

Association Between Maternal Periodontal Status and Pre Term Low Birth Weight Babies: A Retrospective Clinical Case Control Study

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Abstract

Introduction: In reducing the risk for pregnancy-related complications like preterm birth and preeclampsia, maternal health is recognized as an important determinant. In the developing countries as well as developed countries, low birth weight (LBW) and preterm (PTB) delivery are considered to be highly relevant biological determinants for new born infant survival. As per definition, Preterm birth (PTB) delivery is stated as delivery before 37 weeks of gestation and low birth weight (LBW), is a birth weight of less than 2,500 grams. **Aims and Objectives:** To assess maternal periodontal status among preterm and / or low birth weight and normal birth weight groups to determine if it is a risk factor for low birth weight infants. **Material and Methods:** A case control study design was chosen involving total 100 pregnant mothers, 50 mothers with presence of periodontal disease with CPI Score 3 in the case group and 50 mothers with CPI Score 1 or 2 in the control group. Our first definition of case and a control was based on the maternal periodontal status. All mothers after screening were categorized into a case group and control group. **Results:** This study indicated a 4.66 fold increase in PTLBW in cases of periodontal infection with CPI score 3 in comparison to periodontal infection with CPI score 1 or 2. Many Other workers reported a 4.5 to 7 fold increase in incidence of PTLBW in cases of periodontitis with CPI score 3. The important observation which was found in this study was related to the illiteracy of the mother which plays a strong role in causation of periodontal disease as well as to PTLBW. **Discussion:** The overall importance of periodontal therapy during pregnancy is minimal, but that a threshold level may exist during gestation where the presence of periodontal diseases may have a much more significant effect on a baby's birth weight. Preterm birth (PTB) and low birth weight (LBW) are the leading perinatal problems worldwide and have evident public health implications, as they are closely related to perinatal mortality and morbidity. According to the Perinatal Oral Health Consensus, diagnosis and treatment of oral diseases as well as their prevention, which may require dental radiographs and local anaesthesia, are beneficial if commenced during pregnancy, as well as they do not pose any additional foetal or maternal risk as compared to the risk when no care is provided.

Keywords: Maternal health, Periodontal status, Preterm birth, Low birth weight, Community Periodontal Index

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Introduction

Maternal health is one of the important factors in reducing the risk for pregnancy-related complications like preterm birth and preeclampsia. In the developing countries as well as developed countries, low birth weight (LBW) and preterm (PTB) delivery are considered to be highly relevant biological determinants for new born infant survival. The changes including oral changes during pregnancy are of interest for many ages. Physiological changes occurring during pregnancy can badly affect oral health. Rise in

levels of estrogen and progesterone heightens the inflammatory response and that in turn changes the gingival tissue[1]. During pregnancy, women suffers from bleeding and swollen gums due to change in hormonal levels and thus increasing the frequencies of gingivitis and periodontitis[2]. Preterm birth (PTB) delivery is stated as delivery before 37 weeks of gestation and low birth weight (LBW), is a birth weight of less than 2,500 grams[3]. The primary cause of PTB delivery is untimely rupture of foetal membranes. Preterm infants, born with a low birth weight are termed as preterm low birth weight (PTLBW). Both in developed and in developing countries, PTB and low birth weight are considered as relevant biological determinants for newborn infant survival. One of the major cause of infant mortality and morbidity that postures medical and economic burdens on society is Preterm birth[4]. The frequency of preterm birth is increasing worldwide, and determinations to prevent or reduce its occurrence have been ineffective. The significance of PTB comes from its capability to forecast the enlarged risk of mortality among infants born with low birth weight and

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Preterm births. Preterm births is linked to over 50% of long term morbidity and 75% of perinatal mortality[5]. World Health Organization has a target to reduce the number of child births who weighs less than 2,500 g as it is a known forecaster of morbidity and mortality of child[6]. The prime factors for low birth weight (LBW) infant deliveries are: maternal age which can be less than 17 years or more than 34 years, use of alcohol, smoking or drug during pregnancy, hypertension, diabetes, adverse behaviours, multiple pregnancies, insufficient prenatal care. Other factors can be related to race, maternal demoFigy, genitourinary tract infections and cervix length[7-10]. The relationship between preterm delivery and maternal periodontal disease was reported in study by Offenbacher et al². This study which was conducted in year 1996 and it stated that maternal periodontal disease has a 7 times increased risk of delivering a preterm low birth weight (PTLBW) infant. Since then, scholars are trying to explore possible associations between the two. Thus it is imperative to understand the underlying biologic mechanisms for the relationship between periodontal disease and adverse pregnancy outcomes such as preterm birth and low birth weight. So that timely therapeutic interventions can be carried along with standard treatment. Therefore this study was planned to establish the cause effect relationship between maternal periodontal disease and pre term low birth weight (PTLBW) babies. Study was conducted to assess maternal periodontal status among preterm and / or low birth weight and normal birth weight groups to determine if it is a risk factor for low birth weight infants.

Material and Methods

The study was conducted in the Department of Periodontology and Oral Implantology, Rajasthan Dental College & Hospital, Jaipur in association with the Chotturam Memorial Hospital, Makrana, Nagaur.

Selection of patients study

A retrospective case control design was chosen including 100 post-partum mothers, aged 18-35 years from Department of Gynaecology, Chotturam Memorial Hospital, Makrana, Nagaur within 3 months prior delivery and 48 hours after the birth of their children,. Out of these 100 mothers, two groups were prepared, 50 pregnant mothers who have presence of periodontal disease with community periodontal index (CPI) score 3 in the case group and 50 pregnant mothers were with (CPI) score 1 or 2 in the control group.

Patient group

Two groups were prepared as
50 pregnant mothers with CPI Score 1 or 2- Control Group
50 pregnant mothers with CPI Score 3-Case Group

Inclusion criteria

- Pregnant mothers aged between 18-35 years.
- Mothers who had delivered live infant weighing normal (more than 2000g) or PTLBW (less than 2500 g and one or more of the following: gestational age < 37 weeks, preterm Labor (PTC) during the study period were randomly selected.
- CPI Score of mothers in the scale of 1 to 3.
- Associated risk factors (RF): hypertension (HT), history of smoking, smokeless tobacco use, intake of alcohol, socio-economic and educational status of the mothers.

Exclusion criteria

- Case with history of systemic disease such as cardio vascular disease, or placental or uterine complications or any other medical problems that may affect the study outcome was excluded.

Methods

A case control study design was chosen involving total 100 pregnant mothers, 50 mothers with presence of periodontal disease with CPI Score 3 in the case group and 50 mothers with CPI Score 1 or 2 in the control group. Our first definition of case and a control was based on the maternal periodontal status. All mothers after screening were categorized into a case group and control group as follows:

Case group

A case was defined as a mother with periodontal disease with CPI Score 3.

Control group

A control was defined as a mother with periodontal disease with CPI Score 1 or 2.

Study protocol

- All mothers were thoroughly briefed about the nature of the study and an informed consent was obtained (Annexure-A).
- All the information gathered were recorded in a pre-designed performa.
- Each mother included in the study was interviewed directly at the bed side. Information was collected about her educational level, age, family income per months and details about her husband, education and occupation. Adverse habits such as smoking, smokeless tobacco use, alcohol consumption were also recorded for smoking and tobacco chew/paste, the type and form in which it was consumed was also noted.
- The mother's data were obtained from medical file. Information on the outcome of the current pregnancy was gathered from mother's medical record. The birth weight of the infant was also noted from the available infant and maternal record. The history of hypertension was noted from gynaecologist record.
- Periodontal clinical examination was carried upto 48 hours after delivery. The periodontal status of the mother was assessed by using community periodontal index (CPI Score) and bleeding on probing (gingival bleeding) GI (LOE & Silness).

Indicators

Three indicators of periodontal status were used for their assessment: gingival bleeding, calculus and periodontal pockets.

A specially designed lightweight WO CPI probe with a 0.5 mm ball tip was used, with a black band between 3.5 and 5.5 mm and rings at 8.5 and 11.5 mm from the ball tip.

Statistical analysis

For statistical analysis of observations, Chi-square test was applied.

Results

The age group distribution of the mothers between 18-35 years in case and control group. The distribution pattern in age group 18 - 25 indicated 40 % mothers (20/50) in case group (n=50) and 56% mother (28/50) in control group (N=50); in the age group of 26 - 30 indicated 44% mothers (22/50) in case group and 40% mothers (20/50) in control and in the age group of 31-35, 16% mothers (8/50) were in case group and 4% mothers (2/50) were in control group. In case group and control group the selection of mothers was age-matched. Fig I shows mean age of mother of case group and control group.

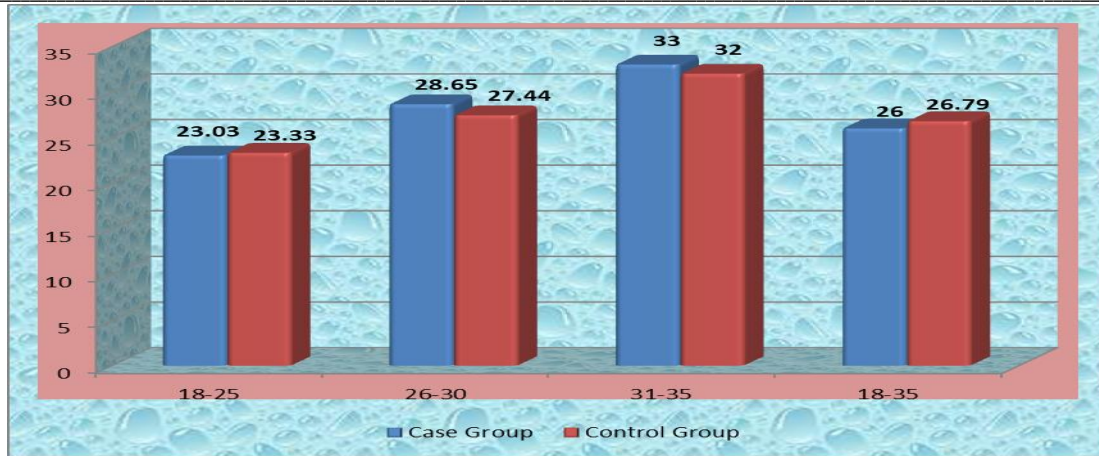


Fig 1: Mean Age Of Mother Of Case Group And Control Group

Table 1: shows mean ± sd age of mother of case group and control group

Age Group	Case Group	Control Group
18-25	23.03 ± 0.89	23.33 ± 0.92
26-30	28.65 ± 0.87	27.44 ± 1.62
31-35	33.00 ± 1.51	32.00 ± 1.41
18-35	26.00 ± 4.34	26.79 ± 4.68

The table 2 and Fig II describes the distribution of babies delivered according to birth weight in case and control group. Out of 50 babies delivered in case group (n=50), 36% babies (18/50) delivered were PTLBW and 64% babies (32/50) delivered were full term normal for gestation age. Whereas in control group 6% babies (3/50) were

delivered with PTLBW and 94% babies (47/50) were delivered ad full term normal for gestation age. The statistical analysis indicated a significant correlation in both group (P < 0.05, Significant on Chi-square test).

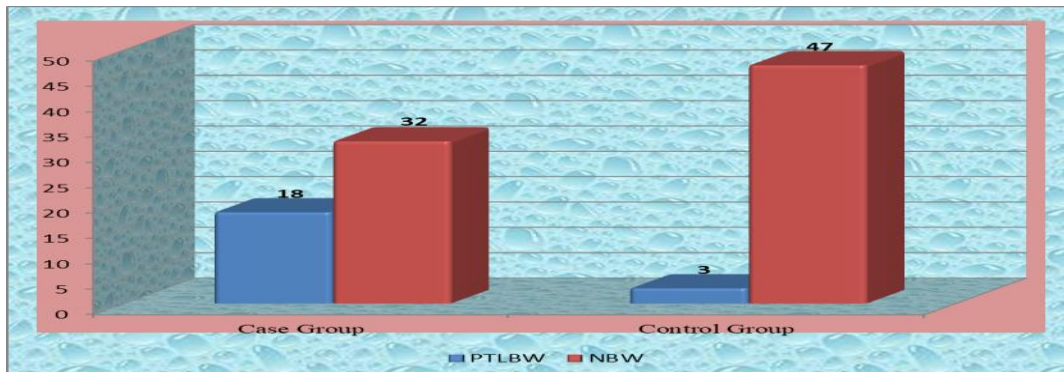


Fig 2: Distribution According To Number Of PTLBW and NBW Baby Of Case & Control Group

Table 2: Shows distribution according to number of PTLBW and NBW baby of case & control group

	Case Group		Control Group	
	No	%	No	%
PTLBW	18	36.00	3	6.00
NBW	32	64.00	47	94.00
Total	50	100.00	50	100.00

Group	N	Mean	Std. Deviation	" t- Value "	" p- Value"	Result
Case	50	2303	137	1.656	< 0.0001	HS
Control	50	2344	109			

Table 3, describes the distribution of deliveries of PTLBW and full term normal delivery according to the age group of mothers in case (Fig 3) and control group (Fig 4). In control group, the babies delivered PTLBW and full term normal for gestation age were 2% (1/50) and 40% (20/50) respectively in the age group of 18 - 25, 2%

(1/50) and 46% (23/50) respectively in the age group of 26 - 30, and, 2% (1/50) and 8% (4/50) respectively in the age group of 31 - 35. The statistical analysis indicated a significant correlation in both groups (P < 0.05 on chi-square test)

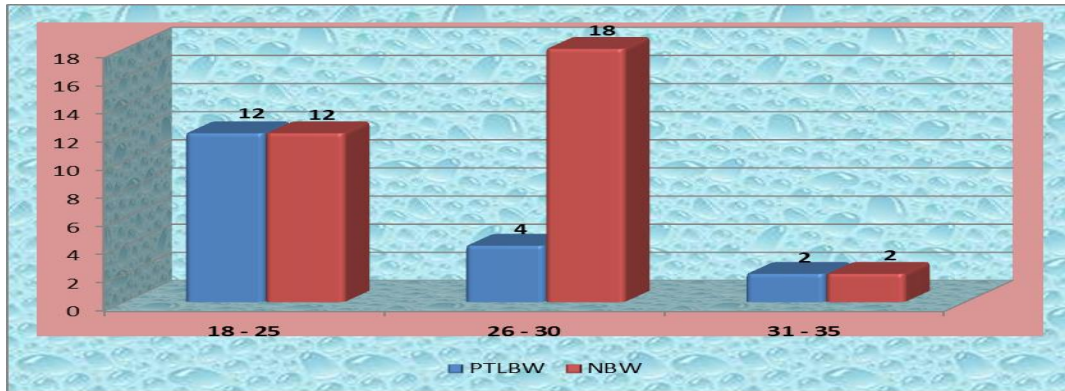


Fig 3: Distribution According To Age Group Of Mother & Birth Weight Of Baby Of Case Group

Table 3: distribution according to age group of mothers & birth weight of baby of case & control group

Age Group (YRS)	Case Group			Control Group		
	PTLBW	NBW	Total	PTLBL	NBW	Total
18 - 25	12 (24.00)	12 (24.00)	24 (48.00)	1 (2.00)	20 (40.00)	21 (42.00)
26 - 30	4 (8.00)	18 (36.00)	22 (44.00)	1 (2.00)	23 (46.00)	24 (48.00)
31 - 35	2 (4.00)	2 (4.00)	4 (8.00)	1 (2.00)	4 (8.00)	5 (10.00)
Total	18 (36.00)	32 (64.00)	50 (100.00)	3 (6.00)	47 (94.00)	50 (100.00)

Whereas in case group, the babies delivered PTLBW and full term normal for gestation age were 24% (12/50) and 24% (12/50) respectively in the age group of 18 - 25, 4% (2/50) and 36% (18/50) respectively in the age group of 26 - 30, and, 4% (2/50) and 4%

(2/50) respectively in the age group of 31 - 35. The statistical analysis indicated a significant correlation in both groups ($P < 0.05$ on chi-square test)

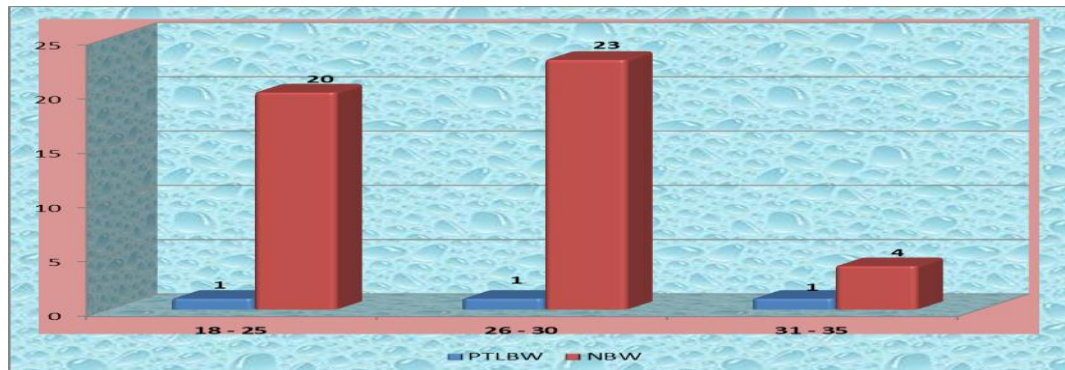


Fig 4: Distribution According To Age Group Of Mother & Birth Weight Of Baby Of Control Group

Table 4: Distribution according to community periodontal index (CPI score) of mothers & birth weight of baby of case & control group

CPI Score	Case group			Control Group		
	PTLBW	NBW	Total	PTLBW	NBW	Total
CPI Score = 1	0	0	0	1	42	43
CPI Score = 2	0	0	0	2	5	7
CPI Score = 3	14	36	50	0	0	0
Total	14	36	50	3	47	50

In case group, out of 50 mothers of case group (as per study protocol) all mothers (100%) were having periodontitis with CPI score 3. Out of these 50 mothers of case group, 14 mothers (28%) delivered as

PTLBW whereas 36 mothers (72%) delivered as full term normal for gestation age. (Fig 5)

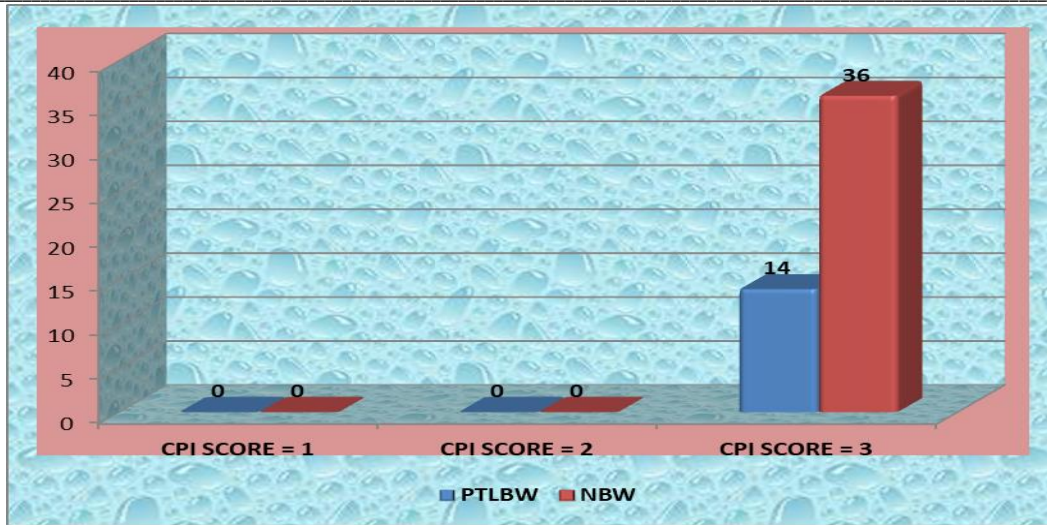


Fig 5: Distribution According To CPI Score Of Mother & Birth Weight Of Baby Of Case Group

Out of 50 mothers in control group, 43 mothers (86%) were having gingivitis with CPI score 1. Out of these 43 mother, 1 mother (2%) delivered as PTLBW whereas 42 mothers (84%) delivered as full term normal for gestation age. Remaining 7 (14%) in control group

were having gingivitis with CPI score 2. Out of these 7 mothers, 2 mothers (4%) delivered as PTLBW and 5 mothers (10%) delivered as full term normal for gestation age.(Fig VI)

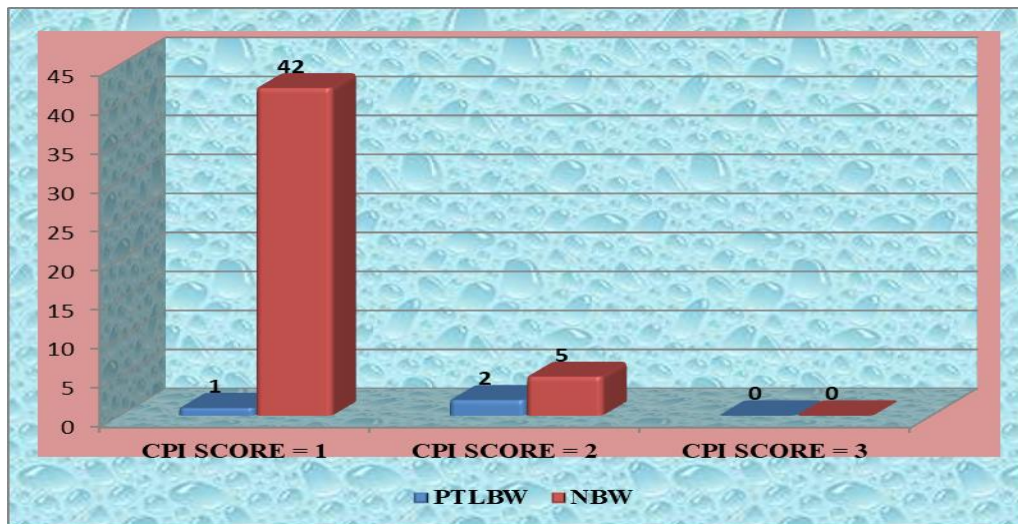


Fig 6: Distribution According To CPI Score Of Mother & Birth Weight Of Baby Of Control Group

Discussion

The overall importance of periodontal therapy during pregnancy is minimal, but that a threshold level may exist during gestation where the presence of periodontal diseases may have a much more significant effect on a baby’s birth weight. Preterm birth (PTB) and low birth weight (LBW) are the leading perinatal problems worldwide and have evident public health implications, as they are closely related to perinatal mortality and morbidity[11].Therefore, those mothers who receive periodontal therapy during pregnancy would be better suited to receive the treatment early in the pregnancy to decrease the chances of delivering a baby with PLBW. Current understanding of maternal and fetal physiology indicates that the benefits of providing dental care during pregnancy far outweigh potential risks.As per the Perinatal Oral Health Consensus, diagnosis and treatment of oral diseases as well as their prevention, which may require dental radioFigs and local anaesthesia, are beneficial if

commenced during pregnancy, as well as they do not pose any additional foetal or maternal risk as compared to the risk when no care is provided[12]. In concordance with the above, American Academy of Periodontology demands oral health professionals to provide preventive services as early as possible in pregnancy so that acute infection or sources of sepsis can be avoided regardless of pregnancy stage[13]. The most important factor is timing at which care is given to pregnant women and this likely impacts the overall as well as the oral health of their children. Good oral health safeguards a woman’s health and reduces the spread of pathogenic bacteria from mothers to their offspring. In spite of this, many women do not pursue – and are even not advised to strive for – dental and oral maintenance as part of their prenatal care. Not only does pregnancy provide that invaluable lessons, but for some women, it may be the time to reap dental benefits. Obstacles and confines in refining oral health and using oral health facilities for expecting women and their

offspring are multidimensional and intricate. Due to lack of understanding about its impact and safety, oral health providers are restricted in providing care to the expectant. Numerous dentists unnecessarily deny or defer treatment to expectant due to apprehension about injuring the foetus or the woman and this may be because they are not trained to do so. They even lack to understand the association between oral and overall health. As a result, prenatal providers fail to refer expectants regularly to dentist. Socio-economic distribution in studied population indicated that in both groups, the maximum number of mother were from SES II (upper middle SE class) but at the same time it was observed that PTLBW deliveries were more in SES IV in case group. This finding was further evaluated and it was observed that in spite of good Socio-economic Status IV in the case group (who delivered 7 (14%) PTLBWs) all of these mothers were illiterate. As reported that positive correlation exists between lower socio-economic status and periodontal disease leading to PTLBW[14-16]. In this study illiteracy had been found to be more significant factor in comparison to SES as a cause of periodontal disease leading to PTLBW. In conclusion, this study indicated a 4.66 fold increase in PTLBW in cases of periodontal infection with CPI score 3 in comparison to periodontal infection with CPI score 1 or 2. Many other workers reported a 4.5 to 7 fold increase in incidence of PTLBW in cases of periodontitis with CPI score 3. The important observation made in this study was illiteracy of the mother plays a major role in causation of periodontal disease as well as to PTLBW.

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