Short Communication

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An Evaluation of the Association between Periodontal Disease and Preeclampsia in Pregnant Women

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ABSTRACT

BACKGROUND AND OBJECTIVE: In the etiology of preeclampsia, one of the most common causes of maternal mortality is the release of inflammatory and immunological factors. On the other hand, periodontal disease also leads to persistent gingivitis. Therefore, the present study was conducted to evaluate the association between periodontal disease and preeclampsia.

METHODS: This case-control study was conducted among 80 pregnant women with preeclampsia (case group) and 80 healthy pregnant women as control group. The mean of periodontal disease indices, including Plaque Index (PI), Clinical Attachment Loss (CAL), and Gingival Bleeding Index (GBI) was measured and compared between the two groups.

FINDINGS: There was no significant difference between the two groups in terms of mean age, BMI, gestational age and number of pregnancies. The mean CAL in the case group was 14.14±1.0 mm and in the control group was 13.14±1.0 mm (p=0.68), the mean PI score in the case group was 1.18±1.13 and in the control group was 1.18±0.17 (p=0.87), and the mean GBI in the case group was 14.2±7.8% and in the control group was 14.3 ± 3.1% (p=0.35).

CONCLUSION: The results of this study showed that the difference between the mean of periodontal disease indices in preeclampsia group and control group was not statistically significant.

KEY WORDS: *Periodontal Disease, Preeclampsia, Pregnant Women.*

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Introduction

Periodontal diseases are among the most common chronic infectious diseases in humans and are categorized into two groups: gingivitis (inflammation of the soft tissue surrounding the teeth) and periodontitis (destruction of the supporting structures of the teeth) (1). According to a study among 1319 people in 13 provinces, only 14.5% of the teenagers were healthy in terms of periodontal condition, 33.7% had gingival bleeding after repeated probing and 48.7% had significant dental plaque (2). Based on a study by Vanterpool et al., 5 – 70% of adults have periodontal disease, depending on the definition of the disease and the geographical location (3).

In a study by Shah et al. among pregnant women, the prevalence of gingivitis was 30 – 100%, and the incidence of periodontitis was 5 – 20% (4). Since 1996, the term Periodontal Medicine has been introduced to describe the relationship between periodontal diseases and systemic diseases, such as atherosclerosis, respiratory diseases, heart attacks, stroke, diabetes, and adverse pregnancy outcomes. Pregnancy-related health problems associated with periodontal diseases include preterm delivery, low birth weight, intrauterine growth restriction, and preeclampsia (5). Preeclampsia, also known as pregnancy poisoning and pregnancy-induced hypertension, is a syndrome with signs of hypertension along with generalized edema and abnormal disposal of protein through the urine, and its significance is due to its association with obstetric hemorrhage and infections, which constitute the triad of most common causes of maternal mortality worldwide.

Despite much effort to find out the etiological mechanisms of preeclampsia, no specific etiology has been identified for this disease. Despite the increase in prenatal care, the prevalence of preeclampsia remains unchanged and occurs in 10 – 15% of pregnancies. Perhaps one of the main reasons behind this lack of change in the incidence of the disease is that the etiology and thus, its prevention are still unknown. What has been observed in the physiopathology of the preeclampsia syndrome is the massive endothelial destruction of unknown origin, which ultimately leads to end organ damage and the involvement of organs such as the brain, kidney, lung, liver, etc., and leads to patient's death (6). One of the hypotheses is the release of immunologic agents such as interleukin (IL) and tumor necrosis factor alpha (TNFα) in response to chronic and hidden infections or paired antigens that stimulate oxidative and inflammatory events, and ultimately lead to damage to endothelial cells in various organs of the body (7). Changes in the maternal immune system in patients with preeclampsia have been observed as changes in the status of cytokines, Th1 cells (T Helper Cell Type 1), and CD4 cells (8), and on the other hand, cytokines and Th1 and CD4 cells play an important role in the onset and development of periodontal diseases (9).

For these reasons, many studies have examined the association between these two complications. A study by Rahimi Sherbaf et al. showed that the indices of periodontal disease in preeclampsia group were more than controls (10). In the study of Yaghini et al., there was no significant difference in the mean of periodontal indices of CAL, GBI and PI in preeclampsia and control group. Therefore, the association between periodontal disease and preeclampsia was not confirmed in this study (11). Considering the importance of preventing preeclampsia in promoting the maternal mortality index, which is an important international index in determining the level of development of countries, and considering that several studies with contradictory results confirmed or rejected the association between periodontal diseases and preeclampsia, as well as studies that indicate the beneficial effects of treatment of periodontal disease in preventing adverse pregnancy outcomes (12), one of the risk factors for preeclampsia was investigated in this study to reduce the risk of preeclampsia and the risk of subsequent maternal and fetal deaths.

Methods

This case-control study (with ethics code: IR.ZAUMS.REC.1396.135) was approved by Zahedan University of Medical Sciences, and conducted among 160 women in their second to fourth pregnancy and singleton pregnancy who had prenatal care card and referred to the Obstetrics and Gynecology Clinics of Ali ibn Abi Talib Hospital in 2017 from the beginning of their pregnancy at specified intervals. Pregnant mothers aged 18-35 years old, gestational age of 20-37 weeks were included in the study based on ultrasonography of the first trimester of pregnancy, and body mass index of 19.8 to 26, and were excluded in the case of gestational diabetes or overt DM, increased chronic blood pressure before pregnancy or in the first half of pregnancy, lupus and other autoimmune diseases, fetal abnormalities and the use of drugs other than routine pregnancy drugs, history of periodontal surgery, prosthetics or denture,

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and addiction to tobacco and opioids. Convenience sampling was done by selecting accessible samples. The case group included 80 pregnant women who developed preeclampsia during the second half of their pregnancy (20-37 weeks), i.e. blood pressure ≥ 140/90 mmHg twice over six hours and proteinuria ≥ 300 mg in 24-hour urine (6), while the control group included 80 pregnant women who did not have signs and symptoms of preeclampsia.

After being selected, and in case of having informed consent, samples were enrolled in the study consecutively and in the order of referral to the center. Data collection form was completed for each patient. The examination conditions were the same for all patients in every respect. All patients were examined by one person, and the examining physician was not informed about the group (case or control) of each patient (blind), the examination was performed while the patient and the examining physician were sitting on the chair, and 25 Watts powerful Head Light, tongue depressor, 15-UNC Williams Probe, and standard dental mirror were used. The main study variables were the indices of periodontal disease, and identical to the similar studies, they were measured at the buccal, lingual, mesial and distal surfaces of all teeth except the third molar.

Finally, the total numbers were divided into all the assessed surfaces (112 surfaces), and their mean was calculated, which included: The Clinical Attachment Loss (CAL), which was measured in millimeters using 15-UNC Williams Probe; The Plaque Index (PI), which was measured by explorer over the gingival margin after sucking one Disclusive tablet. In the absence of plaque, score 1, if a thin layer of plaque was observed, score 2, if an average plaque layer was observed, score 3, and if a thick layer was observed, score 4 was recorded; Gingival Bleeding Index (GBI): in order to evaluate the severity of inflammation, 1 mm Probe was inserted into the gingival margin and was moved along the soft tissue, and in case of bleeding after 10 seconds, it was recorded as positive.

Finally, the total number of positive hemorrhagic gingival surfaces was divided by the total number of evaluated surfaces, and was multiplied by 100 and shown as percent. A data collection form was completed for each patient, which included periodontal indices, patient code, age, number of pregnancies, gestational age, height, weight, BMI, and etc. and was kept until the end of the study. Data were analyzed by SPSS software, T-student test and Independent Sample Test. $P<0.05$ was considered significant.

Results

There was no significant difference in the mean age of pregnancy, body mass index (BMI), age and number of pregnancies in the two groups (Table 1). The mean GBI (gingival bleeding index) in the case group was 14.77±2.81, and in the control group was 14.33±3.17, and there was no significant difference between the two groups ($p = 0.35$). The mean PI (the plaque index) in the case group was 1.185 ± 0.13 and in the control group was 1.188±0.17, and the two groups did not have a significant difference. The mean CAL (the clinical attachment loss) was 1.143±0.145 mm in the case group and 1.133±0.142 mm in the control group and no significant difference was observed in the two groups. In this study, at least one of the indices of periodontal disease was positive in 100% of patients in both groups (Table 2). Although there was no statistically significant difference in the mean total CAL between the case and control groups, it was clinically significant in 11 patients in the case group (13.7%) versus 2 patients in the control group (2.5%), and CAL ≤5 mm was sporadically observed in some teeth, indicating severe periodontal disease.

Table 1. Comparison of BMI, age, gestational age and number of pregnancies between the two groups (N = 80)

Group / Variable	Case Mean±SD	Control Mean±SD	P-value
BMI	22.60±1.82	22.53±1.76	0.79
Age	27.98±4.77	27.73±4.67	0.73
Gestational age	29.11±5.22	28.98±5.17	0.87
Number of pregnancies	2.86±0.77	2.74±0.80	0.35

Table 2. Comparison of periodontal indices between the two groups (N = 80)

Group / Variable	Case Mean±SD	Control Mean±SD	P-value
GBI	14.77 ± 2.81	14.33 ± 3.17	0.35
PI	1.18 ± 0.13	1.18 ± 0.17	0.87
CAL	1.14 ± 0.14	0.13 ± 0.14	0.68

Discussion

In this study, there were no significant differences between the three main indices of periodontal disease (CAL, GBI, and PI) in the two preeclampsia and non – preeclampsia groups. However, the worrying increase in the frequency of periodontal disease in both groups is an alarm for overviewing the routine process of prenatal care. A meta-analysis by Ben-Juan Wei et al. on 13 case-control studies and two cohort studies showed a

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significant difference in the periodontal disease indices between the preeclampsia group and the control group and supported the theory that destruction of periodontal tissue is associated with the risk of preeclampsia (13). The study by Sindhu et al. showed that there was no relationship between periodontal disease and preeclampsia.

This was a cohort study in which the samples were chosen from three different centers (14). The disadvantages of this study that might have affected the results and were also admitted by the author himself in the discussion section were as follows: firstly, dental examinations were carried out by three trained nurses, however examinations by those who do not have enough expertise in this field would not be error-free, and secondly, the diagnosis and reporting of preeclampsia in the studied subjects was based on the items recorded in the patient profile in different centers, who may not follow the same standard criteria. In the study of Rahimi Sherbaf et al., the indices of periodontal disease, including the mean probing depth, the number of areas with probe depth ≥ 4 mm and mean GBI were significantly higher in preeclampsia group compared with the control group (10). Although the continuation of bleeding 60 seconds after probing was considered as GBI positive to confirm gingival hemorrhage in this study, GBI was significantly higher in the case group and the findings of this study confirm the association between periodontal disease and preeclampsia. Maboodi et al. investigated the relationship between periodontal disease and preeclampsia by analyzing one cross-sectional study, 17 case control studies, four clinical trials, six meta-analyses, and two systematic reviews. Based on the findings of this meta-analysis, periodontal disease was introduced as a potential risk factor for preeclampsia (15).

In the meta-analysis by Kunnen et al., 12 observational studies and three randomized controlled trials showed that periodontal disease was an inflammatory stimulus and as a risk factor for preeclampsia (16). In a meta-analysis by Huang et al. on 11 observational studies, the association between periodontal disease and preeclampsia was neglected (17). The confirmation or rejection of the relationship between periodontal disease and preeclampsia, which is seen in limited studies with small sample size as well as large-scale meta-analyses with large sample size, while not rejecting the association of these two diseases with common etiopathology, indicates that to achieve a definitive and reliable result, the study should be as broad as possible, but the breadth of the study should not harm its accuracy. Lang et al. showed that any force by the probe greater than 0.25 newton might cause hemorrhage even in healthy areas of the gum, (that is, in healthy periodontium) (18). Therefore, the fact that in some meta-analyses (15), data were obtained from the records or the examinations were conducted by several individuals or people who did not have enough experience and skill questioned the results of these studies. Before selecting the samples, the definitions and indices of the two diseases should be as comprehensive and standard as possible. For example, in the diagnosis of periodontal disease, we should not limit ourselves to one index, because the depth of probing, or gingival hemorrhage, or the presence of plaque cannot be the sole reason for periodontal disease and the use of all three indices reduces the possibility of error. On the other hand, relying on hypertension or proteinuria alone cannot be sufficient to diagnose preeclampsia. To minimize bias and error, the examination conditions should be the same for all patients and the confounding factors should be considered as much as possible and the examining physician should be unaware of the group of each patients (case or control). Given the contradictory results of these studies, and the presence of common immunological backgrounds between the two diseases, periodontal diseases are presented not as a proven cause, but as a potential risk factor for the incidence of preeclampsia.

The attention of gynecologists to the oral health of women and their timely referral to the dentist in counseling before and during pregnancy can be important in preventing preeclampsia. Performing more extensive studies with high methodological quality will have an effective role in changing the routine care protocols before and during pregnancy, and adding oral care to these protocols.

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