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EFFECTIVENESS OF CUPPING AROMATHERAPY NANOEMULSION ON MEAN ARTERIAL PRESSURE AND HEART RATE IN HYPERTENSION PATIENTS

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ABSTRACT
Hypertension is a cardiovascular disease that contributes to increased morbidity and mortality rates. Pharmacological therapy often causes side effects and decreases patient compliance, so a safe and effective complementary treatment approach is needed. Therapy is known to have physiological effects on the cardiovascular system, while aromatherapy has relaxing and vasodilatory effects. The development of aromatherapy in the form of nanoemulsion is expected to increase the stability and effectiveness of therapy, especially when combined with cupping therapy. This study aims to determine the effectiveness of nano aromatherapy cupping on mean arterial pressure (MAP) and heart rate in hypertensive patients. The study used a quasi-experimental design with a pretest-posttest control group design. The sampling method used random sampling, as many as 30 hypertensive patients were divided into two groups: the intervention group that received cupping therapy and aromatherapy nanoemulsion, and the control group that only received cupping therapy. The dependent variables included mean arterial pressure (MAP) and heart rate measured before and after the intervention. Data analysis used the T test. The results showed a significant decrease in MAP and heart rate in both groups after the intervention ($p < 0.05$). However, the results of the inter-group test showed that the difference in the decrease in MAP and heart rate between the intervention and control groups was not statistically significant ($p > 0.05$). The conclusion of this study shows that cupping therapy with aromatherapy nanoemulsion is effective in reducing MAP and heart rate in hypertensive patients.

Keywords: aromatherapy nanoemulsion; cupping; heart rate; hypertension; mean arterial pressure

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INTRODUCTION

Cardiovascular disease is a leading cause of morbidity and mortality worldwide, with hypertension being a dominant risk factor. Globally, cardiovascular disease accounts for approximately 31% of all deaths, and this number is expected to increase significantly in the coming years. (Hajar, 2016; Roth et al., 2018). In Indonesia, the prevalence of hypertension also shows a significant increasing trend, as reported in the 2018 Basic Health Research (Riskesdas), so an effective and sustainable management strategy is needed. (Dasar, 2018). Pharmacological therapy is the primary approach to managing hypertension, but long-term use is often associated with side effects, drug interactions, and decreased patient compliance. Some cardiovascular medications are known to cause serious side effects such as kidney impairment, cardiotoxicity, and an increased risk of cardiovascular events (Dieterle, 2015; Ghosh et al., 2015). This condition encourages the development of a complementary nursing approach that is safe and can be used as a complementary therapy, in line with WHO recommendations regarding the use of traditional and complementary medicine (Organization, 2019; Zhang, 2018).

One of the complementary therapies widely used for patients with cardiovascular disease is cupping. Cupping therapy is known to have physiological effects on the cardiovascular system, including lowering blood pressure, improving blood circulation, and increasing nitric oxide (NO) production, which plays a role in vasodilation (Desfika et al., 2022; Setyawan et al., 2020; Widada et al., 2018). A number of studies also report that cupping can increase skin permeability, thereby supporting transdermal drug penetration (W.-J. Xie et al., 2019). Aromatherapy is another form of complementary therapy known to have relaxing, anxiolytic, and vasodilatory effects, potentially affecting blood pressure and heart rate. Several essential oils, such as ginger, lavender, and peppermint, have been reported to have antihypertensive activity through antioxidant, vasorelaxation, and angiotensin-converting enzyme (ACE) inhibition mechanisms (Alves-Silva et al., 2021; Camargo et al., 2018; Mohamadinasab et al., 2019; Nematolahi et al., 2024). However, the effectiveness of conventional aromatherapy is still influenced by the stability and bioavailability of the essential oils used (Koyama & Heinbockel, 2020).

Developing aromatherapy in the form of nanoemulsions is a promising approach because it can improve the stability, bioavailability, and transdermal penetration of essential oils. Nanoemulsions are known to protect essential oils from degradation, enhance the sustained release of active ingredients, and prolong the therapeutic effect (Al-Hussaniy et al., 2023; Wilson et al., 2022). In addition, cupping therapy is known to modify the structure of the stratum corneum and increase skin permeability, thus potentially providing a synergistic effect in increasing the penetration of nanoemulsion-based essential oils (W.-J. Xie et al., 2019; Yuan et al., 2023). To the researchers' knowledge, the application of aromatherapy nanoemulsion combined with cupping therapy in the management of hypertension is still very limited. Therefore, this study aims to analyze the effectiveness of aromatherapy nano cupping on mean arterial pressure and heart rate in hypertensive patients.

METHOD

This study used a quasi-experimental design with a pretest–posttest control group approach. The study was conducted at RSH In Care Yogyakarta. Subjects were hypertensive patients who met the inclusion and exclusion criteria. The sampling technique used simple random sampling, with a sample size of 30 respondents. Respondents were divided into two groups, each consisting of 15 people: an intervention group and a control group. The intervention group received cupping therapy combined with aromatherapy nanoemulsion, while the control group received only cupping therapy. Cupping therapy was performed using the Cupping–Puncture–Cupping (CPC) method at the Al-Kaahil, Azh-Zahrul A'la, and Al-Akhda'ain points by trained professionals using sterile procedures. Aromatherapy nanoemulsion containing essential oils of Lavandula angustifolia, Mentha piperita, and Zingiber officinale was applied topically after the cupping treatment in the intervention group.

The dependent variables in this study included Mean Arterial Pressure (MAP), calculated from systolic and diastolic blood pressure, and heart rate. Measurements were taken 30 minutes before and 30 minutes after the intervention using a sphygmomanometer and stethoscope. Data were analyzed univariately and bivariately. Analysis of differences before and after the intervention within each group was performed using a Paired Sample t-test, while comparisons of changes in MAP and heart rate between groups were analyzed using an Independent Sample t-test with a significance level of $p < 0.05$. This research has passed ethical standards with number No.3.10/KEPK/SSG/X/2025.

RESULT

Based on the descriptive analysis of 30 respondents, the characteristics of respondents, based on their antihypertensive medication consumption and age group, are presented in Table 1. The analysis shows that the majority of respondents (20 respondents) were not taking antihypertensive medication, while 10 (33.3%) were taking antihypertensive medication. Based on age group, the majority of respondents were in the 46–55 age range, representing 22 (73.3%). Respondents in the 36–45 and 56–

65 age groups each comprised 4 (13.3%). Based on the results of the normality test using the Shapiro–Wilk test in Table 2, it is known that the data on the difference in Mean Arterial Pressure (ΔMAP) in the intervention group (p = 0.686) and the control group (p = 0.985) are normally distributed. Likewise, the data on the difference in heart rate (ΔHR) in the intervention group (p = 0.111) and the control group (p = 0.323) show a normal distribution, with a significance value greater than 0.05. Thus, it can be concluded that all the difference data (ΔMAP and ΔHR) in both groups meet the normality assumption, so that further analysis uses parametric statistical tests, namely the Paired Sample t-test for the test within the group and the Independent Sample t-test for the test between groups.

Table 1
Respondent Characteristics (n=30)

Characteristics	f	%
Age (Years)		
26 – 35 Years	-	-
36 – 45 Years	4	13.3
46 – 55 Years	22	73.3
56 – 65 Years	4	13.3
Antihypertensive Medication		
Yes	10	33.3
No	20	66.7

Table 2.
Results of Normality Test Using the Shapiro-Wilk Test (n=30)

Variable	Group	*Shaphiro-Wilk*		
		Statistic	Df	Sig.
ΔMAP	intervention	.960	15	.686
	control	.983	15	.985
ΔHR	intervention	.904	15	.111
	control	.935	15	.323

Based on the results of the Paired Sample t-test presented in Table 3, there were significant changes in Mean Arterial Pressure (MAP) and heart rate (HR) values in both the intervention and control groups after therapy. In the intervention group, the mean MAP before the intervention was 199.18 ± 21.14 mmHg and decreased to 185.64 ± 20.56 mmHg after the intervention. The statistical test results showed that the decrease in MAP was statistically significant (t = 3.18; p = 0.007). Meanwhile, in the control group, the mean MAP also decreased from 197.80 ± 18.84 mmHg to 189.87 ± 17.86 mmHg after the intervention, with the results of the paired t-test showing a significant difference (t = 2.74; p = 0.016). Similar results were also found for the heart rate variable. In the intervention group, the mean HR before the intervention was 93.80 ± 19.44 beats/minute and decreased to 89.67 ± 18.79 beats/minute after the intervention, with statistical test results showing a significant difference (t = 3.65; p = 0.003). In the control group, the mean HR before the intervention was 88.33 ± 14.35 beats/minute and decreased to 83.47 ± 11.65 beats/minute after the intervention. This decrease was statistically significant (t = 2.19; p = 0.045). Overall, these results indicate that cupping therapy with or without the addition of aromatherapy nanoemulsion can significantly reduce MAP and heart rate values in hypertensive patients.

Table 3.
Paired Sample t-test Results for MAP and Heart Rate in the Intervention and Control Groups

Variable	Group	Mean Pre ± SD	Mean Post ± SD	T	df	P Value
MAP	Intervention	199.18 ± 21.14	185.64 ± 20.56	3.18	14	0.007
	Control	197.80 ± 18.84	189.87 ± 17.86	2.74	14	0.016
HR	Intervention	88.33 ± 14.35	83.47 ± 11.65	2.19	14	0.045
	Control	93.80 ± 19.44	89.67 ± 18.79	3.65	14	0.003

The results of the Independent Sample t-test showed that the average decrease in Mean Arterial Pressure (ΔMAP) in the intervention group was 13.53 ± 16.48 mmHg, while in the control group it was 7.93 ± 11.18 mmHg. Statistically, there was no significant difference between the intervention and control groups in terms of changes in MAP (t = 1.09; p = 0.286). For the Heart Rate (ΔHR) variable, the average decrease in heart rate in the intervention group was 4.87 ± 8.58 beats/minute, while in the control group it was 4.13 ± 4.38 beats/minute. The analysis showed no statistically

significant difference between the two groups in terms of changes in Heart Rate (t = 0.295; p = 0.770).

Table 4
Independent Sample t-test Results: Differences in ΔMAP and ΔHeart Rate between the Intervention and Control Groups

Variable	Groups		t	df	P Value
	Intervention (Mean ± SD)	Control (Mean ± SD)			
ΔMAP	13.53 ± 16.48	7.93 ± 11.18	1.09	28	0.286
ΔHR	4.87 ± 8.58	4.13 ± 4.38	0.295	28	0.770

DISCUSSION

Respondent Characteristics

Based on the study results, the majority of respondents were in the 46–55 age group. This finding aligns with the theory that increasing age is closely associated with an increased risk of hypertension due to physiological changes in the cardiovascular system, such as decreased blood vessel elasticity, increased arterial stiffness, and increased peripheral vascular resistance, which directly affect arterial blood pressure (Kapuku & Kop, 2022). The predominance of respondents in this age range indicates that late adulthood is a critical period for blood pressure regulation disorders. During this phase, the blood vessels' ability to adapt to hemodynamic changes begins to decline, making individuals more susceptible to increased blood pressure and cardiovascular complications. This condition also explains why nursing interventions, both pharmacological and non-pharmacological, are essential (Kapuku & Kop, 2022). The high prevalence of hypertension in this age group is influenced not only by biological factors but also by lifestyle factors, such as low physical activity, a high-sodium diet, and increased exposure to stress. Therefore, strategies for managing hypertension in this age group require a combination of complementary medical and nursing approaches that focus on improving the patient's physiological and psychological well-being.

Based on the characteristics of antihypertensive medication use, the majority of respondents in this study did not take their medications regularly. This condition can be caused by various factors, such as drug side effects, long treatment duration, and poor patient adherence to pharmacological therapy. This is in line with previous research that found that non-adherence to antihypertensive medication remains a major problem in hypertension management (Kapuku & Kop, 2022). This situation reflects the patient's need for a more acceptable, safe, and non-dependent therapeutic approach. Non-adherence to pharmacological therapy has the potential to increase the risk of hypertension complications, necessitating alternative therapies that can improve patient engagement and comfort in the treatment process. Low adherence to pharmacological therapy drives the need for non-pharmacological and complementary therapeutic approaches to complement modern medicine. The WHO also encourages the use of safe, evidence-based traditional and complementary medicine as part of the healthcare system, particularly for chronic diseases such as hypertension (Organization, 2019).

The Effectiveness of Cupping Aromatherapy Nanoemulsion Therapy on Reducing Mean Arterial Pressure (MAP)

The results of the study showed that the intervention group (aromatherapy nanoemulsion cupping) and the control group (cupping) showed a significant decrease in Mean Arterial Pressure (MAP) values in both the intervention and control groups based on the results of the paired sample t-test ($p < 0.05$). These findings indicate that cupping therapy is effective in improving hemodynamic parameters in hypertensive patients. These results are in line with previous studies that reported that cupping therapy can significantly reduce blood pressure and cardiovascular parameters (Setyawan et al., 2020; Suwito et al., 2024; Widada et al., 2018, 2020). The consistent decrease in MAP in both groups indicates that cupping therapy has a stable therapeutic effect on the cardiovascular system. MAP, as an indicator of arterial perfusion pressure, reflects the balance between cardiac output and peripheral vascular resistance, so an improvement in MAP indicates an improvement in overall

hemodynamic function. This strengthens cupping therapy's position as a potential non-pharmacological intervention in the management of hypertension (Setyawan et al., 2020).

Physiologically, the decrease in MAP after cupping therapy is related to decreased peripheral vascular resistance and increased microvascular blood flow. The mild skin injury during cupping can stimulate the release of nitric oxide (NO), which acts as a powerful vasodilator and contributes to a decrease in mean arterial pressure (Desfika et al., 2022). Increased nitric oxide after cupping therapy plays a key role in enhancing vascular smooth muscle relaxation. This vasodilatory effect leads to decreased systemic pressure and increased tissue perfusion, ultimately contributing to blood pressure stabilization in hypertensive patients (Lee et al., 2019; Nurhayani et al., 2024). Furthermore, cupping therapy is also known to decrease sympathetic nervous system activity and reduce oxidative stress (Ersoy et al., 2019), which play a key role in the pathophysiology of hypertension. This decrease in sympathetic activity contributes to blood vessel relaxation and a decrease in arterial perfusion pressure, which is reflected in a decrease in MAP values (Al-Bedah et al., 2019; Suwito et al., 2024)

The results of the independent sample t-test showed that the difference in MAP reduction between the intervention and control groups was not statistically significant ($p > 0.05$). This means that both groups had a good effect in lowering blood pressure, but the mean value of the intervention group had a higher MAP reduction effect, namely 13.54, compared to the control group (7.93). This may be due to the aromatherapy nanoemulsion applied with cupping. The nanoemulsions used in this study were made from lavender, peppermint, and ginger, which have antihypertensive activity (Alves-Silva et al., 2021; Setyawan & Kintoko, 2024).

The main ingredient in lavender is linalool, which has antihypertensive effects (Camargo et al., 2018). Peppermint oil also contains the active ingredient menthol, which has been shown to inhibit angiotensin-converting enzyme (ACE), a key regulator in blood pressure control (Cam et al., 2020). In this study, aromatherapy was formed into a nanoemulsion preparation which has a smaller size so that it is expected to be able to increase the stability and bioavailability of essential oils (EO), provide sustained drug release, thereby increasing the therapeutic effect in a long time (Al-Hussaniy et al., 2023; Wilson et al., 2022). The combination of cupping therapy and aromatherapy nanoemulsion in this study likely resulted in a higher blood pressure reduction effect than cupping therapy alone, although the difference was not significant. This is because cupping can alter the structure of the stratum corneum by breaking down intercellular lipids, thereby increasing transdermal drug absorption (W. Xie et al., 2015; W.-J. Xie et al., 2019). This is in accordance with research conducted by (Xie et al., 2019) found that skin treated with cupping showed a significant effect on the percutaneous penetration of tetramethylpyrazine, verapamil, and tetrahydropalmatine and could significantly enhance the effects of these drugs on myocardial ischemia and local inflammation.

The Effectiveness of Cupping Aromatherapy Nanoemulsion Therapy on Heart Rate

The results of the study showed that cupping therapy significantly reduced heart rate in hypertensive patients based on the results of a paired sample t-test ($p < 0.05$). This decrease in heart rate indicates an improvement in the balance of the autonomic nervous system after the intervention. This finding aligns with previous research that suggests cupping therapy can lower heart rate and increase cardiovascular relaxation (Suwito et al., 2024). A decrease in heart rate is an important indicator of the cardiovascular relaxation response after cupping therapy. A more stable heart rate reflects decreased sympathetic activity and increased parasympathetic control, which plays a crucial role in maintaining hemodynamic stability in hypertensive patients. This also indicates that cupping therapy not only impacts blood pressure but also regulates cardiac function.

Furthermore, the relaxation effects of cupping therapy can also reduce levels of stress hormones such as cortisol and catecholamines, which contribute to a decreased heart rate. These effects support the role of cupping therapy as a safe and effective complementary nursing therapy in the management of hypertension (Al-Bedah et al., 2019a; Aris Setyawan, 2022). The reduction in stress hormones after cupping therapy indicates an improvement in the neuroendocrine response to stress. This response plays a crucial role in controlling heart rate and blood pressure, making cupping therapy potentially beneficial for both short-term and long-term hypertension management (Refaat et al., 2014; Syahruramdhani et al., 2021).

CONCLUSION

Cupping therapy has been proven effective in reducing Mean Arterial Pressure (MAP) and Heart Rate in hypertensive patients. Significant reductions in MAP and Heart Rate occurred in both the intervention and control groups after cupping therapy. Descriptively, the reduction in MAP was greater in the group receiving the combination of cupping therapy and aromatherapy nanoemulsion than in the control group. However, the results of the intergroup test showed that the difference in MAP reduction was not statistically significant.

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