

# Evaluation of the Knowledge Level, Behavior, and Attitudes of Obstetrics and Gynecology Specialists on the Relationship Between Periodontal Diseases and Pregnancy Outcomes

*Periodontal Hastalıklar ve Hamilelik Sonuçları Arasındaki İlişki Üzerine Kadın Hastalıkları ve Doğum Doktorlarının Bilgi Düzeyi, Davranış ve Tutumlarının Değerlendirilmesi*

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## Keywords

Awareness, periodontal diseases, pregnancy, preterm labor, questionnaires

## Anahtar Kelimeler

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## Abstract

**Objective:** To investigate the knowledge and awareness level of obstetricians on the relationship between periodontal diseases (PDs) and adverse pregnancy outcomes, and to compare them regarding gender, age, professional experience and institution to identify the pertaining issues requiring improvement.

**Materials and Methods:** Data were collected by the administration of an online questionnaire. The link was sent to the e-mail addresses of 80 obstetricians (50 female, 30 men). The questionnaire consisted of 23 questions focused on the determination of the personal characteristics, attitudes, and the level of knowledge of obstetricians about the relationship between periodontal diseases and preterm labor.

**Results:** The presence of gingival disease (GD) was higher in females ( $p=0.001$ ). Females were found to be more aware and sensitive about the relationship between the periodontal diseases and poor obstetric outcomes ( $p<0.05$ ). Obstetricians in training and research institutions and obstetricians in the early postgraduate period were more likely to believe that there was a significant relationship between GD and obstetric outcomes ( $p<0.05$ ).

**Conclusion:** The knowledge and awareness level of obstetricians on the relationship between PDs and adverse pregnancy outcomes may be influenced by gender, age, professional experience and institution. Active collaboration between periodontologists and obstetricians will provide benefits in monitoring and follow-up of the oral health of pregnant women in terms of prevention of poor obstetric outcomes.

## Öz

**Amaç:** Bu çalışmanın amacı kadın hastalıkları ve doğum uzmanlarının periodontal hastalık ve olumsuz gebelik sonuçları arasındaki ilişki hakkındaki bilgi ve farkındalık seviyelerini araştırmak, cinsiyet, yaş, mesleki deneyim ve çalışılan kurum açısından karşılaştırmak ve iyileştirme gerektiren sorunları tespit etmektir.

**Gereç ve Yöntemler:** Toplam 80 (50 kadın, 30 erkek) kadın hastalıkları ve doğum uzmanına e-posta yoluyla gönderilen çevrim içi anket uygulanmıştır. Anket, uzmanlarının kişisel özellikleri, periodontal sağlık ile hamilelikte erken doğum, düşük doğum ağırlıklı bebek ve preeklampsi arasındaki ilişki hakkındaki bilgi düzeyleri ve tutumlarını değerlendiren 23 sorudan oluşmaktadır.

**Bulgular:** Gingival hastalık varlığı kadınlarda daha yüksekti ( $p=0,001$ ). Periodontal/gingival enflamasyon ve kötü obstetrik sonuçlar arasındaki ilişki konusunda kadınların daha yüksek duyarlılığa sahip olduğu görüldü ( $p<0,05$ ). Ağız sağlığının gebelik sonuçlarına etki ettiğini düşünen hekimlerin akademik personelde ve mezuniyet sonrası erken dönemde yer alan grupta daha fazla olduğu tespit edildi ( $p<0,05$ ).

**Sonuç:** Kadın doğum uzmanlarının periodontal hastalıklar ile olumsuz gebelik sonuçları arasındaki ilişki hakkındaki bilgi ve farkındalık düzeyi cinsiyet, yaş, mesleki deneyim ve çalıştıkları kurumdan etkilenebilir. Periodontologlar ve kadın hastalıkları ve doğum uzmanlarının aktif iş birliği, gebelerin ağız sağlığının sorgulanması, tedavi ve takip için yönlendirilmesi, kötü obstetrik sonuçların önlenmesi açısından fayda sağlayacaktır.

## Introduction

Periodontal diseases (PDs) are destructive, chronic, and multifactorial diseases with the primary etiological factor of microbial dental plaques, affecting the supportive tissues of the tooth (1-3). It is a well-recognized fact today that PDs are associated with systemic diseases such as cardiovascular, respiratory system diseases, diabetes, as well as with poor obstetrical outcomes, including premature birth, low birth weight, and pre-eclampsia (4). Increased estrogen and progesterone levels during pregnancy and developing immunosuppression may influence the biological and clinical characteristics of periodontal infections in the presence of microbial dental plaques and may aggravate the response to irritation (5,6). The number of *Prevotella intermedia*, *Bacteroides species*, and *Campylobacter rectus* increases in pregnancy. The increased availability of these pathogens enhances the susceptibility to periodontal damage by interfering with the periodontal microflora (5).

Several epidemiological studies are available on the adverse outcomes of periodontal infections in pregnancy, including abortions, premature birth, very premature birth, low birth weight, very low birth weight, and pre-eclampsia (7-9). Premature birth and low birth weight associated with PD are explained in the literature by the release of inflammatory products into the systemic circulation as a result of the maternal and fetal immunological responses against the hematogenous spread of oral bacteria (5,10). Periodontal disease is critical for both maternal and neonatal well-being, as several study reports support that adverse obstetric outcomes are prevented by treating this situation (11,12). However, pregnant women are not routinely referred to a dental examination during their follow-up (13,14).

The adequate level of knowledge of obstetricians on the association between the complications of pregnancy and dental and PDs is critically important in terms of reducing the negative pregnancy outcomes by questioning and referring the pregnant women to a periodontologist for the symptoms of PD (15). Data from the studies demonstrate that there is knowledge and awareness of periodontal disease and its potential role as a pregnancy risk factor but suggest limited incorporation of dental care into clinical medical practice (16,17) and the attitudes of these obstetricians were not in agreement with their apparent knowledge regarding PDs and their possible repercussions (18).

Our study aimed to investigate the knowledge and awareness level of obstetricians on the relationship between PD and adverse pregnancy outcomes, to compare them according to age, gender, professional experience, and institution and to identify the pertaining issues requiring improvement.

## Materials and Methods

The study protocol was approved by the Bolu Abant İzzet Baysal University Faculty of Medicine, Clinical Researches Ethics Committee (decision no: 2018-71, date: 12.04.2018). This cross-sectional study was conducted to evaluate the awareness on periodontal health during pregnancy and its association to delivery of preterm low birth weight infants by collecting information with an online questionnaire, the link of which was e-mailed to 80 obstetricians in Turkey. One-to-one interviews were made with obstetricians in the National Obstetrics and Gynecology Congress and their e-mail addresses were obtained after their consent. Participants were obstetricians or perinatologists who were dealing with

pregnants only. Specialists focusing on gynecology or general obstetrics were excluded from this study.

The questionnaire was comprised of 23 questions prepared with respect to previously published questionnaires (15-18). The questions were initially translated to Turkish by three lecturers with fluent English language skills. These translated questions were back translated to English by a native English speaker, and the translations which were more consistent with the original version were determined. These steps were taken by the method described by Beaton et al. (19) After checking the Turkish version of the questionnaire in terms of grammar, it was evaluated for validation, and necessary modifications were employed by a pilot study that was conducted on 10% of the total sample size. Those individuals who participated in the pilot study were excluded from the main study to prevent possible bias.

Information was gathered about the personal characteristics, attitudes, and the level of knowledge of obstetricians related to the relationship between PD and preterm labor.

Questions were presented in four sections: Personal data, experiences with oral health, awareness and knowledge of obstetricians on potential changes, which might occur during pregnancy, and on possible risk factors for preterm labor/low birth weight, and Physician behavior towards patients.

When the studies are examined, a power analysis was performed considering the effect of the professional experience in years ( $\leq 10$  and  $> 10$  years) on the knowledge level, which is one of the primary outcomes of the study. Considering a similar study, the sample size was calculated considering Type I errors (0.05), targeted power (0.80), and it is concluded that there should be at least 40 people in each trial group (16).

### Statistical Analysis

Descriptive values of the data obtained were expressed as numbers and percentage frequencies and tabulated. The internal consistency of the 10-item scale was evaluated with the Kuder-Richarson-20 (KR-20) coefficient. The relevance of answers to related questions was examined with the Pearson chi-square test or Fisher-Freeman-Halton test by evaluation of the percentage frequencies listed in the tables. The level of statistical significance was accepted as a p-value of less than 0.05. SPSS (version 23) program was used for statistical analyses.

## Results

A total of 80 (50 female, 30 men) obstetricians, who were either residents or specialists participated in the study. Awareness of obstetricians on periodontitis and low birth weight premature infants were assessed using a scale, which included ten questions. The internal consistency of this scale was found to be 0.715 and was evaluated to be good.

The presence of PD was higher in females ( $p=0.001$ ). The number of females answering "yes" to the following questions "May gingival/periodontal inflammation affect the outcomes of pregnancy?; Have your patients ever complained about gum bleeding or swelling or loose tooth during pregnancy?; Is PD a risk factor for premature births and low birth weight?; Can PD be safely treated during pregnancy?" was high (Table 1).

The presence of PDs was highest in the  $\leq 45$ - year old group ( $p=0.001$ ). The percentage of participants answering "yes" to the training history for oral health was higher in the  $>45$ - year old group ( $p=0.035$ ). Answering "yes" to the taking care of the oral health of patients was found higher in the  $>45$ - year old group ( $p=0.004$ ) (Table 2).

The number of answers given to the questions related to the time elapsed since the graduation from the medical school, and the number of PD cases treated were higher in dentists who graduated within less than ten years from medical faculty ( $p=0.010$ ).

The frequency of PDs was highest in the participants with the duration of professional experience of  $\leq 10$  years in obstetrics and gynecology practice ( $p=0.039$ ). The question about the history of gingival treatment was answered "yes" more commonly in obstetricians with an experience of  $\leq 10$  years in obstetrics and gynecology ( $p=0.004$ ). Answering "yes" to the question "may gingival/periodontal inflammation affect the outcomes of pregnancy?" was found to be highest in the group with an experience of  $\leq 10$  years in obstetrics and gynecology ( $p=0.050$ ) (Table 3).

Answering " $\leq 1$  year" to the question "When was the last time you visited a dentist for a control examination?" was higher in participants working at a private hospital ( $p=0.011$ ). The presence of PDs treated was highest in participants working at a university hospital ( $p=0.016$ ). Answering "yes" to the question "taking care of the oral health of your

		Women		Men		p-value
		%	n	n	%	
When was the last time you visited a dentist for a control examination?	≤1 year	24	48.0 <sup>a</sup>	21	70.0 <sup>b</sup>	0.049
	>1 year	26	52.0 <sup>a</sup>	9	30.0 <sup>b</sup>	
Do you suffer from a gingival disease?	No	18	36.0 <sup>a</sup>	23	76.7 <sup>b</sup>	0.001
	Yes	32	64.0 <sup>a</sup>	7	23.3 <sup>b</sup>	
Have you ever been treated for gingival diseases?	No	32	64.0	23	76.7	0.321
	Yes	18	36.0	7	23.3	
Have you ever been trained for oral health?	No	29	58.0	17	56.7	0.907
	Yes	21	42.0	13	43.3	
Do you take care of the oral health of your patients?	No	21	42.0	13	43.3	0.907
	Yes	29	58.0	17	56.7	
Do you take anamnesis about oral health?	No	24	48.0	19	63.3	0.248
	Yes	26	52.0	11	36.7	
Do you think that pregnancy increases the likelihood of gingival inflammation?	No	1	2.0	2	6.7	0.553
	Yes	49	98.0	28	93.3	
Do you think that gingival/periodontal inflammation may affect the outcomes of pregnancy?	No	4	8.0 <sup>a</sup>	7	23.3 <sup>b</sup>	0.050
	Yes	46	92.0 <sup>a</sup>	23	76.7 <sup>b</sup>	
Have your patients ever complained about gum bleeding or swelling or loose tooth during pregnancy?	No	0	0.0 <sup>a</sup>	3	10.0 <sup>b</sup>	0.049
	Yes	50	100.0 <sup>a</sup>	27	90.0 <sup>b</sup>	
If your answer to the previous question is "Yes"; Have you advised your patient to visit a dentist?	No	0	0	0	0	-
	Yes	50	100.0	27	100.0	
Do you think that periodontal disease is a risk factor for preterm-low birth?	No	3	6.0 <sup>a</sup>	6	20.7 <sup>b</sup>	0.048
	Yes	47	94.0 <sup>a</sup>	23	79.3 <sup>b</sup>	
Do you think that treatment of periodontal diseases during pregnancy can reduce the risk of premature deliveries?	No	3	6.0	4	13.3	0.416
	Yes	47	94.0	26	86.7	
Does gum inflammation cause pre-eclampsia during pregnancy?	No	28	57.1	22	73.3	0.160
	Yes	21	42.9	8	26.7	
Are you aware of the term "pregnancy gingivitis"?	No	6	12.2	6	20.0	0.357
	Yes	43	87.8	24	80.0	
Do you think that progesterone and estrogen play an important role in the etiology of gingivitis during pregnancy?	No	8	16.3	4	13.3	0.719
	Yes	41	83.7	26	86.7	
Do you think that periodontal diseases can be safely treated during pregnancy?	No	4	8.0 <sup>a</sup>	7	23.3 <sup>b</sup>	0.050
	Yes	46	92.0 <sup>a</sup>	23	76.7 <sup>b</sup>	
Do you think that dental plaque scaling and root surface planing procedures can be performed to eliminate periodontal disease during pregnancy?	No	12	24.0	7	23.3	0.946
	Yes	38	76.0	23	76.7	

\*Significant differences between the ratios in the rows were indicated by the letters, <sup>a,b</sup>Placed next to the ratio. If the ratios in the same row carry a completely different letter, it indicates that the difference between them is statistically significant

**Table 2. Comparison of age groups in terms of answers to questions**

	Age				p-value	
	≤45 age		>45 age			
	n	%	n	%		
When was the last time you visited a dentist for a control examination?	≤1 year	35	58.3	10	50.0	0.606
	>1 year	25	41.7	10	50.0	
Do you suffer from a gingival disease?	No	23	38.3 <sup>a</sup>	18	90.0 <sup>b</sup>	0.001
	Yes	37	61.7 <sup>a</sup>	2	10.0 <sup>b</sup>	
Have you ever been treated for gingival diseases?	No	38	63.3	17	85.0	0.096
	Yes	22	36.7	3	15.0	
Have you ever been trained for oral health?	No	39	65.0 <sup>a</sup>	7	35.0 <sup>b</sup>	0.035
	Yes	21	35.0 <sup>a</sup>	13	65.0 <sup>b</sup>	
Do you take care of the oral health of your patients?	No	31	51.7 <sup>a</sup>	3	15.0 <sup>b</sup>	0.004
	Yes	29	48.3 <sup>a</sup>	17	85.0 <sup>b</sup>	
Do you take anamnesis about oral health?	No	35	58.3	8	40.0	0.198
	Yes	25	41.7	12	60.0	
Do you think that pregnancy increases the likelihood of gingival inflammation?	No	3	5.0	0	0.0	0.569
	Yes	57	95.0	20	100.0	
Do you think that gingival/periodontal inflammation may affect the outcomes of pregnancy?	No	8	13.3	3	15.0	0.851
	Yes	52	86.7	17	85.0	
Have your patients ever complained about gum bleeding or swelling or loose tooth during pregnancy?	No	1	1.7	2	10.0	0.153
	Yes	59	98.3	18	90.0	
If your answer to the previous question is "Yes"; Have you advised your patient to visit a dentist?	No	0	0	0	0	-
	Yes	59	100.0	18	100.0	
Do you think that periodontal disease is a risk factor for preterm-low birth?	No	7	11.9	2	10.0	0.821
	Yes	52	88.1	18	90.0	
Do you think that treatment of periodontal diseases during pregnancy can reduce the risk of premature deliveries?	No	5	8.3	2	10.0	0.819
	Yes	55	91.7	18	90.0	
Does gum inflammation cause pre-eclampsia during pregnancy?	No	37	61.7	13	68.4	0.786
	Yes	23	38.3	6	31.6	
Are you aware of the term "pregnancy gingivitis"?	No	7	11.7	5	26.3	0.148
	Yes	53	88.3	14	73.7	
Do you think that progesterone and estrogen play an important role in the etiology of gingivitis during pregnancy?	No	11	18.3	1	5.3	0.275
	Yes	49	81.7	18	94.7	
Do you think that periodontal diseases can be safely treated during pregnancy?	No	10	16.7	1	5.0	0.275
	Yes	50	83.3	19	95.0	
Do you think that dental plaque scaling and root surface planing procedures can be performed to eliminate periodontal disease during pregnancy?	No	17	28.3	2	10.0	0.132
	Yes	43	71.7	18	90.0	

\*Significant differences between the ratios in the rows were indicated by the letters, <sup>a,b</sup>Placed next to the ratio. If the ratios in the same row carry a completely different letter, it indicates that the difference between them is statistically significant

**Table 3. Comparing the results of professional experience in terms of the response to the questions of obstetricians**

	Age				p-value	
	≤10 year		> 10 year			
	n	%	n	%		
When was the last time you visited a dentist for a control examination?	≤1 year	14	53.8	31	57.4	0.813
	>1 year	12	46.2	23	42.6	
Do you suffer from a gingival disease?	No	9	34.6 <sup>a</sup>	32	59.3 <sup>b</sup>	0.039
	Yes	17	65.4 <sup>a</sup>	22	40.7 <sup>b</sup>	
Have you ever been treated for gingival diseases?	No	12	46.2 <sup>a</sup>	43	79.6 <sup>b</sup>	0.004
	Yes	14	53.8 <sup>a</sup>	11	20.4 <sup>b</sup>	
Have you ever been trained for oral health?	No	16	61.5	30	55.6	0.638
	Yes	10	38.5	24	44.4	
Do you take care of the oral health of your patients?	No	13	50.0	21	38.9	0.469
	Yes	13	50.0	33	61.1	
Do you take anamnesis about oral health?	No	11	42.3	32	59.3	0.231
	Yes	15	57.7	22	40.7	
Do you think that pregnancy increases the likelihood of gingival inflammation?	No	2	7.7	1	1.9	0.245
	Yes	24	92.3	53	98.1	
Do you think that gingival/periodontal inflammation may affect the outcomes of pregnancy?	No	1	3.8 <sup>a</sup>	10	18.5 <sup>b</sup>	0.050
	Yes	25	96.2 <sup>a</sup>	44	81.5 <sup>b</sup>	
Have your patients ever complained about gum bleeding or swelling or loose tooth during pregnancy?	No	0	0.0	3	5.6	0.547
	Yes	26	100.0	51	94.4	
If your answer to the previous question is 'Yes'; Have you advised your patient to visit a dentist?	No	0	0	0	0	-
	Yes	26	100.0	51	100.0	
Do you think that periodontal disease is a risk factor for preterm-low birth?	No	4	16.0	5	9.3	0.453
	Yes	21	84.0	49	90.7	
Do you think that treatment of periodontal diseases during pregnancy can reduce the risk of premature deliveries?	No	2	7.7	5	9.3	0.816
	Yes	24	92.3	49	90.7	
Does gum inflammation cause pre-eclampsia during pregnancy?	No	14	53.8	36	67.9	0.320
	Yes	12	46.2	17	32.1	
Are you aware of the term "pregnancy gingivitis"?	No	6	23.1	6	11.3	0.194
	Yes	20	76.9	47	88.7	
Do you think that progesterone and estrogen play an important role in the etiology of gingivitis during pregnancy?	No	4	15.4	8	15.1	0.973
	Yes	22	84.6	45	84.9	
Do you think that periodontal diseases can be safely treated during pregnancy?	No	6	23.1	5	9.3	0.162
	Yes	20	76.9	49	90.7	
Do you think that dental plaque scaling and root surface planning procedures can be performed to eliminate periodontal disease during pregnancy?	No	9	34.6	10	18.5	0.160
	Yes	17	65.4	44	81.5	

\*Significant differences between the ratios in the rows were indicated by the letters, <sup>a,b</sup>Placed next to the ratio. If the ratios in the same row carry a completely different letter, it indicates that the difference between them is statistically significant

patients" was found lower in participants working at public hospitals ( $p=0.001$ ). Answering "yes" to the taking anamnesis about oral health was found higher in participants working at university hospital compared to those working at a public hospital ( $p=0.028$ ). Answering "yes" to the question "Does gum inflammation cause pre-eclampsia during pregnancy?" found lower in participants working at private hospitals compared to those working either at public hospitals or university hospitals ( $p=0.036$ ). The number of participants working either at private hospitals or university hospitals answering "yes" to the following questions was higher "Can PDs be safely treated during pregnancy?; Can dental plaque scaling and root surface planing procedures be performed to eliminate periodontal disease during pregnancy?" (Table 4).

Answering "yes" to the suffering from a gingival disease was found to be higher in specialists and academic personnel ( $p=0.006$ ). Answering "yes" to the taking care of the oral health of your patients was observed to be the highest in the academic personnel group ( $p=0.003$ ). Answering "yes" to the taking anamnesis about oral health was lowest in the specialists' group ( $p=0.003$ ). Answering "yes" to the question, "Can dental plaque scaling and root surface planing procedures be performed to eliminate periodontal disease during pregnancy?" was found to be higher in academic personnel and director groups ( $p=0.007$ ) (Table 5).

## Discussion

A variety of studies have been conducted to evaluate the level of knowledge and behavioral patterns of obstetricians on the relationship between pregnancy and PD (17,18,20). Although the relationship between PDs and poor obstetric outcomes is known, the attitudes and knowledge on this subject are used in a limited manner in clinical medical practice. In our study, we found that among the participants, who have taken an anamnesis about the oral health of the patients were higher in academic personnel and >45 age, and who thought that dental procedures could be applied to eliminate periodontal disease during pregnancy were higher in academic personnel.

Fifty of the 80 participants in our study were female. Similar to our study, the proportion of females was between 40% and 60% in other studies (16,18).

75% of the participants in our study were in the  $\leq 45$  age, similar to the results of studies conducted in India and France (16,21).

When the experiences of the participants as specialists were categorized into 10-year intervals, it was observed that 32.5% of obstetricians had professional experience of 10 years or less. The study conducted in France reported that 39.5% of the participants had a professional experience of 10 years or less (16). The 48.75% of the participants reported that they had suffered from PD, however only 31.25% of them reported that they had received treatment. Cohen et al. (16) observed similar results to those of our study, reporting that 31.2% of obstetricians had a diagnosis of PD and 22.7% of them received treatment. As these findings demonstrated that treatment of PD could be neglected even in highly educated obstetricians, activities to raise awareness, and increase the level of knowledge should target all subgroups in the society.

According to our data, 57.5% of the participants reported that they did not receive any training on oral health. In this series, 53.75% of the participants reported that they did not take oral health history from their patients. Furthermore, 42.5% of the participants reported that they did not take care of the oral health of their patients. Other studies conducted in various countries reported lower rates as 26.3% in France and 49% in the United States (16,22). On the other hand, 96.25% of the participants in our study reported that pregnancy aggravated gingival inflammation, and 86.25% of them reported that PDs influenced pregnancy outcomes. Similar rates of impingement on pregnancy outcomes were reported by obstetricians from France and the United States as 84% and 74.7%, respectively (16,22). Despite the lower rates of participants receiving training on oral care and the lower rates of their taking care of oral health of their patients, their levels of knowledge were higher. This can be explained by the fact that theoretical knowledge has not been applied to clinical practice. Moreover, the percentage of obstetricians aged 45 years and over was higher in regards to being interested in the oral health of patients and in regards to taking anamnesis on oral health. A study in the literature reported that this situation might be related to a better level of knowledge and experience of obstetricians in the 45-50 years age group (17).

								p-value
		Public hospital		University hospital		Private hospital		
		n	%	n	%	n	%	
When was the last time you visited a dentist for a control examination?	≤1 year	9	42.9 <sup>a</sup>	14	45.2 <sup>a</sup>	22	78.6 <sup>b</sup>	0.011
	>1 year	12	57.1 <sup>a</sup>	17	54.8 <sup>a</sup>	6	21.4 <sup>b</sup>	
Do you suffer from a gingival disease?	No	15	71.4 <sup>a</sup>	10	32.3 <sup>b</sup>	16	57.1 <sup>ab</sup>	0.016
	Yes	6	28.6 <sup>a</sup>	21	67.7 <sup>b</sup>	12	42.9 <sup>ab</sup>	
Have you ever been treated for gingival diseases?	No	16	76.2	18	58.1	21	75.0	0.288
	Yes	5	23.8	13	41.9	7	25.0	
Have you ever been trained for oral health?	No	13	61.9	18	58.1	15	53.6	0.877
	Yes	8	38.1	13	41.9	13	46.4	
Do you take care of the oral health of your patients?	No	17	81.0 <sup>a</sup>	7	22.6 <sup>b</sup>	10	35.7 <sup>b</sup>	0.001
	Yes	4	19.0 <sup>a</sup>	24	77.4 <sup>b</sup>	18	64.3 <sup>b</sup>	
Do you take anamnesis about oral health?	No	15	71.4 <sup>a</sup>	11	35.5 <sup>b</sup>	17	60.7 <sup>ab</sup>	0.028
	Yes	6	28.6 <sup>a</sup>	20	64.5 <sup>b</sup>	11	39.3 <sup>ab</sup>	
Do you think that pregnancy increases the likelihood of gingival inflammation?	No	0	0.0	3	9.7	0	0.0	0.113
	Yes	21	100.0	28	90.3	28	100.0	
Do you think that gingival/periodontal inflammation may affect the outcomes of pregnancy?	No	5	23.8	4	12.9	2	7.1	0.248
	Yes	16	76.2	27	87.1	26	92.9	
Have your patients ever complained about gum bleeding or swelling or loose tooth during pregnancy?	No	1	4.8	2	6.5	0	0.0	0.472
	Yes	20	95.2	29	93.5	28	100.0	
If your answer to the previous question is "Yes"; Have you advised your patient to visit the dentist?	No	0	0	0	0	0	0	-
	Yes	20	100.0	29	100.0	28	100.0	
Do you think that periodontal disease is a risk factor for preterm-low birth?	No	3	15.0	4	12.9	2	7.1	0.740
	Yes	17	85.0	27	87.1	26	92.9	
Do you think that treatment of periodontal diseases during pregnancy can reduce the risk of premature deliveries?	No	2	9.5	3	9.7	2	7.1	0.933
	Yes	19	90.5	28	90.3	26	92.9	
Does gum inflammation cause pre-eclampsia during pregnancy?	No	11	55.0 <sup>a</sup>	16	51.6 <sup>a</sup>	23	82.1 <sup>b</sup>	0.036
	Yes	9	45.0 <sup>a</sup>	15	48.4 <sup>a</sup>	5	17.9 <sup>b</sup>	
Are you aware of the term "pregnancy gingivitis"?	No	3	15.0	4	12.9	5	17.9	0.923
	Yes	17	85.0	27	87.1	23	82.1	
Do you think that progesterone and estrogen play an important role in the etiology of gingivitis during pregnancy?	No	3	15.0	4	12.9	5	17.9	0.923
	Yes	17	85.0	27	87.1	23	82.1	
Do you think that periodontal diseases can be safely treated during pregnancy?	No	8	38.1 <sup>a</sup>	3	9.7 <sup>b</sup>	0	0.0 <sup>b</sup>	0.001
	Yes	13	61.9 <sup>a</sup>	28	90.3 <sup>b</sup>	28	100.0 <sup>b</sup>	
Do you think that dental plaque scaling and root surface planing procedures can be performed to eliminate periodontal disease during pregnancy?	No	9	42.9 <sup>a</sup>	5	16.1 <sup>b</sup>	5	17.9 <sup>b</sup>	0.050
	Yes	12	57.1 <sup>a</sup>	26	83.9 <sup>b</sup>	23	82.1 <sup>b</sup>	

\*Significant differences between the ratios in the rows were indicated by the letters, <sup>a,b</sup>Placed next to the ratio. If the ratios in the same row carry a completely different letter, it indicates that the difference between them is statistically significant



	Current position							
		Academic personnel		Director		Specialist		p-value
		n	%	n	%	n	%	
When was the last time you visited a dentist for a control examination?	≤1 year	17	51.5	1	20	27	64.3	0.171
	>1 year	16	48.5	4	80	15	35.7	
Do you suffer from a gingival disease?	No	11	33.3 <sup>a</sup>	5	100 <sup>c</sup>	25	59.5 <sup>ab</sup>	0.006
	Yes	22	66.7 <sup>a</sup>	0	0 <sup>c</sup>	17	40.5 <sup>ab</sup>	
Have you ever been treated for gingival diseases ?	No	19	57.6 <sup>a</sup>	5	100 <sup>b</sup>	31	73.8 <sup>ab</sup>	0.104
	Yes	14	42.4 <sup>a</sup>	0	0 <sup>b</sup>	11	26.2 <sup>ab</sup>	
Have you ever been trained for oral health?	No	17	51.5	2	40	27	64.3	0.417
	Yes	16	48.5	3	60	15	35.7	
Do you take care of the oral health of your patients?	No	7	21.2 <sup>a</sup>	2	40 <sup>ab</sup>	25	59.5 <sup>b</sup>	0.003
	Yes	26	78.8 <sup>a</sup>	3	60 <sup>ab</sup>	17	40.5 <sup>b</sup>	
Do you take anamnesis about oral health?	No	11	33.3 <sup>a</sup>	2	40 <sup>ab</sup>	30	71.4 <sup>b</sup>	0.003
	Yes	22	66.7 <sup>a</sup>	3	60 <sup>ab</sup>	12	28.6 <sup>b</sup>	
Do you think that pregnancy increases the likelihood of gingival inflammation?	No	3	9.1	0	0	0	0	0.161
	Yes	30	90.9	5	100	42	100	
Do you think that gingival/periodontal inflammation may affect the outcomes of pregnancy?	No	4	12.1	2	40	5	11.9	0.253
	Yes	29	87.9	3	60	37	88.1	
Have your patients ever complained about gum bleeding or swelling or loose tooth during pregnancy?	No	2	6.1	0	0	1	2.4	0.659
	Yes	31	93.9	5	100	41	97.6	
If your answer to the previous question is "Yes"; Have you advised your patient to visit the dentist?	No	0	0	0	0	0	0	-
	Yes	31	100	5	100	41	100	
Do you think that periodontal disease is a risk factor for preterm-low birth?	No	4	12.1	0	0	5	12.2	0.709
	Yes	29	87.9	5	100	36	87.8	
Do you think that treatment of periodontal diseases during pregnancy can reduce the risk of premature deliveries?	No	3	9.1	0	0	4	9.5	0.773
	Yes	30	90.9	5	100	38	90.5	
Does gum inflammation cause pre-eclampsia during pregnancy?	No	20	60.6	2	50	28	66.7	0.682
	Yes	13	39.4	2	50	14	33.3	
Are you aware of the term "pregnancy gingivitis"?	No	4	12.1	1	25.0	7	16.7	0.577
	Yes	29	87.9	3	75.0	35	83.3	
Do you think that progesterone and estrogen play an important role in the etiology of gingivitis during pregnancy?	No	6	18.2	0	0	6	14.3	0.876
	Yes	27	81.8	4	100	36	85.7	
Do you think that periodontal diseases can be safely treated during pregnancy?	No	3	9.1	0	0	8	19.0	0.424
	Yes	30	90.9	5	100	34	81.0	
Do you think that dental plaque scaling and root surface planning procedures can be performed to eliminate periodontal disease during pregnancy?	No	3	9.1 <sup>a</sup>	0	0 <sup>a</sup>	16	38.1 <sup>ab</sup>	0.007
	Yes	30	90.9 <sup>a</sup>	5	100 <sup>a</sup>	26	61.9 <sup>ab</sup>	

\*Significant differences between the ratios in the rows were indicated by the letters, <sup>a,b</sup>Placed next to the ratio. If the ratios in the same row carry a completely different letter, it indicates that the difference between them is statistically significant

The majority of participants considered PD as a risk factor for premature birth and low birth weight and thought that treatment of PD in pregnancy could reduce the risk of premature births, and 36.25% of them reported that gingival inflammation could lead to pre-eclampsia. In a study conducted by Shah et al. (17) 87.9% of study participants reported that PDs posed a risk for low birth. The majority of obstetricians was aware of the term pregnancy gingivitis and reported that progesterone and estrogen levels in pregnancy cause gingivitis. In the literature, as current information about the effects of pregnancy on gingival inflammation, some studies concluded that increased estrogen and progesterone levels in pregnancy change subgingival microbiota and immunologic physiological mediators in periodontal tissue (23,24).

86.25% of the participants thought that PD could be safely treated and 76.25% of them thought that dental plaque scaling and root planning were possible during pregnancy. This difference can be explained by the fact that obstetricians may not have an adequate level of knowledge about the treatment procedures of PD. Similar to our results, several investigators reported that 84.6-97.4% of the obstetricians considered that dental/gingival treatments were applicable during pregnancy (16,25).

## Conclusion

This study revealed that updating the periodontal disease and pregnancy information, the institution where the participants work, and their professional experiences affect the awareness of the obstetricians on the dental health of their patients. We think that conducting joint workshops and establishment of health care units enabling the active collaboration of periodontologists and obstetricians will provide benefits in monitoring oral health of pregnant women in terms of improving the dental approach and referral rates of obstetricians. Furthermore, questioning and referring pregnant women for the signs and symptoms of PD during routine pregnancy monitoring will reduce the risk of premature births and delivery of low birth weight infants, as well as decreasing the rates of perinatal mortality and morbidity, which will contribute to the national economy.

## Ethics

**Ethics Committee Approval:** The present cohort study was designed as a survey and was approved by

the Clinical Research Ethics Committee of Bolu Abant İzzet Baysal University (decision no: 2018-71, date: 12.04.2018).

**Informed Consent:** One-to-one interviews were made with obstetricians in the National Obstetrics and Gynecology Congress and their e-mail addresses were obtained after their consent.

**Peer-review:** Externally peer-reviewed.

## Authorship Contributions

Surgical and Medical Practices: G.U., Ü.M.U., T.P., H.A., Concept: G.U., Ü.M.U., T.P., H.A., Design: G.U., Ü.M.U., T.P., H.A., Data Collection or Processing: G.U., Ü.M.U., T.P., H.A., Analysis or Interpretation: G.U., Ü.M.U., T.P., H.A., Literature Search: G.U., Ü.M.U., T.P., H.A., Writing: G.U., Ü.M.U., T.P., H.A.

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