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Periodontitis: A Risk Factor for Adverse Pregnancy Outcome?

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ABSTRACT:-

To assess if there is any change in pregnancy outcome and incidence of preterm low birth weight babies (PLBW) when the non surgical periodontal therapy was done during the 3rd trimester of pregnant ladies having chronic periodontitis. Total 60 subjects were selected, of which 30 had normal periodontal health constituting Group I, and another 30 patients had moderate to advanced periodontitis, out of which 15 underwent non – surgical periodontal therapy constituted Group II A and the remaining 15 who refused for non – surgical periodontal therapy constituted Group II B. Within 1 hour of parturition the weight of the newborn was recorded in all the groups. The gestation age was recorded for the subjects. Serum CRP level and periodontal health status were also recorded within 48 hours of delivery. In Group I & group II the mean birth weight was 3.02 ± 0.39 Kg and 2.45 ± 0.30 Kg respectively. Group II B had a mean weight of 2.05 ± 0.49 Kg. On analysis of GP II A to that of Group I it was statistically significant ($p<0.001$). Also, on comparing Group I it was statistically significant ($p<0.001$). On comparison of birth weight of Group II A & Group II B statistically significant results were obtained ($p<0.05$). Pregnant women with periodontitis who were treated by non surgical periodontal therapy when compared to pregnant women with periodontitis not receiving non surgical periodontal therapy showed statistical difference in weight of the new born babies and gestational age of mother indicating the influence of periodontal health status on PLBW.

Key words:- Periodontitis, Preterm low birth weight (PLBW), Gestation period, C- Reactive protein (CRP), Non surgical therapy.

INTRODUCTION

Periodontal diseases are among the most prevalent diseases throughout the world (1). Inflamed periodontal tissue produce IL-1 β , IL-6, PGE₂ and TNF- α which may have systemic effects on the host. The international definition of Low birth weight adopted by the 29th World Health assembly in 1976 is a birth weight of “less than 2500gm” (upto and including 2499gm) (2), and is considered premature if the fetus is born after a gestation period of under 37 weeks.

Obstetricians recognize that intra-uterine infections act as a risk factor for prematurity and LBW. Bacterial lipopolysaccharides (LPS) and inflammatory chemical intermediates (PGE₂,

TNF- α and IL-1 β) can speed up the physiological process of normal birth. High concentration of these cytokines in pregnant women are responsible for the rupture of the uterine membranes causing premature birth and growth retardation (3). Offenbacher et al.(4) in a pioneering study concluded that there was a statistically significant association between periodontal disease in pregnant women, prematurity and low birth weight of new-borns.

Thus, this study was designed to evaluate the effect of non surgical periodontal therapy in reducing the risk of pre term low birth weight in pregnant women with periodontal disease.

AIMS AND OBJECTIVES

To assess the incidence of preterm low birth weight with periodontitis.

To assess changes in serum C-reactive protein (CRP) level in Pre & Post partum women with and without periodontitis and who underwent non surgical periodontal therapy.

MATERIALS & METHODS

Total 60 pregnant women of age 18-35 years in their 3rd trimester were selected from the outpatient department of RNT Medical college, Udaipur, Rajasthan, India. Prior permission from the ethical committee of affiliated university was taken and patients signed voluntary consent form.

These patients were divided into two groups:

Group I: 30 patients with healthy periodontium.

Group II: 30 patients having moderate to severe chronic periodontitis. This group was further divided into:

Group II A: 15 patients who underwent non – surgical periodontal therapy.

Group II B: 15 patients who refused for non – surgical periodontal therapy for their personal reason,

DATA COLLECTION

Gingival Index (5) (Loe and Silness) and Calculus Index (5) (NIDR) were recorded for the Ramfjord index teeth and probing pocket depth was also recorded at baseline visit. CRP analysis was done in 3rd trimester.

PERIODONTAL THERAPY

Periodontal therapy comprising of oral hygiene instructions, scaling and root planing and antimicrobial mouth rinse Chlorohexidine gluconate 0.2% was carried out at the first visit (i.e. in the 3rd trimester) for subjects belonging to Group II A.

POSTPARTUM ASSESSMENT

Within 1 hour of parturition the weight of the newborn was recorded in all the subjects (Group I, II A, II B). The gestation age also was recorded for the subjects. Postpartum serum CRP level and the periodontal health status were also recorded within 48 hours of delivery.

RESULTS & STATISTICAL ANALYSIS

The data derived for each of the group was analyzed by independent students't – test, Paired t - test.

PREGNANCY PARAMETERS**Maternal Age**

The mean maternal age for all the subjects ranged from 24.33 ± 3.89 to 25.20 ± 2.11 years. In Group I the mean maternal age was 24.33 ± 3.89 years. The mean maternal age of Group II A and Group II B was 25.20 ± 2.11 years and 24.64 ± 3.42 years respectively.

When compared mean maternal age of Group II A Vs Group I, it was statistically non significant ($p>0.05$). The mean maternal age of Group II B when compared to Group I was also statistically non significant ($p>0.05$). Mean maternal age of Group II A & Group II B also showed statistically non significant results ($p>0.05$) (Table 1)

Table I - Comparison Of Maternal Age, Gestational Age, Birth Weight.

PARAMETER	COMPARISON	'T'	'P'
Maternal age	GP I v/s GP II A	- 0.968	>0.05 (NS)
	GP I v/s GP II B	- 0.294	>0.05 (NS)
	GP II A v/s GP II B	0.497	>0.05 (NS)
Gestational age	GP I v/s GP II A	6.999	<0.001 (S)
	GP I v/s GP II B	11.457	<0.001 (S)
	GP II A v/s GP II B	2.061	<0.05 (S)
Birth weight	GP I v/s GP II A	5.447	<0.001 (S)
	GP I v/s GP II B	6.671	<0.05 (S)
	GP II A v/s GP II B	2.580	<0.05 (S)

Gestational Age

The mean gestational age for all the subjects ranged from 32.13±1.92 to 38.23±1.05 weeks. In Group I the mean gestational age was 38.23±1.05 weeks. The mean gestational age of Group II A was 33.80±2.34 weeks. The Group II B had a mean maternal age of 32.13±1.92 weeks.

When the mean gestational age of Group II A was compared to Group I it was statistically significant ($p<0.001$). The mean gestational age of Group II B when compared to Group I was also statistically significant ($p<0.001$). Mean gestational age of Group II A & Group II B when compared showed statistically significant result ($p<0.05$) (Table 1)

Birth Weight

The mean birth weight for all the new born babies ranged from 2.05±0.49 to 3.02±0.39 Kg. In Group I the mean birth weight was 3.02±0.39 Kg. The mean birth weight of Group II A was 2.45±0.30

Kg. The Group II B had a mean weight of 2.05±0.49 Kg.

When the mean birth weight of group II A was analyzed to that of Group I it was statistically significant ($p<0.001$). The mean birth weight of Group II B when compared to Group I was also statistically significant ($p<0.001$). On comparison of birth weight of Group II A & Group II B statistically significant results were obtained ($p<0.05$) (Table 1)

PERIODONTAL PARAMETERS**Gingival Index**

The mean gingival index for Group I when compared pre and post partum was 0.61±0.58 and 0.65±0.56 respectively. The mean gingival index of Group II A when compared pre and post partum was 1.63±0.25 and 1.35±0.23 respectively. The mean gingival index for Group II B when

compared pre and post partum was 1.65 ± 0.24 and 1.70 ± 0.23 respectively.

On intergroup comparison of Pre and Postpartum gingival index between Group I & Group II A, results were statistically significant ($p < 0.001$).

Between Group I & Group II B results were also

statistically significant ($p < 0.001$). on comparing Group II A & Group II B, Pre partum values were statistically non significant ($p > 0.05$) but Post partum values were statistically significant ($p < 0.001$) (Table 2).

Table 2. Gingival index

Parameter	Observation period	Comparison	t' value	P value
Gingival index	Pre- partum	Gp I vs Gp IIA	-8.247	<0.001S
		Gp I vs Gp IIB	-8.457	<0.001s
		Gp IIA vs Gp IIB	-0.244	>0.05NS
	Post- partum	Gp I vs Gp IIA	-6.033	<0.001S
		Gp I vs Gp IIB	-8.965	<0.001S
		Gp IIA vs Gp IIB	-4.005	<0.001S

Charted value of 't' (from distribution table by Fisher & Yates) for

$p < 0.05 = 2.042$, S= significant; NS= Non- significant

Calculus Index

The mean calculus index for Group I when compared pre and post partum was 0.61 ± 0.55 and 0.64 ± 0.54 respectively. The mean calculus index of Group II A and Group II B when compared pre and post partum was 1.41 ± 0.16 and 0.74 ± 0.17 , 1.62 ± 0.15 and 1.69 ± 0.15 respectively.

When the Pre and Postpartum comparison of calculus index between Group I & Group II A was done, it was seen that the pre partum values were statistically significant ($p < 0.001$) and post partum

values were statistically non significant ($p > 0.05$).

When the Pre and Post partum comparison of calculus index between Group I & Group II B was compared it was seen that the Pre and post partum values were statistically significant ($p < 0.001$). When Pre and Post partum comparison was made between Group II A & Group II B it was seen that Pre partum values were statistically significant ($p < 0.01$) and Post partum values were also statistically significant ($p < 0.001$) (Table 3).

Table 3. Calculus index

Parameter	Observation period	Comparison	t' value	P value
Calculus index	Pre- partum	Gp I vs Gp IIA	-7.399	<0.001S
		Gp I vs Gp IIB	-9.418	<0.001s
		Gp IIA vs Gp IIB	-3.518	<0.01S
	Post- partum	Gp I vs Gp IIA	-0.913	>0.05NS
		Gp I vs Gp IIB	-9.993	<0.001S
		Gp IIA vs Gp IIB	-15.968	<0.001S

Charted value of 't' (from distribution table by Fisher & Yates) for

$p < 0.05 = 2.042$

S= significant; NS= Non- significant

Probing Depth

The mean probing depth for Group I when compared pre and post partum was 1.65 ± 0.25 and 1.68 ± 0.37 respectively. The mean probing depth of Group II A when compared pre and post partum was 4.74 ± 0.83 and 4.66 ± 0.85 respectively. The mean probing depth for Group II B when compared pre and post partum was 4.64 ± 1.02 and 4.76 ± 1.06 respectively.

When the Pre and Postpartum comparison of probing depth between Group I & Group II A was done, it was seen that the pre and post partum

values were statistically significant ($p < 0.001$). When the Pre and Post partum comparison of probing depth between Group I & Group II B was done, it was seen that the Pre and post partum values were statistically significant ($p < 0.001$). When Pre and Post partum comparison was made between Group II A & Group II B it was seen that Pre partum values were statistically non significant ($p > 0.76$) and Post partum values were also statistically non significant ($p > 0.77$) (Table 4).

Table 4. Probing Pocket Depth (PPD)

Parameter	Observation period	Comparison	t' value	P value
PPD	Pre- partum	Gp I vs Gp IIA	-18.863	<0.001 ^S
		Gp I vs Gp IIB	-15.301	<0.001 ^S
		Gp IIA vs Gp IIB	0.306	>0.76 ^{NS}
	Post- partum	Gp I vs Gp IIA	-16.474	<0.001 ^S
		Gp I vs Gp IIB	-14.368	<0.001 ^S
		Gp IIA vs Gp IIB	-0.296	>0.77 ^{NS}

Charted value of 't' (from distribution table by Fisher & Yates) for

$$p < 0.05 = 2.042$$

S= significant; NS= Non- significant

C-Reactive Protein

The mean CRP values for Group I when compared pre and post partum were 0.85 ± 0.54 mg/l and 0.85 ± 0.55 mg/l respectively. Mean CRP values of group II A when compared pre and post partum was 10.44 ± 4.79 mg/l and 10.29 ± 4.81 mg/l respectively. When Mean CRP values for Group II B were compared pre and post partum they were 22.27 ± 27.03 and 21.96 ± 26.65 mg/l respectively.

When the Pre and Postpartum comparison of CRP values between Group I & Group II A was done, it

was seen that the pre partum values was statistically significant ($p < 0.001$) and statistical non significant result was observed post partum ($p > 0.05$). When the Pre and Post partum CRP values between Group I & Group II B were compared, it was seen that the Pre and post partum values were statistically significant ($p < 0.01$). When Pre and Post partum comparison was made between Group II A & Group II B it was seen that Pre and post partum values were statistically non significant ($p > 0.05$) (Table 5).

Table 5. C- Reactive protein

Parameter	Observation period	Comparison	t' value	P value
C Reactive protein	Pre- partum	Gp I vs Gp IIA	-7.719	<0.001S
		Gp I vs Gp IIB	-3.069	<0.01s
		Gp IIA vs Gp IIB	-1.614	>0.05NS
	Post- partum	Gp I vs Gp IIA	-7.570	>0.05NS
		Gp I vs Gp IIB	-3.068	<0.01S
		Gp IIA vs Gp IIB	-1.613	>0.05NS

Charted value of 't' (from distribution table by Fisher & Yates) for

$p < 0.05 = 2.042$, S= significant; NS= Non- significant

DISCUSSION

The estimated incidence of PLBW babies in India is as high as 32.8% (6). Offenbacher S et al (1996) (4) suggested that 18.2% of all PLBW cases may be attributable to periodontal disease.

Lopez N. J et al (2002) (7) in a research report cited that inadequate pre - natal care is a risk factor for pregnancy outcomes in low socio-economic status and poorly educated women (Sokol et al 1980). In the same report it has been shown that adequate utilization of pre- natal care is associated with improved birth weight and lower risk of PTB (Quick et al 1981, Greenberg 1983, Donaldson & Billy 1984). Also it was identified that periodontal disease might be one of the factor associated with some of the approximately 50% of preterm births that occur in women without established risk factors (Kramer, 1987).

Patients with periodontitis may have elevated circulating level of inflammatory markers. Systemic dissemination has been reported within 40 minutes of commencing dental procedures in an animal model and 30 minutes after irrigation of periodontal pocket in humans (8). CRP and other acute – phase molecules are present at relatively

low levels in plasma, but may be raised dramatically with tissue injury or various bacterial infections including periodontitis. Ebersole et al (1997) (8) observed a relationship between CRP and severity of periodontitis. Considering the fact that periodontal infections are both preventable and readily treated, these findings provide new opportunities for intervention strategies to reduce the incidence of PLBW Lopez NJ et al (2005) (9) Thus, this study envisaged investigating the effect of periodontal therapy on birth outcome and correlating acute phase systemic inflammatory protein CRP, as one of the inflammatory mediator for periodontitis.

Certain studies show that performing periodontal therapy during pregnancy improves the clinical parameters for periodontitis which are used to assess the periodontal disease (10). The result of this present study also show that periodontal therapy elicits a good response in improving the clinical parameters, with accordance to Offenbacher S et al. (2006) (10). Yalcin F et al. (2002) (11) reported a constant increase in clinical indices such as gingival index, plaque index during the three trimesters of pregnancy, if left untreated.

The present study showed that there has been a significant reduction in the individual clinical parameters such as gingival index and calculus index following periodontal therapy, which is in accordance with Offenbacher S et al (1996, 2006) (4,10)

Results in this study showed that there is a reduction in probing pocket depth following periodontal therapy during pregnancy as also reported by Offenbacher S et al. (2006) (10).

Periodontitis causes premature delivery which is birth before 37 weeks of gestation (4,12). The present study shows that pregnant women who received periodontal therapy had significant improvement in their gestational age when compared with pregnant women who did not receive any therapy.

Offenbacher S et al. (1996,1998) (4,12) states LBW as weight of the new born less than 2500 gm and periodontitis as a risk factor for PLBW. Lopez NJ et al. (2002) (13) stated that institution of non – surgical periodontal therapy reduces the risk of PLBW in pregnant women with periodontal disease. In this study also a statistically significant change in weight of the new born babies in Group II A subjects when compared to Group II B subjects was observed.

An increase in CRP levels has been observed in pregnant women suffering from periodontitis (14,15,16) and non – surgical periodontal therapy during pregnancy has shown to decrease the level of CRP as stated by Iwamoto Y et al. (2003) (17) & Mattila K et al. (2002) (18). This study also showed that there was a statistical significance

seen in CRP levels in subjects of Group I when compared with subjects of Group II A & Group II B, which correlated with the studies done by Iwamoto Y et al. (2003) (17) & Mattila K et al (2002) (18), but there was no significance in CRP levels compared between Group II A & Group II B subjects which correlated with the study by Ioannidou E et al. (2006) (19).

Though an improvement in gestational age, baby weight, and CRP levels was observed in Group II A subjects as compared to subjects of Group II B, which is attributed to non – surgical periodontal therapy instituted to group II A subjects, but this improvement was not as expected i.e gestational age (>37 weeks), baby weight (>2500 gm), and CRP level (<2 mg/l), this may be attributed to non surgical periodontal therapy instituted in late pregnancy i.e third trimester (more than 28 weeks of gestation). Therefore this study suggest that that non surgical periodontal therapy should be provided in early pregnancy or before pregnancy for better outcomes as also stated by Offenbacher S et al. (2006) (10) & Lopez N J et al. (2002) (13). A major advantage in the design of this study has been the presence of pregnant women without periodontitis which was important for this kind of study design in which comparison is required between pregnant women with periodontitis who underwent non surgical periodontal therapy and pregnant women with periodontitis who did not underwent non surgical periodontal therapy. The relationship between poor periodontal health and adverse pregnancy outcome has been proved in many well-controlled studies before.

CONCLUSIONS

Pregnant women with good periodontal health delivered babies that were neither preterm nor were with low birth weight. The serum CRP level was also seen to be in normal range pre partum and post partum.

Pregnant women with periodontitis who were treated by non surgical periodontal therapy when compared to pregnant women with periodontitis not receiving non surgical periodontal therapy showed statistical difference in weight of the new born babies and gestational age of mother in favour of the pregnant women who received non surgical periodontal therapy indicating the influence of periodontal health status on PLBW.

The serum CRP level in pregnant women with non treated periodontitis did not show any significant change when recorded prepartum (during 3rd trimester) and postpartum but, there was a significant change observed when the pregnant women with periodontitis were treated with non surgical periodontal therapy indicating serum CRP to be a marker for periodontal inflammation and showing a decrease on institution of non surgical periodontal therapy during pregnancy.

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