Awareness, knowledge and attitude toward the relationship between periodontal health and pregnancy outcomes among obstetrician-gynecologist healthcare professionals in Turkey: Results of 11th Turkish-German Gynecological Association Congress based survey

Resul Turabi[1], Ömer Birkan Agrali[2], Başak Doğan[2]

[1]Specialist in Periodontology, Private Practice, İstanbul, Turkey

[2]Department of Periodontology, Marmara University Faculty of Dentistry, İstanbul, Turkey

Abstract

Objective: The aim of this study was to evaluate the knowledge and practice behavior of Turkish obstetrician-gynecologists regarding oral healthcare during pregnancy and the association between periodontal disease and adverse pregnancy outcomes.

Material and Methods: A cross-sectional study was conducted on randomly selected Turkish obstetrician-gynecologists using a questionnaire consisting of 26 questions during 11th Turkish-German Gynecological Association Congress. Participation in the survey was voluntary.

Results: Out of 435 attendees approached, 382 (88%) of the gynecologists at the Congress participated in the written questionnaire. Most of the participants (96.1%) acknowledged a connection between oral health and pregnancy, and 77.5% agreed that periodontal disease may affect the outcome of pregnancy. Moreover, a high proportion of participants were aware of the clinical signs of periodontal diseases, mainly gingival bleeding (92.1%). However, almost 20% of participants thought that dental treatment could be performed safely in the first or last trimester of pregnancy. Only 36.9% of participants recommended guidance on dental examination for their patients during prenatal care.

Conclusion: This study demonstrated that Turkish obstetrician-gynecologists have a relatively high degree of knowledge with respect to the relationship between periodontal disease and pregnancy outcomes, but practice behavior was poorly correlated with their knowledge. (J Turk Ger Gynecol Assoc 2022; 23: 275-86)

Keywords: Attitude, awareness, knowledge, periodontal diseases, pregnancy

Received: 01 October, 2021 **Accepted:** 08 July, 2022

Introduction

Periodontium is a structure consisting of gingiva, cementum, periodontal ligament and alveolar bone that surrounds and supports the teeth. The main task of the periodontium is to meet functional requirements and to keep the teeth in the mouth (1). Periodontal diseases are infectious and/or inflammatory diseases affecting the hard and soft tissues around the teeth (2). Microbial dental plaque (MDP) is the primary etiological factor for periodontal diseases, which are generally divided into gingivitis and periodontitis. Gingivitis is an inflammatory and reversible disease of the gum without loss of attachment and alveolar bone (3). In periodontitis, there is an advanced destruction of tooth-supporting alveolar bone (4). Periodontal

Address for Correspondence: *Başak Doğan*
e.mail: basak.sdogan@gmail.com ORCID: orcid.org/0000-0002-3602-4886

Journal of the Turkish-German Gynecological Association published by Galenos Publishing House.
DOI: 10.4274/jtgga.galenos.2022.2021-9-13

disease is initiated by oral microorganisms, but the amount of periodontal destruction has been associated with the host's inflammatory response (5). Systemic diseases and conditions can change the severity of periodontal diseases by affecting the microbiota and host response (6). Thus, MDP is a prerequisite but not the sole factor for the onset of periodontal diseases (7). The severity of the disease, how it affects the person, and how fast it will progress, depends on the immune and inflammatory response of the host which is regulated by systemic factors (8). Moreover, periodontal diseases are increasingly accepted as a risk factor for many systemic diseases and may affect systemic health (9). The association between systemic conditions, such as diabetes or pregnancy, and periodontal diseases have been reported (10). Furthermore, several studies have been conducted on the negative effects of periodontal disease on systemic health and conditions such as cardiovascular diseases, diabetes, preterm birth and aspiration pneumonia (11-15). Especially in recent years, the biological mechanism of systemic infection caused by periodontal disease has been investigated and oral pathogens causing bacteremia have been detected in amniotic fluid (12). Therefore, the two-way relationship between pregnancy and periodontal diseases has recently become more prominent.

The negative effects of periodontal disease, such as preterm birth, low birth weight, miscarriage, preeclampsia and lower genital area infection have been widely investigated (16-30). It has been shown that the treatment of periodontal diseases is important for the health of both pregnant individuals and babies, and it has been shown in many studies that successful treatment causes a significant decrease in negative pregnancy outcomes (25-27,31-35). These results clearly demonstrate the importance of periodontal health during or before pregnancy.

Hormonal changes during pregnancy cause modification of the immune response, increasing the response to irritation accordingly. This state may affect the biological and clinical features of periodontal infections (36). However, without dental plaque, hormonal imbalances do not cause gingivitis (37,38). It has been reported that the distribution and severity of gingivitis increases during pregnancy (36,39-43). As a steroid sex hormone, estrogen, has various effects on periodontium. These include reducing epithelial keratinization, weakening the epithelial barrier, increasing proliferation of blood vessels, stimulating polymorphonuclear leukocyte (PMNL) phagocytosis, inhibiting PMNL chemotaxis, suppression of bone marrow induced leukocytes, inhibition of bone marrow secretion of proinflammatory cytokines, reduction in T-cell inflammation, stimulating gingival fibroblast proliferation and possibly initiating an increase in gingival inflammation without the existence of MDP (44). Another important steroid sex hormone, progesterone, also effects the periodontium by increasing vascular permeability and dilatation, increasing prostaglandin production, decreasing PMNL count and prostaglandin-E_2 levels in gingival crevicular fluid, inhibition of glucocorticoids, reduction of gingival fibroblast proliferation, loss of organization of collagen structure and decrease in its production rate (44). Sex hormones also produce changes in the subgingival flora. Notably, anaerobic microorganisms, which have important roles in the initiation and progress of periodontal disease, become more prominent (36).

Obstetrician-gynecologists, as the most common physicians to see pregnancy candidates and pregnant women, are obliged to provide a wide range of guidance for the mother and baby to complete this period in a healthy way. These include evaluating the oral care of pregnant women and providing precautionary guidance against negative birth results. For this reason, it is expected that obstetrician-gynecologists should have sufficient knowledge about the relationship between periodontal health and pregnancy outcomes, in order to appropriately guide their patients (45).

Studies conducted in the United States, France, India and Brazil have investigated the knowledge and behavior of obstetrician-gynecologists relating to the relationship between periodontal disease and pregnancy (46-50). These studies demonstrated that, even though obstetricians-gynecologists had a remarkably high awareness of this association, their practice was not as effective as expected in the guidance (46,50-52). The studies state that increasing obstetrician-gynecologists' levels of behavior, as well as the knowledge, in terms of periodontal disease and pregnancy outcomes is an important factor in preventing negative outcomes. However, to the best of our knowledge, there is very little evidence in this field regarding obstetrician-gynecologists in Turkey. Therefore, the aim of the study was to evaluate the knowledge and behaviors of Turkish obstetrician-gynecologists relating to the relationship between periodontal disease and pregnancy.

Material and Methods

The study protocol was approved by the Marmara University Faculty of Medicine Local Ethics Committee (approval number: 09.2016.264, date: 03.2016). The study participants were obstetrician-gynecologists who participated in the 11th Turkish-German Gynecology Congress held in Belek-Antalya on 11-15.05.2016. The Congress secretariat was contacted on 08.05.2016. It was established that around 1300 Turkish obstetrician-gynecologists would attend the Congress. By taking the error rate as 5% and power as 95%, it was calculated that 297 contributors should be reached.

Survey content

The survey questions used in our study were taken from previous studies (46,48,49). The survey consisted of 26 single and multiple-choice questions. There were multiple-choice questions in which a single answer was correct or multiple answers were correct. The survey contained three parts. The first part included questions about the participants' personal and sociodemographic characteristics, such as gender, age, experience, type of practice, practice zone, last visit to the dentist and history of periodontal disease. The second part included questions about the etiology of periodontal disease, its systemic effect on pregnancy and their negative consequences, and questions about the attitude and behavior of the participants.

Study plan

The surveys were distributed to 435 Turkish obstetrician-gynecologists randomly selected from the first day of the Congress to its last day. Verbal information was given about the purpose of the study. It was stated that participating in the questionnaire was voluntary. After participants had given written informed consent form they subsequently filled out the questionnaire form.

Inclusion criteria

The inclusion criteria were: willingness to participate in the study; being a citizen of the Republic of Turkey; having a specialty degree in the related discipline; practicing his/her profession in Turkey; and answering all of the survey questions.

Statistical analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS for Windows), Release 25.0 (IBM Inc., Armonk, NY, USA). Univariate and multivariate analyzes were performed according to age, gender, professional experience, type of application, way of working, periodontal disease history to assess whether demographic characteristics of the participants affect their attitudes and behaviors in their knowledge and clinical practice. In the presentation of the data, chi-square or Fisher's exact tests were used in the analysis of categorical variables with frequency, percentage, arithmetic mean and standard deviation. A $p<0.05$ value was considered statistically significant.

Results

In the present study, 382 (87.8%) of the 435 questionnaires distributed to obstetrician-gynecologists were completed and the responses were included in the study.

Socio-demographic characteristics, level of knowledge about oral health and self-assessment of periodontal disease histories

Table 1 shows participant self-assessments and information, including gender, age, experience in their expertise, regional location and type of practice, dental examination history, whether they have been diagnosed with periodontal disease before, whether they have been treated for periodontal disease and their level of knowledge about oral health. Sex distribution was 43.5% male and 56.5% female. The average age of the participants was 39.9±7.9 years. When the participants were stratified by age, 58.6% were 40 years old and below, while 41.4% were over 40 years old. The average experience of the participants was 10.3±7.9 years. Therefore, the participants were grouped based on having 10 years of experience or not. While 60.7% of obstetrician-gynecologists were in the group with 10 years and less experience, 39.3% were in the group with more than 10 years. In terms of the type of practice, 92.1% stated that they worked in a hospital, 4.7% in private practice and 3.6% in both hospital and private practice. Regional distribution was: 7.9% Black Sea region; 11.5% Aegean region; 13.4% Mediterranean region; 37.4% Marmara region; and 29.8% in inner Anatolia or other regions. Most (81.9%) reported a personal dental visit at least every year. Only 35.1% of the participants were previously diagnosed with periodontal disease, of which only 82.1% were treated. Nearly two fifths (39.8%) stated that they found their own knowledge about oral health sufficient.

Knowledge levels of obstetrician-gynecologists about the relationship between periodontal disease and pregnancy

Data relating to the knowledge levels of participants on the relationship between periodontal disease and pregnancy are shown in Table 2. In the question "Definition of periodontal diseases", 92.7% of participants knew that it is a disease in which inflammation is seen and more than one microorganism is effective. However, over 30% thought that periodontal disease was always characterized by degenerative process and smaller proportions thought there was a relationship with osteoporosis (8.1%), that it is an infection caused by a single type of microorganism (1.8%) and one respondent (0.3%) believed that a tumoral process was at work. In the question "Clinical findings that can be seen in periodontal disease", the correct options from the multiple choice answers were selected by a proportion of respondents as follows: gingival bleeding (92.1%); tooth mobility (67.8%); alveolar bone destruction (43.2%); and tooth loss (66.5%). However, the wrong tooth decay option was marked by a large percentage (40.8%). Notably, 95.5% of participants considered periodontal disease an important disease that needed to be treated. The intraoral findings that pregnant women frequently complain

of were selected as: 78% gingival bleeding; 53.9% dental caries; 38.7% gingival enlargement; and 26.7% tooth loss. The majority of respondents (96.9%) thought that oral care is always important during pregnancy, whereas 3.1% of the participants stated that oral care is important in cases when any risks are present. Most (85.3%) believed that pregnancy influences periodontal disease. A larger proportion (97.4%) reported that tooth/gum treatment could be done during pregnancy, but only 79.3% felt that treatment should be done in the second trimester, while 4.6% and 16.1% of participants stated that treatment should be done in the first and third trimesters, respectively. Nearly all (96.1%) agreed that pregnant women should pay more attention to oral health in order to prevent possible pregnancy problems. The proportion of participants who knew the effect of periodontal disease on pregnancy was 77.5%. When asked about what these effects might be, 92.6% of participants believed preterm delivery, 45.2% low-weight delivery, 33.4% abortion, 10.1% lower genital area infection and 3.4% preeclampsia.

The behavior of the obstetrician-gynecologists on the relationship between periodontal disease and pregnancy

Data relating to participant's behavior towards the relationship between periodontal disease and pregnancy is shown in Table 3. The proportion of participants who clinically observed the effect of periodontal disease on pregnant women was 37.2%. The rate of those who asked questions about oral health to women who would become pregnant was 38.5% and the rate of those who visually examined the mouth was 12.3%. Only 36.6% of the participants stated that they referred their patients who considered becoming pregnant to the dentist. Worryingly, only 15.2% of participants informed their patients about oral health.

When participants' behavior regarding the relationship between periodontal disease and pregnancy were evaluated according to participant demographic characteristics, there was no difference between the groups, with the exception of age grouping and experience (Table 4). In answer to the question "Do you perform visual oral examination?", those in the age group >40 said "yes" significantly more often than those in the ≤40 group (p=0.017). Similarly, referral rate of the patients who considered becoming pregnant to the dentist was more reported often by older respondents (p=0.049). Furthermore, there was a difference detected between the age groups in the frequency of giving information about oral health to pregnant patients (p=0.037) with respondents aged >40 years significantly more likely to report always providing this information (p=0.042).

Comparative evaluation of participants' behavior towards the relationship between periodontal disease and pregnancy by respondent clinical experience is shown in Table 5. In the question "Do you perform visual oral examination", those who

Table 1. Socio-demographic characteristics, knowledge and self-assessment levels of obstetrician-gynecologists (n=382) regarding their periodontal disease histories

		n (%)
Sex	Males	166 (43.5)
	Females	216 (56.5)
Mean ± SD age (years)	39.9±7.9	-
Mean ± SD professional experience (years)	10.3±7.9	-
Type of practice	Hospital	352 (92.1)
	Private practice	16 (4.7)
	Hospital and private practice	14 (3.6)
Practice region	Mediterranean	51 (13.4)
	Black sea	30 (7.9)
	Aegean	44 (11.5)
	Marmara	143 (37.4)
	Central Anatolia and others	114 (29.8)
Last dental visit (years)	≤1	313 (81.9)
	>1	69 (18.1)
Diagnosed with periodontal disease		134 (35.1)*
Diagnosed with periodontal disease and treated (n=134)		110 (82.1)*
Evaluate your knowledge about oral health	Good	152 (39.8)
	Middle/poor	230 (60.2)

*M: Mean, SD: Standard deviation, p<0.001, *Yes responders

Table 2. Knowledge levels of obstetrician-gynecologists (n=382) regarding the relationship between periodontal disease and pregnancy

		n (%)
Definition of periodontal diseases	*The disease in which inflammation is seen and multiple microorganisms are effective*	354 (92.7)
	It is always characterized by a degenerative process	116 (30.4)
	It is an autoimmune disease	15 (3.9)
	It is a disease related to osteoporosis	31 (8.1)
	It is an infection caused by a single type of microorganism	7 (1.8)
	Tumoral process always accompanied	1 (0.3)
Clinical findings that can be seen in periodontal disease	*Gingival bleeding*	352 (92.1)
	Tooth mobility	259 (67.8)
	Alveolar bone destruction	165 (43.2)
	Tooth loss	254 (66.5)
	Dental caries	156 (40.8)
Are periodontal diseases important diseases to be treated?	*Yes*	365 (95.5)
	No/I don't know	17 (4.5)
Oral symptoms often described in pregnant women	*Gingival enlargement*	148 (38.7)
	Gingival bleeding	298 (78.0)
	Dental caries	206 (53.9)
	Tooth loss	102 (26.7)
How important is oral care during pregnancy?	*Always*	370 (96.9)
	At risk	12 (3.1)
	Never	0 (0)
Does pregnancy influence periodontal disease?	*Yes*	326 (85.3)
	No/I don't know	56 (14.7)
Can dental/ periodontal treatment be performed during pregnancy?	*Yes*	372 (97.4)
	No/I don't know	10 (2.6)
If yes, what is the safest trimester for tooth/periodontal treatment? (n=372)	First	17 (4.6)[a]
	Second	29 (79.3)[a]
	Third	60 (16.1)[a]
Is it necessary for pregnant women to pay more attention to oral health to prevent possible pregnancy problems?	*Yes*	367 (96.1)
	No/I don't know	15 (3.9)
Does periodontal disease influence pregnancy?	*Yes*	296 (77.5)
	No	86 (22.5)
If yes, what situation/ situations affected? (n=296)	*Preterm birth*	274 (92.6)[b]
	Low-weight newborn	134 (45.2)[b]
	Abortion	99 (33.4)[b]
	Low genital-tract infection	30 (10.1)[b]
	Pre-eclampsia	10 (3.4)[b]

[a]n=372, [b]n=296, Correct answers are shown in italics

Table 3. The behavior of obstetrician-gynecologists (n=382) on the relationship between periodontal disease and pregnancy

		n (%)
Have you clinically observed the effect of periodontal disease on pregnant women?	Yes	142 (37.2)
	No	240 (62.8)
During the examination, do you ask questions about oral health to pregnant women or women who will become pregnant?	Yes	147 (38.5)
	No	235 (61.5)
Do you perform visual oral examination?	Yes	47 (12.3)
	No	355 (87.7)
Do you refer your patients who want to get pregnant to the dentist?	Yes	140 (36.6)
	No	242 (63.4)
How often do you inform your pregnant patients about oral health?	Always	58 (15.2)
	At risk	256 (67.0)
	Never	68 (17.8)

had >10 years experience were significantly more likely to than those in the ≤10 group (p=0.006). Participants in the >10 year experience group also referred their patients who decided for pregnancy to the dentist significantly more often (p=0.017). Moreover, there was a significant difference between the experience groups in the frequency of giving information about oral health to pregnant patients (p=0.003), with those who never provided information about oral health to pregnant patients significantly more likely to be less experienced (p=0.01).

Referral frequency of pregnant individuals to the different health specialities by obstetrician-gynecologists

Data including the referral frequency of pregnant individuals by participants to different health specialities is shown in Table 6. The frequency participants recommended birth courses to pregnant patients was: 0.2% always; 30.1% usually; 22% occasionally; 16.2% rarely; and 11.5% never. The frequency participants provided nutritional counseling advice to pregnant

patients was 39% always, 38.2% generally, 16% occasionally, 4.5% rarely and 2.4% never. However, the frequency participants recommended that pregnant patients seek a dental examination was 14.4% always, 22.5% generally, 31.4% occasionally, 20.9% rarely and 10.7% never. Conversely, the frequency participants provided genetic screening advice to pregnant patients was 36.6% always, 23% generally, 18.3% occasionally, 19.1% rarely and 3.9% never time responses.

Discussion

Studies conducted around the world suggest that pregnant women have inadequate oral care and mostly do not apply for dental examination (53). Pregnant women have been shown to have a higher incidence of periodontal disease compared to those are non-pregnant (42). The negative relationship between periodontal disease and pregnancy have been investigated and demonstrated in various studies (20,23-25,28,38,54). Moreover, the high rate of periodontitis (20%) seen in pregnant women suggests the importance of identification and treatment of the population in this risk group (55). Obstetrician-gynecologists are in an ideal position to improve the oral health of mothers and to avoid any problems during pregnancy, as they often see pregnant women or women who are about to become pregnant. Various studies have been conducted to measure the knowledge and attitudes of obstetrician-gynecologists regarding the relationship between periodontal disease and pregnancy in different countries, including the USA, Brazil, France, India, Iran, the United Arab Emirates and Saudi Arabia (46-50,52,56-59). The aim of this study was to investigate the level of this knowledge and attitudes towards this relationship among Turkish experts.

Since we wished to make comparisons with existing studies, a questionnaire was prepared which included questions from previously published studies (46,48,49). In previous studies, the questionnaires were either e-mailed (45,47,48,60,61), mailed (50) or forms distributed by hand (46). We decided to apply the method of distributing questionnaires by hand, with the aim of increasing the return rate, despite the higher cost. The questionnaires were distributed to 435 obstetrician-gynecologists at Turkish-German Gynecology Congress, which had a high number of contributors and 398 questionnaires were collected at the end of the Congress, with a 91% return rate. Researchers in existing studies achieved a return

Table 4. Comparative evaluation of the behaviors of the obstetrician-gynecologists (n=382) regarding the relationship between periodontal disease and pregnancy in different age groups

		Age	n (%)	P[a]	P[b]
Have you clinically observed the effect of periodontal disease on pregnant women?	Yes	≤40	79 (35.3)	0.359	-
		>40	63 (39.9)		
	No	≤40	145 (64.7)		
		>40	95 (60.1)		
During the examination, do you ask questions about oral health to pregnant women or women who will become pregnant?	Yes	≤40	78 (34.8)	0.080	-
		>40	69 (43.7)		
	No	≤40	146 (65.2)		
		>40	89 (56.3)		
Do you perform visual oral examination?	Yes	≤40	20 (8.9)	**0.017**	-
		>40	27 (17.1)		
	No	≤40	204 (91.1)		
		>40	131 (82.9)		
Do you refer your patients who want to get pregnant to the dentist?	Yes	≤40	73 (32.6)	**0.049**	-
		>40	67 (42.4)		
	No	≤40	151 (67.4)		
		>40	91 (57.6)		
How often do you inform your pregnant patients about oral health?	Always	≤40	27 (12.1)	**0.037**	**0.042**
		>40	31 (19.6)		
	At risk	≤40	150 (67)		0.980
		>40	106 (67.1)		
	Never	≤40	47 (21)		0.053
		>40	21 (13.3)		

[a]Chi-square test, $p<0.05$. [b]Fisher's exact test $p<0.05$.

rate between 25% and 88% (45-47,49,50,61). Of them, 382 questionnaires (88%) that met the inclusion criteria were evaluated. Notably, the existing studies, which come from a range of countries, have differing numbers of participants. In the study conducted in Brazil, 875 participants were included (48). Since the number of participants in other existing studies varies between 55 and 349 (45-47,49,50,60,61) the present study has a relatively high rate of participants. Women constituted 56.5% of participants of our study. In a study conducted in India, all participants were women (60). This was unusual, as in other studies the rate of female participants was between 40% and 60% (45-48,50). In the present study 58.6% of participants were 40 years old or younger. Similar to our study, it was shown in studies conducted in India (49) and the United States of America (45,50) that the mean age was between 40 and 50 years. In other studies conducted in India (60) and France (46), 51% to 74% of the participants were ≤45 years old.

In the present study, participants' average years of experience was 10.3±7.9. Moreover, 60.7% of participants had 10 years or less experience. Similarly, 67.8% of participants in the Indian study had 10 years or less experience (60). In another study conducted in France, 39.5% of the participants had 10 years or less experience (46).

When the type of practice was evaluated in the present study, 92.1% of participants worked only in hospital. In contrast, in studies conducted in India (60) and France (46), between 35% and 49% of the experts worked only in hospital.

In the present study, it was observed that 81.9% of participants applied to a dentist and had an examination in the preceding year. Similarly, in studies conducted in France (46) and Brazil (48), 71.6% and 83.9% of the participants, respectively, stated that they were examined by a dentist in the previous year. In the study conducted in India, 42% of the participants stated that they had not been examined by a dentist in the last year (60). This suggests that Turkish obstetrician-gynecologists who responded to this questionnaire were at least as concerned about their own dental health as French and Brazilian peers.

More than a third of respondents had been formerly diagnosed with periodontal disease. Studies conducted in India (60) and France (46) showed that, respectively, only 62% to 75.4% of the participants with a history of periodontal disease received treatment, respectively. This suggests that obstetrician-gynecologists pay attention to their own oral hygiene, but they

Table 5. Comparative evaluation of the behaviors of the obstetrician-gynecologists (n=382) regarding the relationship between periodontal disease and pregnancy by experience

		Experience	n (%)	P[a]	P[b]
Have you clinically observed the effect of periodontal disease on pregnant women?	Yes	≤10	78 (33.6)	0.074	-
		>10	64 (42.7)		
	No	≤10	154 (66.4)		
		>10	86 (57.3)		
During the examination, do you ask questions about oral health to pregnant women or women who will become pregnant?	Yes	≤10	83 (35.8)	0.176	-
		>10	64 (42.7)		
	No	≤10	149 (64.2)		
		>10	86 (57.3)		
Do you perform visual oral examination?	Yes	≤10	20 (8.6)	**0.006**	-
		>10	27 (18)		
	No	≤10	212 (91.4)		
		>10	123 (82)		
Do you refer your patients who want to get pregnant to the dentist?	Yes	≤10	74 (31.9)	**0.017**	-
		>10	66 (44)		
	No	≤10	158 (68.1)		
		>10	84 (56)		
How often do you inform your pregnant patients about oral health?	Always	≤10	29 (12.5)		0.069
		>10	29 (19.3)		
	At risk	≤10	150 (64.7)	**0.003**	0.222
		>10	106 (70.7)		
	Never	≤10	53 (22.8)		**0.001**
		>10	15 (10)		

[a]Chi square test, p<0.05. [b]Fisher's exact test p<0.05.

cannot be protected from periodontal diseases and they care about the treatment.

Only 39.8% of participants in the present study found themselves capable of assessing the oral health of their patients. This rate was approximately 85% in studies from India (60) and France (46). This suggests that Turkish obstetrician-gynecologists find themselves inadequate in this regard. In the present study, 92.7% of participants were aware that periodontal disease is a disease in which inflammation is present and more than one microorganism may be effective. Similarly, in France (46), Brazil (48) and the United States (50) the rate of awareness of a relationship between periodontal disease and pregnancy was between 85% and 94%. On the other hand, in India, around 48% of obstetrician-gynecologists were unaware of this relationship (60).

The majority of participants accurately marked gingival bleeding as an earliest clinical finding of periodontal diseases. Similarly, in a study conducted in France, 87.4% of the participants correctly identified gingival bleeding (46). In a study conducted in India, gingival bleeding was identified by only 45.5% (60). Regarding the question 'Clinical findings that can be seen in periodontal disease', 67.8% of participants accurately marked tooth mobility, which gives an idea about the existence or loss of the tooth supporting structures. Likewise, tooth mobility was similarly identified by 59.4% in France (46). Again, the proportion with this knowledge was lower in India (30.3%) (60). Regarding the question "Clinical findings that can be seen in periodontal disease", alveolar bone destruction was identified by around 43% in the present study and 46.8% in France (46). In the study conducted in India, only 4.4% of participants identified this sign as being of importance (60). Regarding the question "Clinical findings that can be seen in periodontal disease", 66.5% of participants accurately identified tooth loss while this was less in the Indian (60) and French (46) studies, at 5.3% and 21.1%, respectively. In an American study only 5% and 32% identified gingivitis and periodontitis as causes of tooth loss (50). These findings suggest that obstetrician-gynecologists' knowledge about late signs of periodontal disease is lower than that of early signs. Regarding the question "Clinical findings that can be seen in periodontal disease", dental caries was incorrectly identified by 40.8%. This incorrect option was selected by only 9.5% in India (60) and 14.2% in France (46). Reassuringly, 95.5% of participants thought that periodontal diseases are important diseases that should be treated which compares favorably with rates reported of 42.8% in India (60) and 53.5% in France (46).

Table 6. The referral frequencies of the pregnant individuals to different specialities by obstetrician-gynecologists (n=382)

		n (%)
How often would you recommend childbirth classes to your pregnant patient?	Always	77 (20.2)
	Occasionally	115 (30.1)
	Usually	84 (22.0)
	Rarely	62 (16.2)
	Never	44 (11.5)
How often would you recommend nutrition consultation to your pregnant patient?	Always	149 (39.0)
	Occasionally	146 (38.2)
	Usually	61 (16.0)
	Rarely	17 (4.5)
	Never	9 (2.4)
How often would you recommend dental examination to your pregnant patient?	Always	55 (14.4)
	Occasionally	86 (22.5)
	Usually	120 (31.4)
	Rarely	80 (20.9)
	Never	41 (10.7)
How often would you recommend genetic screening to your pregnant patient?	Always	136 (35.6)
	Occasionally	88 (23.0)
	Usually	70 (18.3)
	Rarely	73 (19.1)
	Never	15 (3.9)

This study also investigated obstetrician-gynecologists' knowledge of oral symptoms often described by pregnant women. Participants selected gingival bleeding (78%) most often from intraoral signs. Gingival bleeding was similarly identified by 65% in France (46), 68% in Brazil (48) and 81% in India. In the United States, gingival bleeding was selected by 52% (50). Gingival enlargement, one of the intraoral findings that pregnant women often complain about, was selected by 38.7% of the participants in the present study. Response rates to the same finding were 81% in India (49), 80.4% in France (46), 68.5% in Brazil (48) and 52% in the United States (50). Tooth loss was identified by 26.7% of participants in the present study. These rates were 42.4% in Brazil (48) and 25% in the United States (50). In France (46), tooth loss was identified by only 4.2%. Dental caries was marked by 53.9% of participants in the present study. Tooth decay was similarly incorrectly selected by 42% and 58% in studies conducted in Brazil (48) and the United States (50).

Regarding the importance of oral care during pregnancy, 96.9% of participants in the present study stated that it is always important, and 3.1% stated that it is important in the presence of any risk. Studies conducted in the United States (47) and France (46) similarly indicated that oral care is always important during pregnancy, 71.5% and 85%, respectively. In the study conducted in India (60), this rate was 39.2%. Only 13.1% of the obstetrician-gynecologists in France (46) and 33%

in India stated that oral care is important in the presence of any risk (60).

In the present study 85.3% of participants stated that pregnancy has impacts on periodontal disease. Studies have shown that the rate of those who think that pregnancy influences periodontal disease is between 64% and 81% (46,47,50,60). The slightly higher rate detected in our study suggests that gynecologists in Turkey can make evaluations by giving more importance to the relationship between periodontal disease and pregnancy.

In the present study, 97.4% of participants stated that dental/periodontal treatment can safely be performed during pregnancy. Obstetrician-gynecologists stated the same in the studies from France (46) and India (49,60), with rates between 84.8% and 97.4% respectively. However, only 79.3% of participants in the present study stated that the second trimester would be the most appropriate period for proper dental/periodontal treatment. Higher rates of this recognition were reported from Brazil at 94% (61) and between 84% and 92% in two studies (49,60) conducted in India. This data reveals that a substantial percentage of obstetrician-gynecologists in Turkey do not know that the second trimester is the most appropriate period for dental treatment of periodontal disease. This knowledge should be reinforced amongst Turkish obstetrician-gynecologists.

In this study, the rate of participants who knew that periodontal disease effected pregnancy was 77.5%. This was similar to results from the USA and France, at 84% and 74.7%, respectively (46,47). In a study conducted in India, this rate was only 47.3% (60).

In terms of the effect of a preterm birth, 92.6% in the present study selected this. Similarly, preterm birth was marked by between 80% and 85% in studies conducted in the United States and France (45-47). However, in studies from Brazil and India, lower rates were reported, with rates between 57% and 65% (49,60,61). In the present study, 45.2% of participants identified low birth weight as one of the possible effects of periodontal disease in pregnancy, which falls in the middle of the range reported from elsewhere of between 32.1% and 66.9% (45-47,60,61). In the present study, only 10.1% of participants marked lower genital tract infection as one of the effects of periodontal disease on pregnancy. Even fewer respondents identified this in studies conducted in France and India (46,60). In the present study, only 3.4% selected preeclampsia as one of the effects of periodontal disease in pregnancy. In contrast, preeclampsia was identified by 33% of respondents in a study from India (49), but this response rate was, at most, 11% in other similar studies conducted in France and the United States (45-47). In the present study, only 37.2% of participants had personal clinical experience of the effect of periodontal disease on pregnant women. Similarly, this rate was 23% in a French study (46). However, in India, 62.5% of gynecologists reported that they observed this effect (60). Given that experts' knowledge about the effects of periodontal disease has yielded such different results in terms of observed symptoms, this may be due to behavioral and cognitive differences specific to different regions and cultures of both physicians and patients.

In the present study, only 38.5% of the participants asked questions about oral health of women who would become pregnant. This rate was 26.3% in France (46) and 49% in the United States (47). However, in India, the majority of the participants stated that they asked questions about oral health to their patients who were about to become pregnant (60).

The proportion who actually examined the mouth of the women planning a pregnancy was only 12.3% in the present study. This rate is much lower than in other reports where the proportion varied from 25% to 80% (46,47,60). The majority of those who visually performed oral examinations were in the >40 age group ($p=0.017$). Moreover, the majority of respondents who would perform an oral exam were also in the more experienced group ($p=0.006$). The cause of these discrepancies may be due to poorer emphasis on the importance of this aspect of health care during more recent medical training as, with increasing age and experience, obstetrician-gynecologists were more likely to perform oral examinations.

In the present study, the proportion of participants who referred their patients who were considering pregnancy to a dentist was just over a third. Similarly, the referral rates were 33.2% in France (46) and 36.7% in Brazil (61). We suggest that the reasons behind these low referral rates should be investigated globally. In the present study, increasing age and experience of the respondent was positively correlated with referral to a dentist.

In the present study, only 15.2% of participants always informed their patients about oral health regardless of risk factors, whereas 67% informed their patients only in case of risk. Similarly, the proportion who always gave information was 10.5% in France and 33.9% in India (46,60). The rate of obstetrician-gynecologists who provided information in the presence of any risk was 55.8% in France and 38.3% in India, but in India a higher proportion always informed their patients regardless of risk (46,60). Again in the present study, most of the respondents who always informed their patients were in the older age group ($p=0.042$). Furthermore, most of the participants who never gave information about oral health were less experienced ($p=0.042$). Once again, older, more experienced respondents were more likely inform patients about the importance of oral health in pregnancy.

Finally, the reported intention of advising patients about consulting with other specialists was investigated. Recommendation to

attend childbirth courses was at the forefront with just over half reporting that they would recommend this to their patients. In a study conducted in Brazil, this rate was 87.3% for obstetricians to "always or generally" refer to childbirth courses (48). In the present study, 77.2% of the participants always or generally referred pregnant patients for nutritional counseling, while in a study from Brazil, this rate was 88.9% (48). However, in the present study, 36.9% of participants always or usually referred for dental examination which is less than in a study conducted in Brazil (48). Conversely, in this study, 58.6% of the participants always or usually referred for genetic screening. Fewer participants (28.6%) always or generally refer pregnant individuals for genetic screening in Brazil (48), possibly due to the lower consanguinity rates in Brazil. These results suggest that Turkish obstetrician-gynecologists give the greatest importance to nutritional counseling but least to dentist referral.

Conclusion

Given the limited nature of the study, we conclude that Turkish obstetrician-gynecologists have enough knowledge about periodontal diseases and their effects. However, the clinical practice and advice given by Turkish obstetrician-gynecologists in this field of pregnancy health care are inadequate. Older and more experienced Turkish obstetrician-gynecologists tend to be better at dealing with this aspect of health care and also more frequently refer pregnant patients to a dentist. Considering the frequency with which Turkish obstetrician-gynecologists refer pregnant patients to different health branches, it is striking that referrals to a dentist is in the last place. It would be beneficial to create common clinical and educational environments where dentists/periodontologists and obstetrician-gynecologists can share their knowledge about the relationship between periodontal disease and pregnancy. We believe that it may be useful to make presentations on this subject in joint workshops and gynecology congresses.

Acknowledgements: *We would like to thank the organizing committee of 11th Turkish-German Gynecological Association Congress for the opportunities they provided us to carry out this study. We would like to express our sincere thanks to Jessica Helen Martin for her valuable contribution on English-language editing.*

Ethics Committee Approval: *The study protocol was approved by the Marmara University Faculty of Medicine Local Ethics Committee (approval number: 09.2016.264, date: 03.2016).*

Informed Consent: *After participants had given written informed consent form they subsequently filled out the questionnaire form.*

Peer-review: *Externally peer-reviewed.*

Author Contributions: *Concept: Ö.B.A., B.D.; Design: Ö.B.A., B.D.; Data Collection or Processing R.T., B.D.; Analysis or Interpretation: R.T., B.D.; Literature Search: R.T., Ö.B.A., B.D.; Writing: R.T., Ö.B.A., B.D.*

Conflict of Interest: *No conflict of interest is declared by the authors.*

Financial Disclosure: *The authors declared that this study received no financial support.*

References

1. McFall J, Walter T. Tooth loss in 100 treated patients with periodontal disease. A long-term study. J Periodontol 1982; 53: 539-49.
2. Kinane DF, Peterson M, Stathopoulou PG. Environmental and other modifying factors of the periodontal diseases. Periodontology 2000 2006; 40: 107-19.
3. Highfield J. Diagnosis and classification of periodontal disease. Aust Dent J 2009; 54 (Suppl1): S11-26.
4. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. Lancet 2005; 366: 1809-20.
5. Offenbacher S, Barros SP, Beck JD. Rethinking periodontal inflammation. J Periodontol 2008; 79: 1577-84.
6. Gulati M, Anand V, Govila V, Jain N. Host modulation therapy: An indispensable part of perioceutics. J Indian Soc Periodontol 2014; 18: 282-8.
7. Salvi GE, Lang NP. Host response modulation in the management of periodontal diseases. J Clin Periodontol 2005; 32(Suppl6): 108-29.
8. Bouchard P, Malet J, Borghetti A. Decision-making in aesthetics: root coverage revisited. Periodontology 2000 2001; 27: 97-120.
9. Cohen DW, Shapiro J, Friedman L, Kyle GC, Franklin S. A longitudinal investigation of the periodontal changes during pregnancy and fifteen months post-partum. II. J Periodontol 1971; 42: 653-7.
10. Mealey BL, Moritz AJ. Hormonal influences: effects of diabetes mellitus and endogenous female sex steroid hormones on the periodontium. Periodontology 2000 2003; 32: 59-81.
11. Beck JD, Eke P, Heiss G, Madianos P, Couper D, Lin D, et al. Periodontal disease and coronary heart disease: a reappraisal of the exposure. Circulation 2005; 112: 19-24.
12. Cullinan MP, Seymour GJ. Periodontal disease and systemic illness: will the evidence ever be enough? Periodontology 2000 2013; 62: 271-86.
13. Lin D, Moss K, Beck JD, Hefti A, Offenbacher S. Persistently high levels of periodontal pathogens associated with preterm pregnancy outcome. J Periodontol 2007; 78: 833-41.
14. Madianos PN, Lieff S, Murtha AP, Boggess KA, Auten RL Jr, Beck JD, et al. Maternal periodontitis and prematurity. Part II: Maternal infection and fetal exposure. Ann Periodontol 2001; 6: 175-82.
15. Taylor GW, Borgnakke WS. Periodontal disease: associations with diabetes, glycemic control and complications. Oral Dis 2008; 14: 191-203.
16. Agueda A, Echeverria A, Manau C. Association between periodontitis in pregnancy and preterm or low birth weight: Review of the literature. Med Oral Patol Oral Cir Bucal 2008; 13: E609-15.
17. Agueda A, Ramón JM, Manau C, Guerrero A, Echeverría JJ. Periodontal disease as a risk factor for adverse pregnancy

outcomes: a prospective cohort study. J Clin Periodontol 2008; 35: 16-22.
18. Bosnjak A, Relja T, Vucićević-Boras V, Plasaj H, Plancak D. Pre-term delivery and periodontal disease: a case-control study from Croatia. J Clin Periodontol 2006; 33: 710-6.
19. Canakci V, Canakci CF, Yildirim A, Ingec M, Eltas A, Erturk A. Periodontal disease increases the risk of severe pre-eclampsia among pregnant women. J Clin Periodontol 2007; 34: 639-45.
20. Dörtbudak O, Eberhardt R, Ulm M, Persson GR. Periodontitis, a marker of risk in pregnancy for preterm birth. J Clin Periodontol 2005; 32: 45-52.
21. Goepfert AR, Jeffcoat MK, Andrews WW, Faye-Petersen O, Cliver SP, Goldenberg RL, et al. Periodontal disease and upper genital tract inflammation in early spontaneous preterm birth. Obstet Gynecol 2004; 104: 777-83.
22. Han YW, Ikegami A, Bissada NF, Herbst M, Redline RW, Ashmead GG. Transmission of an uncultivated Bergeyella strain from the oral cavity to amniotic fluid in a case of preterm birth. J Clin Microbiol 2006; 44: 1475-83.
23. Jarjoura K, Devine PC, Perez-Delboy A, Herrera-Abreu M, D'Alton M, Papapanou PN. Markers of periodontal infection and preterm birth. Am J Obstet Gynecol 2005; 192: 513-9.
24. Jeffcoat MK, Geurs NC, Reddy MS, Cliver SP, Goldenberg RL, Hauth JC. Periodontal infection and preterm birth: results of a prospective study. J Am Dent Assoc 2001; 132: 875-80.
25. López NJ, Da Silva I, Ipinza J, Gutiérrez J. Periodontal therapy reduces the rate of preterm low birth weight in women with pregnancy-associated gingivitis. J Periodontol 2005; 76: 2144-53.
26. López NJ, Smith PC, Gutierrez J. Higher risk of preterm birth and low birth weight in women with periodontal disease. J Dent Res 2002; 81: 58-63.
27. López NJ, Smith PC, Gutierrez J. Periodontal therapy may reduce the risk of preterm low birth weight in women with periodontal disease: a randomized controlled trial. J Periodontol 2002; 73: 911-24.
28. Louro PM, Fiori HH, Filho PL, Steibel J, Fiori RM. Periodontal disease in pregnancy and low birth weight. J Pediatr (Rio J) 2001; 77: 23-8.
29. Toygar HU, Seydaoglu G, Kurklu S, Guzeldemir E, Arpak N. Periodontal health and adverse pregnancy outcome in 3,576 Turkish women. J Periodontol 2007; 78: 2081-94.
30. Zadeh-Modarres S, Amooian B, Bayat-Movahed S, Mohamadi M. Periodontal health in mothers of preterm and term infants. Taiwan J Obstet Gynecol 2007; 46: 157-61.
31. Albandar JM. Aggressive periodontitis: case definition and diagnostic criteria. Periodontology 2000 2014; 65: 13-26.
32. Gazolla CM, Ribeiro A, Moysés MR, Oliveira LA, Pereira LJ, Sallum AW. Evaluation of the incidence of preterm low birth weight in patients undergoing periodontal therapy. J Periodontol 2007; 78: 842-8.
33. Offenbacher S, Boggess KA, Murtha AP, Jared HL, Lieff S, McKaig RG, et al. Progressive periodontal disease and risk of very preterm delivery. Obstet Gynecol 2006; 107: 29-36.
34. Sadatmansouri S, Sedighpoor N, Aghaloo M. Effects of periodontal treatment phase I on birth term and birth weight. J Indian Soc Pedod Prev Dent 2006; 24: 23-6.
35. Tarannum F, Faizuddin M. Effect of periodontal therapy on pregnancy outcome in women affected by periodontitis. J Periodontol 2007; 78: 2095-103.
36. Armitage GC. Bi-directional relationship between pregnancy and periodontal disease. Periodontology 2000 2013; 61: 160-76.
37. Figuero E, Carrillo-de-Albornoz A, Martin C, Tobias A, Herrera D. Effect of pregnancy on gingival inflammation in systemically healthy women: a systematic review. J Clin Periodontol 2013; 40: 457-73.
38. Jafarzadeh H, Sanatkhani M, Mohtasham N. Oral pyogenic granuloma: a review. J Oral Sci 2006; 48: 167-75.
39. Gürsoy M, Pajukanta R, Sorsa T, Könönen E. Clinical changes in periodontium during pregnancy and post-partum. J Clin Periodontol 2008; 35: 576-83.
40. Laine MA. Effect of pregnancy on periodontal and dental health. Acta Odontol Scand 2002; 60: 257-64.
41. Lieff S, Boggess KA, Murtha AP, Jared H, Madianos PN, Moss K, et al. The oral conditions and pregnancy study: periodontal status of a cohort of pregnant women. J Periodontol 2004; 75: 116-26.
42. Loe H, Silness J. Periodontal Disease in Pregnancy. I. Prevalence and Severity. Acta Odontol Scand 1963; 21: 533-51.
43. Moss KL, Beck JD, Offenbacher S. Clinical risk factors associated with incidence and progression of periodontal conditions in pregnant women. J Clin Periodontol 2005; 32: 492-8.
44. Güncü GN, Tözüm TF, Cağlayan F. Effects of endogenous sex hormones on the periodontium--review of literature. Aust Dent J 2005; 50: 138-45.
45. Strafford KE, Shellhaas C, Hade EM. Provider and patient perceptions about dental care during pregnancy. J Matern Fetal Neonatal Med 2008; 21: 63-71.
46. Cohen L, Schaeffer M, Davideau JL, Tenenbaum H, Huck O. Obstetric knowledge, attitude, and behavior concerning periodontal diseases and treatment needs in pregnancy: influencing factors in France. J Periodontol 2015; 86: 398-405.
47. Morgan MA, Crall J, Goldenberg RL, Schulkin J. Oral health during pregnancy. J Matern Fetal Neonatal Med 2009; 22: 733-9.
48. Rocha JM, Chaves VR, Urbanetz AA, Baldissera Rdos S, Rösing CK. Obstetricians' knowledge of periodontal disease as a potential risk factor for preterm delivery and low birth weight. Braz Oral Res 2011; 25: 248-54.
49. Tarannum F, Prasad S, Muzammil, Vivekananda L, Jayanthi D, Faizuddin M. Awareness of the association between periodontal disease and pre-term births among general dentists, general medical practitioners and gynecologists. Indian J Public Health 2013; 57: 92-5.
50. Wilder R, Robinson C, Jared HL, Lieff S, Boggess K. Obstetricians' knowledge and practice behaviors concerning periodontal health and preterm delivery and low birth weight. J Dent Hyg 2007; 81: 81.
51. Egea L, Le Borgne H, Samson M, Boutigny H, Philippe HJ, Soueidan A. Oral infections and pregnancy: knowledge of health professionals. Gynecol Obstet Fertil 2013; 41: 635-40.
52. George A, Shamim S, Johnson M, Dahlen H, Ajwani S, Bhole S, et al. How do dental and prenatal care practitioners perceive dental care during pregnancy? Current evidence and implications. Birth 2012; 39: 238-47.
53. Vergnes JN, Pastor-Harper D, Constantin D, Bedos C, Kaminski M, Nabet C, et al. Perceived oral health and use of dental services during pregnancy: the MaterniDent study. Sante Publique 2013; 25: 281-92.
54. Armitage GC. Development of a classification system for periodontal diseases and conditions. Northwest Dent 1999; 79: 31-5.
55. Kim AJ, Lo AJ, Pullin DA, Thornton-Johnson DS, Karimbux NY. Scaling and root planing treatment for periodontitis to reduce preterm birth and low birth weight: a systematic review and meta-analysis of randomized controlled trials. J Periodontol 2012; 83: 1508-19.
56. Golkari A, Khosropanah H, Saadati F. Evaluation of knowledge and practice behaviours of a group of Iranian obstetricians, general practitioners, and midwives, regarding periodontal disease and its effect on the pregnancy outcome. J Public Health Res 2013; 2: e15.
57. Hashim R, Akbar M. Gynecologists' knowledge and attitudes regarding oral health and periodontal disease leading to adverse

pregnancy outcomes. J Int Soc Prev Community Dent 2014; 4(Suppl 3): S166-72.

58. Rahman G, Asa'ad F, Baseer MA. Periodontal health awareness among gynecologists in Riyadh, Saudi Arabia. J Int Soc Prev Community Dent 2015; 5: 211-7.
59. Shah HG, Ajithkrishnan C, Sodani V, Chaudhary NJ. Knowledge, attitude and practices among Gynecologists regarding Oral Health of expectant mothers of Vadodara City, Gujarat. Int J Health Sci 2013; 7: 136-40.
60. Satyanarayana K, Durga Bai Y, Aruna P, Sindhura N, Monisha G, Sreenivasulu G. Awareness on the Association between Periodontal Diseases and Pregnancy Outcomesm Among Gynecologists: a cross-sectional study. J Int Oral Health 2016; 8: 579-84.
61. Zanata RL, Fernandes KB, Navarro PS. Prenatal dental care: evaluation of professional knowledge of obstetricians and dentists in the cities of Londrina/PR and Bauru/SP, Brazil, 2004. J Appl Oral Sci 2008; 16: 194-200.