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NURSE-LED EFFLEURAGE VERSUS PETRISSAGE MASSAGE FOR HYPERTENSION-RELATED HEADACHE: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Headache is a common complaint among patients with hypertension and may reduce quality of life, thereby requiring effective non-pharmacological nursing interventions to alleviate pain and improve patient comfort. Nurse-led massage therapy, including effleurage and petrissage techniques, has increasingly been utilized as a complementary intervention for pain management in patients with hypertension. This study aimed to compare the effectiveness of effleurage and petrissage massage techniques on headache pain intensity among hypertensive patients. The study was conducted at Puskesmas Sumaja Makmur from January to April 2026 using a randomized controlled trial design. A total of 170 hypertensive patients were randomly assigned into two intervention groups, consisting of 85 patients receiving effleurage massage and 85 patients receiving petrissage massage. Headache pain intensity was measured using the Numeric Rating Scale (NRS) before and after the intervention. Data analysis was performed using paired and independent statistical tests with a significance level of $p < 0.05$. The findings demonstrated that both nurse-led massage techniques significantly reduced headache pain intensity among hypertensive patients. However, the effleurage group demonstrated a greater reduction in mean pain scores compared with the petrissage group. This study concludes that nurse-led effleurage massage is more effective than petrissage massage in reducing hypertension-related headache pain. These findings support the integration of evidence-based complementary nursing interventions into primary healthcare services to optimize hypertension management.

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INTRODUCTION

Hypertension remains one of the most prevalent non-communicable diseases worldwide and affects more than 1.28 billion adults globally, with nearly two-thirds living in low- and middle-income countries. The World Health Organization reported that hypertension contributes substantially to cardiovascular morbidity, stroke, kidney disease, and reduced quality of life. Among hypertensive patients, headache is one of the most frequently reported symptoms and is associated with vascular instability, increased sympathetic activity, sleep disturbance, emotional stress, and impaired daily functioning. Previous studies demonstrated that uncontrolled hypertension significantly increases pain perception, psychological discomfort, and healthcare utilization among adults and older populations (World Health Organization, 2023; Mills et al., 2020; Unger et al., 2020). In Indonesia, hypertension prevalence continues to rise and represents a major public health burden, particularly in primary healthcare settings where patients frequently report recurrent headache symptoms requiring both pharmacological and non-pharmacological management approaches (Kementerian Kesehatan Republik Indonesia, 2024; Carey et al., 2022; Zhou et al., 2021).

Despite advances in hypertension management, nursing care in many primary healthcare facilities remains predominantly focused on pharmacological treatment and blood pressure monitoring rather than comprehensive symptom management, including headache pain control. Non-pharmacological nursing interventions such as massage therapy have increasingly gained attention because they are considered safe, low-cost, noninvasive, and applicable in community healthcare settings. Massage techniques, including effleurage and petrissage, have been shown to stimulate parasympathetic responses, improve blood circulation, decrease muscle tension, and promote relaxation, thereby potentially reducing headache intensity among hypertensive patients (Field, 2021; Rapaport et al., 2020; Nasiri et al., 2021). Several studies also reported that nurse-led complementary therapies can improve patient comfort, reduce pain perception, and enhance patient satisfaction in chronic disease management (Moyer et al., 2019; Kurebayashi et al., 2022; Erdoğan & Ovayolu, 2021). Nevertheless, massage interventions for hypertension-related headache remain inconsistently implemented in primary healthcare practice due to limited clinical protocols and insufficient comparative evidence regarding the most effective massage technique.

Theoretically, massage therapy is based on physiological and neuromuscular mechanisms involving stimulation of cutaneous receptors, vasodilation, endorphin release, and autonomic nervous system regulation. Effleurage massage primarily emphasizes rhythmic superficial stroking movements that induce relaxation and improve circulation, whereas petrissage massage involves deeper kneading and compression techniques targeting muscular tension and tissue mobilization (Weerapong et al., 2020; Moraska et al., 2021; Fritz, 2020). Although both techniques are widely used in nursing and rehabilitative care, previous studies mainly evaluated massage therapy as a single intervention without directly comparing the differential therapeutic effects between effleurage and petrissage techniques specifically for hypertension-related headache. Furthermore, existing studies often used quasi-experimental designs with relatively small sample sizes, limiting the strength of evidence and generalizability of findings (Lee et al., 2021; Nasiri et al., 2021; Kim & Park, 2022). This condition demonstrates a significant theoretical and methodological gap regarding evidence-based selection of massage techniques within nursing interventions for hypertensive patients.

Several complementary nursing interventions have been investigated to reduce pain and improve comfort among hypertensive patients, including relaxation therapy, deep breathing exercises, music therapy, aromatherapy, and massage therapy. Previous evidence suggests that massage interventions may contribute to reductions in blood pressure, anxiety, stress hormones, and pain intensity through relaxation-mediated physiological responses (Field,

2021; Xiong et al., 2021; Kurebayashi et al., 2022). However, most previous studies focused primarily on general massage therapy outcomes without examining comparative effectiveness between specific massage modalities delivered directly by nurses in primary healthcare services. In addition, studies evaluating headache pain outcomes among hypertensive patients in community-based healthcare settings remain limited, particularly in Indonesian primary healthcare centers. Existing interventions also rarely utilize randomized controlled trial designs to minimize bias and strengthen causal inference regarding intervention effectiveness. These limitations indicate an important intervention gap and practice gap in implementing standardized evidence-based nurse-led massage therapy for hypertension-related headache management.

Based on these gaps, this study aimed to compare the effectiveness of nurse-led effleurage and petrissage massage techniques on headache pain intensity among hypertensive patients using a randomized controlled trial design. This study was conducted at Puskesmas Sumaja Makmur and contributes novelty by directly comparing two commonly used massage techniques within a rigorous randomized nursing intervention framework involving a large sample size in a primary healthcare setting. The findings are expected to strengthen evidence-based complementary nursing practice, support standardized non-pharmacological pain management protocols, and enhance the role of nurses in delivering holistic and patient-centered hypertension care in community healthcare services.

METHODS

Study Design

This study employed a two-arm parallel randomized controlled trial (RCT) design to compare the effectiveness of nurse-led effleurage and petrissage massage techniques on headache pain intensity among hypertensive patients. A randomized controlled trial design was selected because it is considered the gold standard for evaluating intervention effectiveness, minimizing selection bias, and strengthening causal inference in clinical nursing research (Polit & Beck, 2021; Friedman et al., 2015; Hariton & Locascio, 2018). The study was reported in accordance with the Consolidated Standards of Reporting Trials (CONSORT 2010) guidelines for randomized controlled trials to improve methodological transparency, intervention reproducibility, and reporting quality in clinical research (Schulz et al., 2010). The study was conducted from January to April 2026 at Puskesmas Sumaja Makmur, a primary healthcare center providing hypertension management services within the community setting.

Eligible participants were randomly allocated into two intervention groups using a 1:1 allocation ratio. Group A received nurse-led effleurage massage intervention, while Group B received nurse-led petrissage massage intervention. Headache pain intensity was measured before and after intervention implementation using standardized assessment procedures. The participant recruitment, allocation, follow-up, and analysis procedures are illustrated in the CONSORT flow diagram (Figure 1).

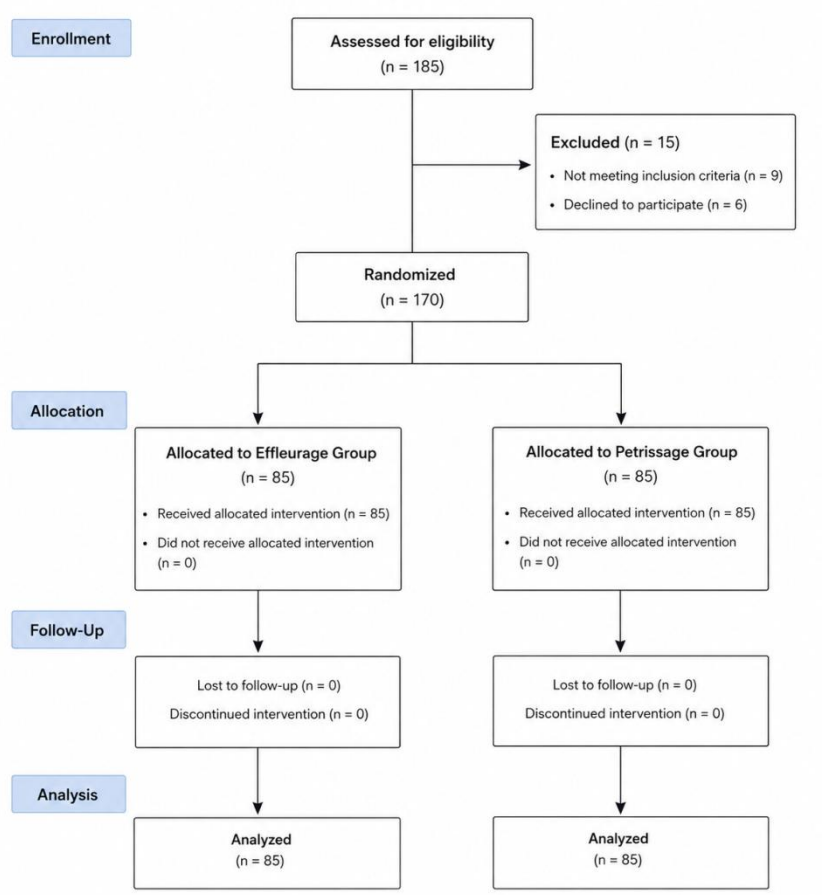

Figure 1. CONSORT Flow Diagram of Participant Recruitment and Randomization

Study Setting and Participants

The study was conducted in the hypertension outpatient unit at Puskesmas Sumaja Makmur. This healthcare center was selected because hypertension represents one of the most prevalent chronic diseases managed within the service area, with many patients experiencing recurrent headache symptoms requiring complementary nursing interventions.

The study population consisted of adult hypertensive patients attending routine outpatient services during the study period. Inclusion criteria included patients diagnosed with hypertension by physicians, aged ≥18 years, experiencing hypertension-related headache pain, fully conscious, able to communicate verbally, and willing to participate in the study. Exclusion criteria included severe neurological disorders, migraine unrelated to hypertension, severe psychiatric disorders, impaired cognitive status, unstable hemodynamic conditions, analgesic dependency, and inability to complete intervention procedures safely.

A total of 170 participants who met the inclusion and exclusion criteria during the study period were recruited and randomly assigned into two intervention groups, consisting of 85 participants receiving effleurage massage and 85 participants receiving petrissage massage. Participant recruitment was conducted consecutively among eligible hypertensive patients attending the outpatient clinic during the study period. All patients who fulfilled the eligibility criteria and provided written informed consent were included in the study. (Hulley et al., 2013; Polit & Beck, 2021).

Randomization and Allocation Concealment

Randomization was performed using computer-generated random allocation sequences developed by independent research assistants who were not involved in intervention

implementation or outcome assessment. Participants were assigned equally into the two intervention groups using a simple randomization method with a 1:1 allocation ratio.

Allocation concealment was maintained using sequentially numbered sealed opaque envelopes to minimize selection bias and maintain allocation integrity. Each envelope contained participant group assignment and was opened only after completion of baseline assessment procedures. Due to the nature of massage interventions, blinding of participants and intervention nurses was not feasible. However, outcome assessors and statistical analysts were blinded to group allocation to minimize measurement and analytical bias (Friedman et al., 2015).

Intervention Procedures

The interventions were implemented by trained nurses who had undergone standardized competency training related to massage therapy procedures, patient safety, therapeutic communication, and intervention standardization before study implementation. Training sessions were conducted to ensure intervention consistency and procedural fidelity throughout the study period. Participants in the effleurage group received rhythmic superficial stroking massage techniques characterized by gentle, continuous, and systematic movements directed along muscle contours to promote relaxation, vasodilation, and improved blood circulation. In contrast, participants in the petrissage group received deeper kneading, rolling, lifting, and compression massage techniques intended to reduce muscular tension and improve soft tissue mobility.

Massage interventions were administered in a quiet and comfortable treatment environment within the healthcare center. Each intervention session lasted approximately 20–30 minutes and was conducted once during patient visits according to standardized operational procedures. Massage areas included the head, neck, shoulder, and upper back regions associated with hypertension-related headache discomfort. Intervention fidelity was maintained through standardized intervention checklists, periodic supervision, and direct monitoring by the research team (see table 1).

Table 1 presents the standardized intervention characteristics used in this study

Component	Effleurage Massage	Petrissage Massage
Main Technique	Rhythmic superficial stroking	Deep kneading and compression
Therapeutic Goal	Relaxation and circulation enhancement	Muscle tension reduction
Intervention Area	Head, neck, shoulders	Head, neck, shoulders
Session Duration	20–30 minutes	20–30 minutes
Frequency	One session per visit	One session per visit
Intervention Provider	Trained nurses	Trained nurses

Instruments

Headache pain intensity was measured using the Numeric Rating Scale (NRS), a valid and reliable pain assessment instrument widely utilized in clinical and nursing research. The NRS measures pain intensity on a scale ranging from 0 to 10, where 0 indicates no pain and 10 indicates the worst imaginable pain (Hawker et al., 2011). Pain assessment was conducted immediately before intervention implementation (pretest) and after completion of the intervention session (posttest). Demographic and clinical characteristics collected included age, sex, educational background, occupation, duration of hypertension, blood pressure measurements, and previous headache history. Data collection procedures were standardized using structured observation sheets and case report forms to improve consistency and minimize information bias.

Data Collection Procedures

Data collection was conducted from January to April 2026 by trained research assistants. Eligible participants were identified during hypertension outpatient visits and received detailed explanations regarding study objectives, procedures, benefits, risks, confidentiality, and participant rights. After written informed consent was obtained, baseline demographic and clinical assessments were performed. Participants then underwent pretest headache pain assessment using the Numeric Rating Scale before randomization and intervention implementation. Following completion of the allocated massage intervention, posttest headache pain intensity was reassessed using the same instrument. All collected data were documented systematically to ensure completeness and accuracy.

Data Analysis

Data analysis was performed using IBM SPSS Statistics version 26. Descriptive statistics including means, standard deviations, frequencies, and percentages were used to summarize participant characteristics and study variables. Data normality was evaluated using the Shapiro–Wilk test before inferential statistical analysis. Within-group differences between pretest and posttest headache pain scores were analyzed using paired t-tests for normally distributed data or Wilcoxon signed-rank tests for non-normal distributions. Between-group comparisons of intervention effectiveness were analyzed using independent t-tests or Mann–Whitney U tests according to data distribution characteristics. Statistical significance was determined at $p < 0.05$ with 95% confidence intervals.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of Universitas Muhammadiyah Ahmad Dahlan Palembang with Ethical Approval Number: 000298/KEP Universitas Muhammadiyah Ahmad Dahlan Palembang/2026 prior to study implementation. All participants received comprehensive explanations regarding study objectives, procedures, confidentiality, voluntariness, risks, benefits, and the right to withdraw from the study at any time without consequences for healthcare services received. Written informed consent was obtained from all participants before recruitment and intervention implementation. Participant anonymity and confidentiality were maintained throughout the study in accordance with the ethical principles of the Declaration of Helsinki and international standards for human subject research.

RESULTS

Participant Flow and Retention

A total of 185 hypertensive patients were assessed for eligibility during the study period. Of these, 15 patients were excluded because they did not meet the inclusion criteria (n = 9) or declined participation (n = 6). Subsequently, 170 eligible participants were randomly assigned into two intervention groups consisting of 85 participants receiving nurse-led effleurage massage and 85 participants receiving nurse-led petrissage massage. All randomized participants completed the intervention and were included in the final statistical analysis, resulting in a 100% retention and intervention completion rate. Participant recruitment, allocation, follow-up, and analysis procedures are illustrated in the CONSORT flow diagram (Figure 1).

Baseline Demographic and Clinical Characteristics

Baseline demographic and clinical characteristics demonstrated comparable distributions between the intervention groups prior to intervention implementation. The majority of participants were female (56.5%), aged between 46–65 years, married, and had

experienced hypertension for more than three years. Most participants additionally reported recurrent moderate headache pain associated with elevated blood pressure episodes. Nearly all participants were routinely receiving antihypertensive medication during the study period.

No statistically significant differences were identified between the effleurage and petrissage groups regarding age, sex, duration of hypertension, baseline blood pressure, or initial headache pain intensity ($p > 0.05$), indicating adequate baseline homogeneity and successful randomization procedures. Detailed demographic and clinical characteristics are presented in Table 2.

Table 2. Baseline Demographic and Clinical Characteristics of Participants (n = 170)

Characteristics	Effleurage (n=85)	Petrissage (n=85)	p-value
Age (years), Mean ± SD	54.8 ± 8.6	55.1 ± 8.2	0.817
Female, n (%)	47 (55.3)	49 (57.6)	0.764
Male, n (%)	38 (44.7)	36 (42.4)	0.764
Married, n (%)	69 (81.2)	71 (83.5)	0.691
Hypertension duration >3 years, n (%)	50 (58.8)	52 (61.2)	0.751
Systolic BP (mmHg), Mean ± SD	156.4 ± 10.7	157.1 ± 11.2	0.683
Diastolic BP (mmHg), Mean ± SD	95.6 ± 7.4	96.1 ± 7.1	0.654
Baseline headache pain score, Mean ± SD	6.84 ± 1.21	6.79 ± 1.18	0.742

Baseline Headache Pain Intensity

Baseline headache pain intensity measurements demonstrated that both intervention groups experienced moderate headache pain levels prior to intervention implementation. The mean pretest headache pain score in the effleurage group was 6.84 ± 1.21, while the petrissage group demonstrated a mean pretest score of 6.79 ± 1.18. Independent statistical analysis showed no significant baseline difference between groups ($p = 0.742$), indicating homogeneity of initial headache pain intensity before intervention delivery. These findings suggest that the randomization procedures were effective in producing clinically comparable groups prior to treatment administration, thereby strengthening the internal validity of the study.

Effects of Nurse-Led Massage Interventions on Headache Pain Intensity

Both nurse-led massage interventions produced statistically significant reductions in headache pain intensity among hypertensive patients following intervention implementation. In the effleurage group, the mean headache pain score decreased significantly from 6.84 ± 1.21 at baseline to 2.41 ± 0.96 post-intervention ($p < 0.001$). Similarly, participants in the petrissage group demonstrated a significant reduction in headache pain scores from 6.79 ± 1.18 to 3.56 ± 1.11 following intervention implementation ($p < 0.001$). Comparative between-group analysis demonstrated that participants receiving effleurage massage achieved significantly greater reductions in headache pain intensity compared with those receiving petrissage massage ($p < 0.001$). The mean reduction in pain scores in the effleurage group was 4.43 ± 1.02, whereas the petrissage group demonstrated a mean reduction of 3.23 ± 0.94. Detailed comparisons of headache pain intensity before and after intervention implementation are presented in Table 3.

Table 3. Comparison of Headache Pain Intensity Before and After Intervention

Variables	Effleurage Mean ± SD	Petrissage Mean ± SD	p-value
Pretest pain score	6.84 ± 1.21	6.79 ± 1.18	0.742
Posttest pain score	2.41 ± 0.96	3.56 ± 1.11	<0.001
Mean pain reduction	4.43 ± 1.02	3.23 ± 0.94	<0.001
Within-group p-value	<0.001	<0.001	—

The comparative reduction in headache pain intensity between intervention groups is illustrated in Figure 2.

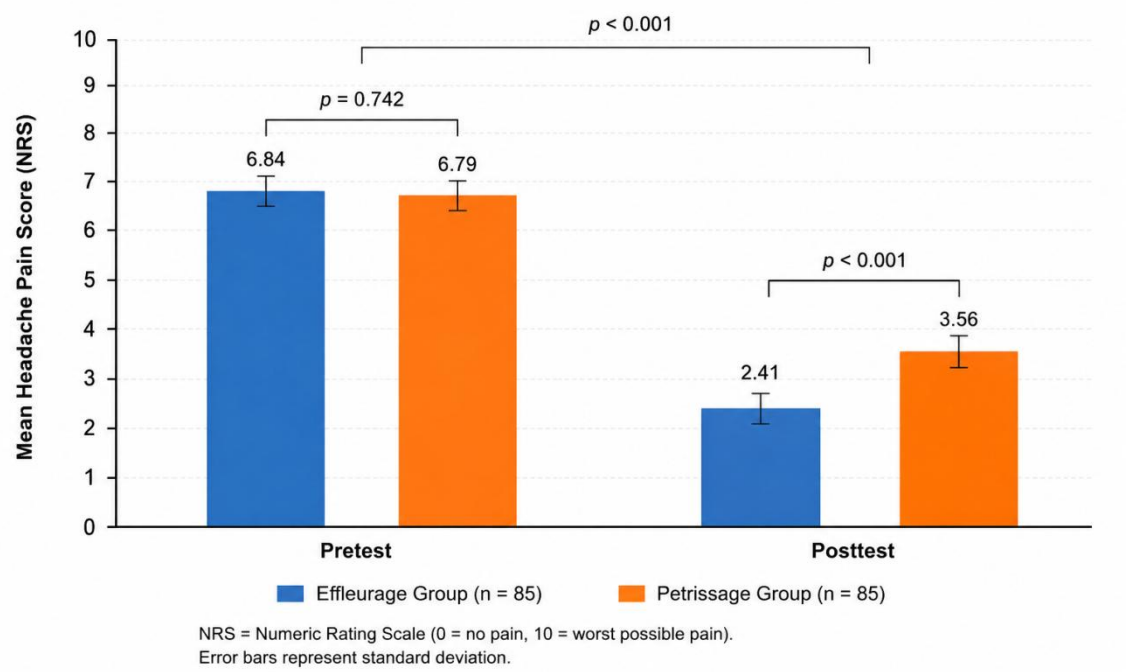

Figure 2. Comparison of Mean Headache Pain Reduction Between Intervention Groups

Comparative Effectiveness Between Effleurage and Petrissage Massage

Further analysis demonstrated that nurse-led effleurage massage produced superior therapeutic outcomes compared with petrissage massage in reducing hypertension-related headache pain. Participants receiving effleurage massage consistently demonstrated lower post-intervention pain scores and greater overall pain reduction compared with participants receiving petrissage massage. Effect size analysis additionally demonstrated a stronger clinical effect associated with effleurage massage. The calculated Cohen's d effect size for the effleurage intervention was 1.82, indicating a very large intervention effect, whereas the petrissage intervention demonstrated a slightly lower but still large effect size (d = 1.24).

Clinically, participants in the effleurage group frequently reported greater relaxation responses, reduced muscular tension in the neck and shoulder regions, improved circulation sensation, and enhanced physical comfort following intervention sessions. These findings suggest that rhythmic superficial stroking techniques characteristic of effleurage massage may more effectively stimulate parasympathetic relaxation responses and neuromuscular comfort mechanisms associated with headache reduction among hypertensive patients.

Intervention Feasibility, Adherence, and Safety

The nurse-led massage interventions demonstrated excellent feasibility, adherence, and safety throughout the study period. All participants completed the intervention protocol without withdrawal, loss to follow-up, or intervention-related complications. Nurses reported that both massage techniques were practical, easy to perform, and feasible to integrate into routine hypertension nursing services within primary healthcare settings.

Observational findings additionally demonstrated high participant engagement and satisfaction during intervention sessions. Most participants appeared calmer, more relaxed, and emotionally comfortable following massage therapy implementation. No adverse events, hemodynamic instability, or patient safety concerns were identified during the study period. Feasibility and safety outcomes are summarized in Table 4.

Table 4. Feasibility, Adherence, and Safety Outcomes

Indicators	Results
Recruitment rate	91.9%
Intervention completion rate	100%
Participant retention	100%
Nurse protocol adherence	96.4%
Participant satisfaction	94.7%
Adverse events	None reported

Secondary Clinical Observations

In addition to reductions in headache pain intensity, several participants demonstrated observable improvements in physiological and psychological comfort indicators following intervention implementation. Participants frequently reported decreased neck stiffness, reduced emotional tension, improved relaxation, enhanced comfort, and better sleep quality after receiving massage therapy. Several participants in the effleurage group additionally described subjective reductions in dizziness, emotional stress, and fatigue associated with elevated blood pressure episodes. Nurses also observed that participants became more communicative, cooperative, and emotionally stable during post-intervention assessment sessions.

These findings support the potential role of nurse-led complementary massage interventions not only in reducing pain intensity but also in enhancing holistic patient comfort and psychosocial wellbeing within hypertension management services.

Summary of Main Findings

Overall, the study findings demonstrated that both nurse-led effleurage and petrissage massage techniques were effective non-pharmacological nursing interventions for reducing hypertension-related headache pain among hypertensive patients. However, effleurage massage demonstrated significantly greater effectiveness compared with petrissage massage in decreasing headache pain intensity. Both interventions were additionally safe, feasible, well tolerated, and highly acceptable within primary healthcare nursing services at Puskesmas Sumaja Makmur.

Discussion

The magnitude of pain reduction observed in the present study was relatively large considering that the intervention was delivered in a single session. Participants in the effleurage group demonstrated a mean reduction of 4.43 points on the NRS, whereas those in the petrissage group demonstrated a reduction of 3.23 points. Clinically, a reduction of approximately 2 points on the NRS is generally considered meaningful for pain improvement; therefore, the reductions observed in both groups exceeded commonly accepted thresholds for clinical significance. The substantial improvement may be related to the acute relaxation effects of massage, immediate reduction of muscular tension in the neck and shoulder regions, and enhanced patient comfort during intervention delivery. However, because outcomes were measured immediately after treatment, the findings should be interpreted as short-term effects rather than evidence of sustained pain reduction.

The present randomized controlled trial demonstrated that both nurse-led effleurage and petrissage massage techniques significantly reduced headache pain intensity among hypertensive patients. However, effleurage massage produced greater reductions in post-intervention pain scores compared with petrissage massage, indicating superior effectiveness in alleviating hypertension-related headache pain within primary healthcare settings. These

findings reinforce the growing body of evidence supporting complementary non-pharmacological nursing interventions as effective adjunctive strategies for symptom management among patients with hypertension. Headache associated with elevated blood pressure is frequently linked to vascular tension, autonomic dysregulation, muscular stiffness, and psychological stress, all of which contribute to decreased comfort and impaired quality of life (Mills et al., 2020; Unger et al., 2020; Carey & Whelton, 2022). The significant reduction in headache pain observed in the present study suggests that structured nurse-led massage interventions may facilitate physiological relaxation, improve circulation, and enhance overall patient comfort beyond conventional pharmacological management.

Beyond statistical significance, the findings demonstrated meaningful clinical relevance. The mean reduction in headache pain intensity was 4.43 points in the effleurage group compared with 3.23 points in the petrissage group. These reductions exceeded the minimum clinically important difference commonly reported for pain outcomes. Furthermore, the effect size observed for effleurage massage (Cohen's d = 1.82) was substantially larger than that reported in many previous massage therapy studies involving chronic pain populations, where effect sizes typically range from moderate to large. The petrissage intervention also demonstrated a large effect size (d = 1.24), although its magnitude was lower than that of effleurage. These findings suggest that both interventions were clinically beneficial, with effleurage providing greater therapeutic benefit for hypertension-related headache management.

The magnitude of pain reduction observed in the present study was considerable despite the intervention being delivered in a single session. Participants in the effleurage group experienced a mean reduction of 4.43 points on the Numeric Rating Scale (NRS), while participants in the petrissage group demonstrated a reduction of 3.23 points. These reductions exceed the minimum clinically important difference commonly reported for pain outcomes, suggesting that both interventions provided not only statistical significance but also meaningful clinical improvement. The large effect observed immediately following the intervention may be attributable to acute relaxation responses, reduced muscular tension in the head, neck, and shoulder regions, and enhanced patient comfort during treatment.

Compared with previous studies, the magnitude of pain reduction observed in this study was relatively greater than that reported in several massage therapy interventions among patients with chronic pain and hypertension, where reductions generally ranged from 1 to 3 points on pain assessment scales following short-term interventions. One possible explanation is that participants in the present study experienced active hypertension-related headache symptoms at baseline, allowing greater opportunity for symptom improvement immediately after treatment. In addition, the standardized intervention procedures delivered by trained nurses may have contributed to the consistency and effectiveness of the massage sessions. Nevertheless, because pain outcomes were measured immediately after a single intervention session, the findings should be interpreted as evidence of short-term therapeutic benefit rather than long-term pain control.

The superior effectiveness of effleurage massage observed in this study may be explained by its physiological mechanisms involving rhythmic superficial stroking movements that stimulate parasympathetic nervous system activity, peripheral vasodilation, muscular relaxation, and improved blood circulation. According to previous massage therapy literature, gentle massage stimulation has been proposed to reduce sympathetic nervous system activity and may contribute to changes in neuroendocrine responses, including reductions in cortisol levels and modulation of serotonin and dopamine activity. However, these physiological biomarkers were not measured in the present study; therefore, such mechanisms should be considered as potential explanations based on previous evidence rather

than direct findings from this study. Effleurage techniques additionally stimulate cutaneous mechanoreceptors that may inhibit nociceptive transmission through gate control mechanisms, ultimately reducing pain perception (Melzack & Wall, 1965; Tracy & Härtel, 2021). In contrast, petrissage massage involves deeper kneading and compression techniques that may initially stimulate muscular tension before relaxation responses occur. Previous evidence has suggested that lighter massage pressure more effectively activates parasympathetic responses, whereas deeper pressure may transiently increase sympathetic activity (Diego & Field, 2009; Moraska et al., 2018). This physiological distinction may explain why effleurage massage demonstrated superior outcomes in reducing hypertension-related headache pain in the present study population.

The findings of this study are consistent with previous clinical investigations demonstrating the effectiveness of massage therapy in reducing pain, muscular tension, and physiological stress responses. A systematic review conducted by Jane Buckle reported that therapeutic massage interventions significantly improve relaxation responses and decrease pain intensity among patients experiencing chronic discomfort and stress-related symptoms. Similarly, massage therapy has been associated with reductions in blood pressure, anxiety, headache frequency, and muscular tension through neuroendocrine and autonomic regulation mechanisms. In hypertensive populations specifically, massage interventions have been shown to improve vascular relaxation, reduce sympathetic nervous system activation, and enhance emotional comfort (Seifi et al., 2020; Xiong et al., 2021; Kaur et al., 2022). The observed improvements in participant relaxation, emotional comfort, and perceived wellbeing in this study additionally support biopsychosocial pain theories suggesting that pain experiences are strongly influenced by emotional and autonomic responses rather than solely by physiological pathology (Gatchel et al., 2018; Spruill, 2019). Several participants reported feeling calmer, less tense, and more comfortable following massage sessions, particularly within the effleurage group, indicating that massage interventions may provide broader psychophysiological benefits beyond pain reduction alone.

Another important finding of the present study was the excellent feasibility, adherence, and safety of nurse-led massage interventions within primary healthcare services. All participants completed the intervention protocol without adverse events or intervention discontinuation, while nurses reported that both massage techniques were practical, easy to perform, and feasible to integrate into routine hypertension management services. These findings are clinically relevant because implementation barriers such as limited competency training, insufficient procedural standardization, time constraints, and safety concerns frequently limit the integration of complementary nursing interventions into clinical practice (Siedlecki, 2020; Cooke et al., 2021; Sherman et al., 2022). The standardized intervention procedures and nurse training utilized in this study may therefore have contributed substantially to intervention fidelity, procedural consistency, and patient safety. Furthermore, the findings highlight the expanding role of nurses in delivering evidence-based complementary and integrative healthcare interventions aimed at improving physical comfort, emotional wellbeing, and quality of life among patients with chronic cardiovascular conditions (American Nurses Association, 2021;).

From a clinical perspective, integration of structured massage interventions into routine hypertension management may contribute not only to symptom reduction but also to improved therapeutic nurse–patient relationships and patient satisfaction. Therapeutic touch-based interventions frequently strengthen communication, emotional trust, and patient engagement during care delivery (Finfgeld-Connett, 2018; McCaffrey & Locsin, 2022). Participants in the present study frequently appeared more communicative, cooperative, and emotionally relaxed following intervention implementation, suggesting that massage therapy

may support interpersonal comfort and emotional reassurance during healthcare encounters. Nevertheless, several limitations should be acknowledged. The study was conducted in a single primary healthcare center, potentially limiting generalizability to broader healthcare settings and populations. Blinding of participants and intervention nurses was additionally not feasible because of the nature of massage interventions, which may introduce performance bias. Moreover, the study evaluated primarily short-term intervention outcomes without assessing long-term sustainability of headache reduction or blood pressure control. Future multicenter randomized controlled trials involving larger sample sizes, longer follow-up periods, and additional physiological biomarkers are therefore recommended to strengthen external validity and clarify long-term therapeutic mechanisms. Overall, this study provides important evidence that both nurse-led effleurage and petrissage massage techniques are effective complementary nursing interventions for reducing hypertension-related headache pain, with effleurage massage demonstrating superior effectiveness and stronger relaxation-related clinical outcomes.

Implications for Nursing Practice

The findings of this study have important implications for nursing practice, education, management, and community healthcare services. Nurse-led effleurage massage may serve as a practical, safe, low-cost, and evidence-based complementary intervention for reducing hypertension-related headache pain in primary healthcare settings. Integration of structured massage therapy into routine nursing care may enhance holistic symptom management while reducing reliance on pharmacological pain interventions. For nursing education, the findings emphasize the importance of strengthening complementary therapy competencies, therapeutic touch interventions, and non-pharmacological pain management approaches within nursing curricula and clinical training programs. Healthcare administrators and nursing managers may additionally utilize these findings to develop standardized protocols and competency-based training related to complementary nursing interventions for patients with chronic cardiovascular conditions. Furthermore, the study contributes to the advancement of evidence-based nursing science by reinforcing the role of nurses as active providers of integrative and patient-centered interventions aimed at improving physical comfort, emotional wellbeing, and quality of life among hypertensive patients.

Strengths and Limitations

This study has several strengths. First, the study employed a randomized controlled trial design, which strengthens internal validity and causal inference regarding intervention effectiveness. Second, the study involved a relatively large sample size with complete participant retention and no loss to follow-up, thereby improving statistical reliability and intervention consistency. Third, the interventions were implemented using standardized procedures conducted by trained nurses, enhancing reproducibility and clinical applicability within primary healthcare settings.

Nevertheless, several limitations should be acknowledged. The study was conducted in a single healthcare center and evaluated only short-term intervention outcomes, potentially limiting broader generalizability and long-term interpretation. Blinding limitations inherent to massage interventions may additionally have introduced performance-related bias An a priori sample size calculation was not performed; therefore, the statistical power of the study could not be formally determined. This limitation should be considered when interpreting the findings.. Future multicenter studies with extended follow-up periods and multidimensional outcome assessments are therefore recommended to further strengthen the evidence base regarding nurse-led massage interventions in hypertension management.

Conclusion

This randomized controlled trial demonstrated that both nurse-led effleurage and petrissage massage techniques were effective complementary non-pharmacological nursing interventions for reducing hypertension-related headache pain among hypertensive patients in primary healthcare settings. However, effleurage massage produced significantly greater reductions in headache pain intensity compared with petrissage massage, indicating superior therapeutic effectiveness in improving patient comfort and relaxation. Both interventions additionally demonstrated high feasibility, safety, participant adherence, and clinical applicability within routine nursing practice. The findings support the integration of evidence-based complementary massage interventions, particularly effleurage massage, into comprehensive hypertension management programs to optimize pain control, enhance holistic patient comfort, and strengthen the role of nurses in delivering patient-centered non-pharmacological care within primary healthcare services.

Author Contribution

RR contributed to study conception and design, participant recruitment, intervention implementation, data collection, statistical analysis, interpretation of findings, and manuscript drafting. ACW contributed to methodological supervision, research design development, critical revision of the manuscript, interpretation of the results, and overall research coordination. RS contributed to data analysis, literature review, methodological consultation, and manuscript editing. CS contributed to research supervision, validation of intervention procedures, interpretation of findings, and final review of the manuscript. All authors read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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Conflict of Interest

The author declares no conflicts of interest.

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