



Effect of Lavender Inhalation Aromatherapy on Sleep Quality in Cancer Patients at Murni Teguh Memorial Hospital

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Abstract

Sleep is a physiological human need. Sleep disorders can affect a person's quality of life. One of the complementary therapies is aromatherapy, which can improve one's sleep quality non-pharmacologically. This study aims to identify the effect of lavender inhalation aromatherapy intervention on sleep quality in cancer patients. The research method used is quantitative or quantitative design with a quasi-experimental design non-equivalent approach. The sampling technique is a non-probability sampling technique, namely the convenience sampling method. Respondents to this study were hospitalized cancer patients totaling 100 respondents consisting of 50 respondents for the intervention group and 50 respondents for the control group. Data was collected using a questionnaire. The sleep quality measurement instrument used is the Sleep Quality Questionnaire. Data were analyzed using the dependent t-test and independent t-test. The results of the study found an effect of lavender inhalation aromatherapy on improving sleep quality in cancer patients with a p-value ($p=0.000$). Conclusion Lavender inhalation aromatherapy can improve sleep quality in cancer patients and is recommended as a nursing intervention and alternative therapy to improve sleep quality in cancer patients.

Keyword: Cancer, Lavender Aromatherapy, Sleep quality

INTRODUCTION

One health problem worldwide is cancer, the second leading cause of death in the United States (Siegel et al., 2022). Cancer is a disorder caused by genetic and epigenetic changes in somatic cells and has abnormal cell growth that can spread to other parts of the body (Saini et al., 2020). In its data, Globocan stated that in 2018 there were 18.1 million new cases with a death rate of 9.6 million deaths, of which 1 in 5 men and 1 in 6 women worldwide experienced cancer. The data also stated that 1 in 8 men and 1 in 11 women died of cancer (Globocan, 2020).

Based on Basic Health Research survey data, the prevalence of tumors/cancer in Indonesia increased from 1.4 per 1000 population in 2013 to 1.79 per 1000 population in 2018.

The highest prevalence is in the province of Yogyakarta, 4.86 per 1000, followed by West Sumatra, 2.47 per 1000, and Gorontalo, 2.44 per 1000. North Sumatra has the highest number of cancer patients on the island of Sumatra. Based on sociodemographics, the highest cancer incidence is in adults (75.1%) (Kemenkes RI, 2018).

Murni Teguh Memorial Hospital Medan is a private hospital for the referral of cancer patients. Data obtained from the medical records of Murni Teguh Memorial Hospital Medan in January - December 2021, namely: (1) the number of cancer patients or all types of cancer who were hospitalized was 7,390 people. (2) the number of outpatient cancer patients is 28,459 people. (3) the number of cancer patients died in the hospital was 474 people. The average number of cancer patients hospitalized daily is 57-60 people.

Some cancer treatments have side effects such as nausea, vomiting, and decreased appetite, so before further treatment, sufferers are psychologically stressed and experience sleep deprivation (Kemenkes RI, 2018). To reduce the side effects of medication, it can be given pharmacologically or non-pharmacologically. Non-pharmacological treatment is simpler, does not cause more severe effects, and costs less (Sugianti et al., 2019). Complementary therapy, or Complementary and Alternative Medicine (CAM), includes non-pharmacological therapy. Complementary therapy is also referred to as alternative therapy or traditional medicine. Various complementary therapies include acupuncture, aromatherapy, homeopathy, massage therapy, hypnosis, herbal medicine, chiropractic, pilates, and yoga. Aromatherapy has been widely used in overcoming one of the health problems of cancer patients, such as sleep disorders. One of the aromatherapy used is lavender.

Several researchers have also tested the effect of lavender aromatherapy on the sleep quality of cancer patients. Lavender aromatherapy is given either by inhalation with various media or by massage. Research conducted by Hamzeh et al., (2020) states that lavender aromatherapy given by inhalation can improve sleep quality in cancer patients. Research has also been conducted on patients who are undergoing chemotherapy. Lavender aromatherapy has been shown to improve the sleep quality of patients undergoing chemotherapy. Lavender essential oil, commonly used in aromatherapy, has a calming effect, affecting sleep quality and reducing stress (Karadag et al., 2017).

Lavender aromatherapy is also a cheaper and safer intervention than pharmacological measures (Blackburn et al., 2017). The research that has been done before has some limitations. One of the limitations is the research conducted by Blackburn et al. (2017) formulated that the research conducted had limitations, namely only focusing on the diagnosis of acute leukemia so that the study results could not be generalized to all cancer patients.

Sleep disturbance is a problem that often occurs in cancer patients (including all types of cancer). Decreased quality of sleep can affect the quality of life of cancer patients. Murni Teguh Memorial Hospital is one of the private hospitals in the city of Medan, which is a referral for cancer patients. Therefore, researchers are interested in testing the effect of lavender aromatherapy on cancer patients regardless of type and stage of cancer so that the research results can be generalized to all cancer patients.

METHOD

The research design used is quantitative or quantitative with a quasi-experimental approach. The quasi-experimental design used a non-equivalent design with an intervention group and a control group to compare two or more groups before and after implementing an intervention (Polit et al., 2018). In this study, there were two variables: lavender aromatherapy as the independent variable and sleep quality as the dependent variable. The intervention group was the group that was given the lavender aromatherapy intervention, while the control group was the group that did not receive the lavender aromatherapy intervention.

This research was conducted in the inpatient room of Murni Teguh Memorial Hospital Medan. This research was conducted from 18 January 2023 to 06 February 2023 inpatients in 5 inpatient rooms that treat cancer patients. The population in this study were all cancer patients hospitalized at Murni Teguh Memorial Hospital. The sampling technique in this study used a non-probability sampling technique, namely the convenience sampling method. Based on the Slovin formula, the number of samples in this study was 100 respondents, consisting of 50 people in the intervention group sample and 50 people in the control group.

Respondent criteria are based on the considerations of the researcher in determining the number of respondents in the study. The inclusion criteria in this study were: (1) aged 19-60 years (2) patients who had been diagnosed with cancer (3) did not experience olfactory disorders (4) patients who had a full level of awareness and were able to answer questions (5) were willing to be respondents and participate in every intervention from start to finish. While the exclusion criteria in this study were: (1) cancer patients who had a history of allergies to flowers and lavender plants (2) patients who used antidepressants, hypnotics, benzodiazepines, and narcotic derivatives that affect sleep quality (3) respondents with unilateral reasons stopped participating in research (4) patients who have respiratory problems (5) patients who die, go home or do not continue treatment until the specified therapy is finished.

In this study, there were two variables: lavender aromatherapy as the independent variable and sleep quality as the dependent variable. This study used an instrument based on

the Pittsburgh Sleep Quality Index (PSQI) assessment of sleep quality. The material used in this research is lavender aromatherapy using an inhaler containing a filter. The packaging used is in the form of a bottle with a cap containing 5 ml per bottle. The material is equipped with a barcode and registered with the Food and Drug Supervisory Agency with number TR226005081 and determined as halal by the Institute for the Assessment of Food, Drugs, and Cosmetics of the Indonesian Ulema Council of West Java with number 01171264861021. The inhaler is purple with a hollow inner and a closed inhaler lid meeting. Each tool contains a filter as a place for the lavender liquid to be dripped.

Data analysis in this study was carried out by distributing the normality of the data in this study using the Kolgomorov-Smirnov test parameters (> 50 samples) with the assumption that the data distribution is normal if the p-value is > 0.05 . Once the data is known to be normally distributed, it is continued with the homogeneity test with the Levene test with the assumption that data homogeneity is fulfilled if the p-value > 0.05 to obtain more accurate inferential analysis results. The inferential analysis used is the comparative test. The comparative test was used as a parametric test (t-dependent and t-independent) to compare the differences in sleep quality before and after being given lavender inhalation aromatherapy in the intervention and control groups.

RESULTS

Data on the demographic distribution of respondents based on the characteristics in Table 1. are as follows:

Table 1. Demographic distribution of respondents based on characteristics

Characteristics	Intervention		Control	
	n	%	n	%
Age				
17-25 year	4	8.0	1	2,0
26-35 year	5	10.0	3	6,0
36-45 year	21	42.0	12	24,0
46-55 year	12	24.0	25	50,0
56-65 year	8	16.0	9	18,0
Total	50	100	50	100
Gender				
Male	23	46.0	20	40.0
Female	27	54.0	30	60.0
Total	50	100	50	100
Education				
Elementary school	7	14.0	3	6.0
Junior high school	13	26.0	11	22.0
Senior high school	24	48.0	30	60.0
Bachelor's degree	6	12.0	6	12.0
Total	50	100	50	100
Marital status				
Marry	46	92.0	49	98.0
Not married yet	4	8.0	1	2.0

Total	50	100	50	100
Cancer Stadium				
Stadium II	2	4.0	1	2.0
Stadium III	33	66.0	37	74.0
Stadium IV	15	30.0	12	24.0
Total	50	100	50	100

Based on Table 1. it was found that the number of characteristics of cancer patient respondents in the intervention group was dominated by respondents aged 36-45 years, namely 21 people (42%), then 12 people (24%) aged 46-55 years, ages 56- 65 years amounted to 8 people (16%), aged 26-35 years amounted to 5 people (10%) and aged 17-25 years amounted to 4 people (8%). Age in the control group was dominated by 46-55 years of age totaling 25 people (50%), aged 36-45 years, totaling 12 people (24%), age 56-65 years totaling 9 people (18%), age 26-35 years amounted to 3 people (6%) and aged 17-25 years amounted to 1 person (2%).

Based on gender, there were more women in the intervention group, namely 27 people (54%), and men totaling 23 people (46%). The control group was also dominated by women, namely 30 people (60%) and men totaling 20 people (40%). Based on the level of education in the intervention group, there were 24 high school students (48%), 13 junior high schools (26%), 7 elementary schools (14%), and 6 undergraduate students (12%). In the control group, there were 30 high school students (60%), 11 junior high school students (22%), 6 undergraduate students (12%), and 3 elementary school students (6%).

Data based on marital status in the intervention group, in the intervention group, there were 46 married people (92%) and 4 unmarried people (8%) and in the control group there were 49 married people (98%) and 1 unmarried person (2%)). Data based on cancer stage from respondents in the intervention group found stadium II totaling 2 people (4%), stadium III, totaling 33 people (66%), and stadium IV totaling 15 people (30%). In the control group, stadium II was found in 1 person (2%), stage III in 37 people (74%), and stage IV in 12 people (24%). The distribution of respondents based on the type of cancer in the intervention group and the control group can be seen in Table 2. Below :

Table 2. Types of Cancer in the Intervention Group and Control Group

Cancer Type	Intervention		Control	
	n	%	n	%
Nasopharynx Cancer	17	34.0	9	18.0
Breast	9	18.0	9	18.0
rectum	5	10.0	9	18.0
Intestines	4	8.0	6	12.0
Ovarium	4	8.0	2	4.0
Gasster	2	4.0	3	6.0

Leukemia	1	2.0	4	8.0
cervix	1	2.0	2	4.0
<i>Brains</i>	1	2.0	-	-
Pancreas	1	2.0	-	-
<i>Myxofibrosarcoma</i>	1	2.0	-	-
Esophagus	1	2.0	-	-
Skin	1	2.0	-	-
Mouth	1	2.0	-	-
Bladder	1	2.0	-	-
Uterus	-	-	2	4.0
Abdomen	-	-	2	4.0
Tongue	-	-	1	2.0
Lungs	-	-	1	2.0

Based on Table 2. The results showed that the types of cancer of the respondents in the intervention group found 15 types of cancer suffered by 50 respondents. The most common type of cancer is nasopharyngeal cancer (Nasopharynx Cancer), namely 17 people (34%), breast cancer as many as 9 people (18%), rectal cancer as many as 5 people (10%), colon cancer as many as 4 people (4%) , ovarian cancer 4 people (8%), gastric cancer 2 people (4%), leukemia 1 person (2%), cervical cancer 1 person (2%), brain cancer 1 person (2%), cancer pancreas by 1 person (2%), Myxo Fibrosarcoma by 1 person (2%), esophageal cancer by 1 person (2%), skin cancer by 1 person (2%), oral cancer by 1 person (2%) and cancer bladder in 1 person (2%).

Data based on the type of cancer from respondents in the control group found 12 types of cancer suffered by 50 respondents. The most common type of cancer was nasopharyngeal cancer (Nasopharynx Cancer), namely 9 people (18%), breast cancer 9 people (18%), rectal cancer 9 people (18%), colon cancer 6 people (12%) , leukemia as many as 4 people (8%), gastric cancer as many as 3 people (6%), ovarian cancer as many as 2 people (4%), cervical cancer as many as 2 people (4%), uterine cancer as many as 2 people (4%), abdominal cancer in 2 people (4%), tongue cancer in 1 person (2%), and lung cancer in 1 person (2%).

The mean difference between the intervention group and the unpaired control group. The basis for decision making is that if the Significance or Sig.(2-tailed) value is >0.05 , H_0 is accepted and H_a is rejected. If the Significance or Sig.(2-tailed) value < 0.05 , H_0 is rejected and H_a is accepted. The results of the independent t-test can be seen in Table 3 below:

Table 3. The average difference between the intervention group and the control group

Variable	Group	Mean	Std.Error Mean	p-value
Pretest sleep quality	Intervention	16.060	0.592	0.215
	Control	15.100	0.489	
Post-test sleep quality	Intervention	22.380	0.318	0.000
	Control	15.360	15.360	

Based on Table 3. the results of the independent t-test of 100 samples, it is known that the mean value of sleep quality before being given lavender inhalation aromatherapy in the intervention group was 16.060 with a standard error of 0.592 while the mean value of sleep quality in the control group was 0.489 with a standard error of 0.489.

The mean quality of sleep after being given lavender inhalation aromatherapy in the intervention group was 22.380 with a standard error of 0.318, while the mean value of sleep quality in the control group was 15.360 with a standard error of 0.334.

The results of the pretest statistical test in the control and intervention groups obtained a p-value = 0.215, meaning that there was no significant difference in the mean sleep quality between the intervention and control groups. The results of the statistical test after (post-test) in the control and intervention groups obtained a p-value = 0.000, meaning that there was a significant difference in the average sleep quality between the intervention and control groups.

In this study, the data used were normally distributed and homogeneous, so the Dependent sample t-test or paired sample t-test was carried out, which aims to test whether there is an average difference between two paired or related samples. The basis for decision making is that if the Significance or Sig.(2-tailed) value is >0.05 , H_0 is accepted, and H_a is rejected. If the Significance or Sig.(2-tailed) value < 0.05 , H_0 is rejected, and H_a is accepted. The results of the dependent sample t-test can be seen in Table 4 below:

Table 4. The average difference between the intervention group and the control group

Pair	Group	Mean	Std.Error Mean	p-value
Pair 1	Pre Intervention	-6.320	0.541	0.000
	Post Intervention			
Pair 2	Pre Control	-0.260	0.276	0.352
	Control Post			

Based on Table 4. it is known that in pair 1, namely in the intervention group, it has a mean value of -6.320, std. deviations 3,830, std. errormean 0.541 with sig.(2-tailed) is 0.000. Whereas in pair 2, namely the control group, it has a mean value of -0.260, std. deviation 1.956, std. the mean error is 0.276 with sig.(2-tailed) is 0.352.

The independent test results in the intervention group obtained a sig.(2-tailed) value which showed a p-value = 0.000 (<0.05), meaning that H_0 was rejected and it could be concluded that there was a significant difference in improving sleep quality in cancer patients before and after being given inhalation aromatherapy lavender in the intervention group. Whereas in the control group, the sig.(2-tailed) value was obtained which showed p-value = 0.352 (> 0.05), meaning that H_0 was accepted and it could be concluded that there was no

significant difference in improving sleep quality in cancer patients before and after in the control group.

DISCUSSION

1. Sleep Quality Before and After Given Lavender Aromatherapy In The Intervention Group

Sleep disturbance is one of the most common complaints in cancer patients (Heydarirad et al., 2019). Management of insomnia is divided into two, namely pharmacological and non-pharmacological management. Pharmacological therapy using benzodiazepine, non-benzodiazepine and miscellaneous sleep promoting agent classes (Ramadhan et al., 2017). Statistical data shows 25-50% of cancer patients use benzodiazepine sleeping pills. Overdose of benzodiazepines is very dangerous because it can increase the death rate (Vukčević et al., 2016).

Complementary and alternative medicine (CAM) is a method that can help treatment with lower side effects and lower costs. Aromatherapy is a Complementary and Alternative Medicine (CAM) method using plant extracts to treat various diseases. One scent that has been proven to improve sleep quality is the scent of lavender.

According to Ramadhan et al., (2017) in his, research found that in 100 grams of *Lavandula angustifolia*, lavender flowers are composed of several ingredients, such as essential oils (1-3%), alpha-pinene (0.22%), camphene (0.06%), beta-myrcene (5.33%), cymene (0.3%), limonene (1.065), cineol (0.51%), linalool (26.12%), borneol (1.21%), terpinene-4-ol (4.64%), linalyl acetate (26.32%), geranyl acetate (2.14%), and caryophyllene (7.55%). It can be concluded that the content of linalyl acetate and linalool ($C_{10}H_{18}O$), but linalyl acetate as the main ingredient of lavender flowers does not have a significant sedative effect on reducing the risk of insomnia.

Lavender flower aromatherapy (*Lavandula angustifolia*) contains linalool which functions as a sedative so that when a person inhales lavender aromatherapy, the aroma released will stimulate the ciliary receptors of the olfactory nerves, which are in the olfactory epithelium to transmit the aroma to the olfactory bulb through the olfactory nerve. The olfactory is related to the limbic system. The most important parts of the limbic system associated with scent are the amygdala and hippocampus, to activate thoughts and feelings (Farrar, 2020). Through the hypothalamus as a regulator, the aroma will be brought to a small but significant part of the brain, namely the raphe nucleus, which is stimulated, namely the

release of serotonin which is a neurotransmitter that regulates the onset of sleep (Ramadhan et al., 2017).

The results of statistical tests in the intervention group before (pre) and after (post) the intervention obtained $p = 0.000$, which means that there is a significant effect on improving sleep quality in cancer patients. These results are in line with research conducted by Blackburn et al., (2017) also found that 50 respondents aged 19-72 years in patients who had just been diagnosed with acute myelogenous leukemia who were given lavender aromatherapy showed a significant increase in sleep quality with a p -value = 0.05.

2. Sleep Quality Before and After Giving Lavender Aromatherapy In the Control Intervention Group

In the control group, no lavender inhalation aromatherapy intervention was given, only measurements were made of the quality of sleep of cancer patients who were hospitalized. Assessment (Post) is carried out after the third day using the same instrument. The measurement (Pre) results in the intervention group and the control group showed poor sleep quality.

The results of statistical tests in the control group obtained $p = 0.352$, which means there is no significant difference in improving sleep quality in cancer patients. Based on the results of research conducted by Özkaraman et al., (2018) showed that there was a significant difference in the value of the Pittsburgh Sleep Quality Index (PSQI) in the intervention group before using lavender aroma and after using lavender aroma which was inhaled every night before going to bed in patients undergoing chemotherapy. In contrast, in the control group, there was no increase in the value of the Pittsburgh Sleep Quality Index. (PSQI) and sleep quality improvement.

Research conducted by Blackburn et al., (2017) also showed a difference in the average Pittsburgh Sleep Quality Index (PSQI) score between the aromatherapy intervention and the placebo. Patients given aromatherapy had lower scores compared to those given placebo. The results showed that aromatherapy significantly increased sleep duration with $p=0.03$, sleep quality with $p=0.05$, and decreased sleep disturbance with $p=0.04$.

Furthermore, in research conducted by Karadag et al., (2017) Comparison of Pittsburgh Sleep Quality Index (PSQI) scores in the control group and the intervention group before and after the intervention showed statistically significant differences with a $p < 0.05$ in the intervention group and concluded that lavender essential oil improves sleep quality and reduces anxiety levels in patients coronary artery disease while in the control group, there was no significant difference.

3. Quality of sleep before and after being given lavender inhalation aromatherapy in the intervention and control groups

Insomnia or difficulty sleeping is another problem for people with leukemia (Mohammed et al., 2018). Sleep is one of the vital needs that is important in maintaining individuals' physiological and psychological well-being. Inadequate and unsatisfactory sleep impedes healing, hurts the immune system, wound healing process, and individual cognitive function, and increases personal stress and anxiety (Karadag et al., 2017).

Poor sleep quality is a condition in which the period and duration of sleep are met at night but disturbed when falling asleep or waking up feeling unrefreshed (Hillman et al., 2017). Based on research from Krisdhiyanti (2016) cited by Aisy (2020) regarding sleep quality in breast cancer patients undergoing chemotherapy at dr. Hasan Sadikin (RSHS) Bandung reported that out of 83 patients undergoing chemotherapy, 69 (83.13%) patients had poor sleep quality, and the most common type of sleep disorder experienced was insomnia (66.67%).

The research results that carried out the percentage of good and bad sleep quality conveyed by respondents in the intervention group before the intervention was in a good category at 26%, and the wrong category was 74%. In contrast, it was obtained for the good category 86% and the bad category 14% after the intervention. In the control group, the pretest data obtained were 26% good category and 74% wrong category, while the post-test good category was 30% and 70% bad category.

Apart from medical therapy, complementary therapy can also support patient care and improve the quality of life Özlü et al., (2017). Aromatherapy is widely used by people living with leukemia for various reasons, and the most common reason is treating insomnia, which is defined as subjective dissatisfaction with the duration or quality of sleep (Mohammed et al., 2018).

Treatment of insomnia is carried out by administering drugs classified into benzodiazepines, non-benzodiazepines and various sleep-promoting agents, but often cause side effects for people living with insomnia (Gaddafi, 2013) cited by Ramadhan et al., (2017). Therefore, treatment is needed that can reduce the risk of insomnia that is safe and has the same or more effectiveness. One of the treatments is using lavender flower aromatherapy (*Lavandula angustifolia*) which does not cause side effects and has a sedative effect in reducing the risk of insomnia (Ramadhan et al., 2017).

Kawabata et al. (2020) research showed that aromatherapy massage can improve sleep quality. Blackburn et al., (2017) the research results recommend that aromatherapy is a feasible

intervention to improve insomnia and other symptoms experienced by people living with acute leukemia.

Statistical test results using the Dependent sample t-test or paired sample t-test, which aims to test whether there is an average difference between two paired or related samples. Based on the results found, there were differences between the intervention and control groups. In the intervention group, lavender inhalation aromatherapy was proven to improve the sleep quality of cancer patients. In contrast, there was no increase in sleep quality in the group that was not given lavender inhalation aromatherapy.

The nursing theory used in this study is Orem's self-care theory, especially for oneself. A person doing self-care must first know what can and should be done. For self-care continues with deciding what can be done and finally produces treatment (Orem, 2001). Sleep is one of the basic needs that must be met (Aligood, 2013). The respondent's adherence or timeliness causes good sleep quality to do therapy that is useful for himself to improve his quality of life. Nurses play a very important role in protecting and managing the implementation of patient self-care (Orem, 2001).

The implementation that can be done by nurses in self-care in cancer patients according to Orem's theory (Marlaine et al., 2015), is by identifying knowledge about self-care with methods of assisting, guiding, and supporting by designing a supportive-educational nursing system.

Furthermore, for nurses to choose interventions that patients themselves can carry out, apply agreed interventions, in this case, lavender inhalation aromatherapy interventions, before going to bed at night, and then evaluate the interventions that have been given until finally, it is expected that patients can carry out independent interventions after assessing their sleep needs.

CONCLUSION

The results of this study found differences in the *Qualitas Sleep Questionnaire* (CEC) scores between the pretest and post-test in the intervention group and the control group. In the intervention group, the test results found a value of $p = 0.000$, so it can be concluded that lavender inhalation aromatherapy improves sleep quality in cancer patients. In the control group or the group that was not given lavender inhalation aromatherapy, the test results found $p = 0.352$, so it can be concluded that there is no significant difference in improving sleep quality in cancer patients.

The results of this study are expected to be used as a reference source for health services in providing complementary therapy, namely lavender aromatherapy intervention, to help improve sleep quality in cancer patients. By implementing lavender aromatherapy interventions by health workers, especially nurses, it is hoped that optimal service will be realized.

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