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Study on association of maternal periodontitis and preeclampsia

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Abstract

Background: The second most leading cause for maternal mortality is hypertensive disorder of pregnancy, which accounts for 15% of total deaths and still births. Preeclampsia is a complex disorder affecting about 5–10% of the obstetric population, resulting from deficient placental implantation during the first half of pregnancy and hypertensive disorders after 20th week of gestation in a previously normotensive woman. Periodontal diseases are plaque induced infections and pathological changes of the periodontium, divided into two categories: gingivitis and periodontitis. Preeclampsia and periodontitis have been found to be associated with high circulating levels of tumor necrosis factor-alpha (TNF- α), interleukin (IL)-10, and IL-6 resulting in inflammatory vascular damage leading to placental endothelial alterations. Periodontal microbiota plays a significant role in systemic diseases directly through a pro-inflammatory effect or indirectly through the host-mediated destruction. The similarities in their pathophysiology have led to the hypothesis of periodontal disease being a risk factor for preeclampsia.

Aim of the study: 1. The aim of the present study was to evaluate the association between maternal periodontitis and preeclampsia.

2. Also the association of periodontitis and preeclampsia after matching for primi Parity.

Materials and Methods: The present study was conducted at Institute of at Madras Medical College, Chennai Tamilnadu during the academic year 2017. The study was done in 200 patients for duration of 8 months. Participants were informed about the aims of the study and a written informed consent was obtained from them. An eligible sample was selected based on the following criteria.

Results: Of the 200 patients analysed 92 were found to have periodontitis, which accounts for 46% of study population. Out of the 92 patients having periodontitis 67 patients were preeclamptic.

The study showed no significant association between age, parity, socioeconomic status and place of residence to periodontitis. There is significant association between maternal periodontitis and preeclampsia.

Conclusion: Delaying treatment may result in more complex problems. Counseling should include reinforcement of routine oral health maintenance, such as limiting sugary foods and drinks, brushing twice a day with fluoridated toothpaste, flossing once daily, and dental visits twice a year. Dental providers often recommend the use of chlorhexidine and fluoridated mouth rinses, and xylitol-containing chewing gum to decrease oral bacteria. No adverse effects have been reported with these products during pregnancy.

Keywords: maternal, periodontitis, preeclampsia

Introduction

Diagnosis of periodontitis is established by inspecting the soft tissue around the teeth with a probe to determine the amount of bone loss around the teeth. Periodontal diseases are plaque induced infections and pathological changes of the periodontium, divided into two categories: gingivitis and periodontitis. Gingivitis, the mildest form of periodontal diseases, affects up to 90% of the population and manifests clinically as edema and erythema of the marginal gingiva. Gingivitis does not affect the underlying tooth anchoring structures (connective tissue and alveolar bone) and is readily reversible by effective tooth cleaning and oral hygiene home care. Inflammation that extends deeper into the supportive tissues and involves the periodontal ligament and alveolar bone is known as periodontitis. This apical extension of the inflammatory process results in progressive destruction of tooth anchoring collagen fibers and supportive bone structures and can clinically lead to the formation of deepened soft tissue pockets between the gingiva and the surface of the tooth. Once periodontal pockets are formed and colonised with bacteria, improving oral hygiene alone is no longer sufficient to reverse the inflammatory process. Intensive professional periodontal treatment, including supra and subgingival scaling and root planing (SRP) and surgical pocket elimination is necessary to restore periodontal health. Preeclampsia is a maternal multi-organ disease, clinically manifest during the second half of pregnancy by hypertension (systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure

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≥ 90 mmHg) with proteinuria (≥ 300 mg/24 hours or 2+ dipstick), often accompanied with varying dysfunction of major organs as the liver, the kidneys and the brain. It is one of the leading causes of maternal and foetal morbidity and mortality. Several factors have been implicated in the pathogenesis of preeclampsia, including genetic, immunologic, inflammatory, ethnic, socioeconomic and environmental factors, but till now the exact cause and pathogenesis are not fully clarified. The current leading hypothesis is that the pathological processes that underlie preeclampsia occur in two stages. Stage one starts with abnormal placentation and impaired vascular remodeling of the myometrial spiral arteries which supply the placental bed. This impaired remodeling is most likely the result of deficient trophoblast invasion into the myometrial arteries. The consequence is insufficient placental perfusion in the second half of pregnancy, when the increasing demands of the growing fetus can no longer be met and leading to placental oxidative stress and the release of various bioactive factors into the maternal circulation. These bioactive factors include inflammatory cytokines such as TNF- α and IL-6, as well as syncytiotrophoblast membrane microparticles (STBMs), which may challenge maternal inflammatory cells. They also include antiangiogenic factors such as soluble endoglin (sEng), the soluble form of the vascular endothelial growth factor (VEGF) receptor (sFlt-1) and placental growth factor (PlGF), which challenge the maternal vascular endothelium. This leads to stage two, endothelial dysfunction and an excessive inflammatory response leading to the maternal clinical features of the syndrome. Preeclampsia, therefore, is most likely the result of a generalised exacerbation of the inflammatory response, including activation of inflammatory cells and endothelial cells. Preeclampsia and periodontitis have been found to be associated with high circulating levels of tumor necrosis factor-alpha (TNF- α), interleukin (IL)-10, and IL-6 resulting in inflammatory vascular damage leading to placental endothelial alterations. Periodontal microbiota plays a significant role in systemic diseases directly through a pro-inflammatory effect or indirectly through the host-mediated destruction. The similarities in their pathophysiologies have led to the hypothesis of periodontal disease being a risk factor for preeclampsia.

Aim of the study

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Inclusion criteria

Women of age 18–35 years who gave birth to live infants in the hospital unit.

Exclusion criteria

- Women who gave birth to more than one infant in a single delivery;
- Those who had undergone *in vitro* fertilization;
- Those who were suffering from any systemic diseases before pregnancy,
- Those with history of placental, cervical, and/or uterine abnormalities;
- Those who had human immunodeficiency virus infection;
- Those who were on antibiotic prophylaxis for dental treatment;

Study design

During the study period, 200 women who were admitted in the obstetric department were analysed. Periodontal examination was performed 48 h after delivery, but before assessment of medical records to avoid the occurrence of bias. Intraoral examination was done with the help of artificial light source, mouth mirror, William's periodontal probe, and cotton pliers. The following clinical parameters were used to evaluate the clinical signs of inflammation and periodontal tissue destruction:

Gingival bleeding index

The gingival bleeding was determined dichotomously by gentle probing of the gingival crevice with the William's periodontal probe. The appearance of bleeding within 10 s indicated a positive score, which was expressed in percentage.

Probing pocket depth

The distance between the base of the pocket and the gingival margin was recorded for each individual tooth.

Clinical attachment level

This is determined by measuring the distance from the cemento-enamel junction to the probable base of the sulcus. Teeth were excluded if their cemento-enamel junction was not identifiable, with large undefined restorations, large carious lesions or fractures, or if they were erupting.

For the purpose of analysis, maternal periodontitis was defined as probing depth ≥ 4 mm and clinical attachment level (CAL) loss ≥ 3 mm at the same site in at least four teeth.

Women were diagnosed with preeclampsia if they had the following:

- Blood pressure $\geq 140/90$ mm Hg on two separate occasions after week 20 of gestation.
- Proteinuria defined as protein concentration ≥ 0.30 g/dl in 24 hours urine collection.

Supportive bone structures and can clinically lead to the formation of deepened soft tissue pockets between the gingiva and the surface of the tooth. Once periodontal pockets are formed and colonised with bacteria, improving oral hygiene alone is no longer sufficient to reverse the inflammatory process. Intensive professional periodontal treatment, including supra- and subgingival scaling and rootplaning (SRP) and surgical pocket elimination is necessary to restore periodontal health.

Results

Table 1: Patients with Periodontitis

Periodontitis	No. of Patients	Cases	Control	Percentage of PTS with Periodontitis
PRESENT	92	67	25	46
Absent	108	33	75	54
Total	200	100	100	100

Chi Square and Exact Measures of Association			
Test	Value	p-value(1-tail)	p-value (2-tail)
Uncorrected chi square	35.51	<0.0000001	<0.0000001
Type	Value	Lower, Upper	Type
CMLE Odds Ratio*	6.029	3.281, 11.31 ¹	Mid-P Exact

There is a statistical significance between preeclampsia and normotensive with respect to periodontitis prevalence. The Odds ratio is 6 Out of 200 patients analysed 92 patients were diagnosed to have periodontitis and severe. Which included mild, moderate and 108 patients were disease free. Out of 92 patients 67 patients had preeclampsia and periodontitis

Discussion

In the present study 200 patients were analysed for periodontitis out of which 100 were preeclamptic and other 100 kept as control were normotensive.

Age group of the study population was between 18-35years and majority of the patients were between the age of 18-25years. Study population were mostly from rural area and from class V socioeconomic status.

35% of study population had stopped schooling from middle standard.

Most of the study population were PIL1. Of the 200 patients analysed 92 were found to have periodontitis, which accounts for 46% of study population. Out of the 92 patients having periodontitis 67 patients were preeclamptic.

The study showed no significant association between age, parity, socioeconomic status and place of residence to periodontitis. There is significant association between maternal periodontitis and preeclampsia.

After matching for primiparity also there was significant association between periodontitis and preeclampsia.

This study shows a positive association between periodontitis and preeclampsia. Hence periodontitis may be considered as a risk factor for preeclampsia.

Conclusion

The present study showed significant association between periodontitis and preeclampsia.

In the study there was significant association between primiparity and Preeclampsia. But after matching for primiparity, maternal periodontitis still remained a significant factor in the preeclamptic group.

Comparison of preeclamptic group and normotensive group showed no significant risk association between maternal age, parity, socioeconomic status and area of residence.

In the present study, maternal periodontitis is associated with an elevated risk for preeclampsia. This finding is consistent with the findings of Boggess *et al.*, Canakci *et al.*, Contreras *et al.*, Cota *et al.*, and Siqueira *et al.*, and is contrary to the study findings of Khader *et al.* and Rai, who found no relation between maternal periodontitis and preeclampsia. The slight

variation in the present study could be related to biases introduced by sample size and heterogeneity of the criteria to define periodontitis.

The association between periodontitis and preeclampsia has been supported by the hypothesis that chronic periodontitis infection increases the risk of developing preeclampsia in pregnant women. The pathogenesis of periodontitis and preeclampsia is multifactorial and similar in many ways. So, periodontal treatment should be considered for reducing the risk of preeclampsia.

At the first prenatal visit, health care providers should assess a woman's oral health. A simple approach to prenatal assessment can be accomplished by using the questions provided here

1. Do you have swollen or bleeding gums, a toothache, problems eating or chewing food, or other problems in your mouth?
2. When was your last dental visit?

As part of routine counseling, health care providers should encourage all women to schedule a dental examination if it has been more than 6 months since their last examination or if they have any oral health problems. Patients often need reassurance that prevention, diagnosis, and treatment of oral conditions, including dental X-rays (with shielding of the abdomen and thyroid) and local anesthesia (Lidocaine with or without epinephrine), are safe during pregnancy. Conditions that require immediate treatment, such as extractions, root canals, and restoration (amalgam or composite) of untreated caries, may be managed at any time during pregnancy. Delaying treatment may result in more complex problems. Counseling should include reinforcement of routine oral health maintenance, such as limiting sugary foods and drinks, brushing twice a day with fluoridated toothpaste, flossing once daily, and dental visits twice a year. Dental providers often recommend the use of chlorhexidine and fluoridated mouth rinses, and xylitol-containing chewing gum to decrease oral bacteria. No adverse effects have been reported with these products during pregnancy.

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