

## ARTICLE INFORMATION

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## Effectiveness of clove oil massage to improve circulation and muscle strength in patients with non-hemorrhagic stroke

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### Abstract

**Background:** Stroke is a medical condition that arises from the disruption or rupture of blood vessels in the brain, making it an emergency that can lead to neuromuscular disorders, muscle weakness, and potentially result in disability or death. One effective treatment to alleviate muscle weakness in non-hemorrhagic stroke patients is massage therapy with clove oil. This therapy helps by boosting endorphin release and decreasing muscle spasticity, which in turn relaxes the muscle tissue in these patients.

**Purpose:** To explain the effectiveness of massage therapy with clove oil on the degree of muscle strength in non-hemorrhagic stroke patients.

**Method:** A quasi-experimental study employing a pre-post test with a control group design was carried out on 48 non-hemorrhagic stroke patients. These patients received range of motion exercises, massage therapy without oil, and massage therapy with clove oil, selected through consecutive sampling. Each treatment was administered six times for 30 minutes over six days. Data analysis was performed using the Friedman test and Kruskal-Wallis test ( $p < 0.05$ ) with SPSS version 22.

**Results:** The clove oil massage therapy had a greater effect on increasing the degree of muscle strength with a  $p$ -value of 0.000.

**Conclusion:** Massage therapy with clove oil is effective in increasing the degree of muscle strength in non-hemorrhagic stroke patients compared to other groups.

**Keywords:** Clove Oil; Massage Therapy; Muscle Strength; Non-Hemorrhagic Stroke Patients.

### INTRODUCTION

A stroke is a pathological condition caused by the rupture or breakage of a blood vessel in the brain, leading to neuromuscular disorders characterized by muscle weakness, which can result in disability or death (Centers for Disease Control and Prevention, 2023; Cydulka, Fitch, Joing, Wang, Cline, & Ma, 2018). When the brain's oxygen and nutrient supply is disrupted, it affects nerve cells and causes stroke symptoms (Brunner & Suddarth, 2018). Strokes are classified into non-hemorrhagic and hemorrhagic

types, with non-hemorrhagic strokes accounting for about 80-85% of cases (Price & Wilson, 2006).

In Central Java, the number of stroke cases in 2017 was 40,972, including 12,542 hemorrhagic and 28,430 non-hemorrhagic strokes, placing Indonesia 13th in the number of post-stroke patients. The incidence of stroke in Central Java showed 74,539 cases in 2018, 116,835 in 2019, 42,376 in 2020, and 55,412 in 2021 (Health Office of Central Java Province, 2022). Stroke is the leading cause of permanent and serious disability worldwide. In 2019,

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Indonesia had the highest number of post-stroke patients, ranking first in Asia (World Health Organization, 2022).

Stroke leads to various degrees of dysfunction, including loss of muscle strength, sensation, mobility in affected limbs, and the ability to perform certain tasks. Post-hemorrhagic stroke patients often experience muscle weakness on one side of their body, resulting in immobilization. If not addressed promptly, immobilization can lead to complications such as tone disorders, orthostatic hypotension, deep vein thrombosis, and contractures. Rehabilitation is a key method to mitigate post-stroke disability (Bland, Whitson, Harris, Edmiaston, Connor, Fucetola, & Lang, 2015)

Post-stroke patients show an increase in muscle strength by up to 20%, but recovery varies, and over 50% of hemiparesis patients suffer from chronic motor disorders. Hemiparesis can cause difficulties in moving limbs, walking, and maintaining balance, impacting daily activities like dressing, eating, drinking, picking up objects, and using the toilet. Proper management of hemiplegic stroke soon after the event can lead to better motor function, improved rehabilitation outcomes, and shorter hospital stays (Siswoutomo, 2017).

Stroke remains a significant health issue worldwide. Recovery rates for non-hemorrhagic stroke patients with hemiplegia vary widely; while some may fully recover, most do not. Recovery depends on the stroke's severity, the patient's physical condition, adherence to the healing process, the patient's determination, and support from family and companions (Brunner & Suddarth, 2018). Stroke management strategies encompass prevention, rehabilitation, and promotion. The recovery phase typically spans from 2 weeks to 6 months post-stroke, a crucial period for functional recovery known as the "golden period" (Batubara & Tat, 2016).

Non-pharmacological therapies to enhance muscle strength in non-hemorrhagic stroke patients with limited mobility include physical therapies such as range of motion (ROM), acupressure, stretching exercises, and massage. During the golden period, appropriate therapies like massage and deep tissue techniques can help reduce muscle weakness. Key areas for increasing muscle strength in stroke

patients include the face, back, arms, shoulders, neck, and legs (Rahayu, Pujiastuti, & Anwar, 2019).

Massage therapy enhances muscle strength by stimulating blood flow and the nervous system, aiding efficient blood return to the heart, and accelerating the removal of lactic acid from muscles. Relaxation massage with pure coconut oil has been shown to improve upper limb muscle strength, with the intervention group having a mean value of 4.27 compared to 2.41 in the control group ( $p = 0.000$ ) (Rahayu et al., 2019). Coconut oil serves as a lubricant, while clove oil can penetrate deeper skin layers, optimizing massage therapy results. Clove oil, containing eugenol, provides antioxidant, analgesic, anti-inflammatory, and antimicrobial effects. It acts as a vasodilator, relaxing spastic muscles and reducing pain and stiffness, thereby improving physical function.

Massage therapy with clove oil can significantly enhance muscle strength, enabling post-stroke patients to regain independence more quickly. Research was conducted to evaluate the effectiveness of clove oil massage therapy on muscle strength in non-hemorrhagic stroke patients, aiming to contribute to the development of complementary therapeutic knowledge in this area.

## RESEARCH METHOD

This research was conducted from September to November 2023 at General Hospital of dr. Soeselo Slawi in Tegal Regency. The sample was selected using consecutive sampling and included participants aged 45-66 years with a medical diagnosis of non-hemorrhagic stroke with hemiparesis, composita mentis awareness, and a muscle strength scale of 1-4. Each group consisted of 16 participants. The control group received range of motion (ROM) therapy according to hospital standards, while the intervention group was divided into two subgroups: one had massage therapy without oil, and the other received massage therapy with oil. Each therapy session was administered six times for 30 minutes over six days. Muscle strength was measured before the first treatment and after each subsequent treatment until the sixth day using the Medical Research Council (MRC) scale. The study employed the Friedman test to assess differences within groups and the Kruskal-Wallis test

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to examine differences between groups. Data analysis was performed using SPSS version 22. Ethical approval for the research was granted by the

Semarang Ministry of Health Polytechnic Research Ethics Committee (No. 1105/EA/KEPK/2023).

## RESEARCH RESULTS

**Tabel 1. Characteristics of the Participants (N=48)**

Variables	Group		
	Control (n=16)	Massage therapy without oil (n=16)	Massage therapy with clove oil (n=16)
<b>Age (Mean±SD) (Range) (Year)</b>		(57.6±6.23) (45-66)	
45 – 55 years old	7/43.7	6/37.5	5/31.2
56 – 66 years old	9/56.3	10/62.5	11/68.8
<b>Gender (n/%)</b>			
Male	8/50.0	9/56.3	8/50.0
Female	8/50.0	7/43.7	8/50.0
<b>Onset of Stroke (n/%)</b>			
Timely treatment	10/62.5	11/68.8	11/68.8
Late treatment	6/37.5	5/31.2	5/31.2
<b>Stroke Attack Frequency (n/%)</b>			
First time	11/68.8	10/62.5	10/62.5
Recurring	5/31.2	6/37.5	6/37.5

Table 1 outlines the demographics of the participants, including age, gender, stroke onset, and stroke attack frequency. Participants' ages ranged from 45 to 66 years, with an average age of 57.6 years and a standard deviation of 6.23. In the control group, 56.3% of participants were aged 56-66 years, in the massage therapy without oil group, 62.5% were aged 56-66 years, and in the massage therapy with oil group, 68.8% were aged 56-66 years.

Regarding gender, the control group was evenly split with 50.0% male and 50.0% female. In the massage therapy without oil group, 56.3% of participants were male, while in the massage therapy

with oil group, there was an equal distribution of 50.0% male and 50.0% female.

For stroke onset status, the majority of participants had a precise onset: 62.5% in the control group, 68.8% in the massage therapy without oil group, and 68.8% in the massage therapy with oil group.

Regarding stroke attack frequency, most participants had their first attack: 68.8% in the control group, 62.5% in the massage therapy without oil group, and 62.5% in the massage therapy with oil group.

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**Table 2. Muscle Strength Measurement in Each Group**

Variables	Group		
	Control	Massage Therapy Without Oil	Massage Therapy With Clove Oil
<b>Upper Extremity</b>			
Δ pre-post 6 <sup>th</sup>	0.62*	1.25*	2.44*
p-value	0.000	0.000	0.000
<b>Lower Extremity</b>			
Δ pre-post 6 <sup>th</sup>	0.56*	1.28*	2.32*
p-value	0.000	0.000	0.000

Table 2 demonstrates that all three groups experienced significant increases in muscle strength in both the upper and lower extremities ( $p=0.000$ ), with notable differences in muscle strength improvements between the groups after the 6-day treatment period. The average muscle strength improvement was highest, with values of 2.44 in the upper extremities and 2.32 in the lower extremities. In comparison, the massage therapy without oil group had average improvements of 1.25 in the upper extremities and 1.28 in the lower extremities, while the control group had average improvements of 0.62 in the upper extremities and 0.56 in the lower extremities.

## DISCUSSION

The statistical data reveals that the most common age range for each group is 56-66 years old, indicating that age is a significant risk factor for non-hemorrhagic stroke. Individuals over 55 face double the risk of stroke, with the risk increasing by 65% for every 10-year age increment for both men and women. Older stroke patients also experience more severe functional limitations compared to younger ones. As people age, their organ function declines, affecting recovery differently in younger and older stroke patients. Additionally, age-related decreases in tissue perfusion to the cerebral vasculature impact recovery (Wayunah & Saefulloh, 2017).

Regarding gender, the participants are predominantly male. This may be because many male participants smoke (Kim, Lee, Nam, Han, Lee, Cho, & Heo, 2015; Windham, Deere, Griswold, Wang, Bezerra, Shibata, & Mosley, 2015). Nicotine

in cigarettes can damage blood vessel walls, reduce blood elasticity, increase arterial hardening, and raise fibrinogen levels, leading to thicker blood vessels. Additionally, women are more protected from heart disease and stroke until midlife due to the hormone estrogen (Kabi, Tumewah, & Kembuan, 2015).

In all three groups, stroke onset with timely treatment (<4.5 hours) was most common: 62.5% in the control group, 68.8% in the massage therapy group without oil, and the massage therapy group with clove oil. Early hospital admission after a stroke significantly influences recovery (Setianingsih et al., 2019). Prompt treatment reduces the risk of cerebral infarction, resulting in less severe neurological damage compared to patients with extensive cerebral infarction. However, only 25.5% of non-hemorrhagic stroke patients received timely treatment, even though treatment within 6 hours of onset yields the best results for cerebral perfusion (Setiawan & Santjaka, 2021).

The frequency of stroke attacks shows that the first attack is the most common in participants. Patients with recurrent strokes experience more severe neurological damage and require longer healing times compared to first-time stroke patients (Damush, Plue, Bakas, Schmid, & Williams, 2007). Recovery for stroke sufferers with repeated attacks also requires more time and training (Olviani, Mahdalena, & Rahmawati, 2017).

In a study involving Parkinson's patients with muscle weakness, 60 participants received massage therapy twice a week to improve upper extremity muscle strength. The results showed that those who received massage therapy experienced significant

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improvements in muscle flexion and extension torsi ( $p < 0.001$ ). Similarly, a study on cerebral palsy patients found that modified massage therapy effectively addressed muscle stiffness. This study involved 20 participants who received 30-minute massage therapy sessions twice a week (Miyahara, Jitkrisadaku, Sringean, Aungkab, Khongprasert, & Bhidayasiri, 2018). The massage techniques applied pressure to the affected areas, aiding in the removal of toxins, carbon dioxide, and other metabolic byproducts.

The deep massage technique helps stretch stiff muscles by lengthening sarcomeres, breaking up subcutaneous adhesions, and preventing fibrosis, while providing sensory feedback from muscle spindle receptors. This mechanism is similar to acupressure, which stimulates the central nervous system. During massage, following the sen lines helps balance the body's energy. Specifically, massaging the shoulder MaSP can increase upper extremity muscle strength in stroke patients with muscle weakness (Peungsuwan, Sermcheep, Harnmontree, Eungpinichpong, Puntumetakul, Chatchawan, & Yamauchi, 2014).

This massage therapy process helps heal and regenerate muscle cells that are not used during the acute phase of a stroke. Massage therapy combined with aromatherapy is more effective in improving motor function and reducing muscle and joint stiffness after a stroke. Massage therapy provides stimulation to sensory nerves and is directly conveyed by motor nerves to the desired organs. The body relaxes, making non-invasive hemodynamic parameters stable because massage releases serotonin, histamine, bradykinin, slow reacting substances (SRS) which cause capillary and atrial dilatation and flare reactions which result in improved blood vessel microcirculation and lower blood pressure. In mild stroke patients, when the stability of the stroke patient's non-invasive hemodynamic parameters is maintained, it makes it easier to restore motor status (Kusyati, 2020).

Massage therapy positively impacts the motor status of stroke patients, effectively stimulating muscle function. The average upper extremity muscle strength significantly increased to 3730 in the group receiving both frirage massage and acupressure, compared to 1.64 in the control group

that only received acupressure. This demonstrates that combining frirage massage and acupressure significantly enhances muscle strength compared to acupressure alone. Massage therapy aims to relax tense muscles and improve blood and lymph circulation, as tense muscles can disrupt these systems. Adding clove oil aromatherapy at specific points around the extremities accelerates recovery in weakened areas (Amirudin, Anonim, & Saleh, 2018).

An Ayurvedic massage study from 2014-2017 involved daily sessions over 10 days, accompanied by steam application, measuring results using Brunnstrom leg development. Post-stroke patients with flaccidity could stand with minimal assistance and improved mobility more quickly. This treatment encouraged faster standing with less assistance and reduced the need for antispastic drugs (Sankaran, Kamath, Nambiar, & Kumar, 2019).

Massage therapy with clove oil, which contains eugenol, can release endorphins and reduce muscle spasticity, thereby increasing muscle strength. Eugenol has antioxidant, analgesic, anti-inflammatory, and antimicrobial properties (Kheawfu, Pikulkaew, Hamamoto, Sekimizu, & Okonogi, 2017). Applying clove essential oil to the skin causes vasodilation, enhancing muscle relaxation and reducing pain from stiffness. Eugenol's analgesic effect arises from its ability to inhibit prostaglandins and inflammatory mediators like leukotrienes, providing muscle relaxation and reducing stiffness. The stimulation from clove essential oil influences the regulatory subsystem to alleviate pain and stiffness in the joints, improving physical function (Haro-González, Castillo-Herrera, Martínez-Velázquez, & Espinosa-Andrews, 2021).

Analysis confirms the hypothesis that massage therapy with clove oil effectively increases muscle strength in non-hemorrhagic stroke patients compared to massage therapy without oil and ROM exercises. The consistent intervention across groups, conducted by an enumerator, highlights the significant role of clove oil in enhancing muscle strength in the massage therapy group.

## CONCLUSION

Clove oil massage therapy holds significant potential as a non-pharmacological treatment for non-hemorrhagic stroke patients, particularly in enhancing muscle strength.

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## SUGGESTION

Additional research is required to investigate these factors and advance them in a more contemporary manner. The findings from this study can serve as a basis for delivering non-pharmacological nursing care to non-hemorrhagic stroke patients.

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