Original Paper

Effect of Education Based on Health Belief Model on Self-care Behaviors of Women With Hypertension in Pregnancy

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ABSTRACT

Introduction: Hypertension in pregnancy is one of the three main causes of maternal death after hemorrhage and sepsis. Education of hypertensive pregnant mothers can be effective in promoting self-care behaviors and ultimately proper control of blood pressure. The use of educational models can be very helpful in this regard compared to traditional methods.

Objective: This study aims to assess the effectiveness of education based on the health belief model (HBM) in improving the self-care behaviors of pregnant women with hypertension.

Materials and Methods: This is a quasi-experimental study with a pre-test/post-test design that was conducted on 90 women with hypertension in pregnancy who referred to one of the specialized women's hospitals in Rasht, Iran, during January-August 2020. The participants were randomly divided into two groups of intervention and control using the random allocation software. The data collection tools included a demographic/obstetric form, a researcher-made HBM questionnaire, and a researcher-made hypertension in pregnancy self-care profile. The HBM-based education was provided to the intervention group at three sessions with an interval of one week. Data analysis was done using chi-square test, independent t-test, and ANCOVA. Cohen's d (effect size) was also measured.

Results: The final data analysis was done on 39 women in the intervention group (mean age: 33.48±4.54 years) and 38 women in the control group (mean age: 32.73±5.93). The difference in the scores of knowledges and HBM constructs was not statistically significant between the two groups at baseline, but it was significant after education (P=0.001). The difference between the two groups was not statistically significant in self-care behaviors at baseline, except for diet/physical activity and disease/stress management (P=0.001). To control the effects of these two variables, ANCOVA was used. After intervention, the difference between the two groups in self-care behaviors was statistically significant (P=0.001).

Conclusion: The HBM-based education can make pregnant mothers more aware of hypertension and increase their self-care behaviors for proper control of blood pressure.

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Highlights

● Pregnant mothers may not be able to manage their hypertension without proper education.

● Education based on the health belief model increased the knowledge of pregnant mothers with hypertension.

● Education based on the health belief model increased the self-care behaviors such as proper nutrition, physical activity and stress management.

Plain Language Summary

Hypertension in pregnancy is the main cause of many maternal and fetal complications and deaths in the world. Self-care behaviors are one of the most important strategies to control blood pressure and maintain it at a normal level. One of the most effective models for disease prevention and control in people with hypertension is the health belief model (HBM). This quasi-experimental study assessed the effectiveness of HBM-based education in improving the self-care behaviors of pregnant women. The scores of knowledges and HBM constructs were significantly different before and after intervention. The use of HBM-based education increased knowledge, perceived sensitivity, perceived severity, perceived benefits, cues to action, and self-efficacy, and reduced perceived barriers, and promoted self-care behaviors of hypertensive pregnant women. Therefore, it is recommended to use HBM-based education to increase self-care behaviors and proper control of hypertension in pregnancy.

Introduction

According to the American College of Obstetricians and Gynecologists (ACOG), "gestational hypertension" is defined as "systolic blood pressure above 140 and diastolic blood pressure above 90 mm Hg, which occurs after the 20th week of pregnancy (or within 12 weeks after delivery). This type of hypertension is without the presence of protein in the urine or dysfunction of internal organs such as the liver; however, if hypertension occurs before the 20th week of pregnancy and remains stable until 12 weeks after delivery, it is called "chronic hypertension". If the systolic blood pressure is above 160 mm Hg or the diastolic blood pressure is above 110 mm Hg, it is called "severe hypertension" in pregnancy [1, 2]. The global prevalence of hypertension in pregnant women is reported to be about 5-10% [3, 4]. Prevalence of hypertension among pregnant women in the US is 13.8% [5]; in Ireland, about 6% [6], and in Iran, 6% [7]. Hypertension in pregnancy is an important risk factor for the mother and the fetus [3].

Many studies have shown the role of self-care in hypertension management [8-10]. Self-care behaviors can be one of the most important strategies to control blood pressure and maintain its normal level [11]. Self-care management for controlling blood pressure refers to the use of knowledge and skills to prevent the occurrence of hypertension or reduce its severity. Effective factors for self-care management of hypertension include: Correct and regular use of medications, lifestyle modification (such as following a low-salt and low-fat diet), performing regular sports activities, avoiding alcohol consumption, appropriate weight control, blood pressure measurement and control, managing and reducing stress, and giving importance to care and visiting doctors [12, 13]. Although many studies have shown the positive and favorable effect of self-care behaviors in controlling high hypertension, many people with hypertension in the world still do not follow self-care behaviors. It is suggested that self-care behaviors should be taught using appropriate educational programs and models in patients with hypertension [14-17]. One of the prominent models in this field is the health belief model (HBM) which has six components of perceived sensitivity, perceived severity, perceived benefits, perceived barriers, cues to actions, and self-efficacy [18, 19]. A study in Iran showed the significant relationship of the components of perceived barriers, self-efficacy and cues to action with self-care behaviors in patients with hypertension, and recommended that the HBM-based educational programs should be developed to promote self-care behaviors to control high blood pressure [20]. On the other hand, the use of HBM can increase the self-efficacy of hypertensive patients; the increase in perceived sensitivity and severity of hypertensive patients can improve their self-care behaviors [21].

To our knowledge, there is no study on the effect of HBM-based educational programs on self-care behaviors of pregnant women with hypertension. Therefore, this study aims to assess the effectiveness of an HBM-based educational program in improving the self-care behaviors of pregnant women with hypertension.

Materials and Methods

This is a quasi-experimental study with a pre-test/post-test design that was conducted on women with hypertension in pregnancy who referred to one of the specialized women's hospitals in Rasht, Iran, during January-August 2020. The sample size was determined to be 90 by considering the first type error level of 0.05, the second type error level of 0.2, the Mean±SD scores of 20.72±1.75 and 22.32±2.94 for systolic pressure [12], and a 20% sample drop. Eligible samples were selected using a convenience sampling method. The inclusion criteria were gestational age up to 28 weeks, blood pressure of ≥140 and ≥90, singleton pregnancy, absence of proteinuria and preeclampsia, no addiction to drugs, smoking and alcohol, no neurological and mental diseases according to medical records, not having abnormal bleeding, age <45 years, reading and writing literacy, and willingness to participate in the study. The exclusion criteria were unwillingness to continue participating in the study and withdrawing for any reason during the study process. The data collection tools included a demographic/obstetric form, an HBM questionnaire, and the hypertension in pregnancy self-care profile.

The demographic/obstetric form surveys age, weight, insurance status (based on the patient's medical file), educational level, occupation, place of residence, economic status, wanted/unwanted pregnancy, time of previous delivery, history of infertility, history of using assisted reproductive technologies (ARTs), and information about blood pressure based on the self-reports. The HBM questionnaire was designed by the researcher according to a previous study [22] and the scoring method was based on Khorsandi et al.'s study [23]. The questionnaire had two parts. The first part included items measuring knowledge (6 items) and the second part with 42 items measured perceived sensitivity (6 items), perceived severity (6 items), perceived benefits (6 items), perceived barriers (6 items), cues to actions (6 items), and self-efficacy (6 items). The items were rated on a five-point Likert scale as 1 (completely disagree), 2 (disagree), 3 (no idea), 4 (agree), and 5 (completely agree). The total score ranges from 42 to 210, with higher scores indicating better status. To determine the validity of this tool, face validity and content validity

were measured. The initial draft was sent to 11 faculty members and experts in midwifery and health education from Qazvin University of Medical Sciences. The content validity ratio (CVR) was obtained as 0.87 and the content validity index (CVI) was 0.95. To determine the reliability using Cronbach's α coefficient, the initial draft was completed by 20 mothers with hypertension in pregnancy who were not among the samples. Cronbach's α was obtained 0.83 for the knowledge subscale, 0.7 for perceived sensitivity, 0.83 for perceived severity, 0.7 for perceived benefits, 0.7 for perceived barriers, 0.7 for cues to actions, 0.78 for self-efficacy, and 0.74 for the whole scale. The hypertension in pregnancy self-care profile was developed based on the scale designed by Han et al. [24], and its Persian version was validated by Ghanei Gheshlagh et al. [25]. It had 19 items measuring hypertension self-care behaviors in 4 areas of diet/physical activity (9 items), drug regimen/physician visit (4 items), food labeling (2 items), disease/stress management (4 items). The items were rated on a four-point Likert scale as 1 (never), 2 (sometimes), 3 (often), and 4 (always). The score ranged 9-36 for diet/physical activity, 4-16 for drug regimen/ physician visit, 2-8 for food labeling, and 4-16 for disease/stress management. The total score ranged 19-76, with higher scores indicating higher self-care behaviors for hypertension in pregnancy. The CVI was 0.94. Moreover, Cronbach's α was obtained 0.76 for diet/physical activity, 0.84 for drug regimen/doctor visit, 0.93 for food labeling, and 0.70 for disease/stress management, and 0.80 for the whole scale.

The participants were randomly divided into two groups of intervention and control using the random allocation software (Figure 1). Both groups received information from their health care providers during the study, while the intervention group was also given HBM-based education by the researcher. The content of the educational sessions was reviewed and approved by five faculty members of the schools of midwifery and health at Qazvin University of Medical Sciences (Table 1). Due to the COVID-19 pandemic at the time of the study, educational sessions were conducted virtually and on WhatsApp. First, groups of 5-15 were created in WhatsApp. Then, the date and time of the meetings were determined in consultation with the group members and they were requested to become online at the determined time. Additional files including pictures, pamphlets and related educational videos were also shared in the groups. The intervention was provided at 3 sessions for three weeks and each session lasted for 90 minutes.

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Table 1. The protocol of HBM

Week	Duration (min)	Objective	Content
1st	90 minutes online + virtual training during the week	Introducing and getting to know each other Explaining the objectives of training sessions Information about the concept of self-care and promoting self-care behaviors in the field of diet and proper weighting, paying attention to food labels Information about hypertension in pregnancy Measuring and increasing the levels of knowledge, perceived sensitivity and perceived severity based the HBM	Sending an educational voice about hypertension in pregnancy, self-care behaviors, diet and proper weighting Sending educational materials including images and videos about the prevalence of hypertension in pregnancy and its complications, and self-care behaviors Evaluation of the likelihood of hypertension and its complications according to individual characteristics and known risk factors through question and answer, group discussion and brainstorming. Talking about mothers' experience of the disease and its complications Question and answer and group discussion about mothers' knowledge, self-care behaviors and increasing their knowledge through sending educational voices, texts, images and videos
2nd	90 minutes online + virtual training during the week	Measuring the changes in perceived sensitivity and perceived severity of self-care behaviors learned in the previous week Assessment of perceived benefits of and perceived barriers to self-care behaviors Increasing perceived benefits and reducing perceived barriers Teaching self-care behaviors, adherence to medication regimen and regular physician visits Teaching self-care behaviors and appropriate physical activity for hypertension during pregnancy	Phone call and evaluation of changes in HBM constructs and self-care behaviors learned in the previous week using a checklist Assessment of perceived benefits and perceived barriers through question and answer, group discussion, brainstorming and expression of experiences Increasing perceived benefits through sending educational voices, texts, images and videos Reducing perceived barriers by assessing barriers, proposing solutions, and providing educational materials Teaching self-care behaviors by group discussion and sending educational voices, texts, images and videos
3rd	90 minutes online + virtual training during the week	Assessing the change in perceived benefits of and perceived barriers to self-care behaviors learned in the previous week Evaluation of practice guidelines and self-efficacy Increasing the cues to action and self-efficacy Stress management self-care behavior training Teaching self-care behaviors for avoiding cigarette and tobacco use	Phone call and evaluation of changes in HBM constructs and self-care behaviors learned in the previous week using a checklist Evaluation of the cues to action and self-efficacy through question and answer, group discussion, brainstorming and expression of experiences Increasing practice guidelines through virtual education, presentation of brochures, group discussions and using the experiences of other mothers, providing free online or telephone counseling to the mothers in the intervention group in the field of midwifery up to one year after delivery in case of performing self-care behaviors and controlling their hypertension in pregnancy Reducing perceived barriers by assessing barriers, proposing solutions, and providing educational materials Teaching self-care behaviors by group discussion and sending educational voices, texts, images and videos

One month after the end of the intervention, the post-test assessment was performed in both groups. During this period, both groups received the usual prenatal care. After the end of the research, to comply with the ethical principles, the educational pamphlet was also given to the control group. After collecting the data, they were entered into SPSS software, version 25 and analyzed. Descriptive statistics such as Mean±SD, percentage, and frequency were used to describe data. Data analysis was done using chi-square test, independent t-test, Cohen's d (effect size), and ANCOVA. The significance level was set at 0.05.

Results

The final data analysis was done on 39 women in the intervention group and 38 women in the control group. Based on the demographic and obstetric variables, there were no significant differences between the two groups. There was also no significant difference regarding blood pressure level (Table 2). According to the independent t-test results, the mean scores of knowledges and the HBM constructs were not significantly different between the two groups before the intervention. However, one month after the intervention, the mean scores showed statistically significant differences (P=0.001). The mean scores of knowledge, perceived sensitivity,
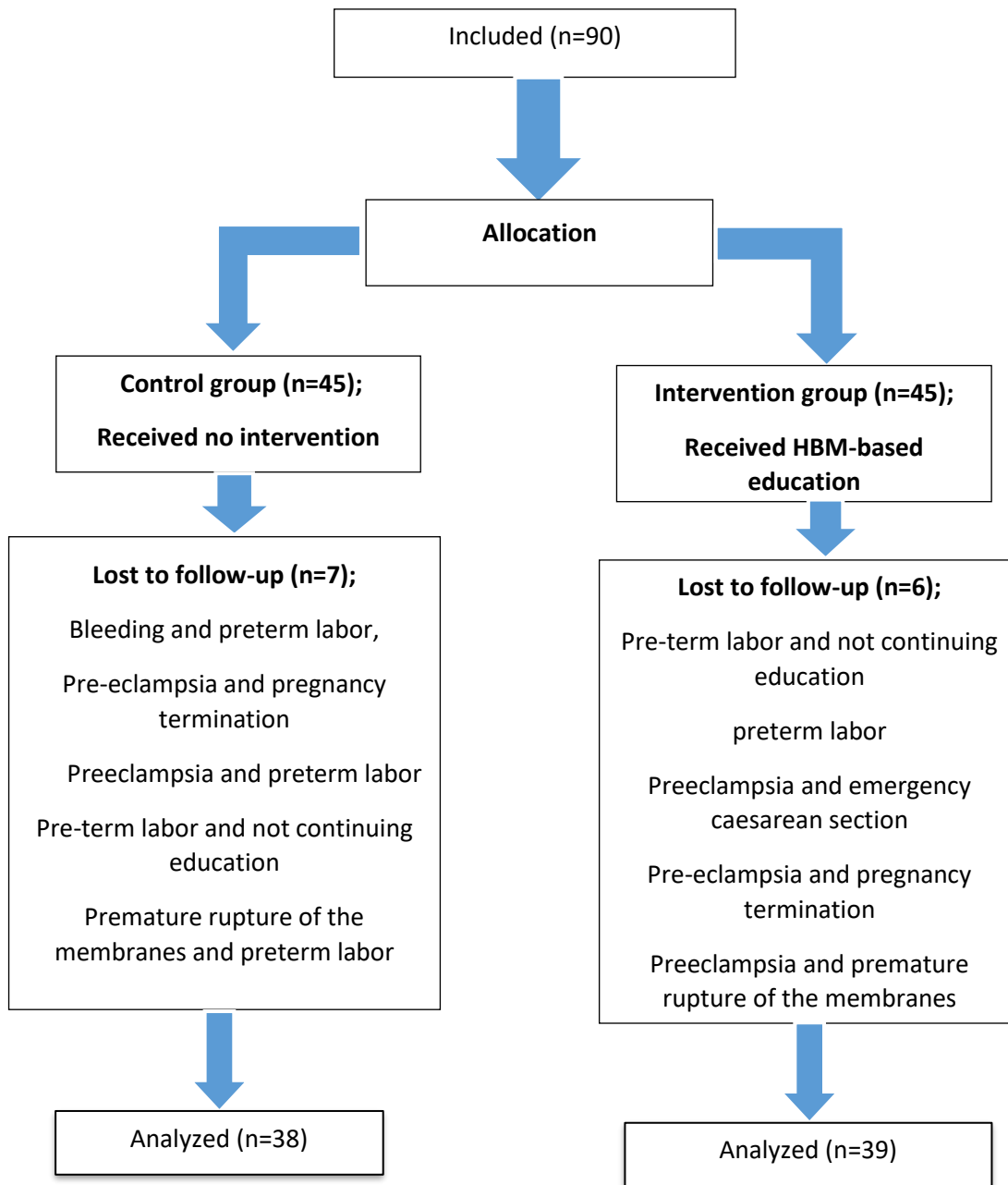
Figure 1. Consolidated standards of reporting trials (CONSORT) diagram of the sampling and allocation processes

perceived severity, perceived benefits, cues to action, and self-efficacy increased in the intervention group, while the mean score of perceived barriers decreased (Table 3).

The mean score of knowledge after the intervention in the intervention group was 29.56±1.04, which was significantly higher compared to the control group that was 24±3.53 (P=0.001). The Cohen's d value was 2.13. The mean perceived sensitivity score after the intervention in the intervention group was 28.61±1.61, which was significantly higher compared to the con-

trol group (23.50±3.25) (P=0.001, Cohen's d=1.99). The mean score of perceived severity after the intervention in the intervention group was 28.51±2.22, which was significantly higher compared to the control group that was 23.18±2.14 (P=0.001, Cohen's d=2.44). The mean score of perceived benefits after the intervention in the intervention group was 28.15±3.63, which was significantly higher compared to the control group that was 22.42±2.59 (P=0.001, Cohen's d=1.81). The mean score of perceived barriers after the intervention in the intervention group was 11.05±1.82, which was significantly

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Table 2. Demographic and obstetric characteristics of the participants

Qualitative Variables		No. (%)		P
		Intervention (n=39)	Control (n=38)	
Educational level	Middle school and lower	16(41)	15(39.4)	0.09*
	High school diploma	14(35.9)	16(42.2)	
	Academic	9(23.1)	7(18.4)	
Occupation	Housekeeper	36(92.3)	35(92.1)	0.97*
	Employed	3(7.7)	3(7.9)	
Place of residence	Rural areas	13(33.3)	15(39.5)	0.84*
	Suburban area	5(12.8)	4(10.5)	
	Urban areas	21(53.8)	19(50)	
Economic status	Poor	10(25.6)	9(23.7)	0.26*
	Moderate	23(59)	24(63.2)	
	Good	6(15.4)	5(13.1)	
Insurance status	No insurance	2(5.1)	2(5.3)	0.97*
	With insurance	37(94.9)	36(94.7)	
Wanted pregnancy	No	9(23.7)	8(21.1)	0.78*
	Yes	29(76.3)	30(78.9)	
Time of previous delivery (y)	<10	14(70)	14(73.7)	0.97*
	>10	6(30)	5(26.3)	
History of infertility	No	29(74.4)	31(81.6)	0.31*
	Yes	10(25.6)	7(18.4)	
History of using ARTs	No	32(82)	32(84)	0.95*
	Yes	7(18)	6(16)	

Quantitative Variables	Mean±SD		P
	Intervention (n=39)	Control (n=38)	
Age	33.48±4.54	32.73±5.93	0.53**
Parity	2.43±1.25	2.21±1.21	0.42**
Delivery	1.23±0.62	1.35±0.67	0.58**

*Chi-square test, **Independent t-test.

Table 3. Hypertension-related characteristics of the participants

Qualitative Variables		No. (%)		P*
		Intervention (n=39)	Control (n=38)	
Time of hypertension occurrence	Before the 20th week	23(59)	24(63.2)	0.26
	Between 20-28 weeks	16(41)	14(36.8)	
Blood pressure at the time of admission	140/90	14(35)	12(31.6)	0.30
	140/90-160/90	17(43)	16(42.1)	
	>160/100	8(22)	10(26.3)	
History of hypertension before pregnancy	No	31(79.5)	32(84.3)	0.41
	Yes	8(22)	6(15.7)	
Duration of hypertension before pregnancy (y)	<2	3(37.5)	2(34)	0.86
	2-5	3(37.5)	2(34)	
	5-10	1(12.5)	1(16)	
	>10	1(12.5)	1(16)	
History of hypertension in previous pregnancy	No	27(69.2)	30(78.9)	0.20
	Yes	12(30.8)	8(21.1)	
History of preeclampsia in previous pregnancies	No	32(82)	33(78.9)	0.64
	Yes	7(18)	5(13.2)	
History of taking antihypertensive drugs before pregnancy	No	36(92.3)	34(89.2)	0.63
	Yes	3(7.7)	4(10.8)	
Taking antihypertensive medication at the moment	No	21(53.8)	23(60.5)	0.55
	Yes	18(46.2)	15(39.5)	
Taking special medications that affect blood pressure	No	16(41)	20(52.6)	0.63
	Yes	23(59)	18(47.3)	
History of chronic diseases in the current pregnancy	No	16(41.1)	18(47.3)	0.63
	Yes	23(58.9)	20(52.6)	
Family history of hypertension	No	10(25.6)	13(34.3)	0.29
	Yes	25(65.7)	29(74.4)	

*Independent t-test

lower compared to the control group (24.13±3.50) (P=0.001, Cohen's d=4.68). The mean score of cues to action after the intervention in the intervention group was 28.15±3.63, which was significantly higher compared to the control group, 22.42±2.59 (P=0.001, Cohen's d=1.81). The mean self-efficacy score after the intervention in the intervention group was 26.30±2.54, which was significantly higher compared to the control group, 17.68±3.13 (P=0.001, Cohen's d=3.02). For more information (Table 4).

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Table 4. Mean scores of Knowledges and HBM constructs in two study groups before and after intervention

Variables	Pre-test		P*	Post-test		P*	Cohen's d**
	Intervention (n=39)	Control (n=38)		Intervention (n=39)	Control (n=38)		
Knowledge	23.7±2.12	24.23±3.55	0.48	29.56±1.04	24±3.53	0.001	2.13
Perceived sensitivity	23.02±2.83	23.68±3.31	0.35	28.61±1.61	23.5±3.25	0.001	1.99
Perceived severity	22.97±2.88	23.42±2.3	0.45	28.51±2.22	23.18±2.14	0.001	2.44
Perceived benefits	23.30±2.33	23.68±3.5	0.54	28.15±3.63	22.42±2.59	0.001	1.81
Perceived barriers	21.82±4.56	20.13±4.27	0.09	11.05±1.82	24.13±3.50	0.001	4.68
Cues to actions	23.30±2.33	23.68±3.05	0.54	28.15±3.63	22.42±2.59	0.001	1.81
Self-efficacy	20.51±3.84	21.31±3.11	0.24	26.3±2.54	11.68±3.13	0.001	3.02

*Independent t-test, **Effect size.

According to the results in Table 5, the mean score of diet/physical activity after the intervention in the intervention group was 31±2.32, which was significantly higher compared to the control group, 19.39±3.14 (P=0.001, Cohen's d=4.20). The mean score of drugs regimen/physision visit after the intervention was 16.02±0.70 in the intervention group and 11.42±2.27 in the control (P=0.001, Cohen's d=2.73). The mean score of food labeling after the intervention was 6.10±1.51 in the intervention group and 3.55±1.67 in the control group (P=0.001, Cohen's d=1.60). The mean score of disease/stress management after the intervention was 13.87±1.60 in the intervention group and 8.92±1.80 in the control group (P=0.001, Cohen's d=2.90).

Discussion

The purpose of this research was the assessment of the effect of an HBM-based educational intervention on the self-care behaviors of women with hypertension in pregnancy. The results showed that the use of an educational intervention based on the HBM constructs increased knowledge, perceived sensitivity, perceived severity, perceived benefits, cues to action, and self-efficacy, reduced perceived barriers, and promoted self-care behaviors of hypertensive pregnant women.

Our results are consistent with the results of Jahani et al., who showed that the scores of knowledges, HBM constructs, self-care behavior significantly increased in hypertensive patients after the educational intervention [26]. In addition, the results are in line with the findings of a similar study on patients with tuberculosis [27]. When hypertensive women' knowledge, perceived sensitivity and perceived severity increase, they are more likely to find a solution to control their disease. By performing self-care behaviors that are cost effective, they can easily control hypertension in pregnancy and prevent its complications.

Table 5. Mean scores of hypertension self-care behaviors in two study groups before and after intervention

Variables	Pre-test		P*	Post-test		P*	Cohen's d**
	Intervention (n=39)	Control (n=38)		Intervention (n=39)	Control (n=38)		
Diet/physical activity	18.15±3.37	22.26±5.21	0.001	31±2.32	19.39±3.14	0.001	4.2
Drug regimen/physision visit	10.76±2.25	11.81±2.55	0.06	16.02±0.7	11.42±2.27	0.001	2.73
Food labeling	3.46 ±1.60	4±2.11	0.21	6.10±1.51	3.55±1.67	0.001	1.6
Disease/stress management	8.97±2.05	10.15±2.59	0.02	13.87±1.6	8.92±1.8	0.001	2.9

*Independent t-test, **Effect size.

In this study, the virtual method and educational images and videos were used for teaching self-care behaviors to hypertensive pregnant women. The results of a study also showed that teaching exercise online during pregnancy as a self-care behavior helped women to control their systolic blood pressure before and immediately after delivery [28]. In Kurt et al.'s study, it was shown that self-management and performing self-care behaviors could increase hypertensive patients' awareness of high blood pressure, compliance with treatment, and proper control of their blood pressure [9]. These are also consistent with our results.

The findings of this study regarding the significant difference in the score of cues to action between two intervention and control groups after education are consistent with the results of Eftekhar Ardebili [29]. The increase in cues to action in the intervention group can be explained by the fact that this group, in addition to radio and TV educational programs, had access to virtual education, midwives and health personnel, brochures, and group discussions with other pregnant mothers suffering from hypertension in pregnancy. They also received one year of free online midwifery counseling by the researcher as a reward for participating in the educational classes.

In the present study, one month after the intervention, the mean score of self-efficacy in the intervention group increased compared to the control group; in the control group, the level of self-efficacy decreased even compared to baseline. The HBM-based education caused hypertensive pregnant mothers to have more perceived sensitivity and severity regarding their disease, and their perceived benefits of self-care increased while their perceived barriers decreased. Therefore, they perceived more self-efficacy and ability to perform hypertension self-care behaviors. This is consistent with the results of some studies [8, 30].

Our results also showed significant increase in self-care behaviors of the intervention group in the areas of diet/physical activity, drug regimen/doctor visit, food labeling, and disease/stress management after education, which is consistent with the results of some studies [31, 32]. Regarding the diet/physical activity, the results are also consistent with the results of Abdolaliyan [33]. Physical activity of pregnant women was lower than average level. The use of the HBM constructs, especially the perceived benefits and perceived barriers can play an important role in promoting the physical activity of hypertensive pregnant women. Regarding food labeling, the results are also consistent with the results of

other studies [34, 35]. as well Makhija et al. showed that stress is one of the effective factors in increasing blood pressure in pregnancy, and yoga exercise during pregnancy is an effective way to manage stress and reduce hypertension and its complications [36]. In Verma et al.'s study, the positive effects of self-care behaviors and lifestyle modification such as healthy diet, weight management, and physical activity as well as stress control on the prevention and treatment of hypertension were also suggested [13].

In conclusion, it seems that education based on the HBM constructs can increase self-care behaviors in pregnant mothers with hypertension. However, it is recommended to conduct more studies so that it can also be used for patients at the bedside. It is also recommended to compare this educational approach with other educational methods in future studies.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Qazvin University of Medical Sciences (Code: IR.QUMS. REC.1398.152). In this study, all ethical considerations, such as obtaining informed consent from the participants, ensuring the confidentiality of their information, their right to leave the study, were considered.

Authors' contributions

Conceptualization and study design: Tahereh Aflaki, Forouzan Olfati and Zinat Jourabchi; Intervention and sampling: Tahereh Aflaki; Supervision: Zinat Jourabchi; Data analysis: Tahereh Aflaki and Moniralsadat Mirzadeh; Initial draft preparation: Tahereh Aflaki and Zinat Jourabchi; Final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

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