Original Article

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The Effect of Training Based on Health Belief Model (HBM) in Preventing Exposure to Polluted Air in Pregnant Women

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ABSTRACT

BACKGROUND AND OBJECTIVE: Air pollution creates a wide range of acute and chronic effects in pregnant mothers. This study was carried out to determine the effect of education using Health Belief Model on improving the prevention of exposure to polluted air in pregnant women.

METHODS: This quasi-experimental study was carried out in two cross-sectional and interventional sections. In the cross-sectional study, 208 pregnant women were randomly selected and data were collected based on Health Belief Model questionnaire (sensitivity, severity, benefits, barriers, practice guidance and perceived self-efficacy, while calculating the scores of each section based on 100). In the intervention study, a total of 114 pregnant women (6 to 24 weeks) were selected by multistage sampling and randomly divided into two groups of case and control. The intervention was performed according to the Health Belief Model and the subjects were followed for three months and then the data were collected and analyzed.

RESULTS: The variables of external action, sensitivity and barriers, predicted a total of 25% of behavioral changes. In the intervention study, the mean awareness score of mothers in the intervention group increased significantly from 43.18±15.50 before the intervention to 71.39±16.68 after the intervention and the mean performance score increased significantly form 73.14±11.29 to 84.75±8.54 ($p<0.001$).

CONCLUSION: The results of this study showed that the implementation of training program based on Health Belief Model with emphasis on predictive behaviors can be effective in reducing exposure to air pollution in pregnant women.

KEY WORDS: *Pregnant mothers, Air pollution, Exposure, Health belief model, Preventive behavior.*

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Introduction

Nowadays, the potential risks of air pollution have affected human populations on a large scale, and most of these risks are targeted at high-risk individuals including the elderly, children, cardiovascular patients, pregnant mothers, and their fetus (1). Air pollution causes a wide range of acute and chronic health effects, which may include cancer, eye diseases, respiratory disorders, gene mutations, increased hospital admissions, cardiovascular diseases and respiratory diseases (2,3). On the other hand, pregnant women are highly vulnerable to air pollution, which affects both their health and their fetus's health (3). A study by Ballester et al. indicated the effect of air pollution on weight, height, head circumference and intrauterine growth restriction (4).

The results of Delpeshe et al. showed that air pollution causes neonatal deaths due to respiratory problems, low birth weight, and delayed intrauterine growth (5). Araban et al. also emphasized the need for training on the health risks of exposure to air pollution in pregnant women (6). Considering the aforementioned complications, identifying the causes and taking preventive measures through educational programs is highly important (7,8). One of the very useful theories in the prevention section is the Health Belief Model (HBM), which has been used abundantly in the past two decades in a wide range of studies on behavior change interventions (8–11). Today, it is believed that people should see themselves vulnerable to damages to be successful in changing their behavior (realize sensitivity and severity), and should believe that a particular type of behavior leads to a valuable outcome at an acceptable cost. They must also feel effective in overcoming the perceived barriers to actions (9–11).

Considering the abovementioned matters and the increasing trend of industrialization of cities and increased air pollution in many cities of Iran and the whole world and given the maternal and fetal problems associated with exposure to air pollution, this study aims to determine the effect of training using Health Belief Model on promoting the preventive behaviors of exposure to air pollution in pregnant women in Arak, so that an important step is taken to improve the health of pregnant women.

Methods

The present study was carried out in two cross-sectional and interventional phases (quasi-experimental), after being approved by the Ethics Committee of Arak University of Medical Sciences with an ethics code of 93–167–17 and registered in the clinical trial registration center with the code IRCT:20140907119005N1. In the cross-sectional phase, 208 pregnant women who were referred to Arak health centers were randomly selected.

In the interventional study, considering the probability of 20% dropouts in the sample size, the sample size was estimated 60 people in each group according to the previous study (9), and of the total sample size, three mothers from the control group and three mothers from the case group were excluded from the study. Therefore, the final analysis was performed on 57 mothers in each group (a total of 114 people). In the interventional study, a multi-stage sampling method was used to divide the Arak city into four sections based on the cardinal directions, and two health centers were randomly selected from each section; one center for the case group and one center for the control group (a total of 8 centers).

Then, the samples were randomly selected from among qualified people in each center (based on the household file number) according to the number of clients in the center. Pregnant women with the ability to read and write, singletons pregnancy, from the sixth week until the end of sixth month of pregnancy, 18 to 35 years of age without a history of chronic disease were included. Women with high-risk pregnancy (pre-eclampsia, pregnancy-induced hypertension, diabetes and hemorrhage) and those who were absent in more than one training session were excluded from the study.

Data were collected using a researcher-made questionnaire that was designed in four parts. The first part consisted of demographic characteristics, the second part consisted of 12 questions related to awareness, the third part consisted of different dimensions of the health belief model, including components of sensitivity (5 questions), severity (7 questions), benefits (7 questions), perceived barriers (7 questions), cues to internal and external action (11 questions), and perceived self-efficacy (8 questions), and the fourth part consisted of 11 questions about the performance of pregnant women regarding the promotion of preventive behaviors regarding exposure to air pollution during pregnancy. For scoring, 1 point was given to "right" answer and 0 point was given to "wrong" or "don't know" answers in the awareness part. Questions regarding the sensitivity, severity,

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perceived benefits and barriers, and cues to internal and external action were categorized using the 5-point Likert scale from “totally disagree” to “totally agree” and from the 1 to 5 points. The standard questionnaire developed by Araban et al. was used in the self-efficacy part (12). The score for each question varies from 1 to 5 points. In performance questionnaire, the score of each question varies from 0 to 4 points according to the mother's behavior regarding the prevention of exposure to polluted air.

Due to the difference in the number of questions in different parts of the questionnaire, the minimum and maximum points of each part were different. Finally, the scores of each section of the questionnaire were balanced by 100 points. The validity of this questionnaire was measured by content validity method and according to reliable references and books, and was then assessed by 11 health education specialists, gynecologists, environmental health specialists and maternal and child health specialists, and finally its validity was confirmed.

The reliability of the questionnaire was also measured by calculating Cronbach's Alpha related to a questionnaire completed by 30 pregnant women who were demographically similar to the population of the present study. Educational intervention was performed on the basis of cross-sectional study and initial needs assessment for the case group and performed in four 60-minute sessions during one month as follows.

The first session focused on increasing the awareness of mothers about the harmful effects of exposure to polluted air on the fetus and pregnant mother during pregnancy. The second session was about increasing the perceived sensitivity and severity of pregnant women by emphasizing the harmful effects of exposure to polluted air on the fetus and pregnant mother and providing relevant statistics. In the third session, lectures and group discussions were conducted to increase the benefits and reduce the perceived barriers related to the proper and timely action of mothers to prevent exposure to polluted air. Finally, the fourth session ended after the distribution of free masks and in this session, the women were assured of their ability to avoid entering the highly polluted areas of the city, the ability to use a mask when leaving home, the ability to leave enclosed areas full of cigarette smoke, and the ability to stay at home during the peak hours of air pollution in order to train self-efficacy and correct behaviors in preventing exposure to polluted air. At the end, the educational booklet and pamphlet were distributed among the pregnant mothers. There was no intervention in the control group. Post-test was performed by redistribution of the questionnaire in the case and control groups, three months after the intervention. Ethics were considered in this research, such as collecting data without the names of people, collective analysis of information and presentation of the pamphlet to the control group after the study. In this study, data analysis was performed using SPSS 20 software, independent t-test, paired t-test, ANOVA and correlation coefficient. $P<0.05$ was considered significant.

Results

In this study, the mean age of the case and control group was 27.25±4.58 and 26.30±4.36 years, respectively (Table 1).

Table 1. Comparison of case and control groups in terms of quantitative and qualitative demographic variables

Variable	Group	Case N(%)	Control N(%)	P-value
Maternal education	Elementary school	8(14)	4(7)	0.342
	Middle school	8(14)	7(12.3)	
	High school diploma	26(45.6)	35(61.4)	
	University digree	15(26.3)	11(22.8)	
Spouse's education	Elementary school	5(8.8)	7(12.3)	0.857
	Middle school	11(19.3)	12(20.2)	
	High school diploma	28(49.1)	28(49.1)	
	University digree	13(22.8)	10(17.5)	
Spouse's job	Employee	12(21.1)	11(19.3)	0.837
	Worker	12(21.1)	10(17.5)	
	Self-employed	33(57.9)	36(63.2)	
Smoker mother	yes	1(1.8)	1(1.8)	1.000
	no	56(98.2)	56(98.2)	
Mother's age (years) Mean±SD		27.25±4.58	26.30±4.36	0.261
Gestational age (weeks) Mean±SD		14.33±5.23	14.04±5	0.756
Pregnancy time Mean±SD		1.79±0.90	1.74±0.95	0.609

The variables of cues to external action, sensitivity and barriers predicted a total of 25% of behavior change. In the interventional study, the mean score of

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the awareness of mothers in the case group increased significantly from 43.18±15.50 before the intervention to 71.39±16.68 after the intervention and the mean performance score increased from 73.14±11.29 to 84.75±8.54 (p<0.001) (Table 2).

Table 2. Comparison of the case and control groups for the health belief model structure, before the intervention and three months after the intervention

Time	Intervention	Before Mean±SD	3 month after Mean±SD	P-value*
Awareness	Case	43.18±15.50	71.39±16.68	0.001
	Control	38.59±15.41	52.09±17.62	0.001
	P **	0.116	0.001	-
Sensitivity	Case	82.59±10.59	90.80±8.91	0.001
	Control	84.56±9.27	85.40±9.08	0.044
	P **	0.294	0.002	-
Severity	Case	79.04±11.54	86.61±10.00	0.001
	Control	78.09±11.85	80.10±11.50	0.001
	P **	0.665	0.002	-
Benefits	Case	81.30±12.83	88.57±10.47	0.001
	Control	78.74±11.89	79.44±11.78	0.212
	P **	0.272	0.001	
Barriers	Case	56.39±12.47	48.82±10.85	0.001
	Control	60.50±12.38	60.30±12.15	0.687
	P **	0.080	0.001	
Self-efficacy	Case	77.67±12.63	83.90±11.70	0.001
	Control	77.93±14.33	79.12±13.40	0.001
	P **	0.917	0.045	
cues to internal action	Case	76.21±19.63	85.96±10.98	0.001
	Control	81.40±13.10	82.45±11.60	0.164
	P **	0.099	0.100	
cues to external action	Case	67.71±20.00	74.03±13.11	0.016
	Control	68.83±15.13	70.87±11.50	0.065
	P **	0.739	0.175	
Performance	Case	73.14±11.29	84.75±8.54	0.001
	Control	70.33±13.79	74.09±12.77	0.001
	P **	0.237	0.001	

*** Paired T test, ** Independent T test**

Discussion

The results of this study indicated a significant change in the awareness of pregnant women who were trained to prevent exposure to polluted air. In this regard, the establishment of training classes for mothers and the distribution of handbooks and pamphlets have been able to increase the awareness of mothers about the behavior associated with the prevention of exposure to polluted air. In the study of Sharafkhani et al., the training increased the mean score of awareness by 35 points in the case group (13). Efstathiou et al. used the health belief model as a theoretical framework and referred to the necessity for increase in awareness in their research (14).

Mothers' special sensitivity to fetal health can provide a good opportunity for more effective training. Therefore, it was important in the present study to increase the perceived sensitivity and severity of pregnancy among pregnant women, along with promoting benefits and reducing perceived barriers to adopt preventive behaviors against exposure to polluted air. The effect of promoting sensitivity and perceived severity after interventional measures in the trained group has been mentioned in various studies (8, 10, 13 and 15). In the present study, educational intervention managed to encourage pregnant mothers to gain the benefits by improving pregnant mothers' beliefs and attitudes toward the importance of preventing exposure to polluted air and overcoming the obstacles. According to researchers, the expression of the benefits of behavior change can reduce the exposure to air pollution (9).

In the present study, after appropriate training and covering barriers and discussing them among pregnant women who participated in training sessions, there was a significant decrease in the mean score of perceived barriers compared to the time before intervention in the case group. This result and the results of other researches (8 – 11) confirm that one can discover the barriers to doing the intended behavior in the research population and attempt to eliminate them based on the health belief model using appropriate training, so that the necessary conditions to improve the preventive behavior of exposure to polluted air is provided. In studies conducted by Efstathiou et al., training was able to influence the perceived barriers and remain constant after two months (14).

Osborne emphasized that perceived barriers were the most influential factor in acceptance (16). The results of this study indicate that the mean score of self-efficacy in the case group has increased significantly after the training. To justify this, it can be said that this is due to the effectiveness of planned educational intervention in increasing the self-efficacy of mothers undergoing educational intervention. Self-efficacy is a model that can motivate individuals to change behavior (17). The results of our research showed that the training significantly changed the items in the cues to external action, which is consistent

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with the research by Tehrani et al., and Efstathiou et al. (14 and 18). The results of this study indicate that the mean cues to action in the case group increased significantly after the training. However, there was no significant difference in the control group. Various studies has mentioned the effect of improving the cues to action after the intervention in the trained group (8, 15, 19, 20). The results of this study showed that the mean performance score in the case group significantly increased after the training, which is due to the effectiveness of planned educational intervention in increasing the performance of mothers undergoing training. These results are consistent with other studies on the effect of health education on promoting preventive behaviors (12, 18 – 20). In this study, the cause of increased performance in the control group can be attributed to the dissemination of awareness from other pregnant women and the staff in health centers. In addition, since pregnant women in the control group were under prenatal care and because they had two prenatal care sessions in the follow-up period, they may have obtained health information regarding air pollution from health care providers. Several studies mentioned the effect of improved performance after educational interventions in the trained group (21 – 23). Considering the results of this research and given the importance of the role of education in promoting the preventive behavior of exposure to polluted air and its maternal and neonatal complications, including low birth weight, early delivery and etc., education in wider dimensions and using different tools in society should be more seriously implemented and should be one of the priorities of care during pregnancy.

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