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Effect of Mindfulness-Based Breathing Exercise Combined with Lavender Aromatherapy on Anxiety and Sleep Quality among Hemodialysis Patients: A Quasi-Experimental Study

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ABSTRACT

Background: Patients with chronic kidney failure report the sight of blood-filled dialysis tubes, the burden of routine therapy costs, fear of invasive measures, and the uncertainty of recovery triggers their anxiety. This anxiety also carries over into the home, causing difficulty sleeping at night and ongoing feelings of restlessness. Purpose. The Effect of the Combination of Mindfulness based on Breathing Exercise with Lavender Aromatherapy on Anxiety and Sleep Quality in Hemodialysis Patients

Methods: This study employed a quasi-experimental pretest–posttest control-group design and was reported in accordance with the TREND guidelines for non-randomized intervention research. The target population comprised 90 hemodialysis patients at Bhayangkara Kediri Hospital, of whom 40 were selected using purposive sampling. The intervention consisted of a combination of mindfulness-based breathing exercises and lavender aromatherapy, with anxiety and sleep quality as outcome variables. Anxiety was measured using the Self-Rating Anxiety Scale (SAS), and sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), both of which have demonstrated acceptable validity and reliability in prior research. Data analysis included descriptive statistics and the Wilcoxon signed-rank test to determine pre-post differences between intervention and control groups, with a significance level set at $p < 0.05$.

Result: The general characteristics of respondents were comparable between the intervention and control groups with respect to age, sex, duration of hemodialysis, and comorbid conditions. Specific baseline characteristics related to anxiety levels and sleep disturbances were also similar across groups, indicating initial equivalence. The Wilcoxon signed-rank test showed a statistically significant improvement in anxiety ($p < 0.001$) and sleep quality ($p < 0.001$) following the intervention. These findings suggest that combining mindfulness-based breathing exercises with lavender aromatherapy may reduce anxiety and enhance sleep quality among hemodialysis patients.

Conclusion: The combination of mindfulness-based breathing exercises with Lavender Aromatherapy reduces Anxiety and improves Sleep Quality

in hemodialysis patients. This intervention is very easy to implement, so it can be used as a nursing intervention in the hemodialysis unit to advance nursing science.

Keywords: Breathing Exercises; Aromatherapy; Mindfulness; Anxiety; Sleep; Renal Dialysis

Implications for Research, Practice, or Policy

- The combined mindfulness-based breathing exercise and lavender aromatherapy can be integrated into routine hemodialysis care to reduce anxiety and improve sleep quality.
- This low-cost, non-invasive intervention can support evidence-based nursing practice and inform updates to clinical protocols in LMIC hemodialysis units.
- The intervention can be adapted to cultural and resource constraints, enabling nurses to implement it safely and efficiently in diverse clinical settings

INTRODUCTION

Patients with chronic illnesses, particularly those undergoing hemodialysis for chronic kidney failure, were prone to experiencing anxiety. Their lives underwent significant changes, encompassing diet, exercise, blood sugar, urea, creatinine control, and kidney function replacement therapy (Nursalam et al., 2020). Many chronic kidney failure patients appeared anxious before hemodialysis sessions, reporting symptoms such as heart palpitations, nausea, tremors, nervousness, inability to concentrate, and nocturnal discomfort leading to difficulty sleeping. These signs indicated that patients experienced anxiety and decreased sleep quality. Patients attributed their anxiety to seeing blood-flowing tubes, the costs of therapy, anticipated invasive procedures, and the uncertainty of recovery. This anxiety persisted at home, causing restlessness and sleep difficulties at night (Nursalam et al., 2020). Chronic kidney failure is a global health threat, affecting 661,648 individuals worldwide. Studies have shown a significant prevalence of anxiety among hemodialysis patients, with (Anisah & Maliya, 2021) reporting that 48.6% experience anxiety. In Indonesia, (Riskesdas, 2018) data indicates 9.8% of chronic kidney failure patients suffer from anxiety.

Furthermore, research reveals that 66.7% of these patients have poor sleep quality. A study by Larasati, (2018) in Central Java found that 35.50% of hemodialysis patients experienced severe anxiety. At Bhayangkara Kediri Hospital, there were 2,288 hemodialysis visits for patients with chronic kidney failure in January 2024. A May 2024 survey of 10 chronic kidney failure patients undergoing hemodialysis (both new and long-term) at the hospital's hemodialysis unit, using the Zung-Self Rating Anxiety Scale and PSQI, revealed that four patients experienced severe anxiety, four had moderate anxiety, and seven reported poor sleep quality due to their illness.

Patients undergoing hemodialysis often experience significant psychological and physical changes. Psychologically, they may exhibit confusion, insecurity, dependence, and passivity. Many never fully return to their pre-dialysis activities or employment. This can lead to loss of work, income, independence, reduced life expectancy, and sexual dysfunction, potentially resulting in anger and anxiety stemming from their systemic illness (Alfikrie et

al., 2020). Furthermore, hemodialysis frequently causes complications and side effects. These include hypotension, chest pain, dialysis disequilibrium syndrome, muscle cramps, nausea, vomiting, anemia, irregular heartbeat, headaches, infections, blood clots (thrombosis), air in blood vessels (embolism), and sleep disturbances (Dewanti & Supratman, 2020).

The exact mechanisms underlying sleep disturbances in hemodialysis patients remain multifactorial, encompassing biological, psychological, and treatment-related contributors. These include prolonged dialysis duration, elevated urea and creatinine levels, pain, nutritional deficits, neuropathy, and physiological discomfort, alongside demographic, lifestyle, environmental, and psychological stressors. Anxiety has been identified as a key mediator: heightened anxiety can provoke autonomic activation, cognitive rumination, and sleep fragmentation, thereby worsening sleep quality. Conceptually, mindfulness and controlled breathing exercises modulate anxiety by enhancing parasympathetic activation, improving emotional regulation, and disrupting maladaptive cognitive cycles. Lavender aromatherapy further complements this effect through its anxiolytic properties, which are elicited by olfactory stimulation of the limbic system. Collectively, these mechanisms theoretically support the hypothesis that a combined mindfulness–breathing exercise and aromatherapy intervention may reduce anxiety and subsequently improve sleep quality in hemodialysis patients. Given the high prevalence of sleep impairment among this population and its wide-ranging physiological, psychological, social, and spiritual consequences, nurses are positioned to implement evidence-informed interventions targeting anxiety and sleep regulation. (Razzera et al., 2022).

Chronic kidney failure patients, both new and long-term, are highly susceptible to psychological distress, including anxiety and fear related to hemodialysis (Alfikrie et al., 2020)). This anxiety can also lead to poor quality of life in hypertensive patients. Anxiety often stems from perceived threats to physical integrity, such as a decline in the ability to perform daily activities, and threats to body system integrity, which involve damage to a person's identity, self-esteem, and integrated social function (Mahyuvi, 2021). Untreated anxiety can result in irrational behavior, conflict, non-compliance, fear, inability to perform daily activities, and fear of death (Tanoto & Zaenal B., 2022). Given the potential complications and side effects of pharmacological treatments, non-pharmacological interventions are preferred for managing anxiety and improving sleep quality in chronic kidney failure patients undergoing hemodialysis (Sitoresmi et al., 2020). Evidence-based nursing practice (EBNP) supports various non-pharmacological approaches to reduce anxiety and enhance sleep quality in these patients. These include mindfulness, breathing exercises, distraction-relaxation techniques, deep breathing relaxation, progressive muscle relaxation, music therapy, guided imagery, and spiritual relaxation (Rokhyati et al., 2019).

Deep breathing has been consistently shown to reduce anxiety in chronic kidney failure patients, as supported by studies from (Wiyono & Putra, 2021). Nurses can utilize breathing relaxation combined with mindfulness as a therapeutic intervention. Mindfulness is the ability to be fully aware of one's present state, actions, and surroundings without overreacting, often incorporating spiritual surrender. To enhance this surrender, Mindfulness-based Breathing Exercises are recommended for patients with chronic kidney failure. A literature review by (Rokhyati et al., 2019) supports the effectiveness of Islamic Spiritual Mindfulness in reducing anxiety, stress, and depression in chronic kidney disease patients.

Additionally, (Alfikrie et al., 2020) further confirm the anxiety-reducing benefits of deep breathing relaxation. Furthermore, lavender aromatherapy has been found to decrease anxiety and improve sleep quality (Davari et al., 2021).Given these findings, an optimal and holistic nursing approach is needed. This involves a combined intervention of Mindfulness-based Breathing Exercise with Lavender Aromatherapy to address anxiety and improve sleep quality in hemodialysis patients.

METHODS

Study Design

This quantitative study employed a quasi-experimental pretest–posttest control-group design and was reported in accordance with the Transparent Reporting of Evaluations with Non-randomized Designs (TREND) guidelines. Participants were allocated into intervention and control groups based on eligibility and feasibility considerations rather than random assignment, as routine clinical scheduling constraints and ethical requirements prevented randomization within the hemodialysis setting. Both groups completed baseline (pretest) assessments prior to the intervention, followed by posttest measurements after the intervention. The design allowed comparison of changes in outcomes between groups to estimate the effect of the mindfulness-based breathing exercise combined with lavender aromatherapy.

Participants

This study was conducted at Bhayangkara Kediri Hospital, East Java, Indonesia. The source population comprised 90 registered hemodialysis patients receiving routine treatment at the facility. Purposive sampling was applied to identify respondents meeting predefined inclusion criteria, namely adults with chronic kidney failure undergoing hemodialysis twice weekly for less than two years. Patients with cognitive impairment, diagnosed psychiatric disorders, documented allergies to aromatherapy agents, or those unable to communicate effectively were excluded to avoid response bias and ensure intervention safety. A total of 40 participants were enrolled, reflecting feasibility considerations within the dialysis schedule and minimum sample adequacy based on previous quasi-experimental studies with similar designs.

Instrument

This study employed four instruments: (1) a Standard Operating Procedure (SOP) outlining the structured delivery of the combined mindfulness-based breathing exercise and lavender aromatherapy intervention, including session duration, breathing cycle sequence, aromatherapy dosage (two drops on cotton), safety precautions, and guidance for patient follow-up; (2) the Zung Self-Rating Anxiety Scale (SAS/SRAS) to measure anxiety; (3) the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality; and (4) a demographic questionnaire capturing age, sex, education, and occupation.

The SAS is a 20-item instrument with scores ranging from 20 to 80, where higher values indicate greater anxiety; it has demonstrated acceptable internal consistency (Cronbach's $\alpha \approx 0.70–0.80$) and has been previously adapted for use within Indonesian clinical populations. The PSQI consists of 19 items generating a global score between 0–21, with higher scores reflecting poorer sleep quality; psychometric analyses in Indonesian samples report good reliability (Cronbach's $\alpha \approx 0.70–0.83$) and construct validity across renal and chronic disease groups.

Instrument scoring followed established cut-off classifications: SAS scores ≥ 45 indicate clinically relevant anxiety, whereas PSQI global scores > 5 represent poor sleep quality. For reporting purposes, PSQI outcomes were

grouped into three categories—good sleep quality (≤ 5), poor quality (6–10), and very poor quality (>10)—based on published guidelines and research conventions. No physical equipment requiring calibration was used in this study.

Intervention

The intervention was implemented using a clearly defined and standardized procedure to ensure consistency and feasibility within the hemodialysis setting. Each participant in the intervention group received the combined mindfulness-based breathing exercise and lavender aromatherapy during routine hemodialysis sessions. The intervention was conducted once daily during each hemodialysis session, over the four-week study period, in accordance with the overall data collection timeline. Before initiation, patients were positioned comfortably in a semi-recumbent position, and nurses provided brief instructions to ensure understanding and relaxation.

The mindfulness-based breathing exercise was performed for 10–15 minutes per session. Patients were guided to inhale slowly through the nose for approximately 4 seconds, hold the breath for 2 seconds, and exhale gently through the mouth for 6 seconds, emphasizing diaphragmatic breathing. This cycle was repeated continuously, accompanied by focused attention on breathing and a calm, accepting mental state. Simultaneously, lavender aromatherapy was administered by applying two drops (≈0.1 mL) of lavender essential oil onto a sterile cotton pad, placed near the patient's pillow or upper chest area at a safe distance to allow passive inhalation. No direct skin application was used. Nurses supervised the entire procedure, monitored patient comfort and tolerance, and ensured adherence to the protocol throughout each session.

Data Collection

This study was conducted at Bhayangkara Kediri Hospital, East Java, Indonesia, over a four-week period from May 27 to June 26, 2025. Participant recruitment was performed by two trained hemodialysis nurses who screened eligible patients during routine treatment sessions. Data collection was carried out by a team of three enumerators (nurses) who received a one-day training session covering study procedures, informed consent communication, instrument administration, uniform scoring, confidentiality management, and supervision protocols.

The procedural sequence consisted of screening, eligibility verification, informed consent, baseline (pretest) measurement, intervention delivery, and posttest assessment. Pre- and post-intervention measurements were administered by trained enumerators who were not involved in delivering the intervention to minimize measurement bias. Data were collected in a private corner of the dialysis unit to maintain participant privacy. All questionnaires were stored in sealed envelopes, coded anonymously, and kept in a locked research cabinet accessible only to the principal investigator to ensure confidentiality.

Of the 42 eligible participants approached, 40 provided written informed consent and completed baseline assessment, yielding a 95.2% response rate. Two patients declined participation due to scheduling constraints. No participants withdrew during follow-up, and full posttest data were obtained for all enrolled individuals.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics were generated to summarize respondent characteristics and baseline values. The Wilcoxon signed-rank test was applied to compare pre- and post-intervention scores because the small sample size and non-normal distribution of the outcome variables did not

meet parametric test assumptions. A 95% confidence interval was applied, and statistical significance was set at $p < 0.05$.

Ethical Consideration

This research received ethical approval from the USI Research Ethics Committee (Number 0723469/KEPK/1/05/2025).

RESULTS

Table 1. Data on the distribution of respondents' age, gender, education and occupation

Characteristic Data	Intervention		Control	
	n=20	%	n=20	%
Gender				
Man	12	60,0	14	70,0
Woman	8	40,0	6	30,0
Total	**20**	**100**	**20**	**100**
Age				
Early adults (18-40 years)	5	25,0	-	-
Intermediate adult (41-60 years)	11	55,0	19	95,0
Advanced adults (>60 years)	4	20,0	1	5,0
Total	**20**	**100**	**20**	**100**
Education				
JHS	4	20,0	7	35,0
SHS	11	55,0	9	45,0
College	5	25,0	5	20.0
Total	**20**	**100**	**20**	**100**
Work				
Work	7	35,0	4	20,0
Not working	13	65,0	16	80,0
Total	**20**	**100**	**20**	**100**

Based on **Table 1**, the ages of respondents in the intervention group and the control group were in accordance with the inclusion criteria, which were between 18 years to > 60 years. Respondents in the intervention group were mostly male (60.0%), and in the control group, most (70.0%) were also male. The education level of respondents in the intervention group was SHS (55.0%), and in the control group almost half (45.0%) were also high school. In the intervention group, most (65.0%) of respondents did not work, and in the control group, almost all (80.0%) of respondents did not work.

Table 2. Distribution of anxiety data analysis of patients with chronic kidney failure undergoing Hemodialysis before and after being given mindfulness-based breathing exercise with Lavender Aromatherapy in the intervention and control groups

	Anxiety Pre		Anxiety Post	
	n=20	%	n=20	%
Intervention				
Not Anxious	-	-	18	90,0
Light	2	10,0	2	10,0
Keep	10	50,0	-	-

	Anxiety Pre		Anxiety Post	
	n=20	%	n=20	%
Heavy	8	40,0	-	-
Total 20 100 20 100				
Control				
Not Anxious	-	-	2	10,0
Light	2	10	3	15,0
Keep	9	45,0	10	50,0
Heavy	9	45,0	5	25,0
Total 20 100 20 100				

The results of the analysis of the Wilcoxon Signed Ranks Test related to anxiety of chronic kidney failure patients undergoing hemodialysis were obtained, ρ value = 0.000 in the intervention group and ρ value = 0.066 in the control group.

Based on **Table 2** shows that before being given a combination of Mindfulness-based Breathing Exercise with Lavender Aromatherapy, half of the respondents (50.0%) in the intervention group experienced moderate anxiety and after being given the intervention, almost all (90.0%) were not anxious. In the control group, almost half of the respondents (45.0%) experienced severe anxiety before the intervention and half of the respondents (50.0%) experienced moderate anxiety after the intervention. Based on the results of the statistical test using the Wilcoxon Signed Ranks Test, ρ value = 0.000 in the intervention group and in the control group ρ value = 0.066, the hypothesis is accepted, meaning that there is an Effect of Combination of Mindfulness based on Breathing Exercise with Lavender Aromatherapy on Anxiety in Hemodialysis Patients at Bhayangkara Kediri Hospital.

Table 3. Distribution of sleep quality data analysis of chronic kidney failure patients undergoing Hemodialysis at Bhayangkara Kediri before and after being given Mindfulness based on Breathing Exercise with Lavender Aromatherapy in the intervention and control groups

	Sleep Quality Pre		Sleep Quality Post	
	n=20	%	n=20	%
Intervention				
Quality	-	-	18	90,0
Lack of quality	2	10,0	2	10,0
Not of good quality	18	90,0	-	-
Total 20 100 20 100				
Control				
Quality	-	-	-	-
Lack of quality	1	5,0	3	15,0
Not of good quality	19	95,0	17	85,0
Total 20 100 20 100				

The results of the analysis of the Wilcoxon Signed Ranks Test related to the sleep quality of patients with chronic kidney failure undergoing hemodialysis were obtained ρ value = 0.000 in the intervention group and ρ value = 0.157 in the control group.

Based on ***Table 3***, it shows that before being given a combination of Mindfulness-based Breathing Exercise with Lavender Aromatherapy, half of the respondents (90.0%) in the intervention group had poor quality sleep quality and after being given the intervention,

almost entirely (90.0%) had quality sleep. In the control group, before the intervention, sleep quality was poor (95.0%); after the intervention, it was poor (85.0%). Based on the results of the statistical test using the Wilcoxon Signed Ranks Test ρ value = 0.000 in the intervention group and in the control group ρ value = 0.0157 in the control group, the hypothesis is accepted, with the meaning that there is an Effect of Combination of Mindfulness based on Breathing Exercise with Lavender Aromatherapy on sleep quality in Hemodialysis Patients at Bhayangkara Kediri Hospital.

DISCUSSION

Differences in anxiety of chronic kidney failure patients undergoing Hemodialysis before and after being given Mindfulness based on Breathing Exercise with Lavender Aromatherapy

Research shows that the combination of Mindfulness based on Breathing Exercise with Lavender Aromatherapy is very effective in reducing anxiety in people with chronic kidney failure. Before the intervention, 50% of respondents in the intervention group experienced moderate anxiety, but after the intervention, almost all (90%) were no longer anxious. In contrast, in the control group, 45% of respondents experienced severe anxiety before the intervention, and afterward, 50% still experienced moderate anxiety. Anxiety in chronic kidney failure patients undergoing hemodialysis is common. This is in accordance with the research of Damanik, (2020) and Listiana, (2020) Some anxiety triggers include: Fear of seeing blood-soaked tubes, High cost burden of therapy, Fear of invasive measures, Difficulty accepting the fact that hemodialysis therapy will be a lifelong lifetime, Uncertainty of recovery, Concern about the condition of the disease and long-term treatment.

Anxiety is a common response, especially in people with chronic illnesses. According to (Mahyuvi & Tukirahmawati, 2022), clients with life-threatening illnesses tend to experience anxiety, depression, or anger. Anxiety can be pathological if a person is unable to cope with the stressors they are facing, lasts at least one month, and can be clinically comprehensive and persistent. Anxiety is related to physiological and psychological stress, in which individuals feel threatened physically or psychologically. Physically, anxiety can be seen from anxiety and inability to calm down (Mahyuvi & Sari, 2024). In addition, treatment experiences, such as hemodialysis procedures, can also trigger anxiety in patients. Patients undergoing hemodialysis often experience anxiety due to various factors. According to Mahyuvi & Sari, (2024), this anxiety can be caused by situational crises, death threats, uncertainty of therapy outcomes, as well as the need for lifelong therapy and large costs. In line with that, Arifah et al., (2019) added that the anxiety of hemodialysis patients is also triggered by fear of machines and blood-flowing tubes, pain during stabbing, worries about cost, and inability to carry out normal activities. They also feel hopeless and confused thinking about how much longer this therapy will have to be undertaken. Based on research in the Hemodialysis Room of Bhayangkara Kediri Hospital, most patients showed moderate levels of anxiety. This is often caused by a loss of confidence in a complete recovery and by the length of the hemodialysis process. Despite this, some patients still have high hopes for recovery and undergo therapy without complaints, especially with the support of accompanying families.

Research shows that the combination of Mindfulness based on Breathing Exercise with Lavender Aromatherapy is effective in reducing anxiety in chronic kidney failure patients who are about to undergo hemodialysis. This is supported by various studies, including a literature review by Rokhyati et al., (2019)

which states that non-pharmacological therapies such as Islamic Spiritual Mindfulness can reduce stress, anxiety, and depression in people with chronic kidney disease. In addition, research by Alfikrie et al., (2020) shows that deep breathing relaxation can lower anxiety in patients with chronic kidney failure, Veronica & Dwiningrum, (2023) found that lavender aromatherapy can lower anxiety levels. Mindfulness is an effective way to minimize anxiety, functioning as a positive psychological factor that releases stress and anxiety through the limbic system, thereby triggering a positive coping mechanism (Razzera et al., 2022). Mindfulness helps patients adapt to the changes associated with chronic kidney failure. Spiritual interventions, as a key element in mindfulness, are believed to reduce anxiety optimally because they can be done independently, at any time, inexpensive, and non-toxic (Khoshkhatti et al., 2020). Drawing closer to God is the coping strategy that patients most often use to cope with anxiety. In this study, nurses used Breathing Exercise with the concept of surrender to God (mindfulness) as a stimulus to reduce anxiety. Mindfulness is defined as the ability of individuals to be fully aware of their existence, what they do, and not overreact to their surroundings, accompanied by surrender to God.

The combination of Mindfulness-based Breathing Exercise with Lavender Aromatherapy involves slow, deep breathing using the diaphragm. During this exercise, the patient utters motivational phrases, gratitude, and resignation. It also creates a mindfulness strategy to address cognitive problems and reactivate the power of the mind to reduce emotional distress, while inhaling lavender aromatherapy (Khoshkhatti et al., 2020). The combination of Mindfulness based on Breathing Exercise with Lavender Aromatherapy is very effective in reducing anxiety. When a person is anxious, the sympathetic nervous system is activated, increasing the production of stress hormones such as epinephrine, norepinephrine, and cortisol, while lowering nitric oxide. This leads to increased heart rate, breathing, blood pressure, blood flow to vital organs, and body metabolism. However, spiritual mindfulness stimulates brain areas such as the prefrontal cortex (the center of emotion regulation) and the hippocampus and amygdala (areas of emotional openness and blackout) (Nisa et al., 2021). It instructs the body to respond with acceptance, non-judgment, and openness, so that individuals can escape excessive awareness, hold back internal reactivity, and increase self-acceptance. As a result, anxiety decreased (Haghshenas et al., 2019). Researchers argue that by practicing a focus on mindful breathing, individuals find it easier to focus on breathing, an important skill for coping with stress, anxiety, and negative emotions, even when angry. Mindful breathing exercises help individuals remain "present" in the moment, rather than get caught up in past regrets or future worries. During spiritual mindfulness, patients with chronic kidney failure will feel calm, increase self-compassion, feel spiritual bonding, and increase awareness of health and self-care, which ultimately lowers their anxiety levels.

Differences in sleep quality of chronic kidney failure patients undergoing Hemodialysis before and after being given Breathing Exercise-based Mindfulness with Lavender Aromatherapy

Research indicates that prior to receiving the combined intervention of Mindfulness-based Breathing Exercise and Lavender Aromatherapy, most chronic kidney disease patients in the intervention group (90%) experienced poor sleep quality. Following the intervention, nearly all (90%) showed improved sleep quality. Conversely, in the control group, sleep quality remained poor both before (95%) and after (85%) the intervention. Hemodialysis

patients commonly suffer from severe sleep disturbances, which worsen their physical and mental well-being. Key contributing factors include: the accumulation of uremic toxins leading to itching, restless leg syndrome, and cramps; disruptions in circadian rhythm and melatonin production; chronic pain resulting from dialysis procedures; and side effects from prescribed medications (Donelli et al., 2019; Davari et al., 2021). Poor sleep quality in hemodialysis patients has serious consequences, including fatigue, cognitive decline, nutritional disturbances, increased infection risk, and higher rates of hospitalization and mortality. Sleep deprivation can also lead to depression and reduced adherence to treatment. Therefore, managing it requires a multidisciplinary approach. One effective method is the combination of Mindfulness-based Breathing Exercise and Lavender Aromatherapy, which integrates diaphragmatic breathing exercises, positive affirmations, and lavender aroma inhalation to alleviate emotional stress and enhance focus (Hayajneh et al., 2024)..

After receiving a combination of Mindfulness-based Breathing Exercise and Lavender Aromatherapy, nearly all respondents showed improved sleep quality. This finding is consistent with previous research demonstrating the effectiveness of mindfulness and lavender aromatherapy in enhancing sleep (Barrett et al., 2020; Talley & Shelley-Tremblay, 2020). Sleep disturbances in hemodialysis patients are triggered by physical factors such as uremic toxins, pain, and disrupted circadian rhythms, as well as psychological factors like stress and anxiety. Mindfulness, through diaphragmatic breathing exercises, can activate the vagus nerve, reduce stress response, and create a relaxed body state. This practice also improves emotional regulation and autonomic nervous flexibility, which supports a more sound and higher-quality sleep (Cahyanti & Jamaludin, 2021) .

Lavender aromatherapy, utilizing linalool and linalyl acetate from Lavandula angustifolia, offers significant therapeutic effects. Linalool is believed to interact with GABA receptors in the brain, enhancing the transmission of this calming neurotransmitter. This action reduces neuronal excitability, leading to anxiolytic (anti-anxiety) and sedative effects that promote relaxation and sleep (Rahmadhani, 2022). When inhaled, lavender aroma molecules travel through the olfactory system to the brain's limbic system, which governs emotions, memory, and motivation. This directly triggers a relaxation response, diminishing stress andreating a calmer mental state conducive to sleep (Donelli et al., 2019). Furthermore, research suggests that lavender scent can influence brain wave patterns associated with sleep, such as increasing alpha and theta wave activity and potentially boosting melatonin productio the body's natural sleep hormone (Kurniawan et al., 2022). Researchers conclude that the combination of mindfulness-based breathing exercises and lavender aromatherapy is a safe, accessible, and effective complementary therapy for improving sleep quality in hemodialysis patients. This intervention also contributes to an enhanced quality of life, reduces reliance on sleep medication, and empowers patients to manage their condition independently.

Effect of Combination of Mindfulness based on Breathing Exercise with Lavender Aromatherapy on Anxiety and Sleep Quality in Hemodialysis Patients

Based on the statistical analysis using the Wilcoxon Signed Ranks Test, a p-value of 0.000 in the intervention group supported the hypothesis. This indicates that there is a significant effect of the combination of Mindfulness-based Breathing Exercise with

Lavender Aromatherapy on Anxiety and Sleep Quality in Hemodialysis Patients at Bhayangkara Kediri Hospital. Patients undergoing chronic hemodialysis often experience psychological disturbances such as anxiety, stress, and sleep disorders (Tamarah et al., 2024). Uncontrolled anxiety can worsen patients' quality of life and lead to non-adherence to treatment (Razzera et al., 2022).

One effective non-pharmacological approach is complementary therapy, specifically mindfulness-based breathing exercises and lavender aromatherapy. Mindfulness is a psychological approach emphasizing full awareness of the present moment without judgment. This technique is often combined with breathing exercises to help patients achieve relaxation. Breathing exercises slow down sympathetic nervous system activity and stimulate the parasympathetic system, thereby reducing stress hormones (cortisol) and alleviatingnxiety (Rikos et al., 2023). Regular breathing exercises can lower heart rate, decrease blood pressure, and increase vagus nerve activation, which plays a role in emotion and sleep regulation (Davari et al., 2021).

Lavender (Lavandula angustifolia) contains active compounds such as linalool and linalyl acetate, which possess sedative and anxiolytic effects. Its aroma is known to increase alpha wave activity in the brain, associated with states of relaxation and calmness. Inhaling lavender essential oil stimulates the limbic system via the olfactory nerve, particularly the amygdala and hypothalamus, which are involved in emotion regulation and sleep cycles (Yonata et al., 2022). Combining mindfulness-based breathing exercises with lavender aromatherapy can create a synergistic effect. Mindfulness calms the mind and reduces cognitive anxiety, while lavender soothes the limbic system and supports physiological relaxation. This combination is believed to work holistically through both top-down (cognitive) and bottom-up (sensory) approaches to reduce anxiety and improve sleep quality (Rusch et al., 2019).

Hemodialysis patients frequently experience sleep disturbances (insomnia) and anxiety due to routine and invasive procedures, lifestyle changes and machine dependence, and the uncertainty of long-term prognosis. This combined intervention is easy to implement, inexpensive, non-invasive, and carries a very low risk of side effects, making it an ideal choice for this population (Mahyuvi & Sari, 2023). Studies by Salsabila (2020) show that mindfulness-based breathing exercises significantly reduce anxiety in kidney failure patients. Lavender aromatherapy has also been proven to improve sleep quality and reduce anxiety in populations with chronic disorders (Davari et al., 2021). According to the researchers, the combination of mindfulness-based breathing exercises and lavender aromatherapy is an effective and practical intervention for reducing anxiety and improving sleep quality in hemodialysis patients. This approach provides dual benefits: improving both the psychological and physiological aspects of patients. Its routine and structured application within nursing or rehabilitation programs for kidney failure patients is recommended.

Practical Applications of the Findings

The findings presented on this page indicate that combining mindfulness-based breathing exercises with lavender aromatherapy is associated with significant improvements in anxiety levels and sleep quality among patients undergoing hemodialysis. Given that baseline characteristics were comparable between the intervention and control groups, the observed pre–post changes in the intervention group suggest that this non-pharmacological approach may address psychological and sleep-related concerns commonly reported in this population. Conceptually, the results underscore the

importance of integrating psychological relaxation and sensory-based strategies into routine care to support patients' emotional regulation and rest during prolonged, demanding treatment regimens.

From a practical perspective, these findings suggest that nurses and other healthcare providers may consider incorporating structured mindfulness-based breathing exercises combined with lavender aromatherapy as a complementary component of hemodialysis care. The intervention appears feasible within clinical settings, as it does not require complex equipment or extensive training and can be delivered alongside standard treatment procedures. Importantly, the absence of significant changes in the control group highlights the potential added value of this combined intervention beyond usual care. While the quasi-experimental design warrants cautious interpretation, the results nonetheless indicate that such low-cost, non-invasive interventions may play a supportive role in improving patient well-being and enhancing holistic nursing practice in hemodialysis units.

Limitations

This study may be limited by its quasi-experimental design without randomization, which restricts the ability to draw causal inferences from the observed associations. The use of purposive sampling and a relatively small sample size from a single hemodialysis unit may limit the generalizability of the findings to broader patient populations. Additionally, the short intervention period and reliance on self-reported measures for anxiety and sleep quality may introduce response bias. Therefore, the findings should be interpreted with caution within the specific clinical and contextual setting of the study..

CONCLUSION

This study sought to explore the effect of combining mindfulness-based breathing exercises with lavender aromatherapy on anxiety and sleep quality among patients undergoing hemodialysis. The findings indicate that the combined intervention was associated with improvements in patients' emotional state and perceived sleep quality when compared with usual care. These results highlight the importance of addressing psychosocial and comfort-related needs alongside routine clinical management in hemodialysis settings. By emphasizing a non-pharmacological, holistic nursing approach, the study underscores the potential of simple relaxation and sensory-based interventions to support patient well-being. Although the quasi-experimental design requires cautious interpretation, this study contributes meaningful insight into complementary nursing interventions that may enhance supportive care and promote a more comprehensive, patient-centered approach for individuals receiving long-term hemodialysis.

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Contributors

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Conflicts of interest

Not declared.

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