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Original Research Article

Periodontal disease and pregnancy outcome in low-risk pregnant women

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ABSTRACT

Background: Preterm delivery is an important cause of neonatal morbidity and mortality. Various infections in the pregnant mother may play a role. Periodontal disease in pregnancy is associated with preterm, low birth weight and small for gestational age neonates. The objective of this study was to correlate the association between periodontal disease and pregnancy outcome in low-risk pregnant women.
Methods: This was a prospective observational study from November 2019 to May 2021 at Ramaiah medical college and hospitals, Bengaluru. All pregnant women with gestational age <32 weeks and without any risk factors receiving antenatal care at Ramaiah hospitals were included.
Results: The study included 109 pregnant women without any risk factors. Periodontitis was found in 50.45%. The Plaque Index mean was 1.237 in cases and 0.844 in controls and was significant. Mean gingival index of cases was 1.282 and of control was 0.913. Nearly 94.5% of cases were having gingivitis and only 24.1% were having gingivitis in controls. The difference was significant. Preterm delivery was seen in 63.6% of cases and in 7.4% of controls which was significant. The birth weight of newborns was <2.5 kg in 69.1% in cases and 9.3% in controls which was significant.
Conclusions: Periodontal disease in pregnancy is an important risk factor for preterm delivery and low birth weight. Periodontal disease can be diagnosed by simple oral examination and can be treated. Early treatment in pregnancy leads to a successful outcome.

Keywords: Periodontal disease, Preterm, Low birth weight

INTRODUCTION

Preterm delivery and low birth weight are important causes of neonatal morbidity and mortality.[1] Maternal health is an important factor in influencing the outcome of pregnancy.[2] Periodontitis is an inflammatory disease affecting the supporting tissues of the tooth.[2] The pathognomic sign of periodontitis is the formation of periodontal pocket. The other signs are gingival bleeding, recession of gingiva, tooth mobility, bone loss and halitosis.[2]

Although, the exact cause of preterm delivery is not known, increasing evidence show that various infections play a role.[3] Periodontal disease has been suggested to be associated with preterm, low birth weight and small for gestational age neonates.[4]

Epidemiological, microbiological and immunological studies have led to the concept that periodontal disease might be a separate risk factor for cardiovascular, cerebrovascular and respiratory disease as well as preterm delivery and low birth weight infants.[5,17-19]

The potential effect of periodontal disease is due to the translocation of periodontal pathogens to the fetoplacental unit and the effect of the inflammatory mediators such as the interleukin-1, interleukin-6, interleukin-8, tumor necrosis factor α (TNF-α) or prostaglandin E2 (PGE2) on the fetoplacental unit.[6]

Periodontal disease represents a previously unrecognised risk factor for low birth weight due to consequence of preterm labour or preterm premature rupture of membranes (PPROM).[7] Most of the studies showed reduction in preterm birth after periodontal treatment.

A crucial factor is the timing of intervention in periodontal disease. Intervention in the second trimester would be too late as periodontal bacteria would have reached the fetoplacental unit. It is beneficial if therapy is done during the preconception period.[8]

Preconception periodontal disease treatment can be more intensive compared to periodontal disease during pregnancy.[9] Preterm and low birth weight was 2.14% after treating periodontal disease and in controls it was 6.7%.[9]

The main periodontal symptoms in pregnancy like swelling and bleeding and these may be due to hormonal changes and not due to periodontal disease. The dental team should educate the patients about the benefits of good oral hygiene and to maintain a good standard for oral health. In a study by Tettamanti et al, they found no relation between preterm delivery and maternal periodontitis.[10]

Periodontal disease is caused by gram negative, anaerobic and microaerophilic bacteria that colonize the subgingival area.[11]

Plaque index (0-5) based on the presence and distribution of plaque in the fissures and over the occlusal surfaces of permanent molars and premolar teeth. Two of the six possible surfaces to be calculated. Gingival index scores each site on a (0-3) scale, with 0 being normal and 3 being severe inflammation characterized by edema, redness, swelling and spontaneous bleeding

Objectives

Objectives were to study the association between periodontal disease and pregnancy outcome in low-risk pregnant women.

METHODS

This was a prospective observational study done at the department of obstetrics and gynecology, Ramaiah medical college and hospitals from November 2019 to May 2021. All pregnant women with gestational age less than 32 weeks and without any risk factors were included in the study. A total of 109 subjects were included in the study. Pregnant women were screened clinically for periodontitis. Out of 109 subjects, 55 subjects had periodontitis and 54 pregnant women who did not have periodontitis were taken as controls.

Inclusion criteria

All pregnant women between 18-35 years booked in our hospital with singleton pregnancy and gestational age of <32 weeks were included. They were included after confirming that they will come for follow up till the delivery.

Exclusion criteria

All pregnant women with the age of <18 years and >35 years were excluded. Those with previous h/o preterm delivery, pregnancy complicated by anemia, pre-eclampsia and diabetes, multiple gestation, with tobacco/ alcohol addiction were excluded.

Statistical analysis

All the quantitative variables such as age was summarised using descriptive statistics such as mean and standard deviation. All the qualitative variables like periodontal status, perinatal outcome was summarized using frequency and percentage (Odd's ratio with 95 percentage confidence interval was used for each pregnancy outcome). Chi square test was used to find the association between various pregnancy outcome and the periodontal disease.

RESULTS

During the period, a total of 109 pregnant women were included, 55 were identified with periodontitis and 54 were taken as control without periodontitis. In our study, the mean age of cases was 26.47±3.94 years and control were 27.01±3.65 years (Table 1).

In this study, education, job, income of the subjects and spouses were analysed in both case and control and there was no significant statistical difference.

In the study group, primigravidae were 52.7 percentage and multigravidae were 47.3 percentage. In controls primigravidae were 40.7 percentage and multigravidae were 59.3 percentage.

The mean plaque index of cases was 1.237 and 0.844 in controls. By applying student unpaired t test the difference was statistically significant ($p<0.001$). Mean gingival index of cases was 1.282 and 0.913 in controls ($p<0.001$). The mean bleeding on probing was seen in 1.281 cases and 0.806 in controls ($p<0.001$) and was statistically significant (Table 2).

Gingivitis was seen in 94.5% of cases and 24.1% of controls which was statistically significant ($p<0.001$). In cases, 63.6% had preterm delivery and in controls only 7.4% had preterm delivery. This was statistically significant with $p<0.001$ (Table 3).

About 69.1 percentage of the cases had low birth weight infants compared to 9.3 percentage of controls (p value of <0.001) and this was statistically significant (Table 4). In 49.1 percentage of cases, the newborns needed neonatal intensive care unit admission compared to the 33.3 percentage of controls.

Table 1: Demography.

Age (In years)	Cases		Controls		X^2	P value
	N	%	N	%		
<25	24	43.6	23	42.6	0.325	0.85
25-30	21	38.2	23	42.6		
≥30	10	18.2	8	14.2		
Total	55	100.0	54	100.0		
Mean±SD	26.476±3.948		27.019±3.657			

Table 2: Comparison of various parameters between cases and controls.

Variables	Cases		Controls		T	P value
	Mean	SD	Mean	SD		
Plaque index	1.237	0.348	0.844	0.291	6.351	<0.001
Gingival index	1.282	0.400	0.913	0.312	5.291	<0.001
Bleeding on probing	1.281	0.318	0.806	0.328	7.379	<0.001

Table 3: Comparison of gestational age at delivery among cases and controls.

Gestational age	Cases		Controls		X^2	P value
	N	%	N	%		
Preterm	35	63.6	4	7.4	37.492	<0.001
Term	20	36.4	50	92.6		
Total	55	100.0	54	100.0		
OR	21.875	95% CI	6.877-69.852			

Table 4: Comparison of birth weight between cases and controls.

Birth weight (kg)	Cases		Controls		X^2	P value
	N	%	N	%		
<2.5	38	69.1	5	9.3	40.825	<0.001
≥2.5	17	30.9	49	90.7		
Total	55	100.0	54	100.0		
Mean±SD	2.395±0.454		3.015±0.38		OR=21.906 (7.414-64.725)	

DISCUSSION

There is a strong association between periodontal disease and adverse outcome of pregnancy.[1] Periodontitis is an inflammatory disease affecting the supporting tissues of the tooth.[2] In pregnancy, there is increased susceptibility to inflammation and increased bleeding on gingival probing and gingivitis.[2] The relationship between periodontal disease and preterm birth are explained by three hypotheses.

The first hypothesis is that the oral bacteria spread through the systemic circulation to the amniotic fluid and cause chorioamniotic infection resulting in preterm labour.[2]

The pathological mechanism of the perioral pathogen shows that it could infect syncytiotrophoblast, chorionic trophoblast and amniotic epithelial cells and promote inflammatory process.[2]

The second theory is that the hematogenous spread of inflammatory products released during the course of periodontal disease by host to counteract these pathogens may be responsible for preterm birth.[2]

The third hypothesis highlights the role of genetic and immune factors linking periodontal disease and preterm birth.[2]

In our study, the prevalence of periodontitis in pregnancy was 50.45%. This is similar to the study by Marianna et al and they have reported the prevalence as 47%.[4] In a similar study Priyanka et al has reported as 11.4%.[1]

In our study the incidence of preterm delivery was 63.6% in cases and 7.4% in controls. Priyanka et al reported incidence of preterm delivery as 33.3% in cases and 17.8% in controls.[1] Davenport et al did not detect any association between periodontitis and preterm birth.[22] In a similar study by Jacob et al the incidence of preterm birth was 48.2% in cases and 14.1% in controls.[13]

In our study the low birth weight of newborn (<2.5 kg) was seen in 69.1% of cases and 9.3% of controls. In a similar study by Priyanka et al low birth weight was seen in 40% in cases and 24.4% of controls.[1] Lopez et al also reported low birth weight of the newborn to be more in cases than controls.[16] In a similar study by Lewis et al the incidence of low birth weight was 18.9% in cases and 13.5% in controls.[21]

In our study 49.1% of newborn needed NICU admission in the case group and in the control group 33.3% required NICU admission. In the study by Priyanka et al the NICU admission was 26.7% in cases and 15.6% in controls.[1]

During pregnancy, periodontal tissue show an enhanced inflammatory response to plaque microbiome and is thought to be mediated by female sex hormones.[12] A full mouth inspection gives a clearer image of periodontitis.[13] The progression of periodontal destruction was associated with an increase in the prostaglandin E2 in the gingival fluid.[13] This will lead to local production of cytokines in the periodontal pocket and also in the amniotic fluid.[13] Although low birth weight babies account for 6-7% of all births, they account for 60-70% of neonatal deaths.[14]

Periodontal disease is one of the common condition responsible for chronic inflammatory challenge in the body.[14] Offenbacher et al reported that mothers of preterm babies had worse periodontal disease.[15]

Dasanayake et al reported that mothers who had severe gingivitis gave birth to preterm, low birth weight infants compared to mothers who delivered at term.[20]

Limitations

The number of cases were limited and study was conducted for a short period.

CONCLUSION

Periodontal disease in pregnancy is an important risk factor for preterm delivery and low birth weight babies. Periodontal infections cause inflammatory response in the host at local and systemic level. The hormone changes during pregnancy promotes an inflammatory response and increases the risk of gingivitis and periodontitis.

Periodontal disease can be diagnosed by simple oral examination. The disease can be treated easily, thereby complications can be prevented. Early treatment in pregnancy can prevent complications and lead to a successful outcome.

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