



## Review

# Foot reflexology for reduction of blood pressure in hypertensive individual: A systematic review

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## ARTICLE INFO

## Keywords:

Blood pressure  
Complementary and integrative medicine  
Foot Reflexology  
Hypertension  
Meta-analysis

## ABSTRACT

**Importance:** Hypertension is the modifiable risk factor associated with cardiovascular diseases and all-cause mortality. Foot reflexology has been proposed to reduce the blood pressure for the patients with hypertension but the available evidences are uncertain.

**Objective:** We conducted a systematic review and meta-analysis, know the efficacy of foot reflexology on blood pressure reduction in patients with hypertension.

**Data sources and selection:** A systematic search of electronic databases such as PubMed, Scopus, ClinicalTrials.gov, Embase, and Cochrane library since inception till January 2022. Randomized controlled trial with foot reflexology as an intervention for lowering blood pressure (BP) in hypertensive patients was included in the study.

**Data extraction and outcome measures:** Data was independently extracted by four authors. Systolic and diastolic blood pressure was the primary outcome measure. Standardized mean difference (SMD) and 95 % confidence interval (CI) were calculated to determine the effect size.

**Results:** The pooled effect of SBP (SMD:  $-2.70$ , 95 % of CI:  $-6.79$ ,  $1.39$ ,  $I^2 = 97\%$ ,  $P < 0.001$ ) and DBP (SMD:  $-2.12$ , 95 % of CI:  $-5.95$ ,  $1.71$ ,  $I^2 = 97\%$ ,  $P < 0.001$ ) changes are not favorable for foot reflexology in terms of reducing blood pressure.

**Conclusion:** Findings from the studies showed that foot reflexology interventions were not much effective in the reduction of blood pressure among patients with hypertension.

## 1. Background

Hypertension [HTN] or High blood pressure is a persistent elevated pressure in the walls of the arteries [1]. It is characterized by systolic blood pressure (SBP) above 140 mmHg and diastolic blood pressure (DBP) above 90 mmHg [2]. 1.39 billion people worldwide have HTN and its prevalence is high in lower- and middle-class populations, which may be due to healthcare cost [3]. HTN can result from modifiable or non-modifiable risk factors. The modifiable risk factor may include stress, poor mental health, obesity, sedentary lifestyle, smoking, and changes in the dietary pattern whereas nonmodifiable risk factor may involve age, gender, and genetic susceptibility. In 95 % of the cases, the

causative factor of HTN is idiopathic and it is considered to be essential hypertension whereas in cases of secondary hypertension treatment of underlying cause may produce better clinical outcome [4]. In primary or essential hypertension, it is the duty of the clinician and researchers to scrutinize various perspective of disease pathology to produce therapeutic results. Despite of effective use of pharmacological agents, the disease control still remains moderate and it calls for integrative approach for the effective management [5]. Foot reflexology one of the ancient healing techniques being the most widely used form complementary and integrative medicine [6]. The technique of foot reflexology involves controlled application of pressure on specific point of the foot which is known to activate different parts of the body thereby improving

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<https://doi.org/10.1016/j.foot.2023.101974>

Received 10 November 2022; Received in revised form 2 February 2023; Accepted 5 February 2023

Available online 7 February 2023

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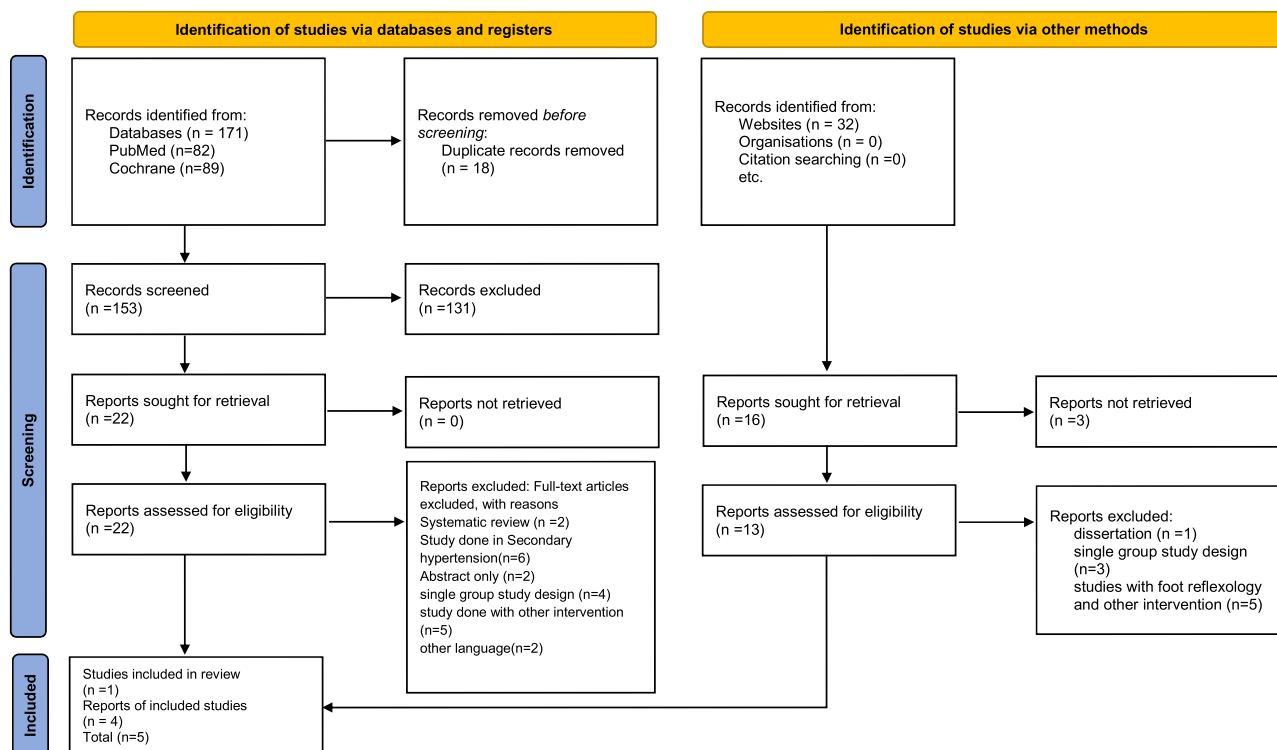


Fig. 1. PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources.

circulation, flow of energy and also regulates homeostasis of the body [7]. The science of foot reflexology believes that healing potential resides inside every individual; only major role of the physician was to help the healing potential to achieve balance and optimizes health [8]. There were few studies which shows the effect of foot reflexology on blood pressure but the results were not convincing. Therefore, we had conducted present systematic review and meta- analysis to find the overall effect of foot reflexology in the management of HTN.

## 2. Methodology

### 2.1. Data sources and searches

For this meta-analysis, electronic databases such as PubMed, Prospero, Scopus, ClinicalTrials.gov, Embase and Cochrane library inception till January 2022. The following medical subject heading such as “Foot Reflexology”, OR “Zone Therapy”, OR “Clinical Foot Reflexology”, OR “Reflexology”, AND “Hypertension”, OR “High blood pressure” OR “Blood pressure” were used. Language restriction were imposed for the search, only articles written in English was included. Full text eligibility of the article is also checked for the inclusion. Present systematic review and meta-analysis was conducted, performed and reported in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines and also the study is registered in Prospero (CRD42022365113).

### 2.2. Study selection

Three authors (PR, YC, and AA) independently performed title and abstract screening to find all eligible articles for this meta-analysis. Articles were selected for inclusion in the meta-analysis if the study evaluated systolic and diastolic blood pressure in hypertension patients and foot reflexology should be given as the intervention with or without standard care. Comparator group may receive either laser to reflexology point or any standard and conventional treatment for the management of hypertension. Articles excluded in the meta-analysis were article

published in languages other than English, non –availability of full text, blood pressure was not assessed as the outcome measure and also study conducted on any other pathological condition excluding hypertension. While the evidences supporting the clinical effectiveness of foot reflexology is very minimal, with no limitation encountered on the design of the study, this meta-analysis and review included both quasi-experimental and randomized control trials.

### 2.3. Data extraction and reliability

Data were independently extracted by three (PR, YC, AA) authors using standardized protocol and reporting form. Any discrepancies regarding the inclusion of studies were resolved by mutual discussion between the authors which also includes the corresponding author (MK) for better clarification. The following information was extracted First author, year, country, age, control group, sample size, experimental group, study design, interventional details for the experimental /control group, outcome parameters were recorded.

### 2.4. Statistical analysis

The mean (i.e.) SBP and DBP differences between experimental and control groups were estimated. Standardized mean difference (SMD) and 95 % confidence interval (CI) were calculated to determine the effect size. The  $I^2$  statistics and Cochran Q test was used to assess heterogeneity. To improve the accuracy of the results, we used a random-effect model.

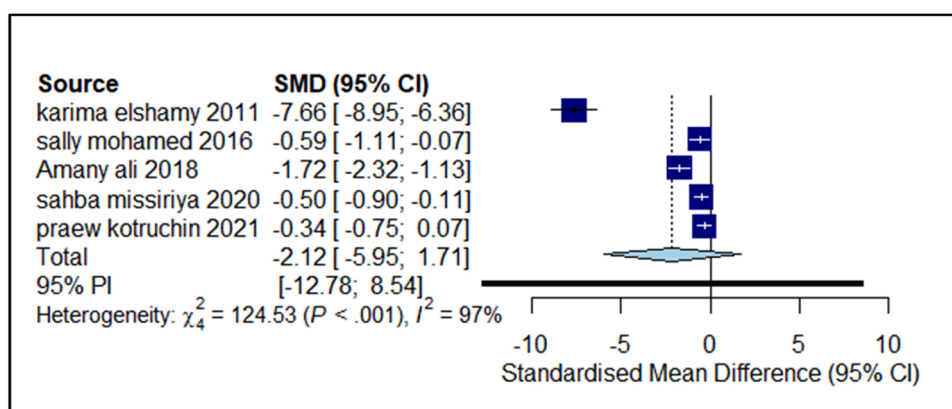
## 3. Results

### 3.1. Literature selection

The literature selection process (Fig. 1) was done by three independent authors (PR, YC, and AA). We have identified 203 potential articles and eligible records from the literature search. 198 articles were excluded after removing possible duplication, records not retrieved,

**Table 1**  
Details of included studies.

S. no	First author	Year	Country	Sample size	Study design	Duration, Timepoint (how long Reflexology given)	Outcome measure	Age of the patients
1	Elshamy et al. [12]	2011	Egypt	T = 80 E = 40 C = 40	Quasi-experimental study	30 mins (15 mins for each foot) twice a week for 4 weeks	Blood Pressure, Quality of Life	Aged between 30–60 years
2	Mohamed et al. [9]	2016	Egypt	T = 60 E = 30 C = 30	Randomized Clinical Trial	20 mins weekly thrice for 8 weeks	Blood Pressure, serum creatinine	Aged between 45 and 55 years
3	El-Abd et al. [13]	2018	Egypt	T = 60 E = 30 C = 30	Quasi experimental design	Monthly once 30 mins (15 mins for each foot) for 3 months	Blood Pressure, Heart Rate, and Quality of Life	Aged between 30 and 59 years
4	Missiriya et al. [10]	2020	India	T = 100 E = 50 C = 50	Randomized Clinical Trial	15 mins weekly twice for 6 weeks	Blood Pressure, and level of stress	Aged between 56 and 79 years
5	Kotruchin et al. [11],	2021	Thailand	T = 94 E = 47 C = 47	Randomized Clinical Trial	–	Blood Pressure and heart rate	Aged between 40 and 80 years



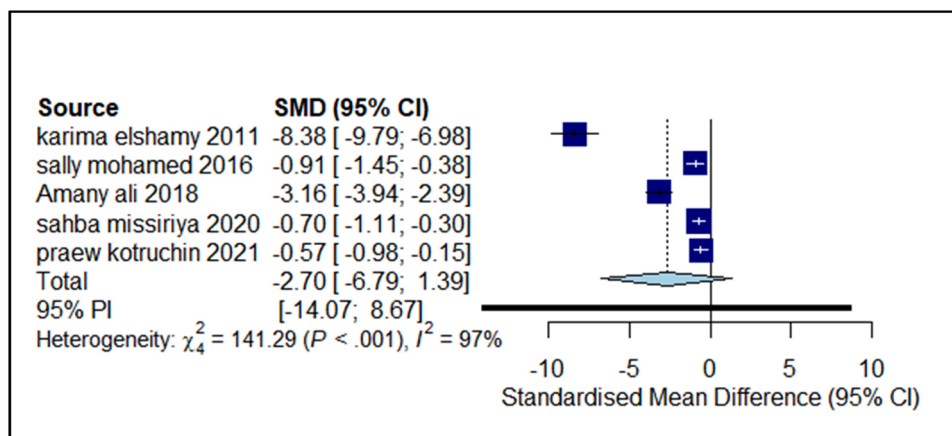
**Fig. 2.** Forest plot for DBP with reflexology.

articles published in languages other than English, and abstract and title screening. Five potential articles were retrieved after reading the full text carefully and included for meta-analysis.

### 3.2. Literature characteristics

All the included studies (Table 1) are done from 2011 to 2021. Three studies were randomized control trials [9–11] and rest of two studies were quasi-experimental studies [12,13]. Out of five studies, three studies were done in Egypt, and the rest of the two studies were in India

and Thailand. The age of the participants ranges from 30 to 80 years. All the studies included both genders. The minimum sample size was 30 whereas the maximum sample size was 50. All five studies included hypertensive patients with foot reflexology interventions. The maximum duration of intervention was 30 min and the minimum duration was 15 min. The frequency of the intervention ranges from 4 weeks to 3 months. All studies reported the duration except [11].



**Fig. 3.** Forest plot for SBP with reflexology.

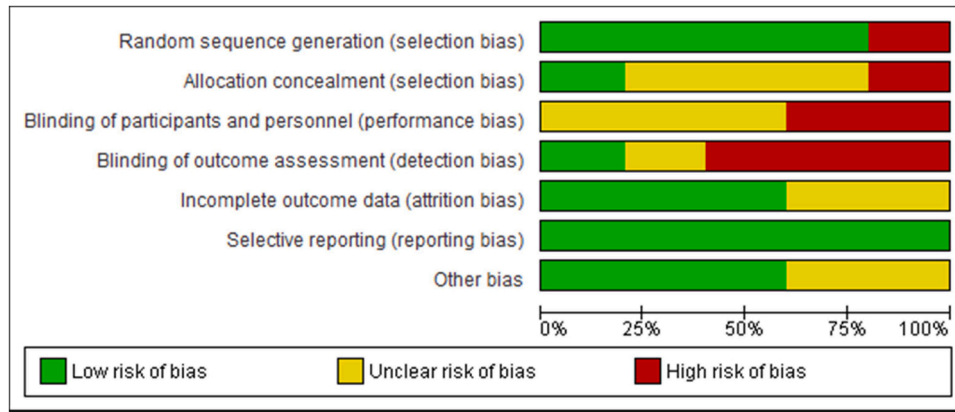


Fig. 4. Risk of bias graph.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
El-Abd 2018	+	?	?	+	?	+	+
Elshamy 2011	+	?	+	?	?	+	?
Kotruchin 2021	+	+	?	+	+	+	+
Missiriya 2019	+	?	?	+	+	+	+
Mohamed 2016	+	+	+	+	+	+	?

Fig. 5. Risk of bias summary.

### 3.4. Meta-analysis

Among the included studies, foot reflexology intervention showed a reduction in SBP (Fig. 2) (SMD:  $-2.70$  mmHg, 95 % of CI:  $-6.79, 1.39$ ) and DBP (Fig. 3) (SMD:  $-2.12$  mmHg, 95 % of CI:  $-5.95, 1.71$ ) without statistically significant. The random effect model was used due to high heterogeneity ( $I^2 = 97\%$ ,  $P < 0.001$ ) among the studies (Figs. 4 and 5).

## 4. Discussion

The most distinguishing feature of our meta-analysis is, it is the first-ever meta-analysis to show the effect of foot reflexology on reducing blood pressure in HTN patients. Foot reflexology, in combination with conventional management showed a statistically insignificant reduction in SBP of 2.70 mmHg and DBP of 2.12 mmHg. There is no previous meta-analysis available to compare our findings. Out of five studies, four studies, patient received foot reflexology along with their usual medication [9–12] and in another one study [13] there is no information about the medication. The maximum reduction in blood pressure [13] was 34.4 mmHg and the minimum reduction in blood pressure was 4.25 mmHg [11]. The procedure of foot reflexology was detailed only in two studies [11,12] rest of the three studies, there is no information regarding the procedure.

Foot reflexology involves the application of pressure on the specific region of the foot, the application of pressure is known to balance the flow of “Qi” in the body, In addition, foot reflexology can affect the target organ and also promotes healing responses [14]. The possible mechanism of reduction of blood pressure is through altering baroreceptor sensitivity by stimulating the nerve ending of the foot [15]. Stress and blood pressure are interdependent the relaxing effects of foot reflexology can reduce stress by regulating the autonomic nervous system, bringing about parasympathetic dominance, reduces sympathetic stimulation and discharge of catecholamine [16]. Limitations of the study were very small sample size, lack of detailed information about the duration and frequency of the intervention for the foot reflexology procedure among the included studies, and also heterogeneity among the age group of the participants.

## 5. Conclusion

The current meta-analysis did not find any adequate evidence to suggest foot reflexology as an effective intervention for patient with hypertension. So, future studies should address specific research question and claims on its beneficial effects for the blood pressure reduction for the patients with hypertension.

### 3.3. Assessment of risk of bias

The quality of included studies were assessed by using Cochrane risk of bias tool in various domains such as random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting and other bias (Figs. 4 & 5).

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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