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The Effect of Health Belief Model-Based Educational Program On Oral and Dental Health among Pregnant Women: An Interventional Study

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ABSTRACT

Background: Oral and dental health education is an effective method to prevent oral and dental diseases in pregnant women. **Objectives:** To evaluate the effect of an educational intervention based on the health belief model (HBM) and assess oral and dental health behavior among pregnant women visiting Obstetrics and Gynecology Outpatient Clinic, Zagazig University Hospitals in 2021. **Method**: A 6-month interventional study was conducted on pregnant women receiving antenatal care at Obstetrics and Gynecology Outpatient clinic, Zagazig University Hospitals. Data collection was conducted in two phases: In the first phase, data were collected by administrating an interview questionnaire containing questions about HBM constructs. Following data collection, the teaching intervention was implemented. The second phase started three months after the completion of the intervention, and the data was recollected from both control and interventional groups. **Results:** A total sample of 100 pregnant women were included in the current study with a mean age of 27.78 (± 5.7) years in the interventional group and 27.29 (± 5.6) years in the control group. After the teaching intervention, there was a statistically significant difference between the two groups in all HBM constructs. Before and after the intervention, there was a significant difference between the mean value of all the variables in the interventional group. **Conclusion:** providing HBM-based education as a teaching intervention positively affects the oral health behavior of pregnant women in the interventional group after the intervention.

INTRODUCTION

According to the World Health Organization (WHO), "oral health" or "oral hygiene" refers to the state of being free of chronic facial and oral pain, oral inflammations and ulcers, gingival illness, dental caries, and other discomfort that affect the ability to bite, chew, smile, speak, and it also means psychosocial wellbeing (e.g., social confidence).[1] It is a significant indicator of overall health and quality of

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life. Almost all diseases and conditions are largely preventable or can be treated in their early stages.[2]

Oral health diseases exist in both developed and developing countries, particularly in low and middle-income countries, and are linked to inadequate fluoride in drinking water and limited medical oral health care availability.[2]

Gingival diseases are more prevalent in pregnant women for a variety of reasons, including increased mouth acidity, sweet food craving, and a lack of

attention to oral hygiene.[3] Research has proven that it is still prevalent during pregnancy despite a general decline in dental caries at all ages, with 40 to 90 percent of pregnant women in developing countries having dental caries.[4]

Prior studies have revealed a high prevalence during pregnancy in Egypt, with 92 percent of pregnant women having dental caries.[5] Integrating oral health into primary care and family practice is a fundamental strategy for decreasing oral health problems and promoting pregnant women's oral and overall health[6] because primary care providers interact more with patients at a higher risk for developing oral diseases than dentists.[7] The Health Belief Model was developed as a model for educators, and it is now one of the most used public health models for explaining health behavior and is regarded as critical to the planning process for effective educational interventions.[7, 8, 9]

Consequently, it is critical to assess oral health knowledge and perceptions among pregnant females using an appropriate model, providing a strong rationale for conducting a study to improve oral health behaviors among pregnant females. The objective of the current study was to evaluate the effect of an educational intervention based on the HBM and its components in changing knowledge and perception of pregnant women visiting Obstetrics, Gynecology Outpatient clinic, Zagazig University hospitals in 2021.

METHOD

An interventional study was conducted at the Obstetrics and Gynecology Outpatient clinic, Zagazig University Hospitals.

Pregnant women receiving antenatal care at Obstetrics and Gynecology outpatient clinic, Zagazig University Hospitals, for an interval of six months (from the 1st May 2021 to the end of October 2021). Inclusion criteria included the following; being pregnant (in the first trimester), having no physical and psychological disorders (sugar intake, smoking and alcohol use, poor hygiene, consumption of psychostimulants), and providing consent to participate in the study. Exclusion criteria included the following; working in the dentistry field, having severe oral and dental problems, missing more than two educational sessions, risky pregnancy (bleeding, preeclampsia, urinary tract infection, decreased fetal movements, etc.).

Sample size was calculated using version 2.3.1. of the Epi Info, the software program. [10] Based on the study of Jeihooni et al. and using the formula for comparing percentages before and after the intervention, at a 95% confidence interval. [11] With a 5% margin of erreor, the estimated sample was 45 participants in each group before and after the intervention (total of 90 women). The total sample size was calculated to be 100 women after adding 10% (10 participants) to account for possible nonresponse (50 in the interventional group and 50 in the control group).[12]

Data collection was carried out in two phases. The first phase started at the onset of the study: the data was obtained using the same questionnaire as in the study of Jeihooni et al. and Ajzen et al. [12] The HBM constructs elements (62 elements) and oral and dental hygiene (10 elements), and questions on internal and external cues for action about the hygienic oral practice were evaluated (Table 1).[13] Each interview questionnaire and HBM took 10-20 minutes to complete. Prior to intervention, data from the interventional and control groups were collected using the previously mentioned questionnaire. The teaching intervention session was implemented for the interventional group after data collection. The female subjects were subdivided into groups, with each group including participants according to their presence in the outpatient clinic while receiving the antenatal care. The intervention was held on the same days of data collection for each group of women (3 sessions, 60-90 minutes each). Lectures, slideshows, panel discussions, and hands-on demonstrations with gums and teeth templates, toothbrushes, and orthodontal flosses were used. Teaching materials and content were developed in accordance with educational objectives and derived from credible sources certified by the Egyptian Ministry of Health and Population. A brief description of tooth structure was presented, followed by the images of dental plaque and dental decay during pregnancy, as well as features of healthy versus unhealthy gums were demonstrated. The leading causes of dental and oral diseases, vulnerability factors, and the major causes of tooth decay among mothers were discussed. The facts and figures about tooth decay were presented in sessions for perceived susceptibility. Images of oral/dental problems were used to assess perceived severity. For perceived

Table (1): Study tool explanation (HBM)[13]

Topic	No. of items	Scoring range
1) Knowledge:	16 items (true/false/don't)	0–32
2) Perceived susceptibility:	7 items/5-point Likert scale	7–35
3) Perceived severity:	7 items/5-point Likert scale	7–35
4) Perceived benefits:	11 items/5-point Likert scale	11-55
5) Perceived barriers:	14 items/5-point Likert scale	14-70
6) Self-efficacy:	7 items/5-point Likert scale	7–35
7) Performance:	14 items	0-14

barriers, the high costs of dental services were presented in the form of group discussions. Topics included performance and health-related behaviors and practices (e.g., daily brushing, using dental floss, reduction of sweet substance consumption, and use of mouthwash). The second phase started three months after completing the teaching intervention. Data were recollected from the control and interventional groups, and this time interval was adequate for evaluating women's oral health behavior. [13, 14, 15]

Study tool: A panel of experts evaluated the validity of the instrument used in data collection, as well as the face and content (n= 10). Prior to the study, a pilot study (10 percent of the total sample) was conducted to assess the content validity and reliability of the questionnaires. No administrative or technical obstacles were founded (the total sample included the pilot sample). Cronbach's Alpha formula was used to determine the reliability To calculate the internal consistency of the instrument's items, which was 0.84. The construct of knowledge, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues for action, and self-efficacy had a reliability of 0.81, 0.73, 0.70, 0.75, 0.71, 0.73, and 0.76, respectively. The questionnaire was translated from English to Arabic by an expert translator, then back-translated by another expert translator, and finally, to ensure validity, the original and translated by another bilingual expert were compared. Family income was calculated according to the classification of Fahmy et al. of social class, wherein enough income and a large loan indicate low social class, not enough and small loan indicates the middle social class, and enough only and enough and saving indicates high social class.[16]

Statistical Package for the Social Sciences (SPSS version 22, SPSS Inc., IBM, Chicago, IL, USA) was used for data analysis. Categorical variables were described using absolute frequencies. In order to analyze qualitative data, the Chi-square test was used. An independent sample t-test was used to analyze quantitative data, whereas the paired t-test was used to analyze paired quantitative data. The statistical significance level was 5% ($P <0.05$).

RESULTS

The study sample included 100 pregnant women, with a mean age of 27.78 ± 5.7 years in the interventional group and 27.29 ± 5.6 years in the control group. Most of the participants were in secondary school and university levels. The results revealed no statistically significant difference in terms of age, education, employment, and family income between groups (Table 2).

Table 3 compares the two groups' mean knowledge and HBM domains scores before and three months after the intervention. Prior to the intervention, there was no statistically significant difference between the interventional and control groups concerning the mean of all HBM constructs. However, following the intervention, the independent sample t-test revealed a statistically significant difference in all variables between the two groups (p < 0.05). Based on the paired t-test, the interventional group's mean value improved significantly in all domains after the intervention (Table 3).

Prior to the intervention, there was no significant difference between the groups regarding internal and external cues for action. Nevertheless, there was a statistically significant difference between the groups (Table 4).

DISCUSSION

Oral disorders are the most prevalent noncommunicable diseases,[17] affecting patients at all stages of life, resulting in pain, discomfort, disfigurement, and in extreme cases, death. Poor oral hygiene and insufficient fluoride exposure negatively affect oral hygiene. [18]

As depicted in Table 2, one hundred pregnant females participated in the study, with approximately half of them between the ages of 26 and 33 years old (48.0 percent in the interventional group and 46.0 percent in the control group). The current study's findings revealed that three months following the training, the interventional group had a statistically significant improvement in HBM and dental health practices compared to the control group (Table 3). Compared to the control group, teaching interventions were found to be successful in promoting knowledge in the

Table (2): Some demographic factors of pregnant women visiting Obstetrics and Gynecology Outpatient clinic, Zagazig University hospitals in 2021

		Interventional group (n=50)	Control group (n=50)	P Value[*]
		No. (%)	No. (%)	
Age (years)	18-25	18 (36.0)	20 (40.0)	
	26-33	24 (48.0)	23 (46.0)	0.9
	34-41	8 (16.0)	7 (14.0)	
	Mean ± SD	27.78 ± 5.7	27.29 ± 5.6	
Education	Illiterate	2 (4.0)	3 (6.0)	
	Elementary school	5 (10.0)	7 (14.0)	
	Preparatory school	12 (24.0)	9 (18.0)	0.9
	Secondary school	16 (32.0)	17 (34.0)	
	University	15 (30.0)	14 (28.0)	
Employment status	Yes	13 (26.0)	16 (32.0)	
	No	37 (74.0)	34 (68.0)	0.5
Family income	Low	8 (16.0)	11 (22.0)	
	Moderate	24 (48.0)	19 (38.0)	0.5
	High	18 (36.0)	20 (40.0)	

[*] *Chi-square test*

interventional group. This finding can be attributed to increasing the level of awareness that may be related to maternal age. The mothers' awareness may also be different depending on the education they receive.

Mohebbi et al. demonstrated that instructional interventions resulted in knowledge promotion of midwives on the oral health of pregnant females.[14] The current study's findings are consistent with those of Jeihooni et al.,[11] Bates and Riedy,[19] DiMarco et al.,[20] Bahri et al.,[21] Nogueira et al.,[22] and Shanthini et al.[23] As a result, it is crucial to improve pregnant females' awareness of dental health, specifically among females in lower social classes.

The current study's results revealed that the mean value for perceived susceptibility and severity in the interventional and control groups was nearly identical, indicating that both were low. The participants were unable to avoid the complexities of their oral disorders due to their low perceived susceptibility, which explains why they were unable to prevent them. However, three months following the intervention, the interventional group demonstrated more differences than the control group (Table 3).

Most participants in the intervention group believed they were at risk of dental decay. As mothers' awareness improved, they were more likely to adopt oral health habits. Behavior change regarding oral

health care is hypothesized to be triggered by knowledge and perceived disease risk. The current study's findings are compatible with those of Peyman and Pourhaji,[24] and Kasmaei et al.[25]

Before the intervention, there was no statistically significant difference between the mean value of perceived severity in the interventional and control groups. The findings revealed that pregnant women in all groups had a low perception of the severity of oral hygiene complications. The interventional group's perceived severity increased more than the control group after the intervention, confirming that the subject neglected oral problems since the perceived severity of the participants was insufficient. This finding is in agreement with the results of Solhi et al.[26] and Lee et al.[27] Before the intervention, there was no significant difference between the mean value of perceived severity in the case and control groups. Nonetheless, the case group's perceived severity increased more than the control group following the intervention.

According to the present study, after the teaching intervention, the mean value of perceived benefits in the interventional group was considerably higher than that of the control group (Table 3). Shamsi et al. illustrated that pregnant women's oral health behaviors enhanced as their perception of benefits-

Table (3): HBM on oral and dental health care among pregnant at Obstetrics and Gynecology Outpatient clinic, Zagazig University hospitals in 2021 before and three months after the intervention

Variables	Groups	Before intervention	After intervention	P-Value [†]
		Mean ± SD	Mean ± SD	
Knowledge (0-32)	Interventional	19.4±5.6	27.4±3.7	0.001[‡]
	Control	18.1±5.1	18.4±5.1	0.4
	P value[*]	0.2	0.001[‡]	
Perceived Susceptibility (7-35)	Interventional	19.1±5.7	28.1±3.5	0.001[‡]
	Control	18.9±5.3	18.7±5.5	0.6
	P value[*]	0.8	< 0.001[‡]	
Perceived severity (7-35)	Interventional	22.7±5.3	27.6±5.4	<0.001[‡]
	Control	21.2±6.7	21.6±6.4	0.5
	P value[*]	0.2	< 0.001[‡]	
Perceived benefits (11-55)	Interventional	41.6±8.5	44.1±6.8	0.003[‡]
	Control	40.7±9.2	40.3±9.4	0.4
	P value[*]	0.6	0.002[‡]	
Perceived barriers (14-70)	Interventional	46.1±12.1	53.9±12.7	<0.001[‡]
	Control	42.8±11.5	43.7±12.5	0.09
	P value[*]	0.1	< 0.001[‡]	
Self-efficiency (7-35)	Interventional	21.5±5.2	23.5±5.6	0.007[‡]
	Control	20.3±7.1	20.8±6.2	0.6
	P value[*]	0.3	0.002[‡]	
Performance (0-14)	Interventional	8.1±3.1	11.3±2.1	0.001[‡]
	Control	8.2±3.2	8.5±2.7	0.5
	P Value[*]	0.8	0.001[‡]	

* Independent sample t-test, † Paired t-test, ‡ Statistical significance: p<0.05 is considered statistically significant.

improved.[13] According to a study by Peyman and Pourhaji, after completing the instructional intervention, the mean value of perceived benefits for dental health behaviors in the interventional group was significantly elevated than that of the control cohort,[24] which is consistent with the findings of a previous study in Iran. [28]

Following the intervention, the mean value for perceived barriers decreased in the interventional group; however, it remained unchanged in the control group (Table 3). Time constraints to see the dentist, ignorance about visiting a dentist during pregnancy and preferring to wait until after the baby was born, high dental costs, fear of fetal harm, and absence of sufficient expertise to use a toothbrush and dental floss were all perceived barriers by mothers. According to Jessani et al., one of the major barriers faced by the women studied was a lack of dental insurance coverage and a lack of time to see the dentist.[18] The researchers found that health practitioners (doctors, dentists) must provide oral health training to pregnant women before and during pregnancy.[26] In this respect, the current findings are consistent with those of Khani Jeihooni et al.[29]

Prior to the teaching intervention, was not a statistically significant difference in perceived self-efficacy between the interventional and control groups, but three months following the teaching intervention, the mean value of the interventional group significantly increased (Table 3). In addition, Bakhtiar et al. demonstrated that the interventional group's mean self-efficacy score substantially increased three months following the teaching intervention. [30]

In terms of the mother's performance, the interventional group's score increased significantly following the education, and it may be linked to the significant influence of HBM-based education. In this regard, a study by Lopes Marinho et al. reported improved oral hygiene following oral health education. [30]

In the current study, the interventional group's mean value of external and internal cues for action increased significantly (Table 4). Furthermore, Jeihooni et al.

Table (4): External and internal cues for action on oral and dental health behaviors taken by pregnant women visiting Obstetrics and Gynecology Outpatient clinic, Zagazig University hospitals in 2021 before and three months after the intervention

	Before intervention			After intervention		
	Interventional group No. (%)	Control group No. (%)	P Value[*]	Interventional group No. (%)	Control group No. (%)	P Value[*]
External cues for action						
Dentist	35 (70.0)	33 (66.0)	0.6	48 (96.0)	34 (68.0)	<0.001[†]
Health services staff	32 (64.0)	28 (56.0)	0.4	45 (90.0)	31 (62.0)	0.001[†]
Husband	30 (60.0)	33 (66.0)	0.5	40 (80.0)	29 (58.0)	0.01[†]
Radio and TV	22 (44.0)	20 (40.0)	0.6	29 (58.0)	17 (34.0)	0.01[†]
Relatives	19 (38.0)	17 (34.0)	0.6	28 (56.0)	17 (34.0)	0.02[†]
Press	13 (26.0)	12 (24.0)	0.8	23 (66.0)	13 (26.0)	0.03[†]
The internet	11 (22.0)	15 (30.0)	0.3	37 (74.0)	17 (34.0)	<0.001[†]
Internal cues for action						
Fear of injury to the fetus due to complications of dental caries	27 (54.0)	23 (46.0)	0.4	45 (90.0)	24 (48.0)	<0.001[†]
Unpleasant personal experience of dental caries in the past	19 (38.0)	23 (46.0)	0.4	38 (76.0)	26 (52.0)	0.01[†]
Feeling healthy and cheerful due to oral and dental health care	21 (42.0)	19 (38.0)	0.6	46 (92.0)	20 (40.0)	<0.001[†]

* Chi-square test, † Statistical significance: p<0.05 is considered statistically significant.

reported no statistically significant difference in internal and external cues for action in the two groups before the teaching intervention, but the experimental group's mean value increased significantly after the teaching intervention. [11] According to a study by Sohli et al., the state of oral health in pregnant women is not satisfactory. Dental care attitudes increased due to educational programs, highlighting the importance of dentists to be successful prenatal team members.[26]

The current study has some limitations, as the results on those pregnant women referred to Obstetrics and Gynecology Outpatient clinic, Zagazig University Hospitals. Therefore, it cannot be generalized to all pregnant women, especially mothers referred to private doctors' offices and clinics to obtain dental care. Another limitation is using a self–reporting tool for data collection, and thus it was possible to determine the actual oral health care behavior.

It can be concluded that providing HBM-based education as a teaching intervention positively affects the oral health behavior of pregnant women in the interventional group after the intervention. Authors recommend that the application of HBM be used effectively to design an educational program to prevent various diseases and complications concerning oral and dental health problems. Follow-up education sessions after the teaching intervention must be held for 1 and 2 months after the intervention to review the content is highly recommended**.**

Ethical Consideration

The study was approved by an Institutional Review Board (IRB) of medical research ethics, Zagazig University, Faculty of Medicine, prior to its implementation (ZU-IRB 5974). In addition, official approval for the implementation of the study was obtained from the director of Zagazig University outpatient clinics to Obstetrics and Gynecology Outpatient clinic, Zagazig University Hospitals, after explaining the aim of the research to get the permission for data collection. Before data collection, informed consent was obtained from each participant, which addresses the confidentiality of data collected

and ensures that participation in the study is entirely voluntary.

Author contributions: Hala El-Maghawry; data collection and analysis, drafted and critically reviewed the manuscript, and submission. Amany AbdAllah; data collection, study design, and drafted and critically reviewed the manuscript. Hanaa Nofal; data collection and analysis and drafted and critically reviewed the manuscript.

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