Review Paper

Educational Interventions to Control Hypertension: A Systematic Review

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ABSTRACT

Background: Hypertension (HTN) is a noncommunicable disease and one of the most important risk factors for cardiovascular diseases. Educational interventions have been conducted to prevent and control HTN. This systematic review tried to summarize the effectiveness of educational interventions to improve blood pressure (BP) control.

Methods: Search was done between January 15, 2023 and June 20, 2023, in databases of Scopus, Google Scholar, Medline, PubMed, Embase, Web of Science (for English articles), as well as SID, IranMedex and Magiran (for Persian articles). Educational intervention studies about controlling BP were selected. The keywords used for the search were "BP," "HPN," "hypertensive," "high BP," "HTN," "education," "health education," "educational intervention," "effectiveness," "interventions" and "training methods." The Cochrane risk of bias (ROB) was used to determine the quality of selected studies. The preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines and checklist were used for reporting.

Results: After searching the aforementioned electronic databases, 4467 related articles (2655 in English and 1812 in Persian) were retrieved. A total of 2625 articles were duplicates, and 1821 articles did not match the inclusion/exclusion criteria and were removed. Finally, 21 studies (10 English and 11 Persian articles) entered the review. In these studies, various individual or community-based interventions were applied, including family-centered, person-centered, texting, training in group sessions, multiple interventions, and community-based interventions. Different methods were used for education, such as lectures, questions and answers (Q&A), group discussion, face-to-face training, counseling, telephone consultation, and PowerPoint presentations. The results showed the positive effect of the designed educational interventions in controlling HPN; however, studies aimed at self-care education were more effective.

Conclusion: Different types of educational interventions and training methods were effective in the control of HTN. Educational interventions are a cheap and applicable way to promote self-care behaviors in hypertensive patients.

Keywords: Hypertension (HTN), Educational intervention, Self-care, Life style

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Introduction

Noncommunicable diseases are among the major causes of death in the world [1]. Today, hypertension (HTN), as one of the most important risk factors for cardiovascular disease, has become a growing health problem that affects people from different ethnicities [2]. Risk factors and predictors of high blood pressure (BP) include overweight, improper nutrition, alcohol consumption, low physical activity and psychological, social, environmental and genetic factors. HTN is a major risk factor for kidney disease, stroke, peripheral vascular disease and congestive heart failure [3]. The prevalence of HTN ranges from 15% to 37% worldwide. India and China have the highest prevalence rate of HTN [4]. In 2015, 13% of all global mortality (7.1 million), 62% of all strokes, and 49% of all myocardial infarctions were attributed to HTN [5].

HTN is a major modifiable risk factor for noncommunicable diseases. Effective treatment for HTN substantially reduces the risk of developing cardiovascular complications [6]. However, despite these benefits, the overall rate of HTN is alarmingly high worldwide, and this condition has caused a high burden of HTN-related diseases [7]. HTN, although easily diagnosed and common, is often asymptomatic and can lead to death and disability if left unchecked [8].

There are several strategies for controlling HTN, including lifestyle modifications, drug therapy, or combined interventions. Therefore, empowering hypertensive patients by education may be an effective step in controlling HTN or reducing its complications [9]. One of the effective strategies for controlling high BP is educational interventions [10]. Many educational interventions are effective in controlling HTN. The common interventions for preventing HTN include behavioral modifications and lifestyle changes such as promoting a healthy diet, physical activity and avoiding stress and mental pressure [11]. The correct use of health education, health promotion models, and theories in teaching the public can effectively control HTN [12]. Correct education and regular educational programs can improve people's knowledge and skills and improve their ability to make correct health decisions [13]. Research shows that the most effective educational programs are based on theory-based approaches rooted in behavior change models; therefore, choosing the appropriate health education model is the first step in the planning process of an educational program [14].

Since a major part of HTN control is the responsibility of individuals, informing patients on how to control HTN seems necessary. However, the value of any educational intervention depends on its efficiency in changing health behaviors. Educational effectiveness can be enhanced by using behavioral theories or models [15]. People's knowledge and perceptions play an important role in controlling HTN. This systematic review summarizes the effectiveness of educational interventions in controlling high BP.

Methods

Search strategies

The study search was done between January 15, 2023, and June 20, 2023. Eight databases, including Scopus, Google Scholar, PubMed, Medline, Embase, Web of Science, SID, IranMedex and Magiran, were searched for English or Persian studies about educational interventions to control BP. The keywords used for the search are shown in Table 1. The only filter used while searching was the type of article, as we were looking for interventional studies.

Also, some gray literature, including trial registry resources and conference proceedings, was searched. In addition, we checked the bibliography of the relevant retrieved articles to find more eligible papers.

Inclusion and exclusion criteria

Inclusion criteria included an original educational intervention to control BP in inpatients aged >18 years.

Exclusion criteria included studies with the outcome of HTN and other noncommunicable disease control together, studies that tested interventions that were only adherence to BP medication, studies that included interventions that had been done for other diseases besides BP, review studies, protocols, and ongoing trials, and non-interventional studies.

Quality assessment

The preferred reporting items for systematic reviews and meta-analyses (PRISMA) was used to report standard studies. It is an evidence-based minimum set for reporting in systematic reviews and meta-analyses. The checklist contains 27 items on the content of a systematic review and meta-analysis [16]. Also, the Cochrane risk of bias (ROB) was used to determine the quality of selected studies. The biases evaluated can be seen in Table 2. Judgment of each item was either "unclear," "high," or "low" ROB [17].

Table 1. The search strategy in this systematic review

No.	Keywords
1	"BP," "HTN," "hypertensive," "high BP," "HTN"
2	"Education" OR "health education" OR "educational intervention" OR "effectiveness" OR "interventions" OR "training methods" OR "application of models/theories" OR "study types"
3	1 AND 2

All studies meeting inclusion criteria for the review were assessed independently by two of the authors (Reza Sadeghi and Victoria Momenabadi) for random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data (attrition bias), selective reporting, and other biases of concern. Studies at high ROB in one or more domains were classified as overall high risk, while those with unclear information in any domain were classed as moderate risk. Low-risk studies met low-risk criteria for each domain [18].

Extracting data

Two authors (Reza Sadeghi and Mohammad Reza Zeid Abadinejad) assessed the quality of the studies, screened all abstracts and if necessary, independently screened the full-text articles. Disagreements were resolved by discussion and if no agreement was reached, a third independent person acted as an arbiter. All articles were checked according to the inclusion/exclusion criteria. How to deal with missing or incomplete data was handled by consensus and additional information about the study design was requested from the corresponding author if necessary.

The information extracted was in a standard form. It included the location of the study, the year the study was conducted, the type of study, the population size and target group, characteristics of the intervention, and study results (Table 3).

Results

After searching the electronic databases, a total of 4467 related articles were retrieved, of which 1812 were Farsi and 2655 were English. Of these articles, 2625 articles were deleted due to duplication. Further, out of 1842 articles, 1821 were excluded from the study due to being a review, not having a consoli-

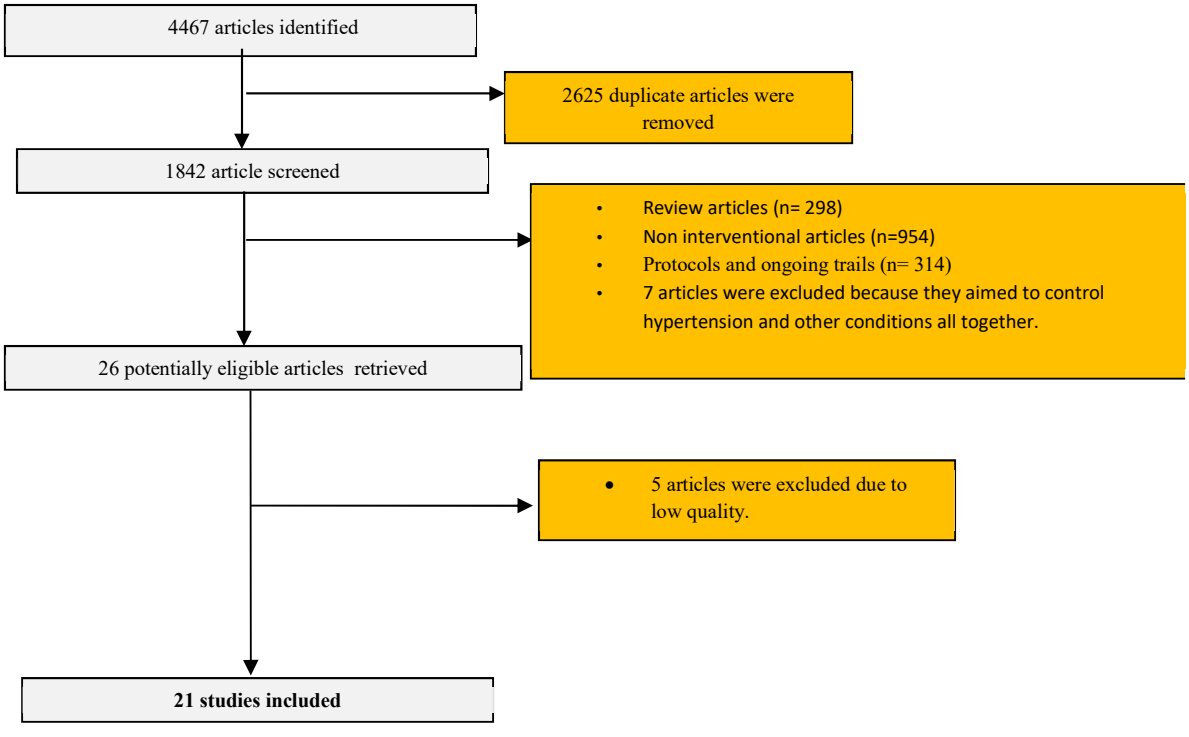

Figure 1. Flowchart for selecting studies

Table 2. Quality assessment of selected articles

Authors (y)	Random Sequence Generation	Allocation Concealment	Blinding of Participants and Personnel	Blinding of Outcome Assessment	Incomplete Outcome Data (Attrition Bias)	Selective Reporting (Reporting Bias)	Other Biases of Concern	Overall ROB
Champagne et al. 2004 [21]	"Unclear"	"Unclear"	"Low"	"Unclear"	"Low"	"Low"	"Low"	"Moderate"
Magadza et al.2009 [22]	"Unclear"	"Low"	"Low"	"Unclear"	"Low"	"Unclear"	Reporting inadequate outcomes	"Moderate"
Babaei-Sis et al. 2016 [23]	"High risk"	"Unclear"	"Low"	"Low"	"Low"	"Low"	Reporting inadequate outcomes	"Low"
Baghae et al. 2016 [24]	"Low"	"Unclear"	"Unclear"	"Low"	"Low"	"Low"	"Unclear"	"Low"
Eghbali et al. 2017 [19]	"High risk"	"Unclear"	"Unclear"	"Low"	"Low"	"Low"	"Unclear"	"Moderate"
Bahrami & Moosawi 2008 [25]	"High risk"	"Unclear"	"Unclear"	"Unclear"	"Low"	"Low"	"Low"	"Moderate"
Jalilian et al. 2014 [26]	"Low risk"	"Unclear"	"Low"	"Low"	"Low"	"Low"	"Low"	"Low"
Hosseini et al. 2014 [27]	"Unclear"	"Unclear"	"Low"	"Unclear"	"Unclear"	"Low"	"Low"	"Moderate"
Ramezankhani et al. 2017 [28]	"High risk"	"Unclear"	"Low"	"Low"	"Low"	"Low"	Reporting inadequate outcomes	"Low"
Bosworth et al. 2009 [1]	"Low"	"Low"	"Low"	"Unclear"	"Low"	"Low"	"Unclear"	"Low"
Stevens et al. 1993 [29]	"Low"	"Unclear"	"Unclear"	"Low"	"Low"	"Low"	"Unclear"	"Low"
Izadirad et al. 2014 [20]	"Unclear"	"Low"	"Unclear"	"Low"	"Low"	"Low"	"Unclear"	"Moderate"
Omidi et al. 2017 [30]	"Unclear"	"High"	"Unclear"	"Low"	"Low"	"Low"	"Unclear"	"Moderate"
Hoseini Soorand et al. 2015 [31]	"Low"	"Low"	"Low"	"Unclear"	"Low"	"Low"	"Unclear"	"Low"
Mattila et al. 2003 [32]	"Low"	"Low"	"Unclear"	"Unclear"	"Low"	"Low"	"Unclear"	"Low"
Sadeghi et al. 2014 [33]	"Low"	"Unclear"	"Unclear"	"Low"	"Low"	"Low"	"Unclear"	"Moderate"
Dickson et al. 2007 [34]	"Unclear"	"Unclear"	"Unclear"	"Low"	"Low"	"Low"	Reporting inadequate outcomes	"Low"

Authors (y)	Random Sequence Generation	Allocation Concealment	Blinding of Participants and Personnel	Blinding of Outcome Assessment	Incomplete Outcome Data (Attrition Bias)	Selective Reporting (Reporting Bias)	Other Biases of Concern	Overall ROB
Ozoemena et al. 2019 [35]	The randomization procedure is prone to bias. "High Risk"	"Low"	"Low"	"Unclear"	"Low"	"Low"	Reporting inadequate outcomes	"Moderate"
Islam et al. 2021 [36]	"Low"	"Low"	"Low"	"Unclear"	"Low"	"Low"	"Unclear"	"Low"
Bhandari et al. 2022 [37]	"Low"	"Unclear"	"Low"	"Unclear"	"Low"	"Low"	"Unclear"	"Low"
Yuting et al. 2023 [38]	"Low"	"Unclear"	"Low"	"Unclear"	"Low"	"Low"	"Low"	"Low"
Mills et al. 2014 [39]	"Unclear"	"Unclear"	"Unclear"	"Unclear"	"Moderate"	"Unclear"	"Unclear"	"High"
Katende et al. 2014 [40]	"Moderate"	"Unclear"	"High"	"High"	"Moderate"	"High"	"High"	"High"
da Silva et al. 2010 [41]	"Unclear"	"Unclear"	"Unclear"	"Unclear"	"Moderate"	"Unclear"	"High"	"High"
Khosravi et al. 2012 [42]	"Unclear"	"Low"	"High"	"Unclear"	"Moderate"	"Unclear"	"Unclear"	"High"
Morisky et al. 1982 [43]	"Unclear"	"Moderate"	"Unclear"	"Unclear"	"Moderate"	"High"	"High"	"High"

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dated standards of reporting trials (CONSORT) score, being a protocol, an ongoing trial, a non-interventional study, or being about controlling HTN and other conditions altogether. Five studies were excluded due to low quality. The quality assessment results are shown in Table 2. Finally, 21 studies entered the review (11 Persian and 10 English articles) (Figure 1).

The characteristics of 21 articles can be seen in Table 2. A positive effect of education on controlling HTN was shown in all educational interventions. Still, studies aimed at self-care education [19, 20] seemed more effective, because the difference between the intervention and the control group was higher (Table 3).

The follow-up time for the study participants was between 1 and 6 months. Different educational methods such as lectures, questions and answers (Q&A), group discussions [23, 24], face-to-face training sessions [19], counseling [25], telephone consultation [1] and PowerPoint presentation [34] were used as the intervention. Some studies used interventions that reinforced education, such as pamphlets, brochures, training packages, and text messages [19, 21, 22, 32, 36].

In some studies, no comparison (control) group was used [22, 26, 34, 19]; in some studies without a control group, no special intervention was done [20, 21, 23, 24, 27, 28, 32]. In all studies, the results of the pre- and post-intervention in the control group were not significantly different.

The aim of some studies were educating about lifestyle modification, such as decreasing excessive salt, and saturated [19] or trans fat consumption [36], increasing fruits and vegetables intake [19, 35, 36], decreasing stress [35, 36, 38], increasing physical activity [20, 23, 27, 36, 38], and reduced consumption of tobacco and alcohol [35, 36]. In Mattila's study, a multidisciplinary lifestyle intervention was conducted in a rehabilitation center [32].

Table 3. Summary of articles included in this review

Author (y)	Place/Setting/Sample Size and Study Population	Study Type	Intervention Method/Duration of Intervention	Outcomes	Results
Champagne et al. 2006 [21]	Barcelona Spain; hospital, 104 patients; (intervention: n=52; control: n=52)	Quasi-experimental	Physician's usual interventions in the control group. Messages (2 days per week were sent to their mobile in the intervention group for 4 months.	-Rate of compliance - Percentage of patients whose HTN was controlled at the end of the study	The compliance rates were 85.7% in the control group and 84.4% in the intervention group. The percentage of patients whose HTN was controlled at the end of the study was 51.5% (95% CI, 34.4%, 68.6% in the control group and 64.7% (95% CI, 48.6%, 80.8% in the intervention group (P=NS).
Magadza et al. 2009 [22]	Bisho, South Africa; workplace, 145 staff members on medicinal therapy (without a control group)	Quasi-experimental	The intervention provided them with information about HTN and its therapy through presentations, monthly meetings, and leaflets.	- Levels of knowledge about HTN and its therapy -Parameters used to indicate beliefs about medicines	Significant increases were shown in knowledge about HTN and its therapy (P<0.0001). Most parameters used to indicate beliefs about medicines were significantly modified positively; P<0.01 for concerns about medicines, P<0.01 for beliefs about the harmful nature of drugs, and P<0.01 for the necessity-concerns differential.
Babaei-Sis et al. 2016 [23]	Shabestar, Iran/health centers; 210 patients with HTN (intervention: n=105; control: n=105)	Quasi-experimental	The educational intervention consisted of five 50-60 minute sessions conducted over 5 weeks in 3 combined training sessions (lectures, Q&A, group discussions in health centers to improve lifestyle.	-Rate of mental health, exercise, nutrition, and weight control - Reduction in HTN	After the intervention, the mean scores of mental health, exercise, weight control, and nutrition increased significantly in the intervention group (P<0.05). However, in the control group, no significant change was observed (P>0.05). Also, a significant effect was observed on reducing HTN in the intervention group after the educational intervention (P<0.05).
Baghaee et al. 2016 [24]	Urmia, Iran; health centers; 80 patients (intervention: n=40; control: n=40)	Quasi-experimental	Education was delivered by lectures, training packet distribution and group discussion, which was held in two 4-hour sessions. During these sessions, issues related to HTN and adherence to treatment were discussed according to the pre-prepared educational content.	- Rate of medication adherence	After the intervention, the mean score of medication adherence in patients with HTN in the experimental group increased significantly (P<0.00).
Eghbali et al. 2017 [19]	Kermanshah, Iran; health centers; 50 patients with high BP (without a control group	Quasi-experimental	Face-to-face training sessions were held at the patients' homes; a training package was provided at the end.	- Levels of self-care	Before the intervention, the mean self-care score was 43.6±6.8, which increased to 66.4±4.6 (P<0.0001).
Bahrami & Moosawi 2008 [25]	Slam-Abad, Zanjan, Iran; health centers and houses; 91 patients	Quasi-experimental	Interventions included counseling to promote lifestyle and secondary prevention with family-based and individual-based methods.	- Patients whose HTN was controlled - Rate of physical activity, dairy product consumption, and fruits	After the intervention, a significant decrease in the systolic BP of the intervention groups was observed. Also, after the intervention, physical activity, dairy product consumption, and fruits significantly increased among the two groups (P<0.0001).
Jalilian et al. 2014 [26]	Tehran, Iran; Health centers; 60 patients (intervention: n=30; control: n=30)	Randomized controlled trial	The trainings were conducted both individually and in groups. In group training, the number of participants ranged from 6 to 8. Group training sessions consisted of lectures and Q&A sessions, each lasting an average of 45 minutes. Each patient was also trained face-to-face on two occasions for 2 minutes.	- Levels of knowledge and attitudes about HTN and its therapy	After the intervention, scores of knowledge and attitudes significantly increased (P<0.0001).

Author (y)	Place/Setting/Sample Size and Study Population	Study Type	Intervention Method/Duration of Intervention	Outcomes	Results
Hosseini et al. 2014 [27]	Jahrom, Iran; Health centers; 80 patients (intervention: n=40; control: n=40)	Quasi-experimental	Implementation of training programs based on the PRECEDE-PROCESS model constructs.	- levels of predisposing factors (knowledge and attitudes about HTN	After the intervention, the scores of enabling factors, reinforcing factors, knowledge and attitudes (predisposing factors increased significantly (P<0.05).
Ramezankhani et al. 2017 [28]	Eslamshahr, Iran; School/112 mothers of elementary school girls and boys (intervention: n=56; control: n=56)	Quasi-experimental	Educational intervention consisted of 2 training sessions, 6 minutes each, using group discussion in 4 groups of 10 and 2 groups of 8.	- Levels of knowledge, attitude, and behavior about HTN	After the intervention, knowledge, attitude, and behavior scores increased in the intervention group compared to the control group (P<0.001).
Bosworth et al. 2009 [1]	Durham, USA; 2 universities; 636 hypertensive patients (intervention: n=318; control: n=318)	Randomized controlled trial	The interventions included a telephone intervention and check in home BP monitoring. The control group received usual HTN care from their primary care provider.	-Patients whose HTN was controlled	After 24 months, there was an improvement in the proportion of patients with controlled HTN in the three groups (4.3% in usual care, 7.6% in the home monitoring group, and 11.0% in the combined intervention group).
Stevens et al. 1993 [29]	Portland, USA; Hospital;564 Participants aged 30 to 54 years (intervention: n=308; control: n=256)	Randomized controlled trial	The intervention consisted of 14 weekly group meetings	- Patients whose HTN was controlled	The average systolic and diastolic BP in the men and women groups was significantly reduced compared to the control group.
Izadirad et al. 2014 [20]	Zahedan, Iran; health centers; on 158 female patients (intervention: n=79; control: n=79)	Quasi-experimental	The training was conducted in two 30-minute lectures and group discussion sessions.	- Levels of attitude, subjective norms, enabling factors, and self-care behavior about HTN	The mean score of attitudes, subjective norms, enabling factors, and self-care behavior increased after the intervention, and the difference was significant (P=0.001). The percentage of drug compliance and regular physical activity increased after the intervention.
Omidi et al. 2017 [30]	Hamedan, Iran; hospital;70 postmenopausal women with HTN (intervention: n=35; control: n=35)	Quasi-experimental	Self-care lectures and PowerPoint presentations in three 3-minute sessions.	-Decrease in BP	The average diastolic and systolic BP in the intervention group decreased significantly. However, it did not show a significant difference in the control group.
Hoseini Soorand et al. 2015 [31]	Zirkouh, Iran; health centers; 110 patients with HTN (intervention: n=55; control: n=55)	Randomized controlled field trial	The lecture method held educational interventions for the intervention group in 6 sessions for 5 minutes. People were given educational pamphlets to reinforce learning.	- Levels of subjective norms, attitude, and perceived behavioral control about HTN	After the intervention, the average scores of attitude, subjective norm, perceived behavioral control and intentional behavior in the experimental group increased (P<0.001).
Mattila et al. 2003 [32]	Southern part of Finland; worksites; 731 hypertensive people (intervention: n=368; control: n=363	Randomized controlled trial	Within 12 weeks of randomization, the basic 5-day intervention period occurred in one of the three rehabilitation centers (Espoo, Imatra, or Savonlinna). About 4 and 8 months later, the subjects participated in two supplemental support interventions, each lasting 2 days.	- Percentage of patients whose HTN was controlled at the end of the study	BP levels were reduced in the intervention group, while only minor changes were observed in the control group. The net changes were greater among men than women.

Author (y)	Place/Setting/Sample Size and Study Population	Study Type	Intervention Method/Duration of Intervention	Outcomes	Results
Sadeghi et al. 2014 [33]	Bam, Iran; health centers; 200 hypertensive patients (intervention: n=100; control: n=100	Quasi-experimental	The educational intervention was conducted during three 60-minute sessions based on Health Belief Model constructs.	- Levels of attitude, perceived severity, perceived susceptibility, perceived benefits and barriers, cues to action, and self-efficacy about BP	After the intervention, knowledge, perceived susceptibility, perceived severity, perceived benefits and barriers, cues to action, and self-efficacy increased in the intervention group compared to the control group (P<0.001). Also, the intervention group's systolic and diastolic levels were reduced (P<0.05).
Dickson et al. 2007 [34]	Carolina, USA; community; 100 community-based nurses (without a control group	Pilot study	The intervention took place in a meeting room for 2 h. The nurses were taught the AHA guidelines with a PowerPoint presentation.	- Levels of knowledge about HTN - Percentage of patients whose HTN was controlled at the end of the study	Knowledge improved, but the change was not statistically significant (P=0.64). Diastolic pressure significantly decreased (P=0.02).
Ozoemena et al. 2019 [35]	Enugu and Nsukka cities in Enugu State, southeast Nigeria, 400 retirees (intervention: n=200; control: n=200	Quasi-experimental	The intervention lasted 16 weeks, and each session lasted about 60 minutes. The videos were shown using a laptop and a projector.	-Levels of knowledge about HTN and self-care practices	The mean HTN knowledge, substance use, physical activity, sleep pattern and quality, healthy diet and medication adherence significantly increased in the intervention group.
Islam et al. 2021 [36]	Banshgram Union of Narail district, located southwest of Dhaka, Bangladesh, 300 participants aged 30 to 75 years (150 per group	Randomized controlled trial	The intervention lasted 6 months. The intervention delivered a blended learning education program, printed materials and weekly phone calls to the team leaders.	- Level of health literacy - The proportion of people who had regular physical exercise - Perception of and practice in salt consumption - Lifestyle modifications	The primary outcome will be the absolute difference in clinic SBP and DBP. Secondary outcomes included the difference in the percentage of people adopting regular exercise habits, smoking cessation, and reducing sodium chloride intake, health literacy of all participants, and the perceived barriers and enablers to adopt behavior changes by collecting qualitative data (P<0.0001). Analyses would include an analysis of covariance to report the mean difference in BP between the control and the intervention groups and the difference in change in BP due to the intervention.
Bhandari et al. 2022 [37]	Kathmandu Medical College and Teaching Hospital, Nepal; 100 participants in each group (18–69 years	Randomized controlled trial	The intervention lasted 3 months. Intervention included text messages three times per week for three months	- Outcomes included BP control, knowledge, and self-efficacy. - Percentage of patients whose HTN was controlled at the end of the study	After the intervention, self-efficacy and knowledge increased. Also, the average systolic and diastolic BP in the intervention group was significantly reduced compared to the group with usual care.
Yuting et al. 2023 [38]	Hubei, China; Participants (n = 134; 66 in the intervention group and 68 controls	Randomized controlled trial	The intervention lasted 3 months. Intervention group participants were instructed to use the Smartphone application.	- Percentage of patients whose HTN was controlled at the end of the study - Increased physical and mental health. - Self-efficacy and life quality	After 12 weeks of follow-up, the mean of self-efficacy, life quality, and physical and mental health increased in the intervention group. The average BP (systolic and diastolic showed a significant decrease.

Note: PRECEDE-PROCESS model is a cost–benefit evaluation framework proposed in 1974 by Lawrence W.

In the included studies, various individual or community-based interventions, including family-centered [25], person-centered [19], texting [31, 37, 38], training in group sessions [20, 22, 24], multiple interventions [23, 24] and community-based interventions [38] were applied. Victor et al. used barbershops as educational sites for African American men [44]. Two studies aimed to improve self-care or the self-management of HTN [19, 20].

The educational models used in the included studies were KAP (knowledge, attitude and practice) [26-28], the PRECEDE-PROCEED model [27], the health belief model [2], the BASNEF model [20, 31] and the theory of planned behavior [31].

Discussion

This systematic review included 21 studies on educational interventions to control HTN, with various individual or community-based interventions. These studies provided relevant information about the effectiveness of the different health education interventions.

Researchers have used various educational models for behavior change. Well-designed health education theories/models can help change behavior and improve health outcomes [31, 45]. The value of an education is determined by its effectiveness in modifying or creating positive health behaviors [46]. However, behavioral science models/theories should be used appropriately to show their maximum impact [44]. The readability and suitability of educational material and choosing the right communication route are the most important and neglected points in increasing the quality and quantity of education [47].

Some studies included in this review aimed to improve self-care or the self-management of HTN. Self-care provides disease prevention, maintains health, and complies with treatments, by the individual [48]. One of the goals of empowering people through education and increasing health literacy is promoting self-care [49]. Therefore, educational interventions should be designed to help people understand the aspects of their disease and perform appropriate self-care. Bosworth's study showed that HTN self-care monitoring at home and tailored behavioral telephone interventions improved BP after 24 months [1]. Some researchers think a decrease in BP may encourage the patient to modify their lifestyle or continue treatment [9].

The aim of some studies included in this review was lifestyle modification. This objective included changing diet, decreasing stress, increasing physical activity, and consuming tobacco and alcohol. Lifestyle modifications can help normal and hypertensive patients prevent or reduce high BP [50]. The study results of Putri et al. showed that lifestyle factors affecting the incidence of HTN in adolescents are smoking, body mass index, physical inactivity, sleep duration, alcohol use and inappropriate diet [51]. Also, Ribeiro et al. study showed lifestyle modification is widely recommended as the first-line treatment for the management of HTN and includes smoking cessation, modifying the diet, increased physical activity and reduced alcohol consumption [52].

Controlling high BP is a challenge in public health. But HTN is a modifiable risk factor [19] and many educational interventions are effective in preventing and controlling HTN. The difference in effectiveness of the interventions may be due to the different nature of the interventions, complementary education material, follow-up time, individual or community-based, and the specific educational models used.

One of the limitations of this review was that it only searched Persian and English databases. Another limitation was that the included studies had a short follow-up time after the interventions, from 1 to 6 months. It is suggested that future studies conduct longer follow-ups to evaluate the long-term effects of these interventions. Another limitation of this study was that the studies were diverse regarding the model, theory, and method of education and the outcome measured; therefore, a meta-analysis was impossible.

Conclusion

Many educational interventions and training methods are effective in the control of HTN. Educational interventions are a cheap and applicable way to promote self-care behaviors in patients with high BP.

Ethical Considerations

Compliance with ethical guidelines

All information sources used in this study had been published before and were therefore in the public domain, but general ethical principles were applied. The researchers maintained integrity, objectivity, thoroughness in searching and adherence to the highest possible technical standards.

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Authors' contributions

Conceptualization and study design: Reza Sadeghi, Victoria Momenabadi, Mohammad Reza Zeid Abadinejad and Narges Khanjani; Data collection, data analysis, data interpretation and drafting the manuscript: Reza Sadeghi and Narges Khanjani; Review and editing: Mahmoud Reza Masoodi, Narges Khanjani, and Reza Sadeghi.

Conflict of interest

The authors declared no conflict of interest.

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