnipresent, as in general these infants demand greater resources throughout their development (3, 4).

Preterm delivery before 37 completed weeks of gestation remains a significant and an unresolved problem (5). Chronic oral infection in the form of periodontal disease has been associated with adverse pregnancy outcomes, including preterm birth (6, 7). Continued efforts to evaluate and establish appropriate definitions of oral disease in pregnancy are warranted (8). It has been claimed that periodontal infection increases the risk of preterm low birth weight. Early evidence has shown that women delivering preterm low birth weight babies were almost 8 times more likely to have periodontal disease (6). The "Focal Infection Theory" proposed by Hunter in 1910 was being resurrected. According to Hunter’s theory, bacteria and their products from local infections could be disseminated throughout the body and cause diseases in other organs (9). Considerable attention has to be focused on the above stated fact. Identification and characterization of periodontal pathogens, as well as elucidation of potential systemic mechanisms of action of bacterial products and inflammatory cytokines, have opened the way for a more realistic assessment of the systemic importance of periodontal disease. Chronic periodontitis could be proposed as a risk factor for preterm birth (10). This study has been undertaken to determine if periodontitis of the pregnant women is a risk factor for delivery of preterm babies.

Material and methods

Study Design

The subjects in the present longitudinal study were chosen from the outpatients of Gynecology Department of the People’s Hospital over a period of one month. The protocol for research was submitted to the Ethical Committee, People’s college of Dental Sciences and was approved.

To be eligible for participation in this study, a pregnant woman must have reached the second trimester. The pregnant women had to have at least 4 teeth with periodontal pockets when examined with a WHO probe. We excluded subjects who required antibiotic prophylaxis. This exclusion was primarily in the interest of patient safety, but it also eliminated one potential source of confusion in the interpretation of study results. Since antibiotics could modify the risk factors being tested. The final sample came up to 98.

After obtaining informed consent from the patient, a questionnaire covering the patient’s oral hygiene and dietary patterns was recorded and structured interviews were conducted after the delivery to collect information regarding the type of delivery, i.e., preterm or full term.

Clinical examination

Each subject received an oral examination to check for dental caries and periodontal disease. A modified World Health Organization (WHO) oral health assessment form 1997 (11) was used for...
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recording the clinical information. For dental caries assessment, Decayed, Missing and Filled Teeth (DMFT) index was used. A tooth was considered decayed when there was frank carious cavitations on any surface of the tooth. A tooth was classified as missing in the index if it was extracted due to caries. A tooth was classified as filled if it had a restoration for a carious lesion. The periodontal status was assessed based on Community Periodontal Index (CPI) and Loss of Attachment (LOA). The examination procedures for the CPI and LOA were as recommended by the WHO (11).

The clinical examination was conducted by a single examiner (GS) on all the subjects in under natural day light. Intra-examiner diagnostic calibrations were performed for over 10% of the study sample; the kappa scores were over 90% and considered adequate.

Statistical analysis

The data collected was analyzed using SPSS Version 11.5. Frequencies and percentages were calculated. Chi- square test was done to test the association. Probability value of less than 0.05 was considered statistically significant. Logistic Regression analysis was also done to analyze the cause and effect relationship between the dependent (Preterm Vs Fullterm delivery) and the independent variable (Periodontal pockets).

Results

The total subjects in the study were 98. The mean age of the subjects was 25 years. Table 1 and 2 show the oral hygiene and dietary practices of the pregnant women. Tooth brush and toothpaste was the material of choice for majority of the participants. Approximately half (52%) of the subjects reported of cleaning their teeth horizontally and less than one third (69.4%) cleaned their teeth twice a day. Nearly three quarters (71.4%) and 81.6% of the study population were vegetarian and consumed sugar less than 3 times a day respectively.

**Table 1: Oral hygiene practices of the pregnant women**

<table>
<thead>
<tr>
<th>Mode of cleaning teeth</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toothbrush</td>
<td>91</td>
<td>92.9</td>
</tr>
<tr>
<td>Finger</td>
<td>7</td>
<td>7.1</td>
</tr>
</tbody>
</table>

**Table 2: Dietary habits of pregnant women**

<table>
<thead>
<tr>
<th>Type of diet</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarian</td>
<td>70</td>
<td>71.4</td>
</tr>
<tr>
<td>Mixed</td>
<td>28</td>
<td>28.6</td>
</tr>
</tbody>
</table>

Caries prevalence of the study population accounted to 87.8%. Chi square test revealed no significant association between caries in the mothers and preterm delivery of the babies (table 3).

**Table 3: Caries status of the study population in relation to preterm/fullterm baby**

<table>
<thead>
<tr>
<th>Caries status</th>
<th>Preterm baby</th>
<th>Full term baby</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects without caries</td>
<td>2 (2%)</td>
<td>10 (10.2%)</td>
</tr>
<tr>
<td>Subjects with caries</td>
<td>38 (38.9%)</td>
<td>48 (48.9%)</td>
</tr>
</tbody>
</table>

Chi square test, p=0.062
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All the subjects demonstrated periodontal pockets with more than half the population (59.2%) presenting shallow pockets (pockets of 4-5 mm) as depicted in table 4. It was observed that significantly greater proportion (28.6%) of subjects with deep pockets delivered a preterm baby in contrast to 12.2%, who delivered fullterm babies.

Table 4: Community periodontal index in relation to preterm/fullterm baby

<table>
<thead>
<tr>
<th>Pocket</th>
<th>Pre term</th>
<th>Full term</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5 mm</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>n (%)</td>
<td>12 (12.2)</td>
<td>28 (28.6)</td>
<td>40 (40.8)</td>
</tr>
<tr>
<td>Total</td>
<td>58 (59.2)</td>
<td>40 (40.8)</td>
<td>98</td>
</tr>
</tbody>
</table>

Chi square test, p<0.001

Table 5: Loss of attachment according to preterm/fullterm baby

<table>
<thead>
<tr>
<th>Pocket</th>
<th>Pre term</th>
<th>Full term</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 mm</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>n (%)</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4-5 mm</td>
<td>(14.3)</td>
<td>(20.5)</td>
<td>(6.1)</td>
</tr>
<tr>
<td>6-8 mm</td>
<td>(32.6)</td>
<td>(3)</td>
<td>32</td>
</tr>
<tr>
<td>9-11 mm</td>
<td>(2%)</td>
<td>(21.5)</td>
<td>46</td>
</tr>
<tr>
<td>≥12 mm</td>
<td>(32.6)</td>
<td>(6.1)</td>
<td>46</td>
</tr>
</tbody>
</table>

Chi square test, p<0.001

It is evident from table 5 that majority of the subjects with loss of periodontal attachment of 9 mm and more had preterm deliveries. The loss of attachment and preterm delivery was significantly related.

Table 6 summarizes the results of multiple logistic regression analysis for the association between maternal periodontitis and preterm birth of babies. This association has also been shown as highly significant in the results of Hosmer-Lomeshow goodness-of-fit test.

Subjects with shallow pockets were very less likely to have preterm babies than those with deep periodontal pockets (OR=0.12, p=0.0001).

Discussion

It has been observed from the present study that there exists an association between the periodontal status of the mother and the preterm delivery of the baby. This finding is in agreement with previous studies (12-16) and reviews that suggested periodontitis to be an associated risk factor to preterm birth babies. In contrast, Davenport and coworkers (17) reported no association. The authors have concluded that variation in ethnic composition of the population studied might be partly responsible for the lack of an association. A systematic review by Medianos et al reported limited evidence that periodontitis is associated with increased risk for preterm low birth weight (18).

In this study participants have had periodontitis prior to the delivery. Attempts were made in this study to control the maternal medication that could have confounded the outcome of the result. It should be noted that logistic regression analysis, yielding odds ratio as an

Table 6: Logistic Regression analysis with type of delivery (preterm Vs full term) as dependent variable and maternal periodontitis as independent variable

<table>
<thead>
<tr>
<th>Maternal risk factors</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>Wald chi square</th>
<th>Odds ratio</th>
<th>95% Confidence interval</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow pockets</td>
<td>-2.10</td>
<td>0.47</td>
<td>19.36</td>
<td>0.12</td>
<td>0.04-0.31</td>
<td>0.0001</td>
</tr>
<tr>
<td>Constant</td>
<td>8.59</td>
<td>1.80</td>
<td>22.64</td>
<td>5386.30</td>
<td>0.04-0.31</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Reference category: Deep periodontal pockets
approximation of relative risk was used in this study to determine the association between the maternal periodontitis and preterm delivery thus the results should be interpreted with caution as there is a possibility that the odds ratio might have slightly overestimated the true risk of association. The association between periodontitis and preterm deliveries in this study may be difficult to generalize to all the entire population as the sample taken is limited. But from the study it is suggestive that there is an association between periodontitis and preterm deliveries.

The rate of pre-term birth appears to be increasing world-wide and efforts to prevent or reduce its prevalence have been largely unsuccessful. If periodontal disease is associated with higher risk of adverse pregnancy outcome, large multicenter randomized-controlled trials will be needed to determine if prevention or treatment of periodontal disease, perhaps combined with other interventions, has an effect on adverse pregnancy outcome (19).

Preventive oral health care instructions to pregnant women can be given both by general practitioners, dental professionals and auxiliary personnel (20) to prevent periodontal disease which has been found to be associated with preterm birth.

Conclusions

In the present study, loss of periodontal attachment of more than 9mm was significantly related to delivery of preterm babies and subjects with deep periodontal pockets were more likely to have preterm deliveries than those with shallow periodontal pockets. Thus it can be concluded that periodontitis is associated with delivery of preterm babies.

References

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