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Slow stroke back massage (SSBM) therapy with lavender essential oil effectively lowers blood pressure

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Abstract
Hypertension is a global health problem that is a major factor causing cardiovascular disease and premature death. While pharmacological therapy is still the main choice, non-pharmacological therapies with minimal side effects, such as a combination of slow-stroke back massage (SSBM) and aromatherapy, are expected to increase relaxation to increase the effectiveness of lowering blood pressure in hypertensive patients. This study aimed to test the effectiveness of SSBM therapy with lavender essential oil in lowering blood pressure in patients with primary hypertension. The research used a quasi-experiment method with a pretest-posttest design with a control group. In this study, the samples used were hospitalized patients with primary hypertension who met the inclusion and exclusion criteria, with as many as 40 respondents using purposive sampling techniques. Slow stroke back massage (SSBM) therapy with lavender essential oil significantly lowers blood pressure values in primary hypertensive patients compared to SSBM therapy with baby oil (P value 0.05). The mean difference in systolic and diastolic blood pressure in the intervention and control groups was 6.25 and 2.65, respectively. This therapy has been proven effective in lowering blood pressure in primary hypertensive patients. Therefore, hospital management may consider applying this nonpharmacological therapy to manage primary hypertension patients.

Keywords: blood pressure; essential lavender; primary hypertension; slow stroke back massage

1. Introduction

Hypertension globally affects more than 1.28 billion people aged 30-79 (WHO, 2023) and is a leading cause of cardiovascular disease and premature death (Roth et al., 2018; Stanaway et al., 2018). According to the World Health Organization (WHO), approximately 46% of adults suffering from hypertension are unaware that they have the disease (WHO, 2023), While the prevalence of hypertension in Indonesia itself reaches 34.1% (Kementerian Kesehatan RI, 2019). This is because hypertension often appears without symptoms, so patients are not aware of their condition and only find out after complications appear. Therefore, hypertension is known as "the silent killer". Hypertension increases mortality and morbidity (Martín-Fernández et al., 2023).

Many long-term high blood pressure patients can experience hypertension-mediated organ damage (HMOD). HMOD describes changes in blood vessels or ends organs (eyes, heart, kidneys, brain, and blood vessels) both in structure and function (Kyada et al., 2018). Initially, they did not show any symptoms, such as microalbuminuria, dystolic dysfunction, coronary calcification, and left ventricular hypertrophy (LVH) (Kyada et al., 2018; Oh et al., 2020; Suvila et al., 2019; Wang et al., 2022), where these symptoms are usually clinical markers of cardiovascular disease (CVD). The results of Kyada et al. (2018) showed that patients with end-organ damage experienced CV complications (54.6%), increased creatinine (25.9%), cerebrovascular accident complications (CVA = 19.4%), increased proteinuria (18.51%), and hypertensive retinopathy (15.7%).

Hypertension is a major contributor to CVD, such as ischemic heart disease, hemorrhagic stroke, and ischemic stroke (Forouzanfar et al., 2017; Rapsomaniki et al., 2014; Zhou et al., 2018). Cardiovascular disease is also a major cause of increased mortality associated with hypertension

(O'Brien, 2017; Peck et al., 2013; Shah et al., 2020). Number of deaths from coronary heart disease (40.1%), ischemic stroke (38.1%), and hemorrhagic stroke (42.5%) (Mills et al., 2020). During 1990–2015, the estimated number of deaths due to hypertension and cardiovascular disease (CVD) increased significantly, in line with the prevailing trend of hypertension prevalence (Mills et al., 2020).

In the period 2010–2030, there was a decrease in the prevalence of hypertension by 33%, which is one of the global targets for non-communicable diseases (WHO, 2023). One of the potential efforts that can be made to support this target is through effective prevention and management of hypertension (Tahkola et al., 2021). Management of hypertension can be done with pharmacological and nonpharmacological therapies (Carey et al., 2021). Pharmacological therapy uses drugs to keep blood pressure within normal limits. Unfortunately, some research results show side effects of hypertension treatment, including dizziness, erectile dysfunction, cough, palpitations, trembling, muscle pain, frequent urge to urinate, decreased libido, continuous hunger, insomnia, and physical fatigue (Gebreyohannes et al., 2019; Kretchy et al., 2015; Olowofela & Isah, 2017). These side effects increase the risk of stress, anxiety, and depression (Kretchy et al., 2015) and increase treatment non-adherence in hypertensive patients (Gebreyohannes et al., 2019). The application of treatment modification approaches by utilizing non-pharmacological therapies (lifestyle modification, complementary and alternative therapies) is a way that can be done to minimize the side effects of hypertension treatment (Dhungana et al., 2022; Fu et al., 2020; Kretchy et al., 2015).

The application of non-pharmacological approaches should begin in the early stages of the disease and continue simultaneously with medical interventions (Verma et al., 2021). One of the non-pharmacological treatments for hypertension is massage therapy. Massage therapy is the most widely used and quite effective complementary therapy (Field, 2014). Slow Stroke Back Massage (SSBM) was first introduced in 1996 by Elizabeth as a gentle and light massaging motion on the back and shoulders. Movements are carried out gently, rhythmically, and constantly, with approximately 60 movements per minute and 3–10 minutes (Atashi et al., 2014; Ghaderi et al., 2013). SSBM is known to relax muscles and stimulate parasympathetic nerve activity, thereby increasing the production of the neurotransmitter acetylcholine. This inhibits sympathetic nerve activity, resulting in systemic vasodilation and decreased heart muscle contractility, ultimately leading to decreased blood pressure (Suwaryo et al., 2022). SSBM therapy can also help reduce stress and improve sleep quality, an important factor in controlling hypertension (Septiari & Restuning, 2017). Some research results also show a significant relationship between SSBM and reduced blood pressure (Mobalen et al., 2020; Mohebbi et al., 2014; Putra et al., 2022; Septiari & Restuning, 2017). The majority of those studies provided only a single intervention. At the same time, combining intervention with aromatherapy massage is expected to increase the effectiveness of therapy to lower blood pressure in hypertensive patients.

One of the most popular aromatherapy oils today is a lavender essential oil containing linalool, which can be used through inhalation or massage on the skin. Previous research results showed the positive effects of lavender oil used in aromatherapy, among others: helps relax tense nerves and muscles (Sayorwan et al., 2012), improves sleep quality (Cho et al., 2013; Karadag et al., 2017), lowering heart rate and body temperature (Jalalodini et al., 2016; Salamati et al., 2017; Sayorwan et al., 2012), lowering blood pressure (Jalalodini et al., 2016; N et al., 2016; Salamati et al., 2017; Sayorwan et al., 2012), reducing anxiety (Cho et al., 2013; Donelli et al., 2019; Karadag et al., 2017; Karan, 2019). Sayorwan et al. (2012) found that lavender aromatherapy can increase alpha brain waves (8-13 Hz) associated with decreased stress and theta waves (4-8Hz), thereby improving sleep quality. Overcoming stress and improving sleep quality are important components of hypertension control (Bautista et al., 2019; Birhanu et al., 2021; Gou et al., 2023).

Research combining SSBM intervention with lavender essential oil to lower blood pressure is rarely done. This study can determine the effectiveness of a combination of very important interventions. This

study aimed to test the effectiveness of SSBM therapy using lavender essential oil in lowering blood pressure in patients with primary hypertension.

2. Research Methods

This is a quasi-experimental study with a non-randomized design and a control group pre-test and post-test design. The population in this study comprised patients undergoing treatment at PKU Muhammadiyah Mayong Jepara Hospital diagnosed with primary hypertension. Sampling was carried out using purposive sampling techniques, with inclusion criteria: patients diagnosed with hypertension (systolic blood pressure ≥ 140 mmHg and diastolic ≥ 90 mmHg, normal pulse 60 – 100 x/min), no injury to the back region, compostive consciousness, no impaired function of the sense of smell, and willingness to be a respondent. Exclusion criteria: patients with emergency hypertension using medical aids such as syringe pumps, hypertensive patients with contraindications to back massage or restriction of mobilization; and patients allergic to the scent of lavender. The sample comprised 40 respondents, with 20 respondents for the intervention group and 20 for the control group.

The instruments used are lavender essential oil, observation sheets, and digital sphygmomanometers. The study lasted three weeks (February 27 – March 16, 2023). In the intervention group, slow stroke back massage (SSBM) with lavender essential oil was given. In contrast, SSBM with baby oil was given in the control group, each done daily for 5–10 minutes for two consecutive days. The blood pressure measurement is done four times (2 times before and two times after the procedure). Statistical tests using paired-samples t-tests and independent-samples t-tests This research has received approval from the research ethics committee of Universitas Karya Husada Semarang with Ethical Approval Number: 156/KEP/UNKAHA/SLE/II/2023.

3. Results and Discussion

3.1.Results

3.1.1.Characteristics of Respondent

Respondents in the intervention and control groups were mostly male (75% and 80%) with secondary education levels (SMK/SMA/MA) (50% and 40%). The intervention group was dominated by 55–65 years (50%), while the control group was 45–54 years (55%). Most respondents in the intervention and control groups were employed (90% each), and most earned less than Rp. 2,272,626 (25% each). The characteristics of the respondents are summarized in Table 1.

Table 1. Characteristics of respondents (n = 40)

	Intervention		Control	
	F	**%**	**F**	**%**
Gender				
Female	5	25	4	20
Male	15	75	16	80
Age				
45-54 years	8	40	11	55
55-65 years	10	50	7	35
66-74 years	2	10	2	10
Education				
Primary (SD/MI/SMP)	5	25	5	25
Secondary (SMK/SMA/MA)	10	50	8	40
University (D1/D3/S1/S2)	5	25	7	35
Occupation				

	Intervention		Control	
	F	%	F	%
Unemployed	2	10	2	10
Employed	18	90	18	90
Income				
No Income	1	5	2	10
< Rp. 2.272.626,-	5	25	5	25
Rp. 2.272.626,-	4	20	4	20
> Rp. 2.272.626,-	10	50	9	45

Source: Primary Data, 2023

3.1.2. Differences in Average Systolic and Diastolic Blood Pressure Values Before and After Slow Stroke Back Massage (SSBM) Therapy with Lavender Essential Oil in the Intervention Group

Before the intervention, the mean systolic and diastolic blood pressure values were 156.80 mmHg and 145.25 mmHg, respectively. After SSBM therapy with lavender essential oil, the average systolic and diastolic pressure values decreased by 11.55 mmHg and 4.05 mmHg, respectively, to 145.25 mmHg and 98.10 mmHg. The statistical Paired-Samples T-Test results showed a significant difference between systolic and diastolic values before and after SSBM therapy with lavender essential oil in the intervention group (P Value < 0.05), as seen in Table 2.

Table 2. Differences in Average Systolic and Diastolic Blood Pressure Values in the Intervention Group (n=20)

Intervention Group Blood Pressure Value	Mean	Standard Deviation	95% CI		P-Value
			Lower	Upper	
Pre and Post Systolic Test	11.550	6.573	8.474	14.626	0.000
Pre and Post Diastolic Test	4.050	2.373	2.940	5.160	0.000

Source: Primary Data, 2023

3.1.3. Differences in Average Systolic and Diastolic Blood Pressure Values Before and After Slow Stroke Back Massage (SSBM) Therapy with Baby Oil in the Control Group

The average systolic blood pressure value in the control group before SSBM therapy with baby oil was 153.60 mmHg. After therapy, the average blood pressure was 148.3 mmHg. The average diastolic blood pressure value was 97.60 mmHg before and 96.20 mmHg after therapy. The decrease in mean systolic and diastolic blood pressure values in the control group was 5.30 mmHg and 1.40 mmHg, respectively. The statistical Paired-Samples T Test found a significant difference in systolic and diastolic values before and after SSBM therapy with baby oil in the control group (P Value < 0.05), as shown in Table 3.

Table 3. The difference in Average Systolic and Diastolic Blood Pressure Values in the Control Group (n=20)

Control Group Blood Pressure Value	Mean	Standard Deviation	95% CI		P-Value
			Lower	Upper	
Pre and Post Systolic Test	5.300	5.243	2.846	7.754	0.000
Pre and Post Diastolic Test	1.400	1.273	0.804	1.996	0.000

Source: Primary Data, 2023

3.1.4. Differences in Average Systolic and Diastolic Blood Pressure Values in The Intervention Group with the Control Group

The difference in mean systolic blood pressure values in the intervention group and the control group before and after therapy was 11.55 and 5.30, respectively, with a difference in mean systolic values in both groups of 6,250. While the difference in the average diastolic values of the intervention group and the control group was 4.05 and 1.40, respectively, the difference in the average diastolic values of the two groups was 2,650. The results of the independent-sample T-test showed a significant difference in the average systolic and diastolic blood pressure values in the group given SSBM therapy with lavender essential oil compared to the group given only SSBM therapy with baby oil (P-value 0.000 < 0.05), as seen in Table 4.

Table 4. Differences in Averages Systolic and Diastolic Blood Pressure Values in The Intervention and Control Groups (n = 40)

Blood Pressure Value	Group	Mean	Standard Deviation	Mean Difference	P-Value
Systolic	Intervention	11.55	6.573	6.250	0.002
	Control	5.30	5.243		
Diastolic	Intervention	4.05	2.373	2.650	0.000
	Control	1.40	1.273		

Source: Primary Data, 2023

3.2. Discussion

Most of the respondents in this study were male. The high prevalence of hypertension in men is associated with lifestyles at risk of increasing blood pressure, such as smoking and alcohol consumption (Olack et al., 2015; Yu et al., 2020). The results of this study contradict some previous research results where hypertension sufferers are dominated by women (Hussain et al., 2016; Katulanda et al., 2014; Mirahmadizadeh et al., 2022; Peltzer & Pengpid, 2018). The World Health Organization (WHO) estimates that almost 50% of people with hypertension are unaware that they have hypertension (WHO, 2023). Previous research has also shown similar things. Patients with undiagnosed hypertension reach almost 70%, and only 25% of those undergoing treatment have blood pressure that can be controlled (Hussain et al., 2016). Hussain added that men and younger people are at higher risk of suffering from undiagnosed and untreated hypertension. This can cause many cases of hypertension in men that may not be recorded. In addition to the many cases of undiagnosed hypertension in men, the dominance of women in cases of hypertension can also be caused by exposure to estrogen and aging. Estrogen exposure and aging also play a role in the influence of the renin-angiotensin-aldosterone system (RAAS) antihypertensive pathway on blood pressure modulation, which may be critical for the development of hypertension in postmenopausal women (Connelly et al., 2022). Hormonal changes after menopause, such as decreased estrogen and decreased activation of nitric oxide and prostacyclin, cause a decrease in vasodilation ability, resulting in increased blood pressure (Kusumawardani et al., 2020).

The majority of respondents in this study were employed. The complexity of job demands (workload, work deadlines, and work conflicts) makes them vulnerable to work stress. Previous research shows that job stress is associated with hypertension (Adjobimey et al., 2022; Gamage & De Alwis Seneviratne, 2016; Rengganis et al., 2020). Stress causes the adrenal glands to secrete more

cortisol. Long-term stress causes a build-up of cortisol, leading to hypertension. (Bautista et al., 2019) Compared to individuals with normal cortisol levels, individuals with high cortisol levels were at up to 3.23 times higher risk of developing hypertension. Bosu (2015) revealed a high susceptibility to hypertension among individuals with sedentary occupations, such as shopkeepers, bank clerks, and civil servants.

This study found a significant difference between systolic and diastolic values in the intervention group before and after SSBM therapy with lavender essential oil (P Value < 0.05) with decreases of 11.55 mmHg and 4.05 mmHg, respectively. In the control group, although there was a significant difference in systolic and diastolic values before and after SSBM therapy with baby oil (P Value < 0.05), the decrease in systolic and diastolic blood pressure values was not as large as in the intervention group, respectively by 5.30 mmHg for systolic pressure and 1.40 mmHg for diastolic pressure. SSBM performs gentle and light-pressure massages on the back and shoulders. This movement is done gently, rhythmically, and constantly, with approximately 60 movements per minute and 3–10 minutes (Atashi et al., 2014; Ghaderi et al., 2013). Gentle massage improves the parasympathetic response, while low pressure from massage can decrease the sympathetic system response (Babajani-Vafsi et al., 2014).

According to Ranjan & Gulati (2023), when the sympathetic nervous system is activated, there will be an increase in the contraction of heart muscle fibers caused by selective vasoconstriction in peripheral organs. The sympathetic nervous system can respond to nerve impulses from the hypothalamus and activate organs and smooth muscles under its control. One effect of this activation is to increase the speed of the heart. In addition, the sympathetic nervous system also stimulates the adrenal medulla to release epinephrine and norepinephrine into the bloodstream. This stimulation of sympathetic nervous system activation increases peripheral vascular resistance and the volume of blood pumped by the heart, ultimately affecting irregular blood pressure increases. SSBM exerts a relaxing effect on muscles and stimulates parasympathetic nerve activity by increasing the production of the neurotransmitter acetylcholine. This then inhibits sympathetic nerve activity, resulting in systemic vasodilation and decreased contractility of the heart muscle, which causes a decrease in blood pressure (Suwaryo et al., 2022). This study's reduction of systolic and diastolic blood pressure was higher than in previous studies. Mohebbi et al. (2014) found that in the intervention group, there was a decrease in systolic blood pressure by 6.44 mmHg and diastolic by 4.77 mmHg after therapy. In the control group, systolic and diastolic blood pressure reduction was 2.31 mmHg and 1.51 mmHg, respectively.

This study also explained a significant difference in the intervention group's average systolic and diastolic blood pressure values after SSBM therapy with lavender essential oil compared with the control group given SSBM therapy with baby oil (P value < 0.05). The mean difference in systolic and diastolic values between the two groups was 6.25 mmHg and 2.65 mmHg, respectively. SSBM improves blood and lymph node circulation, stimulates nerve responses, and increases parasympathetic nervous system activity (Mobalen et al., 2020). The parasympathetic nervous system secretes acetylcholine, which inhibits the SA node and AV node depolarization caused by sympathetic nervous system activity, thereby secreting the neurotransmitter norepinephrine (Gordan et al., 2015). This leads to systemic vasodilation, decreased contractility, and decreased heart rate, cardiac output, and cup volume, resulting in decreased blood pressure. Massage also has the potential to increase serotonin and endorphins, which can help reduce anxiety, pain, and depression (Cheraghbeigi et al., 2019).

Meanwhile, the content of lavender essential oils such as linalool and linalyl acetate, which are applied to the skin during massage, is more quickly absorbed, resulting in central nervous system depression (Ali et al., 2015; Batiha et al., 2023; Koulivand et al., 2013), affects the olfactory nervous system, affecting the production of serotonin and dopamine, which regulate mood and feelings (Fung et al., 2021). The Lavender essential oil also affects the autonomic and parasympathetic nervous systems, which regulate bodily functions such as blood pressure and heart rate. When stressed and

anxious, the sympathetic nervous system responsible for stimulating the "attack" or "leave" response in our body will become more active (Ranjan & Gulati, 2023). However, as we relax, the parasympathetic nervous system becomes more active, causing a decrease in heart rate and blood pressure and thereby increasing relaxation in the body.

The combination of slow-stroke back massage and aromatherapy can provide patients with a more thorough and enjoyable relaxation experience, lowering blood pressure and providing additional benefits in relieving stress and improving overall well-being. Some previous studies have shown that consistent application of massage therapy and aromatherapy can effectively decrease the presence of cortisol, a hormone associated with stress. In addition, this combination has been shown to increase relaxation response activity, induce muscle relaxation, and enhance the effects of sedation and feelings of euphoria (Jalalodini et al., 2016; Mehrabian et al., 2022; Rafii et al., 2020).

4. Conclusion

The therapy of slow stroke back massage (SSBM) with lavender essential oil had a more significant effect on lowering blood pressure values in primary hypertensive patients compared to SSBM therapy with baby oil (P value < 0.05). The mean difference in systolic blood pressure in the intervention group was 11.55 and 5.30 in the control group. The mean difference in systolic values between the two groups was 6.25. Likewise, the intervention group's average diastolic blood pressure value decreased by 4.05 and the control group by 1.40, with a difference in the average diastolic value between the two groups of 2.65. The results of this study are expected to be a reference source for future researchers in research on non-pharmacological therapy of slow stroke back massage with lavender essential oil in patients with primary hypertension. Hospital management is expected to consider applying this nonpharmacological therapy to handle primary hypertension patients. Researchers are then expected to be able to do blood tests after giving therapy to determine whether the increase in serotonin and dopamine is due to the effects of the therapy that has been given or to other factors.

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