B-ICON Proceeding

The Impact of Core Stability Ball Exercises on Post-Stroke Patients' Lower Extremity Muscle Strength at the Sawah Lebar Health Center's Work Area, 2023: Bengkulu City

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ABSTRACT

Background: The most frequent cause of stroke in Asia is in Indonesia, where it ranks first. Predictable will continue to rise until a death toll of 23.3 million is shown in 2030. Data indicates in 2021 In general, 12.1 per 1000 people in Indonesia had stroke symptoms and signs. In other words, more than 12 reported Indonesians per 1000 people in the entire Indonesian region get strokes. Muscle weakness in the lower extremities is most common in stroke patients. Condition This will cause physical and behavioral disturbances in stroke patients who depend on regular activities. **Purpose:** The goal of this study was to determine how Core Stability Exercise with Ball affected post-stroke patients' *maximum Gletus, Hemstring, Gastrocnemius,* and *Soleus* muscular strength in the lower limbs. **Method:** Type studies are quasi-experiments that include control groups for the design of the pretest and posttest. a case study This group of 40 stroke survivors has muscle strength ranging from light to moderate (1-3). Purposive sampling is one of the non-probability sampling strategies, and it is a retrieval procedure sample. Power tool-assisted data gathering employing muscle (MMT). *The Man-Whitney test* was employed in data analysis. **Results:** Results from the study from February to April 2023. It is known that performing Core Stability Exercises with a ball can strengthen the muscles in the gluteus maximus, hamstring, gastrocnemius, and soleus, which are located in the extremities of stroke patients ($p=0.000 < 0.05$), hemstring ($p=0.027 < 0.05$), and soleus ($p=0.050 < 0.05$). **Suggestion:** It is anticipated that health professionals and researchers would create studies involving the *exercise Core Stability Exercises With Ball* (CSEWB), which may be employed on stroke patients with the purpose of enhancing the research on type exercise For enhancing strong muscles in the extremities down.

Keywords: *Lower extremity, post-stroke, core stability exercises with a ball (CSEWB), muscle strength*

1. INTRODUCTION

Non-communicable diseases (PTM) are medical diseases that cannot be transmitted from one person to another. In general, non-communicable diseases occur in low- and middle-income countries (1). According to the World Health Organization (WHO) in 2021, the percentage of the global population that will die from non-communicable diseases is 70%. PTM is a challenge that must be faced in the world of health both internationally and nationally. PTM which is the number one disease that causes death every year is cardiovascular disease. Cardiovascular disease is a disease caused by impaired function of the heart and blood vessels, one of which is stroke.

Stroke is a condition in which there is damage to a part of the brain due to a blocked blood vessel which causes oxygen to not be fulfilled properly. (2). Stroke sufferers will experience loss of motor function and sensory function resulting in hemiparesis, hemiplegia, and ataxia. Due to motor disturbances in the brain, it occurs where the muscles will be rested causing loss or reduction of muscle mass. This causes muscle rigidity to become stiff so that stroke patients can experience limited movement (3).

Meanwhile, the World Health Organization (WHO) in 2021 defines stroke as the rapid development of focal and global signs due to impaired brain function that lasts more than 24 hours due to blood vessel disorders in the brain. Stroke patients have some of the five symptoms of stroke, namely the first is that the patient suddenly feels numb or weak in the face, arms, legs and wrong gait patterns. Hemiparesis or limb weakness is the most common movement disorder in stroke patients. This is because the muscle tone decreases, so the patient is unable to move the body. Complications in stroke sufferers are speech disorders, vision problems, difficulty walking, balance problems, dizziness and long-term complications, one of which is contractures. Contractures are decreased range of motion of a joint (4).

*National Institute Of Neurological Disorders and Stroke,*in 2021 data shows that 60% or around 465,000 individuals with stroke require treatment. Advances in stroke treatment have developed quite rapidly, but nearly 75% of individuals with stroke do not get full and correct recovery or treatment which results in impaired physical mobility which makes daily activities not go well.

*National Stroke Association*in 2021, shows that stroke survivors receive treatment until fully recovered as many as 10% of individuals, stroke survivors recover with mild sequelae of 25%, stroke survivors with moderate to severe sequelae of 40%. Post-stroke recovery time is not the same for every patient, which can take a long time, up to weeks, months, or even years.

Data from the American Heart Association shows that in 2019 there were 7.0 million Americans who had a stroke and had an overall prevalence of stroke with an incidence rate of 2.5%. During this period, stroke as the cause of death in hospital decreased from 9.93% to 8.25% and more frequent home visits from 37.6% to 42.7%. By 2020, one in six deaths from cardiovascular disease will be caused by stroke in America. In the United States, more than 795,000 people experience a stroke in 45 seconds, every four seconds a death from a stroke occurs. The death rate from stroke is 1 per 20 deaths in the United States.

Indonesia ranks first with the most stroke sufferers in Asia. It is predicted that it will continue to increase to show the number of 23.3 million deaths in 2030. The data show that in 2021 In general, the prevalence of signs and symptoms of stroke in Indonesia is 12.1 per 1000. This means that more than 12 Indonesian individuals are recorded as suffering from stroke per year. 1000 residents throughout Indonesia.The prevalence in Indonesia who

live in urban areas is greater (63.9%) than those who live in rural areas (36.1%). In the Provinces of East Kalimantan (14.7%), Yogyakarta (14.6%) and Bengkulu itself the prevalence (9.5%) is the incidence of stroke (Ministry of Health RI, 2018).

Riskesdas data for Bengkulu Province in 2018 shows the prevalence of stroke has increased in each edition.

Prevalence (per mile) of stroke according to doctor's diagnosis of people at age≥ 15 tahun withnumber (9.54%), higher than the prevalence in 2013 of (7.0%). For 2018 the highest number of cases occurred in the age group of 65-74 years (59.99%). In the sex category of stroke sufferers with male sex with prevalence (10.60%) while women with prevalence (8.44%)(5).

Data collection conducted by researchers at the Bengkulu City Health Office showed that one of the non-communicable diseases that claimed the lives of individuals in Bengkulu City was stroke and hypertension. Stroke is one of the diseases that contributes to non-communicable disease data in Bengkulu City. Data from the Bengkulu City Health Office in 2021 stroke cases with an incidence of 420 individuals (5.3%) consisting of 150 men and 270 women. (Bengkulu City Health Office, 2021).

Data collection was carried out by researchers in 2022 who had a stroke, obtained first order data of 157 individuals who were recorded in the Sawah Lebar Health Center area of Bengkulu City in 2021. Second place at the Jembatan Kecil Health Center obtained data for 35 individuals while the third order was placed at the Cage Health Center with a total of 26 individuals in 2021. Researchers conducted interviews and measured lower extremity muscle strength at the Sawah Lebar Community Health Center in Bengkulu City on September 21 2022, there were 8 individual post-stroke patients with complaints of muscle weakness in the lower extremities.

The above phenomenon illustrates that most stroke patients experience muscle weakness in the lower extremities. This condition will result in disruption of fulfilling the needs of daily activities of stroke patients associated with impaired physical mobility. In carrying out daily activities in stroke patients can be assessed from the ability to care for themselves. Daily routines are the basic skills that post-stroke sufferers must have to take care of themselves independently, which includes eating, bathing, dressing, dressing, urinating, defecating, using the toilet and moving around (6).

This condition requires appropriate intervention to save lives and prevent long-term disability in post-stroke patients. Patients must immediately receive comprehensive and optimal multidisciplinary treatment for optimal treatment results. There are two types of treatment for post-stroke patients, namely pharmacological therapy (fibrinolytic or thrombolic and antiplatelet) and non-pharmacological therapy which is usually done to restore muscle strength in post-stroke patients, namely Range Of Motion (ROM). One of the non-pharmacological treatments that can overcome impaired muscle strength is Core Stability Exercises With Ball (7).

Muscle strength from the feet, knees to hips must be adequate to maintain balance or stability of the body when there is external force pressure. The muscle strength is directly related to the ability of the muscles to resist the force of gravity and other external loads which continuously affect the position of the body in stroke patients and will result in impaired physical mobility.(8). Impaired physical mobility is a movement disorder in which the

patient experiences an inability to move positions. Someone who experiences movement disorders or disturbances in their muscle strength will have an impact on their daily activities. The effects of immobilization can cause a decrease in joint flexibility (9).

Based on research (10), which was carried out at Dr Ramelan Hospital Surabaya showed the effect of Core Stability Exercises with the New Bobath Concept approach on stroke patients at the Dr Ramelan Hospital Surabaya Medical Rehabilitation Polyclinic with a sample of 12 individuals. The ABA design is explained as follows A1 is a treatment (Core Stability Exercises), B is not a treatment (Core Stability Exercises), but uses other interventions, and A2 is Core Stability Exercises causing a significant increase in motor coordination ($p < 0.001$) with 2 treatments times a week for 3 weeks, therefore it can be stated that Core Stability Exercises with the New Bobath Concept approach in stroke patients can increase muscle strength.

Core Stability Exercises With Ball (CSEWB) is an exercise that has the ability to strengthen muscle activation (hamstring, gastrocnemius, soleus and gletus maximum) in the lower extremities and emphasizes muscle strength and neuromuscular coordination by restoring weak or numb muscle function thereby increasing the ability to support muscle strength on the lower extremities (11). The main objective of the Core Stability Exercise With Ball (CSEWB) is to increase muscle strength, endurance and individual abilities so that they can perform movements with the widest possible range of motion for lower extremity muscle strength to improve the muscles in the back to toe area (maximum hamstring, gastrocnemius, soleus and gletus) so that it is expected to be able to carry out daily activities as usual and increase functional movement (12)

The researcher will implement an exercise *Core Stability Exercises With Ball* (CSEWB) to increase independence and train muscle strength in post-stroke patients so that their quality of life improves, so that they become independent and useful for the individuals around them. This model can be used by every nurse or family when caring for post-stroke patients.

2. RESEARCH METHOD

This type of research is quantitative using a quasi-experimental design, namely obtaining data that is intentionally generated. According to Sugiyono (2006: 77), defines that: "Quasi-experimental research is a research method that has a control group but cannot fully function to be able to control external variables that affect the implementation of the experiment." With a pretest and posttest with control group design in post-stroke patients on lower extremity muscle strength. This design uses 2 groups, namely the experimental class and the control class. The experimental class was the group that was given the treatment of applying the Core Stability Exercises With Ball (CSEWB) exercise, while the control class group was given the ROM (Range Of Mation) behavior.

Sampling in this study used purposive sampling, one of the non-probability sampling techniques, in which the researcher determined sampling by specifying special characteristics that were in accordance with the research objectives so that they could answer research problems in the Work Area of the Sawah Lebar City Health Center. Bengkulu, which experienced a post-stroke condition, totaling 40 people (20 experimental groups and 20 control groups).

Data collection was carried out using sheets containing assessments that would be asked of respondents by means of interviews and observations. Assessment sheets are used to collect data such as name, age, gender, occupation, type of stroke and frequency of stroke. Data analysis was carried out univariately to see the

frequency distribution of each research variable, and bivariate analysis using the Wilcoson and Man Whitney tests at α 5% to see the relationship between the independent variables and the dependent variable.

3. RESULTS AND DISCUSSION

a. Univariate analysis

Table 5.1 Distribution of Respondents Based on Age, Gender, Education, Type of Stroke and Frequency of Seizures in Post-Stroke Patients at the Sawah Lebar Health Center, Bengkulu City

No	Variable	Group		*Pvalue*
		Intervention	Control	
1	**Age**			
	Means	58.30	58.60	0.897**
	Min	45	47	
	Max	68	69	
	Sd	6,705	7,836	
	Se	1,499	1,752	
	95% Ci	55.16-61.44	54.93-62.62	
2	**Gender**			
	Woman	6 (30.0%)	7 (35.0%)	1,000*
	Man	14 (70.0%)	13 (65.0%)	
3	**Education**			
	Sd	4 (20.0%)	4 (20.0%)	0.861*
	Junior High School	3 (20.0%)	5 (25.0%)	
	Senior High School	9 (45.0%)	7 (35.0%)	
	Pt	4 (20.0%)	4 (20.0%)	
4	**Stroke Type**			
	Hemorrhagic	4 (20.0%)	6 (30.0%)	0.716*
	Non Hemorrhagic	16 (80.0%)	14 (70.0%)	
5	**Attack Frequency**			
	More Than Twice	5 (25.0%)	4 (20.0%)	0.904*
	Second	5 (25.0%)	6 (30.0%)	
	First	10 (50.0%)	10 (50.0%)	

Chi-Square **Independent T-Test

Based on table 5.1 above, the results of the analysis obtained that the mean age in the intervention group was 58.30 years with a standard deviation of 6.705 years. The results of interval estimation can be concluded that 95% believed the mean age of the patients was 55.16-61.44, while the mean age in the control group was 58.60 years with a standard deviation of 7.836 years. The results of interval estimation can be concluded that it is 95% believed that the mean age of the patient is 54.93-62.62.

The results of the analysis obtained in the intervention group were more than partially male as much as 70.0% and the analysis obtained in the control group was more than partially male as much as 65.0% while the results of the analysis in the intervention group were more than 45.0% High school education and at the control group is more than 35.0% with high school education. The results of the analysis in the non-hemorrhagic type

of stroke intervention group were more than a fraction of 16 people (80.0%) compared to the control group of 14 people (70.0%). The results of the analysis in the intervention and control groups were more than half of the first attack frequency of 10 people (50%).

Based on the homogeneity test for the variables age, gender, education, type of stroke and frequency of attacks in the intervention group and the control group showed a p value > α 0.05, meaning that all variables were homogeneity.

Table 5.2 Distribution of Mean Muscle Strength Maximum Gletus in the Lower Extremities Before and After Performing Core Stability Exercises With Ball in Post-Stroke Patients in the Working Area of the Sawah Lebar Health Center, Bengkulu City

Variable	Means	Min	Max	SD	SE	95% CI
Before Treatment						
Intervention	2.60	2	3	0.503	0.112	2.36-2.84
Control	2.60	2	3	0.503	0.112	2.36-2.84
After Treatment						
Intervention	3.60	3	4	0.503	0.112	3.36-3.84
Control	3.05	2	4	0.605	0.135	2.77-3.33

Based on Table 5.2, the results of the analysis showed that the mean Maximum Glare Muscle Strength in the lower extremities before treatment was carried out in the intervention group of 2.60 with an SD of 0.503, SE of 0.112 and an estimated result of 95% confidence with an interval of 2.36-2.84. After being treated, the intervention group was 3.60 with SD 0.503, SE 0.112 and the estimated results were 95% believed with intervals of 3.36-3.84, while the average muscle strength before treatment in the control group was 2.60 with SD 0.503, SE 0.112 and the estimated interval results were 2.36- 2.84. after treatment in the control group, the average muscle strength of the control group was 3.05 with an SD of 0.605, SE of 0.135 and the results of interval estimation were 2.77-3.33.

1. **Bivariate Analysis**

Table 5.3 Differences in Mean Maximum Muscle Strength in the Lower Extremities Before and After Treatment in the Intervention Group in Post-Stroke Patients in the Working Area of the Sawah Lebar Health Center, Bengkulu City

	N	**Median (Min-Max)**	**Z**	***P-value***
Muscle Strength Value				
Before Intervention	20	3.00 (2-3)	-4,472	0.000***
After Intervention	20	4.00 (3-4)		

Based on Table 5.3 above, it illustrates that the results of the Wilcoxon Signed Rank Test statistic test show a p value of 0.000 ≤ α 0.05, which means that there is a difference in the average maximum gletus muscle strength in the lower extremities before and after the intervention in the intervention group.

Tabel 5.4 Differences in Mean Muscle Strength*Maximum Gletus in the Lower Extremities Before and After Treatment in the Control Group in Post-Stroke Patients in the Working Area of the Sawah Lebar Health Center, Bengkulu City*

	N	**Median (Min-Max)**	**Z**	***P-value***
Muscle Strength Value				
Before Control	20	3.00 (2-3)	-3,317	0.001***
After Control	20	4.00 (3-4)		

Based on Table 5.4 above, it illustrates that the results of the Wilcoxon Signed Rank Test statistic show a p value of 0.001 ≤ α 0.05, which means that there is a difference in the mean maximum gletus muscle strength in the lower extremities before and after treatment in the control group.

Table 5.5 Influence *Core Stability Exercises With Ball (CSEWB) Against Maximum Glatus Muscle Strength in the Lower Extremities in Post-Stroke Patients in the Working Area of the Sawah Lebar Health Center, Bengkulu City*

	N	**Median (Min-Max)**	U	***P-value***
Muscle Strength Value				
Intervention	40	0.50 (0-1)	100.000	0.000****
Control	40	1.00 (0-1)		

Based on Table 5.5 above, it illustrates that the results of the Man Whitney statistical test showed a p value of 0.000 ≤ α 0.05, which means that there is a difference in the average maximum gletus muscle strength in the lower extremities between the intervention group and the control group. So it can be concluded that Core Stability Exercises With Ball exercises are more influential than ROM (Range Of Mation) exercises.

DISCUSSION

A. Description of Respondent Characteristics

The results showed that the average age of respondents who had a stroke was 58.30 years with a minimum age of 45 years and a maximum of 68 years for the intervention group while the mean age of the control group was 58.60 years with a minimum age of 47 years and a maximum of 69 years, which means that stroke sufferers in the study the average age is over 50 years, all ages can have a stroke, including children but the older you get, the greater the risk of stroke. It is estimated by the Ministry of Health that many cases of stroke occur at the age of over 45 years. The incidence of stroke increases with a person's age (13) is in line with research conducted by (14) shows that under the age of 50 years have the highest incidence of stroke.

Characteristics of post-stroke patients based ongender in this study most of the intervention group was male with a percentage of 70% and the control group 65%. This result was also supported by research on male respondents who had more strokes (15) was found to be 72.7% in males and 27.3% in females.

Characteristics of post-stroke sufferers Based on the education of the respondents in the intervention group, most of them had high school education with a percentage of 45% and the control group 35% with high school education. According to (16) Very knowledgeable about a disease This is important because with a person's understanding of a disease, prevention efforts will indirectly be carried out by that individual.

Based on the type of stroke, 80% of the intervention group was a type of non-hemorrhagic stroke, while the control group was mostly 70% of the type of non-hemorrhagic stroke. This is in line with the research conducted (17) that the type of stroke respondents who experienced non-hemorrhagic stroke70.9% and hemorrhagic stroke (bleeding) 29.1% of the number of samples studied.

The results of the characteristic study based on the frequency of the first attack were mostly 50% for the intervention and control groups. The results of this study are in line with the research (18) shows that most of the respondents had their first stroke up to 78.8%. The results of this study are in line with statistical studies conducted in the United States which revealed that approximately 700 thousand people in America experience a stroke each year. Of these, around 500 thousand were first attacks and 200 thousand were repeated attacks.

B. Average Lower Extremity Muscle Strength in Post-Stroke Patients Before and After Administration of Core Stability Exercises With Ball (CSEWB) and Range of Mation (ROM)

The results of this study are in line with research conducted by (19) to 45 respondents with an average muscle strength before ROM was 1.60 with an SD of 0.690 and after the intervention was 2.30 with an SD of 0.820, which means that there was a difference after the intervention was carried out while in the control group it was 1.80 with an SD 0.630 and after the control was 1.90 with an SD of 0.670.

Muscle strength is the ability of the muscles to do work by holding the weight it lifts. Strong muscles will make daily muscle work efficient. Untrained muscles are caused by an event, for example in a stroke patient which causes the patient to become partially paralyzed or weak or even completely, will become weak because the fibers shrink (atrophy) and if this event is left unchecked, this condition can result in muscle paralysis (9).

C. Effect of Core Stability Exercises With Ball (CSEWB) on Lower Extremity Muscle Strength in Post-Stroke Patients in Each Group

The results of the Wilcoxon statistical test in the intervention group showed a p value of 0.000 (p value ≤ α 0.05) for the maximum gletus muscle (z=-4.472), hemstring muscle (z= -3.873) and the value of the gastrocnemius and soleus muscles (z=-4.000) which means that there is a difference in the average value of lower extremity muscle strength before and after the intervention, so it can be concluded that there is an effect of Core Stability Exercises With Ball on lower extremity muscle strength in the intervention group. The results of the analysis in the control group showed a p value of 0.001 (p value ≤ α 0.05) for the maximum gletus muscle (z=-3.317), a p value of 0.005 (p value ≤ α 0.05) for the hemstring muscle (z=-2.828) and a p value 0.002 (p value ≤ α 0.05) for the value of the gastrocnemius and soleus muscles (z=-3.

Based on the results of the researchers that the provision of Core Stability Exercises With Ball exercises in post-stroke patients to increase lower extremity muscle strength is effective. This is in line with research(20)showed that there was an effective effect of unilateral and bilateral ROM exercises on muscle strength in stroke patients at a hospital in East Jakarta, totaling 52 people and using a quasy experimental two group pre-post design. The results of the Wilcoxone test between pre-test and post-test muscle strength in the unilateral group obtained a Z value of -4.472 and a p-value of 0.000 (p-value <0.05) while the bilateral group obtained a Z-value of -4.608 and a p-value of 0.000 (p-value <0.05).

D. Effect of Core Stability Exercises With Ball (CSEWB) on Lower Extremity Muscle Strength in Post-Stroke Patients Between Intervention Group and Control Group

Research on "The Effect of Core Stability Exercises With Ball (CSEWB) on Lower Extremity Muscle Strength in Post-Stroke Patients in the Work Area of the Sawah Lebar Health Center, Bengkulu City" Based on the results of the Mann-Whitney Test statistic, it showed a p value of 0.000 (p value ≤ α 0.05) for the maximum gletus muscle, p value 0.027 (p value ≤ α 0.05) for hemstring muscles and p value 0.050 (p value ≤ α 0.05) for the value of the gastrocnemius and soleus muscles, which means that there is a difference in the average value of lower extremity muscle strength between groups after intervention and control were carried out. The results of this analysis showed that the intervention effect of Core Stability Exercises With Ball exercises on increasing Lower Extremity Muscle Strength in post-stroke patients.

This is in line with research (21) used a quasy experimental two group pre-post design with a total sample of 26 people. shows that the results of the Mann-Whitney test between the muscle strength of the unilateral group post-test and the bilateral group post-test obtained a Z value of -2.259 and a p-value of 0.024 (p-value <0.05), thus it can be concluded that there is a difference in muscle strength which is significant between after unilateral ROM exercises and after bilateral ROM exercises.

This research is in line with research (22), showing the effect of adding Core Stability Exercise to increasing standing strength and balance in stroke sufferers in Medan sub-district. This study used a quasi-experimental design using pretest and posttest group design. This study was conducted on 20 stroke respondents who were given Core Stability Exercises before and after the intervention. The statistical test used was Man Whitney with the results of the study showing a value of p = 0.000 where p <0.001, the results obtained are the effect of Core Stability training on increasing muscle strength which aims to stabilize the lower extremities.

E. CONCLUSION

Based on the results of the research and discussion of Core Stability Exercises With Ball exercises on Muscle Strength in the Lower Extremities in Post-Stroke Patients in the Work Area of the Sawah Lebar Public Health Center in Bengkulu City in 2023, the following conclusions can be drawn:

1. The mean age of the respondents was 58 years, the sex of the majority was male, the education in this study was mostly high school, most types of stroke were non-hemorrhagic and the frequency of the first attack was mostly in this study.
2. The results show that the average value of lower extremity muscle strength with Core Stability Exercises With Ball exercises in the intervention group and ROM (Range Of Mation) in the control group consists of:

a. The results of the analysis showed that the average of the maximum gluteal muscle strength in the lower extremities before and after treatment in the intervention group was 2.60 and 3.60. while the average muscle strength before and after treatment in the control group was 2.60 and 3.05

b. The results of the analysis obtained the mean hemstring muscle strength in the lower extremities before and after treatment in the intervention group of 2.75 and 3.50. while the mean muscle strength before and after treatment in the control group was 2.40 and 2.80.

c. The results of the analysis obtained the mean strength of the Gastrocnemius and Soleus muscles in the lower extremities before and after treatment in the intervention group of 2.70 and 3.50. while the mean muscle strength before and after treatment in the control group was 2.55 and 3.05.

3. There is an effect of Range Of Mation (ROM) on muscle strength in the control group.
4. Intervention of Core Stability Exercises With Ball has an effect on increasing lower extremity muscle strength in post-stroke patients.

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