Periodontal Health in Mothers of Preterm and Term Infants

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SUMMARY

Objective: Recent studies have suggested that chronic periodontitis may induce an inflammatory response which can cause premature delivery. This study was designed to assess the association between periodontal health and preterm labor in Iranian female population.

Materials and Methods: In this case-control study, 201 pregnant women without systemic disease or other risk factors for preterm labor were chosen. The control group ($n = 99$) had term labor (infants ≥ 37 weeks) and the case group ($n = 102$) had preterm labor (infants < 37 weeks). Bleeding index, pocket depth and debris index were measured.

Results: The data of bleeding index (cases, 0.64 ± 0.38; controls, 0.57 ± 0.35), probing depth (cases, 2.80 ± 0.30; controls, 1.63 ± 0.23) and debris index (cases, 1.38 ± 0.67; controls, 0.81 ± 0.38) revealed a statistically significant difference between the two groups ($p < 0.05$).

Conclusion: According to the findings of this study, there is a noticeable relationship between periodontal health and duration of pregnancy; periodontal disease could be a risk factor for preterm labor. Oral hygiene is strongly recommended to be included in prenatal care. [*Taiwan J Obstet Gynecol* 2007;46(2):157–161]

Key Words: low birth weight, periodontal disease, pregnancy, preterm labor, risk factors

Introduction

Preterm labor is one of the most prevalent factors for death during the neonatal period; compared with full term infants, preterm infants are 40 times more likely to die during the neonatal period [1]. Furthermore, preterm infants who survive the neonatal period face a higher risk of several disabilities [2].

Smoking, alcohol, some kinds of drugs, insufficient prenatal care, low socioeconomic status, high blood pressure, diabetes and urogenital infection could be risk factors for preterm labor [3,4].

Periodontal disease is initiated and sustained by a wide spectrum of predominantly Gram-negative, anaerobic and microaerophilic bacteria which colonize the subgingival area. It results in the inflammation of gingival and periodontal tissues and progressive loss of the alveolar bone by production of cytokines and other proinflammatory mediators [5,6]. Recent research shows that these bacteria or their toxins can be released in the blood circulation and activate the immune system. This may, consequently, exacerbate osteoporosis, diabetes mellitus, cardiovascular and respiratory diseases, as well as increase the risk of cerebrovascular attacks and preterm labor [7–10].

It is estimated that 50% of premature births are idiopathic [11]; this fact can justify the need for future studies to identify the causes and risk factors that lead to such obstetric complications [12].

Although many studies have revealed the relationship between periodontal disease and preterm labor [6,13–15], there are some research which does not show such an association [16–20]. Additionally, as Paquette [8] and Moliterno et al [12] believe, we need more

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Accepted: December 12, 2006

research in different societies to discover the relationship between them.

As there have been no studies on Iranian women to date, this study was designed in order to consider the relationship between periodontal disease and preterm labor.

Materials and Methods

This case-control study was performed on a group of Iranian mothers from Tehran-Iran, who came to the obstetrics department of Mahdieh Hospital which is part of the public health network in Tehran for childbirth (March 2002–December 2003).

Dental examinations were performed at the dentistry department of the hospital. According to a priori power calculation for achieving a power of 80%, *p* value of 0.05 and selection ratio of 1:1, the sample size was estimated to be 91 in each group, which later increased up to 99 in the control group and 102 in the case group.

Labor before 37 completed weeks of pregnancy is considered preterm, and giving birth after 37 weeks completed weeks is considered full term.

This study received ethical approval from the ethics committee of Shahid Beheshti University of Medical Sciences.

Inclusion criteria

The study population was chosen from those mothers (age, 18–35 years) who had no risk factors for preterm delivery, such as history of suspicious drugs for preterm delivery, smoking, alcohol and drugs consumption, systemic diseases, urogenital infections, history of preterm delivery, short stature, severe stress, malnutrition, history of emergency delivery due to systemic diseases, preeclampsia, abruptio placenta or placenta previa.

Severe psychologic stress was considered a confounding factor, so those possessing such a history were excluded from the study.

Data collection

A gynecologist was responsible for inclusion/exclusion of study participants whose informed signed consent was obtained. A structured questionnaire was administered in two parts: the first section on dental information and the second section on maternal history.

The dentist performing the dental examinations was chosen from among three dentists who had passed some tests measuring the accuracy of their clinical examinations and patient management. She was blinded to the group of the participants and performed dental examinations within 72 hours of delivery.

First, the debris index was assessed by using disclosing agents. After washing their mouths, the bleeding and probing indices were obtained from the participants with a periodontal probe (Hu-Friedy, Chicago, IL, USA).

Mean of indices for each tooth was calculated from the mean of different surfaces of that tooth.

Bleeding index (BI): Through the Cowell method, bleeding was assessed on the buccal and lingual surfaces of the lower teeth and the buccal and palatal surfaces of the upper teeth [21] and was graded as follows: 0 degree, no bleeding; 1st degree, bleeding 30 seconds after probing; 2nd degree, bleeding on probing; 3rd degree, spontaneous bleeding.

Debris index (DI): The Green and Vermillion method was utilized to assess this index for each tooth on the buccal and lingual surfaces of the lower teeth and the buccal and palatal surfaces of the upper teeth [22] and was graded as follows: 0 degree, no plaque detected; 1st degree, plaque on $1/3$ of tooth surface; 2nd degree, more than $1/3$ but less than $2/3$ of tooth surface; and 3rd degree, more than $2/3$ of surface.

Probing depth (PD): The distance from the gingival margin to junctional epithelium on the mesiobucal, distobuccal, midbuccal and lingual (palatal) surfaces of each tooth was assessed with the probe.

Pregnancy status, frequency of brushing, time of gravidity, maternal age, and gestational age were also recorded.

Data was analyzed using SPSS version 11.5 (SPSS Inc., Chicago, IL, USA) for Windows. Independent-sample *t* test was used for comparing numerical variables and Mann–Whitney *U* test for comparing the ordinal variables between two study groups.

Results

The mean gestational age at delivery was 32.50 ± 2.92 weeks in the case group and 39.44 ± 1.14 weeks in the control group.

The distribution of maternal age is presented in Table 1, which shows no statistically significant difference between the case and control groups ($p = 0.2$). There was also no significant difference in gravidity between the case and control groups ($p = 0.4$). The frequency of brushing was higher in mothers who delivered a premature baby than those who delivered a full-term one, but this difference was not statistically significant ($p = 0.5$) (Table 1).

Results of periodontal health indices (BI, DI, and PD) are shown in Table 2. There were significant differences

Table 1. Distribution of maternal age, time of gravidity and frequency of brushing among mothers with term labor and mothers with preterm labor

	Mothers with full term labor (control) (n = 99)	Mothers with preterm labor (case) (n = 102)	p
Maternal age (yr)			
17 <	4 (4.04%)	1 (0.01%)	
34–17	94 (94.94%)	98 (96.07%)	
< 34	1 (1.01%)	3 (2.94%)	0.2*
Gravidity			
1	47 (47.47%)	47 (46.07%)	
2	33 (33.33%)	25 (24.50%)	
3	11 (11.11%)	21 (20.58%)	
4	6 (6.06%)	4 (3.92%)	
5	1 (1.01%)	4 (3.92%)	
6	1 (1.01%)	1 (0.01%)	0.4*
Frequency of brushing			
Nothing or irregular	30 (30.30%)	22 (21.56%)	
1 in 24 hr or less	38 (38.38%)	49 (48.03%)	
2 or 3 in 24 hr	31 (31.31%)	31 (30.38%)	0.5*

**Mann–Whitney U test.*

Table 2. Comparison of probing depth, bleeding index and debris index among women with preterm labor (cases) and women with term labor (controls)

	Mothers with preterm labor (case) (n = 102)	Mothers with full term labor (control) (n = 99)	p
Probing depth (mm)	2.80 ± 0.30	1.63 ± 0.23	< 0.001
Bleeding index			
0	2 (1.96%)	22 (22.22%)	
1	23 (22.54%)	41 (41.41%)	< 0.001
2	52 (50.98%)	27 (27.27%)	
3	25 (24.50%)	9 (9.09%)	
Debris index			
0	5 (4.90%)	36 (36.36%)	
1	39 (38.23%)	24 (24.24%)	< 0.001
2	28 (27.45%)	18 (18.18%)	
3	30 (29.41%)	21 (21.21%)	

between the case and control groups in all the above-mentioned indices ($p < 0.001$).

Discussion

The results of the present study show the association between periodontal health and preterm labor.

The infectious nature of periodontal disease can affect the developing embryo directly or indirectly.

The inflammation process and the production of endotoxins induced by Gram-negative bacteria, as is the case in periodontal disease, lead to the production and release of cytokines and prostaglandins. Such factors, in sufficient amounts, can induce delivery [6,23].

For the first time, Offenbacher et al showed that the risk for a low birth weight infant was 7.5 times higher if there was more than 3-mm attachment loss in 60% of teeth surfaces [5]. Although their findings were confirmed in later studies by Moliterno et al [12], Dasanayake [24] and Radnai [25], there are some research which did not show such an association [16–20].

The difference in these results can be explained by different definitions of periodontitis, various methods used, and population study, which is one of the most important reasons [20,26].

In our study, probing depth was the most important index for periodontal health [6]. Since racial diversity can increase the risk of preterm labor—black women as a case in point [15], this variable was not a confounder in our study, because all the participants were white Iranians.

BI, DI and PD showed significant differences in the two groups. As these indices indicate periodontal health, it can be concluded that the control group had a better periodontal condition than the case group.

Although the frequency of brushing between the two groups did not show any differences, there was a significant difference between their debris indices.

As the debris on the tooth surface is controlled by oral hygiene and brushing, it can be deduced that the quality of brushing was different between the two groups, or the study population failed to provide a true answer to the question.

In this study, there were no significant differences in the frequencies of dental checkup between the two groups. Most of the prenatal dental visits were for emergency needs and not for oral hygiene checkups or treatment of periodontal disease. On the other hand, most of the mothers who had been informed about their periodontal disease by their dentist did not seek any kind of remedy, or the dentist failed to take the necessary measures because of a lack of information in this regard.

There were significant differences in periodontal health indices (PD, DI, and BI) between the two groups. On account that mothers with medical complications or risk factors for preterm labor were excluded from this study, it can be claimed, as already shown in some other studies [6,13,23–29], that periodontal disease may be a risk factor for preterm delivery.

As the results of this study could support the results of some previous investigations, it can be recommended that oral hygiene checkups (e.g. care, instruction) be considered as a prenatal care to prevent the undesired effects of gingival and periodontal diseases. It can be suggested that women be encouraged to receive any kind of periodontal treatment before pregnancy, if needed.

On the other hand, as it is a controversial theory among the researchers, it can be recommended that randomized controlled trials be designed (if possible) to verify the impact of different periodontal therapeutic phases before pregnancy on its duration and probable complications [30].

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