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Determinants of Oral Health in Pregnant Saudi Arabian Women and its Association with Self-efficacy: A Cross-sectional Self-report Survey

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ABSTRACT

Objective: There is no existing data on the association between self-efficacy and self-rated oral health among pregnant women in Saudi Arabia. Thus, the purpose of this study was - in a sample of pregnant women in Saudi Arabia - to assess oral health and find its association with self-efficacy and female characteristics. **Materials and Methods:** A cross-sectional study was conducted on 438 pregnant women who routinely attended the *obstetrics/gynecology outpatient* clinic at King Abdulaziz Medical City in Riyadh. The study was based on a survey that included sociodemographic, clinical and dental data, self-rated oral health, and self-efficacy. **Results:** Of the sample, 33.8% perceived their oral health as "fair" or "poor," and 43.4% reported low self-efficacy. Subgroup analyses show that low - or no-income women and those with irregular eating patterns were associated with low self-efficacy and "fair" or "poor" oral health. The adjusted odds of "fair" or "poor" oral health were: 1.9 (95% [Confidence Interval] CI: 1.1–3.1), 2.2 (95% CI:1.3–3.8), 3.4 (95% CI: 1.6–7.2), 4.7 (95% CI: 1.6–14.2), *and* 12.7 (95% CI: 2.5–65.3) times higher in women with low self-efficacy, sleep deprivation, having given birth 3 or more times, diabetes, and those who did not brush their teeth, respectively. The adjusted odds of low self-efficacy were: 1.8 (95% CI: 1.1–3.0), 2.0 (95% CI: 1.1–3.7), and 2.5 (95% CI: 1.5–4.0) times higher in women with "fair" or "poor" oral health, no family support, and *sleep deprivation*, respectively. **Conclusion:** It was estimated that three in 10 pregnant Saudi women reported a "fair" or "poor" oral health status. The oral health status in pregnant Saudi Arabian women tends to be negatively associated with low self-efficacy, diabetes, sleep deprivation, having three or more children, while it tends to be positively associated with increasing the frequency of tooth brushing per day.

Key words: Oral health, pregnant women, Saudi Arabia, self-efficacy, sleep deprivation

INTRODUCTION

According to the World Health Organization (WHO), "Oral health is essential to general health and quality of life. It is a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial well-being" (WHO, 2016).[1] Oral health plays an important role in an individual's general health,[2] since most pregnant women suffer from different types of oral health problems, and pregnant women are more likely to develop oral diseases than the general population.[3] Pregnancy has a significant impact on women's health, and a previous study shows that pregnancy can be a risk factor for poor oral health due to changes in the

hormonal status.[4] The links between pregnancy as a condition and oral health have been well established by clinical studies. While hormonal changes during pregnancy play an important role in altering oral tissue status, specifically as estrogen and progesterone increase production,[5] most frequent and severe hormonal changes are associated with gingival tissues, which increases the risk of gingivitis throughout pregnancy.[6,7]

Some global studies also reveal that the rate of poor oral health is high among pregnant women. Among pregnant Australian aboriginal women, for example, more than half (55%) of the study respondents rated their oral health status as "fair" or "poor."[4] The prevalence of caries and periodontal diseases among pregnant women was 62.7% and 95%, respectively.[8] Approximately 75% of the pregnant women in Poland rated their dental health as poor.[9] There have only been two studies conducted in the Gulf region: A study in the United Arab Emirates reported 40% of pregnant women rated their oral health as poor,[10] while a study in Kuwait revealed that 20% of pregnant woman surveyed rated their oral health as poor.[11]

Oral health problems can lead to serious complications and increase the risk of adverse outcomes during and after pregnancy, such as poor pregnancy,[12] low birth weight,[3,13] and premature birth.[14] Some of the pregnant women in these studies displayed no apparent signs of oral health complications; thus, it is important to seek early diagnosis and treatment before and during pregnancy. This can be effective in improving oral health and as a result, raise the level of oral health self-efficacy. Self-efficacy was defined as an individual's confidence in his/her ability to behave in such a way as to produce a desirable outcome.[15]

Several studies have found a link between poor oral health, medical conditions, and self-efficacy. The impact of low self-efficacy on oral health was reported to have 2.4 times higher odds of "fair" or "poor" oral health as compared to women with high self-efficacy,[4] and Sandberg *et al.* published a report indicating that diabetes is associated with poor oral health.[16] An interventional study showed that education increased knowledge of oral health, perceived self-efficacy, and susceptibility in pregnant women.[17]

This study was the first to evaluate self-efficacy and self-rated oral health among pregnant women in Saudi Arabia. In pregnant women, the risk of poor oral health is high, and the assessment of self-efficacy in association with self-rated oral health will augment the literature, as self-efficacy may adversely affect oral health in this group.[4] Our study answers the following questions: (1) Is there an association between self-efficacy and self-rated oral health? (2) Are sociodemographic, clinical, and dental characteristics associated with self-rated oral health in pregnant women? and (3) Are sociodemographic, clinical, and dental characteristics associated with self-efficacy in pregnant women?

MATERIALS AND METHODS

A cross-sectional study was carried out in a sample of pregnant Saudi women who routinely attended the obstetrics/gynecology outpatient clinic at the King Abdulaziz Medical City (KAMC) in Riyadh, Kingdom of Saudi Arabia (KSA) between August 14 and 29, 2016. KAMC is considered one of the largest tertiary hospitals in the KSA and the Middle East. The study received scientific and ethical approval from the Institutional Review Board at King Abdullah International Medical Research Center, research protocol #RSS16/003.

The following sociodemographic, clinical, and dental characteristics were collected from each pregnant woman studied: Age, education, income level, employment status, number of children, stages of pregnancy, family support, frequency of brushing per day, diabetes, hypertension, sleep deprivation, regular eating pattern, and frequency of eating fruit and vegetables. We asked participants, "how do you rate your oral health during pregnancy as compared to before pregnancy?" The possible answers were listed on a 5-point scale with the responses: "Poor," "fair," "good," "very good," and "excellent." We defined poor self-rated oral health when the participant response was "fair" or "poor."[4] We assessed the self-efficacy of study participants using six statements from an instrument developed by Finlayson *et al.*[18] Participants rated the following statements on a 5-point scale with the responses from "not at all confident" to "very confident," "under a lot of stress," "depressed, anxious," "feeling like you do not have the time (too busy)," "tired," and "worrying about other things in your life." A score of <17 indicates low self-efficacy, and a score of 17 or more indicates high self-efficacy. This cutoff has been identified according to the median.[4]

As per our best of the knowledge, no previous studies have assessed the Arabic language version of the self-efficacy scale. A translated Arabic version was developed without assessing cultural equivalency between the Arabic-translated version and the original English version. The Cronbach's alpha coefficient was 0.85, and item-scale Spearman's correlations varied between 0.34 ($P = 0.001$) and 0.60 ($P = 0.001$). We assessed the structure of the Arabic version of the self-efficacy scale. Exploratory factor analysis results showed the Arabic version of the self-efficacy scale was dominated by a single-factor structure that explained at least 57.7% of the total variance. The factor loadings for the Arabic version of the self-efficacy scale ranged from 0.635 "feeling like you do not have the time (too busy)" to 0.837 "anxious." The reliability and construct validity of the Arabic version of the self-efficacy scale was satisfactory.

The data were collected by dental students. Each subject was informed of the aims of the study and asked whether

they wanted to participate in the study. Only subjects who were willing to participate were asked to complete the study questionnaire. No identifiable information was collected from participants. A total of 510 pregnant women were asked to participate in the study, and 438 completed and returned the questionnaire: A response rate of 85.9%.

Statistical analysis

All statistical tests were performed using IBM SPSS software Version 23. Univariate analyses [Table 1]: Variables were reported in number and percentage (%). Subgroup analyses [Table 1]: A Chi-square test was used to assess the association between poor self-rated oral health and low self-efficacy across sociodemographic, clinical, and dental characteristics. Multivariate analyses [Table 2]: A multiple logistic regression model was used to identify predictors of poor self-rated oral health. We also identified predictors of low self-efficacy using a multiple logistic regression model. The odds ratio (OR) and 95% confidence interval (CI) for the OR were used to interpret the logistic regression findings. In all analyses, statistical significance was evaluated using 0.05 - level 2-sided tests.

RESULTS

A total of 438 pregnant Saudi Arabian women were included in the analysis. Table 1 illustrates the prevalence rates of poor oral health and low self-efficacy that were classified by the sociodemographic and dental characteristics of the respondents. The mean age of the respondents was 30.6 (standard deviation=5.4) with an age range between 18 and 45 years. 74% of the respondents were unemployed, and 20.5% had no children. In our sample, 28.5% of the respondents reported either no income or a low income of <5000 Saudi Riyal.

According to the respondents, the prevalence of fair or poor oral health in this study was 33.8% (95% CI 29.4%–38.4%). 10 participants did not respond to the oral health status question. The subgroup analyses show that pregnant women with low self-efficacy, lack of formal education, no or low income, a large number of children, 1st and 3rd trimesters, diabetes, sleep deprivation, irregular eating patterns, and those who did not brush their teeth were more likely to report "fair" or "poor" oral health. Figure 1 displays differences in self-efficacy across female characteristics and self-rated oral health. The multivariate analysis in Table 2 shows that a large number of children (OR 3.4; 95% CI 1.6–7.2; $P = 0.002$), do not brush their teeth (OR 12.7; 95% CI 2.5–65.3; $P = 0.002$), have diabetes (OR 4.7; 95% CI 1.6–14.2; $P = 0.005$), experience sleep deprivation (OR 2.2; 95% CI 1.3–3.8; $P = 0.004$), and have low self-efficacy (OR 1.9; 95% CI 1.1–3.1; $P = 0.018$) were strongly associated with "fair" or "poor" oral health.

The prevalence of low self-efficacy in this study was 43.4% (95% CI 38.7%–48.2%). One participant did not respond to the self-efficacy scale. The subgroup analyses show that pregnant women with "fair" or "poor" oral health, no or low income, sleep deprivation, irregular eating patterns, infrequent eating of fruit and vegetables, and no family support were more likely to report low self-efficacy. According to the multivariate analysis in Table 2, the independent risk factors of low self-efficacy were sleep deprivation (OR 12.5; 95% CI 11.5–4.0; $P = 0.001$), no family support (OR 2.0; 95% CI 1.1–3.7; $P = 0.039$), and "fair" or "poor" oral health (OR 1.8; 95% CI 1.1–3.0; $P = 0.020$).
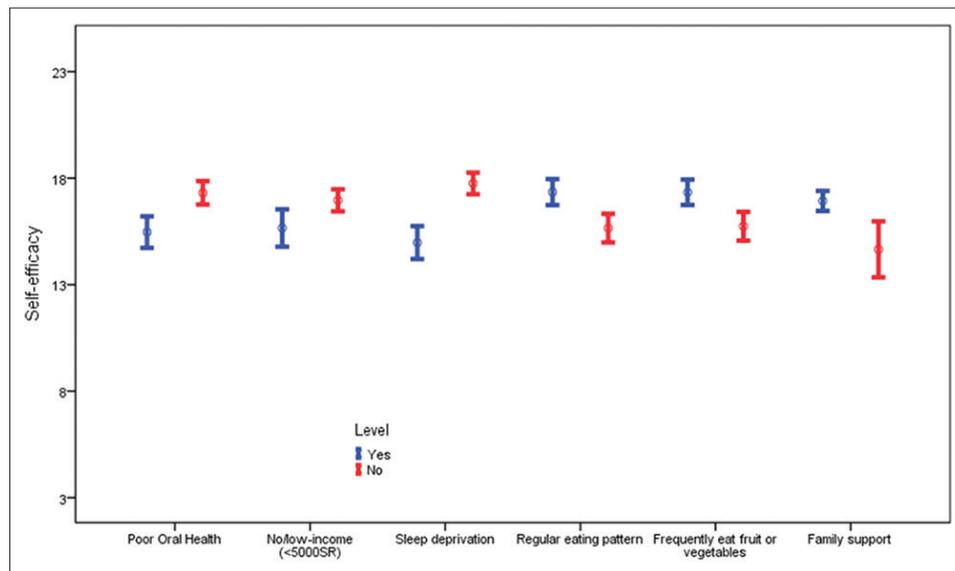
Figure 1: The error bars mean 95% confidence interval: Differences in self-efficacy across pregnant women characteristics and self-rated oral health, high score indicates high self-efficacy

Characteristics	Levels	Overall *n*=438	Low self-efficacy 43.4% (190)		Poor oral health 33.8% (148)	
		n (%)	*n* (%)	*P*	*n* (%)	*P*
Self-efficacy	Low	190 (43.4)			79 (42.9)	0.001*
	High	247 (56.4)			68 (28.0)	
	Missing	1 (0.2)				
Oral health	Poor	148 (33.8)	79 (53.7)	0.001*		
	Good	280 (63.9)	105 (37.5)			
	Missing	10 (2.3)				
Age	<37 years	365 (83.7)	154 (42.3)	0.277	122 (33.9)	0.388
	≥37 years	71 (16.3)	35 (49.3)		26 (39.4)	
Education level	High school or less	194 (44.7)	82 (42.5)	0.726	80 (42.6)	0.002*
	University or higher	240 (55.3)	106 (44.2)		67 (28.4)	
Employment status	Employed	110 (25.3)	46 (41.8)	0.672	30 (28.6)	0.121
	Unemployed	325 (74.7)	143 (44.1)		118 (36.9)	
Income	<5000 SR	121 (28.5	66 (54.5)	0.013*	53 (44.5	0.010*
	5000 to 10000 SR	218 (51.3)	86 (39.6)		68 (31.8)	
	>10000 SR	86 (20.2)	32 (37.2)		21 (25.3)	
Number of children	None	89 (20.5)	38 (42.7)	0.971	22 (25.0)	0.002*
	1 to 2 child	183 (42.0)	81 (44.3)		55 (30.6)	
	3 child or more	163 (37.5)	71 (43.8)		71 (45.2)	
Pregnancy trimester	1st trimester	43 (10.0)	18 (41.9)	0.829	18 (42.9)	0.013*
	2nd trimester	136 (31.7)	62 (45.6)		32 (24.6)	
	3rd trimester	250 (58.3)	106 (42.6)		95 (38.5)	
Frequency of brushing	Do not brush	17 (3.9)	11 (64.7)	0.197	13 (86.7)	0.001*
	Once/day	159 (36.3)	68 (42.8)		63 (40.4)	
	Twice or more/day	262 (59.8)	111 (42.5)		72 (28.0	
Diabetes	Yes	24 (5.5)	13 (54.2)	0.291	15 (62.5)	0.003*
	No	410 (94.5)	177 (43.2)		132 (33.0)	
Hypertension	Yes	(19 (4.4)	10 (52.6)	0.397	5 (26.3)	0.434
	No	417 (95.6)	178 (42.8)		143 (35.0)	
Asthma	Yes	44 (10.1)	19 (43.2)	0.975	16 (38.1)	0.599
	No	390 (89.9)	167 (42.9)		130 (34.0)	
Sleep deprivation	Yes	170 (39.6)	100 (58.8	0.001*	73 (44.0)	0.001*
	No	259 (60.4)	85 (32.8)		72 (28.3)	
Regular eating pattern	Yes	236 (55.1)	85 (36.0)	0.001*	68 (29.6)	0.020*
	No	192 (44.9)	100 (52.1)		76 (40.4)	
Frequently eat fruit and vegetables	Yes	237 (54.4)	89 (37.7)	0.012*	73 (31.7)	0.159
	No	199 (45.6)	99 (49.7)		75 (38.3)	
Family support	Yes	366 (84.5)	146 (39.9)	0.001*	117 (32.9)	0.158
	No	67 (15.5)	43 (64.2)		28 (41.8)	

Table 1: Association between low self-efficacy and poor self-rated oral health and their relation with female characteristics

Characteristics	Reference	Low self-efficacy				Poor oral health			
		P	aOR	95% CI. for aOR		*P*	aOR	95% CI. for aOR	
				Lower	Upper			Lower	Upper
Age <37	≥37 years	0.994	1.0	0.498	1.995	0.675	1.2	0.56	2.445
High school or less	University	0.086	0.6	0.378	1.067	0.052	1.8	0.996	3.081
Employed	Unemployed	0.571	0.8	0.473	1.512	0.879	1.1	0.54	2.054
Income <5000 SR	>10000 SR	0.137	1.7	0.844	3.445	0.128	1.8	0.843	3.903
5000–10000 SR	>10000 SR	0.958	1.0	0.552	1.872	0.751	1.1	0.566	2.201
1–2 children	No children	0.386	0.8	0.423	1.395	0.250	1.5	0.749	3.042
≥3 children	No children	0.679	0.9	0.44	1.707	0.002*	3.4	1.566	7.227
1st Trimester	3rd Trimester	0.934	1.0	0.44	2.125	0.599	1.3	0.542	2.893
2nd Trimester	3rd Trimester	0.228	1.4	0.823	2.262	0.070	0.6	0.333	1.044
Do not brush	Twice or more/day	0.477	1.6	0.45	5.521	0.002*	12.7	2.475	65.319
Once/day	Twice or more/day	0.955	1.0	0.61	1.595	0.010*	1.9	1.17	3.233
Diabetes		0.836	1.1	0.402	3.086	0.005*	4.7	1.588	14.168
Hypertension		0.205	2.1	0.663	6.823	0.064	0.2	0.049	1.086
Asthma		0.809	0.9	0.417	1.978	0.695	1.2	0.505	2.789
Sleep deprivation		0.001*	2.5	1.517	4.008	0.004*	2.2	1.291	3.792
Regular eating pattern		0.255	0.7	0.443	1.241	0.153	0.7	0.377	1.166
Frequently eat fruit and vegetables		0.635	0.9	0.536	1.464	0.939	1.0	0.565	1.694
No family support		0.039*	2.0	1.034	3.680	0.422	0.8	0.374	1.511
Poor oral health		0.020*	1.8	1.101	3.041				
Low self-efficacy						0.018*	1.9	1.115	3.112

*Significant at alpha=0.05. aOR, adjusted odds ratio, <5000 SR, equivalently $1333, 5000–10,000 SR, equivalently $1333–$2666, and >10,000 SR, equivalently $2666, CI: Confidence interval, OR: Odds ratio

Table 2: Determinants of poor oral health and low self-efficacy among a sample of pregnant women

DISCUSSION

This study is unique in that such an exercise has not been documented in Saudi Arabia. It used self-rated oral health as the primary outcome and self-efficacy as the secondary outcome. This cross-sectional survey also indicates whether there is any evidence of an association between "fair" or "poor" oral health and low self-efficacy among a sample of pregnant Saudi women.

The current study has shown that one-third (33.8%) of the studied sample perceived their oral health as "fair" or "poor." Our finding was significantly different when compared to two studies conducted in the Gulf region: 40% (*P* = 0.0334) of pregnant women surveyed in the United Arab Emirates and 20% (*P* = 0.001) of the pregnant women surveyed in Kuwait rated their oral health as poor.[10,11] Possible reasons for these differences could be the sampling techniques applied to recruited subjects and the fact that samples could differ in sociodemographic variables.

Our findings were also consistent with a study based on telephone interviews of pregnant Danish women, which revealed that one-third (33%) of those interviewed reported signs of gingival inflammation.[19] However, poor oral health among pregnant women could also vary by culture and region. A study conducted in a convenience sample of pregnant Australian women demonstrated that 55% rated their oral health "fair" or "poor."[4] The source of differences in findings could be affected by participant response bias because different techniques were used for data collection: our study used a survey form, while the Australian study conducted in-person interviews. This could be true for self-efficacy: Low self-efficacy was reported in 43.4% of our sample and 63.3% of their sample.[4]

We found statistical evidence of a positive association between low self-efficacy and poor self-rated oral health in our sample. The odds of "fair" or "poor" oral health were 1.9 (OR = 2.4) times higher in women with low self-efficacy as compared to women with high self-efficacy. This finding is consistent with what has been reported in pregnant Australian women (OR = 2.4).[4] Another study showed that diabetes is strongly associated with poor oral health.[16] Our findings supported the evidence of an association between diabetes and poor oral health. In our investigation, the "fair"

or "poor" oral health was reported by pregnant women who were diabetic, had three or more children, did not brush their teeth, and had experienced sleep deprivation.

Our study also revealed that pregnant women with sleep deprivation were 2.5 times more likely to report low self-efficacy than those with no sleep deprivation. A low self-efficacy was 2 time higher among pregnant women with no family support as compared to those with family support. The study showed that low self-efficacy was greater among pregnant women with low or no income. Another study confirmed that poor oral health is linked to low income.[20]

Irregular eating was found to be associated with poor oral health and low self-efficacy. Pregnant women with diabetes should be routinely assessed by dentists to prevent harmful effects to their oral health. It is important to further explore the impact of family support and its associations with poor oral health and low self-efficacy. The uniqueness of the work lies in the investigation of oral health and self-efficacy and their predictors among pregnant women in Saudi Arabia since as of this writing; no study has been reported with such a topic.

Several limitations were noted in this study. The study findings represent pregnant women who routinely attend the obstetrics/gynecology outpatient clinic at the KAMC in Riyadh. The findings must be interpreted with caution, as the study is based on a cross-sectional survey, which could establish an association rather than causation. The study was based on subjective perception where participants were asked to rate their oral health status using a 5-point Likert item with the responses "excellent," "very good," "good," "fair," or "poor," and self-efficacy was based on six items using a 4-point Likert. There may be a relationship between stress,[21] dental care services,[22] and poor oral health. These associations are something to study in future research. The cross-cultural adaptation has not been investigated in this study. A study is needed to assess whether the Arabic-translated version and the original English version of the self-efficacy scale are equivalent across the two cultural settings. Despite these limitations, there was no existing data on the association between self-efficacy and self-rated oral health among pregnant women in Saudi Arabia.

CONCLUSION

It was estimated that three in 10 pregnant Saudi women reported a "fair" or "poor" oral health status. Oral health status in pregnant Saudi women tends to be negatively associated with low self-efficacy, diabetes, sleep deprivation, having three or more children, while it tends to be positively associated with increasing the frequency of tooth brushing per day. Regular dental check-ups for pregnant women are a necessity for women at high risk of poor oral health.

COMPETING INTEREST

The authors declare that they have no competing interest.

REFERENCES

1. Oral Health. Available from: http://www.who.int/mediacentre/factsheets/fs318/en. [Last accessed on 2016 Aug 02].
2. Petersen PE, Kwan S. Evaluation of community-based oral health promotion and oral disease prevention WHO recommendations for improved evidence in public health practice. Community Dent Health 2004;21:319-29.
3. Dasanayake AP. Poor periodontal health of the pregnant woman as a risk factor for low birth weight. Ann Periodontol 1998;3:206-12.
4. Jamieson LM, Parker EJ, Roberts-Thomson KF, Lawrence HP, Broughton J. Self-efficacy and self-rated oral health among pregnant aboriginal Australian women. BMC Oral Health 2014;14:29.
5. Laine MA. Effect of pregnancy on periodontal and dental health. Acta Odontol Scand 2002;60:257-64.
6. Asa'ad FA, Rahman G, Al Mahmoud N, Al Shamasi E, Al Khuwaileidi A. Periodontal disease awareness among pregnant women in the central and eastern regions of Saudi Arabia. J Investig Clin Dent 2015;6:8-15.
7. Soroye MO, Ayanbadejo PO. Prevalence of gingivitis and perception of gingival colour among pregnant women attending the antenatal clinic of Lagos university teaching hospital, Idi-Araba. J Orofac Sci 2016;8:53.
8. Gupta R, Acharya AK. Oral health status and treatment needs among pregnant women of Raichur district, India: A population based cross-sectional study. Scientifica 2016;2016:9860387.
9. Gaszyńska E, Klepacz-Szewczyk J, Trafalska E, Garus-Pakowska A, Szatko F. Dental awareness and oral health of pregnant women in Poland. Int J Occup Med Environ Health 2015;28:603-11.
10. Hashim R. Self-reported oral health, oral hygiene habits and dental service utilization among pregnant women in United Arab Emirates. Int J Dent Hyg 2012;10:142-6.
11. Honkala S, Al-Ansari J. Self-reported oral health, oral hygiene habits, and dental attendance of pregnant women in Kuwait. J Clin Periodontol 2005;32:809-14.
12. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. Am Fam Physician 2008;77:1139-44.
13. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Maynor G, *et al.* Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontol 1996;67:1103-13.
14. Carta G, Persia G, Falciglia K, Iovenitti P. Periodontal disease and poor obstetrical outcome. Clin Exp Obstet Gynecol 2004;31:47-9.
15. Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. Psychol Rev 1977;84:191-215.
16. Sandberg GE, Sundberg HE, Fjellstrom CA, Wikblad KF. Type 2 diabetes and oral health: A comparison between diabetic and non-diabetic subjects. Diabetes Res Clin Pract 2000;50:27-34.
17. Shahnazi H, Hosseintalaei M, Esteki Ghashghaei F, Charkazi A, Yahyavi Y, Sharifirad G, *et al.* Effect of educational intervention on perceived susceptibility self-efficacy and DMFT of pregnant

women. Iran Red Crescent Med J 2016;18:e24960.

18. Finlayson TL, Siefert K, Ismail AI, Delva J, Sohn W. Reliability and validity of brief measures of oral health-related knowledge, fatalism, and self-efficacy in mothers of African American children. Pediatr Dent 2005;27:422-8.

19. Christensen LB, Jeppe-Jensen D, Petersen PE. Self-reported gingival conditions and self-care in the oral health of Danish women during pregnancy. J Clin Periodontol 2003;30:949-53.

20. Lamarca GA, Leal Mdo C, Leao AT, Sheiham A, Vettore MV. Oral health related quality of life in pregnant and post partum women in two social network domains; predominantly home-based and work-based networks. Health Qual Life Outcomes 2012;10:5.

21. Ahmed AE, Albalawi AN, Alshehri AA, Alblaihed RM, Alsalamah MA. Stress and its predictors in pregnant women: A study in Saudi Arabia. Psychol Res Behav Manag 2017;10:97-102.

22. Ahmed AE, Alblaihed RM, Albalawi AN, Alshehri AA. Oral health problems among pregnant Saudi Arabian women: A self-report survey. J Clin Res 2018;1:1-8.