

# Effect of maternal periodontal status on birth weight

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## ABSTRACT

**Aim:** The study was to determine the effect of maternal periodontal status on birth weight. **Materials and Methods:** This longitudinal study was conducted at the University of Benin Teaching Hospital, Benin City, Edo State. Recruited into the study were 300 pregnant women aged between 20 and 34 years who were randomly placed into two groups. Test group received oral prophylaxis upon enrolment and control group received prophylaxis after deliveries. The gestational age for enrolment was from 12 weeks to 36 weeks. The groups were balanced for other risk factors, while smoking and alcohol was assessed using the questionnaire. The participants were all primigravid women. Data were collected by means of interviewer-administered questionnaire, clinical dental examination and participants' hospital records. **Results:** Community Periodontal Index (CPI) assessment revealed that 44.4% recorded code 2; 22% had code 3; while 16.6% had code 4. The overall prevalence of low birth and normal weight in this study were 6.3% and 93.8% respectively. The prevalence of low birth weight (LBW) among the test and control group were 0.0% and 12.5% respectively. The highest prevalence of low birth weight delivery (27.3%) among the control group was among the participants with CPI score 4 which was statistically significant ( $P < 0.05$ ). **Conclusion:** The study revealed that the control group had low birth weight deliveries, which was significantly associated with poor periodontal status. Therefore, there is the need for oral prophylaxis among pregnant women preferably before second trimester.

## Key words

Birth weight, maternal, periodontal status

## INTRODUCTION

The reduction of infant mortality is a major concern of modern health care delivery. There are reports of increased infant mortality related to low birth weight (LBW), defined as birth weight less than 2.5 kg in most developing countries.<sup>[1]</sup> A high incidence of LBW babies create a heavy public health burden in developing countries both in terms of infant mortality and life care for those that survive especially with physically and mentally handicapped.<sup>[2]</sup> To this end, risk factors for adverse pregnancy outcomes such as LBW have received attention.<sup>[3-5]</sup> Researchers have suggested that maternal bacterial infection such as those that cause periodontal disease may be potential risk factor for LBW.<sup>[6-8]</sup> The international communities are therefore investigating

the relationship between periodontal disease and adverse pregnancy outcome.<sup>[9-11]</sup> This is rooted on the fact that there is high prevalence of periodontal disease among pregnant women and also that the persistent bacterial colonization in the oral cavity together with inflammatory responses by the host may have consequences beyond the oral tissues, thus leading to systemic damage.<sup>[12]</sup>

Several studies have been conducted to establish the relationship between periodontal disease and adverse pregnancy outcome with respect to low birth weight.<sup>[13-15]</sup> The findings from these studies differed significantly, some found relationship between maternal periodontal status and adverse pregnancy outcome<sup>[16,17]</sup> while others did not.<sup>[13,18]</sup> However, most of these published studies were conducted in developed countries<sup>[13,14]</sup> and few were conducted in Africa<sup>[19]</sup> where periodontal disease is predominant. Though the effects of periodontal treatment of pregnant women on the pregnancy outcome are now being investigated,<sup>[20]</sup> many earlier studies left out the effect of periodontal intervention in most of the studies.<sup>[21,22]</sup> The results of the interventional studies are very varied. These aforementioned reasons gave rise to this investigation in Edo state, Nigeria. The objective of the study was to evaluate the effect of maternal periodontal disease on

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the birth weight of babies. Also to study the effect of periodontal intervention of on the birth weight of babies.

## MATERIALS AND METHODS

This was a longitudinal study conducted among pregnant women aged 20-34 years attending the ante-natal clinic of University of Benin Teaching Hospital (UBTH), Nigeria, over a period of 9 months (June 2009 – February 2010). Subjects were randomly placed in the test group and received scaling and polishing plus oral hygiene instructions immediately after being assigned to the group and again in the second trimester. The other group was randomly assigned to the control group and received scaling and polishing plus oral hygiene instructions after delivery. Exclusion criteria were any medical condition that can effect foetal growth including diabetes, hypertension, genitourinary infection, HIV/AIDS, cardiac diseases, respiratory diseases, those on steroids, also those on an antibiotics. Participants with multiple pregnancies and any one that ends up with induced labour or caesarean section were dropped from the study. Inclusion criteria were primigravidity, ages not above 34 years and not below 20 years. Also included were women in apparent good health, singleton pregnancy, spontaneous vaginal delivery and those that signed informed consent. Data collections were through the interviewer-administered questionnaire carried out by two previously trained dentists. Clinical dental examination was carried out using the CPI (WHO) to assess the periodontal status of the participants. The relevant Obstetrics and Gynaecological information such as gestational age, maternal weight at registration and current weight to know if there was consistent weight gain or not, last menstrual period, blood pressure and when available ultrasound report, also the number of ante-natal visits were all obtained from their case records in the ante-natal clinic. Since all participants were primigravidae there was no need for the history of previous low birth weight delivery. Pregnancy outcome for all participants were obtained from the labour ward register. Written consent was obtained from the participants while approval for this study was granted by the Ethics Committee of the University of Benin Teaching Hospital, Nigeria. Data generated were entered into Statistical Package for Social Sciences (SPSS Inc, Chicago, IL version 16).  $P < 0.05$  was considered as statistical significance.

Descriptive statistics were used to determine mean and standard deviations for age and periodontal status. Chi square tests were used to determine if there were significant differences in the test and control groups.

## RESULTS

The Consort diagram shows that 300 subjects were recruited and randomized (and consented). Twelve subjects were lost to follow-up. One hundred and forty

four patients were in the test group and 144 in the control group [Figure 1]. The age distribution was 20-34 years, with a mean age of  $29.5 \pm 3.57$  years [Table 1]. Chi square tests revealed no significant difference in age categories between the test and control groups.

The periodontal status of participants using CPI showed that both groups had equal degree (7.6%) of periodontal severity (code 4). Majority 100 (34.7%) of participants recorded code 3; 93 (32.4%) had code 2 and 73 (25.3%) had code 1 [Table 2].

The baseline and post treatment assessments of the periodontal status of the test group which showed an

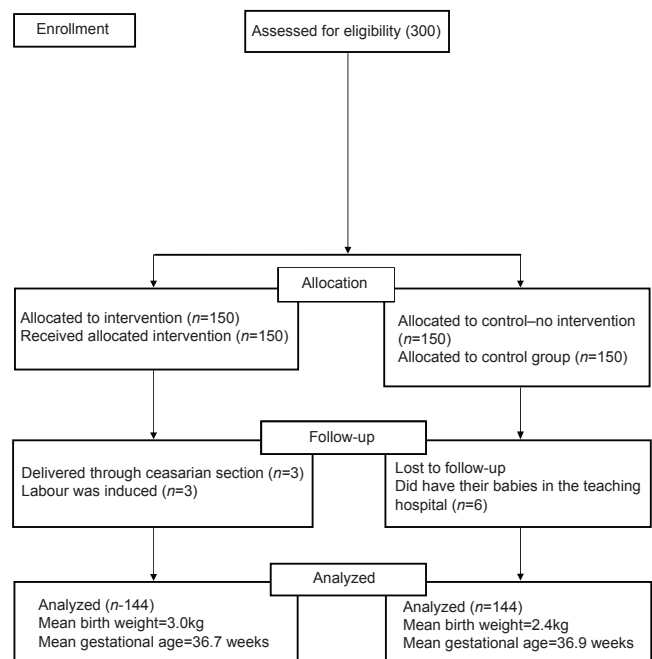


Figure 1: Consort flow diagram

Table 1: The age distribution of participants

Age (years)	Test group n (%)	Control group n (%)	Total n (%)
20-24	12 (8.3)	11 (7.6)	23 (8.0)
25-29	72 (50.0)	67 (46.3)	139 (48.3)
30-34	60 (41.7)	66 (46.1)	126 (43.7)
Total	144 (100.0)	144 (100.0)	288 (100.0)

$\chi^2=0.509$ ;  $df=2$ ;  $P=0.775$

Table 2: Periodontal status of participants using community periodontal index

CPI code	Test group n (%)	Control group n (%)	Total n (%)
1	28 (19.4)	45 (31.2)	73 (25.3)
2	56 (39.0)	37 (25.6)	93 (32.4)
3	49 (34.0)	51 (35.4)	100 (34.0)
4	11 (7.6)	11 (7.6)	22 (7.6)
Total	144 (100.0)	144 (100.0)	288 (100.0)

$\chi^2=7.881$ ;  $df=3$ ;  $P=0.049$ ; CPI – Community periodontal index

improvement following the institution of treatment. The periodontal score among the group that had code 4 (probing depth >6 mm) reduced from 7.6% at 12 weeks to 2.1% at 28 weeks. Code 2 became the predominant score with increased prevalence moving from 56 (39.0%) at 12 weeks to 63 (43.7%) at 28 weeks. There was statistical significance between the pre-treatment and post treatment assessment scores ( $P<0.05$ ) [Table 3].

The CPI score by category of birth weight (low or normal) and by treatment group (test or control). The test group had no low birth weight deliveries while the 18 low birth weight deliveries recorded in this study were from the control group. Relating the periodontal status of participants to the pregnancy outcome showed that the participants with code 4 had the highest percentage (27.2%) of LBW deliveries, followed by those with code 2 that recorded (21.6%) LBW babies and participants with codes 1 and 3 had 6.7% and 7.8% LBW babies respectively. This association was statistically significant ( $P<0.05$ ) [Table 4]. A Chi square test revealed significantly lower number of low birth weight babies in the test group. ( $P<0.0001$ ) [Table 5].

## DISCUSSION

Various maternal factors including demographic characteristics, systemic conditions and oral health status have been associated with pregnancy outcomes. Results showed that age of participant ranged from 20-34 years. This age range has been advocated to be the most favorable for child birth. This is comparable to the study<sup>[23]</sup> whose study group age range was from 18 to 35 years. Adverse pregnancy outcome was more in those whose age was 30-34 years and this seem to agree with

literature report that poor pregnancy out-come is more common as maternal age increases.<sup>[21]</sup> The 28 weeks chosen to carry out the second treatment follows from literatures that maternal periodontal disease peaks from 24 weeks of gestation and reduces from 36 weeks in many women.<sup>[24]</sup> Similar to previous studies,<sup>[25,26]</sup> none of the participants in this study was found to be in perfect periodontal health. The periodontal assessment of subjects using Community Periodontal Index (CPI) ranged from codes 1-4. Both groups had similar degree of periodontal severity 11 (7.6%) of them had code 4 (probing depth >6 mm) at base line of the study.

Following periodontal treatment the prevalence of deep periodontal pocket was 2% in test group and remained 7.6% in control group respectively. The low prevalence of deep periodontal pockets found in this study was similar to some other findings.<sup>[27,28]</sup> but dissimilar to one report.<sup>[29]</sup> The dissimilarity may be attributable to failure to institute treatment as was done in this study.

The prevalence rate of LBW recorded in this study was 6.3% and was among the control cohort. However, it was less than the prevalence rate of 16.5% reported by WHO<sup>[30]</sup> for developing countries and Asia but within the prevalence rate of 5.8 to 28.3% for Nigeria. The findings of 0% low birth weight delivery among test group after the institution of treatment suggests that poor periodontal status may have contributed to the delivery of low birth weight babies. Using the CPI evaluation, the highest percentage of the LBW babies was recorded among mothers with code 4 (27.2%), which was followed by mothers with code 2 that recorded 21.6% of the LBW deliveries. While mothers with good periodontal status code 1 had lowest percentage (6.7%) of LBW babies [Table 4]. This study therefore was similar to the study conducted previously<sup>[31]</sup> in a 5 year prospective study of antenatal mothers in which mothers with mild periodontal disease had fewer LBW babies, while mothers with severe periodontal disease recorded more. The similarity could be due to the fact that both studies were prospective studies and the women were closely monitored antenatally. The result of this study however contrasted with another study<sup>[32]</sup> which did not find any link between maternal periodontal status and low birth weight. It is interesting to note that this our study is one of the few studies carried out in the developing countries which have been said to generally have high prevalence of poor pregnancy outcome and high

**Table 3: Comparison of periodontal status at baseline and post-treatment phase**

CPI code	Test group	
	Baseline n (%)	Post-treatment n (%)
1	28 (19.4)	39 (27.0)
2	56 (39.0)	63 (43.7)
3	49 (34.0)	39 (27.0)
4	11 (7.6)	3 (2.0)
Total	144 (100.0)	144 (100.0)

$\chi^2=7.881$ ;  $df=3$ ;  $P=0.048$ ; CPI – Community periodontal index

**Table 4: Maternal periodontal status and life birth weight of babies**

CPI code	Test group			Control group		
	Low wt n (%)	Normal wt n (%)	Total n (%)	Low wt n (%)	Normal wt n (%)	Total n (%)
1	0 (0.0)	39 (100.0)	39 (100.0)	3 (6.7)	42 (93.3)	45 (100.0)
2	0 (0.0)	63 (100.0)	63 (100.0)	8 (21.6)	29 (78.4)	37 (100.0)
3	0 (0.0)	39 (100.0)	39 (100.0)	4 (7.8)	47 (92.2)	51 (100.0)
4	0 (0.0)	3 (100.0)	3 (100.0)	3 (27.2)	8 (72.7)	11 (100.0)

$P=0.0001$ ; CPI – Community periodontal index

**Table 5: Prevalence of low birth weight among participants**

Birth weight	Low n (%)	Normal n (%)	Total n (%)
Test group	0 (0.0)	144 (100.0)	144 (100.0)
Control group	18 (12.5)	126 (87.5)	144 (100.0)
Total	18 (6.3)	270 (93.7)	288 (100.0)

prevalence of periodontal disease except for a previous study carried out in Tanzania.<sup>[19]</sup> The differences in the various studies could be due to selection criteria and methodologies used, socioeconomic differences among the populations in the studies. This study used CPI, while the Brazilian study used pocket probing without recourse to an internationally approved index.<sup>[27]</sup> The link between periodontal disease and poor pregnancy outcome (LBW) has been said to be due to the fact that in mature biofilms, the bacteria possess a plethora of virulent factors, including lipopolysaccharide (LPS), that may cause direct destruction to the periodontal tissues or stimulate the host to activate a local inflammatory response that, although intended to eliminate the infection, also may lead to further loss of periodontal structures.<sup>[33,34]</sup> Moreover, the infection with maternal periodontal pathogens induces a significant alteration in the architecture of the placenta, especially in areas that are critical for the exchange of nutrients between mother and the size of the fetus.<sup>[35]</sup>

The periodontal status of the test group improved following the institution of treatment similar to some recent studies,<sup>[4,5,25]</sup> and the principal etiologic factor in periodontal disease is the mature biofilms was eliminated which returned the tissues to health. Also it was worthy of note that the mothers were not adversely affected by the treatment given during pregnancy.

## CONCLUSION

Data from this study showed that maternal periodontal disease has a significant negative influence on life birth weight of babies and periodontal treatment was effective in preventing low birth weight deliveries. This therefore supports a specific drive to improve the periodontal health of all childbearing age women as a means of improving pregnancy outcomes.

## REFERENCES

- Fitzharding PM. Follow up studies on the low birth weight infant. *J Clin Perinatol* 1976;3:506-16.
- Offenbacher S, Heasman PA, Collin JG. Modulation of host PGE<sub>2</sub> secretion as a determinant of periodontal disease expression. *J Periodontol* 1993;64:432-44.
- Jeffcoat MK, Geurs NC, Reddy MS, Goldenberg RL, Hauth JC. Current evidence regarding periodontal disease as a risk factor in preterm birth. *Ann Periodontol* 2001;6:183-8.
- Clothier B, Stringer M, Jeffcoat MK. Periodontal disease and pregnancy outcomes: Exposure, risk and intervention. *Best Pract Res Clin Obstet Gynaecol* 2007;21:451-66.
- Lopez NJ, Da Silva I, Ipinza J, Gutierrez J. Periodontal therapy reduces the rate of preterm low birth weight in women with pregnancy-associated gingivitis. *J Periodontol* 2005;76:2144-53.
- Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Maynor G, *et al.* Periodontal infection as a possible risk factor for preterm low birth weight. *J Periodontol* 1996;67 (10 Suppl):1103-13.
- Jeffcoat MK, Geurs NC, Reddy MS, Cliver SP, Goldenberg RL, Hauth JC. Periodontal infection and preterm birth: Results of a prospective study. *J Am Dent Assoc* 2001;132:875-80.
- Offenbacher S, Beck JD, Jared HL, Mauriello SM, Mendoza LC, Couper DJ, *et al.* Effects of periodontal therapy on rate of preterm delivery: A randomized controlled trial. *Obstet Gynecol* 2009;114:551-9.
- Jeffcoat MK, Hauth JC, Geurs NC, Reddy MS, Cliver SP, Hodgkins PM, *et al.* Periodontal disease and preterm birth: Results of a pilot study. *J Periodontol* 2003;74:1214-8.
- Jeffcoat M, Parry S, Samuel M, Clothier B, Catlin A, Macones G. Periodontal infection and preterm birth: Successful periodontal therapy reduces the risk of preterm birth. *BJOG* 2011;118:250-6.
- Tarannum F, Faizzuddin M. Effect of periodontal therapy on pregnancy outcome in women affected by periodontitis. *J Periodontol* 2007;78:2095-103.
- Davenport ES, Williams CE, Sterna JA. The East London study of maternal chronic periodontal disease and preterm low birth weight infants; study design and prevalence data. *Ann Periodontol* 1998;3:213-2.
- Louro PM, Fiori HH, Filho PL, Steibel J, Fiori Rm. Periodontal disease in pregnancy and low birth weight. *J Pediatr (Rio J)* 2001;77:23-8.
- Davenport ES, Williams CE, Sterne JA, Murad S, Sivapathasundram V, Curtis MA. Maternal periodontal disease and preterm low birth weight: Case-control study. *J Dent Res* 2002;81:313-8.
- Moore S, Randhawa M, Ide M. A case- control study to investigate an association between adverse pregnancy outcome and periodontal disease. *J Clin Periodontol* 2005;32:1-5.
- Boggess KA, Lieff S, Murtha AP, Moss K, Beck J, *et al.* Maternal periodontal disease is associated with an increased risk for preeclampsia. *Obstet Gynecol* 2003;101:227-31.
- Dortbudak O, Eberhardt R, Ulm M, Persson GR. Periodontitis: A marker of risk in pregnancy for preterm birth. *J Clin Periodontol* 2005;32:45-52.
- Xiong X, Buekens P, Fraser WD, Beck J, Offenbacher S. Periodontal disease and adverse pregnancy outcomes: A systematic review. *Br J Obstet Gynaecol* 2006;113:135-43.
- Mumghamba EG, Markkanen HA, Honkala E. Initial risk factors for periodontal diseases in Hala, Tanzania. *J Clin Periodontol* 1995;22:343-5.
- Milner M, Barry-Kinsella C, Unwin A, Harrison RF. The impact of maternal age on pregnancy and its outcomes. *Int J Gynecol obstet* 1992;38:281-6.
- Wood S, Frydman A, Cox S, Brant R, Needoba S, Eley B, Sauve R. Periodontal disease and spontaneous preterm birth: A case control study. *BMC Pregnancy Childbirth* 2006;6:24.
- Gandhimadhi D, Mythili R. Periodontal infection as a risk factor for preterm low birth weight. *J Indian Soc Periodontol* 2010;14:114-20.
- Lopez NJ, Smith PC, Guteierrez J. Periodontal therapy may reduce the risk of preterm low birth weight in women with periodontal disease; a randomized controlled trial. *J Periodontol* 2002;73:911-24.
- Miyazaki H, Yamashita Y, Shirahama R, Goto-Kimura K, Shimada N, Sogame A, *et al.* Periodontal condition of pregnant women assessed by CPIITN. *J Clin Periodontol* 1991;18:51-4.
- Newnham JP, Newnham IA, Ball CM, Wright M, Pennell CE, Swain J, *et al.* Treatment of periodontal disease during pregnancy: A randomized control trial. *Obstet Gynecol* 2009;114:1239-44.
- Michalowicz BS, Hodges JS, DiAngelis AJ, Lupo VR, Novak MJ,

- Ferguson JE, *et al.* Treatment of periodontal disease and the risk of preterm birth. *N Engl J Med* 2006;355:1885-94.
27. Lunardelli AN, Perez MA. Is there an association between periodontal disease, prematurity and low birth weight? A population-based study. *J Clin Periodontol* 2005;32:938-9.
28. Mokeem SA, Molla GN, Al-Jewair TS. The prevalence and relationship between periodontal disease and preterm low birth weight infants at King Khalid university hospital. Riyadh, Saudi Arabia. *J Contemporary Dent Pract* 2004;2:040-56.
29. Rajapakse PS, Nagarathine M, Chandrasekara KB, Danasayake AP. Periodontal disease and prematurity among non smoking Sri-Lankan women. *J Dent Res* 2005;84:274-7.
30. Centers for Disease Control. Increasing incidence of low birth weight-United States, 1981 – 1991. *MMWR* 1994;45:335-9.
31. Ovadia R, Diaz-Romero RM. Relationship between pregnancy and periodontal disease. *Series: Med Biol* 2007;14:10-4.
32. Vettore MV, Leao AT, Leal M do C, Feres M, Sheiham A. The relationship between periodontitis disease and preterm low birth weight: Clinical and microbiological results. *J Periodont Res* 2008;43:615-26.
33. Bobetsis YA, Barros SP, Offenbacher S. Exploring relationship between periodontal disease and pregnancy complications. *J Am Dent Assoc* 2006;137:7s-13.
34. Dareau RP, Tanner A, Page RC. The microbial challenge in periodontitis. *Periodontol* 2000 1997;14:12-32.
35. Moliterno LF, Monteiro B, Figueredo CM, Fisher RG. Association between periodontitis and low birth weight: A case-control study. *J Clin Periodontol* 2005;32:886-8.

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