Blood pressure response to foot reflexology adjunct to transcendental meditation training on postmenopausal hypertension

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Abstract

Background: Hypertension is by far the most paramount risk factor that affects the ladies in the early postmenopausal years. Reflexology is a noninvasive therapy that performed on the hands, feet, or ears at perceivers at categorical reflex points.
Purpose: To detect the response of blood pressure to foot reflexology and transcendental meditation training on hypertensive postmenopausal women**.**
Subjects and Methods: Fifty volunteers, postmenopausal women were diagnosed clinically as hypertensive, their age was ranged between (50 – 65) years, their body mass index (BMI) was <30 kg/m² and their blood pressure were ranged between (140/90) mmHg and (180/110) mmHg. They were randomly assigned into two equal groups in number (A& B). Participants in group (A) received the foot reflexology in addition to the transcendental meditation training techniques, while Participants in group (B) received the transcendental meditation training technique only. The treatment program were done three times per week for 8 weeks. Assessment of all subjects in both groups (A& B) was carried out before and after the treatment program throughout using the mercury column sphygmomanometer. **Results:** Both groups (A&B) showed a significant reduction ($P<0.001$) in their blood pressure values after the end of two consecutive months of training program. However, foot reflexology plus transcendental meditation training group (A) showed a greater reduction in the blood pressure values. **Conclusion**: So, it could be concluded that using the foot reflexology in addition to the transcendental meditation training had a positive effect on hypertensive postmenopausal women than using the transcendental meditation training only.

Keywords*:* Reflexology, Transcendental Meditation, Menopause, Hypertension.

INTRODUCTION

Hypertension, characterized as the steady elevation of blood pressure over 140/90 mmHg. Hypertension is a noteworthy wellbeing issue in Egypt with a commonness rate of 26.3 % among the grown-up population. Its incidence increments with aging, roughly 50 % of Egyptians over the age of 60 years, experience the effects of hypertension (1).
Menopause is a term used to depict the end of the main function of the ovaries: the ripening of ova and the surrender of the hormones that cause both the engenderment of the uterine covering and the ensuing shedding of the uterine coating (the menses or period). It happens in

ladies in midlife, amid their late 40s or mid 50s, and signs the end of the prolific period of a lady's (2).

Hypertension is by far the most paramount risk factor that affects the ladies in the early postmenopausal years. Around 30 to half of ladies create hypertension before the age of 60 and the onset of hypertension can bring about numerous side effects that are frequently identified with menopause (3).

Hypertension is the most popular chronic disease in industrialized countries and represents the most prevalent cardiovascular hazard consider after the fifth decade of life in both men and ladies. Mechanisms that are responsible for the incrimination of blood pressure are intricate and multifactorial, including loss of the estrogen, endothelial dysfunction, oxidative stress, alteration in the renin-angiotensin system overflow and the sympathetic activation (4).

Reflexology is a noninvasive therapy that performed on the hands, feet, or ears at perceivers at categorical reflex points. Utilizing of special manipulations with varying degrees of the pressure. It establishes both the psychological and physiological standardization of the body using special manipulations with varying degrees of pressure (5).

It is predicated on the ancient thought that the microcosm of the body subsists in the structure of the feet. They additionally respect connected between mind, body and spirit. Treatment is given as a massage to particular zones of the feet permitting recuperation in all of the body systems, facilitating the relinquishment of pain and dysfunction in an extraordinary way (6).

Reflexology grasps all the body organs and frameworks, physical: by fortifying the blood dissemination, mental: through utilization of the touch and its restorative impact on the body, enthusiastic. The general association at the subtle level with client to relax the body and decrease pain and advance particular muscular and bodily functions (7). It enhances the blood supply, lessens fear, disturbance, diminish the sympathetic modulation, increments the vagal adjustment, and decrease the blood pressure in the healthy subjects and patients with coronary artery disease (8-9).

It has a valuable effect on quality of life and well-being, diminishing of anxiety, stress and pain. Additionally, indicated a valuable effects of reflexology on the baroreceptors reflex sensitivity, blood pressure and sinus arrhythmia (10).

Meditation is defined as a stylized mental technique that repetitively practiced for the purpose of obtaining a subjective experience that is commonly described as very relaxed, silent, and of the heightened alertness, often characterized as blissful. Meditation has been used in the clinical settings as a method of pain, stress and anxiety relieving. Meditation has additionally been studied categorically for its effects on the stress (11-12).

Transcendental meditation is a particular type of mantra meditation that was designed by Maharishi Mahesh Yogi (1918–2008) in India. The meditation practice includes the utilization of a mantra (specific words such as I am calm) and is practiced for 15–20 minutes twice per day while sitting with one's eyes closed (13).Transcendental meditation is said to be associated with the clinical outcomes such as the blood pressure reduction and physiological changes such as the reduced of blood cortisol levels (14).

Both the slow breathing and mental relaxation resulted in the reduction of both systolic, diastolic blood pressure, respiratory rate, heart rate, and electromyographic activity with increment in the skin conductance and peripheral skin temperature (15).

2. Subjects and methods

Subjects

This study was carried out upon a sample of fifty postmenopausal women diagnosed clinically by the gynecologist/ physician as hypertensive. They were selected randomly from the outpatient clinic of Kasr El Ainy University Hospital, between November 2014 to May

2015, their age ranged from 50 to 65 years, their body mass index (BMI) <30 kg/m² and their blood pressure ranged from 140/90 mmHg to 180/110 mmHg, and having the same ordinary daily living activities. The purpose and nature of the study were explained to all participants. All participated women who had the following criteria: They were post-menopausal for at least one year, had essential hypertension (without cause), Duration of hypertension (1-3years), the cause of hypertension was limited to behavioral and environmental factors, and were not participated in any pervious exercise training program for at least 3 months prior to the study. A detailed medical history was obtained from the all participants to screen for any other pathological conditions, as women with tumor, renal or liver or cardiac disease, cardiopulmonary problems, diabetic, having lesion to higher centers, hypo or hyperthyroidism, had any thrombotic disease of the lower extremities or any foot infections or ulcers, or had undergone foot surgery. The women were randomly distributed into two equal groups (A& B) using the computer generated random numbers. Allocation was concealed in sequentially numbered opaque envelopes. Group (A) consisted of twenty five women, performed the foot reflexology in addition to the transcendental meditation training techniques. Group (B) consisted of twenty five women performed the transcendental meditation training technique only. Both groups received their antihypertensive drugs in form of (angiotensin enzyme).The treatment program was performed three times per week for 2 successive months. The Ethical Committee of the Faculty of Physical Therapy, Cairo University approved this study. The study protocol was explained to all participating ladies, who had signed the informed consent form.

Methods

Assessment of all subjects in both groups (A& B) was carried out before treatment and after 2 months of treatment to measure the blood pressure throughout using the mercury sphygmomanometer at least 3 measurements were done and the mean value was taken. Systolic BP was the point at which the first of 2 or more sounds was heard and the diastolic BP was the point before the disappearance of sounds. Reading of the clinical blood pressure was obtained in the left arm of the sitting patients, after 5 minutes of rest, with using the mercury sphygmomanometer.

Before starting the first session, the treatment procedure was carefully explained to the woman, to actively motivate them to perform maximally, also, advice the women to avoid any salty foods and to avoid drinking of coffee, tea and alcohol before the measurement session.

Foot reflexology technique: It was performed for all subjects in groups (A)

Each subject was advised to wear comfortable and light clothes and assume the relaxed supine lying position with her feet rested on the plinth in a quiet room.

The patient asked to remove both the socks and shoes in order to receive the treatment program. Inspection for the either feet of the patient for any broken or cuts skin. Then the feet were cleaned carefully with disinfectant wipe. Positioned both feet close to each other and imagine the map of the body. (16).

Foot Reflexology procedures:

Starting with the warming-up through washing the whole of the sole by the warm water. This helps to tones the energy of the whole body, relaxes, and prepares the feet to be practiced on. Then, massaging the foot included the mixture of 5 minutes of the light pressure and light stroking using the whole hand to the dorsal and plantar surfaces for each foot to relax it and also, relax the patient.

Reflexology intervention was applied by using the mixture of thumb walking and finger pivot techniques to the base of the toes and the foot that correspond with the reflex zones. The pressure was done on certain zones with a special concentration on the following points:
(1)Solar plexus point: it represents the spleen reflex point in the exterior edge of the planter aspect of the left foot.
(2) Pituitary reflex point: it represents the pituitary gland, exactly in the planter aspect of the center of hallux (big toe) of both feet
(3) Heart reflex point: on the bottom of the big toe of the planter aspect of both feet. This point improves the regulation of the heart.
(4) Liver reflex point opposite of the spleen at right foot (17).

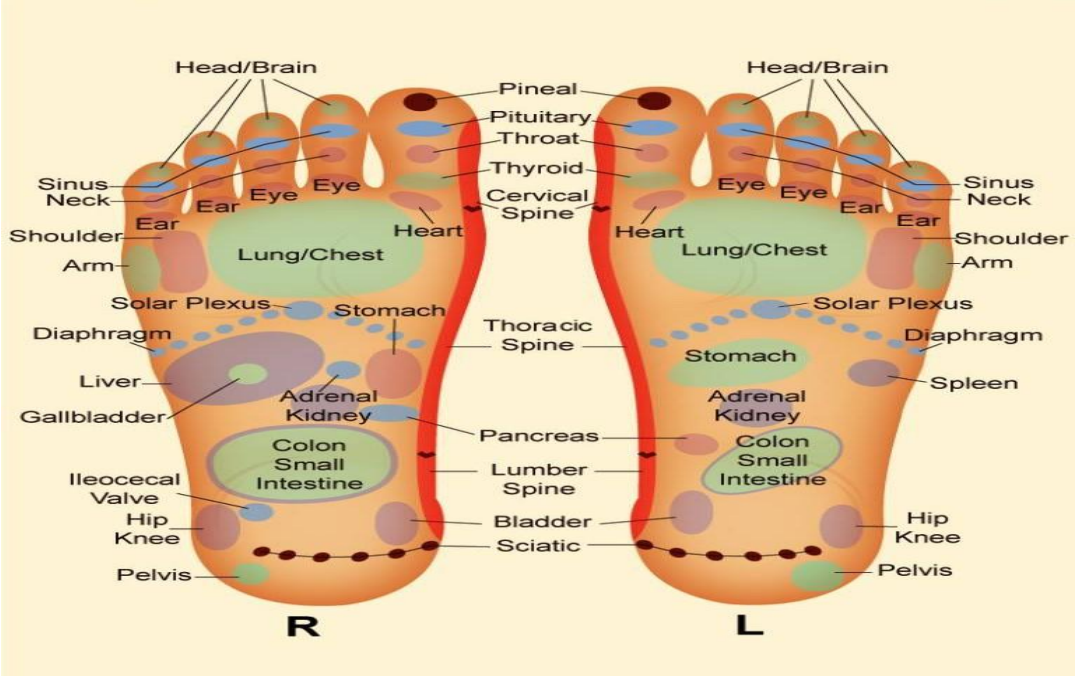

Fig. (1) Foot reflexology Chart (18).

Foot reflexology sessions were done for 30 min (each foot 15 min) twice a week for 8 weeks.

Transcendental meditation training technique: It was performed for all subjects in both groups (A&B). Before starting of the technique each woman was advised to evacuate her rectum and bladder, to be more relaxed and to wear light and comfortable clothes. The session was done in a quite warm room.
Every subject was assuming the comfortable half lying position with the back well supported, with both arms are relaxed at the sides**.** Using small cushions and soft pillows to accommodate and support her body curves and then subject was asked to listen and observe to her own regular breathing (in, out and pause in between them) in order to obtain the mental relaxation for 5 minutes. Then, begin to imagine an object in her mind. This object should be pleasurable and simple to her. It could be the moon, the sea, the sky or etc. Some people prefer a favorite sounds, such as slow music. Whichever you choose, try to visualize the word object, or something to represent the sound (19).
Then the woman was asked gently to close her eyes and then, take a deep breath from her nose slowly and make her abdomen like a balloon and then, to count of four, then asked to expire the air from her mouth with a sigh.
This procedure was repeated four times of deep breaths to a count of four and expired to a

count of four.
Then repeated four times the pattern of deep breath, and expired to a count of four each, brought her breaths down to a calm and rhythmic pattern.
She took herself through the imagination in somewhere she felt more relaxed as in the river or in the beach in the summer, where she sit and hear the soothing sound of the running water, and watch the beautiful scene, and smell the fresh breath of air (13).
Then the woman would give herself affirmations such as: I am calm, I love to do my tasks in a calm and relaxed manner. This procedure was then repeated for 20 minutes. Transcendental meditation technique was repeated three times a week for 8 weeks. Every subject was advised to repeat the previous techniques daily as the home routine.

Statistical Analysis: The collected data was statistically analyzed by using the unpaired t test to compare between the mean values of different variables in the two studied groups (A&B) while the paired t test compared variables within the same group. The Statistical Package for the Social Sciences (SPSS) computer program (version 16 windows) was used for the data analysis. Data were represented as the means and the standard deviations and the percentage of change were calculated. It was considered significant at P value<0.05 and highly significant at P value<0.001.

Results

1-General characteristics of the patients in the two groups (A&B):
As shown in Table 1: The general characteristics for all subjects in both (A & B) at entry of the study.
Group (A): The means of their age, weight, height and BMI were (53.45 ± 3.24 years), (79.80 ± 5.45 kg), (166.35 ± 3.94 cm) and (28.70 ±0.94 kg/m²) respectively. Group (B): The means of their age, weight, height and BMI were (54.50 ± 3.36 years), (80.90 ± 6.66 kg), (168.25 ± 5.50 cm) and (28.33 ± 1.03 kg/m²) respectively. Comparison between both groups (A&B) showed a statistically non significant difference (p= 0.321, p = 0.571, p = 0.216& p =0.242) at age, weight, height and BMI respectively.

Table 1: General characteristics for the two studied groups (A, B):

Variable	Group (A) (n=25)	Group (B) (n= 25)	t value	P value
Age (yrs.)	53.45 ± 3.24	54.50 ± 3.36	-1.006	0.321 (NS)
Weight (kg)	79.80 ± 5.45	80.90 ± 6.66	-0.571	0.571 (NS)
Height (cm)	166.35 ± 3.94	168.25 ± 5.50	-1.257	0.216 (NS)
BMI (Kg/m2)	28.70 ± 0.94	28.33 ± 1.03	1.188	0.242 (NS)

Data are expressed as mean ± SD. NS= p> 0.05= not significant.

2-Diastolic blood pressure (DBP) before and after treatment for both groups (A&B): as shown in (Table 2).
Regarding Group (A): The mean values of diastolic blood pressure at entry of the study was (98.50 ± 8.13) and after the end of treatment program was (86.00 ± 6.81) with percentage of improvement was (12.69%).
Comparison by using paired t-test between at entry of the study and after the end of treatment program showed statistically highly significant decrease (P= 0.001) in diastolic blood pressure and t value was 8.238.

Regarding Group (B): The mean value of diastolic blood pressure at entry of the study was (99.25 ± 7.66) and after the end of treatment program was (95.75 ± 7.66), with percentage of improvement was (3.53%).
Comparison by using paired t-test between at entry of the study and after the end of treatment program showed statistically highly significant decrease (P= 0.001) in diastolic blood pressure and t value was 4.273.

Table 2: Comparison between mean values of DBP measured pre- and post-treatment in the two studied groups (A, B).

	Study group(A) (n= 25)	**Control group(B) (n=25)**
Pre-treatment	98.50 ± 8.13	99.25 ± 7.66
Post-treatment	86.00 ± 6.81	95.75 ± 7.66
Mean Difference	12.5	3.50
Percentage of improvement	12.69	3.53
t value	8.238	4.273
P value	0.001**	0.001**

Data are expressed as mean ± SD. P < 0.01= highly significant.

3- Comparison between mean values of systolic blood pressure (SBP) measured pre- and post-treatment in the two studied groups (A, B) (within group comparison). As shown in (Table 3)**.**
Regarding Group (A): The mean value of systolic blood pressure at entry of the study was (165.75 ± 14.07) and after the end of treatment program was (150.50 ± 11.69) with percentage of improvement was (9.20%).
Comparison by using paired t-test between at entry of the study and after the end of treatment program showed statistically highly significant decrease (P= 0.001) in systolic blood pressure and t value was 8.677.
Regarding Group (B): The mean value of systolic blood pressure at entry of the study was (160.75 ± 12.70) and after the end of treatment program was (154.0 ± 12.94) with percentage of improvement was (4.2%).
Comparison by using paired t-test between at entry of the study and after the end of treatment program showed statistically highly significant decrease (P= 0.001) in systolic blood pressure and t value was 6.110.

Table 3: Comparison between mean values of SBP measured pre- and post-treatment in the two studied groups (A, B).

	Study group(A) (n= 25)	**Control group(B) (n=25)**
Pre-treatment	165.75 ± 14.07	160.75 ± 12.70
Post—treatment	150.50 ± 11.69	154.0 ± 12.94
Mean Difference	15.25	6.75
Percentage of improvement	9.20	4.2
t value	8.677	6.110
P value	0.001**	0.001**

Data are expressed as mean ± SD. P < 0.01= highly significant.

4- Comparison between mean values of pre-treatment and difference in DBP in the two studied groups (A, B).

Pre-treatment, there was no statistical significant difference between the mean value of DBP of study group (A) (98.50 ± 8.13) and its corresponding value in control group (B) (99.25 ± 7.66) with t test = -0.300 and p value = 0.766 (Table 4). Comparison between mean values of DBP before treatment in the two studied groups (A, B) measured by using unpaired t test.

The mean difference is calculated to get the exact effect of the two methods, whether (relaxation techniques plus medications or medications alone), in the two studied groups (A, B). There was a statistical highly significant increase in the mean value of difference in DBP in study group (A) (12.50 ± 6.79) when compared with its corresponding value in control group (B) (3.50 ± 3.66) with t test = 5.219 and p value = 0.001 (Table 4). Comparison between mean values of difference in DBP in the two studied groups (A, B) measured by using unpaired t test.

Table 4: Comparison between mean values of pre-treatment and difference in DBP in the two studied groups (A, B).

	Study group (A) (n= 25)	**Control group (B) (n= 25)**	**t value**	**P value**
Pre-treatment	98.50±8.13	99.25±7.66	-0.300	0.766 (NS)
Mean difference	12.50 ± 6.79	3.50 ± 3.66	5.219	0.001**

Data are expressed as mean ± SD. NS= p> 0.05= not significant; p< 0.01= highly significant.

5- Comparison between mean values of pre-treatment and difference in SBP in the two studied groups (A, B).

Pre-treatment, there was no statistical significant difference between the mean value of SBP of study group (A) (165.75 ± 14.07) and its corresponding value in control group (B) (160.75 ± 12.70) with t test = 1.180 and p value = 0.245 (Table 5). Comparison between mean values of SBP before treatment in the two studied groups (A, B) measured by using unpaired t test.

There was a statistical highly significant increase in the mean value of difference in SBP in study group (A) (15.25 ± 7.86) when compared with its corresponding value in control group (B) (6.75 ± 4.94) with t test = 4.095 and p value = 0.001 (Table 5). Comparison between mean values of difference in SBP in the two studied groups (A, B) measured by using unpaired t test.

Table 5: Comparison between mean values of pre-treatment and difference in SBP in the two studied groups (A, B).

	Study group (A) (n= 25)	**Control group (B) (n= 25)**	**t value**	**P value**
Pre-treatment	165.75±14.07	160.75±12.70	1.180	0.245 (NS)
Mean difference	15.25 ± 7.86	6.75 ± 4.94	4.095	0.001**

Data are expressed as mean ± SD.

NS= p> 0.05= not significant; p< 0.01= highly significant.

Discussion

Hypertension is a standout among the most widely recognized intense factors to atherosclerotic cardiovascular disease. Hypertension impacts a more noteworthy number of men than women until 55 years of age, however after age 55, the rate of women is higher. Estrogen lack has been

connected to the fast increment in the cardiovascular infection in the ladies who have experienced regular or surgical menopause. Cardiovascular disease is the main source of death in ladies and kills more than a large portion of a million ladies each year (20).

The results of the present study revealed that integrating the foot reflexology to the transcendental meditation training (group A) produced a significant reduction of their blood pressure values compared to transcendental meditation training alone (group B) after 2 months of the treatment, which indicated that performing the foot reflexology with the transcendental meditation training are more effective on reducing of the blood pressure in postmenopausal women than transcendental meditation training alone.

The outcomes agree with those of in the investigation of Lu et al., (9) who directed a study to explore the impact of the foot reflexology on the autonomic nervous modulation in with coronary artery disease patients by utilizing of the heart rate variability analysis. They found that foot reflexology may be utilized as an efficient adjunct to the therapeutic regimen to decrement blood pressure and increment the vagal modulation in both healthy people and coronary artery disease patients.

The results of this study came in accordance with Park and Cho (21) as they examined the impacts of 6-weeks of using the foot reflexology on fatigue and the blood pressure in 34 elderly, hypertensive patients. They construed that utilizing of foot reflexology brings about a basic decreasing in fatigue, both diastolic and systolic blood pressure, and triglyceride level in the patients.

Kaur et al., (22) exhibited that the reflexology and foot massage result in noteworthy decline in the heart rate, in both of the systolic and diastolic blood pressure, and amelioration in the oxygen saturation in critically ill patients.

Recent researches has moreover shown that adjustments in the luminosity of the skin and the dermal layer structures at a particular reflex points on the feet may offer rise to the changes felt by therapists during the treatment (16).

Reflexology quiets strain and anxiety by promoting vasodilatation, relaxation, reducing of blood pressure, provision of oxygen-rich supplements to the body cells and enhanced the blood flow (8-23).

Regarding group (A) utilizing of foot reflexology in integration to transcendental meditation training is more effective than utilizing of transcendental meditation training only in group (B) as many benefits of reflexology may be established by balance of the autonomic nervous system (ANS). The ANS controls the body frameworks that are under unconscious control as heart rate, breathing, and blood pressure. These parameters are very delicate to the stressors and fluctuate according to the psychological or physical alterations that experienced by an individual, though the vagal modulation that controls restful and calming alterations and sympathetic modulation or conventional functioning, that are responsible for regulating the arousal and the "fight or flight" reaction (17). Furthermore, through impact of the foot reflexology on the baroreceptor reflex, which regulates the blood pressure. It was inferred that foot reflexology basically cut down the baroreceptor reflex affectability, baroreceptor reflex affectability was measured using sinus arrhythmia and stage IV of the valsalva maneuver, the period in the valsalva maneuver during which the blood pressure is substantially elevated over the standard (10).

With the way that skeletal muscles profound relaxation would evoke the relaxation reaction as it was proved that the release of strain in the skeletal musculature had the impact of quieting the mind. The impact of sympathetic activity was counteracted by the relaxation reaction by permitting the activity of parasympathetic nervous system, subsequently exploiting the reciprocal nature of the two components of the autonomic nervous system (24).

This outcome was affirmed by that of Sivasankaran et al,. (25) who directed a study to inspect the impact of meditation and yoga on laboratory and hemodynamic parameters, and found significant reduction in the blood pressure (Bp).

The results of this study in accordance with those of Schneider et al., (26) they concentrated the impact of 20 minutes twice every day of using the transcendental meditation technique on 201participants, they concluded that, transcendental meditation group has a valuable effect on lessening of myocardial infarction, the mortality danger, and stroke in coronary heart disease patients than the control group. These changes were associated with lessening of psychosocial stress factors, and blood pressure. Therefore, this practice may be clinically valuable in the secondary prevention of cardiovascular disease.

Moreover, Nidich et al., (27) they found that, following 3 months of practicing the transcendental meditation (TM program), there were diminished of the psychological distress and systolic and diastolic blood pressure in the examined group compared with the control group.

The results of this study are fortified by Kaushika et al., (15) who reported that, both mental relaxation and slow breathing exercises brought about a fall in the heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate and the electromyographic activity with increase in skin conductance and the peripheral skin temperature. Both the modalities (mental relaxation and slow breathing exercises) expand the parasympathetic tone however have impacts of different intensity on different autonomic parameters.

Slow breathing decreases blood pressure through enhancing of baroreflex sensitivity in hypertensive patients. These impacts show up conceivably useful in the hypertension management (28).

On the other hand, the results of this study disagreed with those of Cramer et al. (29) who studied the strength of recommendation and the quality of evidence of yoga program (as a modality of relaxation techniques) continued for 8 weeks as a therapeutic means in the management of the prehypertensive and hypertensive patients, they reported that, no evidence was found for effects of yoga (as a modality of relaxation techniques) on diastolic or systolic blood pressure. Larger studies are needed to confirm the emerging but low-quality evidence that yoga may be a useful adjunct intervention in the management of hypertensive patients.

Also, the results of this study contradicting those of Parati et al., (30) who researched the impact of transcendental meditation on blood pressure, their finding did not appear to provide a final answer as to whether (TM) can be considered as an effective non-pharmacological approach for blood pressure reduction in hypertensive subjects. So, they revealed that, there is no sufficient good quality evidence to firmly establish whether or not transcendental meditation (TM) has a positive effect on blood pressure.

Conclusion

Finally, it could be concluded that integrating foot reflexology to transcendental meditation training was found to be an effective, safe, cheap and successful adjunct treatment method in reducing hypertension in postmenopausal women.

CONSENT

All authors declare that written informed consent was obtained from the subject before starting the study for publication of this case report.

ETHICAL APPROVAL

This study was approved by ethical committee of faculty of Physical Therapy, Cairo University.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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