RESEARCH ARTICLE

Association between maternal chronic apical periodontitis (CAP) and low birth weight preterm birth (LBWPT)

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Abstract

Objective: To determine the association between maternal chronic apical periodontitis and low birth weight preterm birth.

Method: The case-control study was conducted at the Gynaecology Ward of the Civil Hospital, Karachi, from September 2017 to April 2018, and comprised women aged 19-48 years with singleton pregnancy delivering spontaneously. The subjects were examined for the presence of periodontitis. The mothers who delivered low birth weight preterm babies were the cases in group A and those who delivered normal birth weight babies were the controls in group B. On the delivery day, after the subject having been moved to the room, data was collected through a questionnaire to record demographic details, history of pregnancy and information about the newborn. The radiographs were assessed for the presence of chronic apical periodontitis. The association between maternal chronic apical periodontitis and low birth weight preterm birth was subsequently determined. Data was analysed using SPSS 24.

Results: Of the 200 subjects, 100(50%) were in group A with a mean age of 27.17±5.11 years, and 100(50%) were in group B with a mean age of 27.08±4.90 years. Low birth weight preterm birth was associated with education level and family size ($p<0.05$). There was no association between maternal chronic apical periodontitis and low birth weight preterm birth ($p>0.05$).

Conclusion: There was no association between maternal chronic apical periodontitis and low birth weight preterm birth.

Keywords: Low birth weight infant, Periodontitis, Preterm birth, Adverse pregnancy outcomes, Chronic apical periodontitis.

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Introduction

The importance of premature delivery, which is birth before the completion of 37 gestational weeks, cannot be discounted. This occurrence is prevalent in less developed countries. The worldwide frequency of premature parturition is 11% with most taking place in the less developed regions.[1]

In Pakistan, the extent of low birth weight preterm (LBWPT) births is also on the higher side.[2] Under five years of age, premature parturition difficulties represent the key reason of death, leaving a mortality of more than a million in 2015 alone.[2]

Premature delivery or being little for gestational age are the reasons for low birth weight (LBW), and are necessary though not direct circuitous reasons for neonatal mortality. The global frequency of LBW is 15.5%, which combines nearly 20 million LBW newborn babies conceived yearly; 96.5% of them in less developed countries.[3] In Pakistan, irrespective of term birth, around 18-25% deliveries are LBW. A study showed that in Pakistan more than 80% of the newborns had a weight of 2100 to 2500gm.[2]

Among children there exist various disabilities linked with preterm birth (PTB), consisting of motor and cognitive damage, like Attention Deficit Hyperactivity Disorder (ADHD). Literature shows various risk factors related to LBWPT, and maternal periodontitis is one of them. It is recognised that the systemic inflammation led by maternal periodontitis is the main factor behind PTB.[4]

Studies advocate that during pregnancy, periodontitis is possibly an indicator for LBWPT. The association between unfavourable pregnancy outcomes and maternal periodontitis has been found in the last two decades.[5]

Mothers having chronic apical periodontitis (CAP) have been recently identified as one of the possible risk factors for LBWPT births.[6] Several studies exhibited the load of CAP in countries, like Spain, Canada, United States, Japan and Turkey.[7] The biological odds of the relationship of CAP with systemic effects depend on the knowledge that shows that humans with lesions of endodontic origin exhibits elevation in serum levels of C-reactive protein (CRP), tumour necrosis factor-alpha (TNF-α), interleukin-1 (IL-1) and IL-2.[8] Compared to the other frequent chronic oral diseases in humans, maternal periodontitis is reported in 5-35% of young females.[5] Evolving evidence advocates that maternal periodontitis not only increases the odds of

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certain systemic diseases, like respiratory and heart diseases, but also LBW in infants.[9] Studies conducted in Pakistan showed that the higher presence of periodontitis among pregnant women led to LBWPT babies.[10]

The actual burden of CAP is not known in Pakistani women. Given its association with premature birth and LBW babies, it is necessary to find out its extent and relation with LBWPT birth.

The current study was planned to determine the association between maternal CAP and LBWPT birth.

Patients and Methods

The case-control study was conducted at the Gynaecology Ward of the Civil Hospital, Karachi (CHK), from September 2017 to April 2018. The sample size was calculated using the World Health Organisation (WHO) calculator taking the odds ratio (OR) of 3.52 (95% confidence interval [CI]: 1.01-12.320)[11] between CAP and LBWPT. The power of the study was kept at 80%, confidence level at 95% and relative precision at 50%. The required sample size was 83 per group, but was inflated to 100.

The sample was raised using non-probability consecutive sampling technique. Those included were women aged 19-48 years with healthy gums and periodontium who had singleton pregnancy and delivered spontaneously either normal vaginal or Caesarean Section (CS) delivery. Women with co-morbid conditions, like eclampsia and pre-eclampsia, gestational diabetes mellitus (GDM), post-delivery body mass index (BMI) <18.5 kg/m^2, PTB in previous pregnancies, those having less than 18 teeth or twin pregnancy were excluded because these manifestations may be related to LBWPT birth. A consent form (in Urdu) was used to record the consent of the participant with signature or thumb print.

The subjects were examined for the presence of periodontitis. To evaluate the clinical attachment loss and probing depth, every tooth was probed from its six sites. Periodontitis was identified if three or more sites in dissimilar teeth showed ≥3mm of probing depth.[6] Potential participants suffered from Periodontitis were excluded since it plays a role of a confounder.

The mothers who delivered LBWPT babies were the cases in group A and those who delivered normal birth weight babies were the controls in group B. On the delivery day, after the mother was shifted to the room, data was collected using a questionnaire to record demographics, history of pregnancy and information about the new-born.

For the diagnosis of CAP, the periapical radiographs of the suspected teeth (unsatisfactorily treated, necrosed teeth and untreated caries) were obtained within two days post-delivery through portable wireless digital radiographic machine. The principal investigator assessed the radiographs for the presence of CAP. For calibration and uniform assessment, the principal investigator first learnt the assessment of radiographs from an experienced endodontist. For the assessment of the radiographs, the periapical index (PAI)[12] was used, which is scored from 1 to 5, or from healthy to severe periodontitis. Participants with score ≥3 were marked as having CAP. Conventional periapical films were employed for the radiographs of teeth and neighbouring tissue to include the periapical area. Participants were informed regarding CAP findings (lesion on periapical radiograph) and were referred for treatment to the Dow Dental College, Dow University of Health Sciences (DUHS), Karachi.

Data was analysed using SPSS 24. Univariate and multivariable logistic regression analyses were used to check the association between LWBPT and CAP, while OR

Table-1: Socio-demographic and gestational characteristics (n=200).

Socio demographic variable	n (%)
Age (years)	
>30	41 (20.5)
≤30	159 (79.5)
Education	
Illiterate	86 (43.0)
Educated	114 (57.0)
Family Income in Rupees (per month)	
≤ 10000	139 (69.5)
> 10000	61 (30.5)
Family Size	
≤ 6 members	126 (63.0)
> 6 members	74 (37.0)
Gestational Variables	
Gravidity	
Primigravida	57 (28.5)
Multigravida	143 (71.5)
Parity	
Primiparous	57 (28.5)
Multiparous	143 (71.5)
BMI	
< 23.86 kg/m^2	180 (90.0)
> 23.86 kg/m^2	20 (10.0)
Preterm Low Birth Weight	
Yes	100 (50.0)
No	100 (50.0)
CAP	
Present	150 (75.0)
Absent	50 (25.0)
No. of teeth having CAP	
0	50 (25.0)
1	115 (57.5)
2	32 (16.0)
3	03 (01.5)

BMI: Body mass index; CAP: Chronic apical periodontitis.

with 95%CI were also calculated. Multivariable analysis was done in order to remove confounders and adjusted OR (AOR) and 95%CI were computed. P≤0.05 was considered significant.

Results

Of the 200 subjects, 100(50%) were in group A with a mean age of 27.17±5.11 years, and 100(50%) were in group B with a mean age of 27.08±4.90 years. CAP was present in 150(75%) subjects, while 115(57.5%) had CAP in single tooth (Table-1).

Table-2: Bivariate analysis of variables with LBWPT birth.

Variables	Cases (n=100)	Control (n=100)	Crude (O.R)	95% C.I	*p*-value
Age (years)					
>30	24	17	1.54	0.77-3.09	0.22
≤30	76	83			
Education					
Illiterate	51	35	1.93	1.09-3.41	0.02
Educated	49	65			
Family Income in Rupees (per month)					
≤ 10000	64	75	0.59	0.32-1.09	0.09
> 10000	36	25			
Family Size					
≤ 6 members	70	56	1.83	1.02-3.28	0.04
> 6 members	30	44			
Gravidity					
Primigravida	34	23	1.72	0.92-3.21	0.08
Multigravida	66	77			
BMI					
< 23.86 kg/m^2	90	90	1.00	0.39-2.52	>0.99
> 23.86 kg/m^2	10	10			
CAP					
Present	72	78	0.72	0.38-1.38	0.32
Absent	28	22			

BMI: Body mass index; CAP: Chronic apical periodontitis; COR: Crude odds ratio; CI: Confidence interval.

Table-3: Multivariate analysis of variables with LBWPT birth.

Variables	Cases (n=100)	Control (n=100)	Adjusted (O.R)	95% C.I	*p*-value
Age (years)					
>30	24	17	1.97	0.93-4.21	0.07
≤30	76	83			
Education					
Illiterate	51	35	1.91	1.07-3.46	0.03
Educated	49	65			
Family Income in Rupees (per month)					
≤ 10000	64	75	0.68	0.36-1.29	0.24
> 10000	36	25			
Family Size					
≤ 6 members	70	56	1.88	1.02-3.48	0.04
> 6 members	30	44			
Gravidity					
Primigravida	34	23	1.80	0.91-3.54	0.09
Multigravida	66	77			

OR: Odds ratio; CI: Confidence interval; LBWPT: Low birth weight preterm.

LBW was significantly associated with education level and family size (Table-2).

Multivariable analysis showed that illiterate participants had 1.91 times more likely to have LBWPT birth compared to the educated mothers, and those having ≤6 members in the family had 1.8 times higher odds of having and LBWPT birth, while there was no association between CAP and LBWTP birth (Table-3).

Discussion

The study determined the association of CAP and other gestational and socio-demographic variables with LBWPT birth among the subjects. The PAI can be used on panoramic radiographs as well where an increased rate of CAP is observed.[13] In spite of frequent use of the index, studies exhibited that it may undervalue the occurrence of CAP equated to periapical radiographs.[6]

The current study exhibited that women with advanced maternal age were significantly positively associated with LBWPT birth. Similar findings were reported earlier.[14-17] The reason this phenomenon is observed is that women in the advanced maternal age are much more likely to experience a variety of major pregnancy complications, like high blood pressure, kidney failure and diabetes during pregnancy, and carry a higher risk of death. However, results of our study are not in line with the findings of other studies.[18,19]

The current study found that uneducated women had higher odds of LBWPT birth compared to those who were educated. Lack of education can lead to inferior nutritional state and less knowledge about oral care. Analogous results were found in a study conducted in India.[13]

The current results showed that LBWPT births were more common in women with low socio-economic status (64%). This observation was in line with generally accepted facts and known knowledge. LBWPT was also reported by studies done in the developed countries.[20]

Small family size was found to be significantly linked with LBWPT birth in the current study which is in line with studies done in Sri Lanka and Germany.[21,22] The probable justification for such a finding might be that in a small family size, the ages of children might be not too high and they are unable to help the mothers which may result in deterioration in the health of the mothers, and, hence, the risk of LBWPT birth.

It was also found that primiparous and primigravida birth prolonged the risk of LBWPT which is not in line with findings reported from Bangladesh.[23] However, the current findings match those of another study.[24]

The current study found that the presence of CAP had a protective effect on LBWPT birth; a protective relationship is biologically not plausible. It was probably because CAP was pervasive in both the controls and the cases, and the presence of active inflammation was not considered. Furthermore, the number of CAP lesions for women was also not taken into account. Also, the inflammation cascade initiated by CAP is of very low magnitude and it cannot induce any LBWPT birth. Despite the absence of a significant association between LBWPT birth and CAP, PAI scores 4 (moderate CAP) and 5 (severe CAP) were found to be greater among the cases, while PAI score 3 (mild CAP) was higher among the controls.

The current study has limitations as self-reporting data has the poetential to carry any bias related to other medical conditions and previous history of pregnancy. Furthermore, the study was conducted in a single hospital, which makes the findings not good enough for generalisation.

Conclusions

No association was found between CAP and LBWPT birth. Periodontal condition of postpartum mothers was not satisfactory. LBW was found to be associated with education level and family size.

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Conflict of Interest: None.

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