Review Article

The effects of purslane consumption on blood pressure in adults: A grading of recommendations, assessment, development, and evaluation-assessed systematic review and meta-analysis of randomized controlled trials

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Background: Results from different studies on the effects of purslane consumption on blood pressure (BP) are still debated. To fill this knowledge gap, we investigated the overall effects of purslane consumption on systolic BP (SBP) and diastolic BP (DBP). **Materials and Methods:** A comprehensive literature search was conducted on Scopus, Web of Science, PubMed, Google Scholar, and Cochrane databases. A random-effect model was used to estimate the weighted mean difference (WMD) and 95% confidence interval (CI) for each outcome. Between studies heterogeneity was assessed by the I2 test. Prespecified subgroup analyses were performed to examine heterogeneity across sample size, age, sex, dosage, duration, and health status. This meta-analysis included randomized controlled trials (RCTs) involving adults (≥18 years) with either parallel or crossover designs. Studies must have included a control group, with the only intervention being purslane consumption and reported data suitable for calculating BP outcomes. Study quality was assessed using the Cochrane risk of Bias Tool and evidence certainty was rated through the grading of recommendations, assessment, development, and evaluation (GRADE) approach. **Results:** Five trials were included in the meta-analysis. Pooled analysis showed that purslane consumption significantly reduced SBP (WMD: −3.06 mmHg, 95% CI: −6.02 to − 0.11, $P = 0.042$; I2 = 95.5%, $P < 0.001$). However, purslane consumption did not change DBP (WMD: −0.62 mmHg, 95% CI: −2.01–0.87 $P = 0.386$; I2 = 81.7%, $P < 0.001$). Nevertheless, after subgroup analysis a significant decrease in DBP levels was observed among participants who were older than 40 years, had diabetes, and underwent a 12-week intervention. According to the GRADE assessment, the certainty of evidence for SBP was rated as moderate due to serious concerns about indirectness, whereas the evidence for DBP was rated as low quality because of significant limitations related to both imprecision and indirectness. **Conclusion:** Our findings suggest that purslane consumption may have a modest but clinically significant effect on reducing SBP compared to placebo and may improve DBP in specific subgroups. Given that even small reductions in SBP are associated with important reductions in cardiovascular risk, purslane may represent a promising complementary nutritional strategy for BP management. However, further well-designed RCTs with larger sample sizes are needed to confirm these effects and assess their long-term clinical significance.

Key words: Blood pressure, meta-analysis, purslane, systematic review

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INTRODUCTION

High blood pressure (BP) is the key preventable risk factor for all-cause mortality, especially cardiovascular disease.[1] It was the cause of death for 10.8 million people in 2019 alone; over the last half-century, due to factors such as population aging, sedentary lifestyle, obesity, and improper diet, the number of people with high BP has increased significantly (90%).[2] Hypertension is confirmed when a high systolic BP (SBP) (≥135 mmHg) or diastolic BP (DBP) (≥85 mmHg) is measured at more than one visit.[3] Despite the widespread use of first-line antihypertensive medications such as long-acting calcium channel blockers, diuretics, angiotensin-converting enzyme inhibitors, beta-blockers, and angiotensin II receptor blockers, BP control remains suboptimal, with fewer than half of patients achieving target levels. This persistent gap has spurred growing interest in alternative therapies, including medicinal plants, which have been traditionally valued for their beneficial properties. Given challenges such as side effects, poor medication adherence, and high costs, plant-based interventions–particularly those rich in bioactive compounds–are increasingly being examined for their potential role in managing elevated BP.[4,5]

Portulaca oleracea (purslane) is one such herbal medicine that is commonly found on all continents. This plant is described in Chinese folklore as a "vegetable for long life."[6] Purslane is a nutrient-rich medicinal plant recognized for its broad spectrum of therapeutic properties, including anti-inflammatory, antioxidant, antihypertensive, antidiabetic, hepatoprotective, neuroprotective, and wound-healing effects. It contains an abundance of essential Vitamins (A, B, C, and E), key minerals (magnesium, zinc, calcium, and phosphorus), and beneficial phytochemicals such as alkaloids, flavonoids, and terpenoids.[7,8] Purslane is also among the richest botanical sources of omega-3 fatty acids particularly α-linolenic acid, gamma-linolenic acid, and linoleic acid which have been revealed to support vascular function through vasodilatory (enhance endothelial nitric oxide synthase activity) and anti-inflammatory (suppress proinflammatory cytokines) mechanisms.[9] Its elevated levels of magnesium and potassium further promote electrolyte balance and endothelial health, while antioxidants and flavonoids such as Vitamins E, C, and β-carotene help decrease oxidative stress, a central factor in the development of hypertension.[10] Taken together, these synergistic components highlight purslane's exceptional potential as a natural agent for BP regulation, distinguishing it from other medicinal herbs.

Chronic hypertension has a lot of complications, for example, it increases some mediators such as the reactive oxygen species (ROS), proinflammation molecules, and endothelin-1 (the most potent vasoconstrictor) and as a result, matrix metalloproteinases (MMPs) are activated.[11] Hence, any agent like purslane as an herbal medicine that inhibit the activation of MMPs can be effective in reducing high BP.[6,12] The results of studies in populations with the lowest mortality rate from heart diseases showed that these people follow a diet containing sufficient amounts of eicosapentaenoic acid from fresh fish as well as linolenic acid found in purslane and walnuts.[13] A human study showed that the consumption of 60 mg purslane extract significantly reduces SBP without causing severe side effects.[14] An animal study revealed that the ethanol extract of purslane was able to inhibit the increase in BP compared to the control group.[15] The results of another animal indicated that feeding purslane (300 mg/kg/day) for 10 weeks improved lipid profiles, decreased SBP level, endothelin-1, and MMPs significantly.[16]

While several individual trials have investigated purslane's effects on BP, no prior study has systematically synthesized this evidence using robust frameworks for evidence certainty and clinical relevance. Given the growing body of evidence regarding the metabolic and vascular benefits of purslane, this systematic review and meta-analysis of randomized controlled trials (RCTs) was conducted to quantitatively assess its effects on SBP and DBP. To enhance and extend existing research, we applied the grading of recommendations, assessment, development, and evaluation (GRADE) framework to evaluate the certainty of evidence, performed subgroup analyses to investigate potential effect modifiers (e.g., participant health status dosage, and intervention duration), and examined clinical applicability across varied trial contexts. This methodology offers a more rigorous and comprehensive synthesis compared to previous narrative or descriptive reviews.

METHODS

The procedures of the current study were followed by the Preferred Reporting Items for Systematic Review and Meta-Analysis [Supplementary Table 1].[17] This meta-analysis was recorded in PROSPERO with the code CRD42023428940.

Search strategy

The following electronic databases were used to find pertinent RCTs up to April 2025: ISI Web of Science, PubMed, Cochrane databases, and Scopus. The subject headings (MeSH) and non-MeSH keywords (Portulaca, OR Portulaca oleracea OR Purslane AND Hypertension OR BP OR Blood pressure OR Diastolic blood pressure OR Systolic blood pressure OR SBP OR DBP OR Metabolic syndrome OR MetS) were used. The searches conducted on various databases had no limitations regarding language or date.

Furthermore, references from related review papers and selected studies were screened manually to identify any studies that might have been missed.

Inclusion and exclusion criteria

The present meta-analysis included RCTs that fulfilled the following criteria: (I) the studies designed as RCTs with parallel or crossover designs, (I) the study participants were adults aged 18 years and above, (III) the studies had to have a control group and the only difference between the studied groups was the purslane consumption, and (IV) the RCTs needed to report mean ± standard deviation (SD) or other data to calculate these values for the effects of purslane on BP (primary or secondary outcome). Studies that were conducted on animals, children (<18), pregnant and lactating women, as well as observational and review articles were excluded from the study.

Data extraction

Two authors (M.V. and Sh.H.) independently extracted data from each eligible RCT, including the first author's name, country of origin, publication year, group-specific sample sizes, duration of intervention, purslane dosage, and key participant characteristics (mean age, gender, and health status). B*P* values–expressed as mean ± SD at baseline, postintervention, and as change scores–were also collected. Any discrepancies between reviewers were resolved through discussion with a third author (G.A.). For studies with missing or unreported data, we attempted to contact the corresponding authors to obtain the necessary information. If no response was received, we followed imputation strategies recommended by the Cochrane Handbook, deriving missing means or SDs from alternative reported statistics such as confidence intervals (CIs) or interquartile ranges to maintain consistency and minimize bias across the analysis.

Quality assessment

Two investigators (M.V. and Sh.H.) used the Cochrane risk of bias tool for RCTs[18] to identify the quality of included articles. This tool consists of several components, including (I) sufficient random sequence generation, (II) allocation concealment, (III) blinding of staff and entire procedures, (IV) indicates incomplete data, (V) selected outcome report, and (VI) other possible sources of bias. The Cochrane Handbook recommends classifying RCTs into three categories based on bias: low risk, moderate risk, and high risk. In case of any disagreements during the quality assessment, a third reviewer (G.A.) would have been consulted.

Certainty assessment

The quality of evidence was assessed using the GRADE protocol. In accordance with this approach, the assessment was based on factors such as risk of bias, indirectness, inconsistency, publication bias, and imprecision. Based on the assessment criteria, the quality of the evidence was categorized as either very low, low, moderate, or high.[19]

Data synthesis and statistical analysis

The meta-analysis was accomplished by fulfilling STATA statistical software (version 14; StataCorp, College Station, Lakeway, TX, USA). We inserted the mean change and SD change of DBP and SBP levels and used them to calculate the pooled effects. In case the results were not reported as means ± SD in an RCT, they were converted with appropriate statistical formulas.[20] Furthermore, if mean changes were not reported, we computed them by using the formula: mean change = final B*P* values – baseline B*P* values. Similarly, SD changes were calculated using the formula: SD change = square root ([SD baseline] 2+ [SD final] 2 – [2R × SD baseline × SD final]), $R = (SD1^2 + SD2^2 - SD_{change}^2)/(2 \times SD1 \times SD2)$.[21] Treatment effects were determined as weighted mean differences (WMDs) and 95% CIs, and we used random effect models to estimate the overall effect size.[22] To assess the variation between studies, we used the *I*-square (I^2) index. It is noteworthy that if I^2 is above 50%, it indicates a significant heterogeneity between the studies.[23] Furthermore, to check potential sources of heterogeneity, subgroup analyses were conducted following the preplanned criteria, including sample size (<60 vs. ≥60), purslane dose (<10,000 mg vs. 10,000 mg), duration of intervention (8 weeks vs. 12 weeks), sex (female vs. Both), age (<40 vs. ≥40 years), and health status (diabetes, NAFLD, metabolic syndrome [MetS]/obesity). Meta-regression analysis using the random-effects model was undertaken to examine the potential association between variations in dose and duration with BP. During our analysis, we utilized visual inspection of funnel plot tests and Egger's linear regression test to effectively assess publication bias.[24,25] In addition, a sensitivity analysis was carried out to evaluate how each trial influenced the overall effect size. Statistical significance was determined by considering $P < 0.05$ in all analyses.

RESULTS

Study selection

A total of 684 papers were identified through our initial literature search. After removing 128 duplicates, 554 studies remained for screening. According to predefined inclusion and exclusion criteria, 523 studies were excluded after screening the titles and abstracts. Therefore, 31 relevant studies remained for full-text review. Among these, 26 studies were excluded because of a lack of required data reporting. Finally, five trials achieving all needed criteria were included for meta-analysis in the current study [Figure 1].

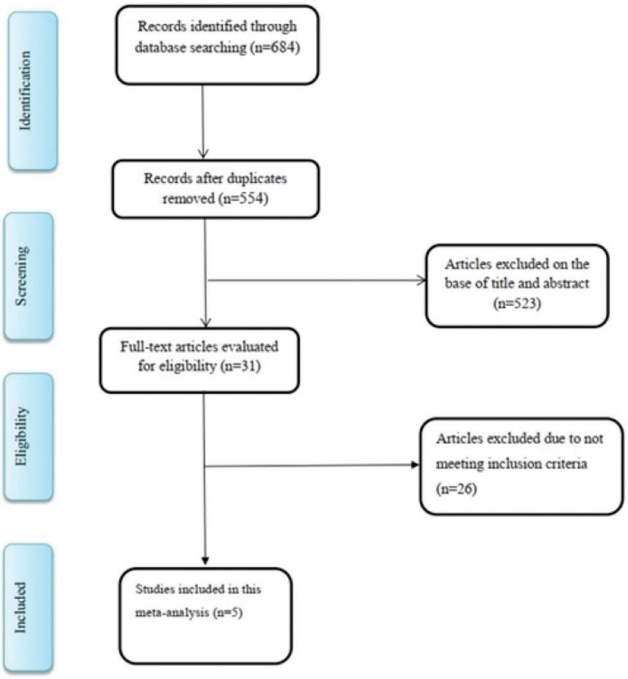

Figure 1: Flow diagram of study screening and selection process

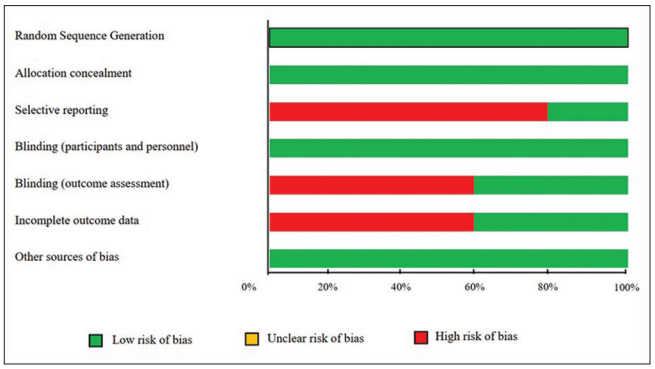

Figure 2: Results of risk of bias assessment for trials included in the current meta-analysis on the effects of purslane supplementation on blood pressure

Study characteristics

Study characteristics of the five studies[14,26-29] are shown in Table 1. In total, 300 participants were included (case = 152 and control = 148) in these publications dated between 2016 and 2021. The mean age of the participants ranged between 40 and 52 years. Study durations ranged from 8 to 12 weeks with sample sizes ranging from 48 to 71 participants. While the majority of trials enrolled both sexes, one study exclusively utilized female participants.[29] These studies were conducted in Iran[26-29] and Israel.[14] Two studies included patients with NAFLD;[26,28] two studies were performed in patients with type 2 diabetes mellitus (T2DM);[14,27] and one study enrolled participants with MetS.[29]

Risk of bias assessment, and grading of recommendations, assessment, development, and evaluation assessment

The results of the risk of bias assessment for the included trials are presented in Figure 2. All studies demonstrated a low risk of bias in domains related to allocation concealment, random sequence generation, and participant blinding. However, approximately 80% of trials showed a high risk of bias in the domain of selective reporting. In addition, 60% of studies were rated as having a high risk of bias due to issues with blinding of outcome assessment and incomplete outcome data. The GRADE profile for the certainty of the evidence is included in Supplementary Table 2. Based on the GRADE assessment, the overall certainty of evidence for SBP was rated as moderate, primarily due to serious concerns about indirectness including variability in study populations and intervention contexts that limited generalizability. In contrast, the evidence for DBP was rated as low quality, reflecting serious limitations in both imprecision, such as wide CIs and small sample sizes, and indirectness, due to discrepancies between study settings and the target population.

Effect of purslane supplementation on systolic blood pressure

Pooled analysis of five RCTs suggested that purslane supplementation significantly decreased SBP levels (WMD: −3.06 mmHg, 95% CI: −6.02 to −0.11, $P = 0.042$). A significant heterogeneity was observed across studies ($I^2 = 95.5\%$, $P < 0.001$) [Figure 3]. Subgroup analysis was conducted to examine sources of heterogeneity. Subgroup analysis shows that health status explains the heterogeneity. After subgroup analysis, we observed that the effect of purslane supplementation on SBP was more robust at the dosages of < 10 g/d (WMD: −6.34 mmHg, 95% CI: −7.95 to −4.73, $P < 0.001$; $I^2 = 89.6\%$, $P = 0.002$), in trials that were treated for 12 weeks (WMD: −4.48 mmHg, 95% CI: −5.35 to −3.61, $P < 0.001$; $I^2 = 82.8\%$, $P = 0.001$) and in studies performed on subjects with diabetes (WMD: −4.85 mmHg, 95% CI: −5.78 to −3.92, $P < 0.001$; $I^2 = 91.6\%$, $P = 0.001$) [Supplementary Table 3].

Effect of purslane supplementation on diastolic blood pressure

Pooling five RCTs together did not indicate a significant effect of purslane supplementation on DBP (WMD: −0.62 mmHg, 95% CI: −2.01 to 0.87, $P = 0.386$) in comparison with the placebo group. A high heterogeneity was found among the RCTs ($I^2 = 81.7\%$, $P < 0.001$) [Figure 4]. Subgroup analysis showed that sample size, dose, health status, duration, and age explain the heterogeneity. After subgroup analysis, we observed that the effect of purslane supplementation on DBP was more robust in trials that treated for 12 weeks (WMD: −1.60 mmHg, 95% CI: (−2.37 to −0.84, $P < 0.001$; $I^2 = 46.6\%$, $P = 0.132$), in studies performed

Table 1: Characteristics of included studies in the systematic review and meta-analysis

First author	Year/ Country	Study design	Subject	Participants (intervention/ control)	Mean age (intervention/ control)	Baseline BMI (intervention/ control)	Duration (week)	Type of administration		Main results
								Intervention	Placebo	
Darvish Damavandi *et al.*	2020 Iran	Randomized, double-blind clinical trial	NAFLD	37/37	46.18/46.05	31.56/31.83	12	300 mg purslane extract	Placebo	There are no significant changes in BP
Papoli *et al.*	2019 Iran	Randomized clinical trial	MetS	32/32	42.16/43.16	28.23/26.30	12	10 g purslane seed +150 cc low-fat yogurt	150 cc low-fat yogurt	Significant reductions in weight, and WC. There are no significant changes in BP
Gheflati *et al.*	2019 Iran	Randomized controlled clinical trial	NAFLD	27/27	40.07/39.81	32.77/31.08	8	10 g of purslane seeds + weight loss diet	Weight loss diet	There are no significant changes in BP
Wainstein *et al.*	2016 Israel	Double-blind, placebo-controlled clinical trial	Type 2 diabetes	31/32	52.4/58.3	29.9/29.1	12	180 mg/day Portusana	Placebo	SBP was reduced significantly more in the purslane group than in the placebo group
Esmaillzadeh *et al.*	2015 Iran	Randomized controlled cross-over clinical trial	Type 2 diabetes	48	51.4	28.99	12	10 g/day purslane seeds +240 cc low-fat yogurt	240 cc low-fat yogurt	Significant reduction in weight and BMI, SBP, and DBP

BMI=Body mass index; WC=Waist circumference; BP=Blood pressure; DBP=Diastolic BP; SBP=Systolic BP; NAFLD=Nonalcoholic fatty liver disease; MetS=Metabolic syndrome

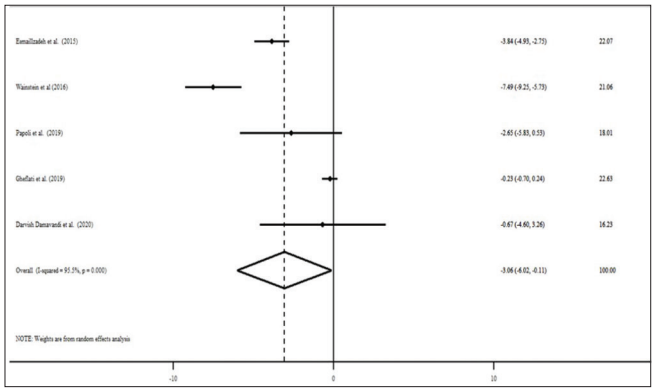

Figure 3: Forest plot illustrating weighted mean difference and 95% confidence intervals for the impact of purslane on systolic blood pressure

on subjects with diabetes (WMD: −2.01 mmHg, 95% CI: −2.84 to −1.17, $P < 0.001$; $I^2 = 0\%$, $P = 0.746$), and in studies on subjects with a mean age of ≥40 years old (WMD: −1.60 mmHg, 95% CI: −2.37 to −0.84, $P < 0.001$; $I^2 = 46.6\%$, $P = 0.132$) [Supplementary Table 4].

Meta-regression analysis

The results of the meta-regression test showed that there was no significant association between the dosage and duration of purslane supplementation and alterations in SBP, and DBP [Supplementary Figure 1a-d].

Sensitivity analysis

Sensitivity analysis for DBP showed that the overall estimates were not influenced by the elimination of any study. Sensitivity analysis for SBP shows that the exclusion of Papoli *et al*. (WMD: −3.14 mmHg, 95% CI: −6.53–0.23),[29] Wainstein *et al*. (WMD: −1.89 mmHg, 95% CI: −4.40–0.61),[14] and Esmaillzadeh *et al*. (WMD: −2.81 mmHg, 95% CI: −7.07–1.44)[27] studies changes the overall effect size to be statistically nonsignificant [Supplementary Figure 2a and b]. These studies may have exerted a disproportionate influence on the overall pooled estimate due to distinct methodological and clinical characteristics. For example, Esmaillzadeh *et al*.[27] implemented a crossover design with a short intervention period (5 weeks) and a small sample of individuals with T2DM, which may have produced condition-specific or unstable treatment effects. Papoli *et al*.[29] examined a homogeneous cohort of middle-aged women with MetS and applied a longer intervention duration (12 weeks), potentially amplifying treatment responsiveness. Wainstein *et al*.[14] investigated patients with T2DM receiving concurrent pharmacotherapy, introducing potential confounding related to baseline medication use and metabolic variability. Together, these design-specific and population-level differences likely contributed to heterogeneity across studies, highlighting the need to carefully consider individual trial contexts when interpreting synthesized outcomes.

Publication bias

Funnel plots showed evidence of moderate asymmetry in the effects of purslane supplementation on BP [Figure 5a and b]. In contrast, Egger's regression tests provided no evidence of publication bias for SBP ($P = 0.257$) and DBP ($P = 0.565$). The discrepancy between Egger's test and funnel plot asymmetry may be attributed to methodological heterogeneity and low statistical power, such as differences in population characteristics, intervention duration, and dosage which could have influenced effect estimates irrespective of reporting bias. According to Cochrane guidance, asymmetry in funnel plots with < 10 studies should be interpreted with caution.

DISCUSSION

As far as we know, this was the first systematic review and meta-analysis of RCTs on the effect of purslane consumption and BP comprehensively. In this study, purslane consumption significantly improved SBP levels compared to control groups. However, the overall effect size of SBP is statistically nonsignificant after eliminating Papoli *et al*.,[29] Wainstein *et al*.,[14] and Esmaillzadeh *et al*.[27] studies. Participants in these studies had different baseline SBP levels, different dosages of purslane, different purslane types, and various health conditions that could influence the observed results. In addition, purslane consumption did not change substantially DBP levels. Nevertheless, a significant decrease in DBP levels was observed among participants who were older than 40 years, had diabetes, and underwent a 12-week intervention. Purslane may be more effective in diabetics because previous studies indicated that it is beneficial for managing glycemic indexes and has antidiabetic properties.[30] Since diabetes and BP are closely related, controlling blood sugar in diabetics may help control their BP.[31]

Research suggests that purslane consumption may positively influence BP regulation, particularly in individuals with T2DM.[27] A study found that a 60 mg

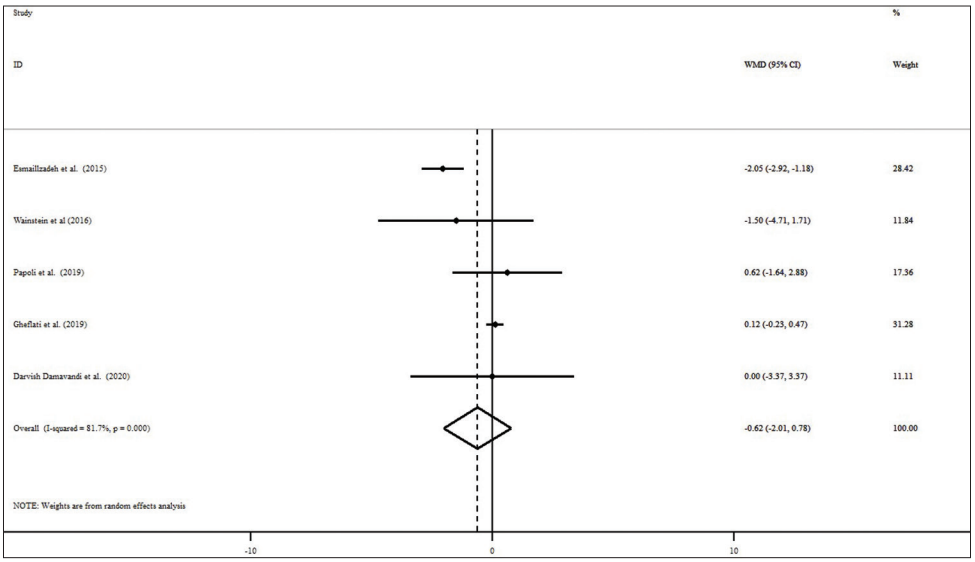

Figure 4: Forest plot illustrating weighted mean difference and 95% confidence intervals for the impact of purslane on diastolic blood pressure. WMD: Weighted mean difference

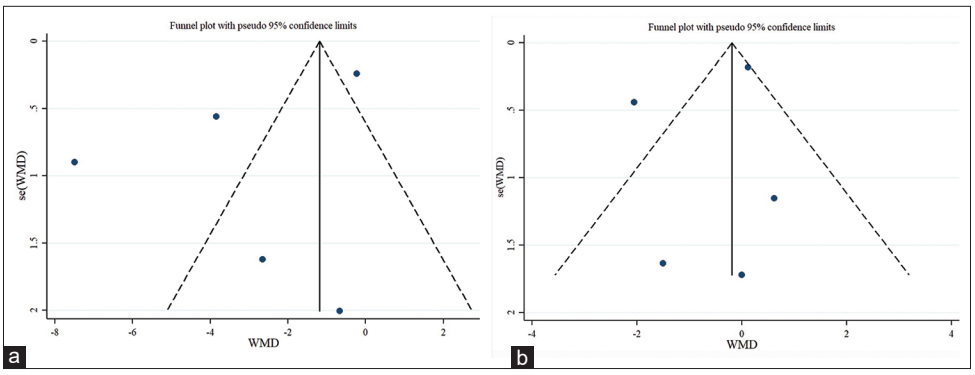

Figure 5: Funnel plot (with pseudo 95% confidence intervals) of the weighted mean difference (WMD) versus the se (WMD) for studies evaluating the association between purslane supplementation and systolic blood pressure (a), and diastolic blood pressure (b) values. WMD: Weighted mean difference

dose of purslane significantly reduced SBP in the overall cohort[14] whereas another study by Darvish Damavandi *et al*.[26] reported that a 12-week supplementation of 300 mg/day had no significant impact on SBP or DBP. In addition, daily consumption of three g of purslane leaves with dinner was associated with improved lipid metabolism and reduced hypercholesterolemia, potentially lowering cardiovascular risk. While animal studies highlight the BP-lowering properties of ethanol extracts and long-term supplementation (300 mg/kg/day), which improved lipid profiles and SBP levels over 10 weeks.[15] Purslane seeds and extracts exhibit distinct biochemical profiles and absorption dynamics, shaping their therapeutic applications.[32] Seeds are rich in fiber, proteins, and essential omega-3 fatty acids, complemented by flavonoids and phenolic compounds.[33] However, their natural matrix requires enzymatic digestion, delaying nutrient release. Conversely, extracts undergo refinement to concentrate bioactive compounds such as alkaloids and polysaccharides, enhancing potency and bioavailability.[34] Extracts bypass digestion, entering circulation more swiftly and exerting faster therapeutic effects.[34] These disparities highlight the need to account for formulation differences when evaluating purslane's clinical efficacy.

Furthermore, the positive effect of purslane consumption on BP may be attributed to its nutrient content, including flavonoids and alpha-lipoic acid (ALA).[32] The beneficial effects of flavonoids and ALA on BP have been indicated in some studies.[35-38] The use of ALA supplements can significantly reduce elevated SBP by inhibiting the reduction of sirtuin 3, hyperacetylation of superoxide dismutase 2, and the overproduction of ROS in mitochondria.[26] In line with our results, omega-3 fatty acids are more effective in reducing SPB than DBP.[39,40] Studies have indicated that omega-3 fatty acids lower BP by increasing endothelial nitric oxide and decreasing angiotensin-converting enzyme activity.[39,41] The suppression of the renin–angiotensin system may be related to peroxisome proliferator-activated receptor gamma (PPARy) activation.[14] Activation of PPARy inhibits adhesion cascades and harmful inflammatory events in the vascular system. So, hypertension can be treated by direct endothelial functional regulation and vascular anti-inflammatory mechanisms induced by PPARy activation in individuals.[42] Another mechanism for lowering BP is related to MMPs. MMPs change the smooth muscle tone, and it could create a vicious cycle of rising BP.[43,44] The results of an animal study indicated that purslane intake could decrease SBP levels, endothelin-1, and MMPs significantly.[16] So, any agent like purslane that inhibits the activation of MMPs can be effective in reducing high BP.[6,12] According to purslane's positive effect on high BP, it may be recommended to include it in hypertension dietary management.

Side effects

The side effects of purslane have only been studied in a few studies. The presence of high levels of oxalate in purslane has been linked to hyperoxaluria, calcium oxalate crystals, and kidney stones.[45] Recent research demonstrated that consuming 0.75 kg of purslane in a single meal could cause nephropathy due to oxalate.[46] The absorption of soluble oxalate may be reduced by consuming purslane with yogurt.[45] Nonetheless, daily consumption of purslane is still questionable.

Strengths and limitations

This meta-analysis has several strengths: first, different confounders were used to conduct subgroup analyses, second, a thorough sensitivity analysis was conducted to ensure stable results, third, the GRADE method was used to determine the certainty of outcomes. Despite this, there are a few limitations to be considered. The included studies differed greatly based on the type of purslane consumed, the dosage, and the health status of participants. In addition, a small number of studies were included. Finally, the included studies were heterogeneous. To identify the heterogeneity sources, we conducted subgroup analyses based on a variety of variables.

CONCLUSION

The results of this meta-analysis demonstrated a significant reduction in SBP levels following purslane consumption, highlighting its potential role in clinical BP management. To enhance the understanding of its therapeutic effects, future clinical trials should investigate varying doses of purslane, considering its potential integration into evidence-based management practices. Moreover, further prospective studies with larger populations across diverse geographic regions and extended durations are necessary to determine the consistency and long-term effectiveness of purslane in lowering BP in clinical settings.

Ethical consideration

Ethics approval and registration were obtained from the Isfahan University of Medical Sciences ethical committee (IR.MUI.RESEARCH.REC.1402.159). The study protocol was registered in PROSPERO.

Data availability

Data will be made available on request.

Acknowledgments

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Nil.

Conflicts of interest

There are no conflicts of interest.

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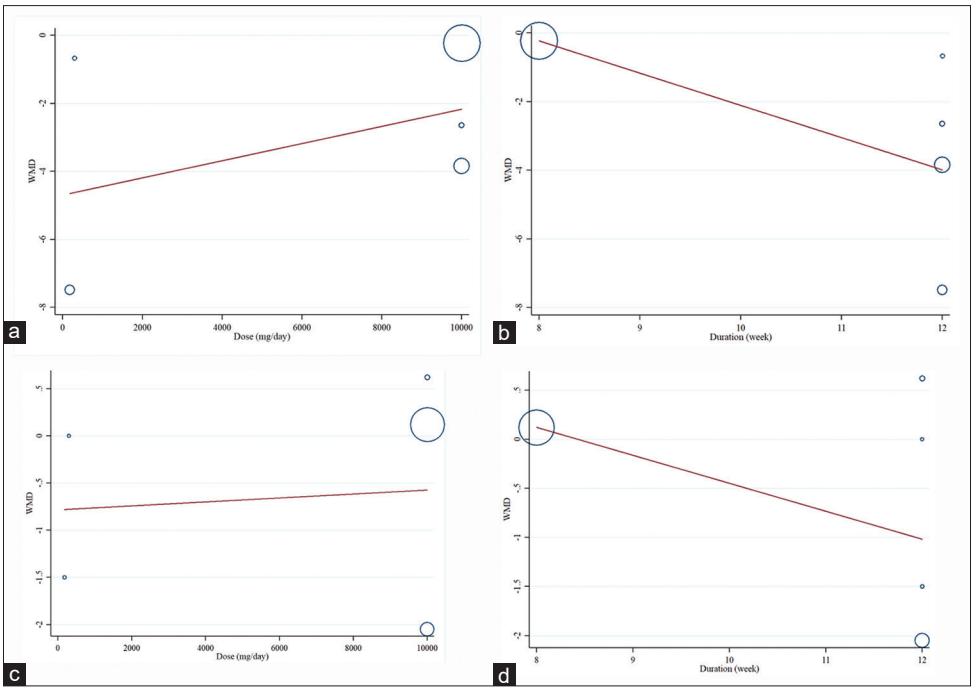
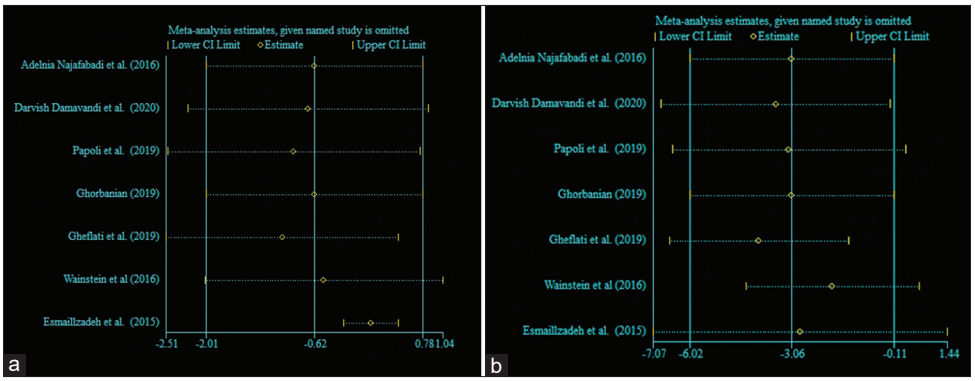


Supplementary Figure 1: Random-effects meta-regression plots of the association between mean changes in systolic blood pressure (a and b), and diastolic blood pressure (c and d) and purslane dose and intervention duration



Supplementary Figure 2: Sensitivity analysis of purslane on diastolic blood pressure (a), and systolic blood pressure (b)

Supplementary Table 1: Preferred reporting items for systematic review and meta-analysis checklist

Section/ topic	Number	Checklist item	Reported on page number
Title			
Title	1	Identify the report as a systematic review, meta-analysis, or both	Page 1
Abstract			
Structured summary	2	Provide a structured summary including, as applicable: Background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number	Page 2
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known	Page 3
Objectives	4	Provide an explicit statement of questions being addressed with reference to PICOS	Page 4
Methods			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number	Page 4
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale	Page 5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched	Page 4
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated	Page 4
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis)	Page 5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators	Page 5 Page 6
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made	Page 5
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis	Page 10
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means)	Page
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis	Page 6
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies)	Page 10
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were prespecified	Page 6
Results			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram	Page 7
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations	Page 7, and Table 1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12)	Figures 2
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot	[Figures 3–4]
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency	[Figures 3–4]
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15)	[Figures 2]
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression, see item 16)	Supplementary Tables 1
Discussion			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers)	Page 10
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias)	Page 12

Contd...

Supplementary Table 1: Contd...

Section/ topic	Number	Checklist item	Reported on page number
		Discussion	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research	Page 12
		Funding	
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review	Page 12

PICOS=Participants, interventions, comparisons, outcomes, and study design

Supplementary Table 2: Grading of recommendations, assessment, development, and evaluation approach summary of findings and quality of evidence assessment

Outcome	Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Quality of evidence
SBP	5	RCTs	Serious[a]	No serious[b]	Serious[c]	No serious[d]	No serious[e]	Moderate
DBP	5	RCTs	Serious	No serious	Serious	Serious	No serious	Low

[a]For risk of bias; the majority of included studies were considered to be at high risk of bias; [b]Downgraded if there was a substantial unexplained heterogeneity (I^2 >50%, P<0.10) that was unexplained by meta-regression or subgroup analyses; [c]Downgraded if there were factors present relating to the participants, interventions, or outcomes that limited the generalizability of the results; [d]Optimal information size was not met, or the 95% CI include the null value lower and upper bounds of the 95% CI were <0.95 and >1.05, respectively; [e]Downgraded if there was an evidence of publication bias using funnel plot. The quality of evidence is divided into 4 levels using GRADE system (high, moderate, low, very low). DBP=Diastolic BP; SBP=Systolic BP; RCTs=Randomized controlled trials; GRADE=Grading of recommendations, assessment, development, and evaluation; CI=Confidence interval

Supplementary Table 3: Results of subgroup analyses for the effects of purslane supplementation on systolic blood pressure according to intervention or participant characteristics

Study group	Number of effect sizes	WMD (95% CI)	*P*-effect	*P* heterogeneity	I^2 (%)[3]	*P* for between-subgroup heterogeneity
Sample size (*n*)						
<60	2	−0.79 (−1.22, −0.35)	0.001	<0.001	97.2	0.001
≥60	3	−5.59 (−7.02, −4.15)	0.001	0.001	85.5	
Dose (mg)						
<10,000	2	−6.34 (−7.95, −4.73)	<0.001	0.002	89.6	<0.001
10,000	3	−0.82 (−1.25, −0.39)	<0.001	<0.001	94.5	
Duration (week)						
8	1	−0.23 (−0.69, 0.23)	0.337	-	-	<0.001
12	4	−4.48 (−5.35, −3.61)	<0.001	0.001	82.8	
Sex						
Female	1	−2.65 (−5.83, 0.53)	0.102	-	-	0.364
Both	4	−1.16 (−1.58, −0.74)	<0.001	<0.001	96.6	
Age (years)						
<40	1	−0.23 (−0.69, 0.23)	0.337	-	-	<0.001
≥40	4	−4.48 (−5.35, −3.61)	<0.001	0.001	82.8	
Health status						
Diabetes	2	−4.85 (−5.78, −3.92)	<0.001	0.001	91.6	<0.001
NAFLD	2	−0.23 (−0.70, 0.23)	0.321	0.828	0	
MetS and obesity	1	−2.65 (−5.83, 0.53)	0.102	-	-	

MetS=Metabolic syndrome; CI=Confidence interval; WMD=Weighted mean difference; NAFLD=Nonalcoholic fatty liver disease

Supplementary Table 4: Results of subgroup analyses for the effects of purslane supplementation on diastolic blood pressure according to intervention or participant characteristics

Study group	Number of effect sizes	WMD (95% CI)	*P*-effect	*P*- heterogeneity	I^2 (%)[3]	*P* for between-subgroup heterogeneity
Sample size (*n*)						
<60	2	−0.19 (−0.52, 0.13)	0.251	<0.001	95.2	0.879
≥60	3	−0.06 (−1.68, 1.55)	0.939	0.570	0	
Dose (mg)						
<10,000	2	−0.78 (−3.11, 1.53)	0.507	0.528	0	0.609
10,000	3	−0.17 (−0.50, 0.15)	0.290	<0.001	90.5	
Duration (week)						
8	1	0.12 (−0.23, 0.47)	0.507	-	-	<0.001
12	4	−1.60 (−2.37,−0.84)	<0.001	0.132	46.6	
Sex						
Female	1	0.61 (−1.63, 2.87)	0.591	-	-	0.479
Both	4	−0.20 (−0.52, 0.12)	0.219	<0.001	85.9	
Age (years)						
<40	1	0.12 (−0.23, 0.47)	0.507	-	-	<0.001
≥40	4	−1.60 (−2.37, −0.84)	<0.001	0.132	46.6	
Health status						
Diabetes	2	−2.01 (−2.84, −1.17)	<0.001	0.746	0	<0.001
NAFLD	2	0.11 (−0.23, 0.47)	0.510	0.945	0	
MetS and obesity	1	0.61 (−1.63, 2.87)	0.591	-	-	

MetS=Metabolic syndrome; CI=Confidence interval; WMD=Weighted mean difference; NAFLD=Nonalcoholic fatty liver disease