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Periodontal disease and pre-term low birth weight: A systematic review article

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ABSTRACT

Introduction

Periodontal diseases are common among world population. Systemic conditions often are influenced by periodontal diseases. Recently there have been many studies that have associated periodontal diseases with adverse pregnancy outcomes. The various adverse outcomes include pregnancy gingivitis, preterm low birth weight, preeclempsia etc. Out of these preterm low birth weight poses a major threat to community health. PTLBW remains an alarming concern for health care providers.

Aim

The goal of this paper is to review the literature regarding periodontal diseases and pre-term low birth weight, and provide oral health care providers with resources to educate their patients.

Search design

The present literature review was based on findings extracted from online search of PMC indexed journals, Google scholar, MEDLINE and CINAHL databases from the year 2000 onwards.

Inclusion criteria

Only case-control studies written and published in English language were included. Study subjects with mean age from 15-45 years met the inclusion criteria.

Exclusion Criteria

Any case control study reported earlier to 2000 were excluded. Reports in languages other than English were excluded from the review. The search keywords were pregnancy gingivitis, periodontal disease, low birth weight, oral health, and preterm delivery.

Results

Of 300 articles, 10 studies with a total of 5358 participants with a mean age ranged from 15 to 45 years were met the inclusion criteria. The studies focused on preterm birth, low birth weight and /or preterm low birth weight and periodontitis. The findings from the selected case control studies were summarised in a tabulated form.

Conclusion

Periodontal disease is a high risk factor for preterm low birth weight babies. However, more precise studies with randomized clinical trial with long term follow-up period must be carried out to affirm the relationship between periodontitis and pre term low birth weight.

Keywords: Low birth weight, periodontal disease, Preterm birth, preeclampsia

INTRODUCTION

Periodontal diseases are one of the most common oral inflammatory diseases affecting world population. They are a group of inflammatory diseases that affect the periodontal attachment apparatus. Periodontal disease is initiated by overgrowth of certain bacterial species, with a majority of Gram-negative, anaerobic bacteria growing in sub gingival sites. The host response to periodontal pathogens causes persistent inflammation and the destruction of periodontal tissues that support teeth, leading to clinical manifestations of periodontal disease. In recent years, periodontal diseases have been associated with a number of systemic diseases such as rheumatoid arthritis, cardiovascular disease, diabetes mellitus, chronic respiratory diseases and adverse pregnancy outcomes including pre-term low birth weight (PTLBW) and pre-eclampsia [1]. Birthweight of "<2500g" finalized in 1976 as the definition of low-birth weight by 29th World health assembly. Preterm birth is defined as birth before 37weeks of gestation. PTLBW considered as significant cause of infant morbidity and mortality whereas, pre-eclampsia is the common disorder associated with PTLBW. Improving periodontal health before or during pregnancy may prevent or reduce the occurrences of these adverse pregnancy outcomes and, therefore, reduce the maternal and prenatal morbidity and mortality [2]. Hence, this article is an attempt to review the correlation between periodontal disease and adverse pregnancy outcome.

METHODS

Searching strategy and inclusion

An electronic database search for relevant case-controlled studies published in English was conducted from 2000-2018 on the following databases: PMC indexed journals, Google scholar, MEDLINE and CINAHL. The search keywords were pregnancy gingivitis, periodontal disease, low birth weight, oral health, and preterm delivery.

RESULTS

Search yield

The search from the databases and manual search from Google retrieved 300 articles, after removal of duplicates. A total of 10 articles were considered for the review (Table 1). The studies were conducted in five countries: US, Chile, Brazil, Turkey, and Iceland.

Table 1: Summary of Relevant Literature on Link between Maternal Periodontal Disease and Pre-term Low birth weight babies.

Author, Year	Country	Sample Size	Relevant Findings
1. Pitiphat/2006 [3]	United States	101 Women	C-reactive protein levels increases during pregnancy due to periodontal disease.
2. Lopez/2002 [4]	Chile	639 Women	Positive association between periodontal disease and pre-term low birth weight babies
3. Jeffcoat/2001 [5]	United States	1313 women	Positive association between periodontal disease and pre-term birth
4. Boggess/2005 [6]	United States	850 women	Periodontitis increases foetal inflammation and immune changes
5. Santo-Pereira/2007 [7]	Brazil	124 women	Periodontitis more prevalent in women who had preterm labour as compared to term labour.
6. Offenbacher/2006 [8]	United States	1020 women	Periodontitis serves as increased risk factor for preterm less than 32 weeks
7. Michalowicz BS/2006 [9]	United States	164 women	Prevalence of oral pathogens higher in women who had preterm labour.
8. Lopez/2005 [10]	Chile	870 women	Treatment significantly reduced PTLBW
9. Buduneli/2005 [11]	Turkey	181 women	PTB vs LBW No significant difference between cases and controls
10. Holbrook/2004 [12]	Iceland	96 women	No association was found between periodontal disease and PTLBW.

DISCUSSION

Primary predictors of spontaneous PTB are black race, young mother, domestic violence, low socio-economic status, stress or depression, cigarette smoking, cocaine or heroin use, low-body mass index, low maternal weight gain before pregnancy, previous preterm birth or second trimester pregnancy loss, previous induced abortion, family history/ inflammatory gene polymorphisms, chronic lung disease, chronic hypertension, diabetes, renal disease [9].

Secondary predictors of spontaneous preterm birth are no or inadequate prenatal care, in-vitro fertilization, low maternal weight gain late in pregnancy, iron-deficiency anemia, preeclampsia, elevated fetal fibronectin, α-fetoprotein, alkaline phosphatase, or granulocyte colony-stimulating factor (G-CSF), early contractions, vaginal bleeding in first or second trimester, short cervical length, bacterial vaginosis, especially early in pregnancy, chorioamnionitis, placental abruption, placenta previa, hydramniosis, pre-eclampsia, multiple fetuses [9].

Prevalence

In the United States, the rate of preterm birth among black women is twice as high, and the rate of recurrent preterm birth is four times as high, as the rate among white women.

Mechanism

Bacteria attack choriodecidual space by releasing exotoxins and endotoxins, they activates the fetal membranes and decidua to create a different number of cytokines, including tumor necrosis factor α, interleukin-1α (IL-1α), IL-1β, IL-6 and G-CSF.7-19 Furthermore, cytokines, exotoxins, and endootoxins stimulate prostaglandin synthesis and also initiate neutrophil chemotaxis, activation, and infiltration, reaching to the synthesis and release of metalloproteases. The prostaglandins initiate uterine contractions whereas the metalloproteases forcefully attack the chorioamniotic membranes, guiding to rupture. The metalloproteases also alter the collagen in the cervix [13].

Effects of Periodontal Therapy on Pregnancy Outcomes

Randomized controlled clinical trials testing the effects of periodontal therapy on the adverse outcomes of pregnancy have shown that scaling and root planning can lower the risk of preterm births in mothers who are infected by periodontitis. Periodontal intervention resulted in a significantly

decreased incidence for preterm delivery. Pregnancy without periodontal treatment was associated with significant increases in probing depths, plaque scores, GCF IL-1β, and GCF IL-6 levels. Intervention resulted in significant improvements in clinical status (attachment level, probing depth, plaque, gingivitis, and bleeding on probing scores) and significant decreases in levels of Prevotella nigrescens and Prevotella intermedia, serum IL-6sr, and GCF IL-1β.

Pitiphat et al [3] conducted a prospective study to determine if self-reported periodontitis was a risk factor for poor pregnancy outcomes. Women were enrolled prior to 22 weeks gestation and completed a self-report questionnaire during their second trimester. Demographic, medical and reproductive history, smoking, prepregnancy weight, and physical activity were assessed at the first prenatal visit. The self-reported questionnaire was validated by bitewing radiographs taken prior to delivery. The majority of the participants were white and middle class. Of the 354 participants who had bitewing radiographs available, the prevalence of self-reported periodontitis was 3.7%. It was noted that women who reported periodontitis had significantly higher mean radiographic bone loss than those that did not.

Jeffcoat at el [5] also established a positive association between periodontal disease and pre-term birth in a prospective study conducted on 1313 women.**Santos-Pereira et al** [7] studied 124 women between the ages of 15-40 to determine if chronic periodontitis increased the risk of experiencing preterm labor (PTL).

Offenbacher et al [5] conducted a prospective study of obstetric outcomes of over 1000 women who received an antepartum and postpartum periodontal examination. Moderate to severe periodontal infection was defined as 15 or more tooth sites with pockets depth greater than or equal to 4 mm. The incidence of increased periodontal pocketing, defined as clinical disease progression, was determined by comparing site-specific probing measurements between the antepartum and postpartum examinations. Treatment was safe, improved periodontal health, and prevented periodontal disease progression. Preliminary data show a 3.8-fold reduction in the rate of preterm delivery, a decrease in periodontal pathogen load, and a decrease in both GCF IL-1β and serum markers of IL-6 response.

A significant positive effect of non-surgical periodontal treatment of periodontal status and its beneficial impact on pregnancy outcomes in women diagnosed with gingivitis and periodontitis was demonstrated by **López et al**. [4, 10] However, it is important to emphasize that women presenting genitourinary infection during the period of the study were medicated with antibiotics. Another significant difference in the study was the use of 0.12% chlorhexidine daily mouth rinses during periodontal therapy.

In a case-control study, **Budeneli** and colleagues found no differences in periodontal infection between women who delivered preterm versus full term. However, women were at significantly increased risk for preterm birth if either P. gingivalis or C. rectus were found in the subgingival plaque [11].

Holbrook et al [12] however found no correlation between periodontitis and preterm low birth weight babies.

CONCLUSION

Periodontal disease is a high risk factor for preterm low birth weight babies. However, more precise studies with randomized clinical trial with long term follow-up period must be carried out to affirm the relationship between periodontitis and pre term low birth weight.

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