Original Article

Periodontitis in Pregnancy and its Impact on Neonatal & Maternal Outcomes in Low Socioeconomic Position - A Retrospective Cohort Study

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ABSTRACT

Objective: Our study objectives were to investigate the detection of periodontitis during last trimester of pregnancy women and its impact on pregnancy outcomes (neonatal and maternal).

Study Design: This retrospective cohort study

Place and Duration of Study: This study was conducted at the department of Gynecology & obstetrics and Pediatrics at PMC hospital, Nawabshah from January 2023 to June 2023.

Methods: Periodontitis was observed as risk factor and its effects were seen on neonatal and maternal outcome. We determined the frequency of periodontitis in pregnant women in low socioeconomic population and its impact on pregnancy outcomes. A total of 250 pregnant women were enrolled in our study out of them 77 were with periodontal disease were selected as the cases (cohorts), whereas the control group consisted of 173 pregnant women who had normal periodontal health during their pregnancy.

Results: The frequency of periodontitis in low socioeconomic pregnant women was 77 (30.8%) out of 250 participants and 173 (69.2%) were disease free under study. 38.9% participants had adverse neonatal health outcome compared to controls with 17.9% with statistically significant correlation between adverse neonatal outcome with maternal periodontitis (p-value 0.001 and OR 1.91). 31.2% participants had adverse maternal health outcome compared to controls with 11.0% with statistically significant correlation between adverse maternal health outcome with maternal periodontitis (p-value 0.012 and OR 2.17). The numbers of adverse pregnancy outcomes in the cases (study group) was observed and there were significant association between periodontitis and pregnancy outcome as compared to controls like amniotic fluid contamination (OR 1.5), maternal infections (OR 1.12), low birth weight deliveries (OR 2.02), preterm deliveries (OR 1.8), neonatal Infection / Sepsis (OR 1.6), adverse neonatal outcome (prolonged hospital stay) (OR 1.91) and adverse maternal outcome (prolonged hospital stay) (OR 2.17) compared to control groups.

Conclusion: Periodontal disease in pregnant women can lead to perinatal infection to both mother and newborn. It is essential for pregnant women to prioritize oral health, as untreated periodontitis may have potential adverse effects on both maternal and fetal health. Timely treatment and preventive measures can reduce the risk of complications and support a healthy pregnancy.

Key Words: Periodontitis, adverse neonatal outcomes, adverse maternal outcomes

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INTRODUCTION

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Periodontitis, a severe form of gum disease, is a significant oral health concern for pregnant women worldwide. Periodontitis is a complex condition with multiple contributing factors. Its primary cause is the accumulation of dental plaque, which is a biofilm containing bacteria that adhere to the tooth surfaces. These bacteria release toxins that trigger an inflammatory response from the body. Over time, persistent inflammation leads to damage and destruction of the dental tissues, such as the alveolar bone, periodontal ligament, and gums.[1] Several causes & risk factors are associated with an amplified risk of developing periodontitis in pregnant women like hormonal changes during pregnancy, particularly increased levels of progesterone may lead to an

overstated response to dental plaque that makes the gums more susceptible to inflammation and infections. Poor oral hygiene practices during pregnancy can lead to the buildup of plaque and tartar on the teeth, use tobacco products, women with pre-existing gum disease, poor nutrition and a diet lacking essential nutrients can decline the immune system and add to the development of gum disease. Moreover high levels of stress, chronic health conditions, genetic predisposition, dental plaque / calculus, delayed or inadequate dental care also contributing to the development and progression of periodontitis.[2] Periodontitis is a second most common disease after dental caries in the world, particularly occurring in women during their pregnancy, hormonal fluctuations and immune system changes create an environment in which pregnant women become more susceptible to developing periodontitis with a frequency of 11.2%, The global burden of disease ranks periodontal disease as the sixth most prevalent disease worldwide.[3]

Individuals with a low socioeconomic status may face challenges in accessing adequate oral healthcare, leading to the exacerbation of oral health issues like periodontal disease. Furthermore, health-related risk behaviors, such as smoking, have been identified as significant contributors to the development and progression of periodontal disease. The detrimental effects of tobacco use on oral tissues compromise the body's ability to fight off infections, making smokers more prone to periodontitis.[4]

Periodontitis during pregnancy: Significant rise in number of periodontitis cases and associated risk factors in women during pregnancy have also got attention of dentists. Many factors harm the mother's health as well as have detrimental effects on the developing baby.[5] Thus, babies born are of low weight and premature which is one of the least noticed impacts of plaque on pregnancy. After the periodontitis has occurred in pregnant women, they present with complains of severe pain in oral cavity.[6] The chances of infection during the delivery process poses significant risks for both the mother and the fetus, making it crucial to address periodontitis in pregnant women. Infections that occur during childbirth can lead to severe complications such as sepsis and other systemic infections, further emphasizing the importance of maintaining optimal oral health during pregnancy. Some studies have suggested a link between periodontitis with an increased risk of preterm deliveries & low birth weight babies.[7]

In Pakistan, periodontitis is highly prevalent across all age groups. Recent studies have indicated that the prevalence of periodontal disease in pregnant women ranges from 22% to 34%. This prevalence is concerning, given the potential adverse effects on both maternal and fetal health. Symptoms like gum bleeding and calculus deposition in pregnant women are red flags for the presence of periodontitis, necessitating timely intervention and management.[8]

Signs and symptoms of periodontitis: Pregnant women should be aware of the signs and symptoms of periodontitis to seek timely dental care. These signs and symptoms include Gum inflammation, bleeding gums, gum recession, bad breath (Halitosis), tooth sensitivity, loose teeth, formation of pockets, pus or abscess formation and changes in bite.

Diagnosis of Periodontitis: To identify periodontitis accurately, various parameters are used, clinical examination is most cost effective method for diagnosis. The presence of gum swelling, and the condition of the teeth can offer further insights into the patient's oral health. Radiographs (X-rays) are also helpful in the diagnosis providing essential information about the extent of bone loss but are limited in pregnancy.[9]

Treatment and prevention of Periodontitis: Professional Dental Cleaning (Scaling and Root Planning): This non-surgical procedure involves the removal of plaque and calculus from below the gum line to control infection and inflammation.[10] Oral hygiene education for pregnant women with periodontitis receive personalized oral hygiene instructions to emphasize the importance of regular brushing, flossing, and mouth wash use for maintaining oral health. Proper oral hygiene practices, good nutrition, lifestyle modification like quitting smoking, regular dental check-ups, stress management and screening for gum disease during prenatal care to identify and address any oral health issues promptly. Always inform your dentist about your pregnancy, including the stage and any medical conditions, to ensure a safe and effective treatment plan. Regular dental check-ups and proper oral hygiene practices are vital for maintaining optimal oral health during pregnancy.[11]

METHODS

This retrospective cohort study was carried in the department of Gynecology & obstetrics and Pediatrics at PMC hospital, Nawabshah for the period of 06 months from January to July 2023.

250 pregnant women were selected who were admitted for delivery at termination of pregnancy after fulfilling the selection criteria. Participants were divided in two groups, 77 had history of periodontitis during pregnancy and were labelled as cohorts (cases) and remaining 173 were selected as controls for comparison using convenience sampling method. Inclusion criteria were: 1) all pregnant women, 2) belonging to low socioeconomic positions and 3) willing to participate in the study. Pregnant women with any systemic or chronic diseases, diabetic women or any other chronic illness related to oral cavity were excluded from the study

Data collection procedure: After getting informed and written consent data was collected on designed questionnaire regarding their health, socio demographic information, oral health hygiene and addiction. All the specific and relevant ladies were enquired for fetal and maternal outcome as low birth weight baby, preterm births, prolonged hospital stay due to poor health outcomes & maternal outcome as amniotic fluid contaminations, sepsis / infections, prolonged hospital stay and hemorrhage. All of the women were interviewed, questioned, examined, investigated, and sorted appropriately in order to account for confounders and bias in the study. Additionally, the existence of prior health or medical records was investigated in order to rule out known medical issues and co-morbidities. The lead investigator carried out every procedure (clinical history collection, examination, investigation, and intervention) related to periodontitis, neonatal examinations and diagnosis confirmed by Pediatricians and gynecological examinations and diagnosis were confirmed by Gynecologists participated in this study as co-authors. Examination of Oral cavity: The probing pocket depth would be measured with periodontal probe and community periodontal index will be used to measure severity of periodontitis. The average healthy pocket depth is 3mm.[12] On the basis of severity of the periodontitis measured through dental probe women affected more were mentioned in grading as A or B on the questionnaire.

Data analysis procedure: Data was processed using the statistical application for social sciences (SPSS Version 26.0), a calculator, and manual sorting processes. To investigate each variable independently, a data collecting form will be created. The data will then be analysed, and the results will be documented and displayed as tables and charts. Tests of significance were applied to calculate p value and odds ratio for comparison and association. Level of significance was set at $P < 0.05$.

RESULTS

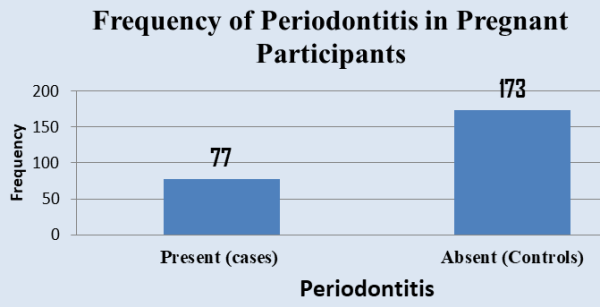

Figure No. 1: Incidence of periodontitis in pregnant women participated in our study (n=250)

The above table shows the frequency of periodontitis in low social class pregnant women who participated in our study. It was observed that 77 (30.8%) out of 250 participants were diagnosed cases of periodontitis. 173 (69.2%) were disease free under study and were labelled as controls for comparison.

Table No. 1: Socio-demographic data of the 250 low social class pregnant women participated in study (n1=77, n2=173)

Variable	Categories	No. of Cases	No. of Controls	Total
1. Age of the Subjects (In years)	18-25	21	38	59
	26-33	30	80	110
	34-40	26	55	81
Total		77	173	250
4. Residence of the Subjects	Urban	28	42	70
	Rural	49	131	180
		77	173	
5. Educational status	Illiterate	52	91	143
	Primary	15	58	73
	Secondary	10	24	34
Total		77	173	250
6. Occupation of Subjects	House wives	58	103	161
	Employed	0	20	20
	Skilled women / Labor	17	41	69
Total		77	173	250
7. Gravida	Primigravida	20	34	54
	Multigravida	57	139	196
Total		77	173	250

The above table shows the sociodemographic status of the study participants.

Table No 2: Comparison of correlation of neonatal health outcome and maternal periodontitis b/w cases and control group (n1=77, n2=173)

Comparison of correlation between neonatal outcome and periodontitis						
		Health outcome of neonates				
		Cases	Controls	Total	p-value	OR
		Poor Health outcome	Normal Health outcome			
Periodontitis	Present	30 (38.9%)	47(27.2%)	77	0.001	1.91
	Absent	31 (17.9%)	142 (82.1%)	173		
Total		61	183	250		

There was statistically significant correlation between adverse neonatal outcome with maternal periodontitis with (p-value 0.001 and OR 1.91). 38.9% participants had adverse neonatal health outcome compared to controls with 17.9%.

Table No. 3: Comparison of correlation of maternal outcome and periodontitis b/w study and Comparison Group (n1=77, n2=173)

Comparison of correlation between neonatal outcome and periodontitis						
		Health outcome of mothers				
		Cases	Controls	Total	p-value	OR
		Poor Health outcome	Normal Health outcome			
Periodontitis in mothers	Present	24 (31.2%)	53 (68.8%)	77	0.012	2.17
	Absent	19 (11.0%)	154 (89.0%)	173		
Total		43	206	250		

There was statistically significant correlation between adverse maternal health outcome with maternal periodontitis with (p-value 0.012 and OR 2.17). 31.2% participants had adverse maternal health outcome compared to controls with 11.0%.

Table No. 4 Pregnancy outcomes of pregnant women in both groups

Pregnancy outcomes of two groups of pregnant women				
Sr. No.	Pregnancy outcomes	Cases	Controls	OR
1	Amniotic fluid contamination	14 (14.28%)	21 (12.14%)	1.5
2	Maternal infection / Sepsis	9 (11.69%)	17 (9.82%)	1.12
3	Low Birth weight deliveries	18 (23.38%)	20 (12.71%)	2.02
4	Preterm Deliveries	10 (12.99%)	13 (5.2%)	1.8
5	Neonatal Infection / Sepsis	11 (14.28%)	15 (8.67%)	1.6
6	Neonatal Adverse outcome (prolonged hospital stay)	30 (38.9%)	47(27.2%)	1.91
7	Maternal Adverse outcome (prolonged hospital stay)	24 (31.2%)	53 (68.8%)	2.17

The above table shows adverse pregnancy outcomes in the both groups and there were significant association between periodontitis and pregnancy outcome as compared to controls. Amniotic fluid contamination was 1.5 times higher, maternal infections were 1.12 times higher, low birth weight deliveries were 2.02 times higher, preterm deliveries were 1.8 times higher, neonatal Infection / Sepsis were 1.6 times higher, In neonatal prolonged hospital stay OR was 1.91 and maternal prolonged hospital stay OR was 2.17 compared to control groups.

DISCUSSION

A variety of disorders that damage the tissues that support and protect teeth can lead to periodontal disease. This disorder has a number of stages as well as various onset and development patterns, and a significant amount of the clinical variations are caused by bacterial plaque and host susceptibility.[13] Although linked to unfavorable pregnancy outcomes, the findings of several systematic reviews on these connections have been inconsistent. To show the connections between maternal periodontal diseases and adverse pregnancy outcomes, numerous epidemiological research and intervention trials have been carried out. Periodontal diseases that raise the risk of adverse pregnancy outcomes include preterm birth, foetal growth restriction, low birth weight, pre-eclampsia, and gestational diabetes.[14]

A number of socio-demographic, behavioral and co-morbid disorders were shown to be independent risk factors for chronic periodontitis. The same risk factors for chronic periodontitis may not apply to persons from developing countries as they do to individuals from

industrialized ones. Socioeconomic status is related to common risk factors associated with periodontitis were collected to see the assess them and it was noted that behavior toward cleaning teeth regularly was not good especially in rural population. In a study conducted by a researcher in Sri Lanka concluded that tobacco use, oral hygiene practices and periodontal disease are significantly associated with periodontitis.[15]

The current study discovered a substantial correlation between periodontal pockets, particularly during pregnancy with poor socioeconomic status and primary education. It was discovered that a higher incidence of periodontal disease in this population was significantly correlated with socioeconomic class 77 ((30.8%)) out of 250 women from low social class. This agrees with the findings of study conducted by Almerich-Silla J, et al.[16]

In our study low birth weight deliveries, preterm deliveries, neonatal Infection / Sepsis and prolonged hospital stay were measured as adverse neonatal outcomes (OR was 2.02, 1.8, 1.6 and 1.91 respectively. In another study conducted by Low birth weight was shown to be associated with periodontitis (OR 2.48; 95% CI 1.72–3.59), and this correlation grew even more when examined separately (OR 3.94; 95% CI 1.95–7.96). This is in accordance with our study as well.

There were significant association between periodontitis and maternal pregnancy outcome like amniotic fluid contamination, maternal infections and prolonged hospital stay were measured as Adverse maternal and it was found that OR was significantly higher in study groups compared to control groups. Many evidences suggest that maternal periodontitis may impact the course and outcome of pregnancy, leading to low birth weight, vulvo-vaginitis, preterm delivery, and preeclampsia. It may also impact the epigenome of the offspring and have some health effects in adulthood. This also agrees the findings of study conducted by Starzynska A, et al.[17]

CONCLUSION

Pregnant women who have periodontal disease run the risk of infecting both the mother and the unborn child. Hence preventing infections can be helpful in reducing the risk of premature birth and infections during pregnancy and delivery. If the significance of oral health and its relationship to systemic health is addressed and counseled by the health care providers can significantly improve maternal health and can reduce the complications. It is essential for pregnant women to prioritize oral health, as untreated periodontitis may have potential adverse effects on both maternal and fetal health. Timely treatment and preventive measures can reduce the risk of complications and support a healthy pregnancy.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Kashif Ali Mastoi, Muhammad Siddique Rajput
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Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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