

**Effect of Periodontal Status on Pregnancy Outcome: A Randomised Control Trial**

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**Abstract**

**Background:** Periodontal disease during pregnancy is associated with an increased risk of preterm low birth weight of the baby. We studied the effect of nonsurgical periodontal treatment on periodontitis related adverse pregnancy outcomes.

**Aim:** This study was conducted to assess the effect of periodontal status on pregnancy outcomes.

**Settings and Design:** A randomised controlled trial was conducted on pregnant women visiting the Department of Obstetrics & Gynaecology, Yenepoya Medical College and Hospital, Mangalore.

**Method and Material:** Periodontal status was assessed using Community Periodontal Index (CPI) before and after intervention in 1<sup>st</sup> and 3<sup>rd</sup> trimester of pregnancy. The total sample was randomly divided into 2 groups with group I receiving oral health education and group II receiving oral health education and oral prophylaxis during 2<sup>nd</sup> trimester of pregnancy.

**Statistical Analysis:** Spearman’s correlation was used to assess the correlation between the periodontal status and the pregnancy outcomes.

**Result:** Periodontal status among pregnant women improved significantly in 3<sup>rd</sup> trimester when compared to 1<sup>st</sup> trimester of group II than group I.

**Conclusion:** Oral health education with oral prophylaxis was found to be more effective. There was no significant correlation between periodontal status, preterm birth and gestational age of the babies whereas there was significant correlation between the periodontal status and birth weight (BW) of babies in both the groups.

**Keywords:** Periodontitis, health education, oral prophylaxis, pregnancy outcome.

### Introduction

The relationship between oral infection and systemic diseases are mostly related to periodontal disease which is caused by bacteria found in dental plaque. About ten species have been identified as putative pathogens in periodontitis, mainly gram-negative rods like *Aggregatibacter actinomycetemcomitans*, *porphyromonas gingivalis*, and *bacteroides forsythus*. Periodontitis exhibit gingival inflammation and destruction of periodontal ligament and alveolar bone which leads to bone loss and apical migration of the junctional epithelium, resulting in the formation of periodontal pockets.<sup>1</sup> Page proposed that periodontitis affects the host's susceptibility to systemic disease in three ways: by shared risk factors, by subgingival biofilms acting as reservoirs of gram-negative bacteria and periodontium acting as a reservoir of inflammatory mediators<sup>2</sup>.

Pregnancy is characterized by complex physical and physiological changes that have a significant impact on almost every organ system of the body. Pregnancy associated gingivitis causes severe gingival inflammation since it is correlated with sex steroid hormone levels<sup>1</sup>. Evidence shows that some periodontal

pathogens can cross the placental barrier and produce infection in foetal membranes. *Prevotella intermedia* are found at high concentrations in pregnancy-associated gingivitis and was significantly higher in preterm neonates<sup>3</sup>.

The gram-negative bacteria associated with periodontitis produces variety of bioactive molecules like lipopolysaccharides that activates macrophages and other cells to synthesize and secrete a wide array of molecules, including cytokines il-1 $\beta$ , tumour necrotising factor- $\alpha$  (TNF- $\alpha$ ), prostaglandin E<sub>2</sub> (PGE<sub>2</sub>) and matrix metalloproteinases. They escape into general circulation, cross placental barrier and augment the physiologic levels of PGE<sub>2</sub> and TNF- $\alpha$  in the amniotic fluid which induce premature labor.<sup>4</sup>

The incidence of preterm delivery and low birth weight (LBW) has not decreased significantly over the last decade and remains at about 10% of all live births in the US.<sup>5</sup> In 2013, almost 16% of babies born globally had LBW, according to the UNICEF. South Asia had highest incidence of LBW (<2.5 kg) with India (28%) having 3<sup>rd</sup> highest percentage behind Mauritania (35%), Pakistan and Yemen (32% each).<sup>6</sup> compared to normal BW infants. LBW infants are more likely to die during the neonatal period and survivors face neurodevelopment disturbances, respiratory problems congenital anomalies, behavioral abnormalities as preschoolers and may have attention deficit hyperactivity disorder.<sup>5</sup>

Oral health is essential to overall health in the prenatal period. Pregnancy is not a time to delay dental care. Interventions to provide periodontal treatment at the time of pregnancy yield consistent results like reducing adverse pregnancy outcomes. Few studies have been conducted in this regard. Therefore a study was conducted on pregnant women to evaluate the effect of

health education and oral prophylaxis on the periodontal status and pregnancy outcomes.

### Material And Methods

This was a randomised controlled trial conducted from October 2016 to September 2017. Pregnant women who were  $\geq 18$  years of age without any systemic conditions in the 1<sup>st</sup> trimester of pregnancy (9<sup>th</sup> -12<sup>th</sup> week of pregnancy) with confirmed singleton gestation visiting Department of Obstetrics & Gynaecology, Yenepoya Medical College and Hospital, Mangalore during the 1<sup>st</sup> 3 months of the study period were assessed for periodontal status using CPI. Pregnant women who had a CPI score  $\geq 3$  and LOA =1 were included in the study. Patients on antibiotics or corticosteroids therapy, who have undergone periodontal treatment within 6 months prior to study or with history of infertility or assisted reproductive technology were excluded. The ethical approval was obtained from the Yenepoya University Ethics Committee (Protocol no: 252/2015) and the trial was registered retrospectively under Clinical Trial Registry – India (CTRI/2017/10/010033). Written consent was obtained from each patient.

#### 1<sup>st</sup> trimester of pregnancy

We recruited 176 pregnant women out of which 26 were excluded. This left 150 eligible for randomization [Figure 1]. They were randomly divided into 2 groups using computer generated random numbers (Quickcals, GraphPad Scientific Software)<sup>7</sup>. To conceal the allocation of study participants Sequentially Numbered Sealed Opaque Envelope was used. Only the study participants were blinded.

#### 2<sup>nd</sup> trimester of pregnancy

Group I: Received oral health education including brushing techniques (modified bass technique), flossing technique (holding 18 inches of floss wound around

both middle fingers tightly between the thumbs and forefingers and gently inserting it between the teeth, Curving the floss to “C” shape by pressing it against the side of the tooth and rub the floss gently up and down) and importance of oral health care during pregnancy. A sequentially arranged series of laminated pictures demonstrating the tooth brushing and flossing technique was shown to the participants and was also demonstrated on a study cast.

Group II: Received oral health education including brushing techniques, flossing technique, importance of oral health care during pregnancy and oral prophylaxis.

#### 3<sup>rd</sup> trimester of pregnancy

The periodontal status was again assessed using CPI (after 3 months of intervention). Pregnancy outcomes including the delivery time (DT), BW were assessed from medical records at the time of delivery.

DT were categorised according to WHO as Normal =  $\geq 37$  weeks, Moderate to late preterm = 32 to <37 weeks, Very preterm = 28 to <32 weeks and Extremely preterm delivery = < 28 weeks.

Premature infants were classified by weight independent of GA<sup>8</sup> as Low birth weight (LBW) <2,500 g, Very low birth weight (VLBW) <1,500 g and Extremely low birth weight (ELBW) <1,000 g.

The Baby Infant Growth Chart Calculator (according to the WHO Child Growth Standards<sup>9</sup>) was used for calculation of the baby weight percentile which is used to classify the babies according to GA<sup>8</sup> as follows: Small for gestational age (SGA): Weight <10th percentile, Appropriate for gestational age (AGA): Weight 10-90th percentile and Large for gestational age (LGA): Weight >90th percentile.

#### Statistics

The adjusted mean was calculated by IBM SPSS statistics for Windows, version 22.0 (IBM Corp,

Armont, NY, USA). Fisher's Exact test was used to compare the periodontal status within the group and spearman's correlation test assessed the correlation between the periodontitis and pregnancy outcomes. A p value <0.05 was considered statistically significant.

### Results

Among the 150 participants, 75 were randomly included in group I and 75 in group II. The Normality tests Kolmogorov–Smirnov and Shapiro–Wilks tests results revealed that the data was not normally distributed. Therefore, to analyze the data non-parametric methods were applied. Multinomial logistic regression analysis was done to assess the association of periodontal status with pregnancy outcomes.

In group I, mean highest CPI scores decreased from 3.42 to 3.02 and LOA increased to 1.2 from 1.14 before and after intervention. In group II, mean highest CPI scores decreased from 3.44 to 0.90 and LOA level from 1.57 to 0.97 before and after intervention. [Figure 2 and Figure 3]. There was no significant difference between group I and II while comparing the pregnancy outcomes. [Table 1]. Spearman's correlation showed significant correlation between pre intervention LOA level and BW ( $p=0.02$ ), post intervention LOA and BW ( $p=0.03$ ) among participants in group I. [Table 2]. The multinomial regression analysis did not show any significant association between the pregnancy outcomes with CPI scores and LOA before and after intervention in group I and II.

### Discussion

Oral health is an integral part of general health and essential for overall well being. In this study CPI identified actual and potential problems posed by periodontal disease which is consistent with study conducted by Offenbacher et al<sup>10</sup> and Lopez et al<sup>11</sup>.

LOA scores also gives an estimate of lifetime accumulated destruction of periodontium. This standardised screening distinguished participants with healthy periodontium, gingivitis and periodontitis. The design and the random allocation to the intervention groups ensured that there is no selection bias.

In this study, there was no much significant difference in the highest CPI score and LOA before and after intervention among group I who received oral health education this because of lack interest in incorporating the proper oral hygiene practices in day to day life.

Among group II, there was significant improvement in highest CPI and LOA levels before and after intervention. This is in consistency with Michalowicz BS et al<sup>12</sup>, Tarannum F et al<sup>13</sup>. Oral prophylaxis stops the progression of gingivitis and periodontitis as it removes the plaque and calculus responsible for adhesion of microorganisms.

While comparing the adverse pregnancy outcomes like preterm delivery, low birth weight of the baby and small gestational age of babies between group I and II, there was no significant difference found which may be due to existence of multiple risk factors other than periodontitis like ascending urinary tract infection or preeclampsia.

Study conducted by Offenbacher S et al<sup>14</sup> showed that incidence of preterm birth and SGA was 11.2% among periodontally healthy women, compared with 28.6% severe periodontal disease. Jeffcoat et al.<sup>15</sup> found that risk of preterm delivery and SGA baby was 4 to 7 times greater for women with generalized periodontitis even after providing nonsurgical periodontal therapy.

Systematic analysis conducted by Xiong X et al<sup>16</sup> showed that periodontal disease is correlated with LBW. Glesse and Saba-Chujfi<sup>17</sup> demonstrated a 12-fold

increase in delivering a LBW baby by a woman with severe gingivitis or generalized periodontitis.

Davenport et al<sup>18</sup> ruled out association of maternal periodontal status and delivery of premature LBW babies with SGA and Mitchell-Lewis et al<sup>19</sup> reported that periodontitis had no significant effect on having full term or preterm infants. A meta-analysis by Chambrone et al<sup>20</sup> conversely showed significant risk of preterm delivery for women with periodontitis

Although periodontal disease has been suggested as an important risk factor for adverse pregnancy outcomes, recent studies failed to find this association. This pose a question if active periodontal treatment during pregnancy would contribute to a decrease in the rates of premature LBW babies. This can be attributed to the existence of multiple risk factors like maternal height and weight, age <15 years or >39 years, low economic and educational level, stress, anxiety, excess of physical

activity, smoking, alcohol or drugs abuse, absence of antenatal care, number of previous children born alive, number of previous abortion, late abortion for preterm LBW babies other than periodontitis.

This present study had limitations. Multiple risk factors for preterm birth or LBW, many of which are common to periodontal disease were not considered and pregnant women with healthy periodontium gingivitis were not included for comparison. With these limitations, the results cannot be generalised among pregnant women with healthy periodontium.

A large sample size can be considered in future studies considering other recognised risk factors to investigate the influence of periodontitis on pregnancy outcomes.

Table 1: Comparison of pregnancy outcomes between group I and II.

Pregnancy outcomes		Groups		Total N (%)	Fisher's Exact test
		Group I N (%)	Group II N (%)		p-value
DT (weeks)	Normal	54(72.0%)	64(85.3%)	118(78.7%)	0.11
	Extremely preterm	3(4.0%)	2(2.7%)	5(3.3%)	
	Very preterm	7(9.3%)	1(1.3%)	8(5.3%)	
	Moderate to late preterm	11(14.7%)	8(10.7%)	19(12.7%)	
BW(kg)	Normal	52(69.3%)	61(81.3%)	113(75.3%)	0.09
	LBW	20(26.7%)	9(12.0%)	29(19.3%)	
	VLBW	1(1.3%)	3(4.0%)	4(2.7%)	
	ELBW	2(2.7%)	2(2.7%)	4(2.7%)	
GA	AGA	40(53.3%)	52(69.3%)	92(61.3%)	0.10
	SGA	33(44.0%)	20(26.7%)	53(35.3%)	
	LGA	2(2.7%)	3(4.0%)	5(3.3%)	

Table 2: Correlation between periodontal status and the pregnancy outcome in group I and II.

		Group I		Group II	
Correlation		Rho	p-value	rho	p-value
Pre-I CPI	DT	-0.12	0.32	-0.14	0.22
	BW	0.11	0.34	-0.07	0.58
	GA	-0.01	0.48	-0.01	0.92
Pre-I LOA	DT	-0.06	0.59	-0.10	0.38
	BW	0.26	0.02*	-0.06	0.64
	GA	0.15	0.21	-0.02	0.87
Post-I CPI	DT	0.04	0.71	-0.03	0.77
	BW	0.12	0.33	0.01	0.94
	GA	0.03	0.83	-0.05	0.64
Post-I LOA	DT	0.08	0.48	0.03	0.80
	BW	0.25	0.03*	0.12	0.29
	GA	0.07	0.56	-0.05	0.66

Spearman's correlation; \*p<0.05 statistically significant, Pre-I: pre-intervention, Post-I: post-intervention

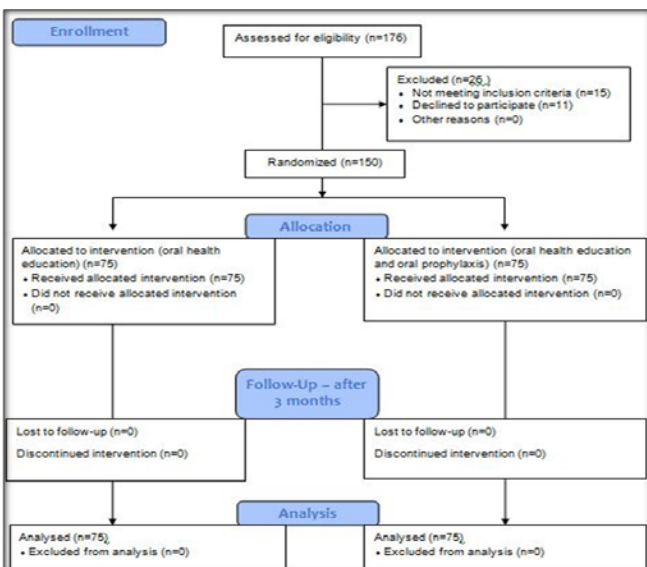


Figure 1: Diagram showing the flow of participants through each stage of the trial

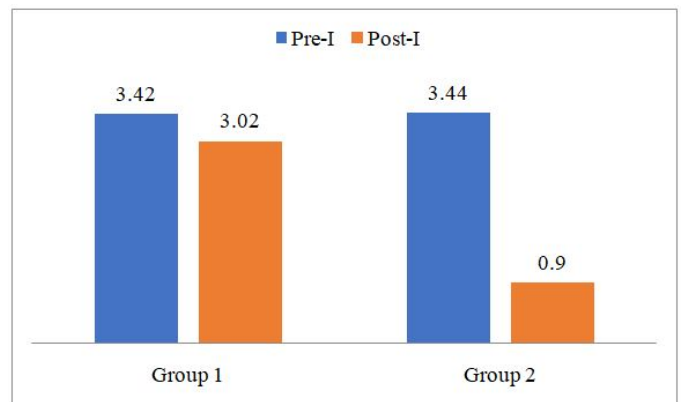


Figure 2: Comparison of mean CPI score of participants before and after intervention



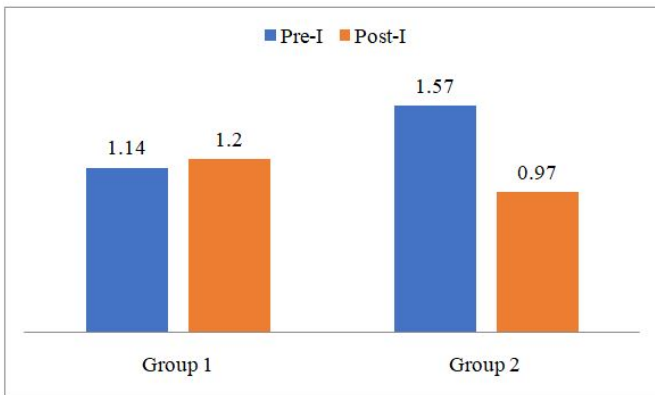


Figure 3: Comparison of mean LOA levels of participants before and after intervention.

### Conclusion

Periodontal status improved significantly in 3<sup>rd</sup> trimester than in 1<sup>st</sup> trimester among group II compared to group 1. Oral health education with oral prophylaxis was found to be more effective. Women should be educated and motivated to maintain a high level of oral hygiene throughout pregnancy. However, if a periodontal infection is diagnosed during pregnancy, the treatment should be administered immediately to reduce the risk of adverse pregnancy outcomes.

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