



Effect of Soybean Powder Supplementation on Menopausal Symptom Severity among Postmenopausal Women: A Community-Based Quasi-Experimental Study

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Abstract:

Background

Menopausal symptoms can adversely affect quality of life and daily functioning among midlife women. Due to concerns regarding long-term hormone therapy, interest has increased in non-pharmacological and dietary approaches such as soy-based interventions, which contain phytoestrogens with estrogen-like activity.

Objective

To evaluate the effect of daily soybean powder supplementation on menopausal symptom severity in postmenopausal women.

Methods

A community-based quasi-experimental pretest–posttest study with a control group was conducted among 100 postmenopausal women aged 45–60 years in a rural area of South India. Participants were assigned to an experimental group (n = 50) that received 25 g of roasted soybean powder daily for six weeks or to a control group (n = 50) with no such intervention. Menopausal symptoms were measured using the Menopause Rating Scale (MRS) at baseline and six weeks later. Group differences in symptom severity distribution were analyzed using appropriate statistical tests at a significance level of $p < 0.05$.

Results

Baseline symptom severity was similar between the groups. At six weeks, the symptom severity distribution differed significantly between the groups ($p = 0.01$). The experimental group showed an increased proportion of women with mild symptoms and a reduction in severe and very severe symptoms, whereas the control group showed minimal change.

Conclusions

Soybean powder supplementation is associated with reduced menopausal symptom severity. Dietary soy may be a feasible complementary strategy for symptom management in community settings.



Introduction

Menopause is a universal biological transition marked by the permanent cessation of menstruation due to ovarian follicular depletion and declining estrogen levels (1). As life expectancy increases, women spend a substantial proportion of their lives in the postmenopausal phase, making menopause-related health concerns an important public health issue (2,3). By 2030, more than one billion women worldwide are expected to be postmenopausal, with a large proportion living in low- and middle-income countries (LMICs) (4).

The menopausal transition is associated with various symptoms that differ in frequency and severity (5). Vasomotor symptoms, including hot flashes and night sweats, are among the most common, while musculoskeletal pain, sleep disturbances, fatigue, mood changes, and urogenital complaints also contribute to a reduced quality of life (6–9). These symptoms can persist for years after menopause and may affect physical health, psychological well-being, social relationships and productivity (10). Despite their impact, menopausal symptoms are often under-recognized in community health programs, particularly in resource-constrained settings, where access to specialized care is limited.

Hormone replacement therapy (HRT) remains an effective treatment for vasomotor symptoms; however, concerns regarding long-term risks, such as cardiovascular events, thromboembolic disorders, and hormone-dependent cancers, have prompted interest in alternative and complementary approaches (11–13). Therefore, non-pharmacological strategies, especially dietary interventions, are being explored for symptom management.

Soybeans are a rich source of isoflavones, a class of phytoestrogens that are structurally similar to endogenous estrogens (1,14). Compounds such as genistein and daidzein can bind to estrogen receptors, particularly estrogen receptor- β , exerting mild estrogenic or antiestrogenic effects depending on hormonal status (15,16). Experimental and clinical evidence suggests that soy isoflavones may influence thermoregulation, vascular function, bone metabolism, and lipid profiles, which are relevant to the physiology of menopause (14,17). However, clinical findings have been inconsistent, likely due to variations in dosage, preparation type, study design, and population characteristics of the studies (18).

Most available research has focused on standardized isoflavone supplements rather than whole soy foods, which may be more feasible and culturally acceptable in

community settings than standardized supplements (19). Evidence from South Asian populations remains limited, despite differences in dietary habits, isoflavone metabolism, and healthcare access (20). Therefore, evaluating locally available food-based soy preparations is important for informing community-level women's health strategies. This study aimed to assess the effects of daily soybean powder supplementation on menopausal symptom severity among postmenopausal women in a community setting in South India.

Materials and Methods

Study Setting

A community-based quasi-experimental study with a pre-test–post-test control group design was conducted to evaluate the effects of soybean powder supplementation on menopausal symptom severity. The study was conducted in a rural area of South India.

Participants

Postmenopausal women aged 45–60 years residing in the study area were screened for their eligibility. Menopause was defined as the absence of menstruation for at least 12 months. Women were eligible if they had experienced natural menopause, understood the local language, and were willing to provide informed consent. Women currently receiving hormone therapy or those with severe chronic illnesses requiring intensive medical management were excluded from the study. A total of 100 eligible participants were recruited using convenience sampling; 50 were allocated to the experimental group and 50 to the control group.

Intervention

Participants in the experimental group received a daily dietary supplement consisting of 25 g roasted soybean powder mixed with 100 ml warm water and 5 g of jaggery. The participants were instructed on preparation and consumption and were advised to consume the mixture once daily for six consecutive weeks. Weekly follow-up visits were conducted to encourage adherence and address any concerns related to the supplements.

The participants in the control group continued their usual dietary practices and did not receive soybean supplementation during the study period.

Outcome Measure

Menopausal symptom severity was assessed using Heinemann's Menopause Rating Scale (MRS), a standardized instrument comprising 11 items covering the somatic, psychological, and urogenital domains. Each item is rated on a 5-point scale ranging from 0 (no symptoms) to 4 (very severe symptoms), with total



scores ranging from 0–44. Higher scores indicate greater severity of symptoms. Assessments were conducted at baseline and after six weeks.

Data Collection Procedure

Following informed consent, baseline demographic data and pre-test MRS scores were collected through structured face-to-face interviews. The intervention was initiated immediately after the baseline assessment in the experimental group. Post-intervention data collection was conducted at the end of six weeks using the same instruments and procedures for both groups to maintain consistency.

Ethical Considerations

Prior to data collection, the study setting's Institutional Ethics Committee granted ethical permission. All subjects provided written informed consent, and the study's confidentiality and anonymity were upheld.

Results

Table 1. Baseline sociodemographic characteristics of postmenopausal women in the control and experimental groups

Demographic Variable	Category	Control n (%)	Experimental n (%)
Age (years)	45–47	9 (18)	16 (32)
	48–50	14 (28)	13 (26)
	51–53	14 (28)	12 (24)
	54–56	13 (26)	9 (18)
Education	Illiterate	7 (14)	8 (16)
	Primary school	9 (18)	8 (16)
	Secondary school	5 (10)	8 (16)
	Higher secondary school	20 (40)	17 (34)
Occupation	Graduate	9 (18)	9 (18)
	Housewife	6 (12)	20 (40)
	Self-employed	16 (32)	12 (24)
	Coolie	9 (18)	4 (8)
	Private employee	12 (24)	8 (16)

	Government employee	7 (14)	6 (12)
Monthly family income (₹)	<5000	15 (30)	13 (26)
	5000–8000	18 (36)	11 (22)
	8000–10000	6 (12)	9 (18)
	10000–12000	11 (22)	17 (34)
Marital status	Married	43 (86)	46 (92)
	Widow	4 (8)	3 (6)
	Divorced	3 (6)	1 (2)
Type of family	Nuclear	16 (32)	22 (44)
	Joint	20 (40)	21 (42)
	Extended	14 (28)	7 (14)
Dietary pattern	Vegetarian	19 (38)	20 (40)
	Non-vegetarian	31 (62)	30 (60)
Medical illness	Yes	28 (56)	19 (38)
	No	22 (44)	31 (62)

A total of 100 postmenopausal women were included in the study, with 50 participants in the experimental group and 50 in the control group. The participants were aged between 45 and 60 years. Most women in both groups were married and belonged to nuclear or joint families. The educational levels ranged from no formal schooling to graduation. Occupational categories included homemakers, self-employed individuals, manual laborers, and private and government employees. Household income levels varied across participants, and both vegetarian and nonvegetarian dietary patterns were reported. Some participants in each group had pre-existing conditions. The baseline sociodemographic characteristics were similar between the two groups.



Menopausal Symptom Severity

Table 2. Comparison of menopausal symptom severity distribution in the experimental and control groups at baseline and six-week follow-up

Assessment Time	Severity Level	Control Group (n = 50) n (%)	Experimental Group (n = 50) n (%)	"p" Value
Baseline	Mild	10 (20)	8 (16)	0.89
	Moderate	20 (40)	18 (36)	
	Severe	14 (28)	18 (36)	
	Very severe	6 (12)	6 (12)	
Six weeks	Mild	9 (18)	12 (24)	0.01*
	Moderate	22 (44)	22 (44)	
	Severe	17 (34)	16 (32)	
	Very severe	2 (4)	0 (0)	

Chi-square test, * $p < 0.05$ considered statistically significant

At baseline, menopausal symptom severity assessed using the Menopause Rating Scale (MRS) showed similar distributions in both groups. In the control group, 20% of participants had mild symptoms, 40% moderate, 28% severe, and 12% very severe symptoms. In the experimental group, 16% had mild symptoms, 36% moderate, 36% severe, and 12% very severe symptoms. There was no statistically significant difference between groups at baseline ($p = 0.89$).

At six-week follow-up, the distribution of symptom severity differed between groups ($p = 0.01$). In the experimental group, the proportion of women with mild symptoms increased to 24%, and no participants remained in the very severe category. The proportion with severe symptoms decreased to 32%. In contrast, the control group showed minimal change, with 18% classified as mild, 44% moderate, 34% severe, and 4% very severe at follow-up.

Comparison of MRS score distributions

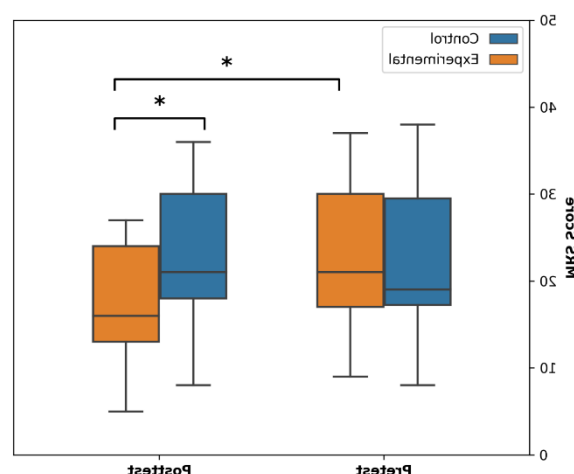


Figure 1. Distribution of Menopause Rating Scale (MRS) scores in control and experimental groups at pretest and posttest. Boxes represent the interquartile range (IQR), horizontal lines indicate medians, and whiskers denote range. Brackets with asterisks indicate statistically significant differences ($p < 0.05$) for the between-group comparison at posttest and the within-group change in the experimental group.

Discussion

This community-based quasi-experimental study assessed the effect of soybean powder supplementation on menopausal symptom severity in postmenopausal women in a rural South Indian setting. A statistically significant reduction in the Menopause Rating Scale (MRS) scores was observed in the intervention group after six weeks, while no significant change was observed in the control group. These findings suggest a potential association between dietary soybean intake and reduced menopausal symptom burden in women.

Soybeans are a rich source of isoflavones, which are plant-derived compounds that are structurally similar to endogenous estrogens (21). Isoflavones, such as genistein and daidzein, preferentially bind to estrogen receptor- β and may exert mild estrogenic or modulatory effects under conditions of estrogen deficiency (16,22,23). This biological activity has been proposed as a mechanism through which soy consumption may influence vasomotor symptoms and other menopause-related issues (24). The reduction in overall symptom scores observed in the present study is consistent with



this proposed pathway, although symptom-specific effects were not separately analysed.

Previous research on soy and menopausal symptoms has yielded mixed results. Variability across studies may be attributed to differences in isoflavone dose, duration of intervention, baseline dietary intake, preparation form (isolated supplements vs. whole soy foods), and participant characteristics (19,25–27). The present study contributes to this body of evidence by evaluating a whole-food soy preparation rather than a standardized extract, reflecting a more pragmatic dietary approach that is applicable in community settings.

The absence of significant changes in the control group suggests that the observed reduction in the intervention group was unlikely to be solely due to temporal variation. However, as the allocation was not randomized, potential confounding factors could not be excluded. Sociodemographic factors such as age, income, occupation, and comorbid illness were associated with post-intervention symptom levels, indicating that symptom experience and response to dietary intervention may be influenced by broader health and social determinants.

From a public health perspective, soybean powder is a low-cost, culturally acceptable, and easily administered dietary option. Such interventions may be particularly relevant in rural or resource-limited settings, where access to specialized menopausal care or pharmacologic therapy is limited. Community health nurses and primary care providers could potentially incorporate dietary education related to soy into broader women's health promotion strategies.

Implications for Future Research

Future studies using randomized controlled designs, longer follow-up periods, and detailed assessments of dietary intake are warranted. Evaluating symptom domains separately and incorporating objective biomarkers may further clarify the relationship between soy intake and menopausal health outcomes.

Conclusions

In this rural community sample, six weeks of soybean powder supplementation was associated with a reduction in menopausal symptom severity. These findings support further investigation of food-based soy interventions as complementary approaches for managing menopausal symptoms in community settings.

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