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Effectiveness of Range of Motion (ROM) and Deep Breathing Exercise (DBE) in Increasing Muscle Strength in Post-Stroke Patients at Pariaman Hospital in 2018

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ABSTRACT

Cerebrovascular injury (CVA) is an abnormal functioning of the central nervous system (CNS) caused by disruption of normal blood flow to the brain. Stroke is divided into two, namely ischemic (85%) and bleeding (15%), the top 3 causes of death in recent years. Stroke has an impact on the socio-economy due to the disability it causes. In 2015, the medical records of Pariaman Hospital, the number of stroke patients treated in the neurological ward was 103 people, in 2016 it increased by 117 people, in 2017 it increased very significantly, as many as 215 people. The purpose of this study is how the effect of Range of Motion and deep breathing exercise (DBE) in increasing muscle strength of post-stroke patients who are treated at Pariaman Hospital. The research design was a quasi-experimental design with a one-group before and intervention design. The population of this study were post-stroke patients who were treated at RSUD Pariaman. Sampling was purposive sampling, amounting to 40 respondents. The data were processed and analyzed univariate and bivariate. The results showed that there was a difference in the mean value of muscle strength before the therapy was 2.75 with a standard deviation of 0.439 and after the therapy was 3.50 with a standard deviation of 0.506. The results of statistical tests show that the value of $p = 0.000$ means that there is a significant difference between the mean value of muscle strength in patients before the procedure and after ROM and DBE therapy.

Keywords: Stroke; ROM; DBE

INTRODUCTION

Stroke is a medical emergency. The more time is wasted, the more nerve cells that cannot be saved and the worse the disability becomes. Most patients due to stroke will experience very varied sequelae, one of which is the inability to move positions and the inability to carry out daily activities that require assistance.

Range of Motion (ROM) exercise is one form of exercise in the rehabilitation process which is still considered effective enough to prevent disability in patients with stroke (Andarmoyo, 2013). This exercise is one form of fundamental nurse intervention that can be carried out for the success of the therapeutic regimen for patients and in an effort to prevent the occurrence of permanent disability conditions in patients after hospitalization so as to reduce the level of dependence of patients on their families. The earlier the rehabilitation process begins, the less likely the patient will experience an ability deficit. Therefore, to assess active and passive ROM exercises can increase joint mobility to prevent the occurrence of various complications.

Muscular strength is the ability of muscles to withstand loads in the form of external and internal loads. This will result in despair from the patient or from the family. Day to day the patient is isolated, meanwhile the motor function which is the system of coordination, balance and gait patterns is connected to the cognitive center. Stroke has a socio-economic impact due to the disability it causes. Because the prevalence of stroke is increasing in Indonesia and is the number one cause of disability, it is very important to prevent it through early detection of risk factors and control efforts. Identification

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of stroke risk factors is very useful for planning preventive interventions (Fitria, 2012).

In Indonesia, stroke is the leading cause of death due to non-infection. According to 2018 Basic Health Research data, the prevalence of the highest number of stroke patients in Indonesia is West Java (131,846), East Java (113,045) and Central Java (96,794). With a population of about 211 million, it means that there are about 1.7 million stroke patients. Meanwhile in West Sumatra, there are 13,834. That number from year to year is estimated to continue to increase. Each time the age of 10 years, calculated from the age of 35 years, the risk of stroke doubles. As many as 5 percent of Indonesians over the age of 65 have experienced at least one stroke. The incidence of stroke is increasing from year to year. For every 7 people who die in Indonesia, 1 of them is due to a stroke (Riskesdas, 2018).

Based on the medical records section of the Pariaman Hospital in 2015, the number of stroke patients treated in the neurological ward was 103 people, in 2016 it increased to 117 people, in 2017 it increased very significantly, as many as 215 people. A very fantastic figure from 2015-2017.

The above explanation shows that post-stroke patients have increased from year to year. But the rehabilitation in these patients is very low. Physiotherapy that is carried out only focuses on exercises in a hospital or clinic. Just waiting for the officers to be given physiotherapy training. Physiotherapy can improve muscle strength in stroke patients but is only done 2x a week and it also takes a special time because physiotherapy is carried out in a hospital or clinic. After that the patient experienced a long vacuum to return to the next physiotherapy. ROM exercise is also part of physiotherapy, can be done anytime, and at least 2x a day with a count of 3x8 each movement. Motor exercise therapeutic relearning programs demonstrate engagement with cognitive processes. Moreover, assisted by a good supply of oxygen to the brain, this will contribute to the rehabilitation of cells that have an oxygen deficit due to damage to blood vessels due to blockage or rupture of blood vessels. Deep Breathing Exercise (DBE) is very effective in inhibiting the hormone norepinephrine (adrenaline) due to depression or anxiety in post-stroke patients. This hormone will cause blood vessels to stiffen, so blood flow is very slow. This condition has a much worse impact on post-stroke patients. The condition of cells in the brain will be more ischemic and infarct (Timby & Smith, 2013).

METHODOLOGY

The design of this study was a quasi-experimental design with a one-group before andintervention design (Kelana, 2011), where a group of post-stroke patients before being given exercise (ROM) and DBE (pretest), then after doing ROM exercises preceded by deep breathing exercises assisted by nurses and families (posttest) to determine the effect of ROM and DBE on patients after stroke for 5 consecutive days. The study was conducted to determine differences in motor strength in post-stroke patients after being given treatment (Laily, 2017).

The population in this study were post-stroke patients in the city of Pariaman. Samples were post-stroke patients who were treated in the neurological ward of Pariaman Hospital 2018 with inclusion criteria of patients or families willing to be respondents, patient's blood pressure ≤ 140/90 mmHg, GCS 15, with Level of Consciousness Cooperative Compos Mentis who was being treated at Pariaman Hospital at the time of the study.

Ethical Clearance

The study got ethical clearance from Research Ethics Committee, Faculty of Medicine, Andalas University, Indonesia No: 281/KEP/FK/2018 dated 9th May 2018.

RESULTS

The study was carried out for approximately 2 months (August to September 2018) in the Pariaman Regional Hospital with a sample of 40 respondents who met the inclusion criteria (refer to table 1).

Univariate Analysis

Table 1: Frequency Distribution of Respondents Based on Age and Gender

Characteristics	Frequency (f)	Percentage (%)
Age		
Young Adults (18 – 40)	3	7.5
Middle Adult (41-60)	17	42.5
Elderly > 60	20	50
Gender		
Male	15	37.5
Female	25	62.5

Age characteristics from 18 to 61 years. More than half (50%) are in the elderly age range. More than half (62.5%) of the respondents are female.

Table 2: The Average Distribution of Respondents Based on Muscle Strength Before and After ROM and DBE (day 1) at Pariaman Hospital

Variable (Muscle Strength)	Mean Median	SD	Min-Max	95 % cl
Before therapy	2.75 3	0.439	2 - 3	2.61 – 2.80
After therapy	2.75 3	0.439	2 - 3	2.61-2.89

The results of the day 1 study showed that the average muscle strength of the respondents before the therapy was 2.75 (95% cl; 2.61 – 2.89) with a median value of 3. The average muscle strength after therapy was 2.75 (95 % cl; 2.61-2.80) (refer to table 2).

Table 3: The Average Distribution of Respondents Based on Muscle Strength Before and After ROM and DBE (day 2) at Pariaman Hospital

Variable (Muscle Strength)	Mean Median	SD	Min-Max	95 % cl
Before therapy	2.75 3	0.439	2-3	2.61-2.80
After therapy	2.80 3	0.464	2 - 3	2.65 – 2.95

The average muscle strength of the respondents before the therapy (day 2) was 2.75 (95% cl; 2.61 – 2.80) with the median value of 3 the lowest muscle strength value being 2 and the highest being 3. The average muscle strength value after the second day of therapy was 2.80 (95% cl; 2.65 – 2.95) with a median value of 3 (table 3).

Table 4: The Average Distribution of Respondents Based on Muscle Strength Before and After ROM and DBE (day 3) at Pariaman Hospital

Variable (Muscle Strength)	Mean Median	SD	Min-Max	95 % cl
Before therapy	2.80 3	0.464	2 - 3	2.65 – 2.95
After therapy	2.94 3	0.53	2 - 4	2.81 – 3.14

The mean value of the respondent's muscle strength before the therapy (day 3) was 2.80 (95% cl; 2.65 - 2.95) with the median value of 3 the lowest muscle strength value was 2 and the highest was 3. Muscle strength after the third day of therapy was 2.94 (95% cl; 2.81 – 3.14) with a median value of 3 (refer to table 4).

Table 5: The Average Distribution of Respondents Based on Muscle Strength before and after ROM and DBE (day 4) at Pariaman Hospital

Variable (Muscle Strength)	Mean Median	SD	Min – Max	95 % cl
Before therapy	2.94 3	0.53	2 - 4	2.81 – 3.14
After therapy	3.20 3	0.564	2 -4	3.02 – 3.38

The mean value of the respondent's muscle strength before therapy (day 4) was 2.94 (95% cl; 2.81 - 3.14) with the median value of 3 the lowest muscle strength value was 2 and the highest was 4 (see table 5 above). The average strength after the fourth day therapy was 3.20 (95% cl; 3.02 – 3.38) with a median value of 3.

Table 6: The Average Distribution of Respondents Based on Muscle Strength Before and after ROM and DBE (day 5) at Pariaman Hospital

Variable (Muscle Strength)	Mean Median	SD	Min-Max	95 % cl
Before therapy	3.20 3	0.564	2 - 4	3.02 – 3.38
After therapy	3.50 3.50	0.506	3 - 4	3.34 – 3.66

On day 5 the average muscle strength of the respondents before the therapy was 3.20 (95% cl; 3.02 – 3.38) with a median value of 3. The mean value of muscle strength after the therapy was 3.50 (95 % cl; 3.34 – 3.66) with a median value of 3.50 (refer to table 6).

Table 7: The Average Distribution of Respondents Based on Muscle Strength Before ROM and DBE (Day 1) and After ROM and DBE (Day 5) At Pariaman Hospital

Variable	Mean Median	SD	Min-Max	95 % cl
Muscle Strength Before Therapy	2.75 3	0.439	2 - 3	2.61 – 2.80
Muscle Strength After Therapy	3.50 3.50	0.506	3 - 4	3.34 – 3.66

The mean value of the respondent's muscle strength before being given the therapy was 2.75 and became 3.50 after being given the therapy, with median before being given the therapy was 3 and became 3.50 after being given the therapy (refer to table 7).

Bivariate Analysis

Effectiveness of Range of Motion and Deep Breathing Exercise before therapy and after therapy.

Table 8: The Difference in the Mean Value of the Respondent's Muscle Strength Before and After the Procedure ROM and DBE in Pariaman Hospital

Variable	Mean	SD	*p* value
Before	2.75	0.439	0.000
After	3.50	0.506	

In table 8 the difference in the mean value of muscle strength before the therapy is 2.75 with a standard deviation of 0.439 and after the therapy is 3.50 with a standard deviation of 0.506. The results of the statistical test showed p = 0.000, meaning that there was a significant difference between the mean value muscle strength values in patients before and after ROM and DBE procedures were performed.

DISCUSSION

Rehabilitation of post-stroke patients in hospitals must be in line with the condition of repair of damaged brain cells. If the acute phase of stroke has passed and the pressure is within normal limits, medical rehabilitation can begin. Meanwhile, the brain's oxygen needs are maintained (Smeltzer, 2013). If the oxygen in the room does not match with the number of patients, then patients who have started to go through the acute phase, are often trained with deep breathing techniques, so that the oxygen needs are met. Then muscle strength training can be started. Not waiting for the patient to go home and one week of rehabilitation, such as physiotherapy. The adult human brain also has some of these abilities to learn new skills, form new memories, and in response to brain injury; this ability continues throughout human life (Wijaya, 2013).

The Central Nervous System (CNS) can be in the form of long-term potentiation (LTP) and long-term depression (LTD). Cerebrovascular injury (CVA) is an abnormal functioning of the central nervous system (CNS) caused by disruption of normal blood flow to the brain. Stroke is divided into two, namely ischemic (85%) and bleeding (15%), the top 3 causes of death in recent years (Smeltzer *et al.*, 2008; Muttaqin, 2008). The difference between these two types of synaptic is dependent on the activity. If the activity is repeated more often, LTP will be formed at the synaptic connection, it can lead to synapse remodeling and even the formation of new circuits, this remodeling process can be temporary or permanent. Sometimes post-stroke patients still experience an increase in blood pressure which makes them limited in giving Rang of Motion (ROM) exercises (Šupínová & Sklenková, 2018). Paying attention to the need for brain cells for oxygen will maximize the results of ROM exercises, so that the disability from residual symptoms that appear can be minimized. Maintain adequate oxygen and protect brain cells, so the damaged brain cells can be replicated by penumbral cells (brain cells around the lesion) (Damhudi, Irawaty & Hariyati, 2012).

CONCLUSION

This paper discussed about how the effect of Range of Motion and deep breathing exercise (DBE) in increasing muscle strength of post-stroke patients. Thus, we believe that there are differences in muscle strength of post-stroke patients before and after the Range of Motion (ROM) and Deep breathing Exercise at Pariaman Hospital. Based on the findings that the difference in the mean value of muscle strength before the procedure was 2.75 with a standard deviation of 0.439 and after the procedure was 3.50 with a standard deviation of 0.506. The results of the statistical test showed a p value = 0.000, meaning that there was a significant difference between the average muscle strength values in patients before and after ROM and DBE procedures.

Conflict of Interests

The authors declare that they have no conflict of interests.

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