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Effectiveness of Aromatherapy Rose Flower Mask in Reducing Blood Pressure among Pre-elderly and Elderly Hypertension Survivors

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Abstract

Hypertension is the third leading cause of death in Indonesia. The incidence rate of hypertension in West Java is 29.4%, and its prevalence in the Greater Bandung area reaches 12.10% of the total population. The prevalence increases with age. Hypertension management includes both pharmacological and non-pharmacological approaches. One practical and efficient non-pharmacological therapy is rose (Rosa centifolia) flower aromatherapy, which is preferred due to its gentle and pleasant fragrance. The mechanism of rose aromatherapy involves two physiological systems: the circulatory and olfactory systems. When the aroma of rose essential oil is inhaled, volatile molecules stimulate olfactory receptors, sending electrochemical signals through the olfactory tract to the limbic system. This stimulation triggers emotional and relaxation responses, promoting calmness and improving blood flow. This study aimed to determine the effectiveness of rose flower aromatherapy masks in reducing blood pressure among pre-elderly and elderly with hypertension. Rose essential oil was applied to masks using room-temperature evaporation at a 50% concentration for six hours. A quasi-experimental design was employed with two groups (control and intervention) and a total of 150 participants. The study was conducted between September and November 2023. The control group received rose aromatherapy via a humidifier, while the intervention group received rose aromatherapy using an aromatherapy mask. Data were tested for normality and analyzed using non-parametric bivariate tests due to non-normal data distribution. Results In the control group, the mean rank of systolic blood pressure before aromatherapy was 199.45, compared to 108.05 in the intervention group. After aromatherapy, the systolic mean rank was 212.53 in the control group and 95.39 in the intervention group. For diastolic blood pressure, the mean rank before aromatherapy was 182.30 (control) and 124.64 (intervention), and after aromatherapy it was 186.04 (control) and 121.03 (intervention). These findings indicate a significant reduction in both systolic and diastolic blood pressure among participants who received rose aromatherapy using a mask. Conclusion Rose flower aromatherapy delivered through a mask is more effective in lowering systolic and diastolic blood pressure compared to humidifier-based aromatherapy among pre-elderly and elderly individuals with hypertension. Regular daily use of rose aromatherapy masks is recommended as a complementary non-pharmacological approach for hypertension management.

Keywords: Hypertension; Rose Aromatherapy Mask; Elderly

Background

Hypertension is the disease that is commonly experienced by the elderly population. Currently, hypertension has a high prevalence, with an estimated 972 million people worldwide, or 26.4% of the total global population, affected by this condition (Winardiyanto, 2020; WHO, 2013). According to Riskesdas (2013), the prevalence of hypertension was 45.9% among individuals aged 55–64 years, 57% among those aged 65–74 years, and 63.8% among individuals aged 75 years and older. The data show that the older the age, the higher the prevalence of hypertension (Aulia et al., 2023).

Hypertension is the third leading cause of death in Indonesia. The incidence rate of hypertension in West Java is 29.4%, while the prevalence in the Greater Bandung area is 12.10% of the total population. Various conditions can trigger high blood pressure, such as tension, anxiety, social status, noise, disturbances, and restlessness. Hypertension can also be influenced by lifestyle factors such as smoking, alcohol consumption, stress, obesity, lack of physical activity, insufficient sleep, heredity, and personality type (Hardini et al., 2021; Septiyani, 2010). These factors must be controlled or managed to prevent hypertension from progressing to cardiovascular diseases, which can often lead to fatal outcomes or sudden death (Haryono, 2018; Solechah et al., 2017).

Management of hypertension consists of two approaches, namely pharmacological and non-pharmacological treatments. Some non-pharmacological therapies that are relatively practical and efficient include juice therapy, herbal therapy, and aromatherapy (Kurniadi et al., 2022; Kenia, 2013). Aromatherapy is a term used to describe a healing process utilizing pure aromatic plant extracts. Its purpose is to improve physical, mental, and emotional health. The aromatic plant extracts used are obtained through various processing methods and are known as essential oils (Kusuma & Rikhi, 2020; Sam'ani, 2017). Common types of aromatherapy include Cendana (Santalum album), lemon (Citrus lemon), jasmine (Jasminum grandiflorum), Cananga (Cananga odorata), rose (Rosa centifolia), and lavender (Lavandula angustifolia) (Lestari et al., 2022; Sholikha, 2011 in Aisyah, 2016).

The soft floral scent most preferred by many people is the rose fragrance, as it has a gentler aroma compared to other flowers. In addition, rose essential oil is widely available in pharmacies and supermarkets, making it easy to obtain. Rose aromatherapy contains linalool and geraniol, compounds known for their calming properties and their ability to induce relaxation in the central nervous system by stimulating the olfactory nerves.

Several chemical constituents found in rose essential oil include geranyl benzoate, caryophyllene, linalool, eugenol, phenylethyl alcohol, farnesol, nonyl compounds, and aldehydes. Inhaling aromatherapy increases alpha waves in the brain, which promote relaxation. This process helps reduce vasoconstrictive activity in blood vessels, allowing smoother blood flow and thereby lowering blood pressure.

The mechanism of aromatherapy is similar. When the volatile molecules of flowers essential oil, which contain geraniol and linalool, are inhaled, these aromatic molecules reach the nasal cavity where cilia from olfactory receptor cells are located. When the molecules adhere to these cilia, electrochemical signals are transmitted through the olfactory pathway to the limbic system, which regulates memory and emotional responses. The hypothalamus, functioning as a regulator, sends signals to the brain that are then converted into electrochemical actions,

resulting in feelings of calmness and relaxation and promoting better blood circulation (Mailani & Burhanto, 2022).

Disturbances in blood flow or hemodynamic disorders can often be alleviated by using essential oils with hypotensive properties, such as dandelion oil, rose oil, marigold oil, and lavender oil (Mindayani et al., 2021). Previous studies on rose aromatherapy have applied the oil by pouring rose essential oil into hot water or using an electric steam diffuser (Putri, 2018). However, these methods have several limitations, including the need for a special room to ensure the vapor is easily inhaled, the uneven dispersion of aroma, potential discomfort to others nearby, and a lack of practicality. Based on these limitations, researchers were inspired to develop an innovative method of aromatherapy application using a mask (aromatherapy mask).

Methods

The research design used in this study was a quasi-experimental two-group pre- and post-test design with control, in which the study was conducted on two groups and measurements were taken twice — before (O1) and after (O2) the intervention. This study aimed to determine the effectiveness of rose flower aromatherapy masks in reducing blood pressure among the elderly in the working area of Pasirkaliki Public Health Center (Puskesmas Pasirkaliki), Bandung City.

The population in this study consisted of pre-elderly and elderly individuals with hypertension living within the working area of Pasirkaliki Public Health Center, Bandung City. The sample size was 150 participants in the control group and 150 participants in the intervention group.

Inclusion Criteria

1. Pre-elderly and elderly individuals aged 45 years and above diagnosed with hypertension.
2. Residents of Pajajaran Subdistrict, Bandung City, within the working area of Pasirkaliki Public Health Center.
3. Able to communicate verbally or non-verbally.

Exclusion Criteria

1. Elderly individuals who are uncooperative.
2. Elderly individuals under special medical care.

The sample size was determined using the sample size formula for paired numerical analytical research. After selection according to the inclusion and exclusion criteria, a minimum of 25 respondents per group was required for participation in this study. Ultimately, 150 respondents were included in the rose aromatherapy mask group, and 150 respondents in the rose aromatherapy steam (humidifier) group. The total number of participants, which was nearly twice the minimum sample size, was intended to strengthen the validity and reliability of the research findings and conclusions.

Data Collection Procedures

The procedures for data collection were as follows:

1. Identifying eligible pre-elderly and elderly participants, namely those aged 45 years and above with hypertension, having normal olfactory function, not allergic to rose aroma, living in Pajajaran Village within the working area of Pasirkaliki Public Health Center

(Puskesmas Pasirkaliki) in Bandung City, and able to communicate verbally or non-verbally.
2. Conducting randomization to determine the intervention group and the control group.
3. Elderly individuals who met the criteria were given an explanation (informed consent) and asked for their approval to participate as respondents.
4. After obtaining consent, blood pressure measurements (pre-test) were taken. Once the blood pressure values were identified, the intervention was administered: the intervention group received the rose aromatherapy mask, while the control group received rose aromatherapy steam. Each intervention was administered for 10 minutes.
5. After the intervention, blood pressure was measured again (post-test).

Data Processing and Data Analysis

Data were processed using computer software. After processing, the data were analyzed and presented in tabular form. The purpose of data analysis was to determine the effectiveness of the rose aromatherapy mask in reducing blood pressure among elderly individuals with hypertension in the working area of Pasirkaliki Public Health Center in Bandung City.

Data analysis was conducted through the following steps:

1) Univariate Analysis

In this study, univariate analysis was conducted to identify blood pressure values before and after aromatherapy. Numerical univariate analysis used mean, median, and standard deviation for systolic and diastolic blood pressure.

2) Bivariate Analysis

Bivariate analysis in this study used a two-mean difference test to determine the effectiveness of the rose aromatherapy mask in reducing blood pressure in elderly participants.

Before conducting the two-mean difference test, a normality test was performed, showing that the data were normally distributed. The next step was to conduct a dependent t-test (Paired t-test) to compare pre- and post-intervention values for each group.

An independent t-test (Pooled t-test) was then performed to determine the effectiveness of the rose aromatherapy mask in reducing blood pressure between the intervention and control groups.

If the normality test indicated that the data were not normally distributed, non-parametric tests were used, namely the Wilcoxon Signed Rank Test and the Mann–Whitney Test (as the equivalents for paired and pooled t-tests) to assess differences in mean values across groups.

The null hypothesis (H0) was rejected when $p < \alpha$ ($\alpha = 0.05$). Data processing was performed using computer software.

Research Results

The results were as follows:

1. Normality Test Results:

Table 4.1 Normality Test Results

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tekanan sistolik sebelum aroma terapi	,137	150	,000	,935	150	,000
Tekanan diastolik sebelum aroma terapi	,068	150	,086	,984	150	,086
Tekanan sistolik sesudah aroma terapi	,116	150	,000	,932	150	,000
Tekanan diastolik sesudah aroma terapi	,117	150	,000	,955	150	,000

a. Lilliefors Significance Correction

The normality test results for systolic and diastolic blood pressure, both before and after aromatherapy using a humidifier, showed that the probability values were smaller than the alpha value ($P < 0.05$).

Therefore, it can be concluded that the data were not normally distributed. Consequently, to determine the effectiveness of rose aromatherapy in reducing blood pressure, non-parametric tests were used, namely the Wilcoxon test and the Mann–Whitney test.

Wilcoxon Test Results for the Control Group and the Intervention Group

Table 4.2. Wilcoxon Test Results for Systolic and Diastolic Blood Pressure

	Negatif rank sistole	Positif rank Sistole	Negatif rank diastole	Positif rank diastole
Control Intervention	115 124	31 5	41 103	84 12
Control Intervention	Pv = 0,000 Pv = 0,000		Pv = 0,000 Pv = 0,000	

As shown in Table 4.2, there is a statistically significant difference in the mean systolic and diastolic blood pressure before and after aromatherapy in both the control and intervention groups. This indicates that the Wilcoxon test demonstrated an effect of aromatherapy on reducing blood pressure among older adults in both groups. However, there was a difference in the effectiveness between aromatherapy delivered using a humidifier and aromatherapy delivered using a mask. This can be seen from the differences in the negative ranks and positive ranks between the control and intervention groups.

The negative ranks represent respondents whose blood pressure decreased after receiving aromatherapy. A greater number of respondents in the intervention group experienced a decrease—124 person for systolic blood pressure and 84 peson for diastolic blood pressure. Meanwhile, the positive ranks represent respondents whose blood pressure increased after aromatherapy. In the control group, more respondents experienced an increase—31 person for systolic blood pressure and 103 person for diastolic blood pressure.

2. Mann–Whitney Test Results for Systolic and Diastolic Blood Pressure Before and After Aromatherapy

Table 4.3. Mann–Whitney Test Results for Systolic and Diastolic Blood Pressure

	Mean rank sistole before	*Mean rank* sistole upter	*Mean rank* Diastole before	*Mean rank* diastole upter
Control Intervention	199,45 108,05	212,53 95,39	182,30 124,64	186,04 121,03
Control Intervention	z = 9,092 Pv = 0,000	Z= 11,652 Pv = 0,000	z = 5,777 Pv = 0,000	z = 6543 Pv = 0,000

As shown in Table 4.3, there is a statistically significant difference in the mean systolic and diastolic blood pressure before and after aromatherapy. Based on the Mann–Whitney test results, it can be concluded that there is a difference in the effectiveness of humidifier aromatherapy and mask-based aromatherapy in lowering blood pressure among older adults. The use of an aromatherapy mask was more effective than aromatherapy delivered through a humidifier.

This can be observed from the differences in the mean ranks of systolic and diastolic blood pressure after the aromatherapy intervention in the control and intervention groups. The mean rank in the control group was higher than in the intervention group (systolic = 212.53 vs. 95.39; diastolic = 186.04 vs. 121.03).

A. Discussion

Table 4.2 shows that the Wilcoxon test results indicate an effect of aromatherapy on reducing blood pressure among older adults in both the control and intervention groups. This study is consistent with research conducted by M. Ridho (2015) on the effect of rose aromatherapy on blood pressure reduction among elderly individuals with hypertension in Sungai Bundung Laut, Mempawah Regency. The study found that rose aromatherapy had a significant effect on reducing systolic and diastolic blood pressure before and after the intervention, with a p-value of 0.000.

These findings are also in line with the study by Mariza and Kalsum (2016), which reported that rose aromatherapy significantly reduced the average blood pressure among older adults. The chemical compounds contained in rose petals have a distinctive aroma that is detected by the olfactory nerve (nervus olfactorius). The impulses are then transmitted to the hypothalamus and influence the central nervous system, where they are perceived as a sensation of relaxation, producing a calming effect.

A relaxed physiological state activates the parasympathetic nervous system, which triggers a decrease in heart rate, reduces cardiac output, and lowers pressure on the blood vessel walls. Additionally, relaxation helps loosen body muscles, including the muscles in blood vessel walls, which can lead to vasodilation and a subsequent decrease in blood pressure (Roswita, 2022).

The explanation above is supported by the theory of Astuti and Nugrahwati (2018), who describe that when essential oils are inhaled through the nose, aromatic molecules enter through the nasal cavity membrane and then reach the olfactory system. The olfactory system consists of nerves that transmit sensory impulses from the nose to the brain’s control center. The brain has core functions, including regulating all bodily systems. It serves as the center for memory, thought, emotion, glandular regulation, hormones, and the nervous system. Once the impulses

are transmitted to the brain, a complex reaction begins. After the impulses are fully interpreted, the brain responds through both hormonal (endocrine) and neural pathways. This process triggers healing reactions that can be felt immediately (Setiawan & Erwanto, 2021).

According to Sudjono (2009), relaxation is a self-management technique based on the functions of the sympathetic and parasympathetic nervous systems. In a state of low tension and absence of strong emotional stimuli, relaxation is considered a form of therapy that teaches individuals how to relax, under the assumption that relaxed muscles help reduce psychological tension (Buston, 2016).

The decrease in blood pressure after the administration of aromatherapy occurs because the chemical compounds contained in rose essential oil produce a distinctive aroma that is detected by the olfactory nerve (nervus olfactorius). The impulses are then transmitted to the hypothalamus and influence the central nervous system, where they are perceived as a sensation of relaxation that produces a calming effect. A relaxed physiological state activates the parasympathetic nervous system, which triggers a decrease in heart rate, thereby reducing cardiac output and pressure on the blood vessel walls. Additionally, relaxation loosens body muscles, including those within the blood vessels, which can lead to vasodilation and a decrease in blood pressure (Caroline, 2022).

The physiological effects of aromatherapy can be divided into two types: those that act through stimulation of the nervous system and those that act directly on organs or tissues through effector receptor mechanisms. Aromatherapy is based on the theory that inhalation or absorption of essential oils triggers changes in body systems, particularly in the brain regions involved in memory and emotion. This stimulation can produce physiological responses in the nervous, endocrine, or immune systems that influence heart rate, blood pressure, respiration, brain wave activity, and the release of various hormones throughout the body. Its effects on the brain may induce calmness or stimulate the nervous system, as well as help normalize hormone secretion. Inhaling essential oils can relieve respiratory symptoms, while topical application of diluted oils may help with certain conditions (Sudoyo, 2013).

According to the Ministry of Health (2014), in general, hypertension is a condition without symptoms, in which abnormally high pressure in the arteries increases the risk of stroke, aneurysm, heart failure, heart attack, and kidney damage. According to Gunawan (2013), the factors that cause hypertension include uncontrollable factors such as heredity, gender, and age. In addition, factors such as obesity, smoking, and alcohol consumption also contribute. In most patients, hypertension has no symptoms, although occasionally some symptoms appear simultaneously and are believed to be associated with blood pressure. These symptoms include headaches, nosebleeds, dizziness, facial flushing, and fatigue, which may occur both in individuals with hypertension and in those with normal blood pressure (Chloranyta, 2022).

The results of the Wilcoxon test showed a difference in the effectiveness of aromatherapy using a humidifier and an aromatherapy mask. This can be seen from the differences in negative rank and positive rank values in the control and intervention groups. The negative rank value indicates lower or decreased blood pressure after the administration of aromatherapy. In the intervention group, more participants experienced a decrease—124 people for systolic pressure and 84 people for diastolic pressure. Meanwhile, the positive rank value indicates higher or increased blood pressure after aromatherapy. In the control group, more participants experienced an increase—31 people for systolic pressure and 103 people for diastolic pressure.

The Wilcoxon test results are supported by the Mann–Whitney test findings, which also show differences in effectiveness between humidifier aromatherapy and aromatherapy masks in reducing blood pressure among the elderly. The use of aromatherapy masks was more effective than humidifier aromatherapy. This can be seen from the differences in mean rank values for systolic and diastolic blood pressure after aromatherapy administration in the control and intervention groups. The mean rank in the control group was higher than in the intervention group (systolic = 212.53 : 95.39, diastolic = 186.04 : 121.03).

This is in line with the study by Maharianingsih & Ariasanti (2022), which stated that there was a difference in the effectiveness of reducing stress levels—one of the most common causes of hypertension. There was a significant difference ($p = 0.000$) between lavender and rosemary (or rose) aromatherapy. Rosemary aromatherapy showed significantly higher effectiveness in reducing stress levels among adult subjects. The effectiveness of aromatherapy in lowering stress levels may be partly due to the chemical compounds found in lavender essential oil, such as linalool and linalyl acetate, which have been proven to enhance mood and provide a relaxing effect.

Descriptive analysis in the study by Maharianingsih & Ariasanti (2022) reported the effectiveness of rosemary aromatherapy: before the intervention, the subjects had an average stress level of 22.14, which decreased on the third day and continued to decline until the seventh day, with a reduction percentage of 51.14% (Maharianingsih & Ariasanti, 2022).

A study by Rahimi et al. (2019) showed that rosemary aromatherapy administered to 39 medical personnel in a hospital emergency room significantly reduced their average stress scores compared to the control group ($p < 0.05$) (Rahimi et al., 2019). The study also mentioned that rosemary aromatherapy had a positive effect in reducing stress among emergency room healthcare workers. The reduction in stress levels through rosemary aromatherapy may occur due to the main active compound, 1,8-cineole, which influences brain function through the nervous system connected to the olfactory nerves (Rahimi et al., 2019). This response affects the performance of neurotransmitters related to recovery processes through the release of norepinephrine in the central nervous system, which influences the brain regions responsible for attention, action, and emotional regulation.

A significantly greater reduction in stress levels was seen with rosemary aromatherapy inhalation compared to lavender, making rosemary an effective aromatherapy option for reducing stress in respondents. Although rosemary contains lower levels of linalool compared to lavender, it has higher effectiveness in reducing stress. This may be due to the higher concentration of the primary compound, 1,8-cineole, in rosemary essential oil. Higher levels of 1,8-cineole in the bloodstream enhance brain performance. After being detected by the olfactory epithelium, 1,8-cineole is transmitted to the hypothalamus, which regulates the release of Corticotropin Releasing Factor (CRF). This stimulation leads to decreased cortisol secretion. The reduction in cortisol levels can influence mood and provide a relaxing effect on the nervous system, contributing to decreased stress levels (Rahimi et al., 2019).

The effectiveness of rose aromatherapy masks will subsequently be tested by examining the durability of the rose scent after being applied to the mask, under open and closed (plastic packaging) conditions. If the aroma can be maintained longer than in previous studies (7 days), it may potentially become a marketable product.

Conclusion and Recommendations

A. Conclusion

1. There is an effect of rose aromatherapy administered via humidifier on reducing systolic and diastolic blood pressure among elderly individuals with hypertension.
2. There is an effect of rose aromatherapy masks on reducing systolic and diastolic blood pressure among elderly individuals with hypertension.
3. Rose aromatherapy masks are more effective in lowering systolic and diastolic blood pressure in elderly individuals with hypertension compared to rose aromatherapy using a humidifier.

B. Recommendations

1. For Patients with Hypertension

Hypertensive patients, particularly elderly individuals in the community who are not taking antihypertensive medications, are advised to use rose aromatherapy masks daily for at least 10 minutes before engaging in activities as a complementary therapy.

2. For Community Nurses

Community nurses, as facilitators of elderly health posts (posyandu lansia), are encouraged to motivate the daily use of aromatherapy masks and to conduct monthly blood pressure monitoring for elderly individuals with hypertension.

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