Systematic Review and Meta-Analysis

Effects of training based on the health belief model on Iranian women's performance about cervical screening: A systematic review and meta-analysis

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Abstract:

CONTEXT: Pap smear test is one of the most important actions in preventing cervical cancer. This study aimed to perform a meta-analysis on all related literature about the effects of health belief model (HBM)-based training on Pap smear screening test performance of Iranian women.

METHODS: The search was performed in Scopus, PubMed, and Web of Science. Eligibility criteria were limited to English and Persian language articles with experimental or semi-experimental methods until October 2019 that evaluated the effect of HBM-based training on Iranian women's performance of Pap smear test. We excluded studies that used both cervical and breast cancer screening together.

RESULTS: Twelve studies were performed on totally 1605 participants. This meta-analysis showed that all of Health Belief Model (HBM) constructs improved significantly among HBM-based trained women, perceived susceptibility (standard mean division [SMD] =0.785; $P = 0.002$; confidence interval [CI] = 0.005 to 1.56; Heterogeneity; $P = 0.013$; $I^2 = 97\%$)., perceived severity (SMD = 1.14; $P = 0.001$; CI = 0.66–1.62; heterogeneity; $P < 0.001$; $I^2 = 92\%$), perceived benefits (SMD = 1.25; $P = 0.001$; CI = 0.545–0.135 heterogeneity; $P = 0.003$; $I^2 = 97\%$), perceived barrier (SMD = 0.20; $P = 0.001$; CI = 0.44–1.24; heterogeneity; $P < 0.001$; $I^2 = 92\%$) and perceived self-efficacy (SMD = 0.638; $P < 0.001$; CI =1.76–0.426; heterogeneity; $P < 0.001$; $I^2 = 97\%$).

CONCLUSION: Cervical screening education program based on the HBM can be effective on Iranian women's performance in their perceived susceptibility, perceived severity, perceived barrier, and perceived self-efficacy about Pap smear test.

Keywords:

Cervical cancer screening, health belief model, smear

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Introduction

Cervical cancer is the most prevalent carcinoma and the major cause of death among women in developing countries. Nearly 25% of the women's mortality is due to malignant tumors and 18% of them related to cervical cancer.[1] The prevalence rate of cervical cancer in Iran has been reported to be 4.5 / 100,000 individuals; besides, reports indicate that this cancer is the fourth most prevalent type of cancer among Iranian women.[2] Due to having a long preinvasive period and accessibility of the screening programs as well as effective treatment of its lesions, cervical cancer is considered as preventable cancer.[3] Cervical cancer screening is one of the most important actions in preventing this disease, the purpose of which is to diagnose the lesions in the premalignant stage and reduce the cancer-caused mortality.[4] Based on the studies in this regard, lack of regular screening results in the increase by 2–6 times in the risk of cervical cancer incidence.[5]

Since 1950, the Pap test has been successful in reducing the prevalence of cervical cancer and its resulted mortality by 79% and 70%, respectively.[4] This method diagnoses 13,000 invasive cancer cases as well as one million precancerous lesions annually.[6] Although in the health system of Iran, the Pap test is performed on the age group of 20–65 years one to three times a year since 1991 and also it is an effective and nonexpensive test, several studies have indicated that the Iranian women have not greatly welcomed it.[7] In general, knowledge, attitude, and beliefs are considered the determinant factors for an individual's participation in screening programs.[3,8] Selecting an appropriate psychosocial model of health behavior is the first step in the planning process.[9] There are various health behavior models, including stage of change model,[10] behavioral intention model,[11] and precede-proceed model[12]. It is interesting that using model based educations was effective on cervical cancer prevention behavior.[13]

The health belief model (HBM) is one of most popular models in the field of health education, the validity and reliability of which have been proved in different studies based on the recognition of beliefs in cervical cancer.[5] This model demonstrates the relationship between health belief and health behavior and is focused on the personal perception about disease and the beliefs about disease prevention as well as the effects of these factors on the health performance. The HBM which was introduced in the field of public health in 1950 includes five elements: perceived susceptibility to cervical cancer, perceived severity to side effect of cervical cancer, benefits perceived to Pap smear, barriers perceived to Pap smear, and self-efficacy to guidance for practice.[8] This model is frequently used in reproductive health and women's cancer prevention studies and programs, but the findings about effect of HBM on Pap smear in different studies have controversies.[14,15]

Review of literature showed that there is no study that summarizes the effect of training the women via health belief method on performing the Pap test in Iran; therefore, the aim of this systematic review study was to evaluate and compare the effects of training based on the HBM on Iranian women's performance about cervical screening.

Methods

Eligible studies include all experimental or semi-experimental studies in which samples were randomly allocated.These included studies used the control group or placebo with double-blind, single-blind, or nonblinded method and were published in Persian or in English language in medical journals that evaluated

the effect of training on Iranian women's performance in Pap test based on HBM until October 2019. The main outcomes were all driven from HBM construct on uterine cervical screening. We excluded studies that used both cervical and breast screening together or other methods of study. The electronic sources reviewed in this study include PubMed, SID, Magiran, Scopus, and Web of Science. Our search was performed using the following key words: ("uterine cervical cancer" OR "uterine Cervical Neoplasm" OR "uterine cervical carcinoma") AND ("Papa Nicola test" OR "pap smear" OR "pap test") AND ("health belief model" OR "HBM" OR "health belief theory") AND ("Iranian women" OR "Persian women").

The two authors independently reviewed the titles and abstracts of studies to find all eligible studies and coded them based on the study entry to the next. In the second phase, the full text of the studies selected by the two authors was evaluated independently and the studies that content were entered into the next step were selected and studies related to the mention of the reason were excluded. Any disagreements through assessment or, if necessary, consultation with a third person has been resolved and a consensus strategy has been used. Identifying and eliminating duplicate studies and several reports from a study has been done.

Two authors evaluated the quality of studies according to the criteria of selection, methods for evaluating, the results, and analyzing the data using the Cochran risk of bias scale.[16] Seven domains related to risk of bias were assessed in each randomized controlled trial. Review authors' judgments were categorized as "low risk," "high risk," and "unclear risk" of bias.

To measure the outcomes of Pap smear education based on HBM constructs, the percentage and mean score of perceived susceptibility to cervical cancer, perceived severity to cervical cancer, benefits perceived to pap smear, barriers perceived to pap smear, and also self-efficacy to guidance for practice were compared between the intervention group and the control group after educational intervention. The study was conducted with the authors of the correspondence study to complete the information and studies that did not complete their data were deleted. The main effect size was calculated as standardized difference in means (SMD). We reported the results based on a random effects model because of high heterogeneity across studies. Cochrane Q-test ($P < 0.05$ as statistically significant) and I^2 index were used to evaluate heterogeneity. All statistical analyses were done by Comprehensive Meta-analysis Version 2 (Biostat, Englewood, NJ, USA).

Results

The search was updated until October 2019; we screened a total of 387 records from the following databases: PubMed (48), SID (5), Magiran (100), Scopus (159), and Web of Science (75). In creating the report of this systematic review, we followed the PRISMA statement.[17] Accordingly, 200 articles were selected in the first step. After evaluating the quality of studies, 12 articles were introduced [Figure 1].

All of the 12 studies included in the final step had been conducted experimentally and semi-experimentally. The total number of samples in the empirical studies that were used to predict the factors influencing HBM-based Pap smear was 1605. The age range of women participating in the study and the conditions for entry into the study are the same in all studies and range from 16 to 60. All subjects were married and had sex relations, and the level of their education varied from illiterate to university education. Characteristics of studies included are reported in Table 1.

Based on the results of "Cochrane Risk of bias tool" assessment [Table 2], for random sequence generation, 4 trials were deemed to be at low risk,[18-22] and also for allocation concealment 2 trial were at high risk.[23,24] Five trials did not report any attempt to blind assessors to treatment assignment[3,19,23,25,26] and five study did not blind.[22,24,27-29] In 2 trials, the participants/providers, or both were blinded to treatment allocation.[20,21] Eight trials did not provide information about the number of participants allocated to groups at randomization[3,19,24-29] and four trials reported attrition bias.[20-23] In 12 studies,

the inclusion and exclusion criteria and selective outcome were clearly defined. The intervention and control groups were demonstrably comparable in 12 Trials.[3,19-29]

Eleven studies used the perceived susceptibility construct.[3,19-23,25-29] In the result of meta-analysis, perceived susceptibility in women with education program improved significantly (SMD = 0.785; P = 0.002; confidence interval [CI] = 0.005–1.56; heterogeneity; P = 0.013; I^2 = 97%) [Figure 2].

Twelve studies used perceived severity construct for performing Pap test.[3,19-29] The education programs could also significantly improve perceived severity construct (SMD = 1.14; P = 0.001; CI = 0.66-1.62; heterogeneity; P < 0.001; I^2 = 92%) [Figure 3].

Eleven studies used perceived benefits construct;[3,19-23,25-29] a combination of findings showed that perceived benefits improved significantly among women who received education program (SMD = 1.25; P = 0.001; CI = 0.545–0.135; heterogeneity; P = 0.003; I^2 = 97%) [Figure 4].

Twelve studies used perceived barrier construct.[3,19-29] This meta-analysis result showed that cervical screening education programs can statistically significantly improve perceived barrier construct (SMD = 0.20; P = 0.001; CI = 0.44–1.24; heterogeneity; P < 0.001; I^2 = 92%) [Figure 5].

"Self-efficacy" was the construct that had been used in five studies.[20,23,25,27,28] A combination of findings showed that education programs can also statistically significantly improve perceived self-efficacy construct (SMD = 0.638; P < 0.001; CI = 1.76–0.426; heterogeneity; P < 0.001; I^2 = 97%) [Figure 6].

Discussion

In this study, training based on the HBM in all of the constructs was effective on the women's performance for performing the Pap test. Heterogeneity was high between included studies that assessed the effect of education program on heath belief model construct. Excluding one by one study did not make any change at degree of heterogeneity.

To investigate the perceived susceptibility construct in the HBM, the individuals' concerns about cervical cancer, perception of proneness to disease, and sense of risk which are usually examined[28,30] were significantly effective that is comparable to another review about cervical screening test.[31] This construct was not significantly effective after education in Bushehr city, which might be related to their few number of training
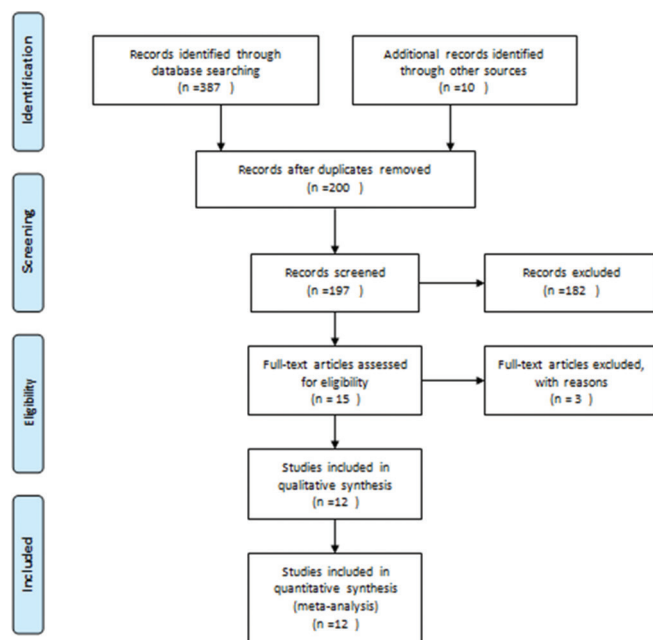

Figure 1: Study selection diagram

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Table 1: Characteristics of studies included

Authors (years, location)	Title	Samples	Intervention group	Methods	Follow-up	Conclusion
Daryani *et al.* (2016, Amol)	The effect of education based on HBM on women's practice about Pap smear test	120	Intervention group: 60 participants 90 min educational sessions every week for 2 weeks Control group: 60 participants without intervention	Practical displays, films, lectures and Q and A and the pamphlet	2 months	Mean score of HBM construct after intervention in case and control groups in terms of Perceived susceptibility: Significant Perceived severity: Significant Perceived benefit: Significant Perceived barrier: Significant Perceived self-efficacy: Significant
Khiyali *et al.* (2017, Fasa)	The effect of educational intervention based on HBM on Pap smear test in women of Fasa city	160	Intervention group: 80 participants 90 min educational sessions every week for 5 weeks Control group: 80 participants without intervention	Group training based on lecture and questioning method and pamphlet	2 months	Mean score of HBM construct after intervention in case and control groups in terms of Perceived susceptibility: Significant Perceived severity: Significant Perceived benefit: Nonsignificant Perceived barrier: Significant
Baghiani *et al.* (2018, Yazd)	The effect of educational intervention based on HBM constructs on performing Pap smear in Yazd	87	Intervention group: 47 participants 90 min educational sessions every week for 2 weeks Control group: 40 participants without intervention	Group training based on lecture and questioning method	2 months	Mean score of HBM construct after intervention in case and control groups in terms of Perceived susceptibility: Significant Perceived severity: Significant Perceived benefit: Nonsignificant Perceived barrier: Significant Perceived self-efficacy: Nonsignificant
Rakhshani *et al.* (2012, Hamadan)	Pap smear test among women: An educational intervention based on HBM	120	Intervention group: 60 participants with 60 min educational sessions every week for 4 weeks Control group: 60 participants without intervention	Group training based on lecture and group discussion	3 months	Mean score of HBM construct after intervention in case and control groups in terms of Perceived severity: Significant Perceived barrier: Significant
Vasheghani *et al.* (2010, Tehran)	Effect of educational intervention based on HBM on knowledge and attitude about Pap smear test among female secondary school teachers in district 11 of Tehran	144	Intervention group: 72 participants 45 min educational sessions for 1 week Control group: 72 participants without intervention	Group training based on lecture and questioning method	1 month	Mean score of HBM construct after intervention in case and control groups in terms of Perceived susceptibility: Significant Perceived severity: Significant Perceived benefit: Significant
Hazavehei *et al.* (2013, Khomeinishahr)	Effect of educational program based on HBM on the practice of women about Pap smear	124	Intervention group: 62 participants 60 min educational sessions every week for 2 weeks Control group: 62 participants without intervention	Group training based on lecturer and questioning method	1 month	Mean score of HBM construct after intervention in case and control groups in terms of Perceived susceptibility: Significant Perceived severity: Significant Perceived benefit: Significant Perceived barrier: Significant
Karimy *et al.* (2010, Zarandieh)	The effect of health education program based on HBM on the performance of Pap smear test among women referring to health care centers in Zarandieh	120	Intervention group: 60 participants 60 min educational sessions every week for 2 weeks Control group: 60 participants without intervention	Group training based on lecture	2 months	Mean score of HBM construct after intervention in case and control groups in terms of Perceived susceptibility: Significant Perceived severity: Significant Perceived benefit: Significant Perceived self-efficacy: Significant

Contd...

Table 1: Contd...

Authors (years, location)	Title	Samples	Intervention group	Methods	Follow-up	Conclusion
Bahmani *et al.* (2016, Kurdistan)	Effect of HBM education on the participation of rural women in Pap smear test	180	Intervention group: 90 participants 60 min educational sessions every week for 3 weeks Control group: 90 participants without intervention	Group training based on lecture and questioning method and pamphlet and film	3 months	Mean score of HBM construct after intervention in case and control groups in terms of Perceived susceptibility: Significant Perceived barrier: Significant Perceived benefit: Significant Perceived self-efficacy: Significant
Tahmasebi *et al.* (2014 and 2015, Bushehr)	The effect of education based on the HBM on women's practice about Pap smear test	100	Intervention group: 50 participants 60 min educational sessions every week for 2 weeks Control group: 50 participants without intervention	Group training based on lecture and questioning method and pamphlet and slideshow	3 months	Mean score of HBM construct after intervention in case and control groups in terms of Perceived severity: Significant Perceived barrier: Significant
Hossaini *et al.* (2014, Bushehr)	Comparing the effects of individual and group training methods based on HBM on the belief and practice of bushehr women regarding Pap smear test	150	Intervention group 1: 50 participants 60 min individual educational sessions week for 1 week Intervention group 2: 50 participants 60 min educational sessions every week for 2 weeks Control group: 50 participants without intervention	Individual training based on counseling and pamphlet group training based on lecture and pamphlet and slideshow	1 week 3 months	Mean score of HBM construct after intervention in case and control groups in terms of Perceived barrier: Significant
Shobeiri (2016, Hamedan)	Effects of group training based on the HBM on knowledge and behavior regarding the Pap smear test in Iranian women: A quasi-experimental study	230	Intervention group: 165 participants 60 min educational sessions every week for 2 weeks Control group: 165 participants without intervention	Group training based on lecture and questioning method and discussion group	Immediately	Mean score of HBM construct after intervention in case and control groups in terms of Perceived susceptibility: Significant Perceived severity: Significant Perceived benefit: Significant Perceived barrier: Significant Perceived self-efficacy: Significant
Pirzadeh *et al.* (2010, Kouhdasht)	The effect of health education based on HBM on performance of women regarding Pap smear test in Kouhdasht health centers in 2010	70	Intervention group: 35 participants 60 min educational sessions every week for 2 weeks Control group: 35 participants without intervention	Group training based on lecture and group discussion and pamphlet	1 month	Mean score of HBM construct after intervention in case and control groups in terms of Perceived susceptibility: Significant Perceived severity: Significant Perceived benefit: Significant Perceived barrier: Significant

HBM=Health belief model

sessions and low rate of interaction between the participants and the trainer.[21,22]

To investigate the perceived severity construct in the HBM, several aspects were studied, including how hazardous the cervical cancer disease,[32] individual's perception of seriousness and severity of the disease, and whether the disease could jeopardize their lives.[28] In two studies in Kurdistan Province, training had no effect on the perceived severity construct in the training group.[21,28] It is clear that native personnel with sufficient skills and fluency in the native language of the region can effectively motivate lay people and improve their performance in Pap test.

The perceived benefits construct deals with early diagnosis of cervical cancer and its on-time treatment. Attempts to make women believe usefull[28,33] were more effective after education in this meta-analysis that is consistent with another review study.[34] Based on the results of the study, the effectiveness of the training provided for the women requires different attitude and performance as well as localization of the trainings.

This meta-analysis result showed that training can lead to significant changes in the mean score of the perceived barriers construct after intervention between the training and control group. This is the only construct that has been significant in all of the included studies in this meta-

Table 2: Risk of bias score in included studies

Authors (years, location)	Sequence generation	Allocation concealment	Compare control group	Blinding of outcome assessment	Incomplete outcome data	Selective outcome reports	Method clearing
Khiyali *et al.* (2017, Fasa)	Low	Unclear	Low	Unclear	High	Low	Low
Baghiani *et al.* (2018, yazd)	Low	Unclear	Low	High	High	Low	Low
Rakhshani *et al.* (2012, Hamadan)	Unclear	High	High	High	High	Low	Low
Vasheghani *et al.* (2010, Tehran)	Low	Unclear	Low	Unclear	High	Low	Low
Hazavehei *et al.* (2013, Khomeinishahr)	Low	Low	Low	Unclear	Unclear	Low	Low
Karimy *et al.* (2010, Zarandieh)	Low	Unclear	Low	Unclear	Unclear	Low	Unclear
Bahmani *et al.* (2016, Kurdistan)	Low	Unclear	Low	High	High	Low	Low
Tahmasebi *et al.* (2014 and 2015, Bushehr)	Low	Low	Unclear	Low	Low	Low	Low
Hossaini *et al.* (2014, Bushehr)	Low	Low	Low	High	Low	Low	Low
Shobeiri, (2016, Hamedan)	Low	Low	Low	Low	Low	Unclear	Low
Pirzadeh *et al.* (2010, Kouhdasht)	Low	Low	Low	High	High	Low	High
Daryani *et al.* (2016, Amol)	Low	High	Low	Unclear	Low	Low	Low
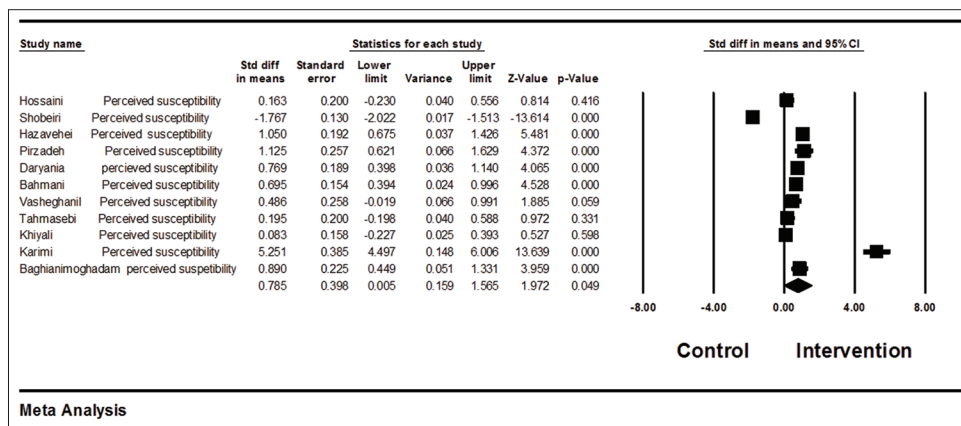
Figure 2: Effects of education program on the women's perceived susceptibility
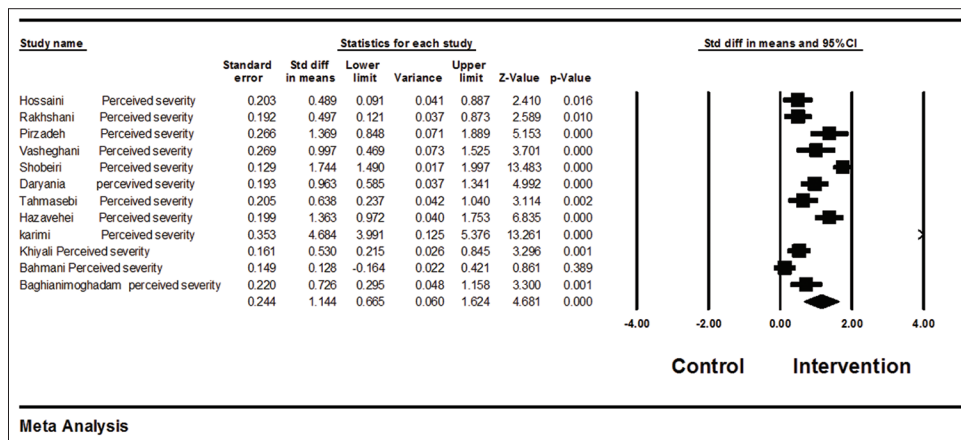
Figure 3: Effects of education program on the women's perceived severity

analysis, which indicates effectiveness and usefulness of the educational interventions in this regard. According to a review study in Asia, shame and virginity, distrust of health system, fear from pain, anxiety and lack of health provider recommendations were the major barriers of performing the Pap test in a conceptual framework based in the HBM.[28] Based on another review study result, the HBM is very powerful in perception of the

behavior construct and very weak in perceptions of the disease construct.[34]

According to the study results, the self-efficacy construct of the health belief improved the Iranian women's ability of perceiving the health staff's explanations, asking questions from the physician, perceiving the necessity of examination, and ability of providing appropriate

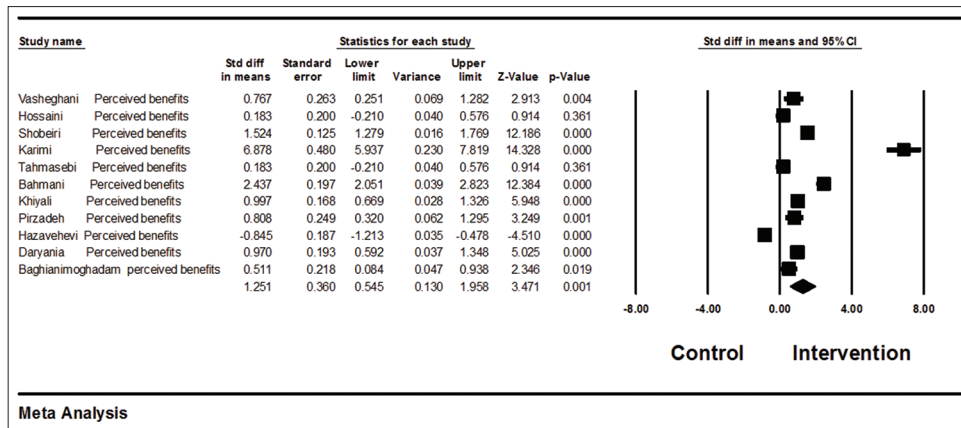| Study name		Std diff in means	Standard error	Lower limit	Variance	Upper limit	Z-Value	p-Value
Vasheghani	Perceived benefits	0.767	0.263	0.251	0.069	1.282	2.913	0.004
Hossaini	Perceived benefits	0.183	0.200	-0.210	0.040	0.576	0.914	0.361
Shobeiri	Perceived benefits	1.524	0.125	1.279	0.016	1.769	12.186	0.000
Karimi	Perceived benefits	6.878	0.480	5.937	0.230	7.819	14.328	0.000
Tahmasebi	Perceived benefits	0.183	0.200	-0.210	0.040	0.576	0.914	0.361
Bahmani	Perceived benefits	2.437	0.197	2.051	0.039	2.823	12.384	0.000
Khiyali	Perceived benefits	0.997	0.168	0.669	0.028	1.326	5.948	0.000
Pirzadeh	Perceived benefits	0.808	0.249	0.320	0.062	1.295	3.249	0.001
Hazavehevi	Perceived benefits	-0.845	0.187	-1.213	0.035	-0.478	-4.510	0.000
Daryania	Perceived benefits	0.970	0.193	0.592	0.037	1.348	5.025	0.000
Baghianimoghadam	perceived benefits	0.511	0.218	0.084	0.047	0.938	2.346	0.019
		1.251	0.360	0.545	0.130	1.958	3.471	0.001

Control   Intervention

Meta Analysis

Figure 4: Effects of education program on the women's perceived benefits

Study name		Standard error	Std diff in means	Lower limit	Variance	Upper limit	Z-Value	p-Value
Hossaini	Perceived barriers	0.202	0.423	0.026	0.041	0.819	2.091	0.037
Pirzadeh	Perceived barriers	0.272	1.524	0.992	0.074	2.056	5.613	0.000
Bahmani	Perceived barriers	0.155	0.835	0.531	0.024	1.140	5.374	0.000
Rakhshani	Perceived barriers	0.191	-0.893	-1.268	0.037	-0.518	-4.664	0.000
Vasheghani	Perceived barriers	0.313	2.044	1.429	0.098	2.658	6.521	0.000
Hazavehevi	Perceived barriers	0.223	2.078	1.641	0.050	2.515	9.324	0.000
Shoberi	Perceived barriers	0.119	1.068	0.834	0.014	1.302	8.947	0.000
Tahmasebi	Perceived barriers	0.202	0.423	0.026	0.041	0.819	2.091	0.037
Daryania	perceived barriers	0.193	0.968	0.590	0.037	1.346	5.018	0.000
Khiyali	perceived barriers	0.161	0.530	0.215	0.026	0.845	3.296	0.001
Karimi	Perceied barriers	0.187	0.616	0.250	0.035	0.982	3.298	0.001
Baghianimoghadam	perceived barriers	0.223	0.735	0.299	0.050	1.172	3.300	0.001
		0.203	0.846	0.448	0.041	1.243	4.170	0.000

Control   Intervention

Meta Analysis

Figure 5: Effects of education program on the women's perceived barrier

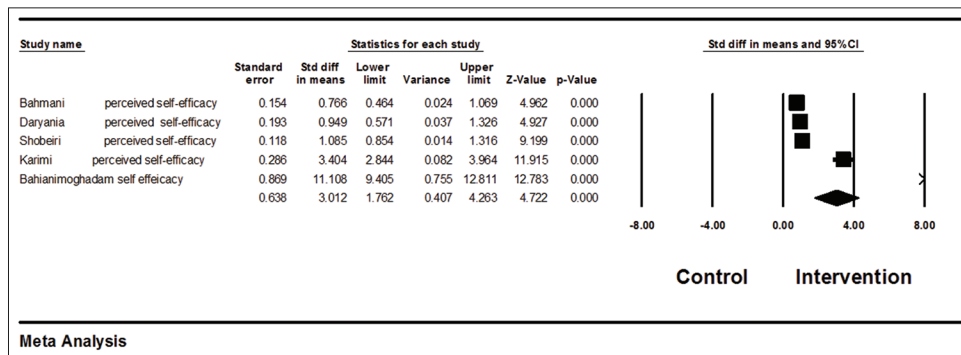| Study name		Standard error	Std diff in means	Lower limit	Variance	Upper limit	Z-Value	p-Value
Bahmani	perceived self-efficacy	0.154	0.766	0.464	0.024	1.069	4.962	0.000
Daryania	perceived self-efficacy	0.193	0.949	0.571	0.037	1.326	4.927	0.000
Shobeiri	perceived self-efficacy	0.118	1.085	0.854	0.014	1.316	9.199	0.000
Karimi	perceived self-efficacy	0.286	3.404	2.844	0.082	3.964	11.915	0.000
Bahianimoghadam	self effeicacy	0.869	11.108	9.405	0.755	12.811	12.783	0.000
		0.638	3.012	1.762	0.407	4.263	4.722	0.000

Control   Intervention

Meta Analysis

Figure 6: Effects of education program on the women's perceived self-efficacy

explanations for others, as well as ability for the next referral and performing the Pap test.[35] Based on the study's results, appropriate training program must be provided in such a way that can bold the individual's role to perceive the value of health and also perform self-care during her healthiness.[36] These might increase power and control of indivisual on health as well as confidence and self-efficacy.[37] Self-efficacy is the most important prerequisite of change in behavior.[38] The results of this meta-analysis were same with another review results in ethnic minority women.[39]

Some of the limitations of the present study included the few number of studies on the effect of training based on the HBM on performing the Pap test in Iranian women. Alsothe majority of the studied samples were allocated from individual medical centers, which might not be good representatives of the Iranian women's population. Furthermore, there is no comprehensive educational program in Iran for providing information on cervical cancer and Pap test. Since preventive and health beliefs and behaviors in any society are founded on sociocultural grounds and the women's health beliefs have significant

impacts on accepting the cancer screening methods, we had selected only Iranian studies for meta-analysis. With regard to the weaknesses and strengths of the HBM in performance Pap test, it is proposed to conduct studies to compare this model with other effective models in screening, such as behavior change model. Finally we recommend that future studies utilize the strong points of each model to compile and develop the educational content of the cervical cancer-specific group training sessions in order to execute it in all health stations and provincial centers.

Conclusion

Cervical screening education program based on the HBM can be effective on Iranian women performance in their perceived susceptibility, perceived severity, perceived barrier, and perceived self-efficacy about Pap smear test.

Conflicts of interest
There are no conflicts of interest.

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