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Soy Juice Is Effective in Reducing Hot Flush Symptoms in Premenopausal Women

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Abstract

Hot flush occur in 73.3% of premenopausal women and are often accompanied by sleep disturbances and mood swings. This study aims to determine the effectiveness of soy milk in reducing hot flush symptoms in premenopausal women. The research method used a pre-experimental design with a one-group pretest-posttest design. The sample was selected using a purposive sampling technique with a total of 31 premenopausal women. Respondents' hot flush conditions were measured using the Hot Flush Range Scale (HFRS) questionnaire. The intervention given to respondents was 250 ml of soy milk. It was given twice daily, in the morning and afternoon, for 7 days. The study was conducted in Sleman Regency in July 2024. Data analysis used the Wilcoxon Signed-Ranks Test. The results showed that soy milk consumption had a significant effect on reducing hot flush symptoms with a significance value of 0.000 ($\rho<0.05$). Isoflavones in soy milk have biological activity resembling estrogen. It binds to estrogen receptors (ERs) as an agonist. This isoflavone activity stimulates the estrogen receptor Erα, influences the transcription process of neuronal cells in the central nervous system, and results in a reduction in hot flash symptoms. Thus, soy extract may be an alternative non-hormonal treatment for hot flash symptoms in premenopausal women.

Introduction

Menopause is characterized by vasomotor symptoms, including hot flashes, excessive sweating, and sometimes trembling and feeling cold, which appear suddenly and sometimes throughout the day or only at night. These symptoms are usually the most common and disturbing during menopause. Vasomotor symptoms begin to be complained of two years before the last menstrual period and peak one year after menopause occurs. Nearly 50% of women experience vasomotor symptoms for four years. The prevalence of hot flashes is highest in low-income countries (65.93%), followed by upper-middle-income countries (54.17%) and high-income countries (49.72%) (Fang *et al.*, 2024). Hot flashes are transient feelings of heat, sweating, flushing, anxiety, and shivering lasting for 1-5 minutes. This symptom is often experienced by women over 40. It is one of the most common symptoms of menopause among women, the primary cause of which is estrogen deficiency and abnormal hypothalamic thermoregulatory control problems that result in an abnormal vasodilatory response to small increases in core body temperature. Hot flashes can be managed with hormone replacement therapy, selective serotonin and norepinephrine reuptake inhibitors, in addition to lifestyle modifications (Bansal & Aggarwal, 2019).

Research reports that hot flashes impact sleep quality during the menopausal transition. This complaint often leads to insomnia and directly impacts mood and sleep disturbances, and vice versa. Anxiety and depression during the menopausal transition also potentially increase the risk of vasomotor symptoms and sleep disturbances (Zhou *et al.*, 2021). The impact of vasomotor symptoms on mood and quality of life can be significant and is often

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underestimated, leading to a decreased quality of life due to an increased risk of cardiovascular and metabolic diseases (Jones *et al.*, 2019), depression, and obesity, which exacerbates the negative effects of this condition (Llaneza, 2017).

Hormonal therapy is a conventional therapy that is effective in reducing vasomotor symptoms, including the frequency and severity of hot flashes, but increases the risk of breast cancer. Surveys show that many women prefer Complementary and Alternative Medicine (CAM) over conventional therapies. They perceive CAM as more natural and safe, has positive effects on maintaining general health, and has few or no side effects (Biglia *et al.*, 2019). Preliminary studies indicate that hot flashes occur in 73.3% of premenopausal women and are often accompanied by sleep disturbances and mood swings. Most women do not seek treatment for their symptoms due to limited knowledge of available treatment options. Based on this background, researchers are interested in analyzing the effect of soy extract on hot flash symptoms in premenopausal women.

Method

This study used a pre-experimental procedure with a one-group pretest-posttest design. The study respondents were perimenopausal women who met the inclusion criteria, namely, aged 40–49, were not allergic to soy protein, and did not have any specific health conditions that could affect the study results. The sampling technique used a purposive sampling method, with a total of 31 respondents. The intervention provided was the administration of soy milk twice a day (morning and evening) for 7 consecutive days. The soy milk was prepared without adding sugar, and 250 ml of soy milk contains 25 mg of isoflavones (Messina, 2016). Each day, the respondents received 50 mg of isoflavones. The researcher directly monitored the consumption of soy milk by the respondents to ensure compliance and consistency of treatment. Hot flush symptoms in respondents were measured using the Hot Flush Range Scale (HFRS) instrument (Hunter *et al.*, 2019). While other symptoms, such as somatic complaints, psychological complaints, and urogenital complaints, were measured using the Menopause Rating Scale (MRS) (Heinemann *et al.*, 2004). Measurements of hot flush complaints were carried out daily during the intervention period to monitor changes in symptom intensity cauTiously. Other complaints were measured before and after the intervention. The data obtained were analyzed using the Wilcoxon Signed-Ranks Test to compare the results before and after treatment. This study has received ethical approval from the Health Research Ethics Commission (KEPK) of Aisyiyah University Yogyakarta with registration number 3691/KEP-UNISA/V/2024. All research procedures were aligned with research ethics standards, including obtaining written consent from respondents before it began.

Results and Discussions

The results of the research and data analysis are presented in the following table:

Table 1. Frequency Distribution of Respondent Characteristics

No	Respondent Characteristics	Frequency (f)	Percentage (%)
1.	Mother Age		
	42	5	16,1
	43	1	3,2
	44	5	16,1
	45	3	9,7
	46	5	16,1
	47	4	12,9
	48	3	9,7
	49	5	16,1

No	Respondent Characteristics	Frequency (f)	Percentage (%)
2.	**Parity**		
	≥ 3	12	38,7
	≤ 2	19	61,3
3.	**History of Contraceptive Use**		
	None	5	16,1
	Non Hormonal	11	35,5
	Hormonal	15	48,4
4.	**Workout**		
	Yes	2	6,5
	No	29	93,5
5	Occupation		
	Not work	21	67,7
	Work	10	23,3
6	Body Mass Index (BMI)		
	Ideal	26	84%
	Overweight	5	16%
7	Age at First Marriage		
	< 20 years old	8	25,8%
	≥ 20 years old	23	74,2%

Source: Primary Data, 2024

Based on Table 1, the majority of respondents were 42, 44, 46, and 49 years old, with 5 respondents (16.1%) representing each age group. Menopause often occurs at a median age of 48 years, with an increase in the average age of menopause with increasing parity. The median age of menopause is 3 years earlier in nulliparous women compared to women with four or more births (Sun *et al.*, 2020). Hasil studi menunjukkan bahwa usia yang lebih tua meningkatkan keluhan hot flush yang dirasakan (Gallicchio *et al.*, 2015). Of the 31 respondents, the majority (61.3%) (19 respondents) had a parity of ≤ 2, and the remaining 12 respondents (38.7%) had a parity of ≥ 3. The risk of moderate and severe menopausal syndrome increases in women with ≥ 3 births; Nulliparous women have a higher risk of severe menopausal syndrome compared to those who have had 1 or 2 births (Sun *et al.*, 2020).

Based on contraceptive history, the majority of respondents used hormonal contraception, 15 respondents (48.4%). Some hormonal contraceptive users experienced milder hot flashes (Gallicchio *et al.*, 2015) especially contraceptives containing a combination of estrogen and progesterone (Grandi *et al.*, 2022). The study results showed that physical activity was not significantly associated with hot flashes (Gallicchio *et al.*, 2015). These results differ from the results of a systematic review that reported that exercise can potentially increase the severity of vasomotor symptoms in menopausal women. Although there was a significant increase in vasomotor symptom severity after exercise compared with a control group that did not receive treatment, the certainty of the evidence for this finding is very low (Liu *et al.*, 2022).

Other studies found that physical activity and exercise can reduce the risk of hot flush. Effective types of exercise include aerobics (Witkowski *et al.*, 2024) and yoga, which significantly affect the physical domain of quality of life in perimenopausal women (Marni & Husna, 2023). Physically active women have experienced fewer hot flush. Physical activity can minimize menopausal symptoms, including hot flush. It is related to a sense

Table 2. Average Hot Flush Symptoms Before and After Intervention

Hot Flush Symptoms	Mean	SD	Minimum-Maximum	N	*p value*
Before *(Pre-Test)*	7,84	1,06	6-10	31	0,000
After *(Post-Test)*	2,45	1,12	1-5	31	

Source: Primary Data, 2024

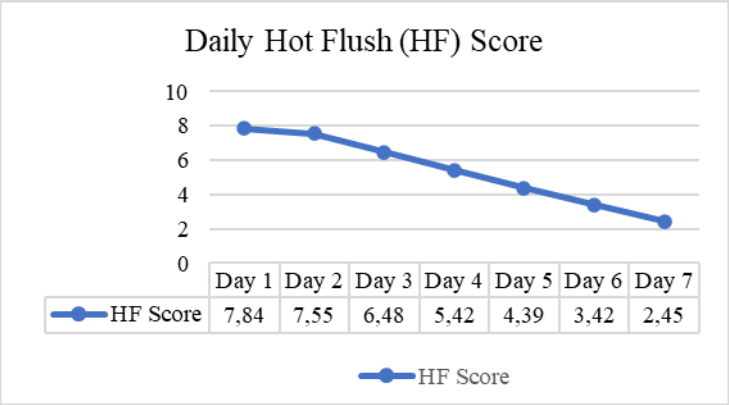

Image 1 Daily Hot Flush Score

of comfort and affects well-being. Physical activity has an indirect effect on psychosomatic factors (Asiamah *et al.*, 2024). A previous study reported that moderate physical activity effectively reduced psychosocial and physical menopause in perimenopausal women in Korea. Thereby improving quality of life by improving menopausal symptoms, although it did not directly affect vasomotor symptoms such as hot flush and sexual problems (M. J. Kim *et al.*, 2014). Perimenopausal women who exercise regularly can improve thermoregulation. It results in active vasodilation and sweating. After exercise, the body produces a more efficient heat dissipation response and increases the body's cooling capacity (Witkowski *et al.*, 2024).

Based on Table 2, before the intervention, the average hot flush symptoms were 7.84, with a minimum level of 6 and a maximum of 10. Furthermore, after the intervention, the average hot flush symptoms decreased to 2.45 with a minimum level of 1 and a maximum of 5. The results of the analysis with the Wilcoxon test showed that there was an effect of giving soy milk on reducing hot flush symptoms in premenopausal mothers with a ρ value of 0.000. So respondents experienced a decrease in hot flush symptoms after consuming soy milk. Based on the results of the Wilcoxon Signed Ranks Test statistic, a ρ value of 0.000 (ρ <0.05) was obtained, showing a significant difference in hot flush symptoms in premenopausal mothers before and after the intervention. Statistically, soy milk has been proven to decrease hot flush symptoms in premenopausal women. Hot flush can be reduced with natural hormone replacement therapy, such as consuming foods rich in phytoestrogens that can increase the production of the hormone estrogen. Foods rich in phytoestrogens include soybean products such as tofu, tempeh, tauco, and soy milk. Isoflavones, one of the important components contained in soy milk, are very helpful in alleviating various symptoms during premenopause and have positive effects on health, used as an alternative therapy for hormonal disorders such as breast and prostate cancer, cardiovascular disease, and osteoporosis (Gómez-Zorita *et al.*, 2020) Although the use of phytoestrogens has side effects on the gastrointestinal system that increase moderately, it does not increase the risk of endometrial cancer or breast cancer as does hormone therapy (Lethaby *et al.*, 2013).

Based on Figure 1, on the first day before being given soy milk, the hot flush score was 7.84, with each day's hot flush decreasing until the 7th day, reaching 2.45. During premenopause, estrogen levels reduce, while norepinephrine levels increase. This leads to increased regulation of serotonin receptors in the hypothalamus, which plays a role in temperature regulation. Decreased

estrogen can affect central alpha-2 receptors, resulting in high central norepinephrine levels. Activation of these noradrenergic and serotonin pathways narrows the upper threshold of the thermoregulatory zone, increasing the likelihood of experiencing hot flush (Morrow *et al.*, 2011). In this study, respondents received a daily intake of approximately 50 mg of phytoestrogen, and with this intake, hot flush complaints decreased daily. Women in Asia experience fewer hot flush complaints than women elsewhere. It is because they regularly consume foods containing 40-80 mg of phytoestrogen per day (Ahmadieh & Jradi, 2021).

In this study, daily soy milk contained large amounts of the isoflavones genistein and daidzein, which can produce estrogen-like effects, functioning estrogenically or anti-estrogenically in humans (Johnson *et al.*, 2019). Consuming isoflavones can help balance estrogen levels in the body and reduce premenopausal symptoms such as hot flush (Mirzavalievich & Abduxolikovich, 2023). Isoflavones are natural compounds with biological activity similar to estrogen and bind to estrogen receptors (ERs) in the cell's nuclear membrane to function as agonists or antagonists. These compounds have a high binding affinity for ERs, particularly ERα and ERβ. This interaction influences cell transcription processes, resulting in stimulation of neurons in the central nervous system and resulting in a reduction in hot flush symptoms (Kang *et al.*, 2022).

Soybeans are a plant that contains isoflavones, and they can be processed into soy milk drinks. Isoflavones are widely used to prevent and treat various women's health problems, particularly premenopausal discomfort (Chalkidou *et al.*, 2023). Soybean isoflavones may be a safer solution during premenopause. Increased health risks during premenopause can be managed by consuming soy products (Khalid, 2020). Isoflavones play a role in regulating the effects of estrogen in the body, depending on the situation. When estrogen levels are insufficient, isoflavones act as agonists and perform estrogen-like functions. Conversely, when estrogen levels are excessive, isoflavones act as antagonists. Isoflavones block estrogen receptors that bind estrogen. Specifically, estrogen antagonist activity is vital in the breast, endometrium, and prostate, suppressing the development of cancer (I.-S. Kim, 2021). A meta-analysis recommends using isoflavones as an alternative intervention that can reduce hot flush by up to

Table 3. Menopausal Symptom Scores (Somatic, Psychological and Urogenital Scales) Before and After Intervention

Menopausal Symptom	Before Intervention		Menopausal Symptom	After Intervention	
	Score	Percentage		Score	Percentage
1. Somatic Subscale			1. Somatic Subscale		
a. Medium	1	3,2%	a. No Symptom	17	54,8%
b. Severe	30	96,8%	b. Light	11	45,2%
Total	31	100%	Total	31	100%
2. Psychological Subscale			2. Psychological Subscale		
a. Medium	9	29%	a. No Symptom	26	83,8%
b. Severe	22	71%	b. Light	5	16,2%
Total	31	100%	Total	31	100%
3. Urogenital Subscale			3. Urogenital Subscale		
a. No Symptom	31	100%	No Symptom	31	100%
4. Total Score			4. Total Score		
a. Medium	3	9,7%	a. Very Light	23	74,2%
b. Severe	28	90,3%	b. Light	8	25,8%

Source: Primary Data Juli, 2024

50%. This therapy is easier and more affordable than hormonal therapy (Taku *et al.*, 2012).

The results of this study found that the majority of respondents experienced severe somatic problems (96.8%), and 71% experienced psychological problems. After a 7-day intervention, with a total of 14 doses of soy extract, there was a decrease in somatic symptoms, with the majority experiencing no symptoms (54.8%). A similar decrease also occurred in psychological problems, from 71% in the severe category to 83.8% experiencing no symptoms. This proves that isoflavone administration in perimenopausal women not only reduces hot flush (somatic symptoms) but also reduces psychological symptoms. This is in line with previous studies that reported that postmenopausal women experience somatic and vasomotor symptoms less frequently than perimenopausal women. This condition is influenced by the level of depression experienced. The frequency of vasomotor and somatic symptoms increases with the severity of depression. Depressive symptoms are more common in the premenopausal phase, while the decrease in symptoms in postmenopause correlates with a reduction in reports of vasomotor and somatic symptoms. However, the relationship between depressive and vasomotor symptoms remains unclear, whether they are caused by physiological, psychological, and social mechanisms. Depression is a major contributor to poorer quality of life and health-limiting conditions, such as cardiovascular disease (Borkoles *et al.*, 2015). Soy isoflavone supplementation can be used as an adjunct therapy to help alleviate depressive symptoms associated with menopause. Research (Ahsan & Mallick, 2017) reported that nearly 90% of perimenopausal women reported a 30% reduction in symptoms of severe to very severe fatigue, a decrease in hot flush, improved depressive symptoms, and an improvement in libido. However, soy isoflavones did not affect urogenital symptoms and vaginal dryness index

Conclusion

Regularly consuming soy milk can help increase phytoestrogen levels in premenopausal women. This increase in phytoestrogen levels plays a key role in reducing the hot flashes that often occur during perimenopause. Phytoestrogens, particularly the isoflavones found in soy, work by mimicking the effects of estrogen in the body, thereby helping reduce symptoms associated with the decline in natural estrogen levels in women entering menopause. This study suggests that regular soy milk consumption may be an effective alternative for managing hot flash symptoms in premenopausal women, thereby improving quality of life during perimenopause

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