



Background Characteristics and Cognitive Factors as Determinants of Oral Health in Pregnant Women, Tehran, Iran: A Cross-Sectional Study

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Article Info	ABSTRACT
<p>Article type: Original Article</p> <hr/> <p>Article History: Received: 10 Nov 2022 Accepted: 30 Jun 2023 Published: 28 Jan 2024</p> <hr/> <p>* Corresponding author: Research Centre for Caries Prevention, Dentistry Research Institute, Tehran University of Medical Sciences, Tehran, Iran; Email: smohebbi@tums.ac.ir</p>	<p>Objectives: Pregnancy can lead to oral health issues, yet many women remain unaware of the potential negative impact on their pregnancy. This study aimed to assess the dental and periodontal health of pregnant women in Tehran, Iran, and identify its associated factors.</p> <p>Materials and Methods: A cross-sectional study was conducted with 221 pregnant women attending 12 randomly selected public health centers in Tehran, Iran. A self-administered questionnaire gathered data on background characteristics, oral health knowledge, and self-reported health. Periodontal status, oral hygiene, and dental health were assessed using bleeding on probing (BOP), simplified oral health (OHI-S), and decayed-missing-filled teeth (DMFT) indices. Statistical analysis included simple and multiple linear regression ($P < 0.05$).</p> <p>Results: The participants' ages ranged from 18 to 42 years (mean: 27.9 years, SD: 5.5). On average, participants scored 4.1 out of 11 (SD: 1.7) for general oral health knowledge and 1.62 out of 4 (SD: 0.9) for knowledge about oral health during pregnancy. The mean DMFT was 8.28 (SD: 5.7), with 65.6% of women having fair oral hygiene according to the OHI-S. Participants reporting poor general health had more debris (B: 0.276, $P = 0.043$), while those with higher general oral health knowledge had fewer missing teeth (B: -0.183, $P = 0.048$).</p> <p>Conclusion: Despite partial free oral health care provided to pregnant women in Iran, the dental and periodontal conditions of the participants were unsatisfactory. Implementing motivational educational programs within the primary health care system could be instrumental in improving the oral health of pregnant mothers.</p> <p>Keywords: Pregnant women; Oral health; Knowledge; Periodontal index; Oral hygiene</p>
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INTRODUCTION

There are a number of oral-health conditions related to pregnancy. In fact, hormonal [1] and behavioral changes make pregnant women susceptible to periodontal diseases, such as pregnancy gingivitis [2], pregnancy granuloma [3], and periodontitis, as well as dental problems, including dental caries, tooth

mobility, and erosion [2]. Potential causes of such problems include increased levels of estrogen and progesterone [1], poor oral hygiene, trans-formation in oral microbial flora subsequent to changes in their daily diet, frequent snacking, and morning sickness [3]. It is moreover well-documented that oral health may affect general health via the intake of

nutrition [4], oral microflora, and influence on the quality of communication and mental health [5]. Moreover, oral-health problems are associated with certain chronic diseases, including diabetes and heart disease [4]. Conversely, conditions such as pneumonia [6], osteoporosis and diabetes [4] may affect oral health. Despite the importance of oral health and its mutual impact on general health [2], a large proportion of pregnant women suffer from oral-health problems and diseases. Furthermore, there are relations between periodontal disease and the risk of pre-term birth, low-birth weight, and preeclampsia [1]. These associations clearly indicate the importance of good oral health as a component of good general health for expectant mothers and their child. Unfortunately, most women are unaware of the negative effects of insufficient oral health on pregnancy [7]. Approximately 40% of American pregnant women have periodontal diseases, while about half of pregnant women do not undertake dental visits [2]. Meanwhile, in Thailand, the prevalence of caries was 74% and gingivitis was 86%, with significant differences between pregnant and non-pregnant women [8]. By the literatures, the prevalence of dental caries among pregnant women in developing countries, such as Brazil, was sometimes up to 100% and in some developed countries, such as USA and Italy, it was between 41% and 52% [1, 9, 10]. Also the mean DMFT in Varamin, Arak and Isfahan (Iran) were 10.34, 5.4 and 10.6 respectively. [11-13]. Despite these oral-health problems, there are numerous barriers to providing dental services to pregnant women. These include a lack of knowledge and incorrect beliefs, such as concerns for fetus health during dental treatment, negative oral-health experiences, negative attitudes towards the oral-health experts and negative dental organizations [3]. As far as we have assessed, there are only few studies about the oral health of pregnant women in Iran, none of which have been conducted in Tehran. Tehran, as the capital of Iran, is a large and multicultural city, and is significantly densely populated. For these reasons, the study of pregnant women in Tehran may affect future interventions on this

target group. Therefore, the current study aims at evaluating the dental and periodontal health in pregnant women and a variety of associated factors.

MATERIALS AND METHODS

Ethical considerations

Ethical approval was obtained from the Research Ethics Committee of Tehran University of Medical Sciences (code IR.TUMS.REC.1394.855). This study was voluntary and the responses were anonymous. All the participants were informed about the objectives and protocol of the study. They were assured about keeping information confidentially and having the right to withdraw from the study at any stage. Furthermore, all respondents signed informed consent forms.

Participants and sampling

This cross-sectional study population consisted of pregnant women who had at least 8 weeks of pregnancy at the time of the study, attending 12 randomly selected public health centers in Tehran, Iran, in 2015. A multi-stage cluster sampling method was used. According to the geographical divisions of the Ministry of Health, the city of Tehran was divided into six regions: north, northeast and northwest (regions 1 to 8 of the municipality as affluent areas), east, south and west (regions 9 to 22 of the municipality as non-affluent areas). These areas were considered as strata, and the health centers located in these six regions were identified as clusters. Two centers were randomly selected from each area. As a result, a total of 12 centers were selected for the data collection, we stayed two days in each center and between 15 to 25 pregnant mothers were reached according to the population covered by each center by non-probability consecutive sampling inside the centers, the study population was selected.

For the sample size calculation based on the rule of thumb, considering that we had nine independent variables for regression analysis, design effect 2, the calculated sample size was 216. Finally, a total of 221 pregnant women were entered for statistical analysis.) response rate: 87.7%).

To collect data, a standard self-administered

questionnaire [14] was used in this study. All participants were asked to fill the questionnaire and after that Clinical examinations were performed by a dentist by CPI (Community periodontal index) probe, and a headlamp.

Data collection

To collect the data, a standard self-administered questionnaire [14] was used in this study. All participants were asked to fill the questionnaire and after that Clinical examinations were performed by a dentist using CPI (Community periodontal index) probe, mirror and a headlamp. The questionnaire consisted of two parts, the first part inquired about background characteristics including age, week of pregnancy, education level of the participants and their husbands, and BMI (Body Mass index in pre-pregnancy), self-reported income and a question on self-reported general health. The second part included, cognitive variables (additional file) related to oral health inquiring general knowledge about oral health (11 multiple-choice questions); and knowledge about oral health during pregnancy (four questions).

Clinical examinations

We used bleeding on probing index (BOP) to assess periodontal status, and simplified oral health index (OHI-S) to evaluate oral hygiene status. For the assessment of the BOP, we have given a scale, zero or one, to each index teeth (16, 26, 36, 46, 11, 31): zero to those without bleeding and one to those with bleeding. At last, we summed up these scales for individuals. The OHI-S has two components: The Debris Index-Simplified (DI-S) and the Calculus Index-Simplified (CI-S) with a possible range of scores from 0 to 3 for each of them. Six tooth surfaces are scored for each individual, four posterior teeth: 16, 26, 36, 46, and two anterior teeth: 11, 31. DI-S and CI-S are summed up to get OHI-S. The interpretation of the index is as follows: good: 0 to 1.2, fair: 1.3 to 3.0 and poor: 3.1 to 6.0. We used DI-S to evaluate oral cleanliness, we considered it as good: 0 to 0.6, fair: 0.7 to 1.8, and poor: 1.9 to 3. DMFT index (with components: D=the number of decayed teeth, M=the number of missed teeth, F=the number of filled teeth) to evaluate dental status [15].

Statistical Analysis

For quantitative variables, the mean and standard deviation (SD) were computed and, frequency and percentage were used for the analysis of qualitative variables. There were no missing variables for background characteristics but the clinical variables had 4.5% (N=10) missing values that were replaced with sample mean of the same variable [16]. Knowledge questions were scored 1 for correct response and 0 for incorrect response.

The association of the independent variables with oral health indices (including DMFT, D, M, F, BOP, CI, DI, and OHI-S), as dependent variables, were evaluated by means of linear regression analyses. First, simple liner analysis was applied, then the variables that revealed statistical significance below 0.2 were entered into the final model of multiple linear regression by stepwise method. The statistical investigation was conducted using IBM SPSS software version 23. The significance level was set at 0.05.

RESULTS

Characteristics of the study population

Among the 221 participants, 33 (14.9%) of the women and 32 (14.5%) of the husbands had academic education (Table 1). Also, 61 women (27.6%) reported to be low income, 117 (52.9%) had medium income and 43 (19.5%) had good and excellent income. Moreover, 207 (93.7%) of the women had no history of systemic diseases (Table1).

Table2 indicates the mean, standard deviation, minimum and maximum for age, week of pregnancy, BMI, general oral-health knowledge, knowledge about pregnancy oral health. The age of the women in the survey ranging from 18 to 42years (mean=27.9 years, SD=5.5). The mean week of pregnancy was 21.3 (SD: 8.6). The BMI of the women ranged from 17.4 to 37.5 kg/m² (mean: 24 kg/m², SD: 3.9).

The general oral-health knowledge of women ranged from 0 to 8 (mean: 4.1, SD: 1.7, maximum achievable of 11). The knowledge of women about oral health during pregnancy ranged from 0 to 4 (mean: 1.6, SD: 0.9, maximum achievable of 4) (Table 2).

Table 1. Distribution of pregnant women (n=221) according to categories of Socio-demographic and general health characteristics.

Variables	Category(s)	Frequency	Percent
Pregnant Women’s Education	Without diploma	104	47.1
	Diploma	84	38.0
	University	33	14.9
Husbands’ Education	Without diploma	121	54.7
	Diploma	68	30.8
	University	32	14.5
Self-reported income	Low	61	27.6
	Medium	117	52.9
	Good or Excellent	43	19.5
Self-reported general health	Ill	14	6.3
	Healthy	207	93.7

Table 2. Mean, standard deviation, and range of backgrounds in pregnant women (n=221).

Variables	Mean	Standard deviation	Maximum	Minimum
Age	27.9	5.5	42	18
Week of pregnancy	21.3	8.6	39	8
BMI	24	3.9	37.5	17.4
General oral health knowledge	4.1	1.7	8	0
Knowledge about pregnancy oral health	1.6	0.9	4	0

BMI: Body mass index before pregnancy

Figure 1 shows that among the questions of general health knowledge, the question, “how many times at least should one brush?” received the greatest number of correct answers (72.85%) by participants versus the question “After tooth brushing with fluoride toothpaste, washing teeth with lots of water is effective in the prevention of decay”, that received the greatest number of false response (90.50%). Figure 2 illustrates the level of knowledge among women regarding oral health during pregnancy. It reveals that the question "when is the initial dental visit recommended during pregnancy?" received the highest percentage of correct responses (71.50%) from participants. In contrast, the question "is the second trimester the optimal time for dental procedures for pregnant women?" received the highest percentage of incorrect responses (93.67%).

Table 3 indicates that the DMFT of the women in the survey ranged from 0 to 32 (mean: 8.28, SD: 5.70), and 6.3% of the women were caries-free. The D component of the participants in the survey ranged from 0 to 13 (mean: 3.33, SD: 2.81) and 15.4% of women had no decayed teeth. The M component of the women ranged from 0 to 17 (mean:1.62, SD: 2.40). More than half of the women (56.6%) had at least one missed tooth due to caries. The F component of the women in the survey ranged from 0 to 18 (mean: 3.18, SD: 4.07). More than half of the women (60.2%) had at least one filled tooth as a result of dental caries. The BOP of the women in the survey ranged from 0 to 6 (mean: 3.78, SD:1.75). Among the women, 209 (94.6%) had a BOP at least 1. The CI of the women ranged from 0 to 2.67 (mean: 0.51, SD: 0.52) and 84.6 % of women had calculus.

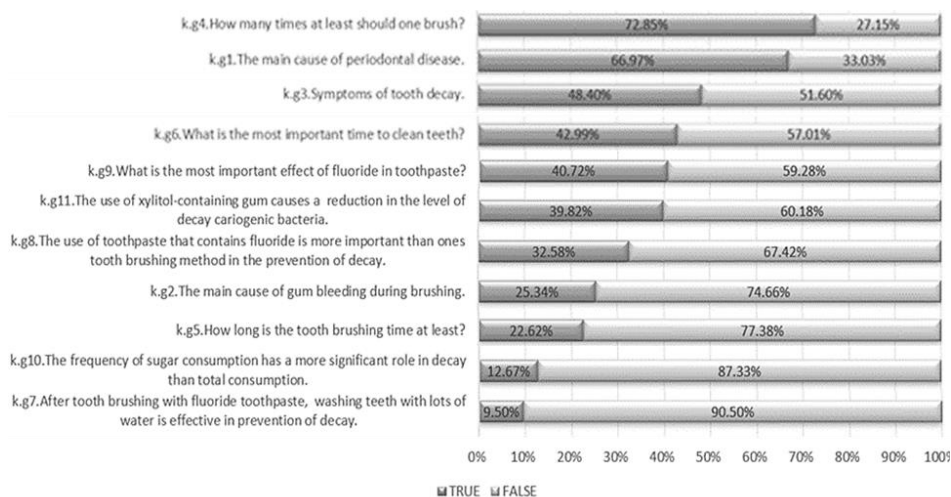


Fig. 1. The percentage of pregnant women's answers (n=221) to questions about general knowledge of oral health, Tehran, Iran

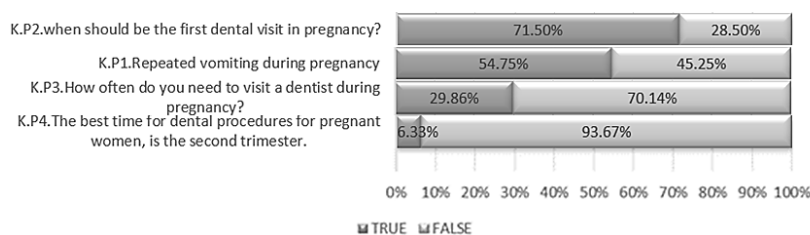


Fig. 2. The percentage of pregnant women's answers (N=221) to questions reflecting their oral-health knowledge during pregnancy, Tehran, Iran

Table 3. Mean, standard deviation, and range of dental and periodontal health indices in pregnant women (N=221).

	Mean	Standard deviation	Maximum	Minimum
DMFT	8.28	5.70	32	0
Decayed teeth	3.33	2.81	13	0
Missed teeth	1.62	2.40	17	0
Filled teeth	3.18	4.07	18	0
Bleeding on probing	3.78	1.75	6	0
Calculus index	0.51	0.52	2.67	0
Debris index	1.38	0.49	3	0.33
OHI-S	1.9	0.87	5.33	0.33

The DI of the women in the survey ranged from 0.33 to 3 (mean: 1.38, SD: 0.49) and 7 women (3.2%) had DI less than 0.6 (good), 179 women (81%) had fair and 35 women (15.8%) had poor oral cleanliness. The OHI-S of the women in the survey ranged from 0.33 to 5.33 (mean: 1.90, SD: 0.87). Fifty-one (23.1%) women had good, 145 (65.6%) women had fair, and 25 (11.3%) women had poor oral hygiene.

Dental health and periodontal health of the study population and associating factors

Table 4 and Table 5 show the results of the simple linear regression for background characteristics, cognitive factors and self-reported general health for dental status and periodontal status, respectively. Table 6 show the results of the multiple liner regression controlling for all backgrounds and confounders.

Table 4. Associations between independent variables, including: socio-demographic characteristics, cognitive factors, self-reported general health, and dental status by simple linear regression

		DMFT		D		M		F	
		B 95.0% Confidence (LL_UL)	Sig	B 95.0% Confidence (LL_UL)	Sig	B 95.0% Confidence (LL_UL)	Sig	B 95.0% Confidence (LL_UL)	Sig
Age		0.324 (0.194_0.454)	<0.001	0.054 (-0.014_0.121)	0.117	0.145 (0.091_0.200)	<0.001	0.124 (0.028_0.221)	0.012
Women's Education	Without diploma	Ref		Ref		Ref		Ref	
	University	0.433 (-1.815_2.682)	0.704	-1.046 (-2.149_0.056)	0.063	-0.337 (-1.289_0.615)	0.486	2.095 (0.536_3.655)	0.009
	Diploma	1.162 (-0.489_2.812)	0.167	-0.492 (-1.302_0.317)	0.232	-0.136 (-0.835_0.564)	0.703	2.068 (0.923_3.213)	<0.001
Husbands' Education	Without diploma	Ref		Ref		Ref		Ref	
	University	1.145 (-1.089_3.379)	0.314	-0.921 (-2.016_0.174)	0.099	0.153 (-0.795_1.101)	0.750	2.152 (0.574_3.731)	0.008
	Diploma	-0.767 (-2.470_0.936)	0.376	-0.747 (-1.582_0.088)	0.079	-0.069 (-0.792_0.654)	0.850	0.288 (-0.915_1.492)	0.637
Self-reported income	Good	Ref		Ref		Ref		Ref	
	Medium	-1.274 (-3.282_0.734)	0.213	-0.219 (-1.211_0.774)	0.664	0.063 (-0.787_0.914)	0.883	-1.119 (-2.550_0.312)	0.125
	Low	-0.737 (-2.979_1.506)	0.518	-2.289 (-1.397_0.819)	0.608	0.219 (-0.730_1.169)	0.650	-1.142 (-2.740_0.456)	0.160
Self-reported general health	0.838 (-3.950_2.274)	0.596	0.400 (-1.133_1.933)	0.607	0.396 (-0.917_1.710)	0.553	-1.494 (-3.710_0.721)	0.185	
Week	-0.044 (-0.132_0.045)	0.331	-0.025 (-0.068_0.019)	0.265	-0.023 (-0.060_0.014)	0.225	0.014 (-0.050_0.077)	0.672	
BMI	0.067 (-0.129_0.263)	0.502	0.027 (-0.070_0.123)	0.587	0.004 (-0.079_0.087)	0.926	-0.019 (-0.159_0.121)	0.788	
General oral health knowledge	-0.241 (-0.697_0.214)	0.298	-0.120 (-0.344_0.105)	0.295	-0.133 (-0.325_0.059)	0.173	0.113 (-0.213_0.439)	0.494	
Knowledge about pregnancy oral health	0.142 (-0.681_0.965)	0.734	-0.010 (-0.415_0.396)	0.962	-0.057 (-0.405_0.290)	0.745	0.151 (-0.436_0.739)	0.612	

DMFT: decayed missed filled teeth

Table 5. Associations between independent variables, including: socio-demographic characteristics, cognitive factors, self-reported general health, and periodontal status by simple linear regression

	OHIS			DI		CI		BOP					
	B	95.0% Confidence (LL_UL)	Sig	B	95.0% Confidence (LL_UL)	Sig	B	95.0% Confidence (LL_UL)	Sig				
Age	0.006	(-0.015_0.027)	0.560	-0.001	(-0.012_0.011)	0.929	0.007	(-0.006_0.019)	0.289	0.002	(-0.041_0.044)	0.936	
Women's Education	Without diploma	Ref		Ref			Ref			Ref			
	University	-0.408	(-0.749_-0.068)	0.019	-0.223	(-0.417_-0.030)	0.024	-0.185	(-0.389_0.020)	0.076	-0.521	(-1.212_0.170)	0.139
	Diploma	-0.308	(-0.558_-0.059)	0.016	-0.155	(-0.296_-0.013)	0.033	-0.154	(-0.304_-0.004)	0.045	-0.051	(-0.559_0.456)	0.842
Husbands' Education	Without diploma	Ref		Ref			Ref			Ref			
	University	-0.474	(-0.813_-0.135)	0.006	-0.236	(-0.429_-0.043)	0.017	-0.238	(-0.441_-0.034)	0.022	-0.122	(-0.814_0.569)	0.727
	Diploma	-0.096	(-0.354_0.163)	0.467	-0.069	(-0.216_0.078)	0.354	-0.026	(-0.181_0.129)	0.739	-0.016	(-0.543_0.511)	0.953
Self-reported income	Good	Ref		Ref			Ref			Ref			
	Medium	0.366	(0.061_0.672)	0.019	0.155	(-0.019_0.329)	0.080	0.211	(0.028_0.393)	0.024	0.225	(-0.393_0.843)	0.473
	Low	0.248	(-0.093_0.590)	0.153	0.138	(-0.056_0.332)	0.163	0.110	(-0.093_0.314)	0.287	-0.108	(-0.798_0.583)	0.759
Self-reported general health	0.359	(-0.117_0.835)	0.139	0.302	(0.034_0.570)	0.027	0.057	(-0.228_0.342)	0.695	0.608	(-0.347_1.563)	0.211	
Week	-0.010	(-0.023_0.004)	0.159	-0.008	(-0.015_0.000)	0.046	-0.002	(-0.010_0.006)	0.640	0.001	(-0.027_0.028)	0.976	
BMI	0.013	(-0.017_0.043)	0.391	0.002	(-0.015_0.019)	0.782	0.011	(-0.007_0.029)	0.240	-0.007	(-0.067_0.054)	0.824	
General oral health knowledge	-0.077	(-0.147_-0.008)	0.029	-0.035	(-0.075_0.004)	0.078	-0.042	(-0.083_0.000)	0.047	-0.069	(-0.210_0.071)	0.332	
Knowledge about pregnancy oral health	0.015	(-0.111_0.142)	0.812	-0.023	(-0.094_0.049)	0.528	0.038	(-0.037_0.113)	0.319	0.082	(-0.171_0.335)	0.525	

OHIS-S: simplified oral health index; CI: confidence interval; LB: lower bound; UB: upper bound

Table 6. Associations between independent variables, including: socio-demographic characteristics, cognitive factors, self-reported general health, and oral health status by multiple linear regression

Dependent Variables	Independent Variables		Unstandardized Coefficient B	Standardized Coefficient Beta	95.0% Confidence Interval for B		Sig
					Lower Bound	Upper Bound	
DMFT	Age		0.324	0.314	0.194	0.454	<0.001
M	Age		0.151	0.347	0.096	0.205	<0.001
	General oral health knowledge		-0.183	-0.126	-0.364	-0.002	0.048
F	Age		0.125	0.170	0.031	0.219	0.009
	Women's Education	Without diploma	Ref				
		University Diploma	2.048	0.179	0.508	3.587	0.009
CI	Women's Education	Without diploma	Ref				
		University	-0.186	-0.127	-0.394	0.022	0.079
		Diploma	-0.164	-0.152	-0.314	-0.013	0.033
	Self-reported income	Good	Ref				
		Medium	0.200	0.191	0.018	0.382	0.031
DI	Women's Education	Without diploma	Ref				
		University	-0.216	-0.156	-0.408	-0.024	0.027
		Diploma	-0.141	-0.138	-0.282	0.001	0.052
	Self-reported general health		0.276	0.135	0.009	0.542	0.043
OHI-S	Women's Education	Without diploma	Ref				
		University	-0.399	-0.163	-0.746	-0.053	0.024
		Diploma	-0.320	-0.178	-0.570	-0.070	0.012
	Self-reported income	Good	Ref				
		Medium	0.152	0.078	-0.193	0.497	0.386
		Low	0.341	0.195	0.038	0.644	0.027

DMFT: decayed missed filled teeth

DMFT was higher in the older mothers (B=0.324, P<0.001). The younger mothers, and mothers with a higher knowledge about general oral-health had a lower number of missing teeth (B=-0.183, P=0.048).

On the other hand, the older participants had higher filled teeth, and those with an academic degree and diploma had more filled teeth than those women without a high-school diploma (B=2.048, P=0.009 and B=2.097, P<0.001, respectively).

The older participants had higher filled teeth, and those with an academic degree and diploma had more filled teeth than those women without a high-school diploma (B=

2.048, P=0.009 and B: 2.097, P<0.001 respectively).

Participants with diploma revealed lower calculus than those without a diploma (B=-0.164, P=0.033); also, those with a medium self-reported income had more calculus than women with a good self-reported income) B=0.200, P=0.031).

The women with an academic degree had lower debris index than women without a diploma (B=-0.216, P=0.027). Furthermore, the women reporting to have a systemic disease revealed more debris (B=0.276, P=0.043).

women with diploma or an academic degree

had lower OHI-S than women without a diploma ($B=-0.399$, $P=0.024$ and $B=-0.320$, $P=0.012$ respectively); moreover, those with a low self-reported income had more OHI-S than women with a good self-reported income ($B=0.341$, $P=0.027$).

No association was found between BMI, week of pregnancy, husbands' education, and knowledge about oral health during pregnancy with any of the oral health outcomes.

DISCUSSION

The mothers participated in this study have low oral-health general knowledge and low oral-health knowledge during pregnancy. The level of oral cleanliness (81%) and oral hygiene (65.6%) in most participants were intermediate and only 6.3% of the women were caries-free.

In this study the mean score of oral-health general knowledge, and oral-health knowledge during pregnancy were 4.1 (out of maximum 11, 37.45% of total score), and 1.6 (out of maximum 4, 40.5%), respectively, which may be estimated as a low level. Comparatively, a study in Singapore reported 38% of women with good knowledge [17]. Moreover, a study in Poland reported that 61% of women evaluate their oral-health awareness as limited and only 39% found it sufficient [18]. In a systematic review conducted in India, the overall score reflecting the state of oral-health knowledge of pregnant women was poor. Even though one study reported 67% of women having good oral-health knowledge, in the rest of studies, this score ranges between 0% to 50.5% [19]. In a study on Turkish women, just 47% knew that oral diseases can affect pregnancy outcomes [20]. In North Carolina, the women were reported to have limited knowledge on oral health issues [21]. Level of oral-health knowledge among pregnant women was low in most of the above-mentioned studies, which was in accordance with the obtained results. Nevertheless, the used scales to measure knowledge differed among the studies which makes the exact comparisons challenging.

Mean DMFT among pregnant women in the present study was 8.28 (SD: 5.7). In the previous Iranian studies, the average of this index ranged from 5.4 to 10.6 [12,13,22]. Based on results, mean of DMFT in the present study was higher than the result obtained from Italy (7.9), India (2.13) and KwaZulu-Natal, South Africa (7.18) while this index finding was lower than which reported in Lithuania (12.06), Poland (12.9) and Brazil (10 and 12.2). [1,10,18,23-26]

The mean of the decayed teeth (D) was 3.33, that was lower than the results reported in Lithuania (4.93), but higher than those reported in India (2.06), Brazil (2.52), and Italy [1,10,23,25]. The percentage of pregnant women with decayed teeth was 84.6%, higher than those reported in Brazil (73.9%), USA (24% to 41%), France (more than 50%), Hungary (69% of study population needed one or more restorative treatments), Pakistan (47%) and Thailand (74%); while this percentage was lower than the results reported in India (90%), in another study in Brazil (100%), and in Lithuania (99.9%) [1,8,9,25-28].

In this study, the mean of missing teeth due to dental caries (M) was 1.62. The mean of M component in India was 0.03 [23]. Among the respondents, 56.6% had at least one missing tooth. In a study in Brazil, 64.7% had missing teeth [26]. This mean was 1.5 in a study in Italy [10].

The mean of number of filling teeth (F) was 3.18 which was reported as 0.04 in India [23], 4.9 in Italy [10], 3.20 in Brazil [1], and 6.97 in Lithuania [25].

These variations in DMFT and its components in the various regions could be due to multiple factors such as differences in socioeconomic and cultural conditions, diet habits, oral-hygiene practices, and dissimilarity in the fluoride content of water. In this study, almost 95% of women had bleeding on probing, pointing out the presence of gingivitis. The prevalence of gingivitis was approximately similar to results from India (95% and 98%), and higher than findings from Brazil. (84.4%, 62%), and Thailand (86.2%); whereas this

number is lower than Nigeria (100%) [1, 8, 28-30]. Also, 84.6% of women had calculus which was higher than India (55.4%) [23]. Similar to previous studies, this study indicate that periodontal diseases are prevalent among pregnant women, hence oral-health improvements are recommended for this specific population. The mean of OHI-S in this study was 1.90, lower than India (2.87, 2.20 and 2.68) [23, 31, 32]; however, this score was higher than Lithuania (1.51) and Nigeria (1.3) [25,30].

According to the OHI-S index, 23.1% of the woman had good oral hygiene, whereas 65.6% of women had fair and only 11.3 % had poor oral hygiene. This figure is as 40.3% good, and 59.7% fair in pregnant women from Nigeria [33]; and 55% fair, and 35% poor in pregnant women from India [32]. These variations could be because of differences in oral-hygiene practices and dental check-ups frequency.

In the present study, there was a positive relationship between DMFT, M and F components with age, and similar to most previous studies, DMFT was positively associated with increased age [9,12,13,22, 25]. The relationship between the increasing score of DMFT and increasing age indicates that factors affecting the DMFT and missing teeth are aggregated in older age. Besides, there was a negative association between the M component and oral-health general knowledge. Desirable general knowledge may affect the opinions of persons about the importance of maintaining teeth. All the results indicate the need for planning to increase women's oral-health knowledge and the need to improve their oral-health practices as a step towards promoting oral health. Moreover, the study showed a positive association between filled teeth (F component) and education. This association could be due to the fact that with the increase in education, the socio-economic situation of individuals is improved and more likely they will seek treatment of decayed teeth. Moreover, in education levels of diploma or higher, CI and DI decreased. As in similar studies, there was an association between

periodontal status, OHI-S and educational level [10,12,30]. This may indicate that people with higher general education are more likely to receive better oral-health education. In comparison with women with a good self-reported income, those with a low self-reported income had worse CI, and those with a medium self-reported income had worse OHI-S. A reason for these observations could be that the women with a low or medium self-reported income could not afford the private treatment costs as much as those with a good self-reported income and they also may be uninformed about the reduced fees available in public health centers for pregnant women.

In this study, there was no association between BMI and dental status similar to findings from a study in Nigeria performed on all ages and gender groups [34]. In other studies, there was a significant relationship between these variables: for example, there was a positive association between BMI and DMFT in a study carried out on adults in Saudi Arabia [35], and an inverse relationship in a study of Saudi Arabian adolescents. [36]. In contrast in this study, there were no relationships between BMI and periodontal status like findings from a study on Brazilian adults [37]. Likewise, there are other studies from Mexico [38], and France [39] reporting that overweight or obese was associated with BOP, calculus, and PI, respectively. In this study, more than 60% of women had normal BMI which may have affected the outcome of the study. In present study, there was no association between the week of pregnancy and considered variables, while in a study conducted in India findings showed that by increasing in trimester there was a definite decrease in the mean of OHI-S and increase in BOP [31]. Some studies indicate an association between systemic diseases, such as diabetes, chronic kidney disease, [4] and bacterial pneumonia [6] with oral health, which is in accordance with the present study in which a positive association between self-reported general health and debris index was seen. This may be caused as such patients pay less attention to cleaning their mouth due to

their systemic condition.

The present study had significant strengths. First of all, a large-scale study was carried out for the first time in Tehran, the capital city of Iran. In total, 87.6% of the respondents answered questionnaire, which was relatively a high response rate. This study was multi-centered: half of the samples were selected from non-affluent areas and a half from affluent areas.

Sampling in this study was performed from public-health centers, and in future works inclusion of private centers is suggested. The study was conducted only on pregnant women in Tehran and this may limit generalizing the findings to pregnant women through Iran. Note that Tehran is a metropolitan multi-cultural city with 14 million inhabitants. This study addresses several important background factors and confounding variables. However, it's important to acknowledge that certain elements, such as prior pregnancy experience, were not taken into consideration. The study primarily examines direct relationships between variables, but it's worth considering the exploration of indirect connections between these factors as another promising avenue for future research. Further studies could potentially investigate both indirect relationships between variables and incorporate additional factors like previous pregnancy experience for a more comprehensive analysis.

CONCLUSION

This study suggests that general oral-health knowledge and knowledge about oral health during pregnancy was low, while the cognitive factors were associated with higher teeth maintenance. Even though pregnant women in Iran are offered free oral-health care and some free dental treatments in public-health centers, their dental condition was not satisfactory and most of them had fair oral hygiene based on OHI-S. It is recommended that more effective programs be developed to improve oral-health practice and oral-health knowledge of pregnant women.

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CONFLICT OF INTEREST STATEMENT

None declared.

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