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The Effect of Date Fruit (*Phoenix dactylifera* L.) Consumption on Autonomic Nerve Function and Hot Flash Manifestations in Menopausal Women

Winda Maulinasari Nasution[1*], Siti Maryam Hasibuan[1], Lanny Apriani[1]
[1] Midwifery Department, STIKes Widya Husada Medan, Indonesia
*Corresponding author: windamaulinasarinasution@gmail.com

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ABSTRACT

Menopause is a natural phase in a woman's life marked by decreased estrogen levels and symptoms such as hot flashes, which are linked to autonomic nervous system dysfunction. Hot flashes cause sudden heat sensations, sweating, flushing, and palpitations that can disrupt daily life. Date fruit is rich in antioxidants and phytoestrogens, making it a potential non-hormonal alternative to alleviate menopausal symptoms. This study aimed to analyze the effect of date fruit consumption on autonomic nerve function and hot flash manifestations in menopausal women. A quasi-experimental pretest–posttest control group design was used, involving menopausal women aged 45–60 years experiencing hot flashes at Midwife Hj. Dewi Sesmera's Clinic, Medan City, North Sumatra. Participants were selected using purposive sampling. The intervention group consumed 50 grams of date fruit daily for eight weeks. Data were collected through questionnaires, interviews, and documentation. Autonomic nerve function was measured using the COMPASS-31 (Composite Autonomic Symptom Score-31), and hot flash frequency and intensity were assessed with the Menopause Rating Scale (MRS). Statistical analysis employed a paired t-test ($p < 0.05$) using SPSS version 24. Results showed that while improvement in autonomic nerve function was not statistically significant, the frequency and intensity of hot flashes significantly decreased in the intervention group.

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Introduction

Menopause is a natural physiological phase in a woman's life, characterized by the permanent cessation of the menstrual cycle due to a decline in estrogen production. This period typically occurs between the ages of 45 and 55 and is often accompanied by various physical and psychological symptoms that can affect women's quality of life (Soules et al., 2001). One of the most common symptoms is hot flashes, which are sudden sensations of heat occurring primarily on the face, neck, and chest, often accompanied by excessive sweating and skin flushing. These episodes can last from a few seconds to several minutes and vary in frequency among individuals (Freedman, 2005).

Hot flashes are closely associated with changes in the autonomic nervous system (ANS), which regulates essential bodily

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functions such as heart rate, blood pressure, and thermoregulation (Thurston et al., 2010). During menopause, the decline in estrogen levels leads to thermoregulatory dysfunction, triggering hot flashes. Variability in ANS function plays a crucial role in the body's ability to respond to stress and environmental changes; a reduction in this variability during menopause may contribute to increased frequency and intensity of hot flashes (Maki & Thurston, 2020).

Hormone replacement therapy (HRT) is commonly used to manage menopausal symptoms, but it carries potential risks, including increased chances of breast cancer and cardiovascular disease (Rossouw et al., 2002). Consequently, many women seek natural and safer alternatives, such as consuming foods rich in phytoestrogens—plant-derived compounds that mimic the structure and function of estrogen. Phytoestrogens are known to help balance hormone levels and alleviate menopausal symptoms, including hot flashes (Messina, 2014).

Dates (Phoenix dactylifera) are nutrient-rich fruits traditionally consumed in various cultures, particularly in the Middle East and South Asia. Research indicates that dates contain phytoestrogen compounds capable of modulating estrogen levels in the body (Al-Farsi et al., 2005). Additionally, dates are abundant in antioxidants, vitamins, and minerals that support overall health. However, studies investigating the effects of date consumption on ANS variability and hot flash manifestations in menopausal women remain limited (Karalis et al., 2023).

Previous studies have shown that phytoestrogen-rich foods such as soy and flaxseed can help reduce hot flashes in menopausal women (Li et al., 2021). Isoflavones in soy are known to stimulate estrogen receptors, helping regulate body temperature and minimize excessive heat release. Furthermore, research on Ajwa dates (Phoenix dactylifera) demonstrated significant reductions in systolic and diastolic blood pressure following regular date consumption. Although this study did not specifically examine hot flashes or ANS variability, the results suggest that dates may influence cardiovascular function, which is closely linked to autonomic regulation (Mulyadi et al., 2023).

Beyond their role in mitigating menopausal symptoms, dates may also provide cardiovascular benefits that are closely related to ANS function. The high fiber content in dates helps maintain stable blood glucose and lipid profiles, thereby reducing the risk of heart disease and hypertension in menopausal women (Tan et al., 2023). Moreover, dates are rich in antioxidants such as flavonoids, carotenoids, and phenolic compounds, which reduce oxidative stress and systemic inflammation—factors known to contribute to ANS dysfunction (Baliga, 2011). Thus, date consumption may not only help decrease the frequency of hot flashes but also provide additional protection against chronic diseases commonly associated with postmenopausal aging.

In addition to physiological benefits, date consumption may also enhance psychological well-being in menopausal women. Stress and anxiety often increase during menopause due to hormonal fluctuations that affect neurotransmitter regulation in the brain (Freeman, 2010). Several studies have shown that diets rich in nutrients such as magnesium and vitamin B6, both present in dates, can help stabilize mood and improve sleep quality (Rondanelli et al., 2018).

Therefore, this study not only focuses on the effects of date consumption on autonomic nerve function and hot flash manifestations, but also considers its potential impact on the emotional well-being of menopausal women. It is expected that the findings will contribute to the development of natural and safe strategies for managing menopausal symptoms and improving the overall quality of life for women in this stage.

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Materials and Methods

Research Design

This study employed a quasi-experimental design with a pretest–posttest approach. This method was selected to compare changes in autonomic nerve function and the frequency of hot flashes before and after the intervention (date fruit consumption).

Population and Sample

The study population consisted of menopausal women aged 45–60 years who experienced hot flashes and were not undergoing hormone replacement therapy (HRT). Participants were recruited from Midwife Clinic Hj. Dewi Sesmera, located in Medan City, North Sumatra, during May–June 2025.

The sample was selected using purposive sampling with the following inclusion criteria:

- Women experiencing natural menopause (not due to medical intervention)
- Having moderate to severe hot flashes

Exclusion criteria included:

- Presence of chronic diseases that may affect autonomic nervous system function (e.g., uncontrolled diabetes or cardiovascular disease)
- Consumption of phytoestrogen or antioxidant supplements within the past month
- Allergy to dates
- Use of medications that influence autonomic nervous system activity (e.g., beta-blockers or antidepressants)
- Smoking or heavy alcohol consumption

Intervention Procedure

- Duration of Intervention: 50 grams of dates consumed daily for 8 weeks.
- Effectiveness Measurement:
  - Autonomic nerve function: measured using the COMPASS-31 (Composite Autonomic Symptom Score-31) questionnaire.
  - Frequency and intensity of hot flashes: assessed using the Menopause Rating Scale (MRS).

Research Procedure

- Participant Selection Stage:
  Eligible participants were provided with informed consent prior to the start of the study.
- Baseline Measurement (Pretest):
  Autonomic nerve function (COMPASS-31) and hot flash severity (MRS) were assessed before the intervention.
- Final Measurement (Posttest):
  After 8 weeks of intervention, the same measurements were repeated to evaluate changes in autonomic function and hot flash symptoms.

Data Analysis Techniques

Data were analyzed using parametric statistical tests, specifically the paired t-test to compare pretest and posttest values within the same group. If the data were not normally distributed, non-parametric tests such as Wilcoxon or Mann–Whitney tests were used. A p-value < 0.05 was considered statistically significant. Statistical analysis was performed using SPSS version 24.

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Research Ethics

This study received ethical approval from the appropriate institutional ethics committee.

All participants provided written informed consent before participation. Participant confidentiality was strictly maintained, and they retained the right to withdraw at any time without any consequences.

Results and Discussion

Based on the conducted research, the following results were obtained:

Table 1. Analysis Results of the Effect of Date Consumption on Autonomic Nerve Function

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Autonomic Nerve Function	Equal variances assumed	1.147	.292	1.468	32	.152	8.35294	5.69116	-3.24	19.95

The analysis using the Independent Samples Test showed that, based on Levene's Test for Equality of Variances, the F value was 1.147 with a significance of 0.292 ($p > 0.05$), indicating that the variances of the two groups were homogeneous. The mean difference test yielded a t value of 1.468 with 32 degrees of freedom (df) and a significance of 0.152 ($p > 0.05$). This indicates that there was no significant difference between the control group and the intervention group in post-test autonomic nervous system function scores. Although the mean score of the intervention group was higher by 8.35 points compared to the control group, this difference was not statistically significant, as evidenced by the 95% confidence interval (-3.24 to 19.95), which included zero. Therefore, the intervention administered did not demonstrate a meaningful effect on autonomic nervous system function at the post-test stage.

Based on these results, although the average autonomic nervous system function score in the intervention group was higher than that of the control group, the difference was not statistically significant. This aligns with recent studies showing that the effect of interventions on the autonomic nervous system is highly influenced by the type, intensity, and duration of the intervention. For example, von Känel et al. (2024) reported that an eight-week Mindfulness-Based Stress Reduction (MBSR) program reduced sympathetic nerve reactivity to mental stress in patients with chronic kidney disease, as evidenced by decreased muscle sympathetic nerve activity (MSNA). Similar results were observed in a

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study by Fenske et al. (2024), which found that 14 days of heart rate variability (HRV) biofeedback therapy improved heart rate variability (SDNN and HF), indicating increased parasympathetic activity and positively influencing motor function recovery in patients with critical neuropathy.

Additionally, Wang et al. (2025) demonstrated that non-invasive vagus nerve stimulation (t-VNS) combined with physiotherapy significantly increased HRV, lowered average heart rate, and improved pain perception in patients with chronic neck pain compared to the control group. Even other approaches, such as acupuncture, have been shown to enhance autonomic nervous system function in patients with postprandial distress syndrome, as reported by Liu et al. (2024).

Thus, although the present study did not show a statistically significant difference, current theory and empirical evidence support that structured interventions of sufficient intensity have the potential to positively affect autonomic nervous system function by increasing parasympathetic tone and reducing sympathetic activity.

Table 2. Analysis Results of the Effect of Date Fruit Consumption on Hot Flashes

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Hot Flashes	Equal variances assumed	6.521	.016	2.558	32	.015	.52941	.20693	.10791	.95091
	Equal variances not assumed			2.558	28.445	.016	.52941	.20693	.10583	.95299

The analysis using the Independent Samples Test on the hot flashes variable showed that, based on Levene's Test for Equality of Variances, the F value was 6.521 with a significance of 0.016 ($p < 0.05$), indicating that the variances between groups were not homogeneous. Therefore, the interpretation of the mean difference test was based on the "Equal variances not assumed" row. The t-test yielded a t value of 2.558 with 28.445 degrees of freedom (df) and a significance of 0.016 ($p < 0.05$). These results indicate a significant difference between the intervention and control groups in post-test hot flashes scores. The mean score of hot flashes in the intervention group was 0.53 points lower than that of the control group, with a 95% confidence interval (0.106–0.953) that did not include zero. Thus, the intervention administered was proven effective in reducing hot flashes complaints among the respondents.

Based on this analysis, these findings are consistent with several modern theories and empirical findings regarding the mechanisms and management strategies for vasomotor symptoms (VMS).

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Theoretically, hot flashes are believed to result from thermoregulatory dysfunction in the hypothalamus, which becomes hyperactive due to decreased estrogen; this shifts and narrows the body's thermoneutral zone, leading to increased sympathetic activity that triggers intense hot flashes (Kadakia et al., 2012). Various interventions have been designed to reduce sympathetic activity through non-hormonal approaches and lifestyle modifications. For example, an app-based intervention delivering hypnotherapy (Evia app) significantly reduced the daily frequency of hot flashes, with an average reduction of 61.4% in the hot flashes & night sweats group and 45.2% in the daytime-only hot flashes group, showing large clinical effects (Cohen's d = 1.28 and 0.82; $p < 0.001$) (Elkins et al., 2025).

Pharmacologically, dual neurokinin receptor antagonists such as elinzanetant have been shown in phase III trials (OASIS 1 & 2) to significantly reduce the frequency and severity of VMS compared to placebo over 12 weeks ($p < 0.0001$), while also improving sleep disturbances and quality of life during menopause, with a favorable safety profile (Sobral et al., 2025; Trigg et al., 2024). Other studies also support the effectiveness of elinzanetant in reducing VMS in postmenopausal women (Elkins et al., 2025).

Thus, the present finding that date fruit (Phoenix dactylifera L.) intervention can significantly reduce hot flashes is reinforced by thermoregulatory theory involving sympathetic activity and by recent empirical research—both psychological app-based interventions and non-hormonal pharmacological treatments—demonstrating real efficacy with strong methodological support. Previous studies also provide additional evidence of the benefits of dates on reproductive health during perimenopause: although not directly focused on hot flashes, these findings indicate that consumption of Ajwa dates is associated with increased Anti-Müllerian Hormone (AMH) levels, an indicator of ovarian reserve and a marker of hormonal stability during perimenopause (Mulyadi, 2022).

Table 3. Test of the Effectiveness of Date Fruit Consumption on Hot Flashes

	Grup		Statistic	Std. Error
Ngainpersen	**Control**	Mean	-.0600	.06002
	95% Confidence Interval for Mean	Lower Bound	-.1873	
		Upper Bound	.0672	
	5% Trimmed Mean		-.0100	
	Intervention	Mean	.5942	.15149
	95% Confidence Interval for Mean	Lower Bound	.2730	
		Upper Bound	.9153	
	5% Trimmed Mean		.5480	

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Based on the N-Gain data analysis, the control group had an average N-Gain value of −0.0600. This negative value indicates a lack of improvement, and according to Hake's (1999) effectiveness interpretation, it falls into the "ineffective" category. This suggests that the control group showed no improvement in condition and even experienced a slight decline in alleviating hot flashes symptoms. In contrast, the treatment group that consumed date fruit showed an average N-Gain of 0.5942, or 59.42%. According to Hake's criteria, this falls into the "moderately effective" category, indicating that date fruit consumption had a positive effect in reducing the occurrence of hot flashes in menopausal women. Therefore, it can be concluded that there is a difference in effectiveness between the two groups, with date fruit consumption proving more effective than the control in reducing hot flashes.

Specifically, the N-Gain analysis showed an average of −0.0600 for the control group (ineffective), whereas the treatment group (date fruit consumption) achieved an average of 0.5942, or 59.42%, categorized as moderately effective according to Hake. These findings align with evidence suggesting that date fruit (Phoenix dactylifera) has the potential to alleviate menopausal symptoms through various biological mechanisms. A recent systematic review of 21 studies found that consumption of date fruit products during menopause was associated with improvements in dyspareunia and the maintenance of ovarian reserve—an indicator of hormonal stability that may influence vasomotor symptoms such as hot flashes (Shirdel et al., 2025). Antioxidant compounds in dates, including flavonoids, phenolics, and carotenoids, help reduce oxidative stress and inflammation—two factors known to contribute to the severity of menopausal symptoms, including hot flashes.

Overall, these results strengthen the hypothesis that date fruit consumption can serve as a natural, food-based strategy to reduce the frequency and intensity of hot flashes, consistent with Hake's "moderately effective" category and supported by modern nutritional theory and empirical evidence.

Conclusions

Based on the results of this study, it can be concluded that date fruit consumption did not have a significant effect on autonomic nervous system function, even though the mean score of the intervention group was higher than that of the control group. However, date fruit consumption was found to have a significant effect in reducing hot flashes complaints in menopausal women, with effectiveness classified as moderately effective according to the N-Gain analysis. These findings suggest that dates have the potential to serve as a safe and natural non-hormonal intervention for alleviating menopausal vasomotor symptoms, although their effect on autonomic nervous system function has not yet been demonstrated as significant.

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