Review Article

Effects of Purslane Supplementation on Blood Lipid Profile: A Systematic Review and Meta-analysis of Randomized Controlled Trials

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Abstract
Background: Blood lipid profiles are known as one of the most important factors in health disorders such as obesity and diabetes, which mostly end in cardiovascular diseases (CVDs) such as coronary heart disease (CHD). Purslane, as an edible herbal plant has shown to have beneficial components for dyslipidemia treatment. This study aimed to evaluate the effects of purslane supplementation on blood lipid profiles in the adult population.
Methods: The terms Portulaca, *Portulaca, Portulaca oleracea,* and *Purslane* together with lipid profile ingredients including triglyceride (TG), total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C) were searched in the following databases until 30 October 2020: PubMed, MEDLINE, Scopus, EMBASE, Science Direct, and SID. A meta-analysis was conducted with eight randomized controlled trials (RCTs) on 444 patients using the STATA software version 14.
Results: Eight eligible studies on 444 patients were identified for the present study. The purslane supplementation caused significant reduction in TG (-18.55 mg/dL, 95% CI [-31.712, -5.388]), TC (-8.43 mg/dL; 95% CI [-14.99, -1.87]), and LDL-C (-6.45 mg/dL, 95% CI [-11.13, -1.77]); however, no significant effect was observed on HDL-C (1.28 mg/dL, 95% CI [-0.56, 2.93], $P=0.170$).
Conclusion: Our results suggested that purslane supplementation could reduce TG, TC, and LDL-C. However, no significant effect was observed on HDL-C.
Keywords: Portulaca, Cholesterol, Low-density lipoprotein, High-density lipoprotein, Triglycerides

Introduction

Obesity is a chronic metabolic disorder characterized by an excessive amount of body fat (1). Three grades have been defined for obesity based on body mass index (BMI): 1) grade 1 obesity ($30 \leq BMI < 35$) 2), grade 2 obesity ($35 \leq BMI < 40$) 3), and grade 3 obesity ($BMI \geq 40$) (2). Today, the growing prevalence of obesity has become a serious health concern. According to epidemiological studies, approximately 500 million people are obese, and by 2030, 38% of the adult population will be overweight and 20% obese (3). Studies have indicated that there is a correlation between high BMI with the increase in coronary heart disease (CHD), cardiovascular disease (CVD), cancer, and premature mortality (4-6). High blood pressure, CHD, metabolic syndrome, diabetes, and dyslipidemia are among the most important complications of obesity and overweight (7).

Although obesity is usually caused by excessive energy intake relative to energy consumption (energy loss through metabolic and physical activities), the factors involved in obesity are very complex and include genetic, physiological, environmental, psychological, social, economic, and even political factors (8). Obese patients clinically may have high levels of low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), total cholesterol (TC), and low concentration of high-density lipoprotein cholesterol (HDL-C) (9), which are known as the main risk factors for diabetes and other health problems that end in CVD and CHD (10,11).

Purslane (*Portulaca oleracea* L.) is an herbaceous plant in the Portulacaceae family (7,8). The leaves of purslane have high levels of omega-3 (linoleic acid), as well as other active components including proteins, fibers, flavonoids, alkaloids, and high levels of vitamins E and C (12-15). Several therapeutic properties including antispasmodic, anti-inflammatory, antipyretic, wound-healing, diuretic,

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and antibacterial activities are known for purslane (16-18). Purslane is known as the "vegetable for long life" in Chinese traditional medicine and was used for various health problems such as fever, diarrhea, and liver and kidney disease (19,20). Besides, based on animal studies purslane probably has anti glycemic and antilipidemic properties (21,22). However, the results of human studies are not conclusive. In a study by Dehghan et al (23), purslane consumption reduced serum lipids and glucose levels, while the results of a study by Bedakhanian et al (24) showed no significant changes.

To date, there are several human trials conducted on the effects of purslane on blood lipid and glucose levels. The previous systematic review and meta-analysis by Hadi et al (1) evaluated the effects of purslane on human blood lipid profiles including five randomized controlled trial (RCTs). The results of this study indicated that purslane can reduce TG, however, no reduction was observed in TC, LDL-C, and HDL-C following purslane administration. To update the previous meta-analysis, the present study undertakes a systematic review and meta-analysis including eight RCTs (i.e., three more studies) that could provide a more accurate assessment of the effect of purslane on blood lipid profile. Considering the important role of blood lipid levels in human health, and given the ease of access and cost-effectiveness of the administration of purslane in patients, the results of the present study estimated the overall effect of purslane supplementation on lipid parameters.

Methods
The present study was conducted using the preferred reporting items for systematic review and meta-analysis (PRISMA) protocols (25).

Eligibility criteria
Type of studies: All clinical trial studies evaluating the effects of purslane on blood lipid profiles were included. No restrictions were put on publication language and date.

Types of participants: Participants of both sexes and all ages were considered.

Types of intervention: The interventions had to be purslane without any other medication which can affect the blood lipid profile. The type or the dosage of used purslane was not a limitation.

The comparison group could be placebo or none.

Type of outcome measures: Primary outcome measures: TG, TC, LDL-C, and HDL-C).

Information sources
A comprehensive electronic database search was performed through Scopus, PubMed/MEDLINE, EMBASE, and Persian databases including SID and Magiran until 30 October 2020. The electronic search

was performed using special syntaxes made by the team members. The syntaxes were a combination of keywords and medical subject headings (MeSH) terms. MeSH terms were identified by searching keywords in https://www.ncbi.nlm.nih.gov/mesh. The syntaxes for each component were combined and searched. The keywords and the relevant MeSH terms were as follow, respectively: Portulaca; *"Portulaca," "Portulaca oleracea"* and *"Purslane"* combined with *"lipoproteins", "hyperlipidemias", "triglycerides", "dyslipidemias", "HDL-cholesterol",* and *LDL-cholesterol.*

The above-mentioned terms were tested several times and finally, the following syntax was prepared for searching:

("Portulaca oleracea" OR "Purslane" OR Portulaca) AND (lipid OR lipoprotein OR "total cholesterol" OR "LDL-cholesterol" OR hyperlipidemia OR triglyceride OR "total cholesterol" OR dyslipidemia OR "HDL-cholesterol")

Study selection
All studies identified by the electronic search were entered into Endnote (Endnote X8) and duplicates were removed. Two authors independently screened the articles' titles and abstracts and unrelated studies were excluded. The eligibility assessment was performed based on the full text for the remaining studies. To increase the accuracy, the assessment was done using abstrackr (a web-based screening tool for systematic review) (26).

Data extraction
A data extraction form was developed using Excel (Microsoft® Office Professional Plus 2016) spreadsheet, by two authors during the study. The extracted data included general characteristics (first author, year, and country), study design (trial design, sample size, intervention characteristics, comparison characteristics, dose, and follow-up duration), participants' information (mean age, sex, and mean BMI), and primary outcomes (TC, TG, LDL-C, and HDL-C).

Quality assessment
Two authors assessed the methodological quality of included studies using the Jadad scale for reporting RCTs (27). This scale scores the studies according to three main items: randomization, blinding, and accountability of all patients. A study with a score of three or more is considered a good-quality study, and a score in the range of 0-2 indicates a poor-quality study.

Statistical analysis
Since the primary outcomes were continuous data, mean differences (MD) and standard deviation of change (SD) were extracted and used to estimate the effect size. The studies in which standard error of the mean (SEM) was

reported, the following formula was used to estimate SD: [SD = SEM × square root (n); n = sample size]. The SD of mean change was calculated using the following formula: [SD = square root ((SD pre-treatment) ^{2} + (SD post-treatment) ^{2} − (2R × SD pre-treatment × SD post-treatment); [R = 0.5] (28). The statistical heterogeneity was evaluated using the I^2 statistic test (29). According to heterogeneity between the studies, a random effect or fixed model was applied in the meta-analysis (28). To determine the possible sources of heterogeneity, subgroup analysis by dose and gender was performed. Also, to evaluate the effect of each variable on the overall result, a sensitivity analysis was performed by omitting the results of one study at a time. Besides, a meta-regression test was performed to evaluate the effect of moderator variables (dose and duration) on the results (28). To evaluate the publication bias, Egger's linear regression test was used (29). Quantitative analysis of studies was conducted using STATA software version 14.

Results
Study selection
The electronic search identified 377 articles. After having removed 147 duplicates, the remaining papers' (n = 230) titles and abstracts were evaluated by two authors independently, in which 200 papers were excluded as they didn't meet the inclusion criteria. Finally, 30 articles were evaluated by full-text, and eight of them (9,24,30-35) were considered appropriate to be included in the study. The PRISMA flow diagram was used to summarize the study selection process for this study (Figure 1).

Study characteristics
The mean age of participants in most of the studies (24,30-35) ranged from 38 to 58. However, one study was conducted at a mean age of 14.3 (9). Eight studies were included in the review, of which six (9,24,31-33,35) were conducted in Iran, and the remaining were from Israel (34) and Yemen (30). In six studies (24,30-32,34,35), purslane administration was used in powder form and in two studies as capsules (9,33). Two studies had only female participants (32,35) and one had only male subjects (24). Seven studies used a parallel RCT design (9,24,30,32-35) and one study was cross-over (31). The follow-up duration varied from four to sixteen weeks. The study of Dehghan et al (23) had the largest number of participants and the longest follow-up duration. All of the studies had reported TG, TC, LDL-C, and HDL-C. A detailed characterization of the included studies is provided in Table 1.

Risk of bias assessment
All eight included studies used a random allocation for participants, and five studies (9,24,31,33,34) described an appropriate methodology for randomization. Five papers (9,24,30,34,35) were double-blinded studies. However, one of the studies (34) was a single-blinded study in giving the placebo to the comparison group. Altogether from nine studies, six were indicated to have good quality (9,24,30,31,33-35). The earned scores of the studies in each domain are provided in Table 2.

Meta-analysis
Effect of purslane supplementation on TG
Eight studies reported outcomes of TG (9,24,30-35). Pooled results from the random-effects model indicated a significant reduction in TG concentrations (WMD [weighted mean difference] = -18.55 mg/dL; 95% CI [-31.74, -5.37], $P = 0.006$; $I^2 = 0\%$, $P = 0.975$) (Figure 2).
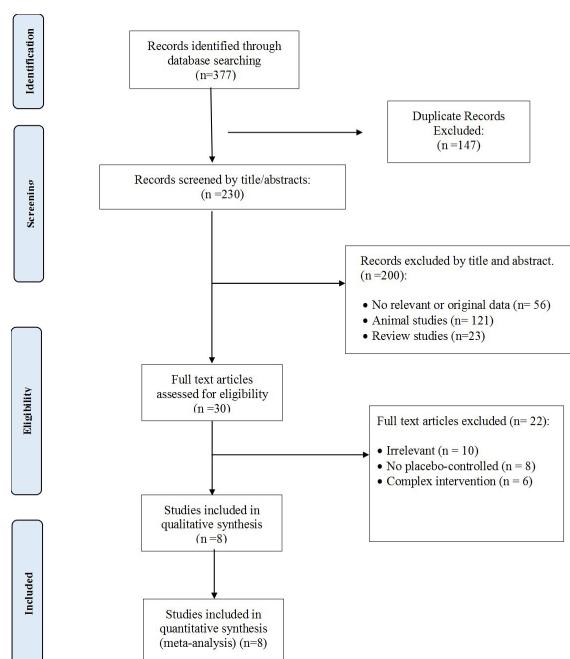

Figure 1. PRISMA flow diagram showing the study selection process.

Table 1. Characteristics of the included studies

First author	Country	N (F/M)	Age (mean±S.D)	BMI (mean±S.D)	RCT design (blinding)	Follow-up (wk)	Comparison	Intervention (dose and type of purslane)
Gheflati et al (33)	Iran	60 (48/12)	TG: 40.07±9.52 CG: 39.81±8.84	TG: 32.77±3.63 CG: 31.09±3.24	Parallel (N.S)	8	Placebo	10 g/day of purslane seeds (sachets)
Bedakhanian et al (24)	Iran	80 (M)	TG: 46.5±7.6 CG: 47.8±6.5	TG: 27.38±1.79 CG: 28.57±2.15	Parallel (yes)	8	Placebo	0.06 g/day (capsules)
Wainstein et al (34)	Israel	63 (22/41)	TG: 52.4±7.9 CG: 58.3±10.8	TG: 29.9±3 CG: 29.1±3.6	Parallel (yes)	12	Placebo	0.18 g/day (Capsules)
Dehghan et al (23)	Iran	196 (F)	TG: 52.33±4.08 CG: 50.17±5.34	TG: 29±5 CG: 29.8±6.4	Parallel (yes)	16	Placebo pills (flavored maltodextrin)	7.5 (g/day) /purslane seeds powder
Esmaillzadeh et al (31)	Iran	45 (Overall)	51.4±6.09	28.99±3.95	Cross-over (NS)	5	240 cc low-fat yogurt	10 (g/day) /purslane seeds powder with 240 cc low-fat yogurt
Sabzghabaee et al (9)	Iran	74 (38/36)	TG: 14.40±1.8 CG: 14.35±1.6	TG: 25.14±3.8 CG: 25.19±5.9	Parallel (yes)	4	Placebo (Lactose)	1 g/day (powdered P. oleracea seeds in capsules)
Farzanegi (32)	Iran	28 (F)	TG: 50.83±6.79 CG: 50.17±5.34	TG: 29.01±4.34 CG: 29.37±4.55	Parallel (NS)	8	Placebo (flavored maltodextrin)	7.5 (g/day) /purslane seeds powder with 40 ml of skimmed yogurt
Mohamed-I Kotb	Yemen	30 (10/20)	40±3.2	TG: 31.03+0.95 CG: 32.27+1.30	Parallel (yes)	8	Metformin (1500 mg/day)	*Portulaca oleracea* (10 g/day)/ 40 mL of skimmed yogurt

Abbreviations: F, Female; M, Male; TG, Treatment group; CG, Comparison group; BMI, Body mass index; NS, Not stated; wk, Week

Table 2. Quality assessment for the included studies

	Gheflati (33)	Bedakhanian (24)	Wainstein (34)	Dehghan (23)	Esmaillzadeh (31)	Sabzghabaee (9)	Farzanegi (32)	Mohamed-I Kotb
Described as randomized	1	1	1	1	1	1	1	1
The method of randomization was appropriate	1	0	1	1	1	1	0	0
Described as double-blinded	0	1	1	1	0	1	0	1
The method of blinding was appropriate	0	1	-1*	1	0	1	0	0
Described withdrawals and dropouts	1	1	1	0	0	1	1	1
Score	3	4	3	4	2	5	2	3
Quality	Good	Good	Good	Good	Poor	Good	Poor	Good

Note: 1; Yes, 0; No. The scores≥3 indicate good quality studies.
*If the method is inappropriate, 1 score will be deducted.

Subgroup analysis indicated that the effect of purslane was more pronounced in the studies in which purslane administration dose was > 1.5 g/day (-24.68 mg/dL; 95% CI [-41.62, -7.75], I²: 0%, P = 0.98) (Table 3). However, such a significant effect was not observed in the < 1.5 g/day subgroup (-9.18 mg/dL; 95% CI [-30.10, -11.73], I²: 0%, P = 0.97). When the studies were analyzed based on gender, a significant reduction of TG concentrations was found in both-gender subgroup (-18.83 mg/dL; 95% CI [-34.26, -3.40], I²: 0%, P = 0.96). No significant effect was found in male (-6.31 mg/dL; 95% CI [-39.70, 27.08], I²: -) and female (-33.06 mg/dL; 95% CI [-71.56, 5.44], I²: 0%, P = 0.76) subgroups (Table 3).

Effect of purslane supplementation on TC
The effects of purslane on TC were evaluated in eight trials (9,24,30-35). Compared with the placebo group, purslane supplementation resulted in a significant reduction in TC levels (WMD: -9.3 mg/dL; 95% CI [-17.41, -1.19], P = 0.025; I² = 29.3%, P = 0.194) (Figure 3). Subgroup analysis based on dose of purslane supplementation

showed a significant reduction of TC levels in the > 1.5 g/day subgroup (-15.50 mg/dL; 95% CI [-28.59, -2.40]; I²: 41.65%, P = 0.14), but this was not observed in < 1.5 g/day subgroup (-3.14 mg/dL; 95% CI [-12.54, 6.25]; I²: 0%, P = 0.71) (Table 3). When the studies were analyzed based on gender, a significant reduction of TC concentrations was found in female subgroup (-37.03 mg/dL; 95% CI [-60.18, -13.95]; I²: 0%, P = 0.98). However, no effect was seen in both-gender (-6.15 mg/dL; 95% CI [-13.83, 1.51]; I²: 0%, P = 0.48) and male (-5.03 mg/dL; 95% CI [-20.15, 10.09]; I²:-) subgroups (Table 3).

Effect of purslane supplementation on LDL-C
Eight studies reported LDL-C as an outcome measure (9, 24, 30-35). Combined results of random-effects model indicated that purslane supplementation caused a significant reduction in LDL-C concentrations (WMD: -6.42 mg/dL, 95% CI [-11.08, -1.76], P = 0.007; I² = 17.9%, P = 0.288) (Figure 4). Subgroup analysis indicated that the LDL-C-lowering effect of purslane was more pronounced in the studies in which purslane administration dose
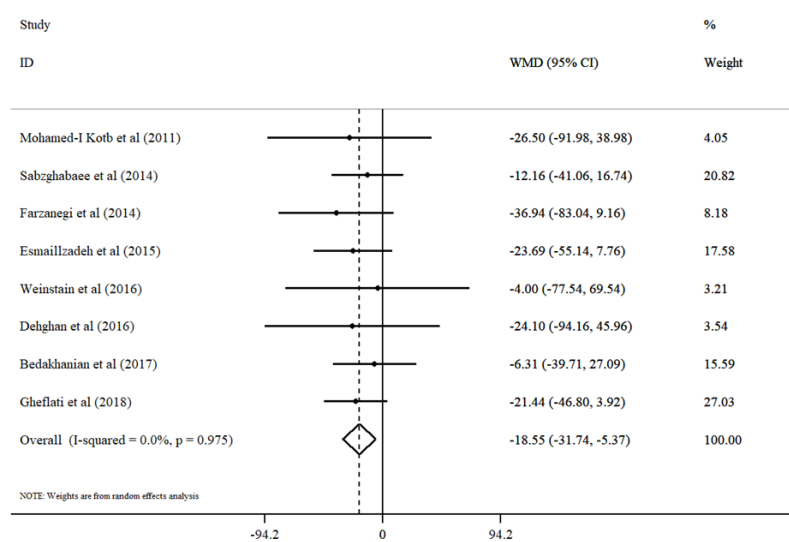
Figure 2. Forest plot of randomized controlled trials investigating the effects of purslane supplementation on triglyceride levels.
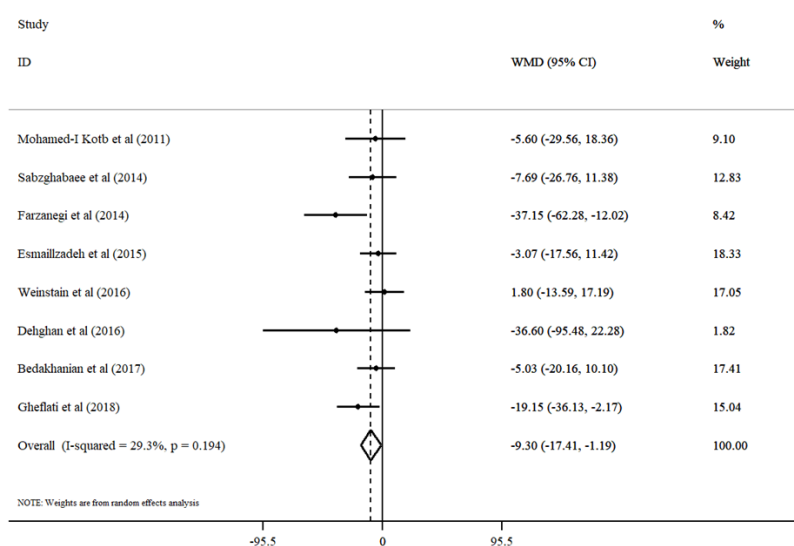

Figure 3. Forest plot of randomized controlled trials investigating the effects of purslane supplementation on total cholesterol levels.

was > 1.5 g/day (-8.26 mg/dL; 95% CI [-13.98, -2.54]; I^2: 22.48%, $P = 0.27$). This significant effect was not observed in the < 1.5 g/day subgroup (-2.02 mg/dL; 95% CI [-9.78, 5.74]; I^2: 0%, $P = 0.46$) (Table 3). When the studies were categorized based on gender, a significant reduction of LDL-C concentrations was found in female subgroup (-10.76 mg/dL; 95% CI [-18.67, -2.85]; I^2: 0%, $P = 0.71$). Neither both-gender (-5.66 mg/dL; 95% CI [-12.33, 1.00]; I^2: 39.74%, $P = 0.15$) nor male (-1.21 mg/dL; 95% CI [-15.50, 13.08]; I^2: -) subsets indicated a significant effect on LDL-C concentrations following purslane administration (Table 3).

Effect of purslane supplementation on HDL-C
Pooled analysis on eight trials (9, 24, 30-35) did not show any significant effect of purslane supplementation on HDL-C concentrations (WMD: 1.21mg/dL, 95% CI [-0.52, 2.93], $P = 0.17$; $I^2 = 0%$, $P = 0.659$) (Figure 5). Also,

subgroup analysis did not reveal any significant effects regarding the dose of purslane and participant gender (Table 3).

Publication bias and sensitivity analysis
To evaluate the impact of each study on the overall effect size, we removed each trial from the analysis. Sensitivity analysis indicated that the combined effect sizes of TG, TC, LDL-C, and HDL-C were not influenced significantly by any individual study. No evidence of publication bias was found in TG (Egger's test 95% CI [-1.46, 1.11]; $P = 0.75$; Supplementary file 1, Figure S1), TC (Egger's test 95% CI [-5.06, 0.73]; $P = 0.11$; Figure S2), LDL-C (Egger's test 95% CI [-2.30, 3.63]; $P = 0.71$; Figure S3), HDL-C (Egger's test 95% CI [-0.53, 2.41] $P = 0.17$; Figure S4).

Meta-regression
Meta-regression analysis of dose and duration of

Table 3. Subgroup analysis to assess the effect of purslane supplementation on lipid profiles

Outcomes	Subgroups		Studies	MD, 95% CI, *P* value	Subgroup heterogeneity
TG	Dose	>1.5 g/day	5	-24.68, [-41.62, -7.75], 0.004	I²: 0, *P*=0.98
		<1.5 g/day	3	-9.18, [-30.10, -11.73], 0.39	I²: 0, *P*=0.97
		Both	5	-18.83, [-34.26, -3.40], 0.01	I²: 0, *P*=0.96
	Gender	Male	1	-6.31, [-39.70, 27.08], 0.71	-
		Female	2	-33.06, [-71.56, 5.44], 0.09	I²: 0, *P*=0.76
TC	Dose	>1.5 g/day	5	-15.50, [-28.59, -2.40], 0.02	I²: 41.65%, *P*=0.14
		<1.5 g/day	3	-3.14, [-12.54, 6.25], 0.51	I²: 0, *P*=0.71
		Both	5	-6.15, [-13.83, 1.51], 0.11	I²: 0, *P*=0.48
	Gender	Male	1	-5.03, [-20.15, 10.09], 0.51	-
		Female	2	-37.03, [-60.18, -13.95], 0.002	I²: 0, *P*=0.98
LDL-C	Dose	>1.5 g/day	5	-8.26, [-13.98, -2.54], 0.005	I²: 22.48%, *P*=0.27
		<1.5 g/day	3	-2.02, [-9.78, 5.74], 0.61	I²: 0, *P*=0.46
		Both	5	-5.66, [-12.33, 1.00], 0.09	I²: 39.74%, *P*=0.15
	Gender	Male	1	-1.21, [-15.50, 13.08], 0.86	-
		Female	2	-10.76, [-18.67, -2.85], 0.008	I²: 0, *P*=0.71
HDL-C	Dose	>1.5 g/day	5	2.10, [4.40, -0.18], 0.072	I²: 0, *P*=0.52
		<1.5 g/day	3	0.04, [2.65, -2.56], 0.97	I²: 0, *P*=0.81
		Both	5	1.12, [3.04, -0.79], 0.25	I²: 11.43%, *P*=0.34
	Gender	Male	1	2.56, [12.19, -7.07], 0.60	-
		Female	2	4.19, [14.14, -5.76], 0.40	I²: 0, *P*=0.83

Abbreviations: TG, triacylglycerol; TC, total cholesterol; LDL-C, low-density lipoprotein cholesterol; HDL-C, high-density lipoprotein cholesterol.

intervention showed no significant changes in TG (Coefficient: -9.96, *P* = 0.846; Coefficient: -17.6, *P* = 0.841), TC (Coefficient: -1.53, *P* = 0.938; Coefficient: -32.2, *P* = 0.415), LDL-C (Coefficient: -5.95, *P* = 0.702; Coefficient: -12.89, *P* = 0.63), and HDL-C (Coefficient: 1.91, *P* = 0.694; Coefficient: -1.64, *P* = 0.849) levels, respectively.

Discussion

The results of the present systematic review and meta-analysis, including eight RCTs done on 444 patients, suggest that purslane supplementation can be effective in reducing the concentration of TG, TC, and LDL-C. However, no significant effect of purslane was observed on HDL-C. The results of the meta-regression analysis of dose and duration of intervention did not indicate any differences in TG, TC, LDL-C, and HDL-C. Subgroup analysis indicated that the favorable effect of purslane supplementation on TG, TC, and LDL-C was significant when the dose of purslane administration was > 1.5 g/day. Furthermore, purslane supplementation seemed to be more effective in reducing TC and LDL-C concentration in females than in males. However, these results should be interpreted carefully, because of the small number of studies in each subgroup based on gender. The reason that purslane was more effective in the female subgroup might be related to the phytosterol component and its synergic influence on female hormones (36).

Purslane is known as a natural product that is well-tolerated and also a safe complementary treatment (30). The recommended optimal dosage of purslane without any adverse effects is up to 30 g a day (37). The studies included in the present review did not report any adverse effects due to purslane consumption. However, there are some concerns about the high level of oxalic acid concentrations in purslane which can increase the risk of kidney stones (38). In addition, oxalic acid can interfere with some minerals such as calcium and iron (39).

The mechanisms by which purslane may have beneficial effects on lipid profiles are diverse. As mentioned above, several flavonoids were observed in purslane including quercetin, kaempferol, myricetin, apigenin, luteolin, genistein, and genistin (40) which may be related to the favorable effects in purslane (41,42). Also, the high omega-3 concentration in purslane may have effects on reducing TG (43,44), TC, and LDL-C (45). In addition, omega-3 improves hyperlipidemia by inhibiting the fatty acid synthase enzyme complex and acyltransferase (30). Besides, beta-sitosterol, another active purslane component, has previously been shown to lower cholesterol and LDL-C concentrations (46).

The beneficial effects of purslane are not limited to lipid control. Results of several studies have shown therapeutic effects including anti-inflammatory, antiscorbutic, antipyretic, and diuretic for purslane seeds and leaves (47). In addition, the potential antioxidant activity of purslane components can reduce oxidized LDL-C levels by reducing lipid peroxidation, through scavenging free
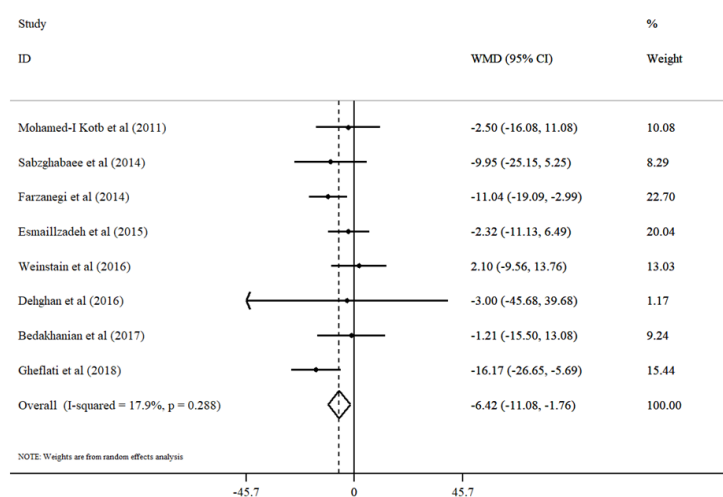
Figure 4. Forest plot of randomized controlled trials investigating the effects of purslane supplementation on low-density lipoprotein levels.
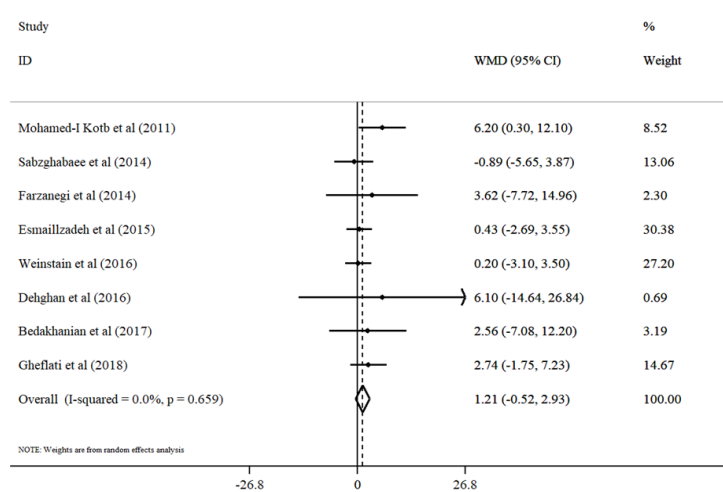

Figure 5. Forest plot of randomized controlled trials investigating the effects of purslane supplementation on high-density lipoprotein levels.

radicals (30).

The previous meta-analysis (18) including five RCTs and 300 patients, indicated a significant effect of purslane on TG (−19.16 mg/dL, 95% CI [−38.17, −0.15]; $I^2 = 0$%), which confirms our results (-18.55 mg/dL, 95% CI [-31.712, -5.388]). However, our study suggested favorable effects of purslane on TC and LDL-C, which was not indicated in the previous meta-analysis (18) (TC: (−6.46 mg/dL, 95% CI [−14.56, 1.65]), LDL-C: (−4.68 mg/dL, 95% CI [−9.61, 0.26]), for the previous study). Both studies indicated no significant effect on HDL-C. The difference between the results of our study and the previous meta-analysis is probably the number of included studies.

Our study has several limitations. There are some confounding variables including the baseline lipid profile, genetic background, and dietary context which affect the outcomes. Furthermore, the analytical tests were diverse among the included studies. Despite these limitations, the strength of our study compared to the previous meta-analysis is the inclusion of two more studies that affected the overall results. Additionally, we followed PRISMA guidelines to perform a comprehensive systematic review and to minimize the biases in the review process.

Results of this meta-analysis suggest that purslane supplementation may have beneficial effects on the lipid profile of patients. However, the effective dosage and potential adverse effects of purslane are still unclear. So the safety of purslane, particularly with higher doses, should be evaluated.

Conclusion

This systematic review and meta-analysis suggested that purslane supplements can improve lipid profile by lowering TG, TC, and LDL-C concentrations. However, no significant effect of purslane was observed on HDL-C. Further high-quality studies with various doses and durations are needed to confirm these results.

Conflict of Interests

The authors report no conflict of interest.

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None.

Supplementary Files

Supplementary file 1 contains Figures S1-S4.

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