Education Based Health Belief's Model Impact on Promoting Preventive Behaviors Related to Hypertension Disease

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Research

Keywords: hypertension, health belief model, Robust ANCOVA

Posted Date: September 8th, 2020

DOI: https://doi.org/10.21203/rs.3.rs-72351/v1

Abstract

Background: Hypertension is the leading cause of many diseases, including heart attacks, strokes, kidney failure and many internal diseases.

Methods: This pretest-posttest quasi-experimental study was conducted using 128 staff of Iran University of medical sciences. They were randomly assigned to an intervention (n=64) or a control (n=64) group. Data collection tool was a questionnaire based on health belief model constructs, which included 42 questions. Results were interpreted using ANCOVA or robust ANCOVA as appropriate.

Results: ANCOVA showed improvement in the cues to action of participants following educational intervention (P = 0.011). Robust ANCOVA revealed that the intervention was successful for participants with low to moderate initial levels of knowledge, perceived susceptibility, perceived severity, perceived barriers, and self-efficacy scores. The levels of these components didn't change in participants with very high baseline scores. Compared to control group, regardless on baseline score, the perceived benefits and practice (behavior) of participants at intervention group were improved significantly (P < 0.05).

Conclusion: The results of this study showed that education based on the health belief model is effective in promoting hypertension preventive behaviors in university staff.

Background

hypertension is the leading cause of many diseases, including heart attacks, strokes, kidney failure and many internal diseases [Lo, 2014 #1][Lo, 2014 #1][1]. The disease is common, asymptomatic, and may last for several years while the person is not aware of it [2, 3]. Hypertension has hit about 50 million Americans and more than 600 million people around the world. It is also the most common cause of adult visits to physicians [4]. Hypertension is the cause of 45% of myocardial infarction, 51% of stroke deaths, and 9.5 million deaths annually, and it is estimated to account for one-fourth of all deaths by 2030 [5]. In Iran, the prevalence of hypertension in adults is reported at 25 to 35 percent [6, 7]. The high prevalence of hypertension around the world and its serious effects on the organs of the body have made this disease a major health problem in all communities [8]. The prevalence of hypertension is still increasing in most parts of the world. It is estimated that this disease is increasing in developing countries, especially Asia and the Middle East mainly due to lifestyle, especially high-calorie diets and the use of ready-made and salty foods [9, 10]. To control blood pressure and prevent its complications, studies suggest promoting preventive behaviors through education by following a healthy lifestyle and making changes to high-risk behaviors such as overeating, smoking, immobility, and adhering to the principles of mental health and avoiding stressful situations [11].

The value of educational programs depends on their effectiveness which in turn it depends largely on correct use of theories and models in health education [12]. Selecting a proper educational model is the first step in the educational planning process. The health belief model (HBM) is one of the educational models in the prevention of chronic diseases and health promotion, acted as an effective framework for

designing educational interventions and promoting preventive behaviors [13, 14]. This model includes the constructs of self-efficacy, perceived susceptibility, perceived severity, perceived barriers, perceived benefits, and cues to action [15]. Due to the importance of education in promoting preventive behaviors against hypertension, this study was conducted to investigate the effect of educational program based on health belief model on promoting behaviors to prevent hypertension in staffs of Iran University of Medical Sciences.

Methods

Study design

This quasi-experimental study was conducted as pretest and posttest using 128 staffs of Iran University of Medical Sciences. They were randomly divided into two groups of intervention (n=64) and control (n=64). Data collection tool was a researcher-made questionnaire based on HBM constructs, which included 42 questions.

The questionnaire included questions about demographic characteristics (5 questions), knowledge (5 questions) and HBM that included perceived susceptibility (4 questions), perceived severity (4 questions), perceived barriers (6 questions), perceived benefits (5 questions), self-efficacy (4 questions), cues to action (3 questions), and practice (6 questions). Susceptibility, severity, benefits, and barriers constructs were 5-points Likert scale, ranging from strongly agree, agree, no comment, disagree, and strongly disagree. The practice questions were 3-points Likert scale, ranging from always, rarely, and sometimes. The cues to action questions were binary questions, yes or no, and knowledge of participants was assessed using true or false questions.

The educational intervention planned as an initial phase followed by five training sessions covering fat consumption, salt consumption, weight control, exercise, and stress management. Training sessions designed using group discussion, lecture, question and answer techniques. At the baseline, end of intervention, and three months after the educational intervention, participants were asked to complete the questionnaire.

Statistical analysis

Results were presented as mean ± SD or percentage as appropriate. Mann-Whitney test was used to compare the levels of quantitative variable between two groups. Chi-squared test was used for categorical variable. Analysis of covariance (ANCOVA) was used to test for differences in component means among the groups by adjusting the effect of components at baseline. The results of ANCOVA are reliable if i) the relationship between the component levels at the end of study and baseline do not differs across the groups (known as the homogeneity of regression slopes), and ii) the independence of the baseline scores and study groups is met. The first assumption was investigated using Mann-Whiney test. The second assumption was verified by augmenting an interaction term (baseline × group effect) to the model. This assumption is violated if the interaction effect was significant. In terms of violation of

ANCOVA assumptions, robust ANCOVA was used. All statistical analysis was performed using R statistical software and WRS2 package (16).

Results

Of 128 participants, 55 (43%) were men and 73 (57%) were women. The mean age of participants was 40.98 ± 8.75 (24 to 58 years). Moreover, 15.6 percent of participants had a high school degree and the remaining, 84.4%, had an academic degree. Eighteen subjects (14%) reported blood pressure history. Demographic characteristics of participants in terms of study groups are given in Table 1. The comparison of participants' characteristics revealed no statistically significant difference in the age (Mann-Whitney test, P=0.241), work experience (Mann-Whitney test, P=0.363), gender (Chi-squared test, P=0.858), blood pressure history (Chi-squared test, P=0.611), and their education levels (Chi-squared test, P=0.572) between the cases and controls.

Table I Demographic characteristics of case and control groups

Characteristic	Cases	Controls	P-value
Age (years)			
Mean ± SD	41.94 ± 9.04	40 ± 8.38	0.241†
Work experience (years)			
Mean ± SD	15.98 ± 8.99	14.41 ± 8.80	0.363†
Gender			
Male	28 (43.8%)	27 (56.3%)	0.858‡
Female	36 (42.2%)	37 (57.8%)	
BP history			
Yes	10 (15.6%)	8 (12.5%)	0.611‡
No	54 (84.4%)	56 (87.5%)	
Education			
High School diploma	12 (18.8%)	8 (12.5%)	0.572‡
Undergraduate degree	29 (45.3%)	29 (45.3%)	
Postgraduate degree	23 (35.9%)	27 (42.2%)	

† Mann-Whitney test was used,
‡ Chi-squared test was used.

Since we used a researcher-made questionnaire to measure the knowledge, perceived susceptibility, perceived severity, self-efficacy, perceived benefits, perceived barriers, and cues to action of subjects, the reliability of questionnaire has to be reported. Cronbach's alpha, the most common measure of internal consistency, was used to obtain the reliability of the questionnaire in measuring aforementioned components (Table 2). For each component, Cronbach's alpha was calculated twice; i) using the baseline data (n=128) and ii) using the data available at the end of study. It turns out that reliability to acceptable at most dimensions except for perceived benefits/barriers measured at baseline where the Cronbach's alpha was well below 70% threshold.

Table 2 Cronbach's alpha for measuring internal consistency of the dimensions of the questionnaire using the participants' information at the baseline and at the end of study

Construct (Component)	Cronbach's α	
	Baseline (n=128)	End of study (n=128)
Knowledge	0.92	0.72
Perceived Susceptibility	0.58	0.61
Perceived severity	0.72	0.68
Perceived barriers	0.53	0.60
Perceived benefits	0.50	0.61
Cues to action	0.84	0.78
Self-efficacy	0.70	0.60
Practice	0.70	0.80

For each group, the mean and standard deviation of the questionnaire (components) at the baseline and end of study are presented in Table 3. Since the normality assumption was violated, the Mann-Whitney test was used to compare the differences between groups. The results revealed no statistically significant difference in component levels between two groups at baseline. At the end of study, the differences were all significant except for the 'cues to action' component.

Table 3 The comparison of components between case and control group at baseline and end of study using Mann-Whitney test. No difference between participants at baseline, but difference were observed following intervention at all components than the cues to action

Component	Baseline			End of study		
	Case	Control	P-value	Case	Control	P-value
Knowledge	2.45±2.14	2.59±2.12	0.503	3.44±1.76	2.55±2.22	0.011
Perceived Susceptibility	11.88±2.42	11.52±2.38	0.451	13.27±1.65	11.56±2.30	< 0.001
Perceived severity	13.42±2.58	13.53±2.61	0.780	15.0±1.51	13.66±2.41	0.001
Perceived barriers	14.33±2.72	14.41±2.79	0.806	16.58±1.86	14.25±2.79	< 0.001
Perceived benefits	16.22±2.23	16.58±2.37	0.316	18.16±1.34	16.33±2.31	< 0.001
Cues to action	1.94±1.22	2.0±1.26	0.596	2.03±1.13	1.95±1.24	0.914
Self-efficacy	13.12±2.24	13.55±2.18	0.251	14.61±1.12	13.64±1.92	0.005
Practice	9.25±1.91	9.33±1.84	0.817	12.59±0.79	9.25±1.78	< 0.001

Although the Mann-Whiney test confirmed the effectiveness of the educational intervention, it can be misleading at it fails to control for the level of components at the baseline. Thus, ANCOVA was used to test for differences in component means among the groups by adjusting the effect of components at baseline. The assumption of homogeneity of regression slopes as well as the independence of baseline scores and study groups were tested using Mann-Whitney and interaction effects. Results showed that these assumptions only met for the 'cues to action' component and for other components the latter assumption was violated. Thus ordinary ANCOVA was used to interpret the results of 'cues to action' component and the robust ANCOVA [17] was used for other components. The results of performing ordinary ANCOVA showed that compared to control group, education intervention increased the 'cues to action' in case group ($F(1,124) = 0.59$, $P = 0.011$).

In Robust ANCOVA, the trimmed means (20%) were compared between two groups at some design points (usually five points) where the relationship between pre and post values were the same in both groups. Comparisons between trimmed means of case and control groups, , were made by constructing 95% confidence intervals using bootstrapping method. Confidence intervals were adjusted for inflation type I error in multiple comparisons. Table 4 represents the results of performing robust ANCOVA for knowledge, perceived susceptibility, and perceived severity components. In this Table, at each design point, and denote the sample sizes used to obtain trimmed means at case and control group respectively. The significant results are displayed in bold face under 95% CI column (Table 4). It appears that the educational intervention raised the knowledge score of those participants who had lower initial score (0 or 3), but it didn't affect the knowledge of participants with high initial scores. It also affect mostly the participants with lower perceived susceptibility (7 to 11) and perceived severity (< 13) at the baseline. In

other words, the intervention was quite successful for participants who had low scores at the beginning of the study.

Table 4 The result of performing robust ANCOVA for knowledge, perceived susceptibility, and perceived severity. Significant results are highlighted in bold face intervals

95% CI	n2	n1	Design point	Variable	
(0.87, 2.46)	1.67	30	30	0	Knowledge
(0.20, 2.59)	1.19	18	47	3	
(0.01, 0.77)	0.38	33	33	5	
(4.17, 2.50)	3.33	13	13	7	Perceived Susceptibility
(3.01, 1.07)	2.04	38	40	10	
(2.59, 0.71)	1.65	42	37	11	
(1.38, 0.53)	0.42	35	31	14	
(1.86, 0.03)	0.92	18	18	16	
(3.59, 1.72)	2.66	17	19	9	Perceived severity
(3.76, 1.62)	2.69	28	25	11	
(1.62, 0.06)	0.79	40	39	14	
(1.34, 0.06)	0.64	33	37	16	
(0.97, 0.64)	0.17	15	18	18	

To avoid a lengthy Table, for remaining components (perceived barriers, perceived benefits, self-efficacy, and practice), the results of performing robust ANCOVA were plotted and displayed by Fig 1. In this Figure, the vertical dashed lines represent non-significant comparisons of the trimmed means between two groups at the defined design point. For example, at panel A (Fig. 1) which displays the scatter plot of the perceived barriers scores at baseline and the end of study, the educational intervention increased significantly the perceived barrier scores of participants with low to moderate baseline scores (non-significant results appeared only for high baseline values, the vertical dashed line 19, which compromises 3% of participants). In other words, intervention was successful in increasing the perceived barriers scores of participants with initial score lower than 19 (that is for 97% of subjects).

The educational intervention was also quite effective in promoting the ‘perceived benefits’ (panel B, Fig. 1) and ‘practice’ score (panel D, Fig. 1) of individuals (scores were significantly higher at case group at all design points). For self-efficacy, the results showed that intervention was successful only for those participants who had pre-score lower than 15 (66% of participants, panel C, Fig. 1).

Discussion

The results of the present study revealed that the educational intervention based on HBM was successful in increasing perceived susceptibility, perceived severity, perceived barriers, perceived benefits, self-efficacy, cues to action, and practice scores of participants. The findings were in agreement with Sadeghi et al study [18] and Ardabili et al study [19]. Abood et al also conducted a study with the aim of applying the health belief model on university staff and showed that educational intervention significantly increased knowledge in the intervention group [20]. The results of the present study showed that the mean scores of perceived susceptibility and perceived severity increased significantly after educational intervention. These results were in line with Sharifi Darani et al study [21]. The study conducted by Baghiani et al, the educational intervention significantly increased the susceptibility and the perceived severity scores in the experimental group [22].

Also, in terms of the perceived severity, our results were consistent with Cherkzy et al [23] and Azadbakht et al [24] studies, but they were inconsistent with Mohammadi et al [25] study who reported lower perceived severity scores after intervention. In justifying this issue, it can be stated that education promotes the perceived susceptibility and subsequently increases the perceived Severity in the intervention group, so that university staff after education found the belief that if non-compliance with preventive behaviors and lack of Blood pressure control is at risk for high blood pressure, and they understand the depth of the risk and the seriousness of the complications in physical, psychological, social and economic terms. The results of the present study showed that the mean score of perceived benefits in the intervention group increased significantly after intervention. These result was consistent with that of the study conducted by Amodeo et al [26]. Also, the results of the present study were consistent with those of the study conducted by Zeinaly et al [27].

the results of the present study showed that the mean score of the perceived barriers after educational intervention was significantly different in the intervention group, but it did not show a significant difference in the control group. This result was consistent with that of the study conducted by Mohammadi et al [25] . Tan showed that perceived barriers led to reduced adherence to medical orders, such as regular use of medications to control the hypertension [28]. Chao et al also reported that there was an inverse relationship between perceived barriers and health behaviors, meaning with increasing the perceived barriers, the probability of health behaviors increase [29]. In the present study, the mean of self-efficacy score increased after educational intervention in the intervention group. The results of a review study conducted by Yehle and Plake showed that both short-term and long-term educational interventions can increase patients' self-efficacy [30]. The results of similar studies also revealed the effect of education based on the health belief model in enhancing mean score of self-efficacy [31, 32].

The results of Mann-Whitney test revealed no significant difference two groups of intervention and control in terms of Cues to action dimension score before and after education. This result was consistent with that of the study conducted by Mohammadi et al [25], but it was inconsistent with the result of the study conducted by Amini et al [33] and Sadeghi et al [18] . Finally, the mean score of Practice (behavior)

increased after the educational intervention in the intervention group. The results of the studies conducted by Amodeo et al [26] confirm the results of the present study.

Conclusion

The results of this study show that education based on the health belief model is effective in promoting hypertension preventive behaviors in university staff. Therefore, by enhancing the knowledge level, perceived susceptibility, perceived Severity, perceived benefits and staff self-efficacy, it is possible to affect their behavior positively.

Abbreviations

EBHBM: Education based health belief's model;

PC: preventive behaviors;

HD: hypertension disease;

Declarations

Acknowledgements

Our grateful thanks go to all participants in the present study.

Authors' Contributions

All authors were responsible for study. NAA, FC and AZ was responsible for the study Conceptualization and led the writing of the paper. FC, JYL and SFI conducted the Literature review and assisted in writing the paper. AZ and JA conducted the Statistical analysis, assisted in interpreting the data and writing the paper. RT and JYL assisted with interpretation of the results and drafting programmatic Implications. FC, NAA and AZ was responsible for data collection and coordination of the Study. AZ co-led the conceptualization, supervised all aspects of writing the Paper, and provided extensive comments on the manuscript. All the authors have read and approved the final manuscript.

Funding

This study did not receive any grant from funding agencies.

Availability of data and materials

The datasets using in the study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study was approved by the Research Ethics Committee of Kermanshah University of Medical Sciences (Code: IR.KUMS.REC. 94-05-27-26894). Written informed consent was obtained from group members. All the procedures performed in the study involving human participants were based on the ethical standards of the Institutional Research Committee and the Helsinki Declaration and its later amendments or comparable ethical standards.

Consent to publish

All participants consented verbally to publication of the interview data.

Competing interests

The authors declare that they have no competing interests.

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Figures

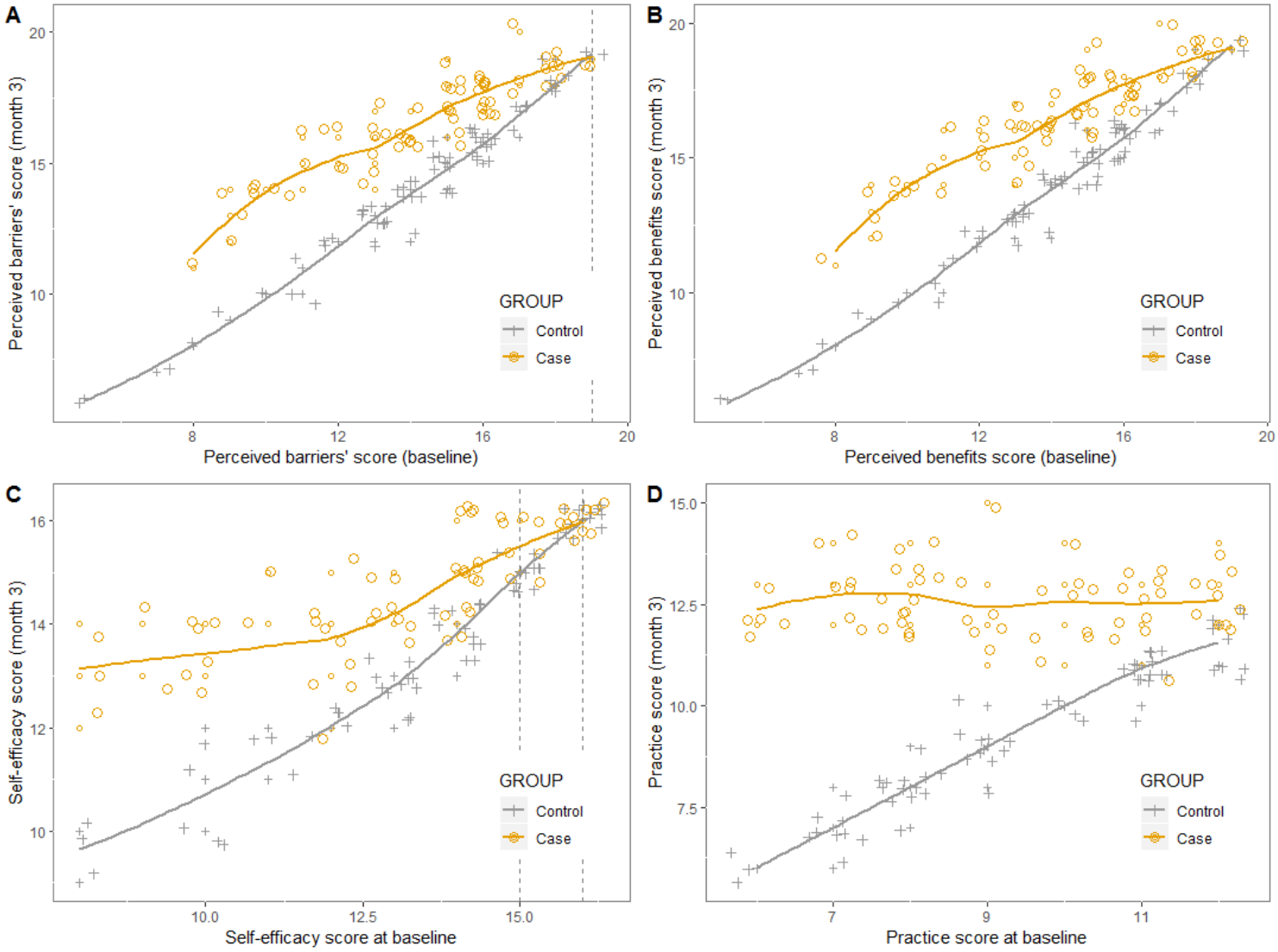

Figure 1

The plot of perceived barriers, perceived benefits, self-efficacy, and practice scores at baseline (on x-axis) against post-perceived barriers, post- perceived benefits, post-self-efficacy, and post-practice scores (on y-axis) from robust ANCOVA. Two regression lines represents intervention group (orange line, circle points) and control group (dark line, plus symbols).