

Periodontitis: A Risk Factor for Preterm Labour

Shamila Ijaz Munir,¹ Falak Naseer,² Amna Ahsan,³ Mahnaz Gondal,⁴ Nazia Khalil,⁵ Nimra Rao⁶

Abstract

Objective: To determine the relationship between periodontitis and preterm labour in pregnant women presenting to a tertiary care hospital in Lahore.

Methods: This case control study was conducted at Obstetrics & Gynecology Unit 4 of Sir Ganga Ram Hospital, Lahore for six months. The delivering women, who consented to participate, were divided into two case and control groups. For each case one control was enrolled who met the inclusion criteria, so total sample size was 380 women. Women delivered before 37 weeks of gestation were case group and those delivered after 37 weeks were control group. A patient was considered having periodontitis if she had probing pocket depth of ≥ 3 mm in at least 3 sites. Data was collected and analyzed on SPSS version 21.

Results: In this study the mean age of the case group patients was 28.52 ± 6.45 years while of the control group was 28.67 ± 6.35 years. The mean value of probing depth pocket in the case group was 3.872 ± 1.37 while the mean value probing depth pocket of the control group was 3.58 ± 1.52 . Out of 380 patients the periodontitis was found in 275 patients. The odds of having periodontitis in case group was 1.85 times higher than control group i.e. $OR = 1.85 [1.17-2.92]$.

Conclusion: Periodontitis is a preventable risk factor of preterm labour in women presenting at a tertiary care hospital.

Keywords: Preterm Labour, Periodontitis, dental hygiene, preterm delivery

Introduction

Preterm delivery is also called as premature birth and it is delivery of a baby before 37 completed weeks of gestation. Preterm delivery is major cause of perinatal mortality and morbidity worldwide. About 15 million infants are born preterm (before 37 weeks of gestation) annually and they have low birth weight ($LBW < 2,500$ g). The incidence of Preterm delivery has been reported in the range from 5% to 7% of live births in some developed countries, but the same is much higher in developing countries.¹ Premature infants are at greater risk of many mental and physical problems like cerebral palsy, delays in developmental

mile stones, hearing loss, poor digestion, weak immune system and perinatal mortality. Women with preterm infants also face many psychological and physical stresses. The prolonged hospital stay, multiple treatment interventions and fear of losing a baby may make them prone to postpartum depression.² Since preterm delivery is a challenge in obstetrics therefore it is necessary to identify the risk factors. The exact cause of preterm labour is often not known but some of the risk factors include vaginal infections, diabetes, high blood pressure, multiple pregnancy, over or underweight, smoking and psychological stress. Among all the above said risk factors for preterm labour, maternal infection is the major one.³

Periodontal disease is caused mainly by gram-negative microaerophilic and anaerobic bacteria. They colonize the subgingival area and produce pro-inflammatory mediators like Prostaglandin E₂, Tumour Necrosis Factor alpha (TNF- α), Interleukin 1 beta (IL-1 β) and IL-6. These pro-inflammatory mediators have systemic effects on the host.⁴ Periodontal diseases are gingivitis and periodontitis. Gingivitis is gingival inflammation without loss of

1. Shamila Ijaz Munir

2. Falak Naseer

3. Amna Ahsan

4. Mahnaz Gondal

5. Nazia Khalil

6. Nimra Rao

1-6. Gynae Unit 4, Sir Ganga Ram Hospital, Fatima Jinnah Medical University, Lahore, Pakistan

Correspondence:

Prof Dr Shamila Ijaz Munir
Head Gynae unit 4, Sir Ganga Ram Hospital, Fatima Jinnah Medical University, Lahore, Pakistan
Email: shamilaijaz@yahoo.co.uk

Submission Date: 31-08-2020
1st Revision Date: 15-10-2020
Acceptance Date: 29-10-2020

connective tissue attachment. Periodontitis is gingival inflammation at sites where there has been apical migration of the epithelial attachment on the root surfaces by the loss of connective tissue and alveolar bone. In the last twenty years many studies have shown the relationship between periodontitis and preterm labour. Periodontitis is a risk factor for preterm labour due to presence of bacteria and pro-inflammatory cytokines in blood that can affect the distant organs.^{5,6}

Rationale of this study is to determine the frequency and association of periodontitis with preterm labour in women presenting in a tertiary care hospital. In literature, the relationship of periodontitis with preterm labour is still not clear. Therefore, we conducted this study to get local evidence and implement the results of this study in local settings. Therefore, in future we can recommend the antenatal screening of pregnant women for periodontal diseases.^{7,8}

Objective

To determine the relationship between periodontitis and preterm labour in pregnant women presenting to a tertiary care hospital in Lahore.

Methods

Study Design: Case control study

Setting: Obstetrics & Gynecology Unit 4 of Sir Ganga Ram Hospital, Lahore

Duration: 6 months (8-5-2019 to 8-11-2019)

Sample Size: Sample size was 380 women. 190 women in control and the same number in case groups were calculated with 85% power of test with 5% level of significance and taking expected percentage of periodontitis i.e. 86% in case and 76% in control groups.

Sampling Technique: Non-probability, consecutive sampling

Inclusion Criteria: Women of age 18-40years, parity < 5 presenting at gestational age >28 weeks (by first trimester scan) were included. Cases were those women in preterm labour (>3 contractions in 10 minutes, Bishop score >4 and cervical dilation >4cm before completion of 37 weeks of gestation). Controls were those women in labour at term (gestational age >37 weeks).

Exclusion Criteria: Women with previous history of preterm labour, cervical incompetence, chronic or gestational hypertension, pre-eclampsia, eclampsia, diabetes, multiple pregnancy, abnormal placental implant (accrete, previa, increta) or placental abruption, amniotic fluid index <5cm or >21cm or women already taking treatment for periodontitis or other dental problems were excluded.

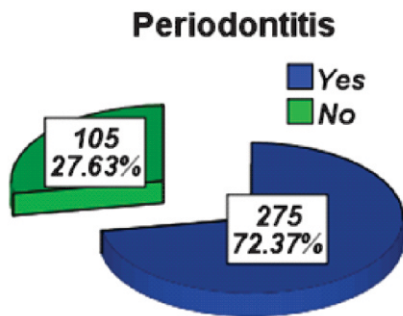
Data Collection Procedure: After taking informed consent, demographic profile was noted. Then women were divided into two groups i.e. cases in preterm labour and controls in term labour. After delivery the women were assessed for periodontitis by a single senior dentist having at least 4 years residency experience. Probing pocket depth was assessed and periodontitis was labeled according to WHO criterion for periodontitis i.e. probing pocket depth ≥ 4 mm in at least 3 sites, in different teeth. All this information was recorded on proforma. SPSS version 21 was used to enter and analyze the collected data. Odds ratio was calculated to measure association of periodontitis and preterm labour. OR >1 was considered as a risk of preterm labour.

Results

The mean age of the cases group patients was 28.52 ± 6.45 years while the mean age of the control group was 28.67 ± 6.35 years. The mean gestational age of the cases group patients was 34.48 ± 1.74 weeks while in control group was 38.92 ± 0.79 weeks. There were 65 (17.11%) nulliparous women, 62 (16.32%) had one child, 115 (30.26%) had two children, 85 (22.37%) had three children and 53 (13.95%) women had four children. The mean BMI of the cases group patients was 24.84 ± 5.054 kg/m² while in control group was 26.50 ± 5.45 kg/m². This difference was statistically significant i.e. p-value = 0.002. According to this study the mean probing pocket depth of periodontitis in the cases group was 3.872 ± 1.37 while in control group was 3.58 ± 1.52 . This difference was statistically significant i.e. p-value = 0.050. (Table-1). The results of this study show that out of 380 patients the periodontitis was found in 275 (72.37%) patients (Fig-1). In cases group the periodontitis was found in 149 (78.4%) respondents while in control group the periodontitis was found in 126 (66.3%) respondents. The odds of having periodontitis in cases group is 1.85 time higher than control group i.e. OR = 1.85 [1.17-2.92]. (Table-2)

Table 1: Demographic Features of Patients

n	Study Groups	
	Case 190	Control 190
Age (Years)	28.52±6.45	28.67±6.35
Gestational age (weeks)	34.48±1.74	38.92±0.79
BMI (Kg/m ²)	24.84±5.05	26.50±5.45
Probing depth	3.87±1.37	3.58±1.52
Primiparous	61	66
Multiparous	129	124

**Figure-1: Distribution of Periodontitis**

Among patients with age ≤ 30 years the odds of having periodontitis is 2.28 time higher in cases group than control groups i.e. OR=2.28[1.22-4.26]. Among patients with gestational age > 36 weeks there is insignificant difference found between the study groups with periodontitis i.e. p-value=0.068. Among

Table 2: Association of Periodontitis with Preterm Labour

Periodontitis		Study Groups		Total	OR [95% CI]
		Case	Control		
Yes		149	126	275	1.85 [1.17-2.92]
		78.4%	66.3%	72.4%	
No		41	64	105	1.85 [1.17-2.92]
		21.6%	33.7%	27.6%	
Total		190	190	380	1.85 [1.17-2.92]
		100%	100%	100%	

multi-parity patients the odds of having periodontitis is 2.23 time higher in cases group than control groups i.e. OR=2.23[1.27-3.89]. Among patients with overweight & obese BMI status the odds of having periodontitis is 2.19 time higher in cases group than control groups i.e. OR=2.19[1.12-4.28]. (Table-3)

Discussion

In this study cases and controls were recruited with intent to conduct a case-control study with cases being mothers who experienced preterm labor and controls being mothers without preterm labour and having

infants weighing more than 2500 grams. These cases and controls came from same pool of patients delivering in Sir Ganga Ram Hospital Lahore in Gynae Unit 4. Counseling was done and informed consent was taken during early labour so all cases could be enrolled with a comparable number of controls. The advantage of the study is that all

Table 3: Association of Periodontitis with Preterm Labour Stratified by Effect Modifiers

Age (Years)	Period on titis	Study Groups		Total	OR (95% CI)
		Case	Control		
≤ 30	Yes	95	75	170	2.28 [1.22-4.26]
		82.6%	67.6%	75.2%	
> 30	No	20	36	56	1.41 [0.71-2.79]
		17.4%	32.4%	24.8%	
> 30	Yes	54	51	105	1.41 [0.71-2.79]
		72.0%	64.6%	68.2%	
Gestational age 32-36 weeks	No	21	28	49	--
		28.0%	35.4%	31.8%	
Gestational age > 36 weeks	Yes	132	0	132	0.51 [0.24-1.061]
		84.6%	0%	84.6%	
Gestational age > 36 weeks	No	24	0	24	0.51 [0.24-1.061]
		15.4%	0%	15.4%	
Primiparous	Yes	17	126	143	1.25 [0.56-2.82]
		50.0%	66.3%	63.8%	
Primiparous	No	17	64	81	1.25 [0.56-2.82]
		50.0%	33.7%	36.2%	
Multiparous	Yes	47	48	95	2.23 [1.27-3.89]
		77.0%	72.7%	74.8%	
Multiparous	No	14	18	32	2.23 [1.27-3.89]
		23.0%	27.3%	25.2%	
BMI < 24.9	Yes	102	78	180	2.19 [1.12-4.28]
		79.1%	62.9%	71.1%	
BMI < 24.9	No	27	46	73	2.19 [1.12-4.28]
		20.9%	37.1%	28.9%	
BMI > 24.9	Yes	74	49	123	2.19 [1.12-4.28]
		74.7%	63.6%	69.9%	
BMI > 24.9	No	25	28	53	2.19 [1.12-4.28]
		25.3%	36.4%	30.1%	
BMI > 24.9	Yes	75	77	152	2.19 [1.12-4.28]
		82.4%	68.1%	74.5%	
BMI > 24.9	No	16	36	52	2.19 [1.12-4.28]
		17.6%	31.9%	25.5%	

periodontal examination was done in a standardized way by trained medical practitioners.

In our study the mean age of the cases group patients was 28.52±6.45 years which was not significantly different from controls 28.67±6.35 years. This result is similar to other study having the mean age for case 25 ± 6.3 (SD) years, while the mean age of the control group was 22 ± 3.4 years.⁹ There was no significant

difference among the parity between cases and controls, and the mean gestational age of preterm labour was 34 weeks which is similar to other studies.¹⁰ High or low BMI was not significantly associated with preterm birth and was same in both cases and control groups.¹¹

In current study out of 380 patients the periodontitis was found in 275(72.37%) patients in total. In the cases group the periodontitis was found in 149(78.4%) participants and in control group the periodontitis was found in 126(66.3%) participants. According to this study the odds of having periodontitis in case group is 1.85 time higher than control group i.e. OR=1.85[1.17-2.92]. The results of this study are similar to the results of a study conducted by Chokkaiyan et al.¹² in which periodontitis among cases was 86% and among controls it was 75%. Although the reported difference was significant (P=0.001) yet the frequency of periodontitis is not negligible in control group.

The study conducted by Offenbacher et al.¹³ reported a link between poor maternal periodontal health and preterm delivery. As per the said study pregnant women with periodontitis have 7.5 times more risk of developing preterm labour as compared to controls. This result is higher than our study result.

Another study published in 2018¹⁴ showed that the mothers in the periodontitis group delivered preterm infants at eight-fold higher frequency and low birth weight infants with ten-fold higher frequency as compared to control group. The studies conducted in USA show significant relationship between periodontal disease and preterm delivery among African-American racial/ethnic groups and those women who smoke during pregnancy.^{15,16} Another study by Jeffcoat et al¹⁷ demonstrated that there is beneficial effect on preterm labour if periodontal treatment is successful. As per logistic regression analysis there is significant relationship between successful periodontal treatment and full-term birth (adjusted odds ratio 6.02; 95% CI 2.57–14.03). The subjects, refractory to periodontal treatment were significantly at higher risk to have preterm labour.

On the other hand, a study by Lohsoonthorn et al¹⁸ on Thai women does not provide enough evidence that periodontal disease is associated with preterm labour.

Lohsoonthorn et al. reported that among cases 25.3% women had periodontitis while among controls 22.7% women had periodontitis. The reported difference was insignificant (P>0.05), thus showing a non-significant relationship between periodontitis and preterm labour.

Two studies conducted in the United Kingdom have failed to determine significant relationship between periodontal disease in pregnancy and risk of preterm delivery.^{19,20} In addition, Martinez-Martinez et al.²¹ suggested that Preterm birth is because of many other reasons therefore periodontal pathogens are not sufficient to cause Preterm birth.

There are many cohort studies reported in literature showing an association among periodontitis and preterm birth, low birth weight or preterm pre-labour rupture of membranes. In 2016, a hospital-based prospective study on 790 pregnant women found that periodontitis was a risk factor for preterm birth and low birth weight.²² Recently periodontitis was also found to be associated with pre-eclampsia and PROM as common causes of preterm birth.²³

A meta-analysis done by Vivares-Builes²⁴ reviewed 99 observational studies. Most of them have highlighted association among maternal periodontitis and a higher risk of low birth weight, preterm delivery and pre-eclampsia.

There is a need of more multicenter studies to be conducted to reach a definite association between periodontitis and preterm labour. For the time being, routine ante-natal dental evaluation can be practiced and patients having periodontitis should be treated to prevent preterm labour.

Conclusion

Our study has concluded that periodontitis is associated with preterm labour in women who presented at a tertiary care hospital of Lahore, Pakistan.

Author's Contribution

SIM: Original Idea, Conception of work

FN: Paper writing

AA: Designed Analysis

MG, NR: Data Collection

NK: Analytical interpretation of results

References

1. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, et al. The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. *Bulletin of the World Health Organization* 2010;88(1):31-8.
2. Omar AE. Physiological, Psychosocial, Behavioral, Socio-demographic Risk Factors and Antepartum Bed Rest Associated with Gestational Age at Birth and Postpartum Depression in High Risk Pregnant Women: Case Western Reserve University; 2013.
3. Kruse, A.B., Kuerschner, A.C., Kunze, M. et al. Association between high risk for preterm birth and changes in gingiva parameters during pregnancy—a prospective cohort study. *Clin Oral Invest* 2018;22: 1263–1271
4. Khadem N, Rahmani ME, Sanaei A, Afiat M. Association between preterm and low-birth weight with periodontal disease: a case-control study. *Iranian journal of reproductive medicine* 2012; 10(6): 561.
5. Murphey C. Oral health experiences of pregnant and parenting adolescent women: a qualitative descriptive study. *International journal of nursing studies* 2013; 50(6):768-75.
6. Haerian-Ardakani A, Eslami Z, Rashidi-Meibodi F, Haerian A, Dallalnejad P, Shekari M, et al. Relationship between maternal periodontal disease and low birth weight babies. *Iran J Reprod Med* 2013; 11(8): 625-30.
7. Ren H, Du M. Role of Maternal Periodontitis in Preterm Birth. *Frontiers in Immunology* 2017;8:628-32
8. Graves D. Cytokines that promote periodontal tissue destruction. *Journal of periodontology* 2008;79: 1585-91.
9. Karimi MR, Hamissi JH, Naeini SR, Karimi M. The relationship between maternal periodontal status and preterm and low birth weight infants in Iran: a case control study. *Global journal of health science* 2016; 8(5):184.
10. Harper LM, Parry S, Stamilio DM, Odibo AO, Cahill AG, Strauss III JF, et al. The interaction effect of bacterial vaginosis and periodontal disease on the risk of preterm delivery. *American journal of perinatology* 2012;29(05):347-52.
11. Govindasamy R, Dhanasekaran M, Varghese SS, Balaji VR, Karthikeyan B, Christopher A. Maternal Risk Factors and Periodontal Disease: A Cross-sectional Study among Postpartum Mothers in Tamil Nadu. *J Pharm Bioallied Sci.* 2017;9(Suppl 1): S50-S54.
12. Chokkaiyan S, Arumugam SC, Kumar S, John LB, Ghose S. Periodontitis as a risk factor for preterm labour and low birth weight among pregnant women attending a tertiary care teaching hospital. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology* 2015;4(6):1804-10
13. 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. *Journal of periodontology* 1996;67:1103-13.
14. Fogacci MF, Cardoso EdC, Barbirato Dd et al. No association between periodontitis and preterm low birth weight: a case-control study. *Arch Gynecol Obstet* 2018;297, 71–76.
15. Lunardelli AN, Peres MA. Is there an association between periodontal disease, prematurity and low birth weight? A population-based study. *Journal of Clinical Periodontology* 2005;32(9):938-46.
16. Mannem S, Chava VK. The relationship between maternal periodontitis and preterm low birth weight: A case-control study. *Contemporary clinical dentistry* 2011;2(2):88.
17. Jeffcoat M, Parry S, Sammel M, Clothier B, Catlin A, Macones G. Periodontal infection and preterm birth: successful periodontal therapy reduces the risk of preterm birth. *BJOG: An International Journal of Obstetrics & Gynaecology* 2011;118(2):250-6.
18. Lohsoonthorn V, Kungsadalpipob K, Chanchareonsook P, Limpongsanurak S, Vanichjakvong O, Sutdhibhisal S, et al. Is maternal periodontal disease a risk factor for preterm delivery? *American journal of epidemiology* 2009;169(6):731-9
19. Moore S, Ide M, Coward P, Randhawa M, Borkowska E, Baylis R, et al. A prospective study to investigate the relationship between periodontal disease and adverse pregnancy outcome. *British dental journal* 2004;197(5):251.
20. Bhattacharya S, Raja EA, Mirazo ER, Campbell DM, Lee AJ, Norman JE, et al. Inherited predisposition to spontaneous preterm delivery. *Obstetrics & Gynecology* 2010;115(6):1125-33.
21. Martínez-Martínez RE, Moreno-Castillo DF, Loyola-Rodríguez JP, Sánchez-Medrano AG, San Miguel-Hernández JH, Olvera-Delgado JH, et al. Association between periodontitis, period on to pathogens and preterm birth: is it real? *Archives of gynecology and obstetrics* 2016;294(1):47-54.
22. Perunovic ND, Rakic MM, Nikolic LI, Jankovic SM, Aleksic ZM, Plecas DV, et al. The association between periodontal inflammation and labor triggers

(elevated cytokine levels) in preterm birth: A cross-sectional study. *Journal of periodontology* 2016; 87(3): 248-256.

23. Puertas A, Magan-Fernandez A, Blanc V, et al. Association of periodontitis with preterm birth and low birth weight: a comprehensive review, *The Journal of Maternal-Fetal & Neonatal Medicine*,

2018;31(5):597-602

24. AM Vivares-Builes, LJ Rangel-Rincón, JE Botero et al. Gaps in knowledge about the association between maternal periodontitis and adverse obstetric outcomes: an umbrella review *Journal of EvidenceBased Dental Practice* 2018;18(1):1-27