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RELATIONSHIP BETWEEN MATERNAL PERIODONTAL HEALTH AND PRE-TERM LOW BIRTH WEIGHT BABIES- A MYTH OR REALITY: A CASE CONTROL STUDY.

Dental Science

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ABSTRACT

Background and Objective:
In both developed and developing countries, preterm low birth weight (PTLBW) has a tremendous impact on both the health care system and the individual families affected. Periodontal disease is suggested to be an important risk factor associated with preterm low birth weight babies (PTLBW). PTLBW babies are a major issue in public health as they are related to high rate of infant mortality and morbidity. The aim of the present study was to examine the relationship between maternal periodontal disease and preterm low-birthweight infants.

Materials and Methods:
60 systemically healthy post-partum mothers between the age group of 18-35 years who reported to the Department of Dental Surgery, Bokaro General Hospital, Jharkhand were included in the study. Based on inclusion and exclusion criteria, they were categorized into PTLBW group as cases and full-term normal birthweight group (FTNBW) as controls.
PTLBW cases (n = 30) defined as spontaneous delivery before/<37 completed weeks of gestation and infants weighing < 2499g. Controls (FTNBW) were normal births at or after 37 weeks of gestation and infants weighing ≥ 2500 g. Data on periodontal status, pregnancy outcome variables, and information on other factors that may influence adverse pregnancy outcomes were collected within 2 days of labor. Data were subjected to Student's t-test and Pearson's correlation coefficient statistical analysis.

Results:
The statistical results proved a positive correlation between gestational age, low birth weight and clinical parameters. There was a statistically significant difference with respect to the gestational period at the time of delivery and birth weight of the infants in experimental (PTLBW) group (<0.001) as compared to control (FTNBW) group was observed. Overall, there was statistically significant poor periodontal status in the (PTLBW) group compared to (FTNBW) group.

Conclusion:
A positive co-relation was observed between periodontitis, gestational age, low birth weight and a positive correlation was found with respect to PTLBW and periodontitis.

INTRODUCTION

The mouth serves as a mirror to reflect the health of the entire body and nevertheless serves as a portal for disease to the rest of the body.[1] Since the old wives' tale of "the loss of a tooth for every pregnancy", oral health during pregnancy has long been a focus of interest.[2] It is well known that hormonal changes during pregnancy are associated with oral mucosal changes most of which are reversible clinically.[3,4] The reasons for these changes are not well established. However, they can complicate pregnancy. [5] Of all the changes, the ones most well documented about is pregnancy gingivitis and pregnancy epulis (synonyms – pregnancy tumour, epulis gravidarum, pregnancy granuloma.) [6]

Periodontitis may be regarded as a continuous pathogenic and inflammatory challenge due to ulceration of sulcular and junctional epitheliumas seen during periodontal pocket formation when an established gingivitis lesion progresses to advanced periodontitis. The continuous release of cytokines in inflamed periodontal tissues is responsible for the progression of gingivitis to periodontitis and advanced periodontal tissue destruction.

The inflammatory cytokines e.g. interleukins such as IL-lα, IL-1β, IL-6, and IL-8, are present in the diseased periodontal tissues, and their unopposed production seems to play an important role in chronic leukocyte recruitment and tissue destruction. Acute periodontal disease primarily involves a local innate immune response to the microflora of the oral biofilm. Gingival epithelial cells recognize bacterial cell components via toll-like receptors and respond by producing IL-1 and TNF-α. Bacteria and bacterial products also penetrate the underlying tissues. [6] There they interact with fibroblasts and dendritic cells. These cells also produce proinflammatory cytokines. Additional immune signals are generated by alternative complement activation. These bacterial products and proinflammatory cytokines affect vascular endothelial cells as well. Endothelial cells express cellular adhesion molecules (ICAM and VCAM) that recruit circulating immune cells. Vascular permeability is also increased – allowing the influx of phagocyte cells and serum into the gingival tissue. Neutrophils and macrophages are attracted to the site of infection by chemotaxis following gradients of complement proteins, cytokines, and bacterial products. Activated macrophages produce IL-12 and interferon-gamma (IFN-γ).

Overall, these processes result in gingival inflammation, and are responsible for the clinical manifestations of gingivitis further leading to periodontitis. It is possible that monitoring cytokine production or its profile may allow us to diagnose an individual's periodontal disease status and/or susceptibility to the disease.

In the last decade, periodontal infections have been associated with different systemic diseases and preterm low birth weight (LBW).[7]One reasonable mechanism begins with deleterious effects of endotoxins released from Gram-negative bacteria especially the increased no. of Prevotella intermedia during pregnancy responsible for periodontal disease.

Pre-term (PT) birth is a major cause of infant mortality and morbidity that has considerable societal, medical, and economic repercussions. The rate of PT birth appears to be increasing worldwide and efforts to prevent or reduce its prevalence have been largely unsuccessful. If periodontal disease is associated with higher risk of adverse pregnancy outcome in these specific populations, large multicenter randomized-controlled trials will be needed to determine if prevention or treatment of periodontal disease, perhaps combined with other interventions, has an effect on adverse pregnancy outcome in these women.

The aim of the study was:
1. To assess maternal periodontal health among preterm low birth weight group PTLBW and full term normal birth (FTNBW) groups

2. To correlate gestational age and low birth with periodontal clinical parameters.

MATERIALS AND METHOD
60 systemically healthy primiparous mothers between the age group of 18-35 years who reported to the Department of Dental Surgery, Bokaro General Hospital, Jharkhand were included in the study. All mothers were eligible for the study, except those with congenital heart disease requiring antibiotic cover for invasive procedures, who had a multiple

delivery, whose infants were stillborn, or whose infants did not fit either the "case" or "control" definitions. Patients outside that age group or having any systemic diseases were excluded as they may influence PTLBW. Based on inclusion and exclusion criteria, they were categorized into PTLBW group as cases and full term normal weight birth weight group (FTNBW) as controls.

PTLBW cases (n = 30) defined as spontaneous delivery before/<37 completed weeks of gestation and infants weighing <2500g. Controls (FTNBW) were normal births at or after 37 weeks of gestation and infants weighing ≥ 2500 g. Data on periodontal status, pregnancy outcome variables, and information on other factors that may influence adverse pregnancy outcomes were collected within 2 days of labor. Data were subjected to Student's t-test and Pearson's correlation coefficient statistical analysis.

Statistical analysis
A two-sample Student's t-test assuming equal variances using a pooled estimate of the variance was performed to test the hypothesis that the resulting mean parameters between the two study groups were equal. The Pearson's correlation coefficient was used to reveal correlation between the gestational age/period versus Clinical parameters. The statistical analysis was performed using a software program (SPSS Version 18, SPSS Inc., Chicago, IL, USA), statistical significance being defined at $P < 0.05$.

RESULTS
The present study population comprised of a total of 60 subjects between the ages of 18 and 35 years; divided into two groups, PTB and FTB groups, respectively. The mean age for PTB group was 23.6 ± 1.245 years was not statistically different from the FTB group at 24.3 ± 1.924 years. However, statistically significant difference was observed with respect to the gestational period at the time of delivery, with mean values (35.8 ± 0.375)weeks for PTB and (38.6 ± 0.458) weeks for FTB with a $P < 0.001$. The mean birth weight of the infants was also low in the PTB group (2.426 ± 0.372) kg compared to FTB group (3.240 ± 0.265) kg which was statistically significant ($P < 0.001$)   Oral hygiene status was poorer in the PTB group when compared with full term group (FTB), which was statistically significant ($P < 0.001$). Other clinical parameters like bleeding on probing, pocket depth and CALs between the two study groups were also showed a statistically significant difference ($P < 0.001$). In general, periodontal status was less healthy in the PTB group compared to full term group (FTB) [TABLE 1]

Table 1 Comparison of different variables among the two study groups

Variables	PTLBW (n=30, W<2500g)	FTNBW (n=30, W>2500g)	(Mean±SD)	P-value
OHI-S	4.234±0.525	1.438±0.654	2.085±0.378	P<0.001
SBI	3.678±0.730	1.345±0.234	1.056±0.122	P<0.001
CPI	3.467±0.463	1.854±0.262	2.071±0.144	P<0.001
PPD	6.012±0.648	2.845±0.123	2.035±0.481	P<0.001
CAL	4.670±0.568	1.642±0.546	2.795±.0345	P<0.001

OHI-S – Oral Hygiene status simplified, SBI – Sulcus Bleeding index, CPI- Community Periodontal index, PPD- Probing pocket depth, CAL- Clinical attachment level, SD- Standard deviation P<0.001- statistically highly significant

Table 2 Correlation between gestational period, low birth and clinical parameter

Group	Weight W(kg)	SBI	CPI	PPD	CAL
PTLBW	2.426 ± 0.372	0.482*	0.276	0.42	0.322*
FTNBW	3.240 ± 0.265	0.124	-0.129	-0.072	0.180

PTLBW preterm low birth weight group
FTNBW full term normal birth weight group, SBI – Sulcus Bleeding index, CPI- Community Periodontal index, PPD- Probing pocket depth, CAL- Clinical attachment level, *-statistically significant

DISCUSSION
As the title of the present study brings our focus on whether the association between maternal periodontitis with PTLBW is a myth or

reality, our findings strongly support that the two are connected. The findings however disagree with Davenport et al. [8] who reported no evidence for an association between PLB and periodontal disease. Their results did not support a specific drive to improve periodontal health of pregnant women as a means of improving pregnancy outcomes.

In the present study, the mean age of mothers among PTLBW was 23.6 ± 1.245 years and 24.3 ± 1.924 years for those in the FTNBW group, which shows no statistically significant difference between the two groups.

When means of gestational period/weeks at the time of delivery between PTBLW (35.8 ± 0.375)weeks and FTNBW groups (38.6 ± 0.458) weeks were compared the results were found to be statistically significant ($P < 0.001$). Similarly, birth weight of the infants in the PTLBW group was low (2.426 ± 0.372)kg when compared to FTNBW group (3.240 ± 0.265)kg, which suggests that delivery outcomes have been influenced by gestational age. The present finding are in agreement with the findings of Love et al.[9]

The SBI (3.678±0.730), oral hygiene index-simplified (4.234±0.525), and CPI (3.678 ± 0.730) among PTLBW group showed statistically significant(<0.001) difference as compared to FTNBW group. This agrees with Modarres et al. indicating that the control group had a good periodontal condition than the case group. The increased circulating levels of progesterone in turn cause dilation of gingival capillaries, permeability, and gingival exudates that may explain the redness and increased bleeding tendency during pregnancy.[10]

In the present study, PTLBW group showed significant ($P < 0.001$) association between PPD (6.012±0.648) and low birth weight (2.426 ± 0.372) as compared to FTNBW group. This is in concurrence with studies conducted by Agueda et al.[11,12]

In the present study, CALs were much higher in FTNBW group (1.642±0.546) as compared to PTB group (4.670±0.568). This indicated a greater loss of attachment in the PTLBW group, which was statistically significant. Jarjoura et al. compared the periodontal status of 83 PB mothers and 120 controls and found that PTLBW was associated with attachment loss.[13]

The present study showed a positive correlation between gestational age and clinical parameters which were significant in the PTLBW group compared to FTNBW with respect to bleeding index and CALs which was also observed in similar study conducted by Lopez et al.[14]

CONCLUSION
A positive co-relation was observed between periodontitis, gestational age, low birth weight and a positive correlation was found with respect to PTLBW and periodontitis. It has been well documented that periodontal disease is a treatable and preventable condition. In the event of a positive association of periodontal infection with PLBW, this would have potential applications in preventive oral health programs as an integral component of prenatal care for pregnant mothers. Indeed, as healthcare professionals working as a team, an understanding of the role of periodontal and systemic relationship and its implications will further enhance the quality of medical and dental care being provided to our patients in the community.

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