

## Dental caries status and its associated factors in pregnant women, Shiraz, Iran, 2014

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Dental caries is a common problem in pregnant women which has negative impacts on their quality of life. The aim of this study was to evaluate pregnant women's dental caries status and its associated risk factors in Shiraz, Iran, in 2014.

**METHODS:** In this cross-sectional study, we selected 423 pregnant women attending Shiraz governmental health centers for routine obstetric examinations by randomized cluster sampling. The women's dental caries status was assessed using decayed, missed, and filled tooth (DMFT) index. The women's demographic characteristics and their oral hygiene habits were evaluated using a valid and reliable questionnaire. The relationship between women's DMFT index and their demographic and oral hygiene characteristics was evaluated using Pearson correlation, analysis of variance, independent sample t-tests, and multiple linear regression models.

**RESULTS:** The mean DMFT index was  $5.8 \pm 3.6$ . We found lower scores of DMFT index in women who were younger ( $P < 0.001$ ), brushed their teeth more ( $P = 0.014$ ), and used home preventive measures such as mouthwash ( $P = 0.003$ ) and toothpick ( $P = 0.006$ ).

**CONCLUSION:** Dental caries status of the pregnant women was unacceptably lower than optimal. Interventions focusing on holding educational programs and taking office-based preventive measures for pregnant women or women who intend to be pregnant are recommended. The interventions are more necessary for older pregnant women and those who use fewer home preventive measures.

**KEYWORDS:** Dental Caries; Iran; Pregnancy

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Dental caries is caused by localized dissolution and destruction of calcified parts of the teeth.<sup>1,2</sup> It is the most prevalent infectious disease.<sup>3,4</sup> Its prevalence in adult population of developed countries is 40%-50%.<sup>5</sup> There are several indices for evaluating dental caries in a community; however, the most popular one is decayed missing filled teeth (DMFT) index.<sup>6</sup>

Dental caries is more prevalent among women than men. DMFT index in 15- to

24-year-old women has been reported twice higher than that of men in the same age.<sup>7</sup> One of the reasons for the high prevalence in women is the changes that occur during pregnancy. It is hypothesized that the risk of tooth decay in pregnancy could be increased because of changes in the saliva composition, repeated gastric reflux and vomiting. Furthermore, poor oral hygiene and changes in dietary habits like craving for carbohydrates during pregnancy can exacerbate the effect of such changes.<sup>8-10</sup>

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The prevalence of dental caries during pregnancy in different studies conducted in different countries has been reported differently. The prevalence was reported from 41% to 52% in the developed countries.<sup>11-13</sup> However, it was about 100% in two studies conducted in developing countries.<sup>14,15</sup> Furthermore, the mean score of DMFT index in pregnant women was reported 10 to 18.5 in developing countries<sup>14-16</sup> while it was 7.9 in a study done in Italy.<sup>13</sup> The reported prevalence of dental caries in pregnant women living in different parts of a country has also been different. For example, in India, the prevalence was described from 60% to 87%.<sup>17-19</sup> This is also the case in Iran. In Iran, the mean scores of DMFT index in Isfahan<sup>20</sup> and Mashhad,<sup>21</sup> were around 10 while the score was 6.2 and 5.4 in Ahvaz<sup>22</sup> and Arak,<sup>23</sup> respectively. However, to the best of our knowledge, no study has assessed the status of dental caries in pregnant women in Shiraz, a large city in the south of Iran.

Different studies have also reported different risk factors for dental caries in pregnant women. Socioeconomic status such as education level, employment during pregnancy, monthly family income and insurance coverage<sup>12,23,24</sup>, age<sup>19,20</sup>, gestational age,<sup>19</sup> number of previous pregnancies,<sup>20</sup> interval between pregnancies,<sup>20</sup> frequency of oral hygiene practice such as tooth brushing and applying fluoride toothpaste,<sup>24</sup> and knowledge about dental health care<sup>24</sup> were shown to be associated with dental caries in pregnant women.

Dental caries can lead to adverse consequences during pregnancy.<sup>19,20,23</sup> It often leads to painful and stressful situations negatively affecting the quality of life of pregnant women.<sup>25</sup> Moreover, because of pain, pregnant women may use analgesics and/or other medications with unpredictable risks for the health of fetus.<sup>26</sup> Therefore, reducing the prevalence of dental decay in pregnant women is of great importance. To hold interventional programs in this regard, the authorities require epidemiological data

indicating the current status. Although a few studies in this regard have been conducted in Iran, to the best of our knowledge, no research has evaluated the prevalence of dental decay and its associated factors in pregnant women in Shiraz. Because of a wide variance of the prevalence rate in different places, we were prompted to conduct this study.

## Methods

This cross-sectional study was done in Shiraz. The target population was pregnant women attending the governmental health centers affiliated to Shiraz University of Medical Sciences for routine obstetric examination from February to May 2014. Having considered  $\alpha = 0.05$ ,  $\delta = 3$ , and  $d = 0.3$ , the sample size was determined to be at least 387 to estimate mean DMFT indices. The participants were selected by randomized cluster sampling. To do the sampling, we wrote the name of all governmental health centers located in Shiraz ( $n = 88$ ) and selected 11 out of them by balloting. All women attending each selected center in a single day (totally 423 women) were requested to contribute in the study. The women who consented to contribute were included.

By using the World Health Organization (WHO) oral health questionnaire (version 2013) and considering the WHO criteria for DMFT index, we assessed the related indices of the pregnant women.<sup>27</sup> Two faculty members of the Department of Oral Medicine trained a senior dental student on how to measure the DMFT index. The student examined the women using a plane mouth mirror and WHO probe. Also, gauze or cotton rolls and a flashlight were used for field dryness and illumination. Dental examination was conducted in a systematic manner from one tooth to the adjacent one. The student recorded a tooth as decayed when he found a damaged enamel or a cavity or lesion on a tooth surface, or. A tooth was considered filled when it had permanent restorations. Also, the teeth extracted because of caries were recorded as missed. For the

purpose of diagnosing caries, radiography was not used because it was impossible to utilize the equipment in most field situations.<sup>27</sup> To evaluate intra-rater reliability, we conducted a pilot study on 20 women and the student examined the women twice two weeks apart. The intraclass correlation coefficient (ICC) between the calculated DMFT indices revealed a high agreement (ICC = 0.98,  $P < 0.001$ ).

To obtain data on the women's demographic and oral health status, we prepared a questionnaire and its content validity was confirmed by the faculty members of the department. The questionnaire consisted of two parts: demographic information (8 questions), and oral health status (4 questions). Reliability of the questionnaire was assessed using the above mentioned pilot study in which pregnant women were interviewed twice at an interval of two weeks to fill out the questionnaire. The agreement between the two measures was assessed using Kappa coefficient (Kappa = 0.625 and  $P = 0.005$  for frequency of tooth brushing, Kappa = 0.784 and  $P < 0.001$  for other home preventive measures, and Kappa = 0.732 and  $P = 0.001$  for dental visits).

The data were analyzed using SPSS software (version 18, SPSS Inc., Chicago, IL, USA) to determine the mean DMFT index. Independent sample t-test, analysis of variance (ANOVA, with Duncan post hoc test), and Pearson correlation test were used to evaluate the association between DMFT index and demographic and oral health factors. To control the confounding factors, we entered all demographic and oral health characteristics into a multiple linear regression model considering the DMFT index as the dependent variable. For all analyses, statistical significance was set as  $P < 0.05$ .

The Research Ethics Committee of Shiraz University of Medical Sciences approved the study protocol (Ethical code #ec-9375-7125). Informed consent was obtained from all participants. The DMFT index of the

pregnant women was determined without using any radiological procedures. The clinical examinations were performed for all women in the presence of a female health care worker. The name of the participants was not recorded in their questionnaires. Only the research team could have access to the data.

## Results

**Description of the participants:** Of the 423 pregnant women who were asked to participate in the study, 381 (90%) agreed to be interviewed. The women's age ranged from 16 to 41 years (median = 27 years) and their gestational age varied from 4 to 39 weeks (median = 27 weeks). Most of them did not have a university degree and were homemakers (Table 1).

**Oral health status of the studied pregnant women:** Of the studied women, 72.1% reported that they brush their teeth once or more per day. About half of them did not use any other preventive measures. Only 81 women (21.0%) had a prior dental visit for check-up (Table 1). Mean  $\pm$  standard deviation (SD) DMFT index was  $5.8 \pm 3.6$  (range: 0-18). The mean  $\pm$  SD decayed, missed, and filled teeth of the women were  $1.3 \pm 1.5$ ,  $2.7 \pm 2.3$ , and  $1.7 \pm 2.1$ , respectively.

**The association between the women's demographic characteristics and their dental caries:** There was a statistically significant association between the women's DMFT index and their age; the older the women, the higher the DMFT index ( $r = 0.378$ ,  $P < 0.001$ ). Furthermore, the mean DMFT index of the women with self-employed husbands was higher than that of those whose husband were employee ( $P = 0.042$ ) (Table 1).

**The association between the women's pregnancy status and their dental caries:** We did not find a significant association between women's gestational age and their DMFT index ( $r = 0.08$ ,  $P = 0.097$ ). However, we found a significant relationship between the women's DMFT index and the number of their pregnancies ( $P < 0.001$ ). Post hoc test

revealed a significant difference between the mean DMFT index of the women in their first and second pregnancies and that of the women in their third pregnancy or more ( $P < 0.001$ ) (Table 1).

**The association between the women's oral hygiene status and their dental caries:** To evaluate the effect of home preventive measures, we compared the mean DMFT index of the following 4 groups: the women who used dental floss, those who used tooth pick, those using mouth wash, and those who did not use any of these measures. A significant difference was shown among the 4 groups ( $P = 0.011$ ). Furthermore, post hoc test showed a significant difference between

DMFT index of the women who used mouth wash with that of those who did not use any of these measures, but it did not show a similar difference between the mean DMFT index of the women using dental floss or tooth pick and that of the women who did not. Mean DMFT index of the women who had a prior dental check-up was significantly lower than that of the women without such check-ups ( $P = 0.019$ ) (Table 1). However, we could not find a significant difference between the mean DMFT index of the women who had dental check-ups in different times, i.e. during the present pregnancy, during 6 months before pregnancy, and more than 6 months before pregnancy ( $P = 0.972$ ).

**Table 1.** Demographic characteristics and the factors affecting decayed, missed, filled tooth (DMFT) index of the pregnant women attending governmental health centers in Shiraz

Woman's characteristics (n = 381)	Values	DMFT (mean ± SD)	P
Demographic characteristics	Age (year) (mean ± SD)	28.10 ± 5.34	-
	Education [n (%)]		0.318**
	Without university education	295 (77.4)	5.86 ± 3.73
	With university education	86 (22.6)	5.42 ± 3.31
	Woman's occupational status [n (%)]		0.626**
	Homemaker	361 (94.8)	5.74 ± 3.66
	Employed	20 (5.2)	6.15 ± 3.23
	Husband's education [n (%)]		0.166**
	Without university education	260 (68.2)	5.93 ± 3.86
	With university education	121 (31.8)	5.41 ± 3.10
	Husband's occupational [n (%)]		0.042**
	Self-employed	286 (75.1)	5.96 ± 3.79
	Employee	95 (24.9)	5.17 ± 3.07
	Insurance status [n (%)]		0.126**
With insurance	340 (89.2)	5.66 ± 3.62	
Without insurance	41 (10.8)	6.58 ± 3.74	
Pregnancy status	Gestational age (month) (mean ± SD)	25.80 ± 8.50	-
	Pregnancies number [n (%)]		< 0.001*
	One	156 (40.9)	4.97 ± 3.50***
	Two	137 (36.0)	5.73 ± 3.47***
Three or more	88 (23.1)	7.23 ± 3.72 <sup>#</sup>	
Oral hygiene status	Tooth brushing frequency [n (%)]		0.084**
	Once or more per day	275 (72.1)	5.45 ± 3.40
	Less than once per day	106 (27.8)	6.10 ± 3.86
	Other preventive measure [n (%)]		0.011*
	None	176 (46.2)	6.20 ± 3.82***
	Dental floss	135 (35.4)	5.76 ± 3.48***
	Tooth pick	63 (16.5)	4.89 ± 3.31***
	Mouth wash	7 (1.8)	2.71 ± 2.14 <sup>#</sup>
	Dental check-up [n (%)]		0.019**
	No	300 (78.7)	6.60 ± 4.12
Yes	81 (21.3)	5.54 ± 3.47	
In present pregnancy [n (%)]	25 (6.6)	-	
< 6 month before pregnancy	22 (5.8)	-	
≥ 6 month before pregnancy	34 (8.9)	-	

SD: Standard Deviation; DMFT: Decayed, missed, filled tooth

\*One-way ANOVA, \*\*Independent sample t-test, \*\*\*<sup>#</sup>Different symbols show statistically significant differences

**Table 2.** Multiple linear regression model for the factors affecting decayed, missed, filled tooth (DMFT) index of the pregnant women attending governmental health centers in Shiraz

Independent variables (n = 381)	$\beta$	SE	P
Number of pregnancies (/three or more)			
One	-0.41	0.55	0.458
Two	-0.45	0.50	0.362
Woman's education level (/with university education)			
Without university education	0.09	0.52	0.865
Woman's occupational status (/employed)			
Housekeeper	-0.08	0.83	0.919
Husband's education level (/with university education)			
Without university education	-0.07	0.47	0.876
Husband's occupational status (/employee)			
Self-employed	0.57	0.49	0.244
Insurance status (/without insurance)			
With insurance	-0.80	0.58	0.171
Frequency of tooth brushing (/less than once daily)			
Once or more per day	-1.01	0.41	0.014
Other home preventive measure (/none)			
Dental floss	-0.32	0.40	0.419
Tooth pick	-1.38	0.49	0.006
Mouth wash	-3.92	1.30	0.003
Dental check-up (/no)			
Yes	0.64	0.43	0.137
Age (year)	0.23	0.04	< 0.001
Gestational age (week)	0.02	0.02	0.369

SE: Standard error

**Multiple linear regressions analysis:** No significant association was found between the women's DMFT index and their number of pregnancies, their husband's occupational status, and having dental check-ups. However, there was a significant relationship between the women's DMFT index and their age ( $P < 0.001$ ), frequency of tooth-brushing ( $P = 0.014$ ), and using tooth pick ( $P = 0.006$ ) and mouth wash ( $P = 0.003$ ). If the women brushed their teeth once or more per day, their DMFT index would decrease about 1.01. One year increase in the women's age led to 0.23 increases in their DMFT index. Using tooth pick and mouth wash as home preventive measures caused 1.38 and 3.92 decrease in the women's DMFT index, respectively (Table 2).

## Discussion

This study evaluated dental caries status and its associated factors in pregnant women in Shiraz in 2014. We found unacceptable oral hygiene habits and high dental caries in the pregnant women. There was a significant

association between the women's DMFT index and their use of home preventive measures.

### Oral health status of pregnant women:

Oral health habits of the pregnant women in our study were worse than those in other countries. In our study, 72.1% of the pregnant women versus 84.0% in Spain,<sup>28</sup> 86.2% in Lithuania,<sup>14</sup> 99.1% in Italy,<sup>13</sup> and 94.0% in Kuwait<sup>29</sup> reported daily tooth brushing. In addition, only half of the women in our study versus two-thirds of Kuwaiti pregnant women<sup>29</sup> had used other preventive measures. Considering poor oral hygiene in pregnant women, we recommend that dentists and oral health care providers should instruct pregnant women regarding their oral hygiene habits.

Only one-fifth of pregnant women in the present study had a prior dental check-up while more than half of the pregnant women in Spain had regular dental check-up.<sup>28</sup> To decrease the consequences of dental problems during pregnancy, the problems should be diagnosed and treated before pregnancy.

Therefore, women should be educated about the importance of regular dental visit before pregnancy. Furthermore, for better management of dental problems during pregnancy, prenatal care providers should encourage all pregnant women to visit a dentist and follow the dentists' recommendations.

#### *Dental caries status of pregnant women:*

In our study, the mean score of DMFT index in the pregnant women was 5.8. The score was lower than that of Iranian adults (35-44 years old) which was  $11.0 \pm 6.4$ <sup>30</sup> and higher than that of Iranian adolescents (14-18 years old) which was  $2.61 \pm 1.89$ .<sup>31</sup> Furthermore, other Iranian studies reported the scores in pregnant women ranging from 5.4<sup>23</sup> to 10.6.<sup>20</sup> Also, the scores ranging from 7.9 to 18 were shown in pregnant women of other countries.<sup>13-15</sup> Several factors were shown to be effective on the score in pregnant women such as dietary habits,<sup>1</sup> oral hygiene,<sup>28</sup> the use of fluoridated toothpastes,<sup>1</sup> level of fluoride in drinking water,<sup>32</sup> and access to oral health services.<sup>11</sup> The high scores of DMFT index in pregnant women highlight the urgent need for interventional programs to promote oral health in this population. Pregnant women and those who intend to be pregnant should be considered as a target group for oral health promotion programs and oral health services should be more accessible and affordable for them. Pregnant women should be educated about proper oral hygiene techniques and appropriate non-cariogenic diet. Furthermore, the fluoride level of drinking water should be optimal in all regions.

In our study, similar to researches conducted in other developing countries,<sup>9,18,19</sup> untreated dental caries constituted a major proportion of DMFT index scores; however, in developed countries, the filled teeth had the highest proportion.<sup>11,13</sup> This finding emphasizes the importance of free, or with a minimum charge, dental check-up before and during pregnancy. Furthermore, in our study, similar to the one from Lithuania, many missed teeth were found in the

pregnant women.<sup>14</sup> These findings can show the women's lack of awareness about the importance of their teeth and highlight the need for training on oral hygiene and consequences of tooth loss.

***Factors affecting pregnant women's dental caries:*** Our results, similar to other studies done in Iran and other countries,<sup>9,11,14,19,20</sup> showed a significant positive correlation between the pregnant women's DMFT index and their age. This may be because of the cumulative effect of various risk factors in women's teeth during years. The results highlight the importance of interventional programs about oral hygiene habits for older pregnant women.<sup>33,34</sup>

Our study, similar to other studies<sup>23,24,28,35</sup> showed a significant association between the women's DMFT index and their oral hygiene habits such as frequency of tooth brushing and the use of other home preventive measures. Because preventive measures lower the environmental opportunities of microbial growth in the mouth, taking such measures leads to fewer dental caries. The high prevalence of dental caries in pregnant women highlights the importance of holding interventional programs to improve the women's oral hygiene habits. Pregnant women should be educated on the importance of oral hygiene and proper techniques of preventive measures.

In our study, univariate analysis showed higher scores of DMFT index in the pregnant women with more previous pregnancies. Another Iranian study<sup>20</sup> and the studies conducted in Hungary<sup>36</sup> and the US<sup>37</sup> also showed similar findings. The mentioned studies considered pregnancy as a risk factor for women's tooth decay.<sup>37</sup> Although pregnancy does not have any direct effect on the dental caries,<sup>8,20,24</sup> the high prevalence of dental caries in pregnant women may be because of the changes in the saliva composition, repeated gastric reflux, and vomiting.<sup>8</sup> However, in our study, multivariate analysis could not confirm the association.

In the current study, univariate analysis also

showed a significant relationship between the occupation of the women's husband, a good determinant of socioeconomic status of family, and the women's DMFT index. Low socioeconomic status was reported as a risk factor for pregnant women's dental caries in other studies, as well.<sup>12,20,23</sup> The finding might be because of more pregnancies, poor dietary habits, and oral hygiene in the women of low socioeconomic families. Thus, after controlling the confounding factors, using multivariate analysis, there was not a significant relationship between the women's DMFT index and determinants of socioeconomic status.

This study had some limitations. First of all, it was a cross-sectional study and all limitations of this type of study are possibly present. Furthermore, because some pregnant women in Shiraz attended private health centers for routine obstetric examinations, our selected participants attending governmental health centers in Shiraz might not be a true representative of the general population. Also, an important risk factor of dental caries in pregnancy, excess usage of carbohydrates, was not evaluated in this study. For better evaluation of the risk factors of dental caries in pregnant women, a prospective cohort study in all pregnant women is recommended.

### Conclusion

We found unacceptably poor oral hygiene and high dental caries in the studied pregnant women. This may show the

inadequacy of the current programs for prevention of pregnant women's dental caries. To establish new interventional programs, authorities should consider the pregnant women as a target group for oral health promotion programs and oral health services should be provided for them with a more accessible and affordable manner. Women in childbearing age, especially pregnant women and those who intend to be pregnant, should be encouraged to have regular dental visits. Furthermore, oral health education programs are necessary for these women. They should be educated on the importance of oral hygiene in pregnancy and the proper techniques of home preventive measures such as tooth brushing and mouth washing. We recommend the educational programs to be held especially for older pregnant women and those who use fewer home preventive measures.

### Conflict of Interests

Authors have no conflict of interest.

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