

The effect of training interventions on the psychological factors of oral health in pregnant women

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Abstract

Background and aim: Oral health is crucial for high-risk pregnant women in order to preserve their health and the health of their infants. Therefore, this study aimed to determine the impact of training programs on the behavior of pregnant mothers concerning oral health in Khorramabad, Iran.

Methods: This is an educational experimental study carried out in 2015 on 164 pregnant women referring to health centers in the city of Khorramabad who were randomly divided into two groups (each n=82). The instruments for data collection included a questionnaire based on the Health Belief Model regarding oral health and two checklists of oral health indexes (OHIS and DMFT). Data were analyzed using SPSS 20 via paired-samples t-test, independent-samples t-test and Chi-square.

Results: The mean score of knowledge and performance, and the variables of the components of the Health Belief Model including the perceived susceptibility, severity, benefits, barriers and self-efficacy regarding the oral health care, significantly increased in the intervention group following the training intervention ($p < 0.001$). However, the DMFT index did not show any changes after the intervention in the intervention and control groups ($p = 0.381$). On the other hand, the OHIS index significantly decreased in the intervention group as compared with the pre-intervention scores ($p = 0.002$).

Conclusion: The results of this study showed that training based on the Health Belief Model leads to the enhancement of performance regarding oral health in pregnant women and thus prevents any increase in OHIS and DMFT levels during pregnancy.

Keywords: Pregnant women, Health Belief Model, OHIS, DMFT

1. Introduction

Tooth decay is a common disease among human populations. Although it threatens all age groups and both genders, some groups are more vulnerable to tooth decay due to their specific physiological conditions (1). Hormonal and nutritional changes in pregnant women predisposes them to develop gum disease and dental caries. On the other hand, nausea and vomiting in early pregnancy makes the oral environment conducive to tooth decay. Furthermore, the prevalence of gingivitis in pregnant women is 36% to 100% (2). Studies have shown that there is a strong

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relationship between poor oral hygiene and poor pregnancy outcomes, such as low birth weight, preeclampsia, and preterm labor. Additionally, poor oral hygiene during pregnancy increases the chances of early tooth decay among the born children (3). However, despite the importance of this issue, research has shown that pregnant women do not adequately adhere to oral health. For instance, a study showed that 63% of pregnant mothers increase the consumption of high sugar foods during pregnancy, 65% of these women brushed their teeth only once a day, and 59% of them experienced bleeding from the gums while brushing their teeth (4). Various studies conducted in different societies have reported that the prevalence of tooth decay among pregnant women is between 23 to 43 percent and the average DMFT index value is higher among pregnant women as compared with the general population (5, 6). In a study by Burgess et al., the mean DMFT index value in pregnant women referring to health care centers in Manaus, the Amazon, and Brazil was 10, and the index of missing teeth was the most salient with a score of 4.28. Results also showed that 62% of pregnant women had moderate gingivitis and 64% of them had a minimum level of dental plaque (7). This index value was calculated by Gharizadeh et al. in a study among pregnant women in Ahvaz, Iran as 6.23 ± 3.01 (8). In the study of Shamsi et al. in Arak, Iran, the average DMFT index score in pregnant women was 5.4 ± 2.83 (9). On the other hand, it is believed that dental plaque plays a role in tooth decay, and the goal of oral health is the removal of this microbial layer from all dental surfaces (10). A systematic literature review by Vamos et al., conducted to investigate the effect of training interventions during pregnancy to enhance oral health status, indicated that few oral health interventions have been carried out regarding dental plaque and calculus (11). Therefore, in this study, in addition to dental caries index (DMFT), plaque and dental calculus index (OHIS) was also studied among pregnant women. These figures indicate the necessity of planning for the prevention of dental caries in all population groups and especially pregnant women as a vulnerable group. In order to achieve this goal, researchers have used models to help them change the participants' behavior. The Health Belief Model (HBM) is one of the effective models used in training and health promotion (12). In this study, perceived susceptibility (the attitude of the mothers about how much they perceived themselves to be susceptible to caries) and perceived severity (the attitude of the mothers about the seriousness and the complications arising from tooth decay for both themselves and the fetuses) were assessed. The combination of these two factors makes up the mothers' perceived threat regarding this disease. The perceived threat along with perceived benefits (i.e. the analysis of the benefits obtained from proper oral health) and perceived barriers (i.e. the analysis of the potential obstacles to preemptive measures taken to prevent the development of tooth decay) together with perceived self-efficacy of the mothers, lead them towards appropriate behavior. Mazlumi et al. studying female high school students in Yazd, Iran, using the Health Belief Model, demonstrated that there is a significant relationship between the scores of perceived severity and perceived barriers with the score of oral health behaviors (1). Additionally, the study by Shamsi et al. conducted on pregnant women living in Arak, Iran using the Health Belief Model showed that the performance score of the intervention group increased after the intervention (13). Based on these studies, in order to plan for oral health training, it is necessary to take account of individuals' understanding and perception of the health problems. In order to achieve this goal, knowledge of the factors affecting behavior change will facilitate the actualization of change. Therefore, it is essential to investigate the factors affecting the adoption of preventive measures against dental decay in pregnant women using models that identify and reinforce factors influencing this behavior. Given the fact that previously, no interventional study based on the Health Belief Model had been conducted in Iran to help reduce the dental decay, plaque, and calculus indices among pregnant women, this study aimed to design and evaluate a systematic training program in order to improve the health of mothers and their children.

2. Material and Methods

2.1. Research design and participants

The present study was an educational experimental study that was carried out in 2015, in which the studied population included pregnant mothers referring to the health and treatment centers of Khorramabad, Iran. The sample size was calculated as 63 individuals based on the following formula. Considering a possible 30% dropout rate, the final sample size was set at 82 individuals for each of the control and intervention groups.

2.2. Selection criteria

Inclusion criteria included the primiparity of the pregnant mothers residing in Khorramabad, being at least literate, and giving informed consent to participate in the study. Exclusion criteria included being employed in professions related to dentistry, suffering from advanced oral and dental disease, and not being pregnant. In this study, primiparous mothers were selected so that the participants would not have an experience of previous training by midwives or any personal experience in terms of dental care during pregnancy, and also they would not have been affected by dental changes during previous pregnancies. Additionally, literate mothers were selected so that the

participants could understand the questionnaire items and also in order to better assess the variables of the questionnaire.

2.3. Sampling method

In this study, the multistage random sampling method was used. To increase the dispersion and increase the accuracy of the study as well as covering the social and cultural characteristics of the studied population, first, the city of Khorramabad was divided on the map into 5 regions (strata) North, South, Center, East and West. Within each geographic area (stratum), some urban health centers or bases (cluster heads) are present. From the available health centers (cluster heads) 2 centers / bases were selected randomly for sampling (a total of 10 centers / bases all over the city). The centers were then randomly divided into the intervention and the control groups. Within each center, a specific number of samples were chosen depending on the size of the covered population.

2.4. Instrument and procedures

The data collection instrument was a questionnaire composed of the three parts: 1) Demographic data (demographic questions included age, education level, occupation, weeks of pregnancy, socioeconomic status, health insurance coverage status of the mother), 2) A checklist recording DMF (D = decayed teeth, M = missing teeth, F = filled teeth), and the OHIS (an index indicating the level of dental plaque and calculus), 3) The third part included questions about the dimensions of the Health Belief Model. The decayed, missing, and filled teeth index (DMFT) and the Oral Hygiene Index Simplified (OHIS) were completed by a dentist during examinations (both before and after the training program). The teeth were examined individually and with the help of a dental mirror and sterile catheters. The DMFT criteria were used to evaluate the amount of tooth decay, and the OHIS index was used to investigate dental plaque and calculus based on the method of Greene and Vermilion. This index is actually a combination of two indicators of the amount of dental plaque and calculus. The value of OHIS is obtained as a result of a numerical sum of these two index values. In this method, 6 surfaces of six teeth are examined. The examined teeth included 4 posterior teeth of the upper and lower quadrants and two anterior teeth. To determine the amount of debris, as well as dental plaque and calculus, each of the aforementioned surfaces was examined carefully. The extent and amount of debris, dental plaque, and calculus on the tooth surface were examined and scores of from zero to one were assigned. Zero meant that no debris is present on the tooth surface and 1 meant that debris and plaque covered two thirds of the surface of the tooth. After recording the score of debris and plaque, the oral hygiene index was calculated. For each subject, the debris score of surfaces were added and then were divided by the number of the examined surfaces. The total score is determined by the average of the individual. The average score of a person or group is called the debris index. The same method was used for determining the plaque index in this study. The sum of the two averages of the debris and plaque index is called the oral hygiene index - simplified (OHIS) (14) In order to prevent errors related to the differences between the participants, all dental examinations were performed by a dentist before and after training.

The questions related to the HBM model included questions of susceptibility (eight questions including how much the mothers considered themselves at risk for dental caries and whether they considered themselves more vulnerable to caries compared to the general population), questions related to severity (seven questions including questions about complications that occur for the mother or fetus as a result of tooth decay, and so on), questions related to perceived benefits (10 questions consisting of questions about the benefits of oral health behaviors including prevention of tooth decay, avoidance of wastage of money, and a positive effect on the health of the fetus, etc.), perceived barriers (12 questions including items regarding unfamiliarity with the proper techniques of brushing the teeth and using dental floss, lack of time and money to visit a dentist, a sense of boredom and impatience during pregnancy, etc.), questions of self-efficacy (8 questions including the ability to properly brush and floss, the ability to overcome the drowsiness and lethargy, and the ability to start a diet with less sugar and sweets, etc.). All questions of the attitudinal segments were based on a standard 5-point Likert scale and ranged from “totally agree” to “totally disagree”. The performance checklist included 12 questions in different fields such as the manner of brushing, flossing, regular visits to the dentist, and the use of fluoride mouthwash after nausea and vomiting. The first item (manner of brushing) was measured and recorded by the direct observation of the performance of the mother on a human teeth model and the other items were completed in a self-report questionnaire.

In terms of scoring, in the awareness section, the correct answer got a score of 1 and the wrong answer was given a score of zero. In the perceived susceptibility, severity, benefits, barriers and self-efficacy section, the scores for each question ranged from 0 to 4, such that the “totally disagree” answer got zero points, “disagree” got a score of 1, “have no idea” got a score of 2, “agree” was given a score of 3, and “strongly agree” received 4 points. In the

performance checklist, each appropriate behavior received a score of 1 and each inappropriate behavior received a score of 0. The total score of each of these areas (awareness, perceived susceptibility, severity, benefits, barriers, self-efficacy and performance) was 100. The validity and reliability of these instruments have been verified in the study of Mohsen Shamsi entitled “of oral health behaviors in pregnant women in Arak, an application of the Health Belief Model” (9). In the mentioned study, the validity of the data collection instrument was assessed using content validity via an extensive literature review. The general reliability of the whole instrument was confirmed with a Cronbach alpha of 0.84. The reliability of the perceived susceptibility section of the questionnaire was 0.73, that of perceived severity was 0.70, the reliability of the perceived benefits section was 0.75, that of perceived barriers was 0.71, that of the action guide section was 0.73, and the reliability of the self-efficacy section was 0.76, which fact confirms the reliability of the difference sections of the questionnaire. The reliability of the performance checklist was obtained using Cohen’s Kappa inter-rater agreement coefficient as 0.89.

Before the intervention, data were collected through the aforementioned questionnaires in both groups. Next, the training intervention was conducted for the intervention group during one month in 4 sessions of 60 minutes each. For this purpose, at the beginning of the intervention, an educational video about oral and dental diseases was shown to the intervention group, so that the mothers could become interested in the issue and better participate in the training, and then the session continued with questions and answers about the topic. These training sessions continued with familiarizing pregnant mothers with oral and dental diseases (for example raising the awareness of the mothers regarding the structure of mouth, teeth, and the surrounding tissues, the characteristics of a healthy gum, the symptoms and complications of oral and dental disease during pregnancy, the effect of hormonal factors on the predisposition to dental caries during pregnancy, some of the factors affecting tooth decay like the role of microbial agents, saliva, nutrition, etc., the benefits of flossing to prevent tooth decay, the right time to do dental exams during pregnancy, the needed frequency of oral examinations during pregnancy, methods of prevention of dental caries, the right time to replace toothbrushes, etc.). Additionally, group discussion sessions were held among the pregnant mothers with the purpose of increasing perceived susceptibility, severity, benefits, self-efficacy and reducing barriers with regard to oral and dental health care. In these sessions, the pregnant mothers discussed with the health care educator such topics as the statistics and figures of tooth decay among women during pregnancy, the greater importance of oral hygiene and dental care during pregnancy, the effects of diet and nutritional changes during pregnancy and the increased risk of tooth decay, the impact of hormonal changes on the increased risk of dental caries during pregnancy, regular visits of expectant mothers to health care centers on the set dates for oral and dental examinations during pregnancy, their self-confidence and abilities to learn the correct methods of brushing and flossing their teeth. Moreover, they talked with successful individuals including other mothers who had healthy teeth as a result of proper oral and dental hygiene. The proper techniques of brushing and flossing were taught by a dentist using practical demonstration strategies in a step by step manner. For lasting impact, training materials such as videos and educational pamphlets were put at the disposal of the intervention group. No training was provided for the control group. But in order to follow the principles of research ethics, educational pamphlets were made available to them after the completion of the post-test questionnaires.

2.5. Ethics of research

To observe ethical considerations, the mothers were briefed, the importance and objectives of the study were explained to them, written consents were obtained, and the participants were assured of the confidentiality of the information. Despite problems such as the dropout of some participants, the post-test questionnaires were filled out again three months later.

2.6. Statistical analysis

The data were analyzed using IBM® SPSS® Statistics version 20 (IBM® Corp., Armonk, NY, USA) via descriptive statistics such as mean, standard deviation and relative and absolute frequency distribution tables and analytical statistics including paired-samples t-test, independent-samples t-test and Chi-square test.

3. Results

A comparison of the two groups before the intervention showed that in terms of individual and demographic characteristics, there were no significant differences between them. As can be seen, the average age of the mothers in the intervention group (27.5 ± 5.77 years) and the control group (27.6 ± 38.41 years) were not significantly different ($p=0.9$). The independent-samples t-test also showed that there was no significant difference between the mean weeks of pregnancy in the intervention group (10 ± 1.67) and in the control group (9.1 ± 47.59) ($p=0.07$) (Table 1). The studied psychological factors including awareness ($p=0.736$), perceived susceptibility ($p=0.299$), perceived

severity ($p=0.306$), self-efficacy ($p=0.210$), and DMF ($p=0.630$) showed no significant differences between the two groups before the intervention. But the perceived barriers ($p=0.000$) and the OHIS index ($p=0.000$) were significantly different. (Table 2).

Table 1. Some personal characteristics and underlying variables in the control and interventions groups consisting of pregnant mothers living in Khorramabad, Iran.

Demographic characteristics		Group		
		Intervention	Control	
Age of mother (years)		27.5079 (5.77222)	27.3810 (6.41930)	0.907
Weeks of pregnancy		10.0000 (1.67525)	9.4762 (1.59492)	0.075
Marital Duration (years)		6.5873 (4.78450)	6.4286 (5.19837)	0.859
Income status	Moderate	13 (20.6)	22 (34.9)	0.194
	Little	34 (54)	29 (46)	
	Good	16 (25.4)	12 (19)	
Educational level	Below diploma	20 (31.7)	22 (35)	0.121
	Diploma	35 (55.6)	24 (38.1)	
	Academic	8 (12.7)	17 (27)	

Table 2. A comparison of the mean score of awareness and the constructs of the health belief model in the intervention and control groups before and after the intervention.

Variable		Group (mean ± SD)		p-value ^a
		Intervention	Control	
Knowledge	Before	6.0000±1.95926)	6.1111±1.72375	0.736
	After	8.6984±1.76558)	6.9524±1.81773	< 0.001
	p-value ^b	P<0.001	P<0.001	
Perceived susceptibility	Before	17.5397±4.40610	16.7302±4.30381	0.299
	After	26.4127±3.17569	20.4603±3.23202	P<0.001
	p-value ^b	P<0.001	P<0.001	
Perceived severity	Before	13.6032±3.35309	14.2540±3.74152	0.306
	After	23.2063±2.85204	17.0794±3.06542	P<0.001
	p-value ^b	P<0.001	P<0.001	
Perceived benefits	Before	18.6667±4.45044	18.0952±4.74415	0.487
	After	30.4762±4.81214	18.9365±3.64503	P<0.001
	p-value ^b	P<0.001	0.264	
Perceived barriers	Before	28.8254±9.61273	37.2698±7.19589	P<0.001
	After	15.2698±7.45569	33.2698±5.25543	P<0.001
	p-value ^b	P<0.001	P<0.001	
Perceived Self-efficacy	Before	14.7778±3.71329	15.6032±3.63912	0.210
	After	24.7460±3.19762	16.2540±3.60541	P<0.001
	p-value ^b	P<0.001	0.323	
Behaviors	Before	5.1746±1.63174	5.5079±2.10891	0.323
	After	7.7778±1.65046	6.3016±2.12993	P<0.001
	p-value ^b	P < 0.001	0.011	
OHI S	Before	0.4549±0.42111	0.1686±0.30395	0.031
	After	0.3754±0.35879	0.2451±0.30893	P<0.001
	p-value ^b	0.002	0.002	
DMF	Before	9.9841±4.03010	9.6032±4.78418	0.630
	After	10.0794±3.74726	9.6039±4.49207	0.519
	p-value ^b	0.381	0.381	

a: Significant, independent-samples t-test; b: Significant, paired-samples t-test.

After the training intervention, the paired-samples t-test showed that the mean scores of the aforementioned variables increased significantly in both the intervention and the control group, except for the scores of perceived benefits, perceived self-efficacy and post-intervention behavior (Table 2). However, the independent-samples t-test

showed that the differences between the intervention and the control groups were significant in all the constructs ($p < 0.001$), such that the construct scores increased much more in the intervention group than the control group. The mean score of DMFT index results did not have any significant differences between the intervention and control groups before and after the intervention. However, the OHIS index showed significant differences in both groups before and after the intervention. Before the intervention, the score of this variable was higher in the intervention group than in the control group, but, after the intervention, it decreased in the intervention group and significantly increased in the control group (Table 2).

4. Discussion

People's readiness to recognize and practice the appropriate ways of living in order to maintain health and avoid diseases requires the modification of their behaviors (15). This need for adopting new behaviors is even more important for pregnant women due to its effects on maternal and fetal health. Despite this importance, study results show that pregnant women do not follow principles of oral and dental hygiene adequately, and have little awareness of the importance of oral and dental health during pregnancy and its outcomes (16, 17). Our study showed that most of the studied pregnant women were not aware of the importance of oral and dental health care during pregnancy before the training intervention. Indeed, the mean of this variable was 6 before training, which increased to 8.69 after training. Among the reasons for the low levels of awareness of pregnant women in the control and intervention groups before the intervention, mention can be made of the failure of the staff of the health centers, midwives, gynecologists, and private dentists to inform their clients of the importance of oral and dental hygiene before and during pregnancy, and the failure of the women living in this region to regularly and annually visit dentists for oral and dental care due to the high costs of dental work. This finding is consistent with the results of a study conducted on pregnant women in Hong Kong to evaluate their oral and dental health knowledge and beliefs. In that study, Zhong and his colleagues found that from among 100 subjects in the study, only 39 percent knew that hormonal changes during pregnancy are involved in gingivitis (18). This is also consistent with the research findings of Nayak et al. (19), Shamsi et al. (9), and Cardenas (20) that reported that the awareness of pregnant mothers is less than average.

In the present study, the awareness of both the control group and the intervention group regarding oral and dental hygiene was not at a favorable level before the intervention, but their awareness increased after the intervention and this increase was significant in both groups. However, the mean score of this variable increased in the intervention group by 2.69 points, while the change in the control group was measured as 0.84 points. Although this change is significant in the control group, its amount is much less than that of the intervention group. This change is probably due to the effect of the initial assessment. That is, the participants in the control group probably became sensitive and curious regarding the questions after the completion of the questionnaire, and may have made inquiries about the answers to the questions from other sources, for example, the health center midwife. Therefore, the changes in the control group could be attributed to the effect of the completion of the questionnaire as pointed out by other researchers (21, 22). This applies to the questions related to the Health Belief Model constructs, too.

Our findings revealed that the average scores of the perceived susceptibility and severity in both the intervention and control groups were similar and at an unfavorable level before the intervention, such that about half of the mothers not only did not consider themselves susceptible to tooth decay in this period but also were unfamiliar with the complications of tooth decay and the failure to follow through with oral and dental health care during pregnancy. After the training intervention, the average score of the perceived susceptibility and severity of pregnant women about oral and dental health showed significant differences between the experimental and control groups, which is consistent with the findings of Shamsi et al. (9). The increased perceived susceptibility and severity in the intervention group after the intervention was due to the impact of the training intervention through educational videos and group discussion between pregnant women participating in the training sessions. In a study by Ramezankhani et al., the positive impact of perceived susceptibility on oral and dental hygiene behavior and the DMFT index has been confirmed (23). Additionally, in a study by Solhi et al. using the Health Belief Model, the presence of a significant relationship has been reported between perceived susceptibility and brushing and flossing skills, such that perceived susceptibility is regarded as a powerful factor affecting optimal performance (24). Therefore, it is necessary for mothers to be more sensitive and watchful about tooth decay during pregnancy.

In line with the results of the research by Shamsi et al., in the present study, the mean scores of benefits and self-efficacy of the intervention group significantly increased after the intervention. The results of the control group showed no change in this regard (9). In a study by Mehri, perceived benefits and self-efficacy had the highest

statistically significant positive correlation with their oral health behaviors (25). In the present study, understanding the benefits resulting from the observance of oral and dental hygiene such as a reduction in the costs of dental work, having healthy and beautiful teeth that increases their self-confidence as well as saving the fetus from the adverse effects of gingival and dental diseases, increased the perceived benefits in the intervention group. In this regard, the study by Solhi et al. showed the presence of an inverse correlation between the perceived benefits and the OHIS index value, such that the higher the perceived benefits of oral health behaviors are, the lower the score of the oral hygiene index (OHIS) is (24). Buglar also verified the positive impact of self-efficacy on the adoption of proper oral and dental hygiene behaviors. In the study by Buglar, self-efficacy was a significant predictor of oral health practices, including brushing and flossing. This study recommends that health care staff should enhance people's self-confidence regarding brushing and flossing (26). In a study by Ramezankhani et al., a significant relationship was found between DMFT index and perceived self-efficacy (23). Both cross-sectional and longitudinal studies have demonstrated that perceived self-efficacy is a precise predictor of oral and dental health that improves oral health behaviors over time, and not just temporarily (27-30). Among the reasons for the increased perceived self-efficacy in the intervention group, mention can be made of step by step instruction and training of correct brushing and flossing techniques by a dentist, and the use of practical presentation and demonstration strategies and group discussion that emphasized the ability to properly use toothbrushes and dental floss, the ability to overcome drowsiness and boredom, and the ability to start a diet restricting sugar and sweets, while the control group were deprived of these training sessions.

In the case of perceived barriers, there were differences between the two groups before the intervention, and perceived barriers were higher in the control group. After the intervention, the score of this variable significantly decreased in both the control and the intervention groups. However, the mean score of this variable decreased by 12 points in the intervention group, while the change in the mean score of this variable in the control group was just about 4 points. Although this difference was significant in the control group, it is much lower than that of the intervention group and is probably influenced by the initial assessment. After the intervention, the mean score of perceived barriers in the intervention group significantly decreased in comparison with the control group. In line with the research conducted by Mehri and Solhi, the most important perceived barriers in this study were reported as lack of enough time to visit the dentist, high costs of dental work, fear of harm to the fetus, fatigue and sluggishness, and lack of sufficient skills to properly use toothbrushes and dental flosses (24, 25). This can be attributed to the fact that in this study, the perceived barriers were likely mental barriers and the training intervention was able to modify them. Such a finding reveals the necessity of designing and implementing training interventions in the community at large. The results of various studies have been inconsistent regarding the perceived barriers construct. This may stem from the considerable variety of perceived barriers, including financial, physical, psychological, and social barriers and the different effects of training interventions on the modification of these barriers (31).

In the present study, the mean score for oral health behaviors of the pregnant mothers was moderate in both the control and the intervention groups before the intervention. One of the factors affecting this issue could be the physiological, hormonal and physical changes that occur during pregnancy. The same condition can be observed in other studies such as the study by Lydon and the study by Shamsi conducted on pregnant women in Arak, Iran (32). In the present study, the mean score of performance of the intervention group significantly increased after the intervention in comparison with the control group, which can be attributed to the positive effect of training based on the Health Belief Model. The results show that pregnant women perform oral health behaviors when they are confident that they are able to perform health-related behaviors, when they understand the benefits of oral and dental health, and feel that they can follow principles of oral and dental health and hygiene in spite of the barriers (25).

The random selection of the samples in the present survey led to a similar distribution of the studied variables in both the control and the intervention groups. There were only significant differences in the variables of perceived barriers and the OHIS index between the two groups. The value of the OHIS variable significantly increased in the control group after the intervention, while it decreased in the intervention group. These changes indicate that the training of the intervention group not only prevented an increase in the OHIS index value, but also significantly decreased it. This index is an indicator of dental plaque and calculus. Dental plaque has been recognized as the most important factor leading to oral and dental diseases, and the most effective method of removing or reducing it is brushing the teeth. Therefore, the most important result of oral and dental performance is a reduction of dental plaque, and measuring the amount of dental plaque can help with the assessment of oral and dental performance (33). In the study by Gharizadeh conducted on pregnant women in Arak, Iran, the amount of debris (soft foreign materials) was 91.4%, and the amount of plaque and calculus (hardened materials) was 73.3%. In this study, the

majority of pregnant women had a low socio-economic status and the educational attainment level of more than half of the pregnant women was at the elementary school level (66%). The participants were among the low income families with a high rate of unemployment, in which oral and dental disease prevention and treatment are not taken seriously (8). The average value of this index in the studied population of Khorramabad was obtained as 0.31 ± 0.39 . This is not consistent with the cited studies because, in the present study, the studied pregnant women benefited from a middle class socioeconomic status, such that the educational attainment level of 55.6% of the participants of the intervention group and 38.1% of the participants of the control group was at the high school diploma level. Furthermore, 54% of the participants of the intervention group and 46% of the participants of the control group belonged to middle income families. These findings are in line with other research studies that indicate the positive effect of the socioeconomic status of oral health behaviors (34, 35). However, the presence of dental plaque and calculus can lead to periodontal disease and further decay in the future, and can have a considerable impact on the health of the baby.

The average DMFT in the studied population of Khorramabad, Iran, was obtained as 9.79 ± 4.41 . This index value was 6.23 (3 ± 0.1) among pregnant women in Ahwaz, Iran, and 5.4 (2 ± 0.83) among the pregnant women living in Arak, Iran, while this index value was 2.9 among pregnant women older than 30 living in Finland. The differences in the means of the DMFT values among pregnant women could be due to the effect of different cultures, inappropriate individual hygiene habits, and poor oral and dental health care in the community (8). One of the reasons for the high prevalence of dental caries in the Iranian society as compared with other societies (such as Finland), could be a high sugar diet and increased use of sugar and sweets in Iranian society, such that the per capita annual consumption of sugar in Iran increased by 22 percent from 25.1 kilograms in 1991 to 31 kilograms in 2006 (36). In the present study, the DMFT index value increased by 0.09 points in the intervention group after the intervention, but did not change in the control group. This change in the score of the intervention group was due to the increased number of filled and repaired teeth after the intervention. Several reasons can be mentioned for the high DMFT index value in the studied population residing in Khorramabad, including unhealthy eating habits including the consumption of high sugar foods, failure to follow appropriate oral and dental hygiene practices, failure to refer to dentists at least once a year due to low income and awareness levels, referring to dentists only under urgent conditions, such as to treat toothaches or to extract teeth, the low ratio of dentists to the population, the insufficient number of dentists present at health centers, and dental work not being covered by health insurance.

5. Conclusions

The results of the present study showed that training designed based on the constructs of the Health Belief Model can increase awareness, perceived susceptibility, severity, benefits, and self-efficacy, and decrease perceived barriers, and enhance performance of oral and dental health care among pregnant women. Additionally, health training based on the constructs of the Health Belief Model can prevent increases in mean DMFT and OHIS index values during pregnancy. Carrying out complementary studies on dental and oral health care on similar target groups with different methodologies can provide an appropriate route for future research on this topic.

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Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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