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Association between Maternal periodontitis and Infants with pre-term low birth weight

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Abstract

Introduction: Infants with pre-term low birth weight (PTB) has an important association with maternal periodontitis. This has a significant public health implication because it is responsible for a greater part of neonatal mortality and morbidity in both developed and developing countries.PTB is defined as a delivery that takes place before 37 weeks (<259 days) of gestation.

Aim: To summarise and compare the existing evidence of association between maternal periodontitis and infants with pre-term low birth weight.

Material and Methods: A comprehensive electronic search was performed from January 2000 to April 2023 for the studies published in the last 23 years (2000-2023) using the following data bases: PubMed, Google Scholar, EBSCO host to retrieve articles in English language. Appropriate key words and Medical Subject Heading (MeSH) Terms were selected and combined with Boolean operators like AND. Study Design included Observational studies, including case control studies and prospective cohort studies.

Results- Ten studies were included for qualitative synthesis and systemic analysis.All the studies evaluated the significant relationship between maternal periodontal disease and preterm birth and low birth weight and found a positive co-relation. A noticeable relationship between periodontal health and duration of pregnancy was noticed; periodontal disease could be a risk factor for preterm labour, low birth weight babies.

Conclusion- The results indicate that periodontitis of patients during pregnancy can be regarded an important risk factor for preterm birth and low birth weight.

Introduction

Pre-term low birth weight (PTB) is one of the leading adverse neonatal outcomes overall worldwide and has a significant public health implication because it is responsible for a greater part of neonatal mortality and morbidity in both developed and developing countries. According to the World Health Organization (WHO), PTB is defined as a delivery that takes place before 37 weeks (<259 days) of gestation.

Periodontitis is defined as the inflammation of the gums and bone surrounding our teeth, and usually infections are the causal aetiology behind it. In its early stage, it's called gingivitis, the gums can become swollen, red and bleed. In its more serious form, called periodontitis, the gums can pull away from the tooth, bone is lost, and the teeth may fall out. Periodontitis is mostly seen in adults and can a leading initiator and promotor of systemic diseases.

Recent findings have pointed towards 40% pregnant women having periodontitis. In 1996, Offenbacher et al. conducted a case-control study, suggesting that maternal PD could lead to a 7-fold increase in the risk of preterm LBW (PLBW). Moreover, it has been observed in animal models, that infection with Gram-negative periodontitis-associated micro-organisms may adversely affect pregnancy outcomes. As pointed out by Offenbacher et al, these findings have been shown potential significance to risk assessment of PLBW, to oral health care during pregnancy.

Analysis of literature has pointed towards various factors associated with preterm and/or low birth weight infants. Maternal risk factors include age, height, weight, socio-economic status, low maternal weight, ethnicity, smoking, alcohol, nutritional status, and stress. However, a significant proportion of low birth-weight is of unknown aetiology. Even after taking increased care to avoid these known risk factors which were identified in approximately one fourth of preterm low birth cases, there still has been a relatively small decrease in the proportion of preterm low birth weight leading to a continued search for other causes.

During pregnancy, 4 major hormones including Oestrogen, Progesterone, HCG and HCS are produced in large amounts. Most of the time, increase of these hormones may bring some changes in gingiva. Results of clinical studies prove that 30% to 100% of pregnant women suffer from gingivitis which can further lead to periodontitis. The increased level of progesterone and oestrogen in plasma during pregnancy can affect periodontal structure through interference in sub gingival micro flora composition, maternal immune system, and facilitates pro-inflammatory mediator production. Preterm birth (PTB) and Low birth weight (LBW) are considered a primary public health challenge and the most relevant biological determinant of new-borns' survival, both in developed and in developing countries. The importance of preterm birth and LBW not only comes from its capacity to predict increased risk of mortality and morbidity among infants born with this condition but it also reflects the mother's exposure to other risk factors such as unfavourable socio-economic conditions, malnutrition and diseases of the mother, among others as discussed above.

Premature births are among the leading causes of perinatal mortality and morbidity globally. Neonatal delivery before 37 weeks of gestation is the leading cause of low birth weight. Premature birth is the leading cause of neonatal mortality in low-income countries. Premature deliveries occurred in approximately 12.9 million births worldwide, representing around 9.6% of all births, although there are clear regional discrepancies. Specifically, African nations reported a higher incidence

of premature births (18%) followed by the United States (12–13%) and Europe (5–9%).

Other studies like the recent review of Puertas et al. (2018) documented evidence from several studies examining the possible link between periodontitis with premature birth. The study of Bobetsis et al. argued that, based on biological plausibility, periodontitis can contribute to premature birth through bacteraemia where toxins and their products derived from maternal periodontitis can reach the bloodstream and cause injury to the placenta unit and pass into the amniotic fluid, leading to chorio-amniotic infections, increasing the risk of premature birth. It has also been reported that the dissemination of local inflammation throughout the body may contribute to preterm low birth weight. Studies suggest that inflammation in periodontal tissues due to periodontitis increases secretion of different inflammatory cytokines, notably interleukin B (IL-1β), interleukin IL-6, interleukin 8 (IL-8), interleukin 17 (IL-17), and tumour necrosis factors alpha (TNF-α).

Other similar study done by Hill (1998) found that periodontal bacteria's have the potential to produce infection in the upper genital tract in pregnant women, causing preterm birth. Hill also found bacterial species of Fusobacterium nucleatum and Capnocytophaga in the amniotic fluid cultures in women with preterm labor. A randomized controlled trial done by lopez et al showed that periodontal therapy reduced the incidence of preterm and low birth weight in women with periodontal disease. However, Michalowicz et al revealed that periodontal therapy had no effect on the incidence of preterm birth.

As we have seen the association has not been consistent these inconsistencies could be explained by several factors as follows: (i) lack of a unified diagnostic standard for PD; (ii) the variety of definitions used for adverse pregnancy outcomes (APOs), such as PLBW, preterm or LBW, and preterm and/or LBW; (iii) confounding effect of the risk factors. There have been a few systematic reviews and meta-analyses on the relationship between PD and adverse neonatal outcomes so far. However, the heterogeneity of the previous studies still needs further exploration of confounding factors and more detailed subgroup analysis, and due to the publication of new data.

Study Design

The following focused research question in the Participants (P), Index Test (I), Reference standard (R) and Target condition (T) format was proposed: "Whether there was higher risk of preterm birth and/ or Low birth weight in the population of pregnant women with periodontal disease compared with the population of periodontal health pregnant women." Studies evaluated the markers of Clinical attachment loss (CAL), Periodontal probing depth (PPD), Bleeding index, Plaque index for diagnosis of Maternal Periodontitis and summarising the evidence between maternal periodontitis and infant low birth weight.

Eligibility Criteria

Inclusion- The inclusion criteria were as follows-

- **Study Design**-Observational studies, including case control studies and prospective cohort studies
- **Participant characteristics**- Women aged 18-35 who delivered infants premature. Maternal registers were checked in order to have case controls for the above cases. A case was defined as any delivery below 37 weeks and a case control were defined as of 37 weeks and above. Mothers with systemic conditions like malnutrition, alcohol dependent, stress etc were included as well.
- **Outcome measurements**-Comparison of prevalence of low birth weight and pre-term birth rate between

women with periodontitis and periodontal health controls

- Articles were complete and written in English.
- Articles published from 2000-2023 and available as free full text.

Exclusion

- Incomplete studies, unclear definition of cases and unavailable data.
- Non-clinical studies, in-vitro studies, and animal studies.
- Studies not fully available in database.
- Articles only reporting abstracts were also excluded.
- Studies not using PTB or LBW as independent observational outcomes separately.
- Languages other than English.

Search Protocol and Study Selection

A comprehensive electronic search was performed from January 2000 to April 2023 for the studies published in the last 23 years (2000-2023) using the following data bases: PubMed, Google Scholar, EBSCOhost to retrieve articles in English language. In addition to electronic search, a hand search was also made, and reference lists of the selected articles

Search Strategy

Appropriate key words and Medical Subject Heading (MeSH) Terms were selected and combined with Boolean operators like AND. The search strategy was as follows: (Periodontitis AND infant low birth weight), (Maternal periodontitis AND pre-term low birth weight), (Maternal Periodontitis AND premature births), (Periodontal disease AND low birth weight). The search and screening, according to the previously established protocol were conducted.

A two-phase selection of articles was conducted. In phase one, two reviewers titles and abstracts of all articles. Articles that did not meet the inclusion criteria were excluded. In phase-two, selected full articles were independently reviewed and screened by the same reviewers. Any disagreement was resolved by discussion. When mutual agreement between the two reviewer was not reached, a third reviewer was involved to make the final decision. The final selection was based on consensus among all authors.

Study Characteristics

As shown in Table 1, data was evaluated from ten studies, from an aggregate of total 15,621 women who were pregnant who were exposed with periodontal disease or non-exposed. All studies had study designs of randomized clinical trial. Among the included studies, Two studies were conducted in Iran, two studies conducted in Brazil, two studies conducted in India and one each from Malaysia, Poland, Taiwan, Rwanda. All the studies evaluated the significant relationship between maternal periodontal disease and preterm birth and low birth weight, whether it is an important risk factor and other factors. Majority of the studies used Women who delivered babies below 37 weeks of gestation and below 2,500 g, as the definition for Pre Term Low Birth Weight, with Clinical Attachment Loss, Pocket Probing Depth, Bleeding Index , and CPITN index for perinodal disease indicators in pregnant women. From the results, it was concluded that there is a noticeable relationship between periodontal health and duration of pregnancy; periodontal disease could be a risk factor for preterm labour, low birth weight babies, with the hypothesis needing further verification with more well-planned case control studies.

Descriptive Study Characteristics

Author	Year of Study	Country	Sample Size	Maternal Periodontitis	PTLBW Definition	Outcome Assessed	Conclusion
Relationship between maternal periodontal disease and birth of preterm low weight babies Renata Tolêdo Alves	2006	Brazil	The study population included 59 women (n = 25 □ group I: 3 mothers; group II: 22 mothers) and the Therezinha de Jesus maternity hospitals (n = 34 □ group I: 16 mothers; group II: 18 mothers), in Juiz de Fora, MG, Brazil.	Presence of Maternal periodontitis with Periodontitis and low birth babies-84.21	Women who delivered babies below 37 weeks of gestation and below 2,500 g.	Presence of Maternal periodontitis with Periodontitis and low birth babies-84.21 Presence of maternal periodontits without periodontis and normal weight babies is-62.50	Periodontal disease was an associated factor for birth of preterm low weight babies, among the 59 subjects studied, suggesting that an assessment of periodontal disease should be included in prenatal care programs
The association between maternal periodontitis and low birth weight infants among Malay women NorkhafizahSaddki, Norsa'adah Bachok, Nik Hazlina Nik Hussain, Siti Lailatul Akmar Zainudin, WihaskoroSosroseno	2008	Malaysia	Systematic random sampling for 250 subjects for each exposed and non-exposed group. Of 500 subjects enrolled in the study, 28 (5.6%) were lost. 472 subjects, 232 with periodontitis were in the exposed group and 240 with healthy periodontium were in the nonexposed group.	The incidence of LBW was 14.2% (95% CI: 9.70–18.75) in women with periodontitis.	Low birth weight has been defined by WHO as weight at birth of < 2500 grams (5.5 pounds)	The incidence of LBW was 14.2% (95% CI: 9.70–18.75) in women with periodontitis, and 3.3% (95% CI: 1.05–5.62) in women without periodontitis. The relative risk of having LBW infants was 4.27 times higher for women with periodontitis compared with those without periodontitis (95% CI: 2.01–9.04). An association was found between maternal periodontitis and	The results of this study provide additional evidence that pregnant women with periodontitis are at a significantly higher risk of delivering LBW infants.

						LBW (OR = 3.84; 95% CI: 1.34–11.05)	
The relationship between maternal periodontitis and preterm low birth weight: A case-control study Satheesh Mannem and Vijay K. Chava.	2011	India	134 healthy women were examined and 104 were selected and divided into 52 cases and 52 controls.	Plaque index (P<0.001 with an odds ratio 26.45) Bleeding index (P <0.001 with an odds ratio 4.21) Highly significant (P<0.0001) association between probing pocket depth and preterm low birth weight was consistent when using at least one site with (PPD) ≥4 mm and CAL ≥3 mm in at least 4 teeth.	Case defined as premature delivery (WHO 1950) occurring at less than 37 weeks of gestation, and is generally accompanied by low birth weight, i.e., a birth weight less than 2500 g.	Plaque index (cases 1.21±0.56; controls 0.63±0.31), Bleeding index (cases, 2.08±0.62; Controls, 1.52±0.61), Birth weight (cases, 2.01±0.36; controls 2.87±0.32), and Probing Pocket Depth (PPD) ≥4mm and Clinical Attachment Level (CAL) ≥3mm in at least 4 teeth (odds ratio 137.50, P value < 0.0001) revealed a statistically significant difference between the two groups P< 0.05).	A noticeable relationship between periodontal health and duration of pregnancy; periodontal disease could be a risk factor for preterm labor.
Periodontitis and risk of preterm birth and low birthweight--a meta-analysis Tomasz Konopka 1, Anna Paradowska-Stolarz	2012	Poland	The meta-analysis included 15 case-control studies, 1 cross-sectional study and 6 cohort studies. The essays came from 4 continents: 8 from Europe (including 2 from Poland), 7 from South America, 4 from North America, and 3 from Asia. The total analysis covered 12047 pregnant women.	For low birth weight, the overall OR was 1.5 (95% Cl: 1.26-1.79, p = 0.001) for premature births--2.73 (95% CI: 2.06-3.6, p < 0.0001).	Preterm infants are born at less than 37 weeks gestational age and low birth weight infants are born with a birth weight below 2.5kg regardless of gestational age	The total analysis covered 12047 pregnant women.The overall odds ratio of giving premature birth to a child with low weight for mothers with periodontitis in the model of random effects amounted to 2.35 (1.88-2.93, p < 0.0001). For low birth weight, the overall OR was 1.5 (95% Cl: 1.26-1.79, p = 0.001) for premature births--2.73 (95% CI: 2.06-3.6, p < 0.0001).	The hypothesis of periodontitis as an independent risk factor of preterm birth and/or low birth weight needs further verification. In order to achieve that, it is necessary to conduct more methodologically well-planned cohort and intervention studies.

Association between maternal periodontal disease and preterm delivery and low birth weight Yen-Li Wang, Jui-Der Liou, Whei-Lin Pan	2013	Taiwan	Final study group consisted of 211 women.	The rate of LBW was 7.3% (6/82) for HG (healthy group) women and 14.5% (9/62) for PG (periodontitis group)women and the difference was significant ($\chi 2$ = 15.345; p = 0.005). According to post hoc analysis, the mean infant weight was lower for PG than for HG women (p = 0.009). After Bonferroni correction, the p value should be <0.0167 (0.05/3) for a significant difference. Thus, the difference in infant birth weight between HG and PG women is significant. the infant birth weight significantly differed for PG and HG (p = 0.0096).	Preterm birth is defined as delivery at a gestational age < 37 weeks and is the main cause of low birth weight (LBW) in pregnancy outcomes	PG (Periodontitis group) women had a higher frequency of LBW (14.5%) than GG (Gingivitis group)women (3.0%) and the HG (Healthy group) women (7.3%). PG women had the highest PB frequency, followed by GG women. More severe periodontitis is indicative of a higher percentage of PB.	This study provides inadequate evidence to identify periodontal disease as a risk factor for preterm delivery. Conversely, the association between periodontal disease and LBW is significant. Differences between our results and those of previous studies may be due to population differences for both periodontal health and the incidence of PB or LBW.
Relationship between maternal periodontal disease and low birth weight babies Ahmad Haerian-Ardakani, Zia Eslami, Fahimeh Rashidi-Meibodi, Alireza Haerian, Pantea Dallalnejad, Marjan Shekari, Amir Moein Taghavi, and Solmaz Akbari.	2013	Iran	This was a case-control study. The sample included 88 ex-pregnant women.Half of the mothers had low birth babies (LBW) (birth weight below 2500g- case group) and the others had normal weight babies (>2500g- control group).	Percentage of the sextants diagnosed with periodontitis (CPITN grade III and IV) in women with LBW infants (case group) was 1.6 times more than the control group. The number of sites that had bleeding on probing was significant(p<0.0001, student's t test). The amount of supragingival calculus was also significant(p=0.007, student's t test). Among the LBW risk factors, only previous history of LBW babies was significantly higher in the case group (p=0.0081).	Low birth weight (LBW) babies, defined as babies having birth weights of less than 2500g, represented disproportionately large component of neonatal and infant mortality rates.	LBW infant among case mothers reached statistical significance (p=0.0081, Student t-test). Mothers of LBW infants had less healthy areas of gingiva (p=0.042), and more deep pockets (p=0.0006, Mann-Whitney test).	The maternal periodontal disease can be a potential independent risk factor for LBW.
Effect of maternal periodontitis and low birth weight—A case control study Luise Maria Souza, Simone Seixas da Cruz,	2015	Brazil	A case-control study was carried out on 951 mothers. The case group (n = 269) consisted of	Women who had at least four teeth with probing depth ≥4 mm and clinical attachment loss ≥3 mm, with bleeding on probing at the same site, were	Low birth weight is further categorized into very low birth weight (VLBW, <1500 g) and extremely low birth	The frequency of periodontitis was 16.4% (case group) and 17.4% (control group). Periodontitis did	The findings of this study showed no association between maternal periodontal disease and low birth weight, even after

Isaac Suzart Gomes-Filho, Mauricio Lima Barreto,Johelle Santana Passos-Soares, Soraya Castro Trindade, Ana Claudia Morais Godoy Figueiredo, Claudia Maria Coelho Alves,Julita Maria Freitas Coelho &Maria Isabel Pereira Vianna			mothers of newborns with birth weight <2500 g and a control group (n = 682) of mothers of newborns with birth weight ≥2500 g.	diagnosed with periodontitis. The frequency of periodontitis was 16.4% (case group)	weight (ELBW, <1000 g) [1]. Low birth weight is a result of preterm birth (PTB, short gestation <37 completed weeks).	not show an association with LBW (ORcrude = 0.92; 95% CI = 0.63–1.35), even after adjustment for the following confounders: maternal age, pre-gestational body mass index, number of pre-natal consultations, number of pregnancies, maternal schooling level, smoking habit during pregnancy and hypertension (ORadjusted = 1.00; 95% CI = 0.61–1.68)	appropriate adjustments for confounding factors.
The Relationship Between Maternal Periodontal Status of and Preterm and Low Birth Weight Infants in Iran: A Case Control Study Mohammad Reza Karimi, Jalaleddin H Hamissi, Simin RafieyanNaeini,and Mojgan Karimi	2015	Iran	This case-control study with 264 mothers in Qazvin, Iran over a period of 6 months.	58% of women in the primiparity subgroup under case group proved on personal oral health to control dental plaque (TN=1) and 39% were in need of learning oral health principles(TN=2). 3% of these women required more complicated treatments such as oral surgeries (TN=3)CPITN index, 58% of women included in the primiparity subgroup categorized under case group, were of code 1, and 27% were of code 2, 12% were of code 3 and 3% were of code 4. In multiparity subgroup categorized under case group, 24% were of code 1, 52% were of code 2, 15% were of code 3 and 9% were of code 4. Nine percent of mothers had	Preterm infants are born prior to completion of 37 weeks of gestation.	The mothers in the sample group with single delivery delivered 8 times low birth weight infants more than the mothers in the control group with single delivery. And also the mothers in the sample group with multiple deliveries; delivered 10 times low birth weight infants and 8 times premature infant more than the mothers in the control group.	More studies should be carried out in through preventing and treating periodontal diseases, expenses incurred due to preterm labor and low birth weight.

				babies with weights less than 2500gr at birth (LBW). 21% of mothers included in primiparity subgroup categorized under case group had babies with low weight at birth. In multiparity subgroup/control group, 3% of mothers had babies with low weight at birth, while18% of mothers included in multiparity subgroup categorized under case group had babies with low weight at birth, 12% of mothers had low birth weight pregnancy.			
A relationship between maternal periodontal disease and preterm low birth weight: A cross-sectional study Priya Vidhal, Sneha Puri, M.L. Bhongade.	2020	India	A total of 90 patients were evaluated for the present study. The test group consisted of 45 patients having preterm delivery and low birth weight infants. The control group consisted of 45 patients having full term delivery with normal birth weight infants.	45 were of test group. The mean DI, PBI, CAL, PPD, GR for test group it was 1.02, 1.07, 3.18, 2.36, and 1.14	Patients with labour before 37 completed weeks of pregnancy was considered preterm and/or if the weight of the newborn was ≤2499 gms were allocated to the test group.	The mean DI, PBI, CAL, PPD, GR for control group was 0.66, 0.51, 1.73, 2.44, and 0.37 respectively while for test group it was 1.02, 1.07, 3.18, 2.36, and 1.14 respectively. There was significantly greater mean Clinical Attachment Loss in the test group compared to control group.	Therefore, it can be concluded that there is a significant relationship between maternal periodontal disease and preterm birth and low birth weight
Assessing the association between periodontitis and premature birth: a case-control study Peace Uwambaye, Cyprien Munyanshongore, Stephen Rulisa, Harlan Shiau, Assuman Nuhu & Michael S. Kerr	2021	Rwanda	A total of 555 women in the postpartum period were enrolled in the study. Cases and controls were enrolled in a ratio of 1:2; each enrolled case of preterm birth was followed by 2 unmatched	The mean number of sextants with CPITN grade IV (or periodontitis) was significantly higher (p=0.0006 Mann-Whitney test) but the mean number of sextants with CPITN grade zero or healthy gingiva (p=0.042), grade I or mild gingivitis (p=0.002), grade II or established gingivitis	Neonatal delivery before 37 weeks of gestation is the leading cause of low birth weight	Women who had periodontitis had 6 times the odds of giving birth to premature birth infants compared to women who had no periodontitis (OR: 6.360, 95% CI 3.9, 10.4).	The study results indicate that periodontitis is strongly associated with premature birth

			control subjects that were next on the register and who delivered at term gestation. A total of 185 cases of preterm deliveries and 370 controls of term delivery were enrolled in the study.	(p<0.0001) was significantly higher in the control group The number of sites that had bleeding on probing was significantly higher in the case group (p<0.0001, student's t test). The amount of supragingival calculus was also significantly higher in the case group (p=0.007, student's t test). Among the LBW risk factors, only previous history of LBW babies was significantly higher in the case group (p=0.0081).			

Table 1: Showing Descriptive study characteristics.

Abbreviation

CAL-Clinical Attachment Loss

CI- Clinical Incidence

DI-Debris Index

ELBW-Extreme Low Birth Weight

GG-Gingivitis group

GR-Gingival Recession

HG-Healthy Group

LBW- Low Birth Weight

OR-Odds Ratio

PBI-Papillary Bleeding Index

PG-Periodontitis group

PPD- Pocket probing Depth

PTLBW-Pre Term Low Birth Weight

VLBW-Very Low Birth Weight

Discussion

The aim of this systemic review and meta-analysis is to summarise the existing evidence of the association between Maternal periodontitis and Infants with pre-term low birth weight. A total of 15,621 pregnant women from 10 eligible studies were included for review and analysis.

Majority of the studies point towards a strong co-relation between periodontal disease and associated increased risk of various adverse pregnancy outcomes such as preterm birth and low birth weight. Low birth weights include infants with less than 37 weeks of gestational weeks.

In the studies investigated, Plaque is indicated as a major risk factor for periodontal disease and low infant birth. As indicated by Satheesh Mannem et al, the Plaque index showed highly significant differences (P<0.001 with an odds ratio 26.45) in both cases and controls. This could be as, during pregnancy the oral microflora uses the progesterone and oestrogen hormones. Vitamin k growth factors and they form the plaque on the gingival and tooth surfaces.This is in agreement with several studies conducted in different population groups by Mohammad Rez et al.

Another, highly significant factor is the CPITN index and its co- relationship with low term infant pre-term birth weight. As demonstrated by Mohammad Reza et al,

there is a relation between CPITN and low birth weight and as the CPITN increases in degree, the birth weight decreases. As to CPITN index, 58% of women included in the primiparity subgroup categorized under case group, were of code 1, and 27% were of code 2, 12% were of code 3 and 3% were of code 4. The present study demonstrated a 42.22% prevalence of CPITN score 3, corresponding to shallow pockets. The mothers in the sample group with single delivery delivered 8 times low birth weight infants more than the mothers in the control group with single delivery. The mothers in the sample group with multiple deliveries; delivered 10 times low birth weight infants and 8 times premature infant more than the mothers in the control group. This is in agreement with studies conducted by Peace Uwambaye et al, and Ahmad Haerian-Ardakani et al.

Bleeding on probing, the most important factor associated with pregnancy outcome is gingival bleeding. Hormonal changes due to increased levels of oestrogen and progesterone during pregnancy have a special effect on chronic periodontitis (Salomon and Chung 1994).As the vascular permeability increases in the gingival tissue and as the circulating bacteria and their products can diffuse through tissues more readily than in normal health and finding may be explained by the fact that bleeding on probing has the strongest association with preterm birth. Such bleeding is present during active phase of periodontitis and means that the sulcular and/or pocket epithelium is no longer intact, being more permeable to lipopolysaccharides and other bacterial products. This factor is also seen in agreement with studies of Ahmad Haerian-Ardakani et al's study (bleeding on probing was significant ($p<0.0001$, student's t test), by Peace Uwambaye et al (bleeding on probing was significantly higher in the case group ($p<0.0001$, student's t test).

The above analysis findings are in agreement with several other studies that have supported the association between periodontitis and premature birth. Offenbacher et al, reported for the first time that there was a possible relationship between maternal periodontitis and delivery of a preterm infant where they reported that periodontitis during pregnancy could lead to seven times higher risk of premature birth. Lopez and his colleagues also assessed the risk of premature birth and low birth weight in women with periodontitis in the USA and found that pregnant women with periodontitis were at a higher risk of giving birth to premature infants with low birth weight. This is seen in correspondence with studies done by Renata Tolêdo Alves et al in Brazil, NorkhafizahSaddki et al in Malaysia, Satheesh Mannem et al in India, Ahmad Haerian-Ardakani et al in Iran, Mohammad Reza Karimi et al in Iran ,Priya Vidhale et al in India, and Peace Uwambaye et all in Rwanda.

Offenbacher et al suggested in 1996 that periodontal infection during pregnancy could lead to a sevenfold higher risk of Pre-term low birth weight. In a further 814 participants, Offenbacher et al again demonstrated that maternal periodontal infection was significantly associated with a higher prevalence of Pre-term low birth weight. Lopez et al found higher mean PD and CAL, a higher percentage of bleeding sites, higher units with redness, deeper PD (4-6 mm), and surfaces with plaque in women with PLBW infants. This is in agreement with this systemic review.

Although, there were some studies that were inconsistent with Offenbacher et Al'sresults , as well as Lopez. The study demonstrated that the hypothesis of periodontitis as an independent risk factor of preterm birth and/or low birth weight needs further verification. Tomasz Konopka et all carried out this analysis in Europe, North and South America and Asia and concluded that it is

necessary to conduct more methodologically well-planned cohort and intervention studies on this. This is in agreement with Luise Maria Souza et al study which found showed no association between maternal periodontal disease and low birth weight, even after appropriate adjustments.

Yen-Li Wang et al demonstrated in the study from Taiwan that there is no significant relationship found between periodontal disease and Pre-term birth, but the association between periodontal disease and Low birth weight is significant. This case highlighted the idiopathic adverse outcomes of adverse pregnancy outcomes. The case pool was limited to homogenous ethnicity and high socioeconomic status which may have resulted in the generalised results.

Based on these findings, periodontal infections in pregnant women can be viewed as a potential obstetric risk factor. The fact being periodontal infections are both preventable and readily treated, this study findings provide opportunities for intervention strategies to reduce the incidence of preterm low birth weight.

Generally speaking, the more intensive the periodontal disease is, the more probable preterm labour and low birth weight will be and a reverse relationship exists between the average birth weight and the intensity of periodontal infections.

Ideally, women should begin their pregnancy without periodontal infections, and they should be educated and motivated to maintain a high level of oral hygiene prior to and throughout pregnancy. However, if a periodontal infection is diagnosed at any time during pregnancy, the treatment should be administered as soon as possible to reduce the risk of PT/LBW.

Conclusion

The results indicate that periodontitis of patients during pregnancy can be regarded an important risk factor for preterm birth and low birth weight. The promotion of the early detection and treatments of periodontal disease in young women before and during pregnancy will be beneficial, especially for women at risk.

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