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PREVALENCE OF PERIODONTAL DISEASE IN PREGNANT WOMEN IN SOUTH OF JORDAN: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Pregnancy introduces a unique physiological state characterized by hormonal fluctuations that can affect periodontal health. The increased levels of estrogen and progesterone during pregnancy enhance the vascular permeability of the gingiva, promoting the proliferation of periodontal pathogens and predisposing pregnant women to periodontal disease. **Purpose**: This study aims to delineate the prevalence of periodontal disease in pregnant women and explore the associated gynecological and obstetric factors, including but not limited to preterm birth, preeclampsia, fetal growth classifications (such as small or large for gestational age), gravidity, parity, obstetric complications, and the type of delivery. **Methods**: We conducted a cross-sectional study design, in which we enrolled pregnant women from various prenatal clinics attending at Prince Hashim bin Abdullah II in Aqaba between the period of February/2024-May/2024. Comprehensive periodontal examinations were conducted to assess the periodontal status using indices such as the Plaque Index, Bleeding on Probing, and Periodontal Pocket Depth. Gynecological and obstetric data, including pregnancy outcomes and complications, were collected through patient interviews and medical record reviews. Statistical analyses will involve statistical tests such as Wilcoxon rank-sum, chi-square, and fisher's exact test to identify factors significantly associated with periodontal disease during pregnancy. **Results:** In this study we enrolled 225 patients, the median age was 29 years, and the median gravidity was 3. Most patients were multiparous, with a median gestational age of 32 weeks. Significant differences were observed in periodontal disease markers: patients with periodontal disease had higher median bleeding on probing (74 vs. 24, $p<0.001$) and greater probing depths (2.70 vs. 2.55, $p<0.001$) compared to those without periodontal disease. Other demographic and obstetric variables showed no significant differences between the groups. **Conclusion:** Our study highlights the prevalence of periodontal disease among pregnant women and its significant impact on oral health. While no direct link to adverse obstetric outcomes was found, the potential for systemic inflammation underscores the need for routine periodontal screening and proactive management as part of prenatal care.

KEYWORDS: Periodontal disease, pregnant women, preterm birth, preeclampsia, gestational age, gravidity, parity, obstetric complications.

INTRODUCTION

Pregnancy is associated with several fluctuation in the underlying physiological process derived by the increased levels of the female sex hormones.[1] By the end of the third trimester, the hormones progesterone and estrogen reach their peak levels in the plasma, which is up to 10 and 30 times respectively, higher than the levels observed normally during the menstrual cycle.[1,2] On the other hand, the receptors for these hormones have been identified to be associated with various periodontal cell subsets, making the periodontal tissue a potential target.[3,4]

The transient rise in these hormones has been linked to an increase in the prevalence, extent, and severity of gingival inflammation throughout the gestational period.[5] Additionally, periodontitis has also been shown to be present and associated with pregnancy.[5] However, the reported prevalence varies across studies, typically ranging from 0%[6] to 61%.[7] These discrepancies are mainly due to the varying terms and definitions used in different studies.[8]

The effects of hormonal changes during pregnancy extend beyond increasing gingival inflammation; they also play a crucial role in regulating various vital

processes such as implantation, maintenance of pregnancy, immune responses, induction of parturition, and cervical ripening.[9] These processes protect both the mother and the fetus from external pathogens.[10] Adverse pregnancy outcomes have multifactorial etiology and pathology, influenced by factors such as lifestyle, socioeconomic status, genetics, and more.[11]

Current studies on the origins of pregnancy-associated adverse events suggest that these outcomes depend not only on the route of infection, whether vaginal or cervical, but also on the focal infection model, where periodontitis may be linked to these adverse outcomes. Consequently, periodontal pathogens and their byproducts, along with inflammatory mediators, can be distributed through hematogenous spread between the urogenital sources and the feto-placental unit.[12]

The high incidence of periodontal disease among pregnant women, coupled with the fact that periodontal diseases can be treated and prevented, highlights the potential association with adverse pregnancy outcomes as an important consideration for healthcare providers.[10] Therefore, this study aims to delineate the prevalence of periodontal disease in pregnant women and explore the associated gynecological and obstetric factors. These factors include, but are not limited to, preterm birth, preeclampsia, fetal growth classifications (such as small or large for gestational age), gravidity, parity, obstetric complications, and the type of delivery.

METHODS

Data Collection

We conducted a cross-sectional study, in which pregnant women were enrolled who were attending our prenatal clinics at Prince Hashim bin Abdullah II in Aqaba, Jordan during the period February-2024 and May-2024. Comprehensive periodontal examinations will be conducted to assess the periodontal status using indices such as the Plaque Index, Bleeding on Probing, and Periodontal Pocket Depth. Gynecological and obstetric data, including pregnancy outcomes and complications, will be collected through patient interviews and medical record reviews. Patients signed an informed consent, and the Institutional Review Board (IRB) was obtained.

Periodontal Diseases Assessment

We assessed periodontal disease using several key clinical variables. The Plaque Index (PI) was used to measure the thickness of dental plaque at the gingival margin, serving as an indicator of oral hygiene and plaque accumulation. Bleeding on Probing (BOP) was evaluated by gently probing the gingival sulcus to detect bleeding, which indicates the presence of gingival inflammation and potential periodontal disease. Periodontal Pocket Depth (PPD) was measured to determine the depth of the space between the tooth and surrounding gingival tissue, reflecting the severity of periodontal disease. These variables provided a comprehensive assessment of the patients' periodontal health and were essential for diagnosing and staging periodontal disease.

Statistical Analysis

We reported continuous variables as medians with interquartile ranges (IQR), and categorical variables as frequencies with percentages. To evaluate the associations between demographic and clinical variables and the study groups, we used the Wilcoxon (Mann-Whitney U) and one-way ANOVA tests for continuous variables. For categorical variables with fewer than five categories, we employed chi-squared (χ^2) and Fisher's exact tests. A p-value of less than 0.05 was considered statistically significant. All analyses were conducted using R software (Version 4.3.1) with the glm and gtsummary packages.

RESULTS

In this study, we enrolled a total of 225 patients. **Table 1** shows the pathologic characteristics of the patients. The median age was 29 (95% CI: 26-34). Their pregnancy records and history were documents. The median gravidity was 3 (95% CI: 2-4). The parity of the patients was documented, 46 (24%) patients were nulliparous, 54 (28%) were primiparous, and the majority were multiparous. Only 8 (4.1%) patients were grand multiparous. The median gestational week at presentation was 32 (95% CI: 21-36). Most patients didn't report any previous miscarriages 161 (81%). Almost all patients 198% (99%) didn't have any preterm birth, nor preeclampsia 199 (100%). Regarding the delivery method, the majority had C-section 82 (53%), 51 (33%) had vaginal delivery, and 21 (14%) had both methods with different births. We assessed the obstetric complications; most patients didn't report any complications. The reported complications were gestational diabetes in 3 patients, gestational hypertension in 1 patient, and diabetes mellitus in 3 patients.

Further analysis focused on the pathologic characteristics across patients with and without periodontal diseases (see **Table 2)**. There were no significant differences between the groups in terms of age (p=0.9), gravidity (p>0.9), parity (p>0.9), gestational weeks (p=0.5), history of miscarriage (p=0.6), preterm birth (p>0.9), preeclampsia (p=0.5), type of delivery (p=0.4), or obstetric complications (p=0.2). Specifically, the parity distribution was similar between the groups, with no significant differences observed.

Regarding previous miscarriages, the majority of patients in both groups had no previous miscarriages (84% in the no periodontal disease group vs. 77% in the periodontal disease group). The distribution of previous miscarriages did not significantly differ between the groups (p=0.6).

The incidence of preterm births was also comparable between the groups, with almost all patients in both groups reporting no preterm births (99% in both groups,

p>0.9). Similarly, the occurrence of preeclampsia was not significantly different, with one case reported in the no periodontal disease group and none in the periodontal disease group (p=0.5).

The type of delivery was examined, showing no significant differences between the groups. The majority of patients in both groups had C-sections (58% in the no periodontal disease group vs. 49% in the periodontal disease group), followed by vaginal deliveries (28% vs. 38%) and a smaller portion had experienced both methods across different births (14% vs. 13%, p=0.4).

When assessing obstetric complications, there were no significant differences between the groups. In the no periodontal disease group, no cases of diabetes mellitus, gestational diabetes mellitus, or gestational hypertension were reported, while in the periodontal disease group, there were 3 cases of diabetes mellitus (3.1%), 3 cases of gestational diabetes mellitus (3.1%), and 1 case of gestational hypertension (1.0%) (p=0.2). The plaque index did not show significant differences between the groups, with similar distributions across the different index categories (p=0.4).

However, significant differences were observed in the periodontal disease variables. Patients with periodontal disease had a significantly higher median bleeding on probing (74, 95% CI: 64-89) compared to patients without the disease (24, 95% CI: 13-37, p<0.001). Additionally, the probing depth was significantly greater in patients with periodontal disease (median 2.70, 95% CI: 2.65-2.75) compared to those without the disease (median 2.55, 95% CI: 2.53-2.58, p<0.001). These findings indicate a substantial impact of periodontal disease on oral health markers in this cohort.

Table 1: Patients characteristics.

Characteristic	**N = 225[1]**
Age	29 (26, 34)
Gravidity	3.00 (2.00, 4.00)
Parity	
0	46 (24%)
1	54 (28%)
2	35 (18%)
3	38 (19%)
4	14 (7.2%)
5	8 (4.1%)
Gestational Age (Weeks)	32 (21, 36)
Previous Miscarriages	
0	161 (81%)
1	17 (8.5%)
2	10 (5.0%)
3	5 (2.5%)
4	7 (3.5%)
Preterm Birth	
Yes	2 (1.0%)
No	198 (99%)
Preeclampsia	
Yes	1 (0.5%)
No	199 (100%)
Type of Delivery	
Both	21 (14%)
Cesarean Section	82 (53%)
Vaginal	51 (33%)
Obstetric Complications	
DM	3 (1.7%)
GDM	3 (1.7%)
GHTN	1 (0.6%)
None	163 (95.6%)
Plaque Index	
0	3 (1.7%)
1	18 (10%)
2	55 (32%)
3	97 (56%)
Bleeding on Probing	54 (26, 77)
Probing Depth	2.63 (2.56, 2.72)

Table 2: The pathologic characteristics between the patients with and without periodontal disease.

Characteristic	**No, N = 104[1]**	**Yes, N = 121[1]**	**p-value[2]**
Age	29 (27, 34)	29 (26, 34)	0.9
Gravidity	3.00 (2.00, 4.00)	3.00 (2.00, 4.00)	>0.9
Parity			>0.9
0	21 (24%)	25 (23%)	
1	22 (25%)	32 (30%)	
2	15 (17%)	20 (19%)	
3	18 (20%)	20 (19%)	
4	8 (9.1%)	6 (5.6%)	
5	4 (4.5%)	4 (3.7%)	
Gestational Age (Weeks)	32 (21, 36)	33 (21, 37)	0.5
Previous Miscarriages	0.6		
0	76 (84%)	85 (77%)	
1	6 (6.7%)	11 (10%)	
2	4 (4.4%)	6 (5.5%)	
3	3 (3.3%)	2 (1.8%)	
4	1 (1.1%)	6 (5.4%)	
Preterm Birth			>0.9
Yes	1 (1.1%)	1 (0.9%)	
No	89 (99%)	109 (99%)	
Preeclampsia			0.5
Yes	1 (1.1%)	0 (0%)	
No	89 (99%)	110 (100%)	
Type of Delivery			0.4
Both	10 (14%)	11 (13%)	
Cesarean Section	40 (58%)	42 (49%)	
Vaginal	19 (28%)	32 (38%)	
Obstetric Complications	0.2		
DM	0 (0%)	3 (3.1%)	
GDM	0 (0%)	3 (3.1%)	

GHTN	0 (0%)	1 (1.0%)	
None	75 (100%)	89 (92%)	
Plaque Index			0.4
0	2 (2.5%)	1 (1.1%)	
1	5 (6.3%)	13 (14%)	
2	26 (33%)	29 (31%)	
3	46 (58%)	51 (54%)	
Bleeding on Probing	24 (13, 37)	74 (64, 89)	**<0.001**
Probing Depth	2.55 (2.53, 2.58)	2.70 (2.65, 2.75)	**<0.001**

[1] Median (IQR); n (%)
[2] Wilcoxon rank sum test; Fisher's exact test; Pearson's Chi-squared test

DISCUSSION

Pregnancy is associated with significant fluctuations in physiological processes due to elevated levels of female sex hormones.[1] By the end of the third trimester, plasma levels of progesterone and estrogen peak, reaching up to 10 and 30 times higher, respectively, than those typically observed during the menstrual cycle.[1,2] Additionally, receptors for these hormones have been identified in various periodontal cell subsets, suggesting that periodontal tissue can be a potential target.[3,4]

In this study, we investigated the pathologic characteristics and obstetric history of 225 pregnant patients, focusing on the prevalence and impact of periodontal disease. Our findings provide important insights into the oral health status of pregnant women and highlight the significant relationship between periodontal health and pregnancy outcomes.

Our cohort had a diverse reproductive history, with a significant portion being multiparous. The median age and gravidity indicate a relatively young population with moderate pregnancy experience. The low incidence of previous miscarriages, preterm births, and preeclampsia in our cohort suggests effective prenatal care and management protocols. The varied delivery methods, with a notable proportion of C-sections, reflect broader global trends and underline the complexity of obstetric care.[13]

The prevalence of obstetric complications such as gestational diabetes, gestational hypertension, and diabetes mellitus was low, indicating good overall health and management among the studied patients. These findings align with other studies that suggest effective prenatal monitoring can significantly reduce the incidence of such complications.[14]

Our primary focus on periodontal disease revealed significant differences between patients with and without the condition. Specifically, patients with periodontal disease had significantly higher bleeding on probing and greater probing depths compared to those without the disease. These findings are consistent with existing literature, which indicates that periodontal disease is characterized by increased bleeding on probing and deeper periodontal pockets.[15]

Periodontal disease is known to contribute to systemic inflammation, which can impact pregnancy outcomes such as preterm birth and low birth weight. However, our study did not find significant differences in obstetric outcomes between patients with and without periodontal disease. This could be due to the overall low incidence of obstetric complications in our cohort, possibly attributable to effective prenatal care and early interventions.[16]

The relationship between periodontal disease and adverse pregnancy outcomes has been extensively studied. Inflammatory mediators released in response to periodontal infections can enter the systemic circulation and affect the maternal-fetal interface. This systemic inflammation can lead to adverse outcomes, including preterm birth, low birth weight, and preeclampsia. Our findings support the need for routine periodontal screening and management as part of comprehensive prenatal care to mitigate these risks.[17]

Despite the significant findings related to periodontal disease markers, our study did not observe a notable difference in obstetric outcomes between the two groups. This lack of significant difference might be explained by the overall health status of the cohort, which likely benefited from good prenatal care and timely medical interventions. The low complication rates in our study suggest that comprehensive prenatal care can effectively manage and mitigate the risks associated with periodontal disease during pregnancy.

Our study emphasizes the importance of oral health in pregnant women and its potential impact on pregnancy outcomes. The significant differences in periodontal disease markers between affected and unaffected patients underscore the need for increased awareness and intervention. Healthcare providers should consider routine periodontal assessments as part of prenatal care to identify and manage potential risks early.

Further research is needed to explore the causal relationships between periodontal disease and adverse pregnancy outcomes. Larger, longitudinal studies could provide more definitive evidence and help develop targeted interventions. Understanding the biological mechanisms underlying these associations is crucial for developing effective prevention and treatment strategies.

CONCLUSION

Our study highlights the prevalence of periodontal disease among pregnant women and its significant impact on oral health markers. While we did not find a direct association with adverse obstetric outcomes, the potential for systemic inflammation and related complications underscores the importance of comprehensive oral healthcare during pregnancy.

Routine periodontal screening and proactive management should be integral components of prenatal care to improve maternal and fetal health outcomes.

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