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Original Article

Impact of health belief modification on intention to make smoke free home among pregnant women

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Abstract

BACKGROUND: This study examined the effects of health education on modification of health belief and intention among pregnant women to have smoke free home.

METHODS: In this randomized controlled study, 91 pregnant women completed the study in two groups. Intervention group was educated about the harms of environmental tobacco smoke (ETS) exposure. The Health Belief Model (HBM) was a framework for analyzing the beliefs. After 10-12 weeks, the HBM constructs and weekly ETS exposure at home were compared between the two groups.

RESULTS: After performing educational program, the subjects in intervention group perceived more susceptibility and severity and reported lower weekly ETS exposure at home than subjects in control group; but, the self efficacy and perceived barrier were not different. The relationships between HBM constructs and weekly ETS exposure were significant; but, there was no significant difference in point prevalence of having smoke free home.

CONCLUSIONS: This study indicated that the health education about ETS exposure can modify health belief and reduce EST exposure among pregnant women, but cannot affect the self efficacy and perceived barrier. To have smoke free home, they need to increase their self efficacy.

KEYWORDS: Health Belief Model, Environmental Tobacco Smoke Exposure, Pregnant Women.

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Tobacco smoking has been and still is primarily a custom of men in Iran,[1,2] leaving women and children as the majority of the involuntary smokers. According to Yunesian, 24% of women were exposed to the second hand smoke in Tehran.[3]

Environmental tobacco smoke (ETS), for which there is no risk free level of exposure, causes disease in non-smokers.[4] For women, pregnancies represent a period of particular vulnerability, during which exposure to tobacco smoke may adversely affect the developing fetus. Recent medical evidence demonstrated the linkages between exposure to ETS among pregnant women and a variety of prenatal complications, both in mothers and their fetus, such as pregnancy loss, low birth weight, preterm delivery, and fetal death.[5-10] Therefore, the ETS exposure is an important reproductive health challenge for health policy makers and health care providers.

Although the providing smoke free environment interventions should be administered before pregnancy time, the sensitivity of moth-

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er on fetal health in 9-month window of a woman's pregnancy is an important opportunity for a public health intervention.

According to Ma, tolerance behavior towards ETS exposure (letting people smoke in the house or not asking people to put out their cigarettes) significantly differed due to increased knowledge that ETS exposure is harmful.[11]

Also, previous studies demonstrated that the avoidance of environmental tobacco smoke among pregnant women was related to knowledge about ETS exposure harms in women[12] and educating non-smoking pregnant women about ETS exposure and positive communication skills led to increased assertive actions against ETS exposure.[13] But, it is important to concern that empowering women to limit exposure to ETS in their homes is related to their social and cultural contexts and their social situation in society.

Though in prenatal care education, pregnant women are recommended to avoid ETS exposure, it is still a health problem in pregnant women in Iran. There are many barriers affecting the implementation of smoke free policy at home for women. Unlike western societies where people mostly socialize in pubs and clubs, in Iranian culture families and relatives gather together at houses. Moreover, women have traditionally accepted the fact that men smoke in their presence.[14] This difference in social habits in conjunction and cultural norm may result in restriction of having smoke free home.

Therefore, the health education should produce strong attitude in pregnant women for implementing smoke limitation at home. Based on construct of the Health Belief Model (HBM), if a pregnant mother thinks or feels that her baby is susceptible to harm as a result of her actions, she will be more cautious about her behavior.[15]

Critical review of the HBM furthers our understanding of the factors influencing the behavior of individuals. Conceptualization of influential factors upon an individual's health including behavior, assists in the design and strategic approach of intervention programs. The various components of the HBM provide a useful framework for examining the health behavior of high-risk women.[16-18]

The original model postulated that preventive health behaviors may be predicted by the following individual perceptions: (1) perceived susceptibility to a disease or illness, (2) perceived severity of a particular condition, (3) perceived barriers, which may prevent actions, and (4) perceived benefits of the recommended behavior.[15]

Following the previous study that health education can change health belief,[19,20] the first hypothesis of this study was to utilize components of the HBM to modify the health beliefs of ETS exposure among pregnant women.

Confirming the HBM that individuals must believe they are susceptible to a perceived threat before taking a health-related action, the secondary hypothesis of the current study was to determine whether health belief modification was followed by increasing likelihood of taking assertive action against to ETS exposure at home.

Methods

A two-group longitudinal, randomized controlled study was conducted from November 2008 to August 2010 in accordance with published guidelines.

This study has been registered in IRCT (registration ID: IRCT138809242857N1) and has been approved by Ethics Committee of the Isfahan University of Medical Sciences.

Theoretical framework of the intervention study was based on HBM, which predicts greater compliance in patients who report feeling greater susceptibility to the risk of experiencing negative health outcomes.[22]

The educational package was prepared by researchers and proofread by four health educators. The topics of the package were the effects the toxic substances from secondhand smoke crossing the placenta and putting the infant at increased risk for neonatal and prenatal morbidity and mortality.

The data collection tool was questionnaire

consisted of several sections: demographics, health belief towards ETS exposure, weekly number of ETS exposure at home to identify the intention to make smoke free home. All the variables were measured by self-report. Self reported ETS exposure validity was confirmed by previous study.[23] To inquire about the health beliefs, the women were asked questions about their perceived susceptibility/severity of second-hand smoke, perceived barriers and the main barrier for making smoke free home. The questions of HBM constructs were designed on five-point Likert scales and were measured by summing up the participants' responses to statements.

To assess the validity of the final version, 10 percent of the final sample was randomly interviewed. The correlation coefficient between the scores on the questionnaire and the interviews was 0.88. Cranach's alpha for evaluation of the internal consistencies was 0.82.

Sample-size calculation showed that 44 participants were needed in each group, using an α of 0.05 and a β of 0.80.

The data were collected prospectively at two times: intake (pre-intervention) and during the third prenatal care (10-12 weeks later) in 10 health centers in Isfahan, Iran. The prenatal care centers were selected by stratified random selection. From each health center of Isfahan, randomly five clinics were selected. All non-smoker pregnant women with a history of exposure to ETS in selected prenatal centers were screened for inclusion by the study staffs. The criteria for inclusion included Iranian nationality, 12 weeks gestation or less, and having ETS exposure at least within 2 months before or since becoming pregnant.

Eligible pregnant women were invited to participate and they gave written informed consent to be research subjects. At the beginning of the study administration, the total number of the participants was 130 pregnant women. After completion, the women were allocated by systematic random allocation, to receive education intervention or no education (control group); 65 women were included in each group and then a pre-intervention questionnaire was administered in both groups.

The face-to-face education was conducted by study staffs after routine prenatal care and prenatal education for the intervention group. They were also given a resource booklet to use at home. The home resource booklet used simple and pictorial terms to communicate knowledge. In this booklet, we explained side effects of ETS exposure for her and for a fetus and also for smokers. The control group was given routine prenatal care and prenatal education. The systematic reinforcement of the messages by study staff was done, when the women in the intervention group attended the second antenatal checkups. The focus of the intervention was to increase the women's sense of susceptibility/severity, and reduce perceived barriers and smoke free home strategies (i.e., limiting someone else for smoking at home).

During the third prenatal care, the questionnaire was completed. Only follow-up data analysis was performed by data analyzer blinded to intervention status.

A total of 91 women (47 women in the intervention group and 44 women in the control group) completed the study, with a retention rate of 75.83%; 15% dropped out (because of abortion and disaffection for maintenance) and 6.66% were lost in the follow up.

Statistical analysis was performed using SPSS 13.0 (Chicago, IL, USA). The results were reported as geometric mean or numbers with percentages. The categorical data were analyzed using Wilcoxon–Mann–Whitney U test at the statistical level of significance of $p<0.05$. A multiple regression model was used to evaluate the relation between HBM constructs (independent variable) and weekly ETS exposure adjusting for potential cofounders including age of women and men, income, and education level.

Results

To examine group equivalence at baseline, the comparisons of demographics (age and years of education), health belief constructs

(perceived susceptibility, perceived severity, perceived barriers and self efficacy) and weekly EST exposure were done.

There were no statistically significant differences in the demographic and health belief constructs with the independent t test and the Wilcoxon–Mann–Whitney U test. These results demonstrated the relative equivalence of the groups on these relevant variables (Table 1).

To examine the hypotheses, the theoretical constructs in both groups were compared at third referral. The mean and standard deviations of the measured variables and their intercorrelation coefficients with mean weekly exposure at third was calculated for the intervention group (Table 2).

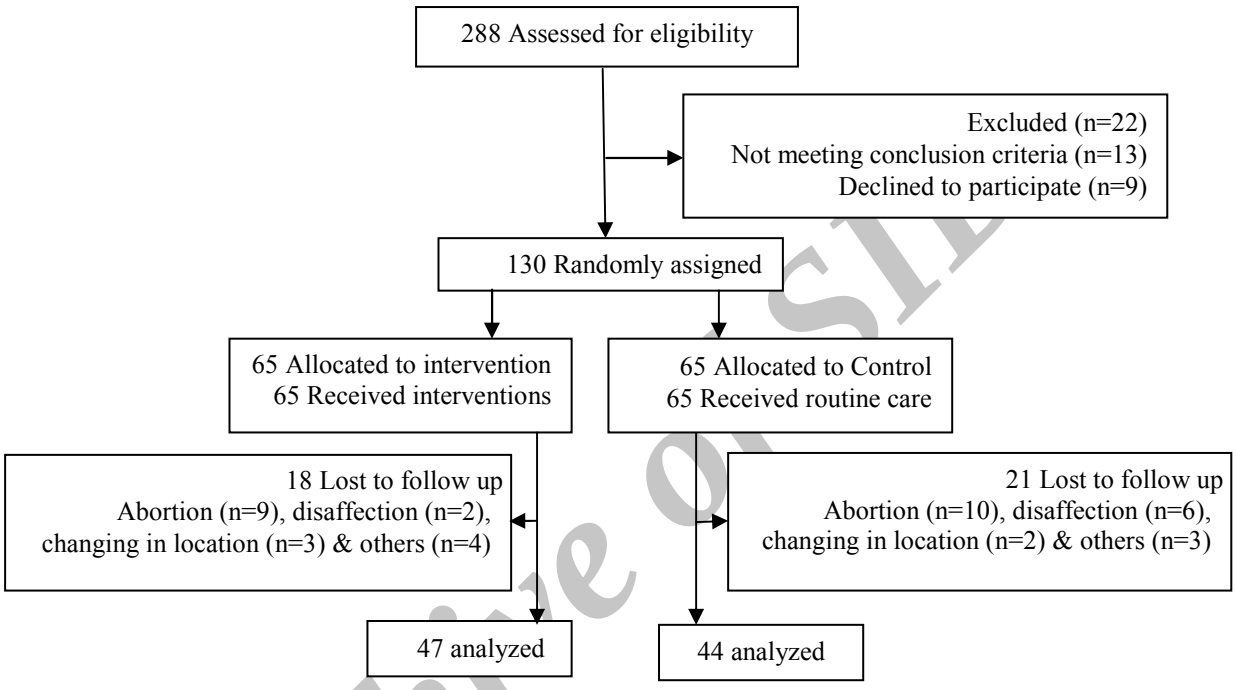

Table 1. Followed up quantitative variables at intake in study groups

	Intervention group	Control group	
	Mean (±sd)	Mean (±sd)	
Age of women	27.21 (±5.06)	25.9 (±5.28)	0.23+
Age of men	31.91 (5.99)	31.41 (±5.83)	0.68+
Monthly income (×1000 Rials)	3721.7 (1197.6)	3577.3 (±1024.3)	0.54+
Perceived susceptibility	16.42 (± 2.42)	15.95 (±4.16)	0.67*
Perceived severity	16.11 (±2.21)	16.07 (±3.76)	0.47*
Perceived barriers	6.81 (±2.03)	6.86 (±1.3)	0.97*
Self efficacy	6.68 (±1.75)	6.86(±1.99)	0.62*
Weekly ETSE (n)	31.62 (±22.99)	31.77 (±23.8)	.99*،

Note: ETS= Environment Tobacco Smoke exposure
+T-test
*Wilcoxon–Mann–Whitney test.

Table 2. Followed up variables at third refer in study groups and correlation between Health Belief model constructs and weekly ETS in intervention group

	Intervention group	Control group	Sig+	ETS
	Mean (±sd)	Mean (±sd)		R
Perceived susceptibility	18.31 (±2.08)	15 (±2.64)	<.0001	-.51*
Perceived severity	18.21 (±1.33)	16.59 (±2.68)	.001	-.44**
Self efficacy	7.38 (±1.58)	7.02 (±2.25)	.39	-.41**
Perceived barrier	6.6 (±1.83)	6.88 (±1.37)	.66	.2
Weekly ETSE (n)	13.42 (±16.4)	27.59 (±17.12)	<.0001	-

Note: ETS= Environment Tobacco Smoke Exposure
+Wilcoxon–Mann–Whitney test.
* P < .001 for between-group differences.
** P < .01 for between-group differences.

Compared to the control group, the intervention group reported significantly higher perceived susceptibility, and perceived severity for ETS exposure. But, the differences in the perceived barriers and self efficacy between groups were not significant. In the intervention group, the mean weekly exposure at third referral was significantly lower than that for the control group.

Consistent with the health belief model, the scores on the perceived susceptibility/severity construct and self efficacy at the third referral were associated with weekly number of ETS exposures in the intervention group.

The descriptive data at the third referral indicated that 11.6% of the control group and 8.5% of the intervention group were already living in smoke-free homes; but, the difference of point prevalence was not significant ($\square^2$ =2.42, df=2, p=0.62) .

In the intervention group there were statistically significant differences between perceived susceptibility/severity and self efficacy at intake and these theoretical constructs at third referral. These results demonstrated the change in some theoretical constructs after the education program in the intervention group (Table 3). Unlike women in the control group, in terms of the intake time, women in the intervention group at the third time reported significantly lower weekly ETS exposure. Multiple regression analysis showed that the impact of perceived susceptibility/severity on weekly ETS exposure and changing level of ETS exposure were independent of age of women and men, educational level and monthly income (Table 4).

The results showed the high level intention to make smoke free home at third referral in intervention and control groups which were 40.4% and 26.4%, respectively. But, there was no differences between them ($\square^2$=1.08, df=3, p=0.78). In intervention group, 27.7% and in control group, 31.8% mentioned that the shame was the main barrier for asserting limitation policy to make smoke free home (Figure 1). The space limitation as main barriers was robust.

Discussion

This study established the preliminary confirmation of the efficacy of applying the education based on HBM to promote health belief towards EST exposure (perceived susceptibility/severity, perceived barriers and self efficacy) and to assert smoke free policy at home in pregnant women.

The results indicated that the health education based on HBM in treated women was effective; and the perceived susceptibility/severity constructs changed for the better.

Table 3. Comparison of dependent variables between referral times

	Intervention group	Control group
	p	
Perceived susceptibility	<.0001	0.06
Perceived severity	<.0001	0.33
Perceived barrier	0.64	0.79
Self efficacy	0.02	0.58
Weekly ETSE (n)	0.0001	0.97

Note: ETS= Environment Tobacco Smoke Exposure

Table 4. Results of Regression model analysis adjusting for confounder variables

Dependent variables	Independent variables	B	p	CI	
Weekly ESTE (n)	Perceived susceptibility	1.96	0.005	-3.32	-.61
	Perceived severity	-1.98	0.005	-3.31	-.60
	Self efficacy	-.2.68	0.008	-4.63	-.72
	Perceived barrier	1.63	0.19	-.82	4.08
Changing in ETSE (n)	Perceived susceptibility	2.57	0.0001	1.16	3.97
	Perceived severity	3.17	0.001	1.42	4.99
	Self efficacy	-.54	0.61	-2.71	1.62
	Perceived barrier	-1.69	0.20	-4.31	.92

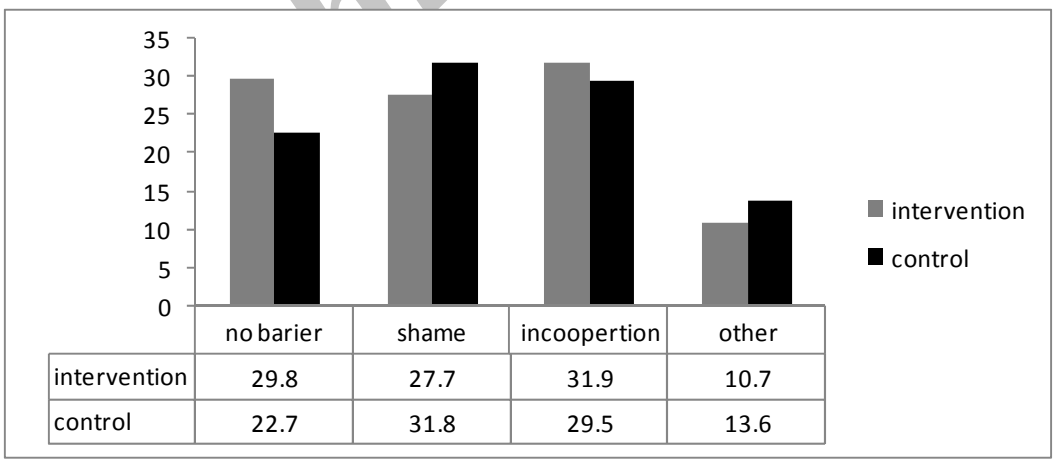

Figure 1. The main barriers for making smoke free home

This finding was confirmed by other researches.[23,24] But, unlike some of the study results which provided evidence based on increase in self-efficacy followed by training,[22] this study indicated that education was not efficient on self-efficacy of the pregnant women to create a smoke-free environment. It seems that for creating the self-efficacy of the women in the cultural context of the study population, mutual interaction training is ne-

cessary for both the smokers and ETS women; besides, sheer education cannot make women to believe in their own ability to deal with risky pregnancy situations.

Lee also had reported that avoiding from tobacco smoke among the Chinese women was dependent upon the awareness and knowledge rate of the pregnant women and their spouses.[13] In addition to lack of training effect on women's self-efficacy, to avoid smoking inside the home, the results of the study indicated the effectiveness of education on understanding the barriers. Similar to the present study, Sharifirad also reported that training was not associated with reducing the perceived barriers by the adolescents' smokers.[22]

Increasing the individuals' awareness and knowledge about the current barriers to deal with adverse conditions with greater understanding of perceived susceptibility may explain the cause of lack of change in perceived barrier construct followed by the training of the pregnant women.

According to the importance of perceived susceptibility/severity constructs in the health belief model theory for the incidence of health behaviors, the first hypothesis can be accepted based on the effect of training on modifying the HBM. Therefore, based on the second hypothesis of the study, it was expected that by modifying the HBM in the trained group, smoking prevention laws inside the home to be implemented more by this group compared to the other group.

The results also indicated that weekly number ETS exposure at home was lower in the trained group in comparison with the other group, and this reduction was correlated with perceived susceptibility/severity level, so that with increase in perceived susceptibility/severity weekly number ETS exposure was reduced.

Despite the statistical significant reduction in weekly number ETS exposure followed by modifying the HBM, lack of ability to create a smoke-free environment in both groups indicated the indecisive effect of modified HBM in implementing the policy of smoke-free home. However, it should not be denied that trained individuals with higher perceived susceptibility pay more attention to their environment and often report the smoking contact more than others; and this might be one of the reasons of lack of a significant difference in comparing the two groups.

Other studies also indicated that in order to recognize the harmful effects of contact with cigarette smoke, training the pregnant women caused them to reduce and prevent the cigarette smoke around them.[12, 13]

According to Katz, pregnant women with ETS exposure in contrast with other women with high risk behavior were more possible to report that in the future they would continue to use the information and skills that they learned through intervention.[26] But, Pletsch reported that counseling with passive smoker women during pregnancy did not reduce ETS exposure.[27]

Another finding of this study was lack of cooperation of the people around them for having smoke free home, which was one of the major barriers particularly in the trained group. Furthermore, shame of expressing their demands for having a smoke-free environment at home had a significant impact even in the trained group which could be another reason for supporting the lack of self-efficacy in the studied women.

Therefore, in order to preserve reproductive rights based on the rights for having an environment free from toxic and contaminated substances,[28] it is necessary that prenatal trainings be conducted along with increase in communication and conversation skills and give the enforcement power to the women in order to establish health behaviors in the family. Other studies also indicated that the inability of women in adoption and enforcing the laws to prevent smoking inside the home was the other important and effective factor in contacting the pregnant women with cigarette smoke.

Yang reported that 54.4% of the pregnant women's spouses in China had no restriction on smoking inside the home and only 14.2% of

them were not allowed to smoke inside the home whereas, 50% of the Chinese women expressed dissatisfaction form the smoking of their spouses inside the home.[29]

In addition to necessity of increasing the efficacy and ability level of the women for obtaining their own effective role for maintaining the family health and policy making power and implementing it in this regard, the presence of pregnant women's spouses during the prenatal trainings may facilitate prevention of pregnant women to avoid contact with cigarette smoke. Studies indicated that involving the husbands in pregnancy health education during the prenatal care had more effect on incidence of health behaviors.[30]

The important limitation of this study was related to sample size. A larger sample would have given us more confidence in study findings. Another study limitation was that ETS exposure was self-reported information. Differences in self-reported amounts of exposure might be due to recall bias.

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Conflict of Interests
Authors have no conflict of interests.

Authors' Contributions
AK played a major role in formulation of study design, data collection supervising, acquisition of analysis and interpretation of data and writing and revising the manuscript. Soheila Ehsanpour was involved in played a role in formulation of study design and data collection supervising. AH played a role in analysis and interpretation of data. NSNZ, NMB and ZM involved in data collection supervising.

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