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Dental Anxiety Amongst Pregnant Women: Relationship With Dental Attendance and Sociodemographic Factors

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ABSTRACT

Introduction: : Access to oral care during pregnancy is important for the maintenance of optimal oral health.

Objective: : The aim of this study was to estimate dental anxiety (DA) and its association with previous dental visits and sociodemographic factors amongst pregnant women.

Methods: : A cross-sectional study was conducted (June through August 2019) amongst pregnant women ($N = 825$) attending hospitals and health centres in Dhahran, Khobar, and Dammam cities in the Eastern province of Saudi Arabia. The Modified Dental Anxiety Scale (MDAS) was used to assess DA and the World Health Organization Oral Health Survey for Adults was administered to evaluate patterns of dental attendance.

Results: : DA was found in 90.9% of the pregnant women. The mean DA score of the sample was 12.53 ± 5.33 (range, 5 to 25) and it was significantly higher amongst non-Saudi (13.21 ± 5.24) vs Saudi women (12.15 ± 5.34) ($P = .006$), those who had negative dental experience (13.99 ± 5.62) vs those without such experience (12.2 ± 5.21) ($P < .001$), and those with dental pain or discomfort (13.18 ± 5.46) vs without pain or discomfort (11.94 ± 5.14) ($P = .001$). The study found a significant relationship between DA and reasons for dental attendance before pregnancy ($P = .002$) and time since the last dental visit ($P = .009$). Multiple logistic regression analysis showed significantly increased odds (OR, 1.69; 95% CI, 1.25 to 2.27) of experiencing moderate to extreme DA amongst pregnant women who visited the dentist after a year/never visited compared to those who visited in less than a year. Similarly, participants with negative dental experience were significantly more likely to have moderate to extreme DA (OR, 1.49; 95% CI, 1.02 to 2.20) than those without negative experience after adjusting for sociodemographic factors.

Conclusions: : DA was highly prevalent amongst pregnant women, which was significantly associated with negative dental experience, dental pain or discomfort, and reasons for and time since the last dental visit.

Introduction

Pregnant women experience increased risk of developing periodontal disease, dental caries, tooth erosion, tooth mobility, pyogenic granuloma, and salivary changes.[1] Despite the high prevalence of oral diseases, only 23% to 42% of women visit the dentist during pregnancy.[2] Access to care during pregnancy is important for the avoidance of possible adverse oral effects, in addition to complications associated with periodontal disease, such as premature birth, low birth weight, and preeclampsia.[3] Seeking dental treatment is not only for the maintenance of the mother's oral health but also for the infant's, because if a pregnant woman has dental

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caries, then the cariogenic bacteria can be transmitted to her infant.[4]

Many factors have been associated with the neglect of oral health amongst pregnant women, including patient's low oral health knowledge, negative dental experience, or the dentist's misconception of not providing dental treatment during pregnancy.[1,5] Poor access to oral care amongst pregnant women is also related to low socioeconomic status and distant geographic locations.[3]

"Anxiety is irrational, and the perceived feeling is an inability to predict or control future events."[6] If the feeling is induced by dental situations, the anxiety is considered as dental anxiety (DA), which can stimulate muscle tension and increase the heart rate.[7] Literature indicates that negative oral health outcomes are associated with anxiety and depression.[3] Similarly, the vicious cycle of DA can also lead to the avoidance of dental care, which can deteriorate oral health and compromise the self-esteem of the patients.[8]

There is a lack of evidence on DA and its influence on the patterns of dental visits amongst pregnant women despite the high prevalence of dental and periodontal problems amongst this cohort. In addition, the level of DA in each trimester of pregnancy is still not fully understood. Therefore, this study aimed to assess DA during pregnancy and evaluate its association with previous dental attendance amongst pregnant women in the Eastern province of Saudi Arabia.

Material and methods

This cross-sectional study included pregnant women visiting prenatal clinics in major hospitals and primary health care centres in Dhahran, Khobar, and Dammam cities in the Eastern Province of Saudi Arabia. Data collection was conducted during June through August 2019. The study included both Saudi and non-Saudi pregnant women of all ages. The study participants were recruited as a convenient sample. The pregnant women willing to participate in the study were provided with a hard copy of the self-administered questionnaire. A sample of 1,014 participants was calculated assuming a 3% margin of error, 95% confidence level, population size of 20,000, and 50% response distribution.

The variables related to DA and dental visits were measured using a questionnaire that contained items related to dental visits from the World Health Organization Oral Health Survey for Adults.[9] The items of the Modified Dental Anxiety Scale (MDAS) were included in the questionnaire to evaluate DA. The MDAS is a brief questionnaire with 5 items, and each item uses a 5-point Likert scale that ranges from *not anxious* (1) to *extremely anxious* (5). The minimum score of the MDAS is 5, whilst the maximum score is 25. Higher scores of the scale indicate higher DA. The cutoff score of the MDAS for no dental anxiety is 5; low anxiety, 6 to 10; moderate anxiety, 11 to 14; high anxiety, 15 to 18; and extreme anxiety ≥19.[10] The reliability and validity of the MDAS have been confirmed in adult populations.[11] It was also found that the use of the MDAS questionnaire did not increase anxiety amongst study participants.[12]

Meetings with researchers were held to evaluate the items of the questionnaire from the cultural and religious points of view in the country. The questionnaire presents 3 sections. The first included sociodemographic information such as age, monthly income, education level, number of previous pregnancies, trimesters, dental pain or problem, negative dental experience, and medical conditions. The participants responded to questions about DA in the second section of the questionnaire. The questions about dental visits were asked in the third section. The frequency of dental visits and timing of the last dental visit were solicited. The questionnaire was available in both English and Arabic languages to accommodate both Arabic and non-Arab study participants. Initially, the questionnaire was pilot tested amongst 30 females. This helped to evaluate the feasibility of the study, estimate the average time needed to fill out the questionnaire, and ensure the understanding of questionnaire items by the participants.[13]

Ethical approval (EA: 2,019,040) was obtained from the ethics committee at the College of Dentistry Imam Abdulrahman Bin Faisal University, Dammam. The 4 researchers distributed the questionnaire amongst study participants after obtaining approval from the administration of hospitals/health centres. Written informed consent was obtained from the study participants. Ethical guidelines of the Declaration of Helsinki were followed during the conduct of the study.

Statistical analysis

Data were entered in Microsoft Excel (2010) and then transferred to SPSS Version 22.0 for statistical testing. Frequency distributions were calculated for categorical variables and means and standard deviations for continuous variables. The independent-sample *t* test was performed to compare mean scores of DA in two categories of study participants, and one-way analysis of variance tests were performed to compare mean DA in 3 or more categories. Multiple logistic regression analysis (backward likelihood ratio method) was performed to evaluate the influence of independent variables (nationality, level of education, monthly family income, number of previous pregnancies, medical problem, dental pain or problem, negative dental experience, and time since last dental visit) on DA which was divided into 2 categories (1 = moderate to extreme DA, 2 = no to low DA). Statistical testing was performed at a significance level of $P < .05$.

Results

A total of 825 pregnant women (mean age, 29.08 ± 5.18 years) provided their responses about DA and dental visits. The response rate of the study was 81.36%. Most participants (63.8%) were Saudi and had a college/university education (65.6%). Nearly one-third of the participants were in the second (37.3%) and third trimesters (36.8) of pregnancy. Pain or discomfort in teeth or mouth was experienced by 47.8% of the participants. Negative dental treatment experience was reported by 18.5% of the participants. The study sample had a mean DA score of 12.53 ± 5.33. The mean DA score was significantly higher amongst non-Saudi (13.21 ± 5.24) than Saudi women (12.15 ± 5.34) ($P = .006$). Similarly, the participants who had a negative dental experience demonstrated

Table 1 – Relationship between sociodemographic factors and dental anxiety in pregnant women.

Study variables	N (%)	Mean Dental Anxiety Score ± SD	P value
Nationality			
Saudi	526 (63.8)	12.15 ± 5.34	.006*
Non-Saudi	299 (36.2)	13.21 ± 5.24	
Number of pregnancies			
First pregnancy	216 (26.2)	12.10 ± 5.07	.33
Second pregnancy	257 (31.2)	12.46 ± 5.16	
Third pregnancy	180 (21.8)	13.08 ± 5.34	
≥ Fourth pregnancy	172 (20.8)	12.63 ± 5.84	
Level of education			
No education	13 (1.6)	14.23 ± 6.99	.498
School education	271 (32.8)	12.44 ± 5.56	
University or higher level	541 (65.6)	12.54 ± 5.17	
Monthly family income			
2000−6000 SAR.	343 (41.6)	12.64 ± 5.36	.772
6000−12,000 SAR.	318 (38.5)	12.36 ± 5.14	
>12,000 SAR	164 (19.9)	12.63 ± 5.63	
Trimesters of pregnancy			
First trimester	213 (25.8)	13 ± 5.69	.306
Second trimester	308 (37.3)	12.28 ± 5.32	
Third trimester	304 (36.8)	12.46 ± 5.06	
Medical problems			
Yes	126 (15.3)	12.30 ± 4.99	.596
No	699 (84.7)	12.58 ± 5.39	
Pain or discomfort in teeth or mouth during the last 12 months			
Yes	394 (47.8)	13.18 ± 5.46	.001*
No	431 (52.2)	11.94 ± 5.14	
Negative experience in previous dental visit (s)			
Yes	153 (18.5)	13.99 ± 5.62	<.001*
No	672 (81.5)	12.2 ± 5.21	

* Statistically significant.

significantly higher DA (mean DA score, 13.99 ± 5.62) than those without such an experience (mean DA score, 12.2 ± 5.21) (P < .001). The participants with pain or discomfort also showed greater DA (mean DA score, 13.18 ± 5.46) than those without pain or discomfort (mean DA score, 11.94 ± 5.14) (P = .001). The study found no significant differences in mean DA scores in relation to the number of previous pregnancies and the current trimester (Table 1).

Table 2 shows the results of each item of the MDAS questionnaire. Amongst them, the mean score was the highest for feelings about the local anaesthetic injection (3.17 ± 1.44),

whilst the lowest referred to feelings about scaling and polishing (2.14 ± 1.25). Similarly, the greatest proportion of participants was not anxious about scaling and polishing (42.2%). The most commonly reported anxiety was related to feelings about local anaesthetic injection (84.1%).

The Figure shows the level of DA amongst participants. Most participants (90.9%) had low to extreme DA, and only 9.1% demonstrated no anxiety. More than half of the sample (57.3%) presented low to moderate DA, whilst 33.6% presented high to extreme DA. Table 3 presents the results of the relationship between DA and reasons and the timing of dental visits. The study found a significant relationship between DA and reasons of dental attendance before pregnancy (P = .002) and demonstrated the highest mean DA score (13.32 ± 5.43) related to dental visits due to pain and the lowest mean DA score with routine dental treatment (11.39 ± 4.6). Similarly, DA was significantly related to time since last visit (P = .009), and the participants who visited the dentist after 1 year demonstrated greater DA than those who visited within 1 year.

Bivariate analysis showed significantly increased odds of having moderate to extreme DA amongst participants with dental pain or discomfort (OR, 1.54; 95% CI, 1.17 to 2.04), those who had negative dental experience (OR, 1.52; 95% CI, 1.05 to 2.21), and those who visited the dentist after 1 year/never visited (OR, 1.58; 95% CI, 1.19 to 2.09). Saudi women were significantly less likely than non-Saudi women to have moderate to extreme DA (OR, 0.55; 95% CI, 0.41 to 0.74). In multiple logistic regression analysis, moderate to extreme DA was significantly associated with dental visits after 1 year/never visiting (OR, 1.69; 95% CI, 1.25 to 2.27), negative dental experience (OR, 1.49; 95% CI, 1.02 to 2.20), and having dental pain or problems (OR, 1.64; CI, 1.21 to 2.21) (Table 4).

Discussion

The present study assessed DA and its relationship with dental attendance amongst pregnant women in the Eastern province of Saudi Arabia. The study found an extremely high prevalence of DA amongst pregnant women. This calls for action by dental and health care professionals and policy makers to reduce DA to improve access to oral care and consequently avoid adverse oral and systemic effects during pregnancy. More than 90% of women had DA, and the mean DA score was 12.53 ± 5.33 in the present study. Previous studies using the MDAS

Table 2 – Dental anxiety according to the Modified Dental Anxiety Scale (MDAS) questionnaire items amongst pregnant women.

MDAS questionnaire items	Mean ± SD	Not anxious, No. (%)	Slightly anxious, No. (%)	Fairly anxious, No. (%)	Very anxious, No. (%)	Extremely anxious, No. (%)
Feelings about next day dental treatment (Visit Tomorrow)	2.28 ± 1.24	273 (33.1)	264 (32.0)	137 (16.6)	85 (10.3)	66 (8)
Feelings whilst sitting in waiting room (Waiting Room)	2.29 ± 1.23	264 (32)	280 (33.9)	113 (13.7)	113(13.7)	55 (6.7)
Feelings about tooth drilling (Use of Drills)	2.64 ± 1.38	221 (26.8)	215 (26.1)	137 (16.6)	140 (17)	112 (13.6)
Feelings about scaling and polishing (Scale and Polish)	2.14 ± 1.25	348 (42.2)	210 (25.5)	121 (14.7)	94 (11.4)	52 (6.3)
Feelings about local anaesthetic injection (Injection)	3.17 ± 1.44	131 (15.9)	190 (23)	119 (14.4)	174 (21.1)	211 (25.6)

Levels of dental anxiety among pregnant women

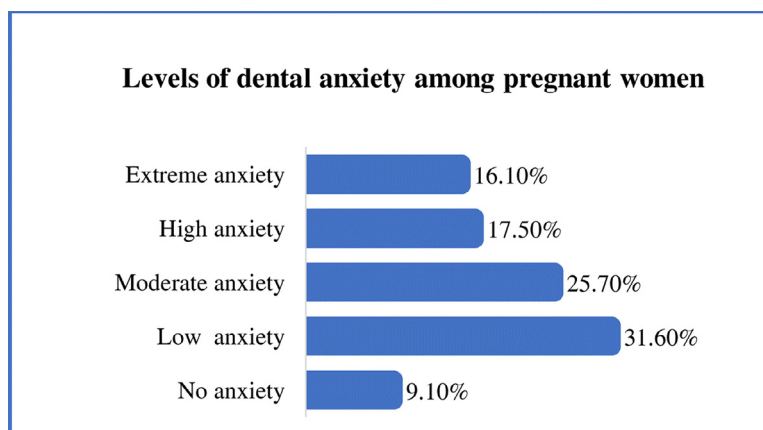| Level	Percentage
Extreme anxiety	16.10%
High anxiety	17.50%
Moderate anxiety	25.70%
Low anxiety	31.60%
No anxiety	9.10%

Figure – Distribution of dental anxiety levels amongst pregnant women.

reported similar mean DA scores in females in the UK (mean DA score, 11.82),[14] India (mean DA score, 11.06),[15] Japan (mean DA score, 11.88),[16] Turkey (mean DA score, 12.3),[17] and Saudi Arabia (mean DA score, 12.2).[18]

According to the World Health Organization, 264 million people reported anxiety in 2017, and 12% of them lived in the Eastern Mediterranean region.[19] A considerable proportion of women (34.5%) in the Eastern Province of Saudi Arabia demonstrate anxiety.[20] Depression is common in pregnant women mostly because of maternal anxiety, life stresses, low education, low income, lack of social support, and poor quality of marital relationships.[21] A positive correlation between general anxiety and DA has been documented.[22] Therefore, the high occurrence of depressive symptoms in pregnant women and the presence of an association between general

anxiety and DA could be the reason for increased DA in our sample.

Moreover, the increased distribution of DA in the present study can be related to a high proportion of participants (47.8%) reporting dental pain or discomfort, which in turn could result from increased burden of caries during pregnancy.[23] In the present study, the participants with dental pain or discomfort had significantly greater DA than those without these signs. Similarly, pregnant women with dental pain or discomfort were 1.64 times more likely to experience moderate to extreme DA than those without pain or discomfort after controlling other sociodemographic factors. In addition, the present study also demonstrated increased DA amongst participants with no school education as compared to those with

Table 3 – Relationship between reasons for dental visits and time since last dental visits with dental anxiety amongst pregnant women.

Dental attendance	No. (%)	Mean Dental Anxiety Score ± SD	P value
Reasons for dental visits before pregnancy			
Consultation/advice	108 (13.1)	11.79 ± 5.36	.002*
Pain or trouble with teeth, gums, or mouth	354 (42.9)	13.32 ± 5.43	
Treatment/follow-up treatment	144 (17.5)	11.69 ± 5.05	
Routine checkup/treatment	76 (9.2)	11.39 ± 4.6	
Don't know/don't remember	143 (17.3)	12.59 ± 5.43	
Reasons for dental visits during pregnancy			
Consultation/advice	97 (11.8)	12.44 ± 5.31	.117
Pain or trouble with teeth, gums, or mouth	185 (22.4)	12.89 ± 5.21	
Treatment/follow-up treatment	67 (8.1)	11.78 ± 5.45	
Routine checkup/treatment	55 (6.7)	10.98 ± 4.73	
Don't know/don't remember	421 (51.0)	12.72 ± 5.42	
Time since the last dental visit			
Less than 6 months	228 (27.6)	12.02 ± 5.01	.009*
6−12 months	193 (23.4)	12.04 ± 5.59	
More than 1 year but less than 2 years	215 (26.1)	12.49 ± 5.15	
2 years or more but less than 5 years	103 (12.5)	14.24 ± 5.74	
5 years or more	40 (4.8)	13.23 ± 5.26	
Never received dental care	46 (5.6)	12.93 ± 5.07	

* Statistically significant.

Table 4 – Association of sociodemographic factors with moderate to extreme dental anxiety (N = 825).

Variables	Unadjusted odds ratio (95% CI)	P value	Adjusted odds ratio (95% CI)	P value
Nationality	0.55 (0.41 to 0.74)	<.001	0.61 (0.44 to 0.84)	.003
Saudi*				
Non-Saudi				
Number of pregnancies	1.23 (0.88 to 1.73)	.225	1.26 (0.89 to 1.80)	.196
1–3 pregnancies*				
≥ 4 pregnancies				
Level of education	0.76 (0.57 to 1.02)	.066	0.81 (0.59 to 1.10)	.181
No/school education*				
University or higher level				
Monthly family income	1.04 (0.78 to 1.37)	.808	0.91 (0.67 to 1.23)	.525
Low income*				
Moderate/high income				
Medical problems	0.90 (0.61 to 1.32)	.597	0.91 (0.61 to 1.36)	.650
Yes*				
No				
Pain or discomfort in teeth or mouth during the last 12 months	1.54 (1.17 to 2.04)	.002	1.64 (1.21 to 2.21)	.001
Yes*				
No				
Negative experience in previous dental visit (s)	1.52 (1.05 to 2.21)	.025	1.49 (1.02 to 2.20)	.041
Yes*				
No				
Time since the last dental visit	1.58 (1.19 to 2.09)	.001	1.69 (1.25 to 2.27)	.001
1 year				
More than 1 year/never visited*				

* Reference category.

education. Hence, increased dental pain or discomfort and low levels of education can be important factors in the development of DA in pregnant women. Therefore, dental practitioners should use appropriate DA screening and management strategies for pregnant women with low education or with dental pain.

Routine dental care, reflected by periodic dental attendance, is important for the prevention and management of oral diseases.[24] Because oral diseases are associated with systemic disorders such as diabetes, cardiovascular disease, and adverse pregnancy outcomes, regular dental care can thus potentially improve general health and mental and social well-being.[25,26] Despite the benefits of routine dental care, only 13.7% of pregnant women in the Eastern province visit the dentist for routine dental care and most dental visits are for a dental problem.[27] It is documented that the avoidance of regular dental care utilisation is common amongst pregnant women and is related to low income, race or ethnicity, and misconception about the safety of dental treatment during pregnancy.[24,27] Lack of routine dental care utilisation before pregnancy is also significantly associated with reduced routine dental visits during pregnancy.[24] In the present study, the participants who performed routine dental visits demonstrated lower DA scores than those who visited the dentist for pain, treatment, or consultation. Similarly, visiting the dental office within 6 months to 1 year was related to significantly reduced DA in our sample. Additionally, the multiple logistic regression analysis showed significantly increased odds (OR, 1.69) of experiencing moderate to extreme DA amongst pregnant women who visited the dentist after 1 year or never visited at all, as compared to those who

visited within 1 year. Similarly, a multicentre study reported significantly reduced DA amongst participants who visited the dentist compared to those who did not visit the dentist.[28] Frequent and satisfying interactions with dental professionals during routine dental visits may reduce DA in dental patients. Furthermore, our study found no significant differences in DA scores amongst participants in different trimesters of pregnancy. These promising findings should be used to promote routine dental attendance to reduce DA and effectively manage oral health problems during pregnancy.

Dental care utilisation is unequally distributed across pregnant women of different ethnic or racial backgrounds.[24] There is consistent evidence about an association between immigration status and poor dental care utilisation and negative oral health outcomes.[24,29] Migrants tend to be less educated and earn a lower income. Furthermore, they frequently face language and cultural barriers and are unaware of available oral health programmes. These factors increase their vulnerabilities to both systemic and oral health problems.[29] Non-Saudi residents are migrants, and they utilise oral health care disproportionally less. It was reported that non-Saudi women were 7.38 times less likely to perform routine dental visits than Saudi women during pregnancy.[27] The present study showed that non-Saudi women had significantly greater DA than Saudi women. Moreover, Saudi women were less likely (OR, 0.61) than non-Saudi women to demonstrate moderate to extreme DA, accounting for other sociodemographic factors. Low education, low income, and reduced routine dental care utilisation may account for high DA in our sample of non-Saudi women.

There is a large body of evidence regarding having increased DA related to local anaesthetic injection.[15–17] An epidemiologic study reported DA in 76% of adults on receiving a local anaesthetic injection.[15] This agrees with our study, in which most participants (84.1%) had DA due to local anaesthetic injection. Our study also showed that the local anaesthetic injection was related to the highest mean DA score (3.17 ± 1.44), which has also been reported by Ogawa et al.[16] (mean DA score, 2.83 ± 1.08), Tunc et al.[17] (mean DA score, 2.6 ± 1.2), and Appukuttan et al.[28] (mean DA score, 2.79 ± 1.34). The administration of the local anaesthetic injection results in increased DA because of the pain and numbness of the injection and unpleasant taste of the anaesthetic solution.[17] Greater DA in pregnant women than adult populations highlights the importance of further investigating DA in pregnant vs nonpregnant women for improved dental care of women.

A patient with DA feels extreme helplessness and nervousness during dental treatment and may be subject to the lack of dental professionals' understanding of the situation.[30] According to a previous epidemiologic study of the general population, negative dental experiences included painful (71%), frightening (23%), and embarrassing (9%) situations during dental treatment. The authors also reported that the participants with negative dental experience were 22.4 times more likely to have DA than those without such an experience.[31] In addition, multiple studies by White et al.,[32] Mostafa et al.,[18] and Appukuttan et al.[15] reported the negative dental experience as a main factor in the development of DA. Similarly, in our research, 18.5% of the participants reported a negative dental experience in their previous dental visit, and DA was significantly higher in pregnant women who had negative dental experience than those without a negative dental experience. According to the multivariate logistic regression analysis, pregnant women with negative dental experience were 1.49 times more likely to demonstrate moderate to extreme DA than those without negative dental experience.

Due to the limitations of cross-sectional study design regarding the inference of causality, it cannot be asserted that the negative dental experience actually resulted in an increased DA in our sample. An estimated large sample adequately represents pregnant women in the studied area; however, since the study was conducted in few cities in the Eastern province of Saudi Arabia, care should be exercised in generalising study findings to pregnant women in other geographic areas of the country. Convenience sampling in the present study is another limitation with regards to representativeness of the sample. Additionally, there can be biases in the survey study due to over- and underreporting of responses. There is possibility of recall bias related to participants' responses, particularly regarding the last dental visits since 5 years or more or never visited the dentist. Nevertheless, the study provides valuable information that may be used for improved management of pregnant women in dental practice. In the future, a multicentre study should be conducted in different countries to enrich the knowledge base on DA amongst pregnant women. The comparison of DA between pregnant and nonpregnant women can also add valuable information to the current literature on DA amongst pregnant women. Therefore, a comparative study design should be used in the future.

Conclusions

DA was highly prevalent amongst pregnant women. Negative dental experience and pain or discomfort associated with the teeth or mouth were significantly associated with increased DA. Saudi pregnant women demonstrated significantly lower DA compared with non-Saudi women. The highest level of DA was found in pregnant women who performed dental visits due to dental pain or trouble. Routine dental attendance and dental visits during 1 year were related to reduced DA. The study findings may guide dental professionals to adopt improved strategies to manage the care of pregnant women with DA. Health care professionals, researchers, and policy makers can work collaboratively to reduce DA so as to achieve positive oral health outcomes.

Conflict of interest

None disclosed.

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REFERENCES

1. Naseem M, Khurshid Z, Khan HA, et al. Oral health challenges in pregnant women: recommendations for dental care professionals. The Saudi Journal for Dental Research 2016;7:138–46.
2. Gaffield ML, Gilbert BJ, Malvitz DM, Romaguera R. Oral health during pregnancy: an analysis of information collected by the pregnancy risk assessment monitoring system. J Am Dent Assoc 2001;132:1009–16.
3. Silveira ML, Whitcomb BW, Pekow P, et al. Anxiety, depression, and oral health among US pregnant women: 2010 Behavioral Risk Factor Surveillance System. J Public Health Dent 2016;76:56–64.
4. Silk H, Douglass AB, Douglass JM, et al. Oral health during pregnancy. Am Fam Physician 2008;77:1139–44.
5. Lee RS, Milgrom P, Huebner CE, et al. Dentists' perceptions of barriers to providing dental care to pregnant women. Womens Health Issues 2010;20:359–65.
6. Barlow DH. Unraveling the mysteries of anxiety and its disorders from the perspective of emotion theory. Am Psychol 2000;55:1247–63.
7. Carter AE, Carter G, Boschen M, et al. Pathways of fear and anxiety in dentistry: a review. World J Clin Cases 2014;2:642–53.

8. Berggren U, Meynert G. Dental fear and avoidance: causes, symptoms, and consequences. J Am Dent Assoc 1984;109: 247–51.

9. World Health Organization. Oral health surveys: basic methods. 5th edition Geneva, Switzerland: World Health Organization; 2013.

10. Giri J, Pokharel PR, Gyawali R, et al. Translation and validation of Modified Dental Anxiety Scale: the Nepali version. Int Sch Res Notices 2017;2017:5495643.

11. Bahammam MA, Hassan MH. Validity and reliability of an Arabic version of the Modified Dental Anxiety Scale in Saudi adults. Saudi Med J 2014;35:1384–9.

12. Humphris GM, Hull P. Do dental anxiety questionnaires raise anxiety in dentally anxious adult patients? A two-wave panel study. Prim Dent Care 2007;14:7–11.

13. Drummond A. Feasibility and pilot studies: why are they important? London, England: SAGE Publications Sage UK; 2017.

14. Humphris G, Crawford JR, Hill K, et al. UK population norms for the modified dental anxiety scale with percentile calculator: adult dental health survey 2009 results. BMC Oral Health 2013;13:29.

15. Appukuttan D, Subramanian S, Tadepalli A, et al. Dental anxiety among adults: an epidemiological study in South India. N Am J Med Sci 2015;7:13–8.

16. Ogawa M, Sago T, Furukawa H. The reliability and validity of the Japanese version of the Modified Dental Anxiety Scale among dental outpatients. ScientificWorldJournal 2020;2020:8734946.

17. Tunc EP, Firat D, Onur OD, et al. Reliability and validity of the Modified Dental Anxiety Scale (MDAS) in a Turkish population. Community Dent Oral Epidemiol 2005;33:357–62.

18. Fayad MI, Elbieh A, Baig MN, et al. Prevalence of dental anxiety among dental patients in Saudi Arabia. J Int Soc Prev Community Dent 2017;7:100–4.

19. World Health Organization. Depression and other common mental disorders: global health estimates. Geneva, Switzerland: World Health Organization; 2017.

20. Al-Khathami AD, Al-Harbi LS, AlSalehi SM, et al. A primary mental health programme in Eastern Province, Saudi Arabia, 2003-2013. Ment Health Fam Med 2013;10: 203–10.

21. Lancaster CA, Gold KJ, Flynn HA, et al. Risk factors for depressive symptoms during pregnancy: a systematic review. Am J Obstet Gynecol 2010;202:5–14.

22. Pekkan G, Kilicoglu A, Hatipoglu H. Relationship between dental anxiety, general anxiety level and depression in patients attending a university hospital dental clinic in Turkey. Community Dent Health 2011;28:149–53.

23. Krüger MS, Lang CA, Almeida LH, et al. Dental pain and associated factors among pregnant women: an observational study. Matern Child Health J 2015;19:504–10.

24. Boggess KA, Urlaub DM, Massey KE, et al. Oral hygiene practices and dental service utilization among pregnant women. J Am Dent Assoc 2010;141:553–61.

25. Zucoloto ML, Maroco J, Campos JA. Impact of oral health on health-related quality of life: a cross-sectional study. BMC Oral Health 2016;16:55.

26. Nazir MA. Prevalence of periodontal disease, its association with systemic diseases and prevention. Int J Health Sci (Qassim) 2017;11(2):72–80.

27. Albasry Z, Alhaddad B, Benrashed MA, et al. A cross-sectional analysis of dental care utilization among pregnant women in Saudi Arabia. Open Access Maced J Med Sci 2019;7:4131–436.

28. Appukuttan DP, Cholan PK, Tadepalli A, et al. Evaluation of dental anxiety and its influence on dental visiting pattern among young adults in India: a multicentre cross sectional study. Ann Med Health Sci Res 2017;7:393–400.

29. Mehra VM, Costanian C, Khanna S, Tamim H. Dental care use by immigrant Canadians in Ontario: a cross-sectional analysis of the 2014 Canadian Community Health Survey (CCHS). BMC Oral Health 2019;19:78.

30. Humphris G, King K. The prevalence of dental anxiety across previous distressing experiences. J Anxiety Disord 2011;25:232–6.

31. Locker D, Shapiro D, Liddell A. Negative dental experiences and their relationship to dental anxiety. Community Dent Health 1996;13:86–92.

32. White AM, Giblin L, Boyd LD. The prevalence of dental anxiety in dental practice settings. J Dent Hyg 2017;91:30–4.