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Effectiveness of Lavender Aromatherapy Administration on Insertion Pain in Hemodialysis Patients

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ABSTRACT

Insertion pain is a significant problem for hemodialysis patients that can reduce comfort and therapy compliance. Non-pharmacological interventions are needed. This study aims to analyze the effectiveness of lavender aromatherapy to reduce insertion pain in hemodialysis patients at RSUD Ir. Soekarno Sukoharjo. This study method is a randomized controlled trial with a pretest-posttest control group design. The sample consisted of 40 respondents selected through purposive sampling and divided into intervention groups (n=20) and control groups (n=20). The intervention group received lavender aromatherapy inhalation for 5-10 minutes before insertion. The pain scale was measured using the Wilcoxon and Mann-Whitney tests. The results showed that before the intervention, the average pain score of both groups was in the moderate category (intervention=4.45, control=4.35). After the intervention, the pain score of the intervention group decreased significantly to 2.55 (mild pain), while the control group remained at 4.40 (moderate pain). Statistical tests showed a very significant difference between the groups (p=0.000). Cohen's results (2.44) confirmed the influence of the intervention in the large effect size category. In conclusion, lavender aromatherapy was proven to be very effective in reducing insertion pain in hemodialysis patients and is recommended as a complementary therapy.

Keywords: Insertion Pain, Hemodialysis, lavender aromatheraphy

INTRODUCTION

Chronic kidney failure (CKF) is a pathological condition characterized by the dysfunction of most nephrons in both kidneys. According to Saragih et al, kidney failure is marked by a decrease in the glomerular filtration rate (GFR) to less than 60 ml/min/1.73 m^2 over a period of 3 months (1). WHO data in 2021 stated that the population of chronic kidney failure patients worldwide at all stages (1-5) had reached 843.6 million people (2). Based on data from the Basic Health Research (Riskesdas) in 2018, there was a very significant increase from year to year, peaking at 713,783 cases of chronic kidney failure patients (3).

Chronic kidney failure (CKF) causes various complex problems, including the management of comorbidities such as hypertension and type II diabetes mellitus, which often lead to drug interaction side effects. Therefore, handling CKF requires a multidisciplinary approach, patient and community education, as well as strict monitoring. Hemodialysis is a therapy that functions as a kidney substitute, where the hemodialysis process involves

cleaning waste products and excess body fluids. This hemodialysis process requires patients to undergo fistula insertion in each hemodialysis session. This procedure causes pain during the cannulation process (4).

An intervention that can be used as a complementary approach that can be explored is aromatherapy (5). A study by Şahin et al, stated that inhalation of lavender has the potential to be a safe, practical, and economical nursing intervention if proven effective in relieving anxiety and pain after fistula needle insertion in hemodialysis patients. Lavender essential oil is specifically believed to reduce insertion pain due to its active compounds, namely linalool and linalyl acetate. These compounds work by stimulating the parasympathetic nervous system to produce relaxing and calming effects, thereby reducing anxiety (6).

Based on a preliminary study at Ir. Soekarno Sukoharjo hospital, there were 193 visits by chronic kidney failure patients scheduled to undergo hemodialysis during the period of January 2025. The high frequency of these patient visits serves as the basis for the researcher's observation and motivates further investigation. Therefore, the researcher is encouraged to design a study focusing on assessing the effectiveness of lavender aromatherapy intervention in an effort to reduce the insertion pain experienced by hemodialysis patients at RSUD Ir. Soekarno Sukoharjo.

METHODS

This study uses a quantitative research type with a Randomized Controlled Trial design using a pre-test and post-test control group design approach. The study was conducted in the hemodialysis unit of Ir. Soekarno Sukoharjo hospital.

The research population consisted of all CKD patients undergoing hemodialysis therapy, totaling 193 patients in January 2025. The research sample amounted to 40 respondents, obtained using the Slovin formula and divided into two groups: the intervention group with 20 respondents and the control group with 20 respondents. The sample collection technique used was purposive sampling.

The instruments used in this study were the standard operating procedures for administering aromatherapy and an observation record sheet that monitored changes in pain scale quality before and after aromatherapy was administered.

RESULTS

Based on Figure 1 regarding the characteristics of respondent ages, it was found that the majority age in the control group was 56-65 years old, totaling 10 people (50%), while in the intervention group the ages were more varied with an age range of 36-45 (5 people), 46-55 years (5 people), and 56-65 years (5 people), each accounting for the same percentage of 25%. The gender of respondents in both groups was predominantly female, with 11 respondents (55%) in each group. The duration of the disease in both groups that respondents mostly experienced was more than 24 months (>24), totaling 10 (50%) in each group.

Variabel	Kelompok Kontrol (n=20)		Kelompok Intervensi (n=20)	
	f	%	f	%
Jenis Kelamin				
Laki-laki	9	45.0	9	45.0
Perempuan	11	55.0	11	55.0
Pendidikan				
SD	9	45.0	6	30.0
SMP	2	10.0	4	20.0
SMA/Sederajat	5	25.0	10	50.0
Sarjana	3	15.0	1	5.0
Pekerjaan				
Tidak Bekerja	15	75.0	15	75.0
Perawat			1	5.0
Petani	1	5.0	2	10.0
Pedagang	2	10.0	2	10.0
Guru	1	5.0		
Satpam	1	5.0		
Lama Hemodialisa				
< 12 bulan	2	10.0	3	15.0
12-24 bulan	8	40.0	7	35.0
>24 bulan	10	50.0	10	50.0
Usia				
<25 tahun			1	5.0
26-35 tahun	1	5.0	1	5.0
36-45 tahun	2	10.0	5	25.0
46-55 tahun	6	30.0	5	25.0
56-65 tahun	10	50.0	5	25.0
>65 tahun	1	5.0	3	15.0

Figure 1. Respondent Characteristics

Variabel	Kontrol (n=20)			
	Mean	Median	Minimum	Maximum
Posttest Intervensi	2.55	2.50	2	4
Posttest Kontrol	4.40	4.00	3	6

Variabel	Intervensi (n=20)			
	Mean	Median	Minimum	Maximun
Pretest Intervensi	4.45	4.00	3	6
Pretest Kontrol	4.35	4.00	3	6

Figure 2. Frequency Distribution of Pain Levels Before and After Lavender Aromatherapy

Based on Figure 2, the results of the pain level measurement before the administration of lavender aromatherapy showed moderate pain levels in both groups. The average score in the control group was 4.35, while in the intervention group it was 4.45. After receiving lavender aromatherapy, the intervention group experienced a significant decrease in pain score to mild pain (2.55), whereas in the control group it remained the same with an average score of 4.40 (moderate pain).

Kelompok	Variabel	Median	Z	*P (Value)*
Intervensi	Pre	4.00	-4.030[b]	.000
	Post	2.50		
Kontrol	Pre	4.00	-577[c]	.564
	Post	4.00		

Figure 3. Wilcoxon Signed-Rank Test Statistic

Based on Figure 3 of the SPSS output, the Z value is -4.030b, which indicates a change in the average insertion pain score with an Asymp.Sig (2-tailed) value of 0.000 or a p-value <0.05, meaning that the alternative hypothesis (Ha) is accepted and the null hypothesis (Ho) is rejected. This indicates a significant difference between the average insertion pain scores before and after being given lavender aromatherapy. This can be concluded regarding the effectiveness of lavender aromatherapy on the insertion pain of hemodialysis patients.

Variabel	Median	MeanRank	*P Value*
Pretest			
Kelompok Intervens	4.00	21.10	0758
Kelompok Kontrol	4.00	1990	
Posttest			
Kelompok Intervensi	2.50	11.53	0,000
Kelompok Kontrol	4.00	29.48	

Figure 4. Difference in Average Pain Scale Pretest and Posttest of the Intervention Group and the Control Group

Based on Figure 4, the results show that after the treatment, the intervention group experienced a significant decrease in pain from moderate to mild, whereas in the control group, the pain felt remained the same. Wilcoxon and Mann-Whitney statistical tests confirmed that this difference is highly significant (p=0.000), proving that lavender aromatherapy is effective in reducing insertion pain in hemodialysis patients.

The test results using Cohen's yielded a value of 2.44, which according to the interpretation indicates an effect in the large category (large effect size). This finding provides strong quantitative evidence that the administration of lavender aromatherapy is not only statistically significant but also has a substantial practical impact in reducing insertion pain in chronic kidney disease patients undergoing hemodialysis at Ir. Soekarno Sukoharjo hospital.

$M_1 = 2,55$ SDa $= 0,605$

$M_2 = 4,40$ SDb $= 0,883$

Cohen's $= \frac{M_2\text{-}M_1}{\frac{\sqrt{(s_A)^2+(s_B)^2}}{2}} = \frac{4,40\text{-}2,55}{\frac{\sqrt{(0,605)^2+(0,883)^2}}{2}} = \frac{1,75}{\frac{\sqrt{0,366+0,779}}{2}}$

$= \frac{1,85}{\frac{\sqrt{1,145}}{2}} = \frac{1,85}{\sqrt{0,757}} = \frac{1,85}{0,757} \text{x} 1000$

$= \frac{1.850}{757} = \mathbf{2.44}$

Figure 5. Cohen's Test

DISCUSSION

Respondent Characteristics

Based on age in the control group, the majority of respondents were aged 56-65 years (50.0%), whereas in the intervention group, the ages were much more varied, with respondents distributed as 25.0% in the age ranges 36-45 (late adulthood), 46-55 (early elderly), and 56-65 (late elderly). This is supported by previous research showing that the age of chronic kidney disease patients undergoing hemodialysis is in the range of 56-65 years, comprising 13 respondents (43%). This indicates that the prevalence of chronic kidney failure increases with age, ranging from 0.3-0.5% in people over 35 years old. As productive age increases, body organs work harder and may encounter problems, such as skin issues and decreased kidney function (7). The aging process, especially after the age of 55, is a major risk factor that contributes to the development of kidney failure. According to Wahyuni & Sukraeny, this can be explained through a series of physiological changes in the cardiovascular system. As age increases, arterial blood vessels naturally lose their elasticity and become stiffer. This condition causes blood flow resistance to increase, which in turn triggers and maintains high blood pressure or chronic hypertension. Uncontrolled hypertension over the long term can lead to hardening of the kidney blood vessels (nephrosclerosis), ultimately causing narrowing (vasoconstriction) and partial blockage. As a result, the blood supply to the kidneys decreases, leading to progressive damage to its functional units, namely the glomeruli and tubules, eventually triggering kidney disease (8). This research is reinforced by a relevant study conducted by Saragih et al. In their study on the characteristics of stage V chronic kidney failure patients, the most dominant age group was also in the 56-65 years range, which included 22 respondents (31.9%). According to Saragih, this phenomenon can be explained physiologically, where the aging process naturally causes a decline in kidney function. This decline is mainly related to the reduced glomerular filtration rate and the worsening of tubular function with increasing age (1).

The gender in this study shows that the majority of respondents in both the intervention and control groups were female, with a total of 11 respondents or 55.0% of the overall sample. This finding is consistent and in line with various previous studies which also identified women as the dominant group in the population of chronic kidney failure (CKF)

patients undergoing hemodialysis. Biologically, there are several factors suspected to cause the high prevalence of CKD in women. As stated by Karwiti & Umizah, women are anatomically more prone to recurrent urinary tract infections (UTIs) due to a shorter urethral structure compared to men. Chronic untreated UTIs can cause permanent kidney damage. In addition, other risk factors specific to women include susceptibility to autoimmune diseases as well as pregnancy complications such as preeclampsia and eclampsia, both of which can have a direct impact on kidney function (9). Further support comes from research Normawati & Uripno, which found that the majority of respondents were female (56.7%) but also linked the prognosis of CKD in women with challenges in controlling blood sugar levels. This differs from men, whose prognosis is more related to the ability to control proteinuria (10). A different perspective is offered by Utomo, who argues that women's physical condition, which tends to be not as strong as men's, can make the perceived burden of kidney disease heavier (11). This consistency is also seen in research Wibowo et al., where 56.3% of respondents in their study on aromatherapy and intradialytic exercise were also female (12).

The characteristics of the duration of patients undergoing hemodialysis indicate that most respondents in this study are long-term patients. In both the intervention group and the control group, half of the respondents, each consisting of 10 people or 50.0%, were recorded as having undergone hemodialysis therapy for more than 24 months. This research is in line with previous studies; a study by Wahyuni et al., reported very similar results, where 52.5% of their respondents also had a history of hemodialysis for more than 24 months (13). Similarly, research by Normawati & Uripno, and Saragih et al., reinforced these findings, with each reporting 16 respondents and 41 respondents (56.9%) respectively as falling into the long-term therapy duration category (1, 10).

Effectiveness of Lavender Aromatherapy Administration in Hemodialysis Patients

The results of the study before the intervention showed that both groups had almost the same level of pain, with the intervention group in the moderate pain category (4.45) while the control group was at (4.35). After the intervention in the form of lavender aromatherapy, there was a significant change in the intervention group, which experienced a decrease in pain level to 2.55 (mild pain), whereas the control group that did not receive any treatment showed no change, with a pain level of 4.40 (moderate pain). This is in line with research conducted by Bening et al. and Dewi et al., both of which showed that the administration of aromatherapy successfully reduced respondents' pain perception from a moderate category with a scale of 4-6 to a mild category with a scale of 1-3. This reinforces the validity of the finding that lavender aromatherapy is an effective intervention (14, 15).

Noxious stimulation of peripheral nerves causes activation of nociceptors and transmission of signals to the central nervous system, which will produce the perception of acute pain (First pain). If tissue injury occurs, a number of secondary events happen both peripherally and centrally, which, if not modulated or moderated, will lead to states of hypersensitization, allodynia, and hyperalgesia (Second pain). This also applies to visceral pain. If this condition is not addressed, over a chronic period it will lead to persistent pain (Third pain). Similarly, peripheral or central nerve injury causes abnormal neuronal processing of non-harmful stimulation, which also leads to states of hypersensitivity, allodynia, hyperalgesia, and chronic pain (16).

Aromatherapy works by using essential oils extracted from plants. According to Kusmantara Putri & Utomo, lavender specifically contains the active compounds linalool and

linalyl acetate. Both of these compounds have the ability to stimulate the parasympathetic nervous system, which produces a calming or sedative effect. Furthermore, these compounds work at the cellular level by inhibiting sodium flow in nerve fibers, thereby disrupting or blocking the transmission of pain signals to the brain, ultimately reducing the perception of pain experienced by the patient (17). The effectiveness of lavender aromatherapy in reducing insertion pain in hemodialysis patients is strongly proven in this study, as indicated by the decrease in average pain scores from moderate to mild. This is not only supported by various studies but can also be scientifically explained through the mechanism of action of lavender's active compounds, which can modulate pain signals and provide a relaxing effect on the nervous system.

From the test results using Cohen's, a value of 2.44 was obtained, which according to interpretation indicates a large effect size. This finding provides strong quantitative evidence that the administration of lavender aromatherapy is not only statistically significant but also has a substantial practical impact in reducing insertion pain in patients with chronic kidney disease undergoing hemodialysis.

CONCLUSION

There is a significant effect on the average insertion pain scores before and after administering lavender aromatherapy in the intervention group, which was conducted for 3 consecutive days with a duration of 5-10 minutes before the insertion, with a Z value of -4.030 indicating a change in the average insertion pain scores with a P Value (0.000) or ($P < 0.05$), and the effectiveness value in the Cohen's test obtained a result of 2.44 (large category).

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