

Review Article



# Non-pharmacological Management of Hypertension in Arab Countries: A Scoping Review

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## Abstract

**Background:** Non-pharmacological interventions, such as healthy dietary approaches and physical activity, have always been a crucial part of hypertension (HTN) control in clinical practice. These non-pharmacological interventions, however, have never been reviewed in the literature of Arab countries. This review has quantified and evaluated non-pharmacological interventional studies conducted in Arab countries until 2023.

**Methods:** Medline, Web of Science, PubMed, the Cochrane Library, Embase, Science Direct, Scopus, ERIC, ProQuest, Springer, Google Scholar, and CINAHL were explored from database inception until September 2023. Articles of relevance were screened based on their titles and abstracts for selection criteria. Eligible studies were reviewed, and information was retrieved. Jadad scores and the Downs and Black checklist were used to evaluate randomized controlled trials (RCTs) and quasi-experimental studies, respectively.

**Results:** A total of 12 RCTs and 5 quasi-experimental studies met the selection criteria. The studied interventions were eHealth applications, educational programs, wet cupping, physical exercise, adherence therapy, green tea, lifestyle interventions, dietary approaches to stop HTN, motivational interviewing, and cold hibiscus beverages. The most commonly used outcome measure was blood pressure. Nine studies scored high quality. The low and neutral quality scores were mainly due to loss of blindness, poor reporting of participants' characteristics, loss of follow-up, and failure to account for potential confounders.

**Conclusion:** There is a scarcity of HTN non-pharmacological interventional studies, aside from the low or modest quality of nearly 50% of them. Hence, it is recommended that further high-quality interventional studies focus on the areas of dietary approaches (especially DASH), exercise, theory-based education, and behavioral counseling in Arab countries.

**Keywords:** Hypertension, Interventions, Arabs, Scoping review

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## Introduction

Hypertension (HTN) is a major health problem that affects people all over the world, with a high prevalence of mortality and morbidity, particularly in low- and middle-income countries (1). Globally, around 1.28 billion individuals aged 30–79 suffer from HTN, the majority of whom (two-thirds) live in low- and middle-income countries (2). Despite the advances and development of antihypertensive medication, the prevalence of HTN complications remains high (1). The most recent American guidelines on HTN management establish a lower blood pressure (BP) cut-off point of 130/80 mm Hg for a diagnosis of HTN. However, the American

guidelines do not recommend pharmacological therapy for such individuals; instead, it is specifically stated that lifestyle changes should continuously be implemented at this point (3).

In the literature, non-drug management of HTN usually includes physical activity, dietary restrictions and modifications, weight loss, alcohol intake reduction, smoking cessation, dietary supplements, meditation, stress reduction, adequate sleep patterns, acupuncture, BP home monitoring, behavioral counseling support, and lifestyle change maintenance (3-5).

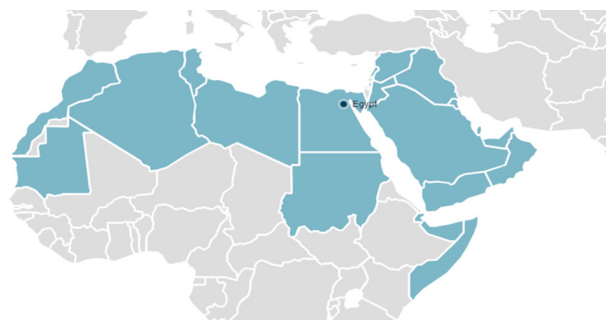
Literature on HTN management always highlights the importance of lifestyle modification, especially dietary



habits. In 1992, the U.S. National Institutes of Health invested a lot of effort to figure out what would be the best dietary pattern to control HTN or decrease BP. A landmark feeding study that compared different types of diets found that one that was high in vegetables and fruits contained reduced-fat dairy products, was lower in saturated fat and overall fat, and had more protein and fiber than the other diets—the dietary approach to stop the HTN “DASH diet”—was the most effective one (6). The Mediterranean diet has also demonstrated effectiveness in lowering BP and the risk of cardiovascular diseases, but less so than the DASH diet (3,7). Exercise has been shown to lower both ambulatory and office BP in individuals with HTN (5,8). Bruno et al (9) concluded that maintaining a healthy body weight or losing weight, limiting alcohol consumption, limiting sodium intake, managing stress, and exercising exhibit efficacy in reducing BP levels in both hypertensive and normotensive people. Self-measured and monitored BP was found effective in reducing BP in hypertensive individuals, either alone or combined with other supportive services, including counseling or education (3,9,10).

Other non-pharmacological strategies have shown positive effects on HTN management, however, indirectly, less effectively, or inconsistently. Despite the plenty of positive health outcomes of smoking cessation in the prevention of cardiovascular and many other diseases, research studies reveal an inconsistent relationship between smoking or smoking cessation and BP readings (9), favoring non-smoking status. Dietary supplements such as garlic, cocoa, potassium salts, and Omega-3 fatty acids were beneficial in reducing BP but with less effectiveness than DASH or regular aerobic exercise (10-12).

It is worth mentioning that most of the literature that tested or reviewed non-pharmacological interventions in managing HTN was conducted in non-Arabic countries and on non-Arabic participants. Considering that changing or modifying lifestyles is influenced by culture, traditions, values, beliefs, and other social aspects, it is necessary to examine these interventions in different people with different cultural backgrounds. Thus, a scoping review is a suitable approach for surveying the existing body of literature pertaining to this particular subject, enabling the identification of research gaps prior to embarking on further investigations or undertaking alternative types of studies such as clinical trials or systematic reviews. The Arab world encompassed 22 developing countries and territories with a total population of 444.81 million in 2021 (13). The countries were Egypt, Bahrain, Oman, Djibouti, Algeria, Iraq, Jordan, Saudi Arabia, Lebanon, Libya, Yemen, Morocco, Comoros, Palestine territory (West Bank and Gaza Strip), Qatar, Kuwait, Somalia, Sudan, the United Arab Emirates, Tunisia, Syria, and Mauritania (Figure 1). Despite socioeconomic variations, Arab states exhibit linguistic, cultural, and religious similarities that greatly influence the development and



**Figure 1.** Member States of the Arab League. Source: <https://www.worlddata.info/alliances/arab-league.php>

execution of population-based health promotion and preventive care initiatives. These approaches are crucial in tackling the morbidity and mortality associated with HTN. Thus, the aim of this scoping review is to search, find, quantify, and evaluate interventional studies that have so far been conducted in Arab countries aiming at managing or controlling HTN among Arab populations.

## Materials and Methods

### Search Strategy

Related data were gathered from Medline, PubMed, Web of Science, Embase, the Cochrane Library, Science Direct, Scopus, ERIC, ProQuest, Springer, CINAHL, and Google Scholar since database inception until September 2023. Search terms included “Non-pharmacological” OR “Non-drug” OR “Behavioral” AND “management” OR “intervention” OR “control” AND “hypertension” OR “hypertensive” OR “Blood pressure” OR “Bahrain” OR “Algeria” OR “Djibouti” OR “Oman” OR “Iraq” OR “Comoros” OR “Jordan” OR “Kuwait”. The other terms were “Lebanon” OR “Egypt” OR “Libya” OR “Mauritania” OR “Palestine” OR “Gaza Strip” OR “West Bank” OR “Morocco” OR “Qatar” OR “Syria” OR “Somalia” OR “Sudan” OR “the United Arab Emirates” OR “Saudi Arabia” OR “Yemen” OR “Tunisia”. The retrieval processes were conducted autonomously by two researchers.

### Selection Criteria

After eliminating duplicates, relevant publications were assessed based on their titles and abstracts. Studies were considered suitable for inclusion if they addressed a non-pharmacological intervention for the management of HTN in Arab countries. The remaining studies were subsequently scrutinized in their entirety to verify their eligibility.

The inclusion criteria were being an interventional study (a randomized controlled or quasi-experimental study) reporting a non-pharmacological intervention for the management of HTN, being conducted in an Arab country, and being published in English as an original article. On the other hand, the exclusion criteria included the unavailability of electronic full text, qualitative and observational studies, review papers, comments, letters, editorials, opinions, protocols, and guidelines. In addition,

studies reporting a pharmacological intervention for HTN management and studies with inadequate outcome data were excluded from the review. Reference lists were cross-referenced, and related sources also underwent examination.

### Data Extraction

Two authors, working independently, collected data from the eligible articles based on the specified criteria for inclusion and exclusion. The acquired information was recorded on a standardized data sheet, which comprised study information (author/s' names and publication year), research design, country, study population, sample size, age of participants, type of intervention, outcome measure, and findings.

### Quality Assessment of Studies

The Jadad score, which evaluates descriptions of randomization, blinding, and dropouts (withdrawals) in trials, was used to evaluate the methodological quality of the included randomized controlled trials (RCTs) (14). The level of quality ranges from 0 to 5, where a report is considered low-quality if it scores 2 or below or high-quality if it scores 3 or higher (15). The potential for bias was investigated for all other quasi-experimental study designs by employing the pertinent criteria from the Downs and Black checklist (16). Based on the ten-item criteria, studies were evaluated and assigned a positive rating if more than 50% of the criteria were satisfied, a neutral rating if exactly 50% of the criteria were met, or a negative rating if fewer than 50% of the criteria were met.

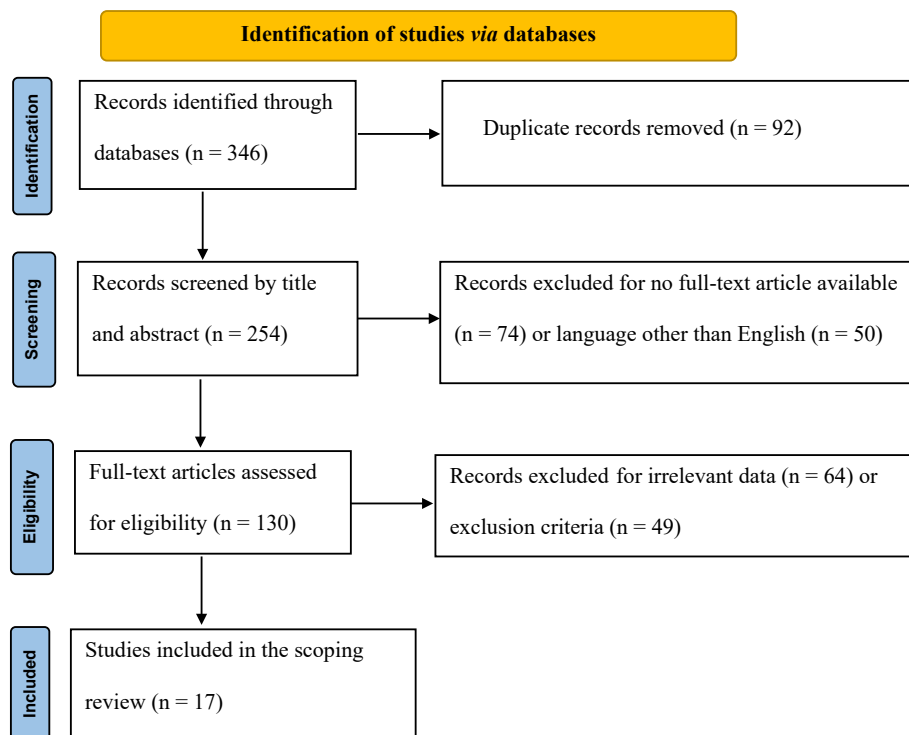
## Results

### Identification of Studies

The database search yielded 346 studies for screening, out of which 130 abstracts were deemed possibly eligible and subsequently retrieved for a thorough evaluation of the full text. The excluded studies were duplicate studies ( $n=92$ ), studies lacking full text ( $n=74$ ), not-English studies ( $n=50$ ), and papers considered irrelevant and meeting additional exclusion criteria ( $n=113$ ). Seventeen papers met the eligibility criteria and were included in this scoping review. The studies were identified according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (17). The flowchart is shown in Figure 2.

### Study Characteristics

The reviewed studies ( $n=17$ ) were published between 2012 and 2022 and distributed among 7 Arab countries, including Egypt ( $n=6$ ), Saudi Arabia ( $n=3$ ), Jordan ( $n=3$ ), Palestine ( $n=2$ ), Tunisia ( $n=1$ ), Sudan ( $n=1$ ), and Lebanon ( $n=1$ ). Among the 17 articles included in this scoping review, 12 were RCTs and 5 were quasi-experimental research. The sample size of the reviewed articles ranged from 18 to 2000 participants. The mean age of participants was  $>40$  years old. Among the 17 included studies, 11 interventions were investigated, including eHealth applications ( $n=4$ ), educational programs ( $n=3$ ), wet cupping ( $n=3$ ), physical exercise ( $n=1$ ), adherence therapy ( $n=1$ ), green tea ( $n=1$ ), lifestyle interventions ( $n=1$ ), DASH ( $n=1$ ), motivational interviewing ( $n=1$ ), and cold hibiscus beverages ( $n=1$ ). The predominant outcome measurements were systolic and diastolic blood



**Figure 2.** PRISMA Flowchart of the Eligibility of Interventional Studies Conducted in Arab Countries. *Note.* PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

pressure (SBP and DBP). The findings demonstrated that all interventions presented a significant improvement in HTN management. The characteristics of the reviewed studies are summarized in Table 1.

**Quality Assessment of Studies**

Eight RCT research reports were judged to be of high

quality according to the Jadad scale (with total Jadad scores of 3 and 4 for five and three studies, respectively). However, four RCT studies were judged to be of low quality according to the Jadad scale. The reason for not earning a full-quality score was that the majority of studies were not double-blinded, and consequently, the method

**Table 1.** Key Attributes of Studies Incorporated in This Scoping Review

Study	Study Design	Country	Study Population	Sample Size	Age (Mean ± SD)	Type of Intervention	Outcome Measure	Findings
Abdelaal and Mohamad (18)	RCT	Egypt	Obese diabetic hypertensive patients were randomly assigned to one of three groups, including aerobic exercise training (AET, n=20), circuit weight training (CWT, n=20), and control (n=19).	59	- CWT group: 52.2 ± 3.00 - Aerobic training group: 53.00 ± 3.5 - Control group: 52.00 ± 3.27	AET or CWT	- SBP - DBP - BMI - Waist circumference	The SBP mean values showed a notable reduction of 3.09 ± 0.69% and 4.79 ± 1.69% in the CWT and AET groups, respectively, after 3 months of training compared to the pre-training period (P<0.05). The DBP mean values exhibited a notable decline of 2.98 ± 1.07% and 6.02 ± 1.06% in the CWT and AET groups, respectively, after 3 months of training compared to the pre-training period (P<0.05).
Abu-El-Noor et al (19)	RCT	Palestine	Participants with HTN who had been prescribed at least one antihypertensive drug at the time of data collection (n=97) and the control group (n=94)	191	- Intervention group: 57.5 ± 11.9 - Control group: 55.4 ± 10.9	Mobile phone app	- Medication adherence - Diet adherence - Appointment adherence	Both the intervention and control groups demonstrated significant improvements in their adherence levels, with the intervention group improving in the total score as well as all three domain scores, including medication adherence, diet adherence, and appointment keeping.
Ahmed et al (20)	QER	Egypt	Patients with essential HTN should follow a treatment plan.	120	48.50 ± 7.89	Educational program	- SBP - DBP - BMI	The intervention led to a considerable improvement in patients' adherence to therapy regimens, as evidenced by a highly statistically significant difference with a P-value of 0.001.
Aleyeidi and Aseri (21)	RCT (pilot study)	Saudi Arabia	The intervention group comprised hypertensive patients who underwent three sessions of wet cupping in addition to their regular anti-hypertensive treatment (n=10), while the control group consisted of hypertensive patients who got only their regular anti-hypertensive treatment (n=8).	18	- Intervention group: 52 ± 7.2 - Control group: 49 ± 9.5	Wet cupping	- SBP - DBP - Adverse events	There was no statistically significant difference between the intervention and control groups in terms of the mean difference in SBP and DBP. No significant adverse effects of wet cupping were observed in this investigation.
Aleyeidi Aseri (22)	RCT	Saudi Arabia	The intervention group (n=40) received wet cupping in addition to conventional HTN treatment, while the control group (n=40) received only conventional HTN treatment.	80	- Intervention group: 52.0 ± 9.4 - Control group: 53.8 ± 9.5	Wet cupping	- SBP - DBP - Adverse events	Wet cupping resulted in an immediate decrease in SBP. After 4 weeks of follow-up, the mean SBP of the intervention group was 8.4 mmHg lower than that of the control group (P=0.046). There were no significant differences in BP levels between the intervention and control groups after 8 weeks. This study found no significant adverse effects associated with wet cupping.
Hassan et al (23)	RCT	Egypt	Patients with primary hypertension	60	46.3 ± 4.2 years	Wet cupping therapy	- SBP - DBP	The treatment group (wet cupping therapy) had significant differences in SBP and DBP compared to the other groups, indicating a favorable outcome.
Alhalaiqa et al (24)	RCT	Jordan	Non-adherent hypertensive patients were assigned to either AT (n=68) or treatment as usual (TAU, n=68).	136	- AT group: 53.4 ± 10.7 - TAU group: 53.9 ± 11.7	AT	- SBP - DBP - Adverse events - Beliefs about Medicines Questionnaire	At 11 weeks, AT reduced SBP by -23.11 mmHg (95% CI: -25.85, -20.36) and DBP by -15.18 mmHg (95% CI: -17.55, -12.80). The AT group demonstrated a 37% enhancement in adherence, as measured by pill consumption, in comparison to the TAU group. No notable adverse effects were reported.

Table 1. Continued.

Study	Study Design	Country	Study Population	Sample Size	Age (Mean ± SD)	Type of Intervention	Outcome Measure	Findings
Alsaqer and Bebis (25)	RCT	Jordan	Participants with HTN were randomly assigned to either the interventional group (public nursing interventions with telehealth application, n=37), control (telehealth application alone, n=36), or standard care (n=37).	110	- Interventional group: 60.37 ± 5.60 - Mobile health applications alone group: 60 ± 6.89 - Standard care group: 61.45 ± 7.36	Public nursing interventions with telehealth application	- SBP - DBP - Quality of life - HTN self-care	In comparison to the two control groups, the interventional group exhibited a significant decrease in SBP; however, there was no significant difference in DBP. Additionally, the interventional group showed better enhancements in self-care maintenance, monitoring, and confidence. Compared to the usual care group, there was a significant enhancement in role constraints caused by physical health and mental issues, pain, energy/fatigue, emotional well-being, and social functioning in terms of quality of life.
Al-Shafei and El Gendy (26)	RCT	Egypt	Patients with HTN were randomly assigned to one of two groups: Grp1 (green tea) and Grp2 (hot water).	200	53 ± 4	Regular green tea and hot water	- SBP - DBP - Pulse pressure (PP) - Left ventricular hypertrophy	Four months of green tea treatment in Grp1, SBP, DBP, and PP had been reduced by 6.6%, DBP by 5.1%, and PP by 9.1%, respectively. However, this effect was not observed at the 4-month follow-up after stopping green tea and hot water consumption. Grp2 demonstrated no significant BP or PP improvement.
Al-Wehedy et al (27)	QER	Egypt	The hypertensive individuals were split into two equal groups. The first group, known as the study group, consisted of 42 patients who underwent a lifestyle intervention to manage their BP. The second cohort consisted of 42 patients who were assigned to the control group and received only standard outpatient care.	84	- Study group: 65.64 ± 4.88 - Control group: 65.11 ± 3.97	Lifestyle intervention	- HTN knowledge - Lifestyle patterns	The lifestyle intervention program was effective in lowering BP by encouraging the adoption of healthy behaviors.
Dwairaj and Ahmad (28)	RCT	Jordan	A total of 57 participants with HTN were allocated to the intervention group, where they received an educational application intervention. Meanwhile, 59 participants were assigned to the control group, where they received conventional care.	116	50 ± 6.2	Mobile application	- SBP and DBP - Self-care - Self-efficacy - Knowledge related to HTN	After 8 weeks of receiving the study intervention, participants in the intervention group showed statistically significant improvements in self-care and knowledge scores compared to participants in the control group. In addition, a greater number of participants in the intervention group represented BP control compared to the control group.
Ead and Ali (29)	QER	Egypt	Hypertensive patients were divided into two groups. One received DASH, and the other received DASH and walking exercise (n=30 in each).	60	- DASH group: 51.10 ± 8.40 - DASH and exercise group: 53.13 ± 7.10	Dietary approaches to stop HTN (DASH)	- SBP - DBP - Hypertensive Patients Knowledge, Attitude Structured Questionnaire	Patients who received DASH and walking exercises had a lower BP than patients who only received DASH.
Jarelnape et al (30)	QER	Sudan	Patients with HTN were randomly assigned to either the intervention group (n=75), who received a health education program about HTN and its management) or the control group (n=75).	150	- Intervention group: 41.46 ± 14.84 - Control group: 38.75 ± 15.03	Health education program about hypertension and its management	- Knowledge about HTN disease aspects - Knowledge about HTN complications - Knowledge about the HTN dietary program	Patients' knowledge of the definition of HTN, signs and symptoms of HTN and hypotension, adherence to drug types of treatment, dietary management, the importance of exercise, and HTN complications improved significantly ( $P=0.001$ ).
Khadoura et al (31)	RCT	Palestine	A total of 173 participants received standard HTN care, while 182 received standard HTN care plus non-blinded motivational interviewing (MI) sessions for 3 months.	355	- Intervention group: 56.1 ± 10.4 - Control group: 55.3 ± 11.0	MI	- Medication adherence - SBP - DBP - Self-efficacy	MI is a client-centered approach that improves medication adherence, mean BP, self-efficacy, and intrinsic motivations in hypertensive patients.

**Table 1.** Continued.

Study	Study Design	Country	Study Population	Sample Size	Age (Mean ± SD)	Type of Intervention	Outcome Measure	Findings
Sahli et al (32)	QER	Tunisia	Hypertensive patients were randomly allocated to either the intervention group (a community-based intervention program, n=921) or control (n=626). At pre-assessment (n=940/940) and post-assessment (n=1,001/976), hypertensive patients were randomly assigned to intervention (a community-based intervention program) and control groups.	2000	- Intervention group: 38.22 ± 13.41 - Control group: 39.52 ± 13.84	Community-based intervention program	- SBP - DBP	The prevalence of HTN decreased from 37.3% to 33.7% in the intervention group, but it was not significant (P=0.1). This proportion increased from 31.1% to 33.4% in the control group without a significant difference (P=0.28).
Saleh et al (33)	RCT	Lebanon	The study encompassed a total of sixteen primary health care centers, with eight serving as controls and eight as interventions. These clinics were situated in rural areas and Palestinian refugee camps across Lebanon. Information on patients diagnosed with diabetes and HTN was collected from their medical records during both the pre- and post-intervention periods. The intervention group consisted of 1433 patients, whereas the control group consisted of 926 individuals.	1547	>40 years	Mobile health	- SBP - DBP	Based on a bivariate analysis of quality indicators, the intervention group demonstrated a noteworthy improvement in BP control (P=0.03) and a considerable reduction in mean SBP (P=0.02).
Salman et al (34)	RCT	Saudi Arabia	Adult females who have normal baseline BP were randomly allocated to one of three groups: Cold (n=100), boiled hibiscus (n=100), or placebo (n=100).	300	39.20 ± 8.71	Cold hibiscus beverage	- SBP - DBP - Heart rate	A cold but not boiled hibiscus beverage lowers BP acutely and safely in adult females with normal baseline BP readings, but only for 15 minutes.

Note. SDL Standard deviation; CI: Confidence interval; MI: Motivational interviewing; BP: Blood pressure; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; BMI: Body mass index; RCT: Randomized controlled trial; QER: Quasi-experimental research.

of blinding was not described (Table 2).

Jadad scale (14) items assess each RCT for randomization, methods of randomization, double-blinding, method of blinding, and a description of dropouts and withdrawals.

Concerning the quasi-experimental research, four studies were deemed to have a neutral rating, while one study earned a positive rating in the assessment of bias risk. Unclear reporting made it difficult to determine whether the criteria were fulfilled in certain cases. More precisely, all the studies did not mention if the coders were kept unaware of the assessment time point, provided no details about the participants' characteristics, had missing follow-up data, and considered no possible factors that could influence the results. In addition, the analyses did not account for variations in the duration of follow-up among participants. Conversely, all five investigations indicated that the subjects were selected from an identical population simultaneously. Furthermore, the statistical tests employed to evaluate the primary outcomes were suitable, adherence to the intervention(s) was consistent, and the applied key outcome measures were precise. However, only one study considered the patients who were no longer available for further observation (Table 3).

The risk of bias items from the Downs and Black checklist (16) evaluate each research report for blinding,

**Table 2.** Quality of Methodology in the Included Research Reports

Study	Jadad Scores					Total Score
	1	2	3	4	5	
Abdelaal and Mohamad (18)	1	1	1	0	1	4
Abu-El-Noor et al (19)	1	1	0	0	1	3
Aleyeidi, Aseri (22)	1	1	0	0	1	3
Aleyeidi and Aseri (21)	1	1	0	0	1	3
Hassan et al (23)	1	1	0	0	1	3
Alhalaiqa et al (24)	1	1	0	0	1	3
Alsaqer and Bebis (25)	1	1	0	1	1	4
Al-Shafei and El Gendy (26)	1	1	0	0	0	2
Dwairej and Ahmad (28)	1	1	0	0	0	2
Khadoura et al (31)	1	1	0	0	0	2
Saleh et al (33)	1	1	0	0	0	2
Salman et al (34)	1	1	1	1	0	4

description of participants who were lost to follow-up, adjustment of analysis based on the length of follow-up, appropriateness of statistical tests employed, and reliability of the intervention component. The other criteria were validity and reliability of the primary outcome measurement, recruitment of participants from the same

**Table 3.** Quality Assessment of Quasi-experimental Studies

Study	Downs and Black Checklist										Rating
	1	2	3	4	5	6	7	8	9	10	
Ahmed et al (20)	0	0	0	1	1	1	1	1	0	0	Neutral
Al-Wehedy et al (27)	0	0	0	1	1	1	1	1	0	0	Neutral
Ead and Ali (29)	0	0	0	1	1	1	1	1	0	1	Positive
Jarelnape et al (30)	0	0	0	1	1	1	1	1	0	0	Neutral
Sahli et al (32)	0	0	0	1	1	1	1	1	0	0	Neutral

population, timing of participants' recruitment, adjustment analysis of the main findings for confounding factors, and the number of participants who lost to follow-up.

### Discussion

Given the high prevalence of HTN in middle- and low-income countries, including Arab countries, one would anticipate these countries to invest relatively in HTN management research, resulting in better HTN control outcomes. Such studies, however, have been limited, and HTN control is found to be extremely low (7.7%) in middle- and low-income countries (35,36). For example, even dietary descriptive research studies, as an essential part of HTN management, were found to be extremely limited, and only 7 studies (with varied quality) were counted in a scoping review (37) in the Gulf Cooperation Council countries—six countries— over 10 years (2009–2010). Furthermore, although the DASH diet has been extensively studied and examined in relation to BP control worldwide since the diet's inception, this current review could retrieve only one study (29) performed in the Arab world. Similarly, only two research studies (18,23) examined the effect of exercise on HTN in the Arab world, despite the huge amount of exercise-related literature existing worldwide.

A higher proportion of the research studies retrieved for this review (25%) examined the use of eHealth strategies for managing HTN. eHealth is defined as an affordable and safe application of technology for communication and information in support of health-related services and other fields (38). Three of these studies used mobile applications, either newly developed for the purpose of the study (19,28) or already previously developed and freely downloaded for the use of the study (25). Saleh et al (33) utilized a telecommunications company to deliver SMS messages to the participants' mobiles. Although discussed separately, these studies used mainly health education strategies in managing HTN using telecommunications. The most common topics included in these studies were HTN disease, diet, physical activity, BP monitoring, and treatment compliance. Counseling was also part of the intervention in one study using phone calls for communication (25). Three studies could reveal significant BP control by comparing BP measurements pre- and post-intervention. While one study (19) reported significant changes in adherence to medication, diet, and appointments among participants, BP was not an outcome

measure. No doubt, health education is beneficial and should always be part of HTN management. However, interventions that combine health education, counseling, and management methods could be more effective (39). Moreover, health education and counseling should include theory- and evidence-based interventions that have been shown to be effective behavioral changes among people (40), which was not obvious or clearly determined in the aforementioned studies; in addition, two (50%) studies were rated as low quality. Similarly, Ahmed et al (20) and Jarelnape et al (30), in their studies, which are rated neutral quality, reported significant BP control among hypertensive patients after providing an educational program; however, the content of the education was not emphasized or elaborated in the report (20), and BP measurement was not an outcome (30). In contrast, Alhalaiqa et al (24) provided counseling therapy sessions called "adherence therapy" (AT), which is rooted in evidence-based practices of cognitive behavioral therapy and MI randomized trials (41). Seven sessions of AT in this high-quality study could lower systolic and diastolic BP significantly. Moreover, Khadoura (31) used MI counseling to increase medication adherence among Palestinian hypertensive patients. The results showed that MI was effective in improving medication adherence and could lower BP significantly.

Noticeably, five (29.45%) of the retrieved studies in this review examined the effect of home remedies or folk practices on BP. Three studies investigated the impact of wet cupping on BP. Wet cupping—called *Hijama* in Arabic—is a highly common folk practice worldwide, including in Arab countries, and has been used to treat many health problems, especially those associated with pain (42). It showed no specific or significant effect on lowering BP (21-23). Despite the promising health effects (especially musculoskeletal symptoms) of wet cupping (43), no evidence has been found regarding its effect on HTN (44). The other two studies examined the effect of green tea (26,34) and hibiscus drinks (34) on BP. The results were significant; consumption of green tea and cold hibiscus was effective in lowering both SBP and DBP. In accordance with these results, recent systematic reviews and meta-analyses (45,46) confirmed the effect of green tea on lowering BP; however, longer and larger trials were recommended to draw clear evidence. In contrast, a more recent systematic analysis and meta-analysis could not observe this effect on SBP but on DBP (47). Hibiscus

drinks were also found to have antihypertensive effects similar to drugs (48,49); however, it is recommended that further studies be conducted to determine the dosages and duration of consumption (49).

Community-based interventions, including education and health promotion, revealed improvements in BP control (50,51). Sahli et al (32) reported the impact of a 3-year community-based intervention project on decreasing the prevalence of elevated BP among adults in Tunisian neighborhoods. The intervention included health education and promotion in dietary practice, physical activity, and smoking prevention. Although there was no substantial difference in the prevalence of HTN between the intervention and control groups, a remarkable reduction in BP was noted in the intervention group. The results might support targeting hypertensive patients with such interventions. Similarly, lifestyle modification interventions were effective in decreasing the BP among hypertensive patients attending medical hospital clinics in Egypt (27), in addition to improving their health promotion profiles. However, the report did not provide details on the program components and framework.

There is strong evidence supporting the adoption of the dietary approach to stop HTN (DASH) and exercise in preventing, managing, and controlling HTN (8,52-54). Ead and Ali (29) examined the effect of DASH and walking exercises on BP in Egyptian participants with HTN. They compared DASH alone with DASH and exercise for BP. DASH alone could lower BP; however, DASH and exercise had a significant antihypertensive effect. Abdelaal and Mohamad (18) studied and compared the impact of aerobic exercise and circuit weight training on the BP of obese Egyptians with HTN. Both types of exercise were effective in BP and weight control; however, aerobic exercise showed a significantly higher positive effect. Even when Hassan et al (23) reported that wet cupping combined with aerobic exercise could lower BP, readers can easily recognize that the reduced BP was mainly due to exercise rather than wet cupping.

## Conclusion

Considering that the goal of scoping reviews is to provide breadth rather than depth of information on a specific topic, they have inherent limitations. As a result, this scoping review did not include a meta-analysis that usually assesses the strength of evidence present in a disease or treatment. Moreover, the included studies were limited to ones that were published in English. Finally, the authors of this scoping review acknowledge their efforts in studying and investigating non-drug interventions and their effects on HTN control in Arab countries. The interventions that encompassed health education and behavioral counseling, dietary modification, physical activity, medication adherence, and HTN management showed significant effects on lowering BP and controlling HTN. Other interventions, such as hibiscus tea consumption, demonstrated promising findings. However, this review

obviously revealed scarcity in these studies, aside from the low or modest (neutral) quality of nearly 50% of them. Therefore, further high-quality interventional research projects and updated studies are recommended in the areas of dietary approaches (especially DASH), exercise, theory-based education, and behavioral counseling in Arab countries and among Arab people. Researchers are encouraged to conduct more studies on home remedies that are common and highly believed by Arab people to have a positive effect on BP, such as hibiscus tea and garlic consumption (55,56), for further evidence and valid findings.

## Authors' Contribution

**Conceptualization:** Nasir Matani.

**Data curation:** Nasir Matani, Mohammad Nazzal.

**Formal analysis:** Nasir Matani, Mohammad Nazzal.

**Investigation:** Nasir Matani, Mohammad Nazzal.

**Methodology:** Nasir Matani, Mohammad Nazzal.

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## Competing Interests

None.

## Ethical Approval

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