

LAVENDER AROMATHERAPY ON REDUCING ANXIETY IN PATIENTS WITH RECURRING DIABETIC FOOT WOUNDS: A PRE-EXPERIMENTAL STUDY

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ABSTRACT

The prevalence of diabetic foot ulcers is currently quite high worldwide, with 6.3% of diabetic patients experiencing them. In Southeast Asia, the prevalence of diabetic foot ulcers reaches 5.5% of the total number of diabetes mellitus sufferers. Sudden changes in the condition can cause diabetic foot ulcer sufferers to exhibit several negative psychological reactions, such as anger, feelings of worthlessness, increased anxiety, and stress. Find out if lavender aromatherapy helps patients with diabetic foot ulcers at the Kitamura Clinic in Pontianak feel less anxious. The study's participants were divided into two groups: an intervention group and a control group, using a pre-experimental design. Over the course of six months, all 77 patients with diabetes mellitus and foot ulcers. Results: Because the data were not normally distributed, a bivariate analysis was performed in SPSS using the Wilcoxon test. Lavender aromatherapy affected anxiety levels in patients with diabetic foot ulcers, as evidenced by the intervention group's p-value of 0.000 (< 0.05), which demonstrated a significant difference between pre- and post-intervention assessments. On the other hand, the group that received H₂O aromatherapy had a p-value of 0.158 (> 0.05), indicating no significant change between pre- and post-intervention assessments and that H₂O aromatherapy did not affect anxiety levels in patients with diabetic foot ulcers. Patients who received lavender aromatherapy saw a higher and statistically significant decrease in anxiety levels after the intervention as compared to the control group. These results validate lavender aromatherapy's efficacy as a supplemental intervention for lowering anxiety in diabetic foot ulcer patients.

Keywords: *Aromatherapy, foot ulcers, anxiety, recurrent diabetic foot ulcer, pre-experimental study.*

INTRODUCTION

Diabetes mellitus (DM), a chronic metabolic disorder, is characterized by persistent hyperglycemia resulting from impaired insulin secretion, action, or both. Despite considerable improvements in the treatment of diabetes, chronic complications remain a major cause of morbidity and mortality worldwide (ElSayed et al., 2024). Among these complications, diabetic foot ulcer (DFU) is one of the most serious because it is associated with infection, prolonged hospitalization, lower-extremity amputation, and increased mortality (Sidhu & Harbuzova, 2024). Current clinical guidelines emphasize that prevention and early management of diabetic foot complications are essential components of comprehensive diabetes care. Furthermore, the global prevalence of diabetic foot ulcers

remains high, making DFU one of the main reasons for disability and reduced quality of life among people with diabetes (ElSayed et al., 2024; Vanathi M & R P, 2024).

Beyond physical complications, diabetic foot ulcers substantially affect patients' psychological well-being. Chronic wounds are frequently accompanied by persistent pain, impaired mobility, limitations in daily activities, social isolation, and financial burden, all of which contribute to increased psychological distress. Anxiety is among the most common psychological problems experienced by patients with DFU, with reported prevalence ranging from approximately 20% to over one-third of patients (Al-Ayed et al., 2021; Kusnanto et al., 2021). Women and individuals with recurrent ulcers tend to experience higher anxiety levels than other patient groups. Persistent anxiety may further reduce treatment adherence, impair self-care behaviors, and negatively influence wound healing outcomes (Almaqhawi et al., 2023).

Because psychological distress contributes to poor clinical outcomes, complementary interventions that are safe, inexpensive, and easy to implement are increasingly recommended as supportive therapies. Lavender aromatherapy has attracted considerable attention because its principal bioactive compounds, particularly linalool and linalyl acetate, exert anxiolytic effects by modulating the olfactory pathway and the limbic system (Koulivand et al., 2013; Ren et al., 2026). Experimental and clinical evidence suggests that these compounds regulate neurotransmitter activity, promote relaxation, improve sleep quality, and reduce anxiety symptoms. Consequently, lavender aromatherapy can be incorporated into routine nursing care without interfering with standard wound management (Saeed et al., 2023).

Lavender aromatherapy has been shown in numerous clinical investigations to be useful in lowering anxiety in a variety of patient demographics. Lavender inhalation significantly reduced preoperative anxiety among ambulatory surgical patients (Wotman et al., 2017). Lavender aromatherapy also reduced anxiety and improved sleep for chemotherapy patients. Additionally, people with type 2 diabetes mellitus reported better sleep, quality of life, and metabolic control after inhaling lavender essential oil. Similarly, aromatherapy massages with lavender essential oil improved the quality of life of diabetic patients and reduced neuropathic pain (Nasiri Lari et al., 2020; Özkaraman et al., 2018; Rivaz et al., 2021). These findings indicate that lavender aromatherapy has considerable potential as a complementary nursing intervention for patients with chronic diseases.

Although previous studies consistently support the anxiolytic effects of lavender aromatherapy, most investigations have focused on surgical patients, oncology patients, or individuals with diabetes mellitus in general. Evidence specifically evaluating patients with recurrent diabetic foot ulcers remains limited, particularly in outpatient wound care settings where anxiety may influence treatment adherence and wound healing. Furthermore, there is little data from Indonesia on the efficacy of lavender aromatherapy as an additional nursing intervention for patients who have recurring diabetic foot ulcers. Thus, the purpose of this

study was to assess the effects of lavender aromatherapy on anxiety levels among diabetic foot ulcer patients undergoing treatment at the Kitamura Wound Care Clinic in Pontianak.

RESEARCH METHOD

The study's participants were divided into two groups: an intervention group and a control group, using a pre-experimental design. Over the course of six months, all 77 patients with diabetes mellitus and foot ulcers at the Kitamura Clinic in Pontianak were included in the study population. Simple random sampling was the method employed in this investigation (Dharma, 2017). A straightforward Excel randomization procedure was used to allocate the samples to the intervention and control groups. 60 participants comprised the study sample, split into two groups: 30 in the intervention group and 30 in the control group. The sample criteria the researcher will use are as follows: inclusion criteria; willingness to be a respondent; patients aged 30-55 years; patients with diabetes mellitus; patients experiencing mild-to-severe anxiety due to wounds; and patients with foot wounds (DFU) graded 1-4 on the Wagner scale.

The Anxiety Inventory (S-AI) Form Y was the study's tool. Spielberger et al.'s State Anxiety Inventory (S-AI) Form Y has shown strong psychometric qualities. Cronbach's alpha coefficients in earlier validation studies ranged from 0.86 to 0.95, indicating good internal consistency and high construct validity. The S-AI demonstrated exceptional dependability in a validation study involving healthcare professionals, with a Cronbach's alpha coefficient of 0.94. The minimum score is 20, and the maximum is 80 (Spielberger, 1970). A total score between 20–35 indicates no anxiety; a total score between 36–50 indicates slightly anxious; a total score between 51–65 indicates moderately anxious; and a total score between 66–80 indicates very anxious (Imandiri, 2017).

RESULT AND DISCUSSION

The individuals' clinical and demographic details are displayed in Table 1.

Table 1. Baseline Participants' Clinical and Demographic Features

Variable	Group		Control (Mean±SD)	Intervention (Mean±SD)	P-value
	Control f (%)	Intervention f (%)			
Age			2.83±0.833	2,82±0.746	0.360
Late adulthood	2 (6.7)	1 (3.3)			
Early older adults	7 (23.3)	8 (26.7)			
Late older adults	15 (50)	16 (53.3)			
Older adults	6 (20)	5 (16.7)			
Wound Grade					

1	4 (13.3)	3 (10)	1.9±0.345	2.00±0.490	0.463
2	23 (76.7)	23 (76.7)			
3	3 (10)	4 (13.3)			
Gender					
Male	11 (36.7)	16 (53.3)	1.6±0.490	1.46±0.507	0.290
Female	19 (63.3)	14 (46.7)			
Neuropathy Status					
Neuropathy	4 (13.30)	12 (40)		1.6±0.498	0.062
Not neuropathy	26 (86.7)	18 (60)	1.8±0.345		
Blood glucose level (mg/dL)					
Mean	231	192	-	-	0.342
Minimum	112	87			
Maximum	501	323			
Pre-intervention anxiety level (%)					
No	0	2 (6.7)			-
Mild	6 (13.3)	9 (30)	2.8±0.406	2.56±0.625	
Moderate	24 (86.7)	19 (63.3)			
Post-intervention anxiety level (%)					
No	1 (3.3)	9 (30)	2.6 ±0.546	1,7±0.456	-
Mild	8 (26.7)	21 (70)			
Moderate	21 (70)	0			

As shown in Table 1, most participants in both groups were aged 56–65 years. The majority of participants had Wagner grade 2 diabetic foot ulcers. Female participants predominated in the control group, whereas male participants were slightly more prevalent in the intervention group. Most participants had no peripheral neuropathy. The intervention group's mean random blood glucose level was 231 mg/dL, while the control group's was 192 mg/dL. The majority of individuals in both groups had moderate anxiety before to the intervention. Anxiety levels in the intervention group significantly dropped after the intervention, while the control group had very slight reductions.

The comparison of anxiety levels both prior to and following the intervention between the two groups is presented in Table 2.

Table 2. Anxiety Levels Prior to and Following Lavender Aromatherapy Comparison

		Group				
Variable		Control		Intervention		P-value
		Mean	Sum	Mean	Sum	
		Rank	Rank	Rank	Rank	
Anxiety level	Pre-intervention	13.50	351.00	3.13	12.50	0.158
	Post-intervention	5.50	121.00	2.50	2.50	0.000

Table 2 shows that following lavender aromatherapy, anxiety levels decreased considerably in the intervention group ($p < 0.001$), whereas there was no discernible change in the control group ($p = 0.158$). These results show that individuals with diabetic foot ulcers saw a significant reduction in anxiety following lavender aromatherapy. Lavender aromatherapy significantly lowered anxiety levels among patients with recurrent diabetic foot ulcers in the intervention group, as shown in Table 2.2. At the same time, no statistically significant reduction was seen in the control group. These results suggest that lavender aromatherapy could be a useful supplemental nursing intervention to help patients with recurrent diabetic foot ulcers feel less anxious. Patients with diabetic foot ulcers often experience anxiety because of extended wound care, dread of amputation, physical limits, and uncertainty about recovery all contribute to psychological anguish and a lower quality of life (Almaqhawi et al., 2023).

The results of this study are in line with previous findings demonstrating the anxiolytic benefits of lavender aromatherapy across a range of clinical contexts. Wotman et al. (2017) showed that among ambulatory surgery patients, inhaling lavender essential oil dramatically decreased anxiety. Likewise, Rivaz et al. (2021) found that people with diabetes who received lavender aromatherapy had a better quality of life and fewer neuropathic symptoms. Can et al. (2024) further demonstrated notable gains in anxiety and sleep quality, and mental abilities among older adults with diabetes receiving lavender aromatherapy. In addition, a recent systematic review and meta-analysis by Kulakaç and Sayılan (2024) concluded that lavender oil consistently and significantly reduces anxiety across different surgical and clinical populations, providing strong evidence supporting the anxiolytic effectiveness of lavender aromatherapy (Kulakaç & Sayılan, 2024).

Linalool and linalyl acetate are lavender's main bioactive constituents, and are primarily responsible for the anxiolytic effects of lavender aromatherapy. These substances affect the limbic system, specifically the hippocampus and amygdala, which control emotional reactions, by stimulating olfactory receptors. Additionally, the pathways of gamma-aminobutyric acid (GABA), serotonin, dopamine, and norepinephrine are modulated by lavender essential oil, which promotes relaxation and lessens anxiety symptoms. (Koulivand et al., 2013; Ren et al., 2026). Furthermore, Shirzad et al. (2023) reported that inhaled lavender aromatherapy not only reduced anxiety but also stabilized hemodynamic parameters

before surgery, suggesting that lavender exerts both psychological and physiological calming effects (Shirzad et al., 2023).

Participant characteristics may also have influenced anxiety levels in this study. Most participants were older adults with Wagner grade 2 diabetic foot ulcers. Increasing age is associated with delayed wound healing, peripheral neuropathy, and decreased functional capacity, all of which may increase emotional distress during long-term treatment. Furthermore, recurrent diabetic foot ulcers and higher wound grades are commonly associated with greater fear of disability, prolonged treatment, and possible amputation, thereby contributing to higher anxiety levels (Vanathi M & R P, 2024; Yang et al., 2025). These results are consistent with other research showing that clinical and demographic factors affect patients' psychosocial outcomes among those with diabetic foot ulcers (Almaqawi et al., 2023).

The study's findings have significant ramifications for healthcare services, particularly regarding preventive and therapeutic interventions. Lavender aromatherapy is a simple, cost-effective, safe, and non-invasive complementary intervention that can be easily integrated into the routine management of diabetic foot ulcers without interfering with standard wound care procedures across various healthcare settings. Implementing lavender aromatherapy in clinical practice can enhance patients' psychological well-being, improve treatment adherence, and support a more holistic, patient-centered approach to care. Growing evidence, including recent clinical trials and systematic reviews, further supports integrating lavender aromatherapy into evidence-based interventions to manage patient anxiety (Kulakaç & Sayılan, 2024).

This study provides new information on the use of lavender aromatherapy, particularly among patients undergoing treatment in an outpatient wound care clinic for recurrent diabetic foot ulcers. Lavender aromatherapy has been shown to have anxiolytic benefits in surgical patients and people with diabetes. In earlier research, there is still no data, especially on patients who have recurring diabetic foot ulcers. Additionally, there is currently little data from Indonesia regarding the application of lavender aromatherapy as an additional Nursing assistance in outpatient wound care settings. Thus, especially in outpatient and resource-constrained healthcare settings, our study contributes to the body of evidence supporting the use of lavender aromatherapy in holistic nursing care for patients with recurrent diabetic foot ulcers (Can et al., 2024; Ren et al., 2026; Yang et al., 2025).

CONCLUSION

Using a p-value of 0.00, compared with 0.158 in H₂O, Aromatherapy with lavender inhalation is beneficial in reducing anxiety levels in individuals with diabetic foot ulcers. The study's findings demonstrate the safety of lavender aromatherapy, straightforward, uncomplicated, and reasonably priced supplemental intervention to lessen patient anxiety. It is also very beneficial for managing patients with diabetic foot ulcers (DFU) and for use

during surgical operations. Incorporating lavender aromatherapy into care promotes evidence-based nursing practice and a patient-centered approach, in which nurses attend to patients' psychological needs in addition to wound healing.

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