



## Case Report

# APPLICATION OF LAVENDER AROMATHERAPY WITH INHALATION METHOD TO OVERCOME SLEEP PATTERN DISTURBANCES IN CHILDREN WITH CHRONIC KIDNEY DISEASE



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### Abstract

Chronic Kidney Disease (CKD) is one of the major health problems in the world due to the high number of patients and deaths caused by CKD. Children with end-stage CKD, with permanent kidney damage, require therapy to replace some of the kidney's excretory functions, such as hemodialysis. Children undergoing hemodialysis often experience sleep cycle disturbances. One form of non-pharmacological therapy that can be applied is aromatherapy using the inhalation method. This article reports pediatric nursing care for children with CKD based on evidence-based practice. The method used is a descriptive case study on three pediatric patients with CKD on hemodialysis and experiencing sleep pattern disturbances. The main nursing intervention provided is lavender aromatherapy using the inhalation method. In this case study, seven nursing problems were found in the three clients: sleep pattern disturbances, hypervolemia, acute pain, decreased cardiac output, risk of ineffective renal perfusion, risk of infection, and risk of nutritional deficits, with the main nursing problem being sleep pattern disturbances. The results of the evaluation of sleep pattern disturbances in the three patients after being given aromatherapy with inhalation methods for three consecutive days showed an improvement in sleep quality as measured by a sleep quality questionnaire. The application of lavender aromatherapy as a non-pharmacological therapy has an effect on improving sleep quality in children with sleep pattern disorders, so it can be concluded that the application of lavender aromatherapy with inhalation effectively improves sleep quality in children.

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## Introduction

Chronic Kidney Disease (CKD) is a progressive disease known to be incurable (Wahyuni et al., 2020). CKD is characterized by a decrease in the glomerular filtration rate (GFR) to  $<60$  ml/min/1.73 m<sup>2</sup> for more than three months or the presence of kidney damage such as albuminuria, urinary sediment abnormalities, and structural disorders (Gomez et al., 2019). CKD is a global issue because its incidence, prevalence, morbidity, and mortality continue to increase annually. WHO data from 2019 show that the number of sufferers and deaths due to CKD is very high, with the death rate reaching 850,000 people per year and approximately 1.5 million people undergoing hemodialysis to survive (Marni et al., 2024). CKD is among the 12 leading causes of death worldwide, with 1.1 million deaths and a 31.7% increase in cases between 2010 and 2015 (Wahyuni et al., 2020). In Indonesia, the prevalence of kidney failure rose from 2.0% in 2013 to 3.8% in 2018 (Kemenkes, 2018). Asia recorded the highest prevalence of CKD in children at 11.2% (Zhang et al., 2022). In Indonesia, cases of CKD in children increased from 275 cases (2022) to 439 cases (2023), with 60 children undergoing therapy at Dr. Cipto Mangunkusumo General Hospital, Jakarta (Sari, 2024).

Common causes of CKD include smoking, long-term use of analgesics, hypertension, and excessive consumption of energy supplements. In children, one of the contributing factors is frequent consumption of packaged sweetened beverages containing high levels of sugar, sodium, preservatives, and artificial sweeteners, which can impose a toxic burden on the kidneys and lead to progressive damage (Susanti et al., 2024). CKD is classified into five stages based on declining GFR, with End-Stage Renal Disease (ESRD) representing the final stage in which kidney damage is irreversible (Wahyuni et al., 2020). At this stage, patients require renal replacement therapy, most commonly hemodialysis, to remove metabolic waste products that can no longer be excreted by the kidneys. The progressive decline in kidney function in CKD leads to the accumulation of uremic toxins, metabolic waste products, and electrolyte imbalances that directly affect the central nervous system. Elevated levels of urea and creatinine, hyperphosphatemia, anemia, and chronic inflammation have been shown to disrupt circadian rhythm regulation and suppress

melatonin secretion, resulting in difficulty initiating sleep and frequent nighttime awakenings in pediatric patients (Darwish & Abdel-Nabi, 2016; Theofilis et al., 2022). These metabolic and neurohormonal disturbances explain the high prevalence of sleep disturbances in children with advanced CKD. Hemodialysis is a common long-term therapy for CKD, but it does not fully restore kidney function. This procedure is performed 2–3 times a week for 4–5 hours per session (Relawati et al., 2018).

Hemodialysis, although essential for survival, does not fully restore kidney function and may further contribute to sleep disturbances. The procedure is typically performed two to three times per week for four to five hours per session (Relawati et al., 2018). Children undergoing hemodialysis are particularly vulnerable to physical and psychosocial complications, including fatigue, discomfort, and sleep disturbances, which significantly reduce their quality of life (Saridi et al., 2024). In pediatric patients, persistent sleep disturbances are associated with serious long-term consequences, such as impaired growth due to disrupted growth hormone secretion, cognitive and academic difficulties, emotional dysregulation, and behavioral problems. Previous studies have shown that children with CKD who experience sleep disturbances are at increased risk of reduced cognitive function and poorer overall quality of life (Darwish & Abdel-Nabi, 2016; Aini & Maliya, 2020). Therefore, addressing sleep disorders in pediatric CKD patients is essential not only for symptom relief but also for optimizing long-term developmental outcomes. Children undergoing hemodialysis are susceptible to physical and psychosocial complications, including sleep disturbances that can reduce quality of life (Saridi et al., 2024).

Sleep pattern disturbance is defined as a condition characterized by changes in sleep quantity and quality due to internal or external factors. According to the Indonesian Nursing Diagnosis Standards, sleep pattern disturbance commonly occurs in patients undergoing medical procedures such as hemodialysis (PPNI, 2017). In pediatric populations, pharmacological management of sleep disorders is often limited due to concerns regarding side effects and long-term safety. Consequently, non-pharmacological interventions are recommended as first-line management. The Indonesian Nursing Intervention Standards emphasize sleep

support interventions, including education, environmental modification, relaxation techniques, and systematic monitoring of sleep patterns, as essential components of nursing care for children with chronic illness (PPNI, 2018). One relaxation technique that has the potential to improve children's sleep quality is aromatherapy (Ghaljaei et al., 2023).

Aromatherapy is a complementary therapy that utilizes essential oils through inhalation to influence the central nervous system and promote relaxation (Nisa, 2023). Lavender essential oil has been widely reported to improve sleep quality and reduce anxiety due to its calming effects on neurohormonal regulation (Cui et al., 2022). Several studies have demonstrated that lavender aromatherapy effectively reduces stress, anxiety, and sleep disturbances in both pediatric and clinical populations (Cho et al., 2017; Afriyanti, 2018). Considering the pathophysiological mechanisms underlying sleep disturbances in CKD, such as neurohormonal dysregulation and increased psychological stress, lavender aromatherapy is particularly relevant as a non-pharmacological intervention. Its rapid onset of action, safety profile, and non-invasive nature make it suitable for children with chronic conditions, including CKD (Muz, 2017; Silva & Melo, 2025).

In this case study, three children with CKD undergoing hemodialysis at Hospital, Palembang were observed to experience sleep problems, including difficulty falling asleep and frequent awakenings at night. Rather than relying solely on medication, this study looks at whether lavender aromatherapy inhalation could be a practical and gentle nursing intervention to support better sleep in these children.

## Presentation of the Case

### a. Patient Information

Pediatric patients included in this case study were children diagnosed with Chronic Kidney Disease (CKD) who were undergoing hemodialysis therapy and experienced sleep pattern disturbances, such as difficulty initiating sleep or frequent nighttime awakenings. All patients were hospitalized at Hospital, Palembang during the study period. Patients were excluded if they had a decreased level of consciousness, were receiving sedative or hypnotic medications that could influence

sleep patterns, had a known hypersensitivity or allergic reaction to lavender or other essential oils, or had acute respiratory conditions that contraindicated inhalation therapy.

### Patient 1 (Child MD)

Child MD was a 6-year-old and 10-month-old boy who had been treated at Hospital, Palembang since October 23, 2024, accompanied by his uncle. He was diagnosed with Chronic Kidney Disease (CKD) stage V. The main reason for admission was generalized and facial edema and the need for his sixth hemodialysis session. The patient had a history of recurrent edema since 2019, which initially improved after one week of treatment. Similar complaints recurred in September 2024, after which he started hemodialysis and had previously undergone five sessions at Dr. M. Djamil General Hospital, Padang. During assessment, the patient complained of weakness and shortness of breath during increased physical activity. Regarding sleep, the patient's uncle reported disturbed sleep patterns characterized by difficulty initiating sleep, frequent awakenings approximately every hour during the night, and excessive daytime sleepiness. The patient routinely received methylprednisolone, cyclosporine (Sandimmun), folic acid, sodium bicarbonate, slow-release calcium, calcitriol, allopurinol, nifedipine, and spironolactone.

### Patient 2 (Child RS)

Child RS was an 8-year-old and 6-month-old boy admitted to the Emergency Department of Hospital, Palembang on October 12, 2024, with a primary complaint of shortness of breath. One month prior to admission, his mother reported worsening cough and dyspnea, especially in the supine position. Additional complaints included decreased urine output, epigastric discomfort, and pallor. He had been diagnosed with CKD stage V since July 2024 and had a history of weakness, fatigue, and exertional dyspnea, accompanied by hypertension with systolic blood pressure ranging from 130 to 150 mmHg. During hospitalization, the patient underwent central dialysis line repair on October 15, 2024, followed by pericardiocentesis on October 19, 2024, due to massive pericardial effusion. At the

time of assessment, respiratory symptoms had significantly improved, and the patient was scheduled for routine hemodialysis three times per week. Sleep-related complaints reported by the mother included difficulty falling asleep, frequent nighttime awakenings every one to two hours, and prolonged daytime sleep lasting approximately two to three hours. The patient's routine medications included folic acid, nifedipine, calcitriol, and sodium bicarbonate.

### **Patient 3 (Child SD)**

Child SD was a 6 year old 7 month old girl admitted to Hospital, Palembang on October 27, 2024, with a diagnosis of CKD stage V. She presented with facial and extremity edema and had a history of three seizure episodes, each lasting approximately five minutes, following previous treatment. Two weeks prior to admission, the patient experienced epigastric pain, nausea, vomiting, and fever, which led to treatment at a community health center and subsequently at Ar Bunda Linggau Hospital, where she was diagnosed with CKD and received three blood transfusions. Following the seizure episodes, the patient was referred for hemodialysis. On October 28, 2024, she underwent central dialysis line insertion in the right anterior axilla and initiated her first hemodialysis session. The patient reported acute stabbing pain at the catheter insertion site, which worsened with movement. Sleep disturbances were reported by the mother, including restlessness, frequent nighttime awakenings, and difficulty returning to sleep. Prior to hospitalization, the patient routinely received folic acid, paracetamol, sodium bicarbonate, calcium supplements, salt capsules, and erythromycin.

### **b. Clinical Findings**

Clinical assessment was conducted on three pediatric CKD patients at different time points. All patients were in a weak general condition with *compos mentis* consciousness and reported difficulty sleeping. Key findings mainly involved fluid overload, cardiovascular complications, pain related to the central dialysis line (CDL), and abnormal laboratory results.

Patient MD showed prominent signs of hypervolemia, including grade 3 periorbital edema, bilateral lower extremity edema, ascites, and a significant weight gain of 4 kg

within two months. The patient also complained of difficulty initiating and maintaining sleep, especially at night. Laboratory findings supported hypoalbuminemia, and renal ultrasound indicated diffuse parenchymal inflammation. Patient RS presented with fatigue, decreased focus, and complaints of poor sleep quality, characterized by frequent night awakenings. Although peripheral edema was absent, imaging findings were notable for cardiomegaly and massive pericardial effusion which improved after pericardiocentesis. Laboratory results revealed anemia, hypoalbuminemia, and elevated creatinine levels.

Patient SD primarily complained of acute pain at the CDL insertion site, accompanied by sleep disturbances, including difficulty falling asleep and frequent yawning during the day. Ultrasound findings confirmed bilateral CKD with fluid accumulation, while laboratory results indicated azotemia, anemia, and hypocalcemia.

### **c. Timeline**

A nursing intervention period focused on evidence-based therapy (EBP) to address the patient's primary problem, namely Sleep Pattern Disturbance. The intervention was conducted over three consecutive days. The therapy provided was Lavender Aromatherapy Inhalation for 15 minutes every evening. In addition, during the same period, nursing interventions for other diagnoses were implemented, such as hypervolemia management, circulation care, pain management, nutrition management, cardiac care, and wound care.

### **d. Diagnostic Assessment**

Diagnostic evaluation of child MD (6 years 10 months) with a medical diagnosis of Chronic Kidney Disease (CKD) stage V. Vital signs with blood pressure 121/85 mmHg, and significant findings of grade 3 periorbital edema, edema of the extremities, and ascites, which suggest fluid regulation problems. Laboratory data (Creatinine 3.08 mg/dL, Urea 85 mg/dL) confirm advanced renal dysfunction, while low Albumin levels (3.3 g/dL) indicate nutritional risk. Imaging via TUG ultrasound shows diffuse parenchymal inflammation of both kidneys, providing an overview of the etiology of the renal condition.

**Table 1**

*Clinical Findings*

Variables	Child MD (November 3, 2024)	Child RS (November 4, 2024)	Child SD (November 3, 2024)
General condition	Weak, compos mentis	Weak, lethargic, compos mentis	Weak, lethargic, compos mentis
Complaints	Edema, weight gain, difficulty sleeping	Easy fatigue, decreased focus, poor sleep quality	Pain at CDL site, sleep disturbance
Edema	Periorbital grade 3, bilateral leg edema, ascites	Periorbital grade 1	None
Vital signs	BP: 121/85 mmHg HR: 98 x/min RR: 22 x/min	BP: 132/83 mmHg HR: 84 x/min RR: 22 x/min T: 37°C	BP: 124/88 mmHg HR: 98 x/min RR: 20 x/min T: 37.2°C
Key lab finding	Albumin: 3.3 g/dL	Hb: 10.0 g/dL Albumin: 3.0 g/dL Creatinine: 4.18 mg/dL	Urea: 111 mg/dL Creatinine: 4.62 mg/dL Hb: 10.7 g/dL Ca: 8.2 mg/dL
Imaging	Renal USG: diffuse parenchymal inflammation	CXR: cardiomegaly Echo: pericardial effusion	Urinary tract USG: bilateral CKD, fluid in vesica

Nursing diagnoses established include hypervolemia, disturbed sleep patterns, risk of ineffective renal perfusion, and risk of nutritional deficit. Diagnostic evaluation of child RS (8 years 6 months) confirmed a medical diagnosis of complex Chronic Kidney Disease (CKD) stage V with cardiological complications. End-stage renal dysfunction was supported by a Creatinine value of 4.18 mg/dL and a history of hypertension. Clinical findings were crucial in solving the diagnostic problem, where symptoms of dyspnea and high blood pressure (BP 132/83 mmHg) were associated with imaging findings of Cardiomegaly and a history of Massive Pericardial Effusion, suggesting a CKD-related cardiac problem. Low Albumin levels (3.0 g/dL) and complaints of fatigue indicated nutritional and blood integrity issues. Nursing diagnoses established based on these data included: decreased cardiac output, disturbed sleep patterns, risk for ineffective renal perfusion, and risk for nutritional deficits.

Diagnostic evaluation of child SD (6 years 7 months) confirmed a medical diagnosis of Chronic Kidney Disease (CKD) stage V with acute complications in the form of seizures and a history of fever. The diagnosis of end-stage CKD was supported by high levels of Urea (111 mg/dL) and Creatinine (4.62 mg/dL), as well as the impression of bilateral

CKD from the ultrasound. Clinical findings also indicated potential cardiovascular/fluid regulation complications, characterized by a blood pressure of 124/88 mmHg and fluid collection from the ultrasound. The primary nursing diagnoses established based on these data were acute pain, disturbed sleep patterns, risk for infection, and risk for ineffective renal perfusion.

**e. Therapeutic Intervention**

Therapeutic interventions focused on the management of chronic kidney disease and the identified nursing problems. The primary nursing intervention for sleep pattern disturbances in all three pediatric patients was Sleep Support through lavender aromatherapy inhalation. The aromatherapy used was lavender essential oil.

The intervention was administered using a standardized direct inhalation protocol. Prior to administration, patient identity was confirmed and baseline sleep quality was assessed. Three drops of lavender essential oil were applied to sterile gauze, which was then placed inside a perforated plastic cover. The prepared gauze was positioned approximately 15–20 cm from the patient and inhaled for 15 minutes.

The intervention was provided in the evening before bedtime and was conducted at the same scheduled time each night. Due to clinical setting considerations, the intervention was administered sequentially,

with each patient receiving aromatherapy one at a time for a 15-minute session. The intervention was delivered by a registered nurse, who remained with the patient during the administration period to observe responses.

Patients were encouraged to relax and close their eyes during the session. Continuous observation was conducted for signs of discomfort, allergic reactions, or respiratory distress. If the patient had not fallen asleep after the 15-minute intervention, continued observation was carried out by the parents or caregivers until the patient fell asleep. This intervention was administered once nightly for three consecutive days. No adverse effects were reported during the intervention period.

In addition to non-pharmacological management, pharmacological therapies were administered collaboratively according to each patient's clinical condition. Child MD received diuretic therapy (furosemide and spironolactone) for hypervolemia, while child RS received antihypertensive medication (nifedipine) for decreased cardiac output. Child SD received antibiotic therapy related to central dialysis line care and deep breathing relaxation therapy for acute pain management. All pharmacological treatments were monitored and adjusted based on clinical response, vital signs, and laboratory findings to ensure compatibility with the non-pharmacological intervention.

#### **f. Follow-up and Outcomes**

Evaluation of the primary nursing intervention was conducted after three days of implementation. The effectiveness of lavender aromatherapy inhalation was assessed using the Sleep Quality Questionnaire, administered at baseline before the intervention and after completion as an outcome measure.

The Sleep Quality Questionnaire is a negatively worded instrument consisting of 11 items related to sleep disturbances and daytime functioning. Each item was scored dichotomously (Yes = 1, No = 0), with higher total scores indicating poorer sleep quality.

Sleep quality was classified as Inadequate (score 9–11), adequate (score 6–8), or good (score < 6). Sleep quality assessment was conducted daily using a structured approach. Questions related to nighttime sleep were asked each morning after the patient woke up, including bedtime and wake-up time, difficulty initiating sleep, frequent night awakenings, difficulty returning to sleep after awakening, non-restorative sleep, morning dizziness, morning fatigue, and fear of nighttime. In addition, several items reflecting daytime functioning were assessed in the evening, as they required evaluation over the course of the day, such as excessive daytime sleepiness (frequent yawning), decreased concentration, and reduced social interaction or activity. Data were obtained through patient self-report with assistance from parents or caregivers and supported by nursing observations.

The evaluation results demonstrated favorable outcomes, with sleep pattern disturbance considered resolved in all three patients. Post-intervention scores showed significant improvement in sleep quality, as presented in Table 2. Child RS achieved the best sleep quality score (Score 2, good sleep), followed by child SD (Score 4, good sleep), and child MD (Score 6, adequate sleep). Patients reported longer and more restful sleep, as well as a reduced frequency of night awakenings. In addition to sleep-related outcomes, other nursing problems also showed improvement. Acute pain and risk of infection in child SD were completely resolved, with the pain scale decreasing to 0 on the Numeric Rating Scale. Meanwhile, kidney-related problems such as hypervolemia in child MD and risk of ineffective renal perfusion showed partial resolution, indicated by reduced edema and stabilization of blood pressure.

Patient safety was closely monitored throughout the intervention period. During lavender aromatherapy administration, patients were directly observed by the nurse for any signs of discomfort, allergic reaction, or respiratory distress.

Table 2

Sleep Quality Score Evaluation Results

Patient	Before Implementation	After Implementation
Child MD	10 (Inadequate Sleep)	6 (Adequate Sleep)
Child RS	9 (Inadequate Sleep)	2 (Good Sleep)
Child SD	9 (Inadequate Sleep)	4 (Good Sleep)

After the intervention, parents or caregivers were instructed to continue observing the child until sleep onset and again upon waking the next morning. No side effects or adverse events were reported during the follow-up period.

Discussion

Based on the results of a case study analysis on three pediatric patients in the Selincih 2 ward of Hospital, Palembang, child MD, child RS, and child SD were diagnosed with Chronic Kidney Disease (CKD) stage V. All three showed common symptoms of CKD, such as facial and extremity edema, fatigue, pain at the site of Central Double Lumen (CDL) insertion, and sleep disturbances, including difficulty initiating sleep and frequent nighttime awakenings. In addition, one of the patients (Child RS) also experienced hypertension, which worsened his sleep quality. CKD is a condition of progressive and permanent decline in kidney function, which results in the accumulation of uremic toxins in the blood. This toxin accumulation can disrupt the function of the central nervous system and reduce the production of melatonin, a hormone that plays a role in regulating the sleep-wake cycle (Darwish & Nabi, 2016; Theofilis et al., 2022). Electrolyte imbalance, anemia, and chronic pain contribute to poor sleep quality (Karava et al., 2022; Gela et al., 2024). This is in line with the findings of Yemina, Waluyo, & Sukmarini (2018) that sleep disturbances such as difficulty falling asleep and frequent nighttime awakenings, are common symptoms in CKD patients undergoing hemodialysis. Hemodialysis, a lifelong renal replacement therapy, also contributes to sleep disturbances, especially in children. This procedure can cause physiological changes such as blood pressure fluctuations, hypovolemia, and post-dialysis fatigue, which affect circadian rhythms (Scherer et al., 2017). Inconsistent dialysis schedules and additional complaints such as pruritus, muscle cramps, and Restless Legs Syndrome worsen

sleep quality (Unruh et al., 2020). Sleep disturbances in pediatric patients have a broad impact on cognitive function, emotional regulation, and quality of life, requiring specialized management through a comprehensive nursing approach. The Indonesian National Nurses Association (PPNI) (2017) states that sleep pattern disturbances are discomfort in the quantity and quality of sleep due to internal and external factors. The recommended nursing intervention is sleep support, which can be provided through pharmacological or non-pharmacological approaches (PPNI, 2018). In this case study, a non-pharmacological approach was chosen using lavender aromatherapy inhalation, with the goal of improving sleep quality without the side effects of medication. Lavender (*Lavandula angustifolia*) was chosen because of its proven effectiveness and safety. The main components of lavender, linalool and linalyl acetate, have sedative, anxiolytic, and relaxant effects through activation of the limbic system (Hamzeh et al., 2020 in Maharianingsih, 2020). Research by Muz & Tasci (2017) found that lavender inhalation for four weeks increased sleep latency, total sleep time, and sleep efficiency in hemodialysis patients. Similar results were also reported by Rahmawati and Suciana (2015, as cited in Silva & Melo, 2025), who showed that lavender was more effective than warm bath therapy in treating insomnia. Lavender is also considered safe for children because it has low toxicity and does not contain irritant components such as menthol or 1,8-cineole, which are found in peppermint and eucalyptus oils (Silva & Melo, 2025; International Federation of Aromatherapists, 2021). The inhalation method is used because it is the fastest and most efficient way to deliver the active compounds to the central nervous system. After inhalation, linalool and linalyl acetate molecules are received by olfactory receptors, then transmitted to the limbic system—specifically the amygdala and

hippocampus—which regulate emotions, memory, and sleep behavior (Lestari & Maisaro, 2019). Activation of the limbic system stimulates the release of serotonin, which is then converted into melatonin, the main hormone that regulates sleepiness (Mishima in Alfiestari, 2019; Siregar in Afistasari, 2019). Furthermore, this process also increases the release of endorphins and enkephalins, which have a relaxing effect and improve mood (Buckle in Pertiwi, 2016). This supports the results of observations in three patients, where after three days of lavender aromatherapy, sleep quality improved and the children appeared calmer and fell asleep more easily. The 15-minute inhalation duration was chosen based on empirical evidence and recommendations from the International Federation of Aromatherapists (2021), which states that this time is sufficient to produce optimal relaxation without causing olfactory desensitization. Research by Akgül et al (2021) and Triana et al. (2020) also showed that a 15-minute inhalation duration was effective in reducing pain and anxiety in children, while Hawkins et al (2019) found significant improvements in relaxation and well-being after inhalation for the same period.

Considering its mechanism of action, clinical effectiveness, and safety, lavender aromatherapy by inhalation can be recommended as an effective and safe non-pharmacological intervention to improve sleep quality in children with CKD undergoing hemodialysis. This intervention can also be implemented continuously at home with simple education for parents, so its benefits extend beyond hospitalization.

The improvement in sleep quality observed in this case study is consistent with previous research demonstrating the effectiveness of lavender aromatherapy in managing sleep disturbances in clinical populations, including patients undergoing hemodialysis. Despite these positive findings, several limitations should be acknowledged. This study involved a small sample size and employed a case study design, which may limit the generalizability of the results. Sleep quality assessment relied primarily on subjective reports supported by nursing observations, without the use of objective sleep monitoring tools. However, simple quantitative indicators such as sleep duration, wake-up time, and frequency of night awakenings were also considered during daily evaluations. Changes in anxiety levels and overall mood were observed clinically, as patients appeared calmer and more

relaxed before sleep, but these outcomes were not formally measured. Additionally, the short duration of the intervention did not allow for evaluation of the long-term effects of lavender aromatherapy, indicating the need for future studies with larger samples, control groups, objective sleep measurements, and longer follow-up periods.

### **Patient perspective**

Child MD and his uncle reported that after three days of 15-minute lavender aromatherapy inhalations, their difficulty falling asleep at night decreased. Child MD stated that he "did not have any difficulty falling asleep last night." The patient's uncle reported improved sleep duration (going to bed at 9:15 PM and waking at 6:00 AM), although the patient still experienced two nighttime awakenings, each lasting approximately 20 minutes. Subjectively, the patient still felt tired upon waking, although the questionnaire indicated "adequate" sleep quality (score 6).

Furthermore, child RS and his mother reported significant improvements in sleep quality. Child RS stated that he "did not have any difficulty falling asleep last night" and felt "sound and comfortable" and "had enough sleep last night." The patient's mother confirmed a good sleep pattern (going to bed at 9:00 PM and waking at 6:30 AM), with only waking once to urinate and returning to sleep easily. Objectively, the patient did not appear lethargic and was in a good mood (smiling), with the questionnaire results indicating "good" sleep quality (score 2).

Child SD also stated that after the intervention, he "had no trouble falling asleep last night" and felt "sleeping soundly and comfortably last night" and "felt he had enough sleep last night." The patient's mother reported that the patient went to bed at 9:10 PM WIB and woke up at 6:30 AM WIB. However, the patient's mother noted that child SD woke up once to urinate and had difficulty falling back asleep for 30 minutes. Despite feeling he had slept enough, child SD still felt lethargic upon waking. The questionnaire results indicated "good" sleep quality (score 4).

### **Informed Consent**

We confirm that verbal consent was obtained from the patient's legal guardian (parent/uncle). The guardian was given a detailed explanation of the purpose of publishing this case report, the confidentiality of the data (which has been anonymized), and this verbal consent was documented. Both the guardian and the patient



(child) have expressed their willingness for the clinical data in this report to be published for educational and scientific purposes.

## Conclusion

The assessment of three pediatric patients with chronic kidney disease identified sleep pattern disturbance as one of the major nursing problems, as reflected by poor baseline sleep quality scores. The implementation of lavender aromatherapy inhalation for 15 minutes before bedtime over a three-day period was associated with improvements in sleep quality, with post-intervention scores reaching adequate to good categories. These findings suggest that lavender aromatherapy may serve as an effective non-pharmacological intervention to support sleep quality in pediatric CKD patients. However, this study was conducted over a short duration and involved a limited number of patients. Future research is recommended to evaluate the effectiveness of lavender aromatherapy in larger cohorts, incorporate control or comparison groups, and assess the sustainability of its effects through longer follow-up periods. If further studies confirm its efficacy and safety, lavender aromatherapy could be considered for integration into pediatric CKD nursing care protocols as a complementary intervention to support sleep management.

## Consent for publication

Verbal consent was obtained from the patient's legal guardian for publication of this case report and accompanying images. The guardian was provided with an explanation of the purpose of publishing the anonymized clinical data and has documented it for review by the Editor in Chief of this journal.

## Declarations

### Ethics approval and consent to participate

The authors confirm that all appropriate consents for participation in this case report were obtained verbally from the patient's guardian and documented. The patient and her guardian consented to the publication of de-identified clinical data. The patient and her guardian understand that names and initials will not be published and that efforts have been made to conceal identities, but complete anonymity cannot be guaranteed. The ethical standards outlined in the Declaration of Helsinki have been upheld in the management and reporting of this case.

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## References

- Afiestasari, L. (2019). Pengaruh pemberian aromaterapi lavender terhadap kualitas tidur pada lansia di Panti Sosial Tresna Werdha Kabupaten Kubu Raya. *ProNers*, 6(1).
- Aini, N. N., & Maliya, A. (2020). Manajemen insomnia pada pasien hemodialisa: Kajian literatur. *Jurnal Berita Ilmu Keperawatan*, 13(2), 93–99. <https://doi.org/10.23917/bik.v13i2.11602>
- Akgül, E. A., Karakul, A., Altın, A., Doğan, P., Hoşgor, M., & Oral, A. (2021). Effectiveness of lavender inhalation aromatherapy on pain level and vital signs in children with burns: A randomized controlled trial. *Complementary Therapies in Medicine*, 61, 102758. <https://doi.org/10.1016/j.ctim.2021.102758>
- Cho, E. H., Lee, M. Y., & Hur, M. H. (2017). The effects of aromatherapy on intensive care unit patients' stress and sleep quality: A nonrandomised controlled trial. *Evidence-Based Complementary and Alternative Medicine*, 2017, Article 2856592. <https://doi.org/10.1155/2017/2856592>
- Cui, J., Li, M., Wei, Y., Li, H., He, X., Yang, Q., Li, Z., Duan, J., Wu, Z., Chen, Q., Chen, B., Li, G., Ming, X., Xiong, L., & Qin, D. (2022). Inhalation aromatherapy via brain-targeted nasal delivery: Natural volatiles or essential oils on mood disorders. *Frontiers in Pharmacology*, 13, 860043. <https://doi.org/10.3389/fphar.2022.860043>
- Darwish, A. H., & Abdel-Nabi, H. (2016). Sleep disorders in children with chronic kidney disease. *International Journal of Pediatrics & Adolescent Medicine*, 3(3), 112–118. <https://doi.org/10.1016/j.ijpam.2016.06.001>
- Daulany, I., et al. (2024). Penerapan terapi sleep hygiene pada anak usia prasekolah yang mengalami gangguan pola tidur di Desa Mataram Baru wilayah kerja UPT Puskesmas Mataram Baru Lampung Timur. *Majalah Cendekia Mengabdi*, 2(4), 329–335.
- Dinas Kesehatan Provinsi DKI Jakarta. (2024). *Profil kesehatan Provinsi DKI Jakarta tahun 2023*. <https://dinkes.jakarta.go.id>
- Fransisca, Y. M. (2023). *Asuhan keperawatan pada pasien chronic kidney disease (CKD) dengan kombinasi terapi sleep hygiene dan terapi musik instrumental untuk menurunkan gangguan pola tidur* (Undergraduate thesis, Universitas Sriwijaya). Repositori Universitas Sriwijaya.

- Gela, Y. Y., et al. (2024). Poor sleep quality and associated factors among adult chronic kidney disease patients. *Frontiers in Medicine*, 11, 1366010.  
<https://doi.org/10.3389/fmed.2024.1366010>
- Ghaljaei, F., Mahmoodi, N., & Zeinabadi, F. Z. (2022). The effect of aromatherapy with rose water on the deep sleep status of premature infants admitted to NICU: A randomized clinical trial. *Anaesthesia, Pain & Intensive Care*, 27(2), 179–184.
- Gomez, M. V. P., Lorenz, A. B., Esmeralda, C. R., Raul, F. P., Beatriz, F. F., Catalin, M. C., Carolina, C. I., & Alberto, O. (2019). Clarifying the concept of chronic kidney disease for non-nephrologists. *Clinical Kidney Journal*, 12(2), 258–261.  
<https://doi.org/10.1093/ckj/sfz007>
- Hawkins, J. R., Weatherby, N., Wrye, B., & Ujcich Ward, K. (2019). Bergamot aromatherapy for medical office-induced anxiety among children with autism spectrum disorder: A randomized controlled trial. *Holistic Nursing Practice*, 33(5), 285–294.  
<https://doi.org/10.1097/HNP.0000000000000341>
- International Federation of Aromatherapists. (n.d.). *Aromatherapy with children: Guidelines*.  
[https://ifaroma.org/application/files/8915/6889/6479/aromatherapy\\_with\\_children\\_guidelines.pdf](https://ifaroma.org/application/files/8915/6889/6479/aromatherapy_with_children_guidelines.pdf)
- Karava, V., Goutou, S., Dotis, J., Kondou, A., Charela, E., Dadoudi, O., Eleftheriadis, T., Stefanidis, I., & Printza, N. (2022). Fatigue and quality of life in children with chronic kidney disease. *Children*, 9(9), 1414.  
<https://doi.org/10.3390/children9091414>
- Kemkes RI. (2018). *Laporan nasional RISKESDAS 2018*. Badan Penelitian dan Pengembangan Kesehatan.
- Laila, R., Aksari, S. T., Rantauni, D. A., & Imanah, N. D. N. (2024). Pemberian aromaterapi lavender terhadap kualitas tidur ibu postpartum di Puskesmas Kesugihan. *Jurnal Intelek dan Cendekiawan Nusantara*, 1(4), 5299–5305.
- Lestari, I., & Maisaro. (2019). Pengaruh aromaterapi lavender terhadap kualitas tidur ibu hamil trimester III. *Jurnal Ilmu Kesehatan*, 8(1), 32–38.  
<https://ejurnaladkhdr.com/index.php/jik/article/view/232>
- Maharianingsih, N. M., Iryaningrat, A. A. S. I., Windidaca, D., & Putri, B. (2020). Pemberian aromaterapi lavender (*Lavandula angustifolia*) untuk meningkatkan kualitas tidur lansia. *Ad-Dawaa' Journal of Pharmaceutical Science*, 3(2), 72–82. <https://doi.org/10.24252/djps.v3i2.13945>
- Marni, L., Diwanto, Y. P., Asmaria, M., Gusni, J., & Nofita, A. (2024). Asuhan keperawatan pada pasien dengan chronic kidney disease (CKD). *Jurnal Keperawatan Medika*, 2(2), 317–328.
- Muz, G., & Tasci, S. (2017). Effect of aromatherapy via inhalation on the sleep quality and fatigue level in people undergoing hemodialysis. *Applied Nursing Research*, 37, 28–35.  
<https://doi.org/10.1016/j.apnr.2017.07.004>
- Nisa, K. (2023). Efektivitas aromaterapi terhadap kualitas tidur pada anak. *Jurnal Kesehatan Tambusai*, 4(2), 1349–1356.
- Pertiwi, A., Indiansari, A., & Kusumaningrum, A. (2016). Pengaruh aromaterapi rosemary (*Rosmarinus officinalis*) terhadap tingkat kecemasan anak prasekolah akibat hospitalisasi. *Jurnal Keperawatan Sriwijaya*, 3(1), 65–71.
- Potter, P. A., & Perry, A. G. (2017). *Fundamentals of nursing* (9th ed.). Elsevier.
- PPNI. (2016). *Standar diagnosis keperawatan Indonesia: Definisi dan indikator diagnostik* (1st ed.). DPP PPNI.
- PPNI. (2018a). *Standar intervensi keperawatan Indonesia* (1st ed.). DPP PPNI.
- PPNI. (2018b). *Standar luaran keperawatan Indonesia* (1st ed.). DPP PPNI.
- Relawati, A., et al. (2018). Edukasi komprehensif dalam meningkatkan kepatuhan diet pasien hemodialisis. *Indonesian Journal of Nursing Practices*, April 2021.
- Rodriguez, R. V., et al. (2019). The effect of aromatherapy with lavender (*Lavandula angustifolia*) on serum melatonin levels. *Complementary Therapies in Medicine*, 47, 102208.  
<https://doi.org/10.1016/j.ctim.2019.102208>
- Sari, B., B., P. (2024, August 3). *Dinkes DKI: 60 anak jalani terapi gagal ginjal di RSCM*. Detik.com.  
<https://news.detik.com/berita/d-7472072/dinkes-dki-60-anak-jalani-terapi-gagal-ginjal-di-rscm>
- Saridi, M., Batziogiorgos, G., Toska, A., Dimitriadou, I., Malli, F., Zetta, S., & Fradelos, E. C. (2024). Assessing daily function and sleep disorders in hemodialysis patients with end-stage renal disease. *Healthcare*, 12(21), 2115.
- Scherer, J. S., Combs, S. A., & Brennan, F. (2017). Sleep disorders, restless legs syndrome, and uremic pruritus in dialysis patients. *American Journal of Kidney Diseases*, 69(1), 117–128.  
<https://doi.org/10.1053/j.ajkd.2016.07.031>
- Silva, R. M. G. D. G., & Melo, E. F. (2025). Aromatherapy and essential oils in pediatric care: Applications and future directions. *Brazilian Journal of Aromatherapy and Essential Oils*, 2, 1–6.  
<https://doi.org/10.62435/2965-7253.bjhae.2024.bjhae21>
- Susanti, E., et al. (2024). Edukasi bahaya konsumsi minuman berlebihan terhadap kesehatan ginjal. *Jurnal Bakti Nusantara*, 2(2), 57–65.
- Theofilis, P., Vordoni, A., & Kalaitzidis, R. G. (2022). The role of melatonin in chronic kidney disease and its associated risk factors. *American Journal of Nephrology*, 53(7), 565–574.  
<https://doi.org/10.1159/000525441>
- Triana, K. Y., Prihandini, C. W., & Lestari, N. M. P. L. (2021). Efektivitas inhalasi aromaterapi lavender terhadap kecemasan dan nyeri saat pemasangan infus pada anak dengan kanker. *Dunia Keperawatan*, 9(1), 121–129.

- Unruh, M., Cukor, D., & Rue, T. (2020). Sleep-HD trial: Effectiveness of insomnia therapies for hemodialysis patients. *BMC Nephrology*, 21, 443. <https://doi.org/10.1186/s12882-020-02107-x>
- Vora, L. K., et al. (2024). Essential oils for clinical aromatherapy: A comprehensive review. *Journal of Ethnopharmacology*, 330, 118180. <https://doi.org/10.1016/j.jep.2024.118180>
- Wahyuni, T., Harianto, J., & Khusnal, E. (2020). Metabolic disease and chronic kidney disease among women in Indonesia. *Indonesian Journal of Public Health*, 17(2), 2–7.
- Yemina, L., Waluyo, A., & Sukmarini, L. (2018). Pengaruh pendidikan kesehatan sleep hygiene terhadap kualitas tidur pasien GSK yang menjalani hemodialisis. *Journal Scientific Solutem*.