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The association between maternal periodontitis and low birth weight infants among Malay women

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Abstract – *Objectives:* Maternal periodontitis has been suggested as one of the risk factors for low birth weight (LBW) infants. The objective of this study was to determine the association between maternal periodontitis and LBW infants among Malay women. *Methods:* Screening periodontal examinations were carried out on all eligible Malay pregnant women in the second trimester of pregnancy attending two randomly selected community maternal and child health clinics in Kota Bharu, Kelantan. Patients with four or more sites with pocket depth 4 mm or higher, and clinical attachment loss 3 mm or higher at the same site with presence of bleeding on probing were diagnosed as having periodontitis in this study. Using this definition, systematic random sampling was utilized for selection of 250 subjects for each exposed and non-exposed group. Of 500 subjects enrolled in the study, 28 (5.6%) were either dropped or lost to follow-up. Of the remaining 472 subjects, 232 with periodontitis were in the exposed group and 240 with healthy periodontium were in the nonexposed group. *Results:* The incidence of LBW was 14.2% (95% CI: 9.70–18.75) in women with periodontitis, and 3.3% (95% CI: 1.05–5.62) in women without periodontitis. The relative risk of having LBW infants was 4.27 times higher for women with periodontitis compared with those without periodontitis (95% CI: 2.01–9.04). After adjustment for potential confounders using multiple logistic regression analysis, significant association was found between maternal periodontitis and LBW (OR = 3.84; 95% CI: 1.34–11.05). *Conclusion:* The results of this study provide additional evidence that pregnant women with periodontitis are at a significantly higher risk of delivering LBW infants.

Key words: low birth weight; Malay; periodontitis; pregnant

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Low birth weight (LBW), which is defined by the World Health Organization as a birth weight of less than 2500 gm (1) is a well-documented risk factor for neonatal and infant morbidity, as well as mortality. More than 20 million LBW infants are born each year, affecting 16.8% of all newborns in developing countries, and contribute to 75% or more of neonatal and infant deaths (1). In Malaysia, the prevalence of LBW has been steadily decreasing from 9.7% of all live births in the year 1998 to 9.0% in the year 2000 and 8.6% in 2002 (2). Nevertheless, the problem remains as 66.2% of all 6038 cases of stillbirths and neonatal deaths in 1999 were LBW (3).

LBW is an outcome of either a short gestational period leading to preterm birth (PTB), or a retarded intrauterine growth or a combination of both. The complex and multifactorial causes of LBW, comprising of a variety of factors that may have impacts on either of the events, have been the focus of a vast number of investigations over the last few decades. Nevertheless, a significant

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proportion of LBW is still of unknown aetiology that occur without even a suspected risk factor. Thus, despite significant advances in perinatal medicine and better understanding of reproductive physiology over the past few decades, the global burden of LBW remains high.

The association between infections of the uterine, genital and urinary systems and the risks of preterm LBW (PLBW) deliveries has been well reviewed (4, 5). However, it was also noted that a consistent and reproducible feature of LBW cases, which is an increased level of maternal inflammatory mediators and cytokines such as prostaglandin E_2 (PGE_2) and tumour necrosis factor alpha (TNF-α), may occur even in the absence of infections of the amniotic cavity or the genitourinary tract (6). This has led to the hypothesis that extra-uterine infections of unknown origin may be a cause of PLBW.

The theory that periodontal infection may contribute to LBW was first tested by Collins *et al.* (7) who demonstrated significant dose–response relationship between levels of both PGE_2 and TNF-α and embryo lethality and foetal growth retardation in pregnant hamsters challenged with periodontal pathogen, *Porphyromonas gingivalis*, inoculated within subcutaneously implanted tissue chamber. These observations prompted Offenbacher *et al.* (8) to investigate the possible link between periodontal infection and PLBW in human. Multiple logistic regression models detected a significant, strong association between periodontal disease and PLBW (OR = 7.5, 95% CI: 6.27–9.58). Further study indicated that PGE_2 levels in gingival crevicular fluid were significantly higher in mothers of PLBW infants than in mothers of infants with normal birth weight (NBW) (9). They hypothesized that periodontal infections, which serve as reservoirs for gram-negative anaerobic organisms and its products, as well as inflammatory mediators like PGE_2 and TNF-α may pose a potential threat to the foetal-placental unit. Their study was a milestone in this new, very important field of periodontal medicine, and was further supported by numerous human observational studies utilizing case-control (10, 11) and cohort designs (12–14), intervention studies (15, 16) and experimental laboratory-based animal studies (17).

This prospective cohort study aimed to determine the association between maternal periodontitis and LBW among Malay women in Malaysia. Findings of this study would undoubtedly provide additional facts on the health and well-being of pregnant women and infants in this country and thus contribute to a much better knowledge and understanding of LBW than we have at present. It is also hoped that knowledge derived from this study would stimulate and motivate more research on the roles of other modifiable determinants of LBW in our local community as well as the important roles of oral diseases in general health and well-being.

Methods

Introduction to the study area

Kelantan is located in the East Coast of Malaysia, and Kota Bharu district, the study area, is the state capital of Kelantan. Health services in Kota Bharu are provided by both public and private sectors. In the public sector, MOH Malaysia is the lead agency in the provision of health care to the community. Under the MOH decentralized system, there are hierarchical levels of health care with prescribed scope of functions. At the primary health care level, there is a two-tier system consisting of a health centre with four community nurse clinics. Antenatal care, which is delivered free of charge as an integral component of primary health care services, is provided mainly at maternal and child health clinics based at the health centres. At present, there are 10 health centres in Kota Bharu district, and of these, two centres were selected using simple random sampling as the research centres.

Population and sample

The study population consisted of Malay pregnant women who received antenatal care from the two randomly selected maternal and child health clinics in Kota Bharu, Kelantan between December, 2003 and June, 2004. Ethical approval to conduct the study was obtained from the Research and Ethical Committee, School of Medical Sciences, Universiti Sains Malaysia. Ethical approval was also sought from the Medical Research and Ethics Committee, MOH Malaysia as the study was conducted in the MOH premises.

Screening periodontal examinations were performed on all pregnant women attending the selected health centres during the study period to determine their exposure status. Written informed consent was obtained from all study participants. The inclusion criteria for screening were all women in the second trimester of pregnancy (14–27 week gestation), while exclusion criteria were women with potential confounders such as active smoking or diabetes. Women with known risk factors for LBW such as alcohol consumption during pregnancy, suffering from chronic hypertension and having multiple foetuses as confirmed by ultrasound examinations were also excluded. Women with history of periodontal treatment during the current pregnancy, or had fewer than 20 teeth and those who were taking antibiotics for any reason at any time during the pregnancy were excluded as these might lead to misclassification of exposure status. For safety reason, women who require prophylactic antibiotics for any periodontal procedures were also excluded from being screened for the study.

A total of 2359 pregnant women attended the selected health centres for antenatal check-up during the study period. Of these, only 1174 women fit the inclusion and exclusion criteria and were subjected to periodontal screening, from which 476 women were diagnosed as having periodontitis while another 698 were not. Systematic random sampling was applied for selection of study subjects to get the prior determined sample size of 500 subjects, 250 women with periodontitis in the exposed group and another 250 women with healthy periodontium in the nonexposed group.

Measurement of maternal periodontitis and criteria of diagnosis

All clinical periodontal examinations in this study were performed by the main author using standardized clinical equipments and instruments. Subjects were examined while seated on a mobile dental chair under good lighting using a mouth mirror and a periodontal probe. The Hu-Friedy CP 11.5B periodontal probe by Hu-Friedy Manufacturing Company, Inc., Chicago was used to determine the following variables: clinical attachment loss (CAL) in millimetre (mm), pocket depth (PD) in millimetre (mm) and presence of gingival bleeding on probing (BOP). CAL and PD were assessed at six sites (mesial, mid and distal surfaces on both palatal/lingual and buccal sides) on each tooth present (excluding the wisdom teeth), while BOP was assessed on four sites (mesial and distal surfaces on both palatal/lingual and buccal sides) of the respective tooth. The presence of four or more sites with PD 4 mm or higher, and CAL 3 mm or higher at the same site with presence of BOP were diagnosed as periodontitis in this study.

Periodontal examinations were repeated at 2–4 weeks interval during the follow-up period to assure their exposure status. In addition, antenatal health records of all subjects were also reviewed for any risk of developing medical illnesses associated with pregnancy that might influence the outcomes such as genito-urinary tract infection, poorly controlled gestational diabetes, or hypertension. Subjects who developed any deteriorating conditions that would affect either their exposure status and/or the study outcomes were dropped from the study and referred for treatment accordingly. Otherwise, subjects remained in study and were followed till parturition. All subjects in the exposed group were referred for the necessary periodontal therapy after delivery.

Recording of maternal characteristics

Self-reported questionnaire were utilized to gain information on socio-economic background and passive exposure to cigarette smoke. Socio-economic characteristics of the subjects were measured by three indicators commonly used in social studies, namely education, occupation and income. Occupation of the subjects was later categorized on the basis of the degree of skills (manual and nonmanual) involved. Passive smoking was defined as being exposed to someone else's cigarette smoke for at least 2 hours/day at home, at work, in vehicles or indoor public places any time during pregnancy.

Past and present obstetric profile of the subjects as documented in the antenatal health records by the attending nurses or medical physicians were obtained. These include parity status, onset of antenatal care, number of antenatal visits and history of previous pregnancies. Rates of weight gain were calculated based on results of anthropometric measurements of maternal weight recorded during each antenatal visit. Outcomes of laboratory investigations on the subjects' haemoglobin level at 18-week gestation were also noted. All record reviews and data extraction procedures were performed by the main author and no reliability assessment was carried out prior to the review.

Recording of pregnancy outcomes

The main outcome of interest in this study was infant birth weight in grams as recorded in the home-based maternal health record by midwife or medical physician attending to the birth at the respective place of delivery. The birth weight was later categorized into NBW or LBW. The definition of LBW in this study was as defined by the

World Health Organization which is a birth weight of less than 2500 gm regardless of duration of pregnancy (1). The degree of severity of LBW was determined based on descriptions by Mayfield*et al.* (18), moderately LBW (MLBW; birth weight 1501–2499 gm), very low birth weight (VLBW; birth weight 1001–1500 gm) or extremely low birth weight (ELBW; birth weight 1000 gm or less). Gestational week of delivery was also noted. Estimation of gestational age was based on either the date of last menstrual period or ultrasound examinations by the medical physician at the respective health centre during antenatal check-ups.

Statistical analysis

Data entries and analyses of results were performed using the Intercooled Stata (version 7.0, StataCorp, TX, USA), SPSS for Windows (version 11.0, SPSS Inc., Chicago, IL, USA), and Epi Info (version 6.0, CDC, Atlanta, GA, USA) statistical software packages. To begin with, descriptive statistics were determined for both exposed and nonexposed groups, including differences in distribution of variables between the two groups. Independent *t*-tests and chi-square tests were used to compare continuous and categorical variables respectively. The level of significance was set at 0.05.

The association between maternal periodontitis and LBW was obtained at both univariable and multivariable level using simple logistic regression analysis and multiple logistic regression analysis respectively. In multiple logistic regression analysis, variables for inclusion in the model were selected using a stepwise elimination variable selection procedure. Following the fit of the preliminary model, the importance of each variable included was verified. This included examination of the Wald statistic for each variable and a comparison of each estimated coefficient with the coefficient from the univariate model containing only that particular variable. Variables that did not contribute to the model were eliminated and a new model fit. The new model was then compared with the old model through likelihood ratio (LR) test to ensure that only significant variables were included. The interactions terms were also checked using the LR test. Multicollinearity problem was checked by variance inflation factor test. The final model was tested for fitness using Hosmer–Lemeshow goodness-of-fit test. The receiver operating characteristic curve, area under the curve and classification table for sensitivity and specificity were also obtained in order to evaluate the model fitness.

Results

Maternal profile: descriptive analysis

Of 500 subjects enrolled in the study, 28 (5.6%) were either lost to follow-up or excluded. Ten of the subjects were from the nonexposed group while the other 18 were from the exposed group. The reasons for exclusion were mainly due to poorly controlled medical problems as diagnosed by the attending medical physician such as gestational diabetes and risk for pre-eclampsia. Exposure status of all the subjects remained stable through out the follow-up period. None of the subjects in the nonexposed group developed periodontitis, nor there were subjects in the exposed group who showed significant clinical deterioration as reflected by marked increase in either number of sites or depths of periodontal pockets in comparison with the baseline data obtained during the initial screening. Thus, at the end of the follow-up period, 472 subjects remained in the study. Of these, 240 were in the nonexposed group and 232 were in the exposed group.

Socio-demographic profile of the subjects is shown in Table 1. The age of the subjects ranges from 14 to 46 years old. The mean age of the subjects in the exposed and nonexposed groups was not significantly different. The nonexposed, however, consisted more of those with higher education level, better occupation standing and higher household income. The differences were significant.

Table 2 shows the comparison of the distribution of obstetric profile in the exposed and nonexposed groups. It was noted that the exposed group had significantly lower mean rate of weight gain (kg/week) during the second trimester, shorter duration of pregnancy and there were more of them with past history of LBW.

Incidence of LBW

The total incidence of LBW in this study was 8.7%. Of these, 14.2% (95% CI: 9.7–18.8) occurred among subjects with periodontitis compared with only 3.3% (95% CI: 1.1–5.6) that occurred among those without periodontitis (Table 3). The relative risk (RR) of LBW infants in subjects with periodontitis was 4.27 times higher than in those without periodontitis, indicating a positive association (RR = 4.27, 95% CI: 2.01–9.04). The proportion of risk for LBW attributable to periodontitis in the group of exposed subjects was 76.6% (95% CI: 50.3–88.9).

Table 1. Socio-demographic profile of 232 exposed and 240 nonexposed subjects

	Periodontal disease status			
Socio-demographic profile	Exposed frequency (%)	Nonexposed frequency (%)	χ^2 statistics (d.f.)	P value
Age (years)	29.32 (6.79)[a]	28.90 (6.28)[a]	0.697 (470)[b]	0.486
Education level				
Tertiary/postsecondary education	46 (19.8)	77 (32.1)	13.85 (2)	0.001
Secondary education	147 (63.4)	143 (59.6)		
Primary education	39 (16.8)	20 (8.3)		
Occupation				
Unemployed/housewife	160 (69.0)	131 (54.6)	14.37 (3)	0.002
Non/semiskilled worker	51 (22.0)	61 (25.4)		
Skilled worker	12 (5.2)	30 (12.5)		
Highly skilled worker	9 (3.8)	18 (7.5)		
Monthly household income (RM)	800.00 (800.00)[c]	1200.00 (1398.75)[c]	5.601 (470)[b]	<0.001

[a] Mean (SD).
[b] t-statistics (d.f.).
[c] Median (IQR).

Table 2. Obstetric profile of 232 exposed and 240 nonexposed subjects

	Periodontal disease status			
Obstetric profile	Exposed frequency (%)	Nonexposed Frequency (%)	χ^2 statistics (d.f.)	P value
Parity status				
Primiparity	60 (25.8)	67 (27.9)	2.08 (2)	0.353
Multiparity	131 (56.5)	142 (59.2)		
Grand/great grandmultiparity	41 (17.7)	31 (12.9)		
Onset of care (gestational weeks)				
First trimester (<14 weeks)	64 (27.6)	70 (29.2)	0.78 (2)	0.676
Early 2nd trimester (14–20 weeks)	127 (54.7)	122 (50.8)		
Late 2nd trimester (>20 weeks)	41 (17.7)	48 (20.0)		
No. of antenatal visits	9.25 (0.12)[a]	9.28 (0.11)[a]	0.20 (470)[b]	0.999
Gestational duration at delivery (weeks)	38.70 (1.39)[a]	39.05 (0.99)[a]	3.14 (470)[b]	0.002
Haemoglobin level (g/dl)				
≤10.5 g/dl	31 (13.4)	24 (10.0)	1.30 (1)	0.255
>10.5 g/dl	201 (86.6)	216 (90.0)		
Rate of weight gain during 2nd trimester (kg/week)	0.41 (0.19)[a]	0.50 (0.20)[a]	4.70 (470)[b]	<0.001
Rate of weight gain during 3rd trimester (kg/week)	0.38 (0.23)[a]	0.38 (0.17)[a]	0.67 (470)[b]	0.946
History of PTB				
No	221 (95.3)	230 (95.8)	0.09 (1)	0.762
Yes	11 (4.7)	10 (4.2)		
History of abortion				
No	194 (83.6)	207 (86.2)	0.64 (1)	0.424
Yes	38 (16.4)	33 (13.8)		
History of LBW				
No	185 (79.7)	219 (91.2)	12.67 (1)	<0.001
Yes	47 (20.3)	21 (8.8)		
Passive smoking exposure				
No	91 (39.2)	100 (41.7)	0.29 (1)	0.589
Yes	141 (60.8)	140 (58.3)	2.08 (2)	

[a] Mean (SD).
[b] *t*-statistics (d.f.).

Of 41 LBW deliveries, 39 infants were MLBW, while the other two infants were VLBW who required admission to the Neonatal Intensive Care Unit in Kota Bharu Hospital because of postnatal complications. Both the cases of VLBW were delivered by mothers exposed to periodontitis. It was also noted that of all births, 19 (4.0%) were delivered prematurely and of these, 18 (94.7%)

Table 3. Incidence of LBW in 232 exposed and 240 nonexposed subjects

Periodontal disease status	n	LBW frequency (%)	95% CI
Exposed	232	33 (14.2)	9.7–18.8
Nonexposed	240	8 (3.3)	1.1–5.6

were also LBW. Sixteen (6.9%) premature infants were delivered by mothers with periodontitis when compared with 3 (1.3%) cases by mothers with healthy periodontium.

Association between maternal periodontitis and LBW

Maternal periodontitis was significantly associated with LBW at both univariable (OR = 4.81, 95% CI: 2.17–10.65) and multivariable levels (OR = 3.84, 95% CI: 1.34–11.05). In the multivariate model, maternal education was another factor found to be significantly associated with LBW, the effect of which depends on the level of education. Longer gestational duration also had a significant protective effect against LBW with an OR of 0.24 (95% CI: 0.15–0.37). Results of Hosmer–Lemeshow goodness-of-fit test suggested that this final model had a good fit. Table 4 summarizes the results of multiple logistic regression analysis for the association between maternal periodontitis and LBW.

Discussion

Despite having numerous human studies showing positive association between maternal periodontal infection and LBW (9–16, 19), and that there is a plausible theory of how periodontitis may increase the risk of LBW, it is not yet clear whether the association is causal, and some studies have even reported otherwise. In a case-control study of 236 women who delivered PLBW infants and 507 controls with NBW outcomes, Davenport *et al.* (20) did not only fail to find an association between PLBW and periodontal disease, but surprisingly found a decreasing risk for PLBW with increasing pocket depth (OR = 0.78, 95% CI: 0.64–0.99). The authors however concluded that variation in ethnic composition of the population studied might be partly responsible for the contradicting results. Similarly, few other case-control studies (21, 22), as well as a large cohort study by Moore *et al.* (23) on 3738 pregnant women in Guy's and St Thomas' Hospital Trust, London, also failed to detect any association between maternal periodontal infection and delivery of LBW infants. Nevertheless, recent systematic reviews (24–26) carried out on this subject matter all reached to a similar conclusion that there is enough evidence to suggest maternal periodontal infection as a possible risk factor for LBW infants although causality is still unclear.

Our study, performed on Malay subjects from the East Coast of Malaysia, supports the research hypothesis that there is a significant association between maternal periodontitis and LBW. The incidence of LBW was 14.2% (95% CI: 9.7–18.8) in pregnant mothers with periodontitis, compared with only 3.3% (95% CI: 1.1–5.6) in those without periodontitis. Significant association was found between maternal periodontitis and LBW at both univariable (OR = 4.81, 95% CI: 2.17–10.65) and multivariable level analysis (OR = 3.84, 95% CI: 1.34–11.05). It was also noted that the strength of association in our study is comparable with studies performed among other populations that showed positive association between maternal periodontitis and LBW (10–12, 14, 19).

Table 4. Association between maternal periodontitis and LBW

Maternal risk factors	Crude OR[a]	Adjusted OR[b]	95% CI[b]	LR χ^2 (d.f.)[b]	P value[b]
Periodontal status					
Nonexposed	1.00	1.00	–	6.91 (1)	0.009
Exposed	4.81	3.84	1.34–11.05		
Education					
Tertiary/postsecondary	1.00	1.00	–	29.00 (2)	<0.001
Secondary	0.25	0.15	0.04–0.55		
Primary	6.50	3.18	1.05–9.58		
Gestational duration (weeks)	0.22	0.24	0.15–0.37	78.32 (1)	<0.001

[a] Determined by simple logistic regression analysis.
[b] Determined by multiple logistic regression analysis.
Note: The multiple logistic regression model has a good fit (Hosmer–Lemeshow goodness-of-fit test: degree of freedom = 8, P = 0.9389; correctly classified = 95.13%, sensitivity = 56.10%, specificity = 98.84%; area under the receiver operating characteristics curve = 0.9480).

The results of our study showed that many preterm infants are LBW. This is consistent with a report on the increasing incidence of LBW in the United States from the year 1981 to 1991 which was attributed to an increase in PTB (27). Evidence from an ultrasound study had also demonstrated that preterm infants weigh less than infants of the same gestational age who remain *in utero* (28). The fact that birth weight increases with greater gestational age is apparent in our findings when the risk of LBW was significantly reduced with longer gestational period (OR = 0.24, 95% CI: 0.15–0.37).

Poor socio-economic conditions as indicated by low level of education, occupation and household income, are important risk factors for LBW (29, 30). Of these three socio-economic indicators measured in this study, only poor maternal education was significantly associated with an increased risk for LBW. Our findings also showed that periodontally healthy subjects hold higher qualifications in education. Thus, we postulated that education may have independent effects, above and beyond income or occupation, because mothers with higher education may be more aware and well-informed about preventive health care and healthy behaviours during pregnancy.

Provision of medical services, nutritional and educational activities during antenatal care has long been accepted as a means to improve pregnancy outcomes although the current supporting evidence is inconclusive (31). Granted that studies documenting on favourable infant birth weights with early onset of antenatal care and more frequent antenatal visits are continuingly being reported (32, 33), the results of our study seemed to agree with those who proved otherwise (34).

Poor past obstetric outcomes such as history of LBW or preterm delivery and spontaneous abortion are well-known risk factors for adverse pregnancy outcomes in successive births, although the mechanisms through which they function have not as yet been clearly explained (35, 36). However, poor obstetrical factors were not associated with LBW in our study, probably because there were only a small proportion of subjects who were at risk. Similarly, parity was not a significant risk factor for LBW in our study.

Foetal growth is affected by maternal nutrition which is reflected by the mother's weight gain during pregnancy. As such, low maternal weight gain has been used as a predictor of LBW. Such association, however, was not apparent in this study. Nevertheless, the results of our study agree that the average rate of maternal weight gain during the second trimester is higher before slowing down slightly in the third trimester (37).

Maternal anaemia during pregnancy has been associated with an increased risk of prematurity and LBW (38). Hence, routine iron supplementation has been part of antenatal care, especially in many developing countries where pregnancy anaemia is common, including Malaysia. While there is inadequate evidence to suggest that antenatal iron supplement is useful in improving pregnancy outcomes, there is also insufficient proof to recommend against it (39). Nevertheless, this preventive effort appears to be beneficial as the majority of our subjects (88.3%) were able to maintain the optimum haemoglobin concentration of at least 10.5 g/dl which might explain for the lack of association between haemoglobin level and infant birth weight in this study.

Maternal passive exposure to cigarette smoke has been linked to LBW deliveries (40). However, the definitive causal association is still absent owing to the conflicting results, which is probably due to the lack of a standardized measure of exposure and the problems of content validity of the measures used. Using self-reported questionnaire as the predictor of exposure, we found no evidence for an association with LBW. Thus, we concluded that imprecise exposure classification might contribute to such findings as actual passive exposure tends to vary widely depending on the dose, duration and intensity of exposure, as well as room size and ventilation rate.

Among the strengths of this study is that the measurement of exposure variable was perfomed prior to the onset of the outcome, thus allowing for determination that periodontitis was present before LBW. While this knowledge alone does not prove a causal association between maternal periodontitis and LBW, it is one of the necessary criteria for such relationship.

Many maternal factors can impact foetal growth that would in turn affect the birth weight. Attempts were made in this study to identify and control for maternal medical and behavioural characteristics that might confound the outcome, which include study protocol that exclude women with pre-existing medical problems or diagnosed with multiple gestation. Restricting the subjects to specific characteristics is one strategy to remove the potential for confounding effects related to the particular characteristics and can reduce differences in related characteristics. Exclusion of subjects with history of tobacco smoking and alcohol consumption was actually due to the fact that none of the women in the source population indulge in these habits as these practices are cultural taboos, and what is more they are against the Islamic religious belief practiced in this country. The confounding effects of gestational duration and other risk factors for LBW were handled at the analytical stage through appropriate statistical models.

On the contrary, it should also be noted that logistic regression analysis, yielding odds ratio as an approximation of relative risk, was used in this study to determine the association between maternal periodontitis and LBW. Thus, the results should be interpreted with caution as there is a possibility that the odds ratio might have slightly overestimated the true risk of association. The use of secondary data obtained from maternal health records posed another limitation to this study. However, within these limitations, we concluded that the odds of having LBW infants was significantly increased for pregnant women having periodontitis when compared with those without periodontitis in our study, and hence provided additional evidence that support the role of periodontitis as an etiologic factor in LBW.

From a public health perspective, the importance of this study lies in the fact that poor periodontal health is a factor that is easily amenable to prevention. This finding reflects the essential contribution of oral health care as the necessary and essential component of a comprehensive antenatal health care programme. Ultimately, it is hoped that the results of this study would establish the groundwork for a closer communication and improved consultation between medical and dental professionals in this country to improve the quality of antenatal health care services towards achieving the nation's visions and goals for health.

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