REVIEW ARTICLE

The Effect of *Salvia Officinalis* on Hot Flashes in Postmenopausal Women: A Systematic Review and Meta-Analysis

Maryam Moradi[1], PhD; Vahid Ghavami[2], PhD; Azin Niazi[3], MS; Fatemeh Seraj Shirvan[3], PhD Condidate; Saye Rasa[4], MD

[1]Nursing and Midwifery Care Research Center, Mashhad University of Medical Sciences, Mashhad, Iran;
[2]Department of Biostatistics, School of Heath, Social Determinants of Health Research Center, Mashhad University of Medical Sciences, Mashhad, Iran;
[3]Department of Midwifery, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran;
[4]Department of Genaeral Practice, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

Corresponding Author:
Azin Niazi, MS; Department of Midwifery, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Ebne- Sina Street, Postal code: 91379-13199, Mashhad, Iran
Tel: +98 51 38591511; **Fax:** +98 51 38597313; **Email:** azin_niazi65@yahoo.com

ABSTRACT

Background: The experience of hot flashes during menopause has a negative effect on quality of life and can cause disturbance in the workplace and disrupt daily activities. Phytoestrogens in *Salvia officinalis* reduce menopause symptoms due to their anti-dopaminergic effects. This study was conducted to systematically review and summarize the results of clinical trials on the effect of *Salvia officinalis* on hot flashes in postmenopausal women.

Methods: In this systematic review, databases including Pubmed, Web of Science, Cochrane library, Scopus, SID, and Magiran were searched using keywords such as menopause, hot flashes, *Salvia officinalis*, and herbal medicines; all possible combinations of these words were used with the Boolean operators of "OR" and "AND". To evaluate the quality of articles, we used Cochrane's Risk of bias tools.

Results: After eliminating the duplicates, a total of 148 articles were found. Following the exclusion of irrelevant articles, 4 studies with number of 310 people were examined. Among them, 3 out of 4 studies examined the effect of *Salvia officinalis* on the frequency of hot flashes, 3 out of 4 studies examined the severity of hot flashes, and only 1 out of 4 studies examined the effect of *Salvia officinalis* on the duration of hot flashes. All 4 reviewed studies indicated that the use of *Salvia officinalis* reduced the frequency and severity of hot flashes in postmenopausal women. Meta-analysis results showed that the effect of *Salvia Officinalis* on the frequency [ES=-1.12 (%95 CI:-2.37; 0.14), I^2=71%] of hot flashes in postmenopausal women was significant compared to placebo, but severity [ES=-2.05 (%95 CI:-6.53; 2.43), I^2=70%] was not significant.

Conclusion: *Salvia officinalis* can be used to reduce the frequency of menopausal hot flashes. Expansive use of this plant can be suggested in case it is confirmed in further investigations.

Keywords: Hot flashes, Menopause, Postmenopausal*, Salvia officinalis*, Systematic review

Moradi M, Ghavami V, Niazi A, Seraj Shirvan F, Rasa S

Introduction

Menopause is caused by the cessation of follicle-stimulating hormone secretion and is defined as a 12-month interruption of menstruation for no other specific reason.[1, 2] More than 88% of women experience hot flashes during menopause. This symptom lasts for more than 5 years in 50% of women and more than 15 years in 10% of women.[3] In addition to disturbing women in the workplace and disrupting daily activities, hot flashes also affect a person's sleep, mood, concentration, communication with others, sexual activity, enjoyment of life, and quality of life.[4, 5] The treatment currently used to improve and reduce the symptoms of hot flashes is hormone therapy with estrogen and progesterone. Complications of hormone therapy at this age include the negative effect on lipids and lipase activity, increased risk of stroke, breast and endometrial cancer, thromboembolic disorders, liver problems, and alzheimer's disease.[6]

The lack of acceptance of hormone therapy, related to concerns about its safety, has led to the popularization of many alternative and complementary methods of treatment.[7] Alternative therapies are divided into two categories: pharmacological and herbal remedies.[8] The effects of non-hormonal drugs were less than those of estrogen, which caused the women to find drugs with lower side effects and lower costs.[9] Phytoestrogens, or plant estrogens, are non-steroidal plants with structural components including heterocyclics that have estrogenic properties but no estrogenic structure and can act on beta-estrogen receptors similar to 17-beta estradiol.[10-12] As herbal supplements are not strictly regulated like prescription drugs, the quality and safety may vary between brands or even between bundles of the same brand.[13] These compounds may also interact with prescription drugs, resulting in dangerous adverse events. Phytoestrogens in *Salvia officinalis* may reduce menopausal symptoms due to their mild anti-dopaminergic effect on the central nervous system and their effect on neurotransmitters.[13, 14]

Many studies have been published on the effects of phytoestrogens; however, there is still no consensus despite over two decades of research. The efficacy of *Salvia officinalis* remains controversial. Some research findings have indicated a significant decrease in the severity and frequency of hot flashes among menopausal women, while other studies have argued that the treatment of *Salvia officinalis* does not reduce the frequency of hot flashes.[15-21]

A Cochrane review evaluated the literature on phytoestrogens for treating vasomotor symptoms in menopausal women. The review included 43 randomized controlled trials with 4,364 participants. However, the review found that very few studies provided data suitable for meta-analysis, meaning that a conclusion on the efficacy of phytoestrogens could not be reached.[22] Several systematic reviews and meta-analyses have been conducted to evaluate the effects of different medicinal plants (including Humulus Lupulus, lavender, and evening primrose) on hot flashes, but the results of these studies have varied due to differences in methodologies and the lack of comprehensive meta-analyses.[23-25] Given that systematic reviews and meta-analyses attempt to collate all empirical evidence that meets predefined eligibility criteria to answer specific research questions, and given the lack of definitive conclusions about the effect of Salvia officinalis, the aim of this systematic review with meta-analysis was to systematically summarize and critically evaluate the effect of Salvia officinalis on hot flashes in postmenopausal women.

Methods and Materials

This study was performed based on the preferred reporting items for systematic reviews and meta-analysis (PRISMA) checklist for systematic reviews.[26] An intensive and regular search of English articles was conducted in Pubmed, Web of Science, Cochrane library, Scopus, SID, and Magiran databases as well as the reference lists

of the retrieved articles through hand searching between May 1990 and March 2023. Each database search was conducted based on the search strategy and keywords. An example of search strategy in PubMed database is shown in the Table 1.

The research question was determined based on the population/problem, intervention, comparison, and outcome (PICO) elements. Specifically, the question was: "In postmenopausal women aged 48 and 65 years, who have been menopaused for at least 12 months and experienced at least three hot flashes per 24 hours or intense hot flashes daily (P), does the daily use of yarrow at a dose between 100 and 280 (I), compared to an alternative or control intervention in the control group (C), reduce or prevent the risk of Salvia officinalis extract on the severity, frequency, and duration of hot flashes in postmenopausal women (O)?"

The main inclusion criteria for this structured review were randomized clinical trials which involved human participants, were published in Persian or English, and examined the effect of Salvia officinalis on hot flashes in postmenopausal women. Exclusion criteria included unrelated studies, duplicates, lack of full-text access, failure to meet the study purpose, unreported sample sizes, or reported results of interventions. The materials were analyzed and interpreted to determine the problem under study and collect the findings based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist.[26] To select the articles and extract data, all articles containing the desired keywords in the title or abstract were included in the study. Two researchers performed quality review and extraction of articles independently, with discrepancies resolved by a third researcher (project manager).

The initial review was based on the abstract, and irrelevant and duplicate articles were removed. To evaluate the quality of articles, we reviewed the studies for selection bias (random sequence generation and allocation concealment), implementation (blinding participants and evaluators), diagnosis (statistical analyst blinding), sample dropout (leaving the study after randomization), and reporting (selective outcome report). Cochran's Risk of Bias tool was used for this purpose.[27] The process of selecting articles and the reasons for their exclusion are shown in the flowchart (Figure 1). The study was approved by ethics committee of Mashhad University of Medical Sciences (ethical code: IR.MUMS.NURSE.REC.1400.058).

Statistical Analysis

Meta-analysis was performed using R software version 4.2.1 using meta and dmetar packages [28-30]. Since our interest outcomes (severity and frequency of hot flashes) were reported as mean and standard deviation at baseline and endpoint, we computed the effect size (D) and standard error (SED) as below: $Mean_{change}=Mean_{endpoint}–Mean_{baseline}$

Where represents the correlation coefficient which was assumed to be 0.5 in this study.

Random effect models were used to calculate overall summary estimates.

$$SD(change) = \sqrt{[SD(baseline)]^2 + [SD(endpoint)]^2 - 2*r*SD(basline)*SD(endpoint)}$$

Table 1: Strategy for systematic search of the published literature in PubMed database

| Search strategy	Result
("Menopause"[Mesh] OR "Postmenopause"[Mesh]) AND ("Hot Flashes/complications"[Majr] OR "Hot Flashes/diagnosis"[Majr]) OR "Vasomotor System"[Mesh]) AND ("Salvia officinalis/adverse effects"[Majr] OR "Salvia officinalis/drug effects"[Majr]) OR "Salvia officinalis"[Mesh]) AND ("Plant Extracts"[Mesh] OR "Plants, Medicinal"[Mesh]) AND ("Complementary Therapies"[Mesh] OR "Traditional Medicine Practitioners"[Mesh]) AND ("Randomized Controlled Trial" [Publication Type] OR "Randomized Controlled Trials as Topic"[Mesh] OR "Controlled Clinical Trial" [Publication Type]) OR "Random Allocation"[Mesh] AND 1990:2023[dp].	100
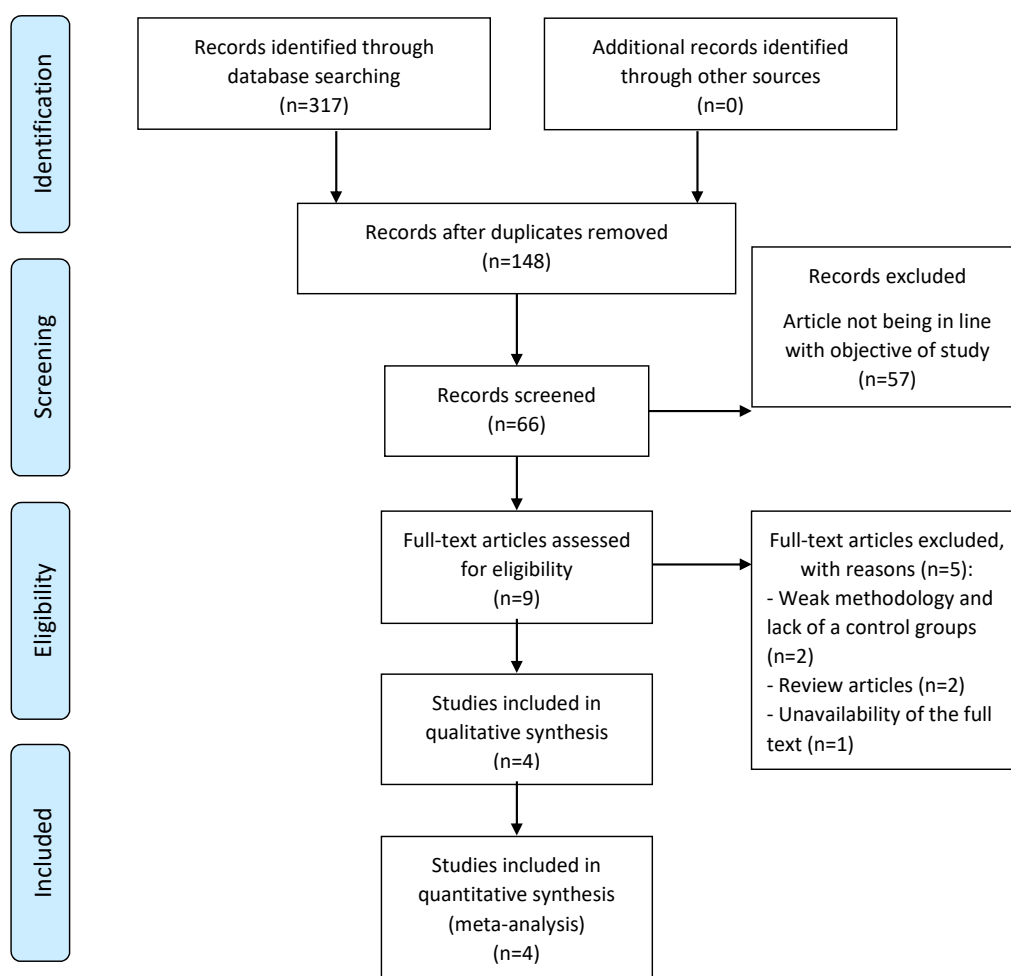
Figure 1: PRISMA Flowchart

Heterogeneity was quantified with the inconsistency index (I^2).[31] Due to the low number of studies, we could not assess publication bias using Egger's (4) and Begg's model.[32]

RESULTS

After the duplicates were removed from the initial search of 317 articles, a total of 148 articles were found. Then, 9 full-text articles were reviewed, of which two articles were excluded due to weak methodology and lack of a control groups;[17, 19] two article were excluded because they were review articles,[11, 22] and one article was excluded due to the unavailability of the full text.[33] Finally, 4 studies with a final number of 310 people were examined[15, 16, 18, 20] (Figure 1). Of these, 3 out of 4 studies examined the effect of *Salvia officinalis* on the frequency of hot flashes,[15, 16, 18] 3 out of 4 studies examined the effect of *Salvia officinalis* on the severity of hot flashes,[16,18, 20], and only 1 out of 4 studies examined the effect of *Salvia officinalis* on the duration of hot flashes.[16] The characteristics of the studies included in the systematic review study are given in Table 2. The lowest[18] and highest[15] sample sizes were 30 and 84 postmenopausal women with a mean age of 45 to 65 years, respectively. In studies, the daily dose of yarrow was between 100 and 280 mg, which is one capsule a day for 8 weeks,[15, 16] 1 capsule a day for 4 weeks,[20] and 3 times a day for 3 months[18] for the intervention group.

Different instruments were used to determine the effect of *Salvia officinalis* capsules on the frequency, severity, and duration of hot flashes in postmenopausal women. These instruments included the Menopausal Rating Scale,[18, 20] a frequency, duration, and severity registration form,[15, 16] and the Hot Flash Severity Score.[20]

Table 2: Characteristics of the studies included in the systematic review

Authors/ year	Place	Objective	Research units	Intervention group	Control group	Compli-cations	Tool	Results
Wilfried et al. 2021[20]	Germany	Evaluate efficacy and safety of fresh Salvia officinalis extract tablets in relieving typical symptoms in menopausal women	80 menopausal women from 48–65 years of age	Contained 280 mg thujone-free spissum extract of freshly harvested sage tips (Salvia off. Lamiaceae) 4 week	Placebo	Not mentioned	Menopausal rating scale [MRS], hot flash severity score [HFS] quantitative electroencephalography [qEEG]	The mean score of severity of flashing and night sweats a week before intervention (P=0.33) and from 2 weeks to 8 weeks after intervention (P=0.225) showed no significant difference; it was significant at 10 (P=0.003) and 12 (P≤0.001) weeks after the intervention, compared to the control group.
Zeidabadi et al. 2020[18]	Iran	Effect of Salvia officinalis extract on symptoms of flashing, night sweat, sleep disorders, and score of forgetfulness in postmenopausal women	Doubleblind randomized controlled clinical trial, 66 postmenopausal women complaining of menopausal symptoms	Intervention group received Salvia officinalis tablets (containing 100 mg S. officinalis extract), with a dose of three tablets a day for 3 months.	Placebo tablets with the same prescription order	Not mentioned	MRS (Menopause Rating Scale) and PSQI (Pittsburgh Sleep Quality Index) questionnaires were completed at the beginning and end of the study. The checklists of hot flash and night sweating	The mean score of flashing, palpitation, sleeping disorders, muscle and joint aches, depression, nervousness, anxiety, and sexual desire and satisfaction significantly decreased by 1.6, 0.4, 1.6, 2.1, 1.4, 1.2, 1.6, and 0.8 units, respectively, in the intervention group compared to the control group (P<0.001). Therefore, the mean score of PSQI (Pittsburgh Sleep Quality Index) significantly decreased by 3.8 units in the intervention group after the intervention [9.4±3.7 vs 5.6±1.9 (P<0.05)].
Sadeghi et al. 2012[15]	Iran	The effect of Sage extract on the number of hot flashes in postmenopausal women	Three-way controlled randomized clinical trial, 84 postmenopausal women aged 60-45 years with complaints of hot flashes	One capsule of 100 mg daily of Sage extract - One week before the intervention and for 8 weeks after the intervention	Placebo - with harmless combination of lactose, magnesium stearate, hydroxypropyl methylcellulose in the form of completely identical capsules	No side effects or laboratory abnormalities were observed during the study	Demographic information (including age, last menstrual age, number of children, education, economic status, employment status, marital status, and body mass index), hot flash count form (part of an FDA-approved general form) Newton et al. - Record form for reviewing stressful events, nutrition and exercise or the use of special drugs (self-made questionnaire of Nahidi et al.)	The mean number of hot flashes decreased in both groups, but this decrease was significantly more evident in the intervention group (Sage extract) (P=0.004).

Authors/year	Place	Objective	Research units	Intervention group	Control group	Complications	Tool	Results
Masoumi et al. 2019[16]	Iran	Comparison of the effect of sage and black cohosh on hot flashes in postmenopausal women	Clinical trial of two groups of 40 people	- Black number one daily -100 mg of sage daily For 8 weeks	The control group did not	No side effects or laboratory abnormalities were observed during the study	General information questionnaire and checklist for recording the number, duration and severity of hot flashes	Sage reduced the duration of clogging from the second week onwards (P<0.001), but the effect of black cohosh was not significant in other cases except in the third week. - In terms of severity, in the group of sage, the intensity decreased after the first week, (P<0.001), but in the group of black cohosh, the severity of hot flashes decreased from the 4th week. - In the sage group, the number of hot flashes changed in different weeks, but in the black cohosh, there was no noticeable change over time.

FDA: Food and Drug Administration

Across all reviewed studies, the results indicated the effectiveness of capsules containing *Salvia officinalis* extract on the severity, frequency, and duration of hot flashes in postmenopausal women.

The quality of the selected articles was systematically evaluated using Cochran's Risk of Bias tool. In terms of random sequence bias, four studies[15, 16, 18, 20] were considered to have low bias for assigning the individuals to control and intervention groups due to the use of random sequence generation software. In terms of allocation concealment bias, four studies were evaluated to have low bias due to the use of computer software.[15, 16, 18, 20] Regarding performance bias, two studies were performed using a double-blind method,[18, 20] and one study was conducted using a triple-blind method.[15] These studies were evaluated as having low bias in terms of performance bias. Blinding was not mentioned in one study.[16] In terms of sample dropout bias, participants were present in the study from randomization to analysis of the results in two studies,[15, 16] and two studies[18, 20] reported the frequency and cause of drop in research units. Thus, these studies were evaluated to have low bias in terms of sample dropout bias. In the review of reporting bias, all four published articles apparently contained all the expected consequences, so they were considered to have low bias. A summary of the risk of bias for each study is provided in Figures 2 and 3.

Meta-analysis results showed that the effect of *Salvia Officinalis* on the frequency [ES=-1.12 (%95 CI:-2.37; 0.14), I^2=71%] of hot flashes in postmenopausal women was significant compared to placebo (Figures 4), but on severity [ES=-2.05 (%95 CI:-6.53; 2.43), I^2=70%] it was not sigifant (Figures 5). Due to insufficient data, in which only 1 out of 4 studies examined the effect of *Salvia officinalis* on the duration of hot flashes, it was not possible to analyze the effect of Salvia officinalis on the duration of hot flash.
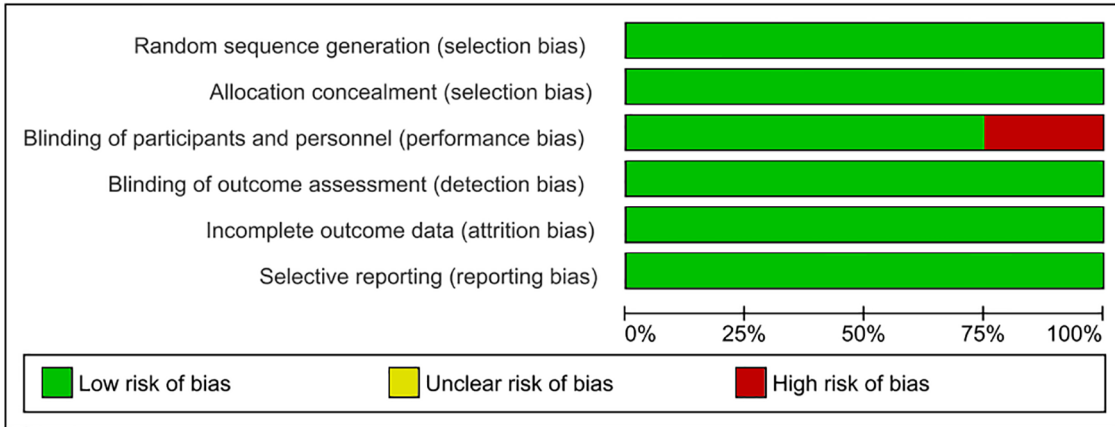
Figure 2: Risk of bias graph; review authors' judgements about each risk of bias item presented in percentages across all studies
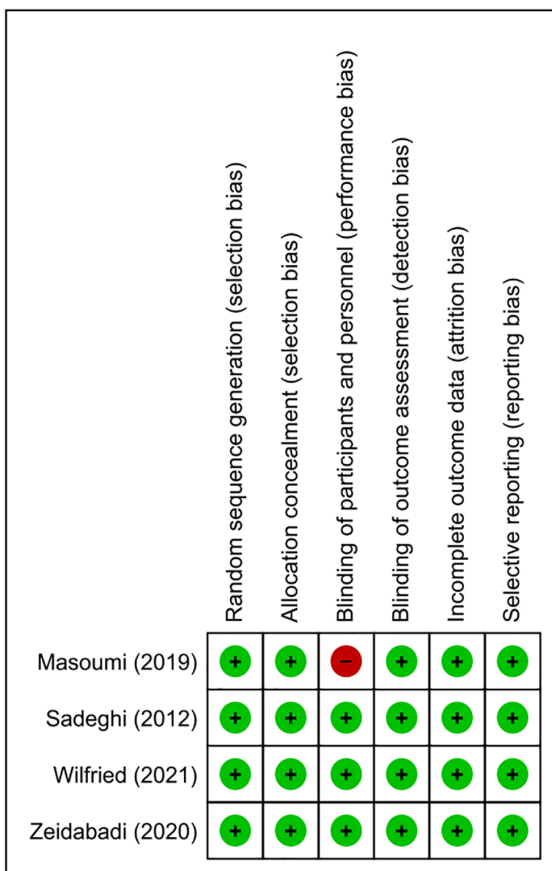

Figure 3: Risk of bias summary; review authors' judgements about each risk of bias item for each included study

Discussion

This systematic review included four studies to determine the effect of *Salvia officinalis* on hot flashes in postmenopausal women. The results showed the effectiveness of Salvia officinalis capsules on the frequency, severity, and duration of hot flashes; however, the meta-analysis results only showed the effect of *Salvia officinalis* on the frequency of hot flash. Some meta-analyses showed positive effects of phytoestrogens on the frequency of hot flashes.[34, 35] A meta-analysis of ten studies found that the phytoestrogen group had a significant reduction in hot flash frequency when compared to the placebo.[36] Although many studies have shown that phytoestrogens can reduce vasomotor symptoms of menopause, many others have not. A review and meta-analysis found little conclusive evidence on the effectiveness of phytoestrogens for treating vasomotor symptoms associated with menopause.[22]

Studies on the effect of *Salvia officinalis* on the frequency of hot flashes demonstrated the effectiveness of this plant. A study showed that daily consumption of one tablet containing
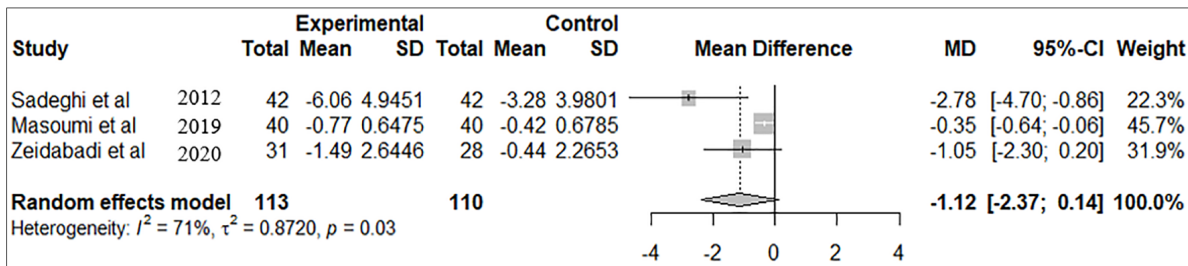

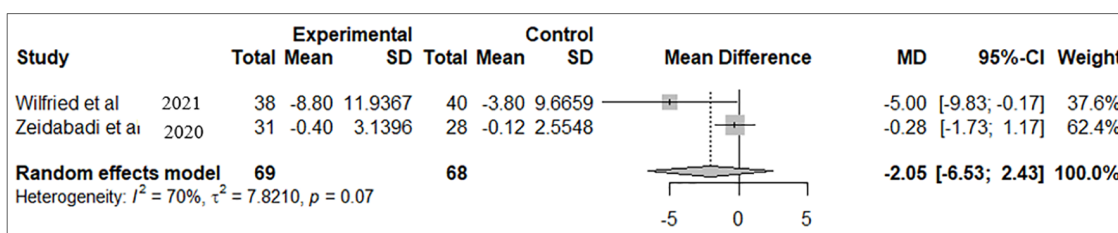**Figure 4:** Forest Plot of the Mean Difference Pooling for frequency of hot flashers

Figure 5: Forest Plot of the Mean Difference Pooling for severity of hot flashers

100 mg of *Salvia officinalis* extract for eight weeks reduced the frequency of hot flashes.[15] Another study found that the mean frequency of hot flashes decreased significantly after eight weeks of treatment. The mean frequency of hot flashes in the first and second weeks after taking the drug showed a statistically significant difference between the two groups of *Salvia officinalis* and black cohosh, but this difference was not significant from the third week onwards. However, considering the statistically significant difference in the frequency of hot flashes in the *Salvia officinalis* group before and eight weeks after the intervention, it can be concluded that *Salvia officinalis* has an effect on the frequency of hot flashes over time. 66% in the group of black cohosh and 70% in the group of *Salvia officinalis* were in the moderate group in terms of duration of hot flashes.[16]

As to the severity of hot flashes, a study found no statistically significant difference between the intervention and control groups two weeks and eight weeks after treatment. However, at 10 and 12 weeks after the intervention, this difference was significant.[20] In another study, taking three tablets a day containing 100 mg of *Salvia officinalis* extract for three months improved the symptoms of hot flashes, night sweats, sleep disorders, and forgetting scores of menopausal women. The results showed a significant difference with the control group only in week 12 of treatment.[18] In another study, taking three tablets a day containing 100 mg of Salvia officinalis extract from the first week onwards had a significant effect on reducing the severity of hot flashes.[16]

One of the strengths of this study is the quality assessment of the included articles using the Cochrane risk-of-bias tool. Overall, the studies had a suitable methodology, but the limited number of available trials and the small number of participants in some studies might have resulted in insufficient statistical power and limited the ability to draw definitive conclusions. Future research could consider dividing women into subgroups based on their circulating levels of estradiol and body mass index to further investigate the effect of phytoestrogens, which may depend on these factors.

CONCLUSION

Salvia officinalis can be used to reduce the frequency of menopausal hot flashes. Therefore, since it is non-invasive and is a herb, it is recommended that this plant should be used to reduce hot flashes. Expansive use of this plant can be suggested in case it is confirmed in further investigations.

ACKNOWLEDGMENT

Conflict of Interest: None declared.

REFERENCES

1 Burkman RT. Berek & Novak's Gynecology. JAMA. 2012;308:516-7.
2 Moghadam R, Ozgoli G, Molayi B, et al. Effect of omega3 on vasomotor

disorders in menopausal women. Journal of Arak University of Medical Sciences. 2012;15:116-26. [In Persian]

3 Speroff L, Fritz MA. Clinical Gynecologic Endocrinology and Infertility. 8th ed. USA: Lippincott Williams & Wilkins; 2011.

4 Freedman RR. Menopausal hot flashes: mechanisms, endocrinology, treatment. The Journal of Steroid Biochemistry and Molecular Biology. 2014;142:115-20.

5 Johns C, Seav SM, Dominick SA, et al. Informing hot flash treatment decisions for breast cancer survivors: a systematic review of randomized trials comparing active interventions. Breast Cancer Research and Treatment. 2016;156:415-26.

6 Cunningham FG, Leveno KJ, Bloom SL, et al. Obstetrícia de Williams. 25th ed. Australia: McGraw Hill Brasil; 2021.

7 Zare E, Nahidi F, Mojab F, Majd HA. The Effect of Pimpinella anisum on Treatment and Recurrence of Menopausal Hot Flashes: A Randomized, Controlled, Multicenter, Double-Blind, Parallel-Group Clinical Trial. Shiraz E-Medical Journal. 2022;23:e117385.

8 Hickey M, Elliott J, Davison SL. Hormone Replacement Therapy. BMJ. 2012;344:e763.

9 De Franciscis P, Conte A, Schiattarella A, et al. Non-hormonal treatments for menopausal symptoms and sleep disturbances: A comparison between purified pollen extracts and soy isoflavones. Current Pharmaceutical Design. 2020;26:4509-14.

10 Ciotta L, Stracquadanio M, Pagano I, et al. Clinical effects of treatment with phytoestrogens in postmenopausal women. Minerva Ginecologica. 2012;64:15-22.

11 Abdnezhad R, Simbar M. A review of the effective herbal medicines on hot flashes in menopausal women. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2020;23:107-19. [In Persian]

12 Mohammed HA, Eldeeb HM, Khan RA, et al. Sage, Salvia officinalis L., Constituents,

hepatoprotective activity, and cytotoxicity evaluations of the essential oils obtained from fresh and differently timed dried herbs: a comparative analysis. Molecules. 2021;26:5757.

13 Heydarpour S, Sharifipour F, Salari N. Effect of aromatherapy using Salvia officinalis on sleep quality of postmenopausal women. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2020;23:50-7. [In Persian]

14 Kim NC. Need for Pharmacopeial Quality Standards for Botanical Dietary Supplements and Herbal Medicines. Food Supplements and Biomaterials for Health. 2021;1:e10.

15 Sadeghi H, Bakhshi M, Behboodi Z, et al. Effect of sage extract on hot flashes in postmenopausal women. Complementary Medicine Journal. 2013;2:324-35. [In Persian]

16 Masoumi SZ, Shayan A, AhmadiNiya Tabesh R, et al. A comparative study on the effect of black cohosh and salvia on hot flashes in postmenopausal women. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2019;22:1-12. [In Persian]

17 Dadfar F, Bamdad K. The effect of Saliva officinalis extract on the menopausal symptoms in postmenopausal women: An RCT. International Journal of Reproductive BioMedicine. 2019;17:287-92.

18 Zeidabadi A, Yazdanpanahi Z, Dabbaghmanesh MH, et al. The effect of Salvia officinalis extract on symptoms of flashing, night sweat, sleep disorders, and score of forgetfulness in postmenopausal women. Journal of Family Medicine and Primary Care. 2020;9:1086-92.

19 Bommer S, Klein P, Suter A. First time proof of sage's tolerability and efficacy in menopausal women with hot flashes. Advances in Therapy. 2011;28:490-500.

20 Wilfried D, Nina CDG, Silvia B. Effectiveness of Menosan® Salvia officinalis in the treatment of a wide spectrum of menopausal complaints. A double-blind, randomized,

placebo-controlled, clinical trial. Heliyon. 2021;7:e05910.

21 Gallagher J. Salvia officinalis for menopausal hot flashes: a pilot study. Focus on Alternative and Complementary Therapies. 2002;7:92-3.

22 Lethaby A, Marjoribanks J, Kronenberg F, et al. Phytoestrogens for menopausal vasomotor symptoms. Cochrane Database of Systematic Reviews. 2013;2013:CD001395.

23 Salehi-Pourmehr H, Ostadrahimi A, Ebrahimpour-Mirzarezaei M, Farshbaf-Khalili A. Does aromatherapy with lavender affect physical and psychological symptoms of menopausal women? A systematic review and meta-analysis. Complementary Therapies in Clinical Practice. 2020;39:101150.

24 Mahboubi M. Evening primrose (Oenothera biennis) oil in management of female ailments. Journal of Menopausal Medicine. 2019;25:74-82.

25 Abdi F, Roozbeh N. The effects of Humulus lupulus L.) hops) on menopausal vasomotor symptoms: a systematic review and meta-analysis. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2016;19:9-17. [In Persian]

26 Sarkis-Onofre R, Catalá-López F, Aromataris E, Lockwood CS. How to properly use the PRISMA Statement. Systematic Reviews. 2021;10:117.

27 Higgins JPT, Thomas J, Chandler J, et al. Cochrane handbook for systematic reviews of interventions. 2nd ed. UK: John Wiley & Sons; 2019.

28 Harrer M, Cuijpers P, Furukawa T, Ebert DD. Doing Meta-Analysis with R: A Hands-On Guide. 1st ed. UK: Routledge (Taylor & Francis Group); 2022.

29 Schwarzer G, Carpenter J, Rücker G. Meta-Analysis with R. Switzerland: Springer International Publishing; 2015.

30 Higgins J, Tompson S, Deeks J, Altman D. Measuring inconsistency in meta-analyses. BMJ. 2003;327:557-60.

31 Egger M, Smith GD, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. BMJ. 1997;315:629-34.

32 Begg CB, Mazumdar M. Operating characteristics of a rank correlation test for publication bias. Biometrics. 1994;50:1088-101.

33 Ghorbani A, Esmaeilizadeh M. Pharmacological properties of Salvia officinalis and its components. Journal of Traditional and Complementary Medicine. 2017;7:433-40.

34 Franco OH, Chowdhury R, Troup J, et al. Use of plant-based therapies and menopausal symptoms: A systematic review and meta-analysis. JAMA. 2016;315:2554-63.

35 Chen MN, Lin CC, Liu CF. Efficacy of phytoestrogens for menopausal symptoms: a meta-analysis and systematic review. Climacteric. 2015;18:260-9.

36 Eden JA. Phytoestrogens for menopausal symptoms: a review. Maturitas. 2012;72:157-9.