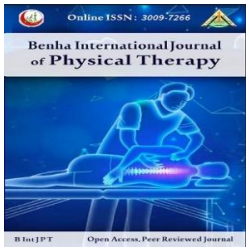
B Int J PT 2025 Jun;3(1):113 -125. DOI: 10.21608/BIJPT.2025.359072.1067

Benha International Journal of Physical Therapy

Online ISSN: 3009-7266 Home page: https://bijpt.journals.ekb.eg/



Original research

Effect of DASH Diet and Acupuncture on Hypertension in Postmenopausal Women.

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Article history:
Submitted: 20-02-2025
Revised: 05-03-2025
Accepted: 20-03-2025

Abstract:

Background: Nearly two-thirds of older women suffer from cardiovascular disease, which is most commonly caused by hypertension. **Purpose:** To examine the combined effect of a dietary approach to stop hypertension (DASH) diet and acupuncture on postmenopausal hypertension. **Methods:** Forty-five postmenopausal women suffering from hypertension participated in the study. They were randomly divided into three equal groups (A, B & C): Group A received the DASH diet and antihypertensive medications, Group B received acupuncture and antihypertensive medications, and Group C received the DASH diet, acupuncture, and antihypertensive medications. All women were assessed before and after the intervention using a mercury sphygmomanometer and stethoscope to measure their blood pressure level and an SF-36 questionnaire to evaluate their quality of life. **Results:** A significant improvement in all assessed outcomes in all groups post-treatment compared to baseline was detected ($p<0.05$). Significant changes post-treatment was detected across three groups in systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) ($p<0.05$). The post hoc test indicated a significant change in the mean value of SBP, DBP, and MAP between groups B and C in favor of group C. Also, no statistically significant change in the mean values of all SF-36 questionnaire items was found across three groups post-treatment except in the role limitation due to physical health, vitality, and general health items, with superiority of group C.

Conclusion: Adding a DASH diet to acupuncture provided a better reduction of blood pressure and enhanced quality of life in hypertensive postmenopausal women.

Keywords: Acupuncture, DASH diet, Hypertension, Postmenopausal women.

Introduction

In female aging, hypoestrogenism is linked to the shift from a reproductive to a non-reproductive state. Pre-menopause, menopause, and post-menopause phases make up this process[1]. Menopause is the termination of a female's normal reproductive life, which is identified by a permanent absence of menstruation owing to the reduction of ovarian follicular activity. It comes

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before the menopausal transition, which typically starts between the ages of 45 and 50 on average[2]

The hormonal level changes as a result of menopausal ovarian senescence, with a drop-in estrogen level. A wide range of indications and symptoms, such as vasomotor symptoms, reduced bone density, mood and energy changes, genital tissue alterations, and effects on sexual activity, might result from this drop, which impacts numerous bodily tissues [3]

Women's quality of life may be adversely affected by vasomotor symptoms, which are associated with low levels of plasma antioxidant activities, boosted cardiovascular responses to stressful conditions, higher cholesterol, greater sympathetic nervous activation, hot flushes, hypertension, and a greater possibility of aortic calcification [4]

A 140-mmHg systolic blood pressure (SBP) over 90 mmHg diastolic blood pressure (DBP) or a 30 mm Hg increase in SBP and/or a 15 mmHg rise in DBP are considered hypertension (HTN) [5]. It is a serious and rapidly expanding health issue worldwide, which affects about two-thirds of women in their sixties and is the most frequent precursor for cardiovascular diseases [6].

The primary reason for rising blood pressure (BP) is a decrease in estrogen, which results in incomplete artery dilatation, which causes blood vessels to contract and raise BP [7]. Approximately 75% of postmenopausal women in the US currently have HTN, which contributes to its high prevalence in older women. Dietary salt, obesity, and infrequent exercise are significant risk factors and exacerbations of postmenopausal HTN [8].

The diet approach to stop hypertension (DASH) diet is high in fruits, vegetables, and low-fat dairy products. It is effective in lowering both SBP and DBP [9], and various clinical trials have indicated that it can lower a wide range of BP levels either by itself or in addition to lifestyle modifications like eliminating sodium, losing weight, or exercising[9, 10,11].

According to Seo et al. [12], acupuncture treatment may help postmenopausal women with HTN by reducing BP and lowering the hazard of cardiovascular problems. Numerous studies revealed that acupuncture not only stimulates specific brain regions but also modifies neurotransmitters in those areas to reduce the autonomic reaction in cases of HTN resulting from imbalanced activities of sympathetic and parasympathetic systems [13].

There has been no previous study investigating the combined effectiveness of the DASH diet and acupuncture in managing HTN in postmenopausal women. So, the current research was carried out to explore the combined effectiveness of the DASH diet and acupuncture in decreasing BP and enhancing quality of life of hypertensive postmenopausal women.

Methods

Sample size calculation: Using the G*power program 3.1.9 (version 3.1, Heinrich-Heine-University, Düsseldorf, Germany), the sample size was determined using F tests (MANOVA: Special effects and interactions), Type I error (α) = 0.05, power (1-β error probability) = 0.90, effect size f2 (V) = 0.1848341, and Pillai V = 0.3120000. Three independent groups were compared for two main outcome measures derived from Faul et al. 22 This study requires 45 patients as a minimum (15 patients in each group).

Participants:

Forty-five postmenopausal women diagnosed as hypertensive in their earlier postmenopausal phase (after one year of menses cessation) were selected from Abu Hammad General Hospital, El-Sharqia Governorate, Egypt. They were aged between 50 and 60 years old, with body mass index (BMI) ranging from 25 -29.9 kg/m2. Their SBP was between 140 and 159 mmHg and DBP was between 90 and 99 mmHg, and all of them were of sedentary lifestyle. Women would be excluded if they had premature or surgical menopause, higher center lesions leading to hypertension, severe uncontrolled hypertension, women receiving hormonal therapy or having secondary hypertension, diabetic women or those with kidney diseases, myocardial infarction, or heart failure.

Randomization:

The participating women were allocated randomly into three equal groups via a computer-generated database of randomized numbers (www.randomization.com). Each woman had a

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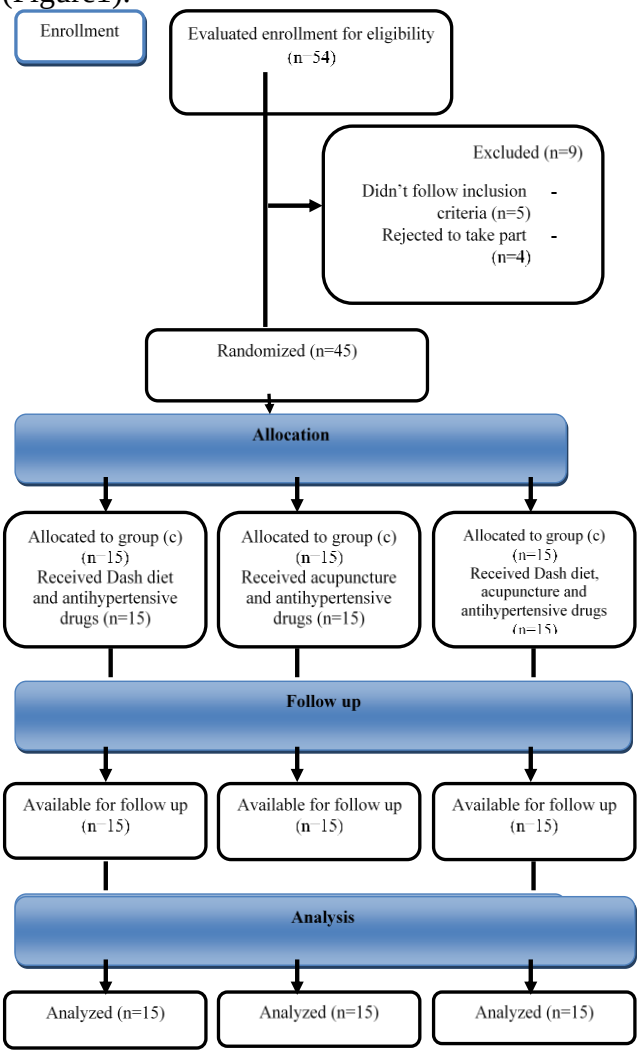
code; cards of sequentially random computer-generated numbers were put in sealed envelopes. According to the cards chosen by an external investigator who was blinded to the research procedures, the participants were allocated to their groups (A, B, or C). Group (A) included 15 participants treated by the DASH diet and antihypertensive medications. Group (B) included 15 participants treated with acupuncture and antihypertensive medications. Group (C) included 15 participants treated by DASH diet, acupuncture, and antihypertensive drugs. Following randomization, there was no participants' dropout (Figure1).



Ethics approval and consent to participate:

Approval for the research was gained from the ethical committee at the Faculty of Physical Therapy, Cairo University (No: P.T.REC/012/003872). It was also registered on ClinicalTrials.gov (NCT06015919). Every participant signed an informed consent before the study began. This research has been conducted regarding the Declaration of Helsinki for studies involving humans.

Interventions:

I- Procedures:

Each postmenopausal woman was asked to provide a thorough medical history before being admitted to the study, and they were fully informed of the protocol to ensure their cooperation throughout the procedure.

1. Medical treatment (antihypertensive drugs):

All postmenopausal women in all groups (A, B & C) received the antihypertensive drug as prescribed by the physician (Concor5, the active ingredient in this medication, is bisoprolol fumarate, a beta-1-selective adrenoceptor blocking agent, with an initial dose of 5 mg once daily).[14]

2. Dietary Intervention:

· The DASH diet, which comprises 50–55% carbohydrates, 15–20% protein, and 25–30% total fat, was given to the intervention groups (A, C). The DASH diet comprises few amounts of refined grains, cholesterol, saturated fats, and sweets while being rich in fruits, vegetables, low-fat dairy products, and whole grains. Additionally, the daily sodium consumption is intended to be below 2400 mg [11,15].

Both groups (A and C) were given the same calories. A clinical nutrition specialist and the therapist implementing the treatments conducted the initial interviews with the participants. A seven-day menu of approved foods was given to each intervention group, along with an exchange list to guarantee a variety of food intake. The following measures were taken to guarantee that the participants followed the dietary plan: A booklet with a list for food exchange was given to them. A personalized dietary plan was created for each participant, relying on her dietary habits, energy needs, and individual preferences, with the intention of modifying the plan twice a month to improve adherence to the regimen. Weekly counseling sessions with the dietitian were used to follow up with the patients. To ensure the participants' plan compliance, they were requested to record their nutritional consumption for three

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randomly selected days every two weeks until the study's completion [16,17].

3. Acupuncture intervention: All participants in groups B & C received acupuncture therapy twice weekly for 12 weeks. While the women were lying on their backs, acupuncture was applied along acupoints Jianshi P5 (3 cm above the transverse crease on the palmar side of the forearm) and Neiguan P6 (2 cm above the transverse crease on the palmar side of the forearm) [13]. The skin over the applied area was first cleaned with 70% alcohol.

Sterile, disposable needles measuring 30 mm in length, 0.25 mm in diameter, and 3.15 mm in insertion depth are used in acupuncture procedures. To attain de qi sensations, the therapist manually rotated the acupuncture needles and kept them there for 30 minutes, intermittently stimulating them every 5 minutes [18].

II- Outcome measures:

1- Measurement of blood pressure:

A mercury sphygmomanometer and stethoscope: A sphygmomanometer mercurial (serial number 1600G004, made in China) was used for measuring SBP and DBP and then to calculate mean arterial blood pressure (MAP) for all participants in all groups (A, B & C) before and following the completion of the study. Patients were advised to sit comfortably for 5 min before the BP measure. Since the BP readings obtained from the supine lying position tend to be slightly higher by 2–3 mmHg in the SBP and decreased by homogenous values for the diastolic pressure, the blood pressure was taken when the patient was seated with their back in a proper supporting position. The arm would rest comfortably at the heart level. The mean of the two measures obtained 15 minutes apart and should not vary by more than 5 mm Hg, was recorded. The BP should be measured at the same time of the day, 3 hours after a meal. Participants were encouraged to refrain from salty meals and high coffee intake [19].

The MAP is identified by systole and diastole of a single cardiac cycle. One popular formula for estimating the MAP is as follows: With DP standing for diastolic pressure, SP for systolic pressure, and PP for pulse pressure, MAP can be expressed as DP + 1/3(SP – DP) or MAP = DP + 1/3(PP). Since it provides a rapid calculation method provided the blood pressure is known, this approach is frequently more suitable for measuring MAP in the majority of clinical conditions [20].

2. Assessment of quality of life (QoL):

The QoL of all postmenopausal women in all groups was evaluated using the SF-36 questionnaire before and after the study program ended. About five minutes are needed to finish the 36-item self-administered questionnaire. It is a general questionnaire for evaluating QoL with good validity and reliability. It uses eight multi-item categories to measure health, including role limitation due to physical health or owing to emotional problems, pain, mental health, physical and social functioning, vitality, and general health evaluation. The answers to each question are calculated to correspond to a standardized set of answers. The results are converted to a scale of 0-100, where 0 denotes the worst measured state of health [21].

Data analysis

Descriptive statistics (mean and standard deviations) were utilized to analyze the gathered data. ANOVA was utilized to compare the three groups' subject characteristics using inferential statistics. The Shapiro-Wilk test for normality revealed that all evaluated variables were normally distributed after the data were checked for extreme scores, homogeneity of variance, and the normality assumption. MANOVA was applied to compare parametric variables across groups. SPSS for Windows, version 20, was applied for all statistical analysis (SPSS, Inc., Chicago, IL). Statistical significance was established at $p<0.05$.

Results

***Subject characteristics*:**

Table 1 illustrates no significant change across groups in the mean values of age, weight, height, and BMI ($p>0.05$).

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Table 1. General characteristics of subjects of three groups

	Group A	Group B	Group C	f-value	p-value	Sign
Age (years)	55 ± 3.3	55 ± 3.4	55.2 ± 3.1	0.014	0.986	**NS**
Weight (kg)	76.1 ± 5.4	70.8 ± 6.8	72.1 ± 6.7	2.78	0.073	**NS**
Height (cm)	164.7 ± 3.5	160 ± 5.9	160.9 ± 7	2.87	0.068	**NS**
BMI (kg/m^2)	28 ± 1.4	27.8 ± 1.5	27.9 ± 1	0.192	0.826	**NS**

Data was described as mean ± standard deviation, NS: non-significant

Effect of DASH diet and acupuncture on SBP, DBP and MAP:

A significant drop in the mean value of SBP, DBP, and MAP was reported in all groups after treatment compared to baseline ($p<0.05$). Post-treatment, a significant change was detected across all groups in the SBP, DBP, and MAP values ($p = 0.008$, 0.049, and 0.033), respectively **(Table 2).** The post hoc test for SBP, DBP, and MAP revealed only a significant change across groups B and C ($P = 0.006$, 0.020, and 0.030), respectively, in favor of group C **(table 3).**

Table (2): Comparison between pre- and post-study mean values of SBP, DBP, MAP between and within groups

Measured variables	Group A	Group B	Group C	f-value	P value
SBP (mmHg)					
Pre-study	146.5 ± 5.8	147 ± 7	148.4 ± 7.8	0.324	0.725
Post-study	133 ± 9.5	138.7 ± 5.9	127.8 ± 11	5.41	0.008*
% of change	9%	5.6%	13.9%		
(P-value)	0.001*	0.002*	0.001*		
DBP (mmHg)					
Pre-study	93.7 ± 3.1	92.6 ± 3.3	89.8 ± 4	1.17	0.320
Post-study	84.4 ± 5.7	85.4 ± 4.9	80.7 ± 5.1	3.23	0.049*
% of change	10%	7.8%	10%		
(P-value)	0.001*	0.001*	0.001*		
MAP					
Pre-study	104.4 ± 5.2	111 ± 4.1	111.5 ± 3.9	0.026	0.974
Post-study	100.5 ± 6.5	102.9 ± 5.1	97 ± 6.1	3.7	0.033*
% of change	3.7%	7.3%	13%		
(P-value)	0.001*	0.001*	0.001*		

SBP: systolic blood pressure, **DBP:** diastolic blood pressure**, MAP:** mean arterial pressure**,** Data is represented as mean ±SD, *: significant

Table (3): post hoc test between groups of SBP, DBP, MAP, and SF-36 questionnaire post-study

Post hoc between groups		SBP	DBP	MAP
Group A vs. B	Mean difference	-5.66	-1	-2.3
	P-value	0.292	0.608	0.870

Group A vs. C	Mean difference P-value	5.33 0.354	3.7 0.065	3.5 0.331
Group B vs. C	Mean difference P-value	11 0.006*	4.7 0.020*	5.9 0.030*

Vs: versus, *: significant, **SBP**: systolic blood pressure, **DBP:** diastolic blood pressure**, MAP:** mean arterial pressure

Effect of DASH diet and acupuncture on SF-36 questionnaire:

A significant rise in the mean value of physical functioning, role limitation due to physical health, role limitation due to emotional problems, mental health, social functioning, bodily pain, general health, and total SF-36 questionnaire was detected in groups A and C ($p<0.05$) with no significant change in group B ($p>0.05$); as well as an increase in the vitality's mean value in group C ($p<0.05$) with no significant change in groups A and B ($p>0.05$) was detected post-treatment compared to baseline (Table 4).

Regarding the between-group comparison, no significant change in the mean values of physical functioning, role limitation due to emotional problems, mental health, social functioning, bodily pain, and total SF-36 questionnaire was detected post-treatment across all groups ($p = 0.238$, 0.066, 0.497, 0.443, 0.430, and 0.238), respectively, while significant changes in the mean values of role limitation due to physical health, vitality, and general health ($p = 0.001$, 0.042, and 0.025), respectively, were reported post-treatment across all groups (Table 4).

Post hoc tests for role limitation due to physical health revealed significant changes across groups A and B (P=0.003) in favor of group A, across groups A and C (P=0.016) in favor of group C, and across groups B and C (P=0.001) in favor of group C. For vitality, no significant change across groups A and B (P=1) or across groups B and C (P=0.320) was detected, but a significant change across groups A and C (P=0.040) was reported, in favor of group C. For general health, no significant change across groups A and B (P=0.167) or across groups A and C (P=1) was detected, while there was a significant change across groups B and C (P=0.026) in favor of group C (Table 5).

Table (4): Comparison between pre- and post-study mean values of between and within groups

SF-36 questionnaire	Group A	Group B	Group C	f-value	P value
Physical functioning					
Pre-study	52.73 ± 11.18	53.47 ± 8.57	51.07 ± 10.89	0.215	0.808
Post-study	59.33 ± 11.31	54.73 ± 7.45	60.40 ± 9.53	1.48	0.238
% of change	12.5%	2.4%	18.3%		
(P-value)	0.001*	0.150	0.001*		
Role limitation due to physical health					
Pre-study	55.27 ± 7.48	51.80 ± 6.01	56.27 ± 9.85	1.30	0.281
Post-study	60.40 ± 6.10	52.06 ± 6.53	67.40 ± 6.91	20.76	0.001*
% of change	9.3%	0.5%	19.8%		
(P-value)	0.001*	0.773	0.001*		
Role limitation due to emotional problems					
Pre-study	56.47 ± 12.32	60.60 ± 11.42	60.73 ± 10.27	0.683	0.511
Post-study	59.47 ± 12.76	60.93 ± 12.14	68.53 ± 7.56	2.90	0.066
% of change	5.3%	0.5%	12.8%		
(P-value)	0.004*	0.733	0.001*		
Vitality					
Pre-study	51 ± 11.79	55.53 ± 8.57	50.6 ± 13.12	0.878	0.423
Post-study	52.53 ± 10.82	55.8 ± 8.55	61.5 ± 9.05	3.43	0.042*
% of change	3%	0.5%	21.5%		

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(P-value)	0.094	0.767	0.001*		
Mental Health					
Pre-study	50.47 ± 12.09	55.33 ± 8.73	54.13 ± 13.52	0.714	0.496
Post-study	52.2 ± 12.09	56.33 ± 9.54	56.73 ± 12.69	0.711	0.497
% of change	3.4%	1.8%	4.8%		
(P-value)	0.010*	0.127	0.001*		
Social functioning					
Pre-study	50.47 ± 12.13	56.20 ± 11.40	52.87 ± 9.72	1.003	0.375
Post-study	51.60 ± 11.73	56.80 ± 11.38	54.80 ± 10.32	0.829	0.443
% of change	2.2%	1%	3.7%		
(P-value)	0.019*	0.204	0.001*		
Bodily pain					
Pre-study	47.73 ± 12.02	50.33 ± 11.36	51.20 ± 13.44	0.322	0.726
Post-study	50.60 ± 8.84	50.40 ± 10.61	54.93 ± 12.32	0.862	0.430
% of change	6%	0.14%	7.3%		
(P-value)	0.008*	0.949	0.001*		
General health					
Pre-study	55.33 ± 10.64	51.67 ± 11.93	52.07 ± 9.65	0.522	0.597
Post-study	58.47 ± 7.84	51.93 ± 10	61.07 ± 9.31	4.01	0.025*
% of change	5.7%	0.5%	17.3%		
(P-value)	0.015*	0.830	0.001*		
Total SF-36 questionnaire					
Pre-study	44.62 ± 5.50	43.22 ± 6.19	43.99 ± 7.89	0.170	0.844
Post-study	46.93 ± 5.04	44.65 ± 6.79	49.02 ± 8.92	1.48	0.238
% of change	5.2%	3.3%	12%		
(P-value)	0.039*	0.224	0.001*		

Data is represented as mean ±SD, *: significant

Table (5): Post hoc test between groups of SF-36 questionnaire post-study

Post hoc between groups		Role limitation due to physical health	Vitality	General health
Group A vs. B	Mean difference	8.33	-3.26	6.5
	P-value	0.003*	1	0.167
Group A vs. C	Mean difference	-7	-9	-2.6
	P-value	0.016*	0.040*	1
Group B vs. C	Mean difference	-15.33	-5.73	-9.13
	P-value	0.001*	0.320	0.026*

vs: versus, *: significant

Discussion

Postmenopausal women have a greater probability than both premenopausal women and men to have hypertension (HTN). A major hazard for cardiovascular illnesses and a factor that lowers postmenopausal women's quality of life is HTN. Due to their distinct physiological traits, postmenopausal women are more likely to develop HTN [10], so, lifestyle changes are essential. The DASH diet and acupuncture are two non-pharmacological treatments for HTN, so this research was intended to give insight into the positive combined effects of the DASH diet and acupuncture on reducing BP and improving QoL in hypertensive postmenopausal women.

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The study's findings indicated a statistically significant drop in BP in all groups, with a relative improvement in health-related aspects of QoL post-treatment compared to pre-treatment, with the superiority of group C, which received the DASH diet and acupuncture. These findings proved the significance of integrating the DASH diet with acupuncture in managing postmenopausal hypertension rather than using each intervention separately.

The significant reduction in BP noticed in groups (A & C) was attributed to the DASH diet effect. Amongst the most well-researched aspects of the DASH diet's possible antihypertensive effects are its increased potassium and lower sodium intake. Specifically, a high dietary sodium intake primarily alters the extracellular matrix of the arterial wall, leading to arterial stiffness. The DASH diet is high in fruits and vegetables that contain high potassium, which exhibits vasoactive qualities and may lower BP by reducing vascular smooth muscle contraction. Vascular structures and functions are closely related to the amount of sodium or potassium consumed. Endothelial stiffness has been shown to reduce nitric oxide synthesis, which causes smooth muscle cells to contract and blood arteries to narrow, elevating blood pressure. Thus, a higher prevalence of HTN is associated with arterial stiffness. Consequently, a diet high in potassium and dietary fibers and low in sodium showed the significance of the DASH diet, which has vasoactive properties and may lower SBP and DBP by lessening the contraction of vascular smooth muscles [23].

The present findings were matched with Juraschek et al. [24], who indicated that the modified DASH diet, which increased or decreased the food content based on the original DASH diet, was linked to a significant drop in SBP and DBP when compared to the control diet.

Engeberding and Wenger [25] also looked at the treatment of HTN in women aged 45 to 64. They indicated that the DASH diet, when integrated with weight loss and exercise, significantly reduced BP in non-medicated, overweight, or obese women with high BP before and after menopause, comparable with a typical American diet. Additionally, Ferdinand et al. [26] investigated the DASH diet and dietary sodium as nutritional alternatives to HTN or cardiovascular health. The research included nearly 50% female and over 50% Black participants, with an average age of mid-40s and BP readings of about 130/80 mm Hg. The authors concluded that the DASH diet is a prophylactic and therapeutic alternative to medications for the management of HTN.

On the same line, Ru et al. [27] investigated the impact of the DASH diet on high BP or HTN in adults. They found that the DASH diet decreased mean SBP, DBP, waist circumference, and triglyceride level in patients with HTN. Furthermore, Filippou et al. [28] evaluated the efficacy of the DASH diet on BP in people with and without HTN in 30 RCTs with a total of 5545 individuals over 15 weeks. They discovered that patients given the DASH diet experienced a 3.2 and 2.5 mmHg drop in SBP and DBP, respectively, comparable to the present study's results.

The outcomes of the meta-analyses[29,30] also showed that the DASH-like diet had a profitable lowering impact on adults' SBP and DBP, though the level of the BP drop varied amongst subgroups. Additionally, Schwingshackl et al. [31] presented a meta-analysis and discovered that the DASH diet decreased SBP/DBP in pre-hypertensive and hypertensive patients by −7.4/−4.4 mm Hg compared to a control diet.

The significant improvement in the measured variables in groups B and C proved the benefits of acupuncture in decreasing SBP and DBP. Acupuncture, a part of Traditional Chinese Medicine (TCM), may help reduce BP by activating the central, afferent, and efferent pathways. Numerous studies have shown that acupuncture not only alters neurotransmitters in associated brain areas to reduce the autonomic response but also activates specific brain regions in hypertension conditions brought on by unbalanced status between the sympathetic and parasympathetic nervous systems.[32,33]. In addition, acupuncture raises sodium excretion, alters plasma norepinephrine, serotonin, and endorphin concentrations, and lowers plasma renin and angiotensin II activities. [13]

Stimulation at the PC 5-6 acupoints was commonly utilized to manage several cardiovascular diseases, including angina, HTN, and arrhythmias. Patients

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with HTN received acupuncture at (PC 5–6) (Neiguan-Jianshi); their strong effect on BP provides further support for the acupoint-specific consequences for HTN, suggesting that meridians and acupoint specificity are closely related. According to Fan et al. [13], acupuncture treatment stimulates somatosensory afferents. Thick myelinated Aα and Aβ (groups I and II), thin myelinated Aδ (group III), and thinner unmyelinated C (group IV) are among the various types of afferent fibers. Additionally, unmyelinated fibers in the median nerve that are activated by P5–6 acupoint activation contribute to the acupuncture inhibiting impact on cardiovascular responses. Researchers have determined that group III fibers play a role in how acupuncture acts. Acupuncture at points P5–6 inhibits cardiovascular excitatory responses through the action of both thinly myelinated and unmyelinated fibers.

Regarding acupuncture results, the study's results were supported by Vilaval et al. [32], who proved significant drop in SBP, DBP, and mean ABP in primary hypertensive patients, which indicates that acupuncture provides better control of BP than the usage of antihypertensive drugs only.

Zheng et al. [35] studied acupuncture for mild hypertensive patients and found no improvement in visit-to-visit Blood Pressure Variability (BPV). In contrast, those who received active acupuncture (thrice weekly, 6-week treatment) showed greater reductions in SBP and DBP at weeks 6, 9, and 12, and its impact on SBP lowering persisted for an additional 6 weeks. As well as, a meta-analysis by Chen et al.[36] showed that acupuncture used in conjunction with antihypertensive medications lowered BP more effectively than antihypertensive medications alone in hypertensive patients.

Furthermore, there have been conflicting findings from studies determining the impact of acupuncture on lowering BP. Zhao et al.[37] asked, "Is acupuncture effective for hypertension?" in 23 RCTs that included 1788 patients with HTN and reported no significant changes between acupuncture and Western medicine for reducing SBP and DBP after treatment.

According to the results of the SF36 questionnaire, the positive impact of the DASH diet on BP is responsible for the increase in QOL scores with antihypertensive treatment. Patients with HTN can lower their BP, cholesterol, blood sugar, and body weight by adopting a heart-healthy diet. Salt causes the heart to work harder because it holds water, increases bodily fluid volume, and raises BP. Headaches are believed to be linked to sodium consumption. The DASH diet has positive benefits on QOL dimensions because it limits sodium and salt intake [38].

The present findings concurred with the research of Kirpizidis et al.[38], who reported that patients' QOL levels improved when they adhered to the DASH diet while receiving antihypertensive medication. Their vitality, mental health, emotional state, physical function, and pain all improved, and this had a favorable effect on their adherence to antihypertensive medication. Additionally, Rifai et al. [39] examined how the DASH diet affected the exercise ability and QoL of heart failure patients. They discovered that the DASH group gradually improved their exercise capacity and QoL scores.

Arab et al.[40] looked at how the DASH diet affected women's mental health indicators, involving stress, anxiety, and depression. They indicated that the DASH diet group had lower stress and depression scores, which improved their QoL.

According to Fan et al. [13], acupuncture can lower blood pressure via a variety of pathways, such as acupoints, afferent and efferent nerves, and neurotransmitters that enhance physical function, pain, emotional condition, and QoL.

Also, Lazuardi et al. [41] studied the impact of press needle on acupoints on BP and QoL in patients with essential HTN. They discovered that the treatment group's QoL improved compared to the placebo group.

Additionally, Wang et al. [42] carried out a comprehensive review of TCM, and specifically acupuncture, as an adjunctive therapy for CVDs. The research highlights how acupuncture has the potential to improve cardiovascular health, which in turn can improve overall health and QoL.

Limitation

This research was the first to examine the efficacy of the DASH diet and acupuncture on postmenopausal hypertension, which might suggest other approaches to managing postmenopausal hypertension and promoting

female general health in a more affordable way with no side effects. Power analysis and randomized study design, in addition to the safety of the approaches utilized by skilled physiotherapists, are further strengths of this research. Yet, there are certain limitations to the research; it examined the short-term impact of the DASH diet and acupuncture on postmenopausal hypertension with no patient follow-up, which should be considered in subsequent research.

Conclusion:

The combined use of the DASH diet and acupuncture provides better results for reducing blood pressure and improving quality of life in hypertensive postmenopausal women than the usage of each of them separately. So, the augmentation of the DASH diet with acupuncture should be suggested in the treatment protocol for hypertension in postmenopausal women.

Acknowledgment

The authors appreciated all participants who contributed to this study.

DECLARATIONS

 Consent to publish: I certify that each author has given their consent to submit the work.

 Competing interests: None.

Funding: No fund.

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Please cite this article as follows: Elsayed A, El-Kosery S, Kamel H, El-Shafei M. Effect of biomechanical awareness and core stability exercises on mechanical low back pain among Egyptian Physiotherapists Effect of DASH Diet and Acupuncture on Hypertension in Postmenopausal Women. B Int J PT 2025 Jun;3(1):113 -125. DOI: 10.21608/BIJPT.2025.359072.1067.

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