Review Article

The effect of natural products use on blood pressure in Iran: Systematic review and meta-analysis

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Abstract

Context: Hypertension (HTN) is the leading risk factor for mortality worldwide. People tend to seek traditional therapies since chemical medicines have various side effects and high costs.

Aims: Therefore, the present study investigated the effect of natural products on blood pressure in Iran by meta-analysis.

Materials and Methods: In this meta-analysis, those initial studies were included that were randomized clinical trials with or without blinded and studies with quasi-experimental design. The national and international databases included Barekat Gostar, SID, Magiran, IranDoc, PubMed, Scopus, Web of Science, Cochrane, and Google Scholar by keywords: natural products, medicinal plants, herbal medicines, pharmaceutical plant, blood pressure, hypertension, Iran.

Statistical Analysis Used: The gathered data were analyzed in STATA ver. 14.

Results: In 76 studies with a sample size of 2886 subjects, 60 types of natural products were used to reduce blood pressure. The most to the least effective natural products for systolic blood pressure (SBP) were the mixture of garlic and lemon juice, barberry, sour tea, barberry juice, cumin powder, resveratrol, garlic, olive leaf, orange juice, artichoke, flaxseed, saffron, *Berberis vulgaris* + apple vinegar, and lemon, respectively. Considering the natural products reducing diastolic blood pressure (DBP), the most to the least effective natural products were the mixture of garlic and lemon juice, sour tea, olive leaf, saffron, and olive oil, respectively.

Conclusion: Based on the results, the mixture of garlic and lemon juice had the greatest effect on reducing both SBP and DBP levels. It was also found out that its effect was slightly greater in decreasing the SBP than the DBP.

Keywords: Blood pressure, Herbal medicine, Hypertension, Iran, Medicinal plants, Natural products, Plants, Medicinal

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INTRODUCTION

Chronic diseases affect the economic, social, and psychological status.[1] Hypertension (HTN) is the leading risk factor for mortality worldwide and one of the most important chronic and pervasive diseases in developed and developing countries.[2,3]

Hypertension affects the patients' sexual activity, professional performance, social roles, and many other aspects of their life, such as the ability to maintain family life and daily activities and changes his/her life undesirably.[4] Some risk factors including obesity, sedentary lifestyle, diet, alcohol consumption, family history, various psychological factors, emotional factors, and anger and hostility influence HTN.[5]

Throughout history, humans have used plants as food or medicine to treat or prevent diseases.[6]

The geographical location of the vast country of Iran, along with its special climatic and altitude conditions (from 26 m below sea level to about 5774 m at the top of the Damavand Mountain), provides a suitable environment for the growth of over 8000 various and unique plant species, probably including 2250 species of medicinal plants.[7] The reason for the widespread use of medicinal plants in traditional Iranian medicine can be attributed to the people's high tendency toward natural, harmless affordable remedies, which are also culturally compatible. Due to the prevalence of cardiovascular diseases, especially high blood pressure, the possible efficiency of these drugs in the treatment of such diseases can prevent their progression and fatal complications.[8] Therefore, this study aimed to investigate the effect of natural products on reducing blood pressure levels in Iran. This study was for the first time conducted with a systematic review and meta-analysis design to compare the results of previous studies and present new findings. The diversity of natural products and the multiplicity of meta-analysis studies conducted to investigate the effect of different natural products on decreasing blood pressure levels are indicative of the very high importance of this issue. These reasons justify the choice of this title for the current meta-analysis.

MATERIALS AND METHODS

Study protocol

The present study is a systematic review and meta-analysis examining the effect of natural products on blood pressure in Iran. The protocol of this study was registered on PROSPERO site (Code: CRD42021231837, dated February 18, 2021).

Study population

The statistical population of this review consisted of individuals who used natural products to decrease their blood pressure level. It should be noted that no criteria were applied in the sample selection process and they were entered into the study regardless of their age, gender, and ethnicity and the type of used natural products.

Study implications

Primary outcome

The main outcome of this study was systolic and diastolic blood pressure (SBP and DBP).

Secondary outcome

The secondary outcomes include lipid and glucose profiles.

Inclusion and exclusion criteria

PICO components

Patient population: All people who used different natural products to reduce blood pressure levels. Intervention: Different forms and types of natural products. Comparison: A group that did not take a natural product or took a placebo. Outcomes: SBP and DBP.

Inclusion criteria to initial studies

In this systematic review, those initial studies were included that were randomized clinical trials (RCTs) with or without blinded and studies with quasi-experimental design. The intervention group was the consumers of natural products (i.e., plant leaves, plant oil, fruit, fruit juice, and plant various forms, including tablets and extracts of natural products). On the other hand, the comparison group consisted of those receiving no intervention or placebo. Eligible trials should have at least an assessment of a SBP or DBP outcome.

Exclusion criteria

The following studies were excluded from the study: case report studies, studies assessed low quality based on the clinical trial quality assessment checklist provided by Cochrane organization, and studies performed out of Iran, as well as studies lacking the required information report, studies expressing the effect of natural products on blood pressure qualitatively, studies examining the effects of both natural products and a chemical medicine simultaneously, and studies not being available in full text.

Search strategy

In this systematic review, the Persian and international databases of PubMed, Scopus, Web of Science, Cochrane, SID, Magiran, and Barekat Gostar and the Google Scholar search engine were searched without time and language restrictions. Moreover, the articles published in languages

other than Persian and English were fully translated to extract their information. The articles up to May 16, 2020, were included, and the search process was performed using the following keywords: "Natural products," "Medicinal plants," "Herbal medicines," "Pharmaceutical Plant," "Iran," "blood pressure," and "Hypertension" using their Persian equivalents mapped in the MeSH. In addition, their combinations were also searched in English language databases using the AND and OR operators. The dissertations and research reports, as well as the articles of research conferences or seminars available in the IranDoc information system, were searched to accomplish searching from unofficial sources.

Furthermore, to find protocols for recorded trials that may not have reached the stage of publishing the findings, searching was performed in the clinicaltrial.gov (Clinical Trial Registration System), ISRCTN system (Clinical Trial Registration System owned by BioMed Central), and the WHO Clinical Trial Registration System. How to search for resources is shown in the PRISMA chart [Figure 1].

Qualitative evaluation of studies

After identifying the initial studies, two authors evaluated all the initial studies independently using the quality evaluation checklist provided by the Cochrane organization.

This checklist consists of seven different items, each of which evaluating one of the dimensions or types of important biases in clinical trials.

In addition, each item in this checklist is judged by three options of bias, namely high risk, low risk, and unclear.[9] Initially, two evaluators assessed the bias risk in all studies and subsequently evaluated the disagreements of the options in each study and united those disagreements into one option with mutual agreement.

Extracting data

To minimize bias in reports and errors in data collection, two researchers extracted data from studies independently. These researchers entered the extracted data into a checklist consisting of researcher's name, study publication year, study title, sample size, mean and standard deviation of SBP and DBP levels before and after the intervention, and amount and duration of natural products usage. Another researcher examined the extracted data to resolve any discrepancies. In case that in one of the initial articles or studies, the required data were not reported, an e-mail was sent to the corresponding author inquiring him/her to send them. If the e-mail was not responded to, it was resent up to 3 times in separate periods (at least once every 5 days).

Statistical analysis

Due to the quantitative nature of the initial outcome, the effect size of the intervention was calculated. Therefore, it was possible to calculate the intragroup mean difference index in the intervention group (i.e., mean difference between SBP and DBP levels before and after the intervention). In this respect, the standardized mean difference index closer to 0 indicated a weaker relationship, while indexes near to 1 or higher suggested a stronger relationship.

The investigated studies were combined according to the sample size, mean, and standard deviation. To evaluate the heterogeneity of the studies, Cochran's Q test and I^2 index were used. Considering that the fixed-effects and the random-effects models are used for low and high heterogeneity, respectively, in the present study, the random-effects model was used (I^2 for SBP = 87.2%, I^2 for DBP = 89.1%). The data were analyzed in STATA software (version 14), and $P < 0.05$ was considered significant.

RESULTS

Literature research

In the early stages, 580 articles were found from the above-mentioned databases, among which 295 overlapping (repetitive) studies were excluded by reviewing the study titles. The abstracts of the remaining 285 articles were reviewed, and out of this number, 145 articles were removed according to the exclusion criteria. Out of the remaining 140 articles, 64 articles were excluded due to their incomplete information or lack of full text. Finally, 76 articles reached the quality evaluation stage, all of which had good quality and entered the meta-analysis process [Figure 1].

Characteristics of studies included in systematic review

The information of the articles entered into the systematic review and meta-analysis stage is presented in Table 1. Although the search phase was conducted without time restrictions, the investigated studies were published within 2001–2020.

Primary outcomes

Based on the results, in 76 studies (sample size = 2886), 60 types of natural products were used to reduce blood pressure levels. In the analysis performed based on the type of natural product, 36 out of 60 natural products were removed from Table 2. The reason for these removals was that only one study had investigated each of these 36 natural products; therefore, it was impossible to provide a new result in these subgroups:

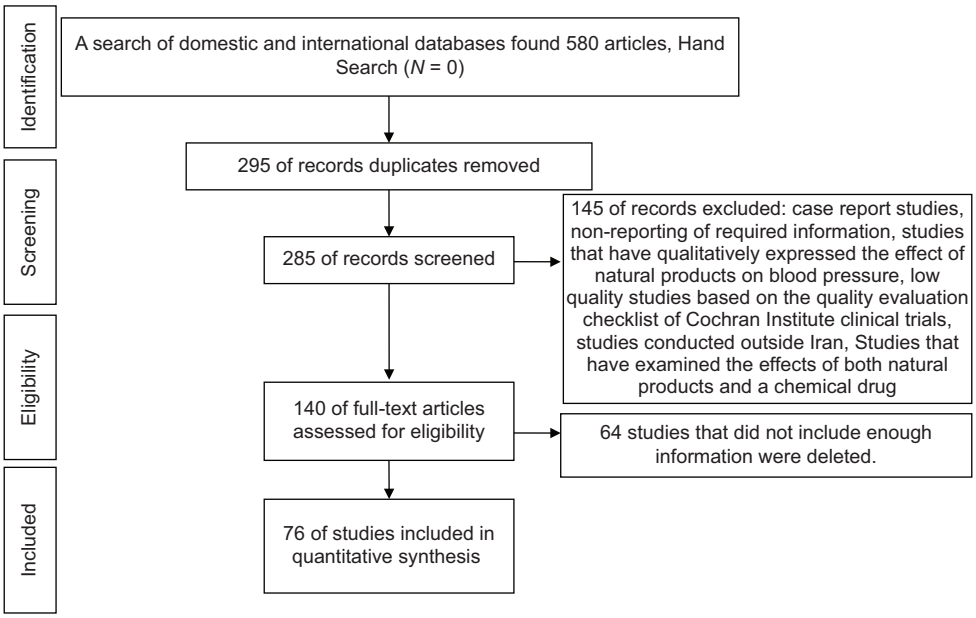

Figure 1: Flowchart of entering studies into the process of systematic review and meta-analysis

Salvia officinalis, flaxseed oil, berry, soy nut, rhubarb, pomegranate juice, cooked beet, raw beet juice, grape seed, curcumin, *Satureja hortensis* L., silymarin, olibanum, nettle, *Shirazi thyme,* walnut leaves, canola oil, *Onopordum acanthium,* damask rose, nano-curcumin, *Cynara scolymus,* walnut oil, almond oil, zucchini, almond, green tea, red grape, dill, tomato, *Nigella sativa* L. seeds oil, sumac, nettle leaf, berry leaf, onion, fenugreek seed.

In the SBP group, the most to the least effective natural products were found to be garlic + lemon juice, barberry, sour tea, barberry juice, cumin powder, resveratrol, garlic, olive leaf, orange juice, artichoke, flaxseed, saffron, *Berberis vulgaris* + apple vinegar, and lemon. Other natural products had no significant effect on SBP levels. In the DBP group, the most to the least influential natural products were garlic + lemon juice, sour tea, olive leaf, saffron, and olive oil. Other natural products showed no significant effect on DBP levels [Table 2].

Secondary outcomes

The information regarding the effect of using natural products on the subjects' levels of lipid profile is presented in Table 3. Accordingly, in the cholesterol group, only the use of cumin significantly reduced the level of cholesterol (−0.37 [CI 95%: −0.71, −0.04]), while the consumption of other natural products did not affect cholesterol levels significantly. It was also found that none of the natural products were significantly effective on triglycerides. In the case of low-density lipoprotein (LDL), the consumption of none of the natural products had a significant effect on its levels, except for resveratrol which could reduce the LDL level (−0.18 [CI 95%: −0.66, −0.29]). In the high-density lipoprotein (HDL) group, except for blackberry, which increased the HDL level of individuals (0.60 [CI 95%: 0.27, 0.93]), other natural products did not have a significant effect on HDL levels [Table 3].

In the analysis performed on the fast blood sugar (FBS) of the subjects, it was revealed that the effect of garlic (−0.39 [CI 95%: −0.79, 0.01]), lemon balm (−0.08 [CI 95%: −0.49, 0.32]), resveratrol (−0.62) (CI 95%: −1.00, −0.24), among which only resveratrol consumption had a significant effect on reducing FBS levels. It is noteworthy that due to the different types of natural products used in 76 studies, the researchers could not analyze the subgroups based on the age group, dosage of natural products, and duration of natural products consumption, as well as the frequency of using natural products.

DISCUSSION

In 76 studies (n = 2886), 60 types of natural products were used to reduce blood pressure. The most effective product in decreasing both SBP and DBP levels was the mixture of garlic and lemon juice. Accordingly, the mixture of garlic and lemon juice reduced SBP and DBP levels by −2.59 and −2.48, respectively. This result indicated that this mixture could lower SBP levels slightly more than DBP levels. Moreover, it was observed that although lemon juice and garlic have been used individually for the treatment of high blood pressure, neither of them was as effective as the mixture of garlic and lemon juice. On the other hand, the least effective products in reducing SBP and DBP levels belonged to lemon and olive oil, respectively. Regarding

Table 1: Characteristics of studies that examined the effect of natural products on blood pressure levels and met the requirements for entering the meta-analysis

Name of author	Type of study	Sample size	Mean age	Name of natural products	Scientific name
Khatami Saravi *et al*., 2020, Sari[14]	Clinical trial	9	61.89	Garlic	*A. sativum*
Parham *et al*., 2020, Qom[15]	Double-blind RCT	38	56.51	Nettle leaf, berry leaf, onion and garlic, fenugreek seed, walnut leaf, cinnamon bark	
Aryaeian *et al*., 2020, Tehran[16]	Double-blind RCT and placebo-controlled	31	48.61	Barberry	*Berberis*
Rafie *et al*., 2020, Ahvaz[17]	RCT	23	50.04	*Ginger*	*Z. officinale*
Rambod *et al*., 2020, Shiraz[18]	Double-blind RCT	49	61.2	Lemon	*C. limon*
Amini *et al*., 2020, Tehran[19]	Double-blind RCT and placebo-controlled	35	28.07	*S. officinalis*	
Morshedzadeh *et al*., 2020, Tehran[20]	Open-labeled RCT	25	32.2	Flaxseed Oil	
Ahmadzadeh *et al*., 2019, Saghez[21]	RCT	10	39.1	Cumin powder	*C. cyminum*
Kianbakht and Hashem-Dabaghian, 2019, Tehran[22]	Double-blind RCT and placebo-controlled	50	57	Berry	
Sedaghat *et al*., 2019, Ahvaz[23]	RCT	34	49.9	Soy nut	
Rezaei *et al*., 2019, Shiraz[24]	RCT	32	46.3	Olive oil	*O. europaea* (olive) fruit oil
Rezaei *et al*., 2019, Shiraz[24]	RCT	34	40.8	Sunflower oil	*H. annuus*
Tahmasebi *et al*., 2019, Ahvaz[25]	RCT	40	54.05	B. vulgaris root	*E. barberry*
Shojaei-Shad *et al*., 2019, Zabol[26]	Experimental study	40	50.22	Rhubarb	*R. rhabarbarum*
Ebrahimi *et al*., 2019, Tehran[27]	Double-blind RCT	40	55.2	Saffron	*C. sativus*
Ardalani *et al*., 2019, Hamedan[28]	Double-blind RCT and placebo-controlled	20	58.33	*C. scolymus*	*C. cardunculus var. scolymus*
Nayebi *et al*., 2019, Azerbayejan[29]	Double-blind RCT and placebo-controlled	16	54.9	Lemon balm	*M. officinalis*
Morshedzadeh *et al*., 2019 Tehran[20]	Open-labeled RCT	25	29.92	Flaxseed	
Jalalyazdi *et al*., 2019, Mashhad[30]	Randomized controlled clinical trial	23	49.87	Sour tea	*H. sabdariffa*
Jazayeri-Tehrani *et al*., SAR 2019, Tehran[31]	Double-blind RCT Placebo-Controlled	42	41.8	Nano-curcumin	-
Mohamadinasab *et al*., 2019, Kerman[32]	Clinical trial	31	56.77	Damask rose	*Rosa × damascena*
Yaghoobzadeh *et al*., 2019, Qazvin[33]	Double-blind RCT placebo-controlled	30	52.9	Olive leaf	*O. europaea*
Lazavi *et al*., 2018, Tehran[34]	RCT	23	56.86	Barberry juice	*Berberis*
Asadi *et al*., 2018, Tehran[35]	Double-blind RCT	31	53.9	Lemon balm	*M. officinalis*
Ghods *et al*., 2018, Tehran[36]	Pilot study	18	50.94	*O. acanthium*	*O. acanthium*
Shishehbor *et al*., 2018, Ahvaz[37]	Double-blind RCT	18	44.6	*Cinnamon*	*C. verum*
Atefi *et al et al*., 2018, Shiraz[38]	Randomized controlled trial	26	59	Olive oil	*O. europaea* L.
Atefi *et al*., 2018, Shiraz[38]	Randomized controlled trial	26	58	Canola oil	*B. napus*
Atefi *et al*., 2018, Shiraz[38]	Randomized controlled trial	25	57	Sunflower oil	*H. annuus*
Rashidi *et al*., 2018, Ahvaz[39]	Double-blind RCT and placebo-controlled	42	30-65	*B. vulgaris* Root	*E. barberry*
Mansouri *et al*., 2018, Zabol[40]	Clinical trial	25	53.8	Cumin powder	*C. cyminum*
Mansouri *et al*., 2018, Zabol[40]	Clinical trial	25	52.8	Garlic	*A. sativum*
Rabiei Kh *et al*., 2018, Sari[41]	Double-blind RCT and placebo-controlled	20	50.5	Walnut Leaves	*J. regia*
Zamani *et al*., 2018, Shiraz[42]	Double-blind RCT, placebo-controlled	45	36.8	Shirazi thyme	*Z. multiflora* Boiss
Zareei *et al*., 2017, Kerman[43]	Semi-experimental	14	20.7	Saffron	*C. sativus*
Javid *et al*., 2017, Tabriz[44]	Double-blind RCT	35	58.8	Lemon balm	*M. officinalis*
Fatemeh *et al*., 2017, Tehran[45]	RCT	40	48.3	Cardamom	*E. cardamomum*
Khalili *et al*., 2017, Karaj[46]	Double-blind RCT and placebo-controlled	30	55.14	Silymarin, Olibanum, Nettle	
Nikaein *et al*., 2017, Shiraz[47]	Double-blind RCT	24	52.1	*S. hortensis* L.	*S. hortensis* L.
Panahi *et al*., 2017, Tehran[48]	Randomized controlled trial	44	44.98	Curcumin	*C. cyminum*
Aslani *et al*., 2016, Isfahan[49]	RCT	27	45.3	Garlic	*A. sativum*
Aslani *et al*., 2016, Isfahan[49]	RCT	30	41.8	Lemon juice	*C. limon*
Aslani *et al*., 2016, Isfahan[49]	RCT	27	43.9	Mix garlic and lemon juice	
Azimi *et al*. 2016, Isfahan[50]	Randomized controlled clinical trial	39	55.21	Ginger	*Z. officinale*
Azimi *et al*., 2016, Isfahan[50]	Randomized controlled clinical trial	42	51.59	Cardamom	*E. cardamomum*

Contd...

Table 1: Contd...

Name of author	Type of study	Sample size	Mean age	Name of natural products	Scientific name
Azimi *et al*., 2016, Isfahan[50]	Randomized controlled clinical trial	42	57.02	Saffron	*C. sativus*
Azimi *et al*., 2016, Isfahan[50]	Randomized controlled clinical trial	40	54.15	Cinnamon	*C. verum*
Lazavi *et al*., 2016, Babol[51]	RCT	21	57	Barberry Juice	*Berberis*
Mohammadipour and Cheraghipour, 2016, Khorramabad[52]	Double-blind RCT	46	45.08	Grape seed	
Mahdavi-Roshan *et al*., 2016, Tehran[53]	Placebo-controlled RCT	27	56.8	Garlic	*A. sativum*
Hashemipour *et al*., 2016, Isfahan[54]	Triple-masked randomized controlled trial	35	13.7	Lemon	*C. limon*
Javidi *et al*., 2016, Shiraz[55]	Randomized controlled clinical trial	30	52.93	Flaxseed	-
Javidi *et al*., 2016, Shiraz[55]	Randomized controlled clinical trial	33	52.15	Flaxseed	-
Asgary *et al*., 2016, Isfahan[56]	Randomized cross-over pilot study	12	55.25	Raw Beet Juice	B. vulgaris subsp. vulgaris Conditiva Group
Asgary *et al*., 2016, Isfahan[56]	Randomized cross-over pilot study	12	53.33	Cooked Beet	*B. vulgaris subsp. vulgaris Conditiva* Group
Rangboo *et al*., 2016, Qazvin[57]	Double-blind RCT	30	47.27	Artichoke	*C. cardunculus var. scolymus*
Asgari *et al*., 2015, Isfahan[58]	Clinical trial	11	58.9	Pomegranate Juice	*P. granatum*
Faghihzadeh *et al*., 2015, Isfahan[59]	Placebo-controlled double-blind parallel RCT	25	44.4	Resveratrol	
Aghababaee *et al*., 2015, Qazvin[60]	RCT	36	45.08	Blackberry	*Rubus*
Soleimani *et al*., 2015, Kashan[61]	Cross-over clinical trial	20	53.3	Sour tea	*H. sabdariffa*
Talebi Pour *et al*., 2015, Zanjan[62]	Clinical trial	30	35	C. vulgaris	*C. vulgaris*
Talebi Pour *et al*., 2015, Zanjan[62]	Clinical trial	30	38	Artichoke	*C. cardunculus var. scolymus*
Aslani *et al*., 2014, Isfahan[63]	Clinical trial	27	30-65	Garlic	*A. sativum*
Aslani *et al*., 2014, Isfahan[63]	Clinical trial	30	30-65	Lemon Juice	*C. limon*
Aslani *et al*., 2014, Isfahan[63]	Clinical trial	25	30-65	Mix garlic and lemon juice	
Abazarfard *et al*., 2014, Shiraz[64]	Randomized controlled clinical trial	50	42.36	Almond	*P. dulcis*
Bayat *et al*., 2014, Isfahan[65]	Placebo-controlled parallel clinical trial	20	51.8	Zucchini	*C. pepo*
Kazemipoor *et al*., 2014, Yazd[66]	Triple- blind and placebo-controlled RCT	35	20-55	Cumin	*C. cyminum*
Afshani *et al*., 2014 Isfahan[67]	Cross-over clinical trial	22	35.91	Orange juice	*Citrus X sinensis*
Keshtkar Aghababaee *et al*., 2013, Qazvin[68]	Clinical trial	36	45.08	Blackberry	*Rubus*
Movahed *et al*., 2013, Bushehr[69]	Placebo-controlled double-blind parallel RCT	33	52.45	Resveratrol	
Kaseb *et al*., 2013, Yazd[70]	Cross-over clinical trial	21	52.59	Olive Oil	*O. europaea*
Kaseb *et al*., 2013, Yazd[70]	Cross-over clinical trial	19	52.59	Almond Oil	*P. dulcis*
Kaseb *et al*., 2013, Yazd[70]	Cross-over clinical trial	8	52.59	Walnut Oil	*Juglans*
Fallah Huseini *et al*., 2013, Tehran[71]	Double-blind and placebo-controlled RCT	35	47.3	*N. Sativa* L. seeds oil	*N. Sativa L*. seeds oil
Ardalani *et al*., 2013, Tehran[72]	Double-blind and placebo-controlled RCT	39	59.76	Sumac	
Kazemipoor *et al*., 2013, Yazd[73]	Triple- blind and placebo-controlled RCT	35	37.23	Cumin	*C. cyminum*
Mozaffari-Khosravi *et al*., 2013, Yazd[74]	RCT	46	52.2	Sour tea	*H. sabdariffa*
Mozaffari-Khosravi *et al*., 2013, Yazd[74]	RCT	48	53.3	Green Tea	*C. sinensis*
Asgary and Keshvari, 2013, Isfahan[75]	Single-blind randomized cross-over study	11	35.91	Orange Juice	*Citrus X sinensis*
Bahreynian *et al*., 2012, Isfahan[76]	Clinical Trial	20	22.5	Red grape	Red Grape
Kianoush *et al*., 2012, Mashhad[77]	Double-blind RCT	59	59	Garlic	*A. sativum*
Mansouri *et al*., 2012, Tehran[78]	Double-blind RCT	12	38.2	Dill	*A. graveolens*
Panahi *et al*., 2012, Tehran[79]	RCT	33	51	*C. vulagaris*	*C. vulgaris*
Tarighat Esfanjani *et al*., 2011, Tabriz[80]	RCT	25	53.9	Nettle	*U. dioica*
Shidfar *et al*., 2011, Tehran[81]	Quasi-experimental study	32	52.7	Tomato	*S. lycopersicum*
Farhadi and Shahghasemi, 2010, Shirvan[82]	Experimental study	20		Barberry	*B. vulgaris*
Golzarand *et al*., 2009, Tabriz[83]	Clinical trial	19	59.1	*B. vulgaris* + Apple vineger	
Golzarand *et al*., 2009, Tabriz[83]	Clinical trial	19	54.6	Apple vinegar	Apple vinegar

Contd...

Table 1: Contd...

Name of author	Type of study	Sample size	Mean age	Name of natural products	Scientific name
Afkhami Ardakani *et al*., 2008, Yazd[84]	Clinical trial	40	30-65	Garlic	*A. sativum*
Golzarand *et al*., 2008, Tabriz[85]	Clinical trial	19	59.1	*B. vulgaris* + Apple vinegar	
Golzarand *et al*., 2008, Tabriz[85]	Clinical trial	19	54.6	Apple vinegar	Apple vinegar
Golzarand *et al*., 2008, Tabriz[85]	Clinical trial	19	59.1	*B. vulgaris* + Apple vinegar	
Golzarand *et al*., 2008, Tabriz[85]	Clinical trial	19	54.6	Apple vinegar	Apple vinegar
Saberi *et al*., 2008, Tehran[86]	Controlled clinical trial	32	55.25	Olive leaf	*O. europaea*
Parastouei *et al*., 2005, Shiraz[87]	Clinical trial	50	55	Garlic	*A. sativum*
Ziaei *et al*., 2001, Tehran[88]	Single blind and placebo-controlled RCT	50	24.56	Garlic	*A. sativum*

Name of author	Duration (day)/daily consumption (dose)	SBP, mean±SD		*P*	DBP, mean±SD		*P*
		Before intervention	After intervention		Before intervention	After intervention	
Khatami Saravi *et al*., 2020, Sari[14]	56/1000 mg	147.11±8.55	135.78±8.84	0.002	83.22±7.29	82.67±5.14	0.714
Parham *et al*., 2020, Qom[15]	56/2250 mg	127.9±2.67	124.06±2.77	0.68	82.41±1.08	77.58±1.17	0.89
Aryaeian *et al*., 2020, Tehran[16]	90/1500 mg	125.6±1.29	120.5±4.8	0.02	77.7±10.8	79.4±4.4	0.33
Rafie *et al*., 2020, Ahvaz[17]	84/1500 mg	128.21±8.79	125.21±11.72	0.204	79.17±8.4	76.65±9.83	0.063
Rambod *et al*., 2020, Shiraz[18]	4	103.37±9.55	99.53±8.12	-	65.67±7.78	63.97±7.9	-
Amini *et al*., 2020, Tehran[19]	56/330 mg	111.33±6.81	109.5±7.91	0.283	73.66±6.28	70±6.82	0.025
Morshedzadeh *et al* ehran[20]	84/10 g	132.8±11.3	121±9.85	<0.001	85.2±5.5	79.6±4.6	<0.001
Ahmadzadeh *et al*., 2019, Saghez[21]	56/3.5 g	117±8	114±7		72±4	73±4	
Kianbakht and Hashem-Dabaghian, 2019, Tehran[22]	84/1200 mg	152.1±7.7	140.5±10.7	<0.001	90.3±8	82.1±8.8	<0.001
Sedaghat *et al*., 2019, Ahvaz[23]	56/60 g	132.3±16.2	125.5±14.2	0.01	86±7.7	79±14.1	0.01
Rezaei *et al*., 2019, Shiraz[24]	84/20 g	129.9±11.3	120.7±8	<0.001	88.9±8.5	83.7±9	<0.001
Rezaei *et al*., 2019, Shiraz[24]	84/20 g	129.9±13.6	120.4±8.9	< 0.001	88.8±10.5	82.4±6.5	< 0.001
Tahmasebi *et al*., 2019, Ahvaz[25]	42/1000 mg	121.3±10.6	119.5±12.4	0.37	76.8±7.6	75.5±9.9	0.30
Shojaei-Shad *et al*., 2019, Zabol[26]	30/1200 mg	144.78±8.73	133.5±10.98	<0.05	95.75±7.72	85.25±8.83	<0.05
Ebrahimi *et al*., 2019, Tehran[27]	12/100 mg	132.7±21.3	124.5±13.2	0.004	79.5±108	76.7±9.9	0.104
Ardalani *et al*., 2019, Hamedan[28]	56/500 mg	141.25±12.34	137.5±11.41	0.12	90±8.43	88.5±7.27	0.05
Nayebi *et al*., 2019, Azerbayejan[29]	90/700 mg	137.2±18.6	130±14.2	0.64	86.2±12	81.3±8.2	0.63
Morshedzadeh *et al*., 2019 Tehran[20]	84/3 g	131.4±11.3	121.9±7.76	<0.001	85.9±4.7	79.3±3.1	<0.001
Jalalyazdi *et al*., 2019, Mashhad[30]	30/480 ml	134.61±2.67	127.17±1.37	<0.001	84.87±1.87	78.17±2.01	<0.001
Jazayeri-Tehrani *et al*., SAR 2019, Tehran[31]	90/80 mg	120.3±4.7	118.2±4.4	0.008	78.8±4.5	77.9±2.9	0.102
Mohamadinasab *et al*., 2019, Kerman[32]	16/0.3 ml	145.03±14.08	136.58±12.49	0.0001	83.32±74.82	76.41±8.23	0.001
Yaghoobzadeh *et al*., 2019, Qazvin[33]	84/500 mg	143.1±8.5	135.6±7.4	0.001	90.3±8.3	86.6±8.5	0.093
Lazavi *et al*., 2018, Tehran[34]	56/200 ml	136.9±21.7	119.52±17.16	-	85.47±13.95	79.52±14.3	-
Asadi *et al*., 2018, Tehran[35]	84/700 mg	135.85±20	135.1±17.6	0.14	84.5±11.9	83.8±11.5	0.98
Ghods *et al*., 2018, Tehran[36]	56/2 g	151.9±13.74	134.6±18.25	0.003	97.41±10.36	85.71±7.48	0.0006
Shishehbor *et al*., 2018, Ahvaz[37]	56/2 g	123.8±13.7	112.7±8.9	-	80.8±7.1	71.6±3.8	-
Atefi *et al et al*., 2018, Shiraz[38]	56/30 g	133.5±19.7	127.8±19.6	0.02	80.5±12.3	79.4±9.9	0.55
Atefi *et al*., 2018, Shiraz[38]	56/30 g	128.5±18.05	127.15±12.74	0.61	79.54±7.77	78.62±6.92	0.49
Atefi *et al*., 2018, Shiraz[38]	56/30 g	125.28±14.52	124.32±14.24	0.70	79±7.91	79.92±7.85	0.54
Rashidi *et al*., 2018, Ahvaz[39]	28/1000 mg	136.5±21.7	133.7±18.9	0.23	81.1±10.6	78±12.4	0.16
Mansouri *et al*., 2018, Zabol[40]	60/200 mg	144.11±12.14	130.17±11.81	<0.0001	95.61±9.14	82.13±8.84	<0.0001
Mansouri *et al*., 2018, Zabol[40]	60/900 mg	147.14±14.78	132.36±14.14	<0.0001	96.83±11.33	79.67±10.11	<0.0001
Rabiei Kh *et al*., 2018, Sari[41]	84/200 mg	126.1±9.5	121.8±8.8	0.005	79.2±6.7	77.4±4.8	0.185
Zamani *et al*., 2018, Shiraz[42]	84/700 mg	116.9±13.60	113.46±12.55	0.002	78.9±9.2	76.57±8.43	0.009
Zareei *et al*., 2017, Kerman[43]	7/300 mg	110.33±7.1	104.66±6.5	0.002	66.93±4.93	62.53±6.32	0.018
Javid *et al*., 2017, Tabriz[44]	12/3 g	123.42±5.91	119.41±4.54	<0.001	81±3.59	77.57±5.86	0.001

Contd...

Table 1: Contd...

Name of author	Duration (day)/daily consumption (dose)	SBP, mean±SD		*P*	DBP, mean±SD		*P*
		Before intervention	After intervention		Before intervention	After intervention	
Fatemeh *et al*., 2017, Tehran[45]	60/3 g	115.5±12.9	115.7±13.08	0.7	77.5±5.8	77.1±5.1	0.4
Khalili *et al*., 2017, Karaj[46]	90/600 mg	133.45±15.76	129.65±12.02	-	79.83±9.77	76.86±6.47	-
Nikaein *et al*., 2017, Shiraz[47]	70/450 mg	129.7±15.5	129.7±15.5	-	83.1±11.3	75.3±9.5	-
Panahi *et al*., 2017, Tehran[48]	56/1000 mg	120±9.4	113±3.5	-	78.2±6.2	77.5±0.3	-
Aslani *et al*., 2016, Isfahan[49]	56/20 g	128±12	95±11	<0.001	81±12	63±8	<0.001
Aslani *et al*., 2016, Isfahan[49]	56/15 ml	122±21	121±13	0.21	80±11	80±2	0.60
Aslani *et al*., 2016, Isfahan[49]	56/20 g Garlic + 15 ml Lemon Juice	134±21	97±11	<0.001	86±21	62±11	<0.001
Azimi *et al*. 2016, Isfahan[50]	56/3 g	143.06±0.2	142.07±0.2	0.02	97.06±0.1	97.09±0.1	0.39
Azimi *et al*., 2016, Isfahan[50]	56/3 g	143.8±0.2	143.6±0.2	0.80	95.2±0.1	95.5±0.1	0.66
Azimi *et al*., 2016, Isfahan[50]	56/1 g	139.08±0.2	139±0.1	0.36	94.06±0.1	94.02±0.1	0.60
Azimi *et al*., 2016, Isfahan[50]	56/3 g	131.4±0.2	133±0.2	0.11	86.2±0.1	86.6±0.1	0.70
Lazavi *et al*., 2016, Babol[51]	28/200 ml	137±22	120±17	<0.0001	85±14	80±14	<0.003
Mohammadipour and Cheraghipour, 2016, Khorramabad[52]	42/200 mg	126±11.06	124.23±9.85	-	82.13±4.74	81.71±6.54	-
Mahdavi-Roshan *et al*., 2016, Tehran[53]	90/800 mg	120±3	121±1.5	-	74.7±2.2	78.8±1.1	-
Hashemipour *et al*., 2016, Isfahan[54]	28	103.37±9.55	99.53±8.12	0.001	65.67±8.78	63.97±7.9	0.053
Javidi *et al*., 2016, Shiraz[55]	84/20 g	122.9±15.93	120.3±18.34	-	72.4±10.7	73.4±12.9	-
Javidi *et al*., 2016, Shiraz[55]	84/40 g	127.79±18.38	115.55±26.8	-	77.76±15.76	73.61±15.25	-
Asgary *et al*., 2016, Isfahan[56]	14/250 ml	133.96±9.44	127.29±8.47	-	82.71±7.22	78.12±4.85	-
Asgary *et al*., 2016, Isfahan[56]	14/250 mg	134.58±11.03	129.17±10.59	-	83.33±7.47	79.79±6.67	-
Rangboo *et al*., 2016, Qazvin[57]	60/2700 mg	132.7±13.55	126.57±8.54	0.004	80±9.21	79.03±6.89	0.044
Asgari *et al*., 2015, Isfahan[58]	14/150 ml	130.91±13	124.55±15.72	0.002	80±8.94	76.36±6.74	0.038
Faghihzadeh *et al*., 2015, Isfahan[59]	84/500 mg	118.96±13.83	104.75±12.37	0.29	79.67±8.39	72.83±9.93	0.69
Aghababaee *et al*., 2015, Qazvin[60]	56/300 ml	121.8±9.64	119.03±6.74	0.005	80.55±5.31	79.72±1.66	0.31
Soleimani *et al*., 2015, Kashan[61]	84/500 mg	153±5.5	139±14.8	0.004	94.85±4.4	89.02±5.2	0.007
Talebi Pour *et al*., 2015, Zanjan[62]	56/900 mg	125±15	118±12	-	80±9	74.00±8	-
Talebi Pour *et al*., 2015, Zanjan[62]	56/900 mg	125±10	120±8	-	82±9	77.00±7	-
Aslani *et al*., 2014, Isfahan[63]	56/20 g	121.8±11.44	108.5±9.48	<0.001	81.11±11.8	70.7±8.73	<0.001
Aslani *et al*., 2014, Isfahan[63]	56/15 ml	119±9.6	121.1±9.25	0.21	80±7.42	79.33±6.68	0.60
Aslani *et al*., 2014, Isfahan[63]	56/20 g Garlic + 15 ml Lemon Juice	130.4±7.34	107.2±7.91	<0.001	87.6±5.22	65.2±7.14	<0.001
Abazarfard *et al*., 2014, Shiraz[64]	90/50 g	137.16±9.73	131.28±9.01	<0.001	84±3.9	76.5±10.71	<0.001
Bayat *et al*., 2014, Isfahan[65]	100 g	125±17.01	113.5±11.82	<0.001	86±9.94	77.5±7.16	<0.001
Kazemipoor *et al*., 2014, Yazd[66]	84/30 ml	112.74±10.4	113.39±11.21	-	75.48±7.89	75.9±6.8	-
Afshani *et al*., 2014 Isfahan[67]	28/500 ml	112.27±7.51	108.64±6.48	0.063	74.09±8.54	73.64±	0.813
Keshtkar Aghababaee *et al*., 2013, Qazvin[68]	56/300 g	121.81±9.64	119.03±6.74	0.005	80.55±5.31	79.72±1.66	0.31
Movahed *et al*., 2013, Bushehr[69]	45/1 g	129.03±14.91	121.45±10.26	< 0.0001	76.93±19.54	78.54±6.35	0.169
Kaseb *et al*., 2013, Yazd[70]	28/40 cc	126.6±15.59	125±12.45	-	81.43±11.08	78.57±7.92	-
Kaseb *et al*., 2013, Yazd[70]	28/40 cc	125.79±13.04	125.26±12.18	-	78.42±7.64	78.42±7.64	-
Kaseb *et al*., 2013, Yazd[70]	28/40 cc	122.5±12.81	122.5±12.81	-	78.75±3.53	77.5±7.07	-
Fallah Huseini *et al*., 2013, Tehran[71]	56/5 ml	129.7±11.9	119.1±7	0.000	77±8	67.4±4.4	0.000
Ardalani *et al*., 2013, Tehran[72]	56/1000 mg	145.34±2.08	115.21±2.89	0.03	90.951.97±	78.33±1.97	0.04
Kazemipoor *et al*., 2013, Yazd[73]	84/30 ml	112.74±10.21	113.39±11.21	-	75.48±7.89	75.9±6.8	-
Mozaffari-Khosravi *et al*., 2013, Yazd[74]	28/3 g	123.1±15.5	116.4±16.3	<0.001	79.4±11.1	74.5±9.3	<0.001
Mozaffari-Khosravi *et al*., 2013, Yazd[74]	28/3 g	119.4±15.1	114.8±15.9	<0.001	78.9±8.3	75.3±7.7	<0.001

Contd...

Table 1: Contd...

Name of author	Duration (day)/daily consumption (dose)	SBP, mean±SD		*P*	DBP, mean±SD		*P*
		Before intervention	After intervention		Before intervention	After intervention	
Asgary and Keshvari, 2013, Isfahan[75]	28/500 ml	110.91±7.01	106.36±6.74	-	72.73±4.67	70.98±7.01	-
Bahreynian *et al*., 2012, Isfahan[76]	28/500 g	104±10.71	101±9.81	-	71.25±8.09	67.25±8.02	-
Kianoush *et al*., 2012, Mashhad[77]	28/1200 mg	120.26±13.25	112.27±20.76	0.021	78.16±8.33	78.48±7.95	0.713
Mansouri *et al*., 2012, Tehran[78]	90/600 mg	121.6±17.7	116±18.9	0.5	81.3±10.3	77.8±11.7	0.2
Panahi *et al*., 2012, Tehran[79]	90/1200 mg	126.34±12.92	125.32±15.61	>0.05	80.77±5.77	82.36±6.27	>0.05
Tarighat Esfanjani *et al*., 2011, Tabriz[80]	28/100 mg/kg	110.6±10.03	100±6.1	-	70.9±10	70.8±10	-
Shidfar *et al*., 2011, Tehran[81]	84/200 g	137.8±7.9	130.1±6.6	0.0001	91±3.9	85.3±3.7	0.0001
Farhadi and Shahghasemi, 2010, Shirvan[82]	14/600 mg	169.05±5.6	145.8±7.5	<0.001	99.8±5.47	83.75±5.84	<0.001
Golzarand *et al*., 2009, Tabriz[83]	28/15 ml	158.91±22.8	145.11±17.17	-	91.28±13.83	86.11±11.46	-
Golzarand *et al*., 2009, Tabriz[83]	28/30 ml	149.39±22.56	141.36±20.17	-	88.74±17.04	86.72±15.06	-
Afkhami Ardakani *et al*., 2008, Yazd[84]	28/900 mg	129.7±20	119.2±16.5	0.001	79.5±7.5	76.3±7.4	0.001
Golzarand *et al*., 2008, Tabriz[85]	56/15 ml	158±22	150±18	-	91±13	90±13	-
Golzarand *et al*., 2008, Tabriz[85]	56/30 ml	149±22	144±20	-	88±17	87±14	-
Golzarand *et al*., 2008, Tabriz[85]	56/15 ml	158±22	150±18	-	91±13	90±13	-
Golzarand *et al*., 2008, Tabriz[85]	56/30 ml	149±22	144±20	-	88±17	87±14	-
Saberi *et al*., 2008, Tehran[86]	14/1000 mg	134.68±15.36	129.46±16.07	0.011	90.3±8.3	86.6±8.5	0.073
Parastouei *et al*., 2005, Shiraz[87]	42/900 mg	133.04±17.94	128.16±17.58	<0.03	85.06±11.35	83.32±9.01	0.29
Ziaei *et al*., 2001, Tehran[88]	224/800 mg	112.59±7.78	112.34±13.55	0.871	69.7±8.94	69.4±13.07	0.853

RCT: Randomized clinical trials, SD: Standard deviation, BP: Blood pressure, SBP: Systolic BP, DBP: Diastolic BP, *A. sativum: Allium sativum, Z. officinale: Zingiber officinale, C. limon: Citrus limon, C. cyminum: Cuminum cyminum, O. Europaea: Olea Europaea, H. annuus: Helianthus annuus, E. barberry: European barberry, R. rhabarbarum: Rheum rhabarbarum, C. sativus: Crocus sativus, C. cardunculus: Cynara cardunculus, M. officinalis: Melissa officinalis, H. sabdariffa: Hibiscus sabdariffa, S. lycopersicum: Solanum lycopersicum, B. vulgaris: Berberis vulgaris, C. vulgaris: Chlorella vulgaris, U. dioica: Urtica dioica, A. graveolens: Anethum graveolens, C. sinensis: Camellia sinensis, N. Sativa: Nigella Sativa, P. dulcis: Prunus dulcis, C. pepo: Cucurbita pepo, B.: Beta vulgaris, P. granatum: Punica granatum, C. verum: Cinnamomum verum, E. cardamomum: Elettaria cardamomum, S. hortensis: Satureja hortensis, C. scolymus: Cynara scolymus, Z. multiflora: Zataria multiflora, O. acanthium: Onopordum acanthium, B. napus: Brassica napus, J. regia: Juglans regia, S. officinalis: Salvia officinalis*

Table 2: The effect of natural products on blood pressure

Natural product	Number of study	SBP					DBP				
		SMD***	Low**	Up*	I^2 (%)	*P*	SMD	Low	Up	I^2 (%)	*P*
Orange juice	2[19,20]	−0.56	−1.06	−0.07	0	0.788	-	-	-	-	-
Mix garlic and lemon juice	2[83,84]	−2.59	−3.40	−1.78	57.2	0.126	−2.48	−4.59	−0.37	93.3	<0.0001
Sour tea	3[35-37]	−1.68	−3.27	−0.09	94.4	<0.0001	−1.66	−3.19	−0.13	94	<0.0001
Barberry	2[50,51]	−2.44	−4.44	−0.42	91.9	<0.0001	−1.29	−4.27	1.68	97.1	<0.0001
Cumin powder	2[33,56]	−0.85	−1.59	−0.12	49	0.162	−0.65	−2.36	1.06	90	0.002
Flaxseed	3[20,28,27]	−0.54	−0.99	−0.08	54.4	0.112	−0.59	−1.53	0.35	89	<0.0001
Olive leaf	2[30,31]	−0.63	−1.22	−0.03	62.9	0.101	−0.44	−0.80	−0.08	0	1.000
Lemon balm	3[25,26]	−0.41	−0.87	0.05	51.6	0.127	−0.40	−0.82	0	40.7	0.185
Barberry juice	2[22,23]	−0.88	−1.32	−0.44	0	0.958	−0.39	−0.81	0.32	0	0.882
Saffron	3[52-54]	−0.53	−0.82	−0.24	0	0.709	−0.39	−0.68	−0.11	0	0.535
Artichoke	2[70,75]	−0.55	−0.91	−0.18	0	0.977	−0.37	−0.86	0.12	45.5	0.176
Olive oil	3[46-48]	−0.46	−0.97	0.04	59.2	0.086	−0.34	−0.66	−0.03	0	0.414
Sunflower OIL	2[43,44]	−0.46	−1.2	0.29	75.1	0.045	−0.31	−1.15	0.51	80.2	0.025
Resveratrol	2[41,42]	−0.81	−1.29	−0.33	35.4	0.213	−0.30	−1.13	0.54	80	0.025
Garlic	9[62-67]	−0.76	−1.25	−0.27	0.88	<0.0001	−0.30	−0.91	0.30	92.3	<0.0001
Chlorella vulagaris	2[73,74]	−0.28	−0.72	0.15	34.3	0.212	−0.22	−1.16	0.73	85.9	0.008
Lemon	2[79,80]	−0.43	−0.74	−0.13	0	1.000	−0.21	−0.51	0.09	0	0.966
Blackberry	2[68,69]	−0.33	−0.66	0.00	0	0.997	−0.21	−0.54	0.12	0	1.000
Berberis vulgaris root	2[50,70]	−0.15	−0.45	0.16	0	0.953	−0.21	−0.51	0.98	0	0.698
Berberis vulgaris + apple vinegar	3[81-83]	−0.49	−0.86	−0.12	0	0.783	−0.19	−0.55	0.18	0	0.712
Apple vinegar	3[58-60]	−0.28	−0.65	0.09	0	0.943	−0.09	−0.45	0.28	0	0.988
Lemon juice	2[14,15]	0.08	−0.28	0.44	0	0.444	−0.04	−0.40	0.32	0	0.820
Ginger	2[33]	−2.61	−7.17	1.96	98.6	<0.0001	0.04	−0.51	0.60	57.8	0.124
Cumin	2[54,55]	0.06	−0.27	0.39	0	0.999	0.06	−0.27	0.39	0	1.000
Cinnamon	2[39,40]	3.5	−5.28	12.28	99.3	<0.0001	1.19	−4.31	6.70	99	<0.0001
Cardamom	2[87,88]	−0.49	−1.49	0.50	89.9	0.002	1.46	−1.56	4.47	98.4	<0.0001

*Up limit, **Low limit, ***Standardized mean difference. Low: Low limit, Up: Upper limit, BP: Blood pressure, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, SMD: Standardized mean difference

FBS, only resveratrol had a significant effect on reducing its levels.

In 2019, Najafpour Boushehri *et al.* performed a meta-analysis of seven RCTs (n = 362) to determine the effectiveness of sour tea on cardiovascular risk factors. According to the findings of the above study, the consumption of sour tea significantly reduced both SBP (−4.71 mmHg) and DBP (−4.08 mmHg) levels.[10] These results were consistent with those of our meta-analysis.

In a meta-analysis performed in 2019 on 6 clinical trials (n = 345), it was shown that ginger supplementation could reduce both SBP and DBP levels (MD: −6.36 mmHg and MD: −2.12 mmHg, respectively).[11] However, in the current meta-analysis, we concluded that ginger does not have a statistically significant effect on lowering SBP and DBP levels. The limited number of studies reviewed in the previous meta-analysis could be one of the reasons for the discrepancy between the results obtained in the previous meta-analysis and the current meta-analysis.

In the analysis conducted based on the individuals' lipid profile and the type of natural product used by them, among the natural products studied, only the use of cumin significantly reduced cholesterol levels (−0.37). Considering the triglycerides level, none of the natural products were significantly effective. However, the consumption of resveratrol (−0.18) could significantly reduce LDL levels. In the HDL group, natural products showed no significant effect on HDL levels, except for blackberry (0.60), which, contrary to our expectations, caused a significant increase in HDL levels.

In the meta-analyses conducted in 2018 on RCT studies, consumption of cumin reduced cholesterol levels in individuals, which is consistent with the results of our research.[12] It can be said that because cumin affects people's appetite, it increases their need to consume body fat and thus reduces their level of lipid profile.

In another meta-analysis study in 2018, which examined the effect of garlic consumption on lipid and glucose profiles, we found that garlic can reduce lipid profile as well as glucose parameters and be therapeutically effective in patients suffering from cardiovascular diseases and diabetes.[13]

In this study, a variety of natural products were studied each with different effects on blood pressure levels and lipid and glucose profiles. Moreover, a wide range of age groups and various doses and durations of natural

Table 3: The effect of natural products on lipid profiles

Natural product	Number of study	Cholesterol					Number of study	TG				
		SMD	Low	Up	I^2	*P*		SMD	Low	Up	I^2	*P*
Garlic	4	0.27	−0.77	1.31	94.5	<0.0001	4	0.81	−0.27	1.89	94.7	<0.0001
Olive oil	3	−0.22	−0.71	0.26	57.1	0.097	3	−0.22	−0.53	0.10	0	0.875
Sunflower Oil	2	−0.09	−0.45	0.27	0	0.795	2	−0.10	−0.46	0.26	0	0.981
Lemon balm	2	0.07	−0.33	0.47	0	0.894	2	−0.27	−0.68	0.13	0	0.937
Resveratrol	2	−0.15	−0.51	0.22	0	0.684	2	−0.30	−0.61	0.01	0	0.735
Blackberry	2	−0.04	−0.37	0.28	0	1.000	2	−0.06	−0.39	0.27	0	1.000
Cumin	2	−0.37	−0.71	−0.04	0	1.000	2	0.30	−0.04	0.63	0	1.000
Natural product	**Number of study**	**LDL**					**Number of study**	**HDL**				
		SMD	Low	Up	I^2	*P*		SMD	Low	Up	I^2	*P*
Garlic	4	0.09	−0.86	1.04	93.6	<0.0001	4	0.91	0	1.83	92.8	<0.0001
Olive oil	3	−0.15	−0.66	0.36	61.3	0.076	3	−0.05	−0.36	0.27	0	0.898
Sunflower oil	2	−0.02	−0.38	0.34	0	0.458	2	0.02	−0.34	0.39	0	0.993
Lemon balm	2	−0.01	−0.42	0.39	0	0.587	2	0.16	−0.30	0.62	20.1	0.263
Resveratrol	2	−0.18	−0.66	−0.29	55.9	0.103	2	−0.15	−0.95	0.65	84.3	0.002
Blackberry	2	−0.06	−0.39	0.27	0	1.000	2	0.60	0.27	0.93	0	1.000
Cumin	2	0.04	−0.26	0.40	0	1.000	2	0.08	−0.25	0.41	0	1.000

Low: Low limit, Up: Upper limit, I^2: *I* square, SMD: Standardized mean difference, TG: Triglyceride, HDL: High-density lipoprotein, LDL: Low-density lipoprotein

product consumption underwent investigation. Due to the very high diversity of natural products, we could not have an analysis based on the duration of consumption of natural products, dosage of natural products, and age group of people.

CONCLUSION

Based on the results, the most effective natural product in reducing DBP levels belonged to the mixture of garlic and lemon juice. On the other hand, lemon and olive oil had the least effect on reducing SBP and DBP levels, respectively. Researchers are recommended to conduct a meta-analysis study to examine the effect of the mixture of garlic and lemon juice on blood pressure levels globally.

Considering the results of this meta-analysis, it is recommended to perform further meta-analysis studies in the field of natural products, for which there are sufficient basic studies available. As a result, it would be possible to analyze the subgroups by such factors as age group, dosage, and duration of use, leading to the provision of a specific natural product for that type and gaining a broader view of the effects of that natural product. In addition, if the focus is shifted on a specific natural product, then the effect of that natural product will be studied on a global scale and there will not be any limitations regarding its geographical scope. Consequently, it would be feasible to compare the results of different studies carried out in various countries and continents since the quality of a particular natural product may vary in different regions.

Conflicts of interest

There are no conflicts of interest.

Authors' contributions

All authors contributed to the completion of this work. MF conceptualized the study, collected data, assessed documents, and wrote the first draft. MA oversaw the research project, contributed original data, and critically edited and reviewed the manuscript. AF second supervisor on the research project contributed to the study's design and analysis of data and the manuscript's critical editing and review. MM improved the research design, edited, and reviewed the manuscript. SSY assisted in document assessment, data extraction, editing, and manuscript review.

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