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THE EFFECT OF INTERMITTENT ELECTRICAL STIMULATION AND EFFLEURAGE MASSAGE USING CANOLA OIL ON THE RISK OF PRESSURE ULCER IN STROKE PATIENT

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ABSTRACT
Stroke is a sudden disease that disrupts blood flow in the body, a brain condition causing disability, immobility, and prolonged paralysis, which reduces blood supply to tissues, especially in patients with prominent bones, increasing the risk of pressure ulcers. This study aimed to identify the effect of intermittent electrical stimulation and effleurage massage using canola oil on the risk of pressure ulcers in stroke patients at Kesdam Iskandar Muda Hospital. The study employed a Quasi-Experimental design with a pretest and posttest approach. The sampling technique used was non-probability sampling, specifically convenience sampling, with a total of 60 participants. The instrument used was the Waterlaw Scale. Data were analyzed using a paired t-test. The study showed that the risk of pressure ulcers in ischemic stroke patients before the intervention was as follows: severe risk (70.0%), mild risk (20%), moderate risk (6.67%), and very severe risk (3.33%). After the intervention, the risk distribution changed to mild risk (60%), severe risk (33.33%), moderate risk (3.33%), and very severe risk (3.33%). %). Statistical analysis revealed a p-value of 0.001 (<0.05), indicating that intermitten electrical stimulation and effleurage massage using canola oil significantly affects the risk of pressure ulcers in stroke patients. This study confirms that intermitten electrical stimulation and effleurage massage using canola oil has a significant effect on reducing the risk of pressure ulcers in stroke patients.

Keywords: canola oil; effleurage massage; intermittent electrical stimulation; pressure ulcer; stroke

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INTRODUCTION

Stroke is a clinical syndrome characterized by acute focal neurological deficits caused by vascular injury to the central nervous system. Stroke is the second leading cause of death and disability worldwide (Shi Q et all, 2012). accounting for 11.9 million new cases and 7.3 million deaths (Abate YH, et al., 2024) with the majority of cases occurring in Asia and low- to middle-income countries (Feigin VL, et all, 2022) In Indonesia, the prevalence of stroke increased more than one and a half times within five years, with treatment costs exceeding USD 150 million in 2018 (Kementerian Kesehatan RI; 2018, Wahyudi E , 2019). The prevalence of stroke in Aceh Province was 6.6% in 2013, and by 2023, Aceh ranked among the top ten provinces with the highest number of stroke patients in Indonesia (Riskesdas, 2018). Approximately 50% of patients with pressure ulcers have a history of stroke (Kernan WN et all, 2021). Stroke leads to motor, cognitive, and sensory impairments (González, et all, 2013, Bártlová S, 2022, Centers for Disease Control and Prevention. Stroke facts). More than 50% of stroke patients experience mobility disorders (Tayyib N, Coyer F, & Lewis P, 2013), which increase the risk of developing pressure ulcers (Shahin ES, Dassen T, & Halfens RJ, 2008, Tayyib N, Coyer F & Lewis P, 2016, Demarré L et all, 2012). Pressure ulcers commonly result in infections (Russo CA, Steiner C & Spector , 2008) and extend hospital stays by 7 to 50 days (Allman RM, et all, 1991).

Pressure ulcers are injuries caused by sustained mechanical loading and deformation of soft tissues such as skin, subcutaneous fat, or muscles trapped between rigid internal anatomical structures (e.g., bone, tendon). When the intensity and duration of deformation exceed the physiological tolerance of an individual and the resilience of the affected tissue, cell death occurs, leading to necrotic areas (National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, Alliance, PPPi , 2014). Risk factors for pressure ulcers include friction, shear, immobility, vascular diseases, and perfusion disorders (Anders J, et all, 2010). Pressure ulcers are preventable; therefore, prevention is of utmost importance (Oomens CW, et all, 2011). Traditional prevention strategies involve repositioning patients every two hours. More recent approaches employ specialized mattresses that redistribute pressure and wheelchair cushions. Despite these preventive measures, the incidence and economic burden of pressure ulcers remain significant (G, Dealey C And Posnett J, 2011). Pressure ulcers are an example where effective preventive strategies can reduce morbidity, mortality, and healthcare costs (Kottner J, Dassen T and Tannen A, 2009).

The Waterlow Scale is a validated and reliable risk assessment tool for pressure ulcers. It consists of 10 items, each scored between 0–8; higher scores indicate greater risk (Ahmetovic A, et all, 2015). A novel method to reduce the risk of pressure ulcers is intermittent electrical stimulation (IES) (Gyawali S, et all, 2011). Low-voltage electrical current is delivered to the gluteal muscles, inducing contractions lasting 10 seconds every 10 minutes. These contractions mimic subconscious postural adjustments made by healthy individuals every 6–9 minutes in response to discomfort when sitting or lying down. Periodic contractions redistribute pressure around bony prominences such as the sacrum and ischial tuberosities, reducing mechanical deformation and improving tissue oxygenation (Solis LR, et all, 2007) The IES system used consists of a dual-channel electrical stimulator (Impulse EMS D7) connected to hypoallergenic electrodes applied directly to the skin over the gluteal region. The stimulator delivers 35 Hz electrical pulses, causing gluteal muscle contractions (Kane A, et all, 2017). Effleurage massage is performed using stroking movements with the full surface of the palm and fingers, adapted to the body part being massaged. Effleurage on the extremities begins with pushing and firm pressure, with each stroke ending at the lymph nodes (axillary nodes for the upper limbs and inguinal nodes for the lower limbs) (Darmareja R, Kosasih CE and Priambodo AP, 2019) Canola oil is a source of vitamins E and K (Clinical Practice Guideline, 1992) Vitamin E, an oil-soluble antioxidant, has been used for skin protection against infections and as an anti-inflammatory agent (Legacy. U.S. Department Of Agriculture; 2019).

METHOD

The design used in this study was a Quasi-Experimental design with a pretest–posttest approach. The sampling technique employed was non-probability convenience sampling, in which participants were selected based on predetermined inclusion and exclusion criteria set by the researchers (Peh HY, et all, 2015) The population of this study consisted of all stroke patients at Kesdam Iskandar Muda Hospital, while the sample comprised stroke patients selected through random sampling using Federer's formula (Aryani, Widiyono and Putra, 2022) resulting in a total of 60 respondents. Thirty respondents were assigned to the Intermittent Electrical Stimulation intervention group, and 30 respondents to the Effleurage Massage with Canola Oil intervention group.. Inclusion criteria included respondents who were willing to participate in the study, stroke patients who had been hospitalized for more than 2 days and less than 5 days, patients who were bedridden, clients at risk of developing pressure ulcers (Waterlow scale < 15), those without contraindications to receiving pressure ulcer preventive care (e.g., lumbar injuries or fractures that had not yet been fixed, which could worsen the patient's condition), and patients with a normal body temperature (36–37°C). Meanwhile, the exclusion criteria consisted of respondents who were unwilling to participate and stroke patients who had stage 4 or higher pressure ulcers.

RESULT

The study was conducted from August 1 to September 19, 2025, involving 60 stroke patients at Kesdam Iskandar Muda Hospital. The results of this study are as follows:

Table 1.
Respondent characteristics (n= 60)

Respondent characteristics	f	%
Age		
Early adulthood (26–35)	4	6.7
Late adulthood (36–45)	8	13.3
Early elderly (46–55)	28	46.7
Late elderly (56–65)	16	26.7
Elderly (>65)	4	6.7
Gender		
Male	22	36.7
Female	38	63.3
Education		
Junior High School	10	16.7
Senior High School	48	80.0
Bachelor's Degree	2	3.3
Marital Status		
Single	4	6.7
Married	46	76.7
Widowed/Widower	10	16.7
Type of Stroke		
Hemorrhagic Stroke	0	0.0
Ischemic Stroke	60	100.0
Stroke Attack Status		
First attack	56	93.3
Sequela attack	4	6.7

Table 1, the characteristics of the respondents show that the majority were female, totaling 38 individuals (63.3%). In terms of age, most respondents were in the early elderly group (46–55 years), accounting for 46.7%. The respondents' educational background was predominantly high school graduates (80.0%), while only one respondent held a university degree (3.3%). Regarding marital status, the majority were married (76.7%). As for the type of stroke, all respondents (100.0%) suffered from ischemic stroke, with no cases of hemorrhagic stroke detected. Most respondents experienced their first stroke attack (93.3%), with a small proportion experiencing recurrent attacks (6.7%).

Table 2.
The Effect of Intermittent Electrical Stimulation and Effleurage Massage Using Canola Oil on the Risk of Pressure Ulcers in Stroke Patients

Variabel	Mean	Std. Deviation	Mean Difference	95% Convidence Interval Lower Upper	Nilai *P*
Effleurage Massage with Canola Oil: Before Intervention After Intervention	-56,806	22,270	3,712	64,340 - 49,271	0,001

Table 2, it can be seen that there is a difference or effect of Intermittent Electrical Stimulation and Effleurage Massage Using Canola Oil before and after the intervention. Analysis using the paired t-test showed a p-value of 0.001 (<0.05), indicating that Intermittent Electrical Stimulation and Effleurage Massage Using Canola Oil had a significant effect on the risk of pressure ulcers in stroke patients at Kesdam Iskandar Muda Hospital, Banda Aceh.

DISCUSSION

The results of this study showed that the majority of respondents were female, with 38 participants (63.3%). These findings are consistent with the study of Branyan & Sahrobji (2024), which reported that female gender has an influence on ischemic stroke, particularly due to decreased hormone levels in women undergoing menopause or in early elderly age [1]. The average age of respondents was predominantly early elderly, aged 46–55 years, with 14 participants (38.9%). The youngest respondent was 26 years old, while the oldest was over 65 years. This finding is similar to a study conducted in the United States by Annie et al. (2020), which showed that ischemic stroke patients were aged between 44‑48 years, with an average age of ≤ 50 years (Abate YH, et al. 2021) A study by Takeshita et al. (2021) also concluded that ischemic stroke was more common in men at the age of 53 and in women at the age of 48 (Feigin VL, et all, 2021) The increasing number of early elderly respondents experiencing ischemic stroke is associated with age-related factors. K. Keller et al. (2019) reported that elderly individuals had a higher prevalence of aortic complex plaques (67.3%) compared to those in middle age (30.9%) (Feigin VL, et all, 2021).

The analysis also showed that most respondents had a senior high school education, totaling 48 participants (80.0%). Education level was considered an important factor in determining respondents' ability to understand the interventions of Intermittent Electrical Stimulation and Effleurage Massage Using Canola Oil. Observations revealed that respondents with higher education levels were more capable of understanding the interventions compared to those with lower education. This finding is consistent with the study of Islam & A. Rahman (2020), which reported that the majority of acute ischemic stroke patients had a senior high school education (59%, n=191) (Utama Riskesdas, 2018). In terms of marital status, most respondents were married (76.7%), which is associated with the average age category of ischemic stroke patients being within marriageable age. Islam & Rahman (2020) stated that in developing countries, including those in Asia, the average age of first marriage is above 18 years (Kementerian Kesehatan RI, 2018). Furthermore, a study by Wibowo et al. reported that most stroke patients were admitted within the first 24 hours after symptom onset, while 6.7% of patients reported admission 7 days or more after the onset of stroke symptoms (Wahyudi E, 2019).

The results of this study showed that prior to the intervention of Intermittent Electrical Stimulation and Effleurage Massage Using Canola Oil, most ischemic stroke patients were at high risk of pressure ulcers, with 42 respondents (70.0%). This percentage indicates that prolonged immobility and paralysis reduce blood supply to tissues, thereby increasing the risk of developing pressure ulcers. After the intervention of Effleurage Massage with Canola Oil at Kesdam Iskandar Muda Hospital, most patients were categorized as low risk, with 36 respondents (60.0%). The risk of pressure ulcers further decreased after providing both Intermittent Electrical Stimulation and Effleurage Massage with Canola Oil, which was assumed to be a novel intervention for these patients. Intermittent Electrical Stimulation has been reported to improve muscle tissue oxygenation ((Riskesdas, 2018). while effleurage massage enhances blood circulation, thereby improving oxygen supply and reducing the risk of pressure ulcers (Rumah Sakit Tingkat II Kesdam, 2024).

The use of oil during massage helps moisturize dry skin naturally; as dry skin reduces elasticity, maintaining skin hydration with lotions or oils during massage is essential [10]. Canola oil is a source of vitamins E and K (González, et all, 2013) Vitamin E, an oil-soluble antioxidant, has been widely used for skin protection against infections and as an anti-inflammatory agent (Bártlová S, 2022, Centers for Disease Control and Prevention Stroke facts).These findings are consistent with Kane et al. (2017), who reported that Intermittent Electrical Stimulation is a potential method for preventing pressure ulcers (Tayyib N, Coyer F and Lewis P, 2013) Similarly, Gyawali et al. (2011) emphasized that maintaining skin integrity in bedridden patients requires nursing interventions such as proper positioning and the application of natural oils like olive oil (Shahin ES, Dassen T and Halfens RJ, 2008) Furthermore, a study by Wiguna, R. N., et al. (2025) demonstrated that effleurage

massage using canola oil significantly reduced the risk of pressure ulcers in stroke patients (Tayyib N, Coyer F and Lewis , 2016).

CONCLUSION

Based on the research results and discussion regarding the effect of intermittent electrical stimulation and effleurage massage using canola oil on the risk of pressure ulcers in stroke patients at Kesdam Iskandar Muda Hospital in Banda Aceh, it can be concluded that intermittent electrical stimulation and effleurage massage using canola oil has an effect in preventing the risk of pressure ulcers in stroke patients in this area. It is hoped that the findings of this study can serve as an intervention to prevent pressure ulcers in stroke patients. This study emphasizes the importance of paying attention to the condition of stroke patients with mobility impairments to minimize potential risk factors for pressure ulcers.

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