Effectiveness of Physical Training Program on Quality of Muscles and Activity Level among Stroke Patient

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Abstract

Background: Stroke is a leading cause of gait impairment, resulting in long-term disability among adults, and frequently results in impaired mobility or motor function. **Aim of study:** Was to evaluate the effectiveness of physical training program on quality of muscles and activity level among stroke patients. **Design:** Quasi- experimental research design was utilized in this study to achieve the aim of this study. **Setting:** The study was carried out at Neurologic and Psychiatric department, and Physiotherapy unit at Benha University Hospital, Egypt. **Subjects:** Purposive sample of 60 adult patients with stroke were recruited. **Tools:** four tools were used to collect data, **I:** Interview questionnaire as age, sex, marital status, **II:** Barthel Index Scale to measure independency in Activity of Daily Living (ADL), **III:** Muscle quality questionnaire; it contained three scales: a- Berg Balance Scale: related to gait-Oxford Scale for measuring muscle strength, c- Modified Ashworth Scale (MAS) for measuring muscle tone and **IV:** Simplified stroke rehabilitation assessment of movement scale. **Results:** There was a statistically significant improvement in the mean score of daily living activities, body balance, voluntary movement of the upper, lower limb and basic mobility, muscle tone and strength post physical training program implementation (P< 0.001). **Conclusion:** The physical training program has led to improvement in voluntary movement and basic mobility, activity of daily living, body balance, muscle tone and muscle strength. **Recommendation:** Applying a physical training program for stroke patients help them to prevent and manage disability that is associated with stroke.

Key Words: Activity level, Physical training program, Quality of muscles, Stroke.

Introduction

Stroke is a global health problem and, it is consider the second commonest cause of death and a leading cause of adult disability worldwide. In 2016, there were almost 14 million incidences of first-time strokes worldwide. Worldwide stroke-related illness, disability and early death are set to double in the next 15 years by 2035 **(Feigin, 2016).** The incidence of stroke in Egypt is 270 thousand yearly; about 75 thousand of them are left disabled **(Ministry of Health, 2017).**

A lot of damage to the left side of the brain, patient may experience paralysis on the right side of the body when messages can't travel properly from the brain to the body's muscles, this can cause paralysis and muscle weakness. Weak muscles have trouble supporting the body, which tends to add

to movement and balance problems **(Lawrence et al., 2017).**

Physical activity is defined as all human movement produced by the action of skeletal muscle that substantially increases energy expenditure. Physical activity is essential for improving and maintaining physical fitness **(Smith et al., 2015).**

The nurses play an important role during physical training for caring the patients who have longer term problems associated with stroke. Using physical training technique is a useful nursing intervention for improving stroke outcomes and helps patients to regain mobility, muscle control, increase muscle tone and strength. Also physical training helps the patient to do activities of daily living such as washing, dressing and eating **(Kabita & Ajish, 2016).**

Nursing care for stroke patients is arranged, based on several priorities to ensure optimal patient outcomes. A first priority during intervention is stabilization and ensuring the safety of the patient, maintain a stable level of consciousness, attain maximum physical functioning and self-care abilities, maximize communication abilities, maintain adequate nutrition, maintain effective personal and family coping **(Alberts et al., 2015).**

Significance of study

Stroke is a clinical syndrome that is characterized with rapidly developing of functional disability and it is the main leading cause of death worldwide. The world Health Organization (WHO) revealed that between 20% to 50% of people that are suffering from a stroke may be exposed to death depending on the severity of the stroke, age of the patient, and effectiveness of management **(World Health Organization, 2020).** In Egypt, it was estimated that a large number of new strokes were around 150,000 to 210,000 events that occurred per year and about 85% of stroke deaths occurred in low and middle-income countries such as Egypt **(WHO, 2020).** Stroke is the leading cause of long-term functional disability where 50% to 70% are functionally independent and 15% to 30% live with permanent disability **(Aslani et al., 2017).** In addition, 32% will use home healthcare services and 26% require long-term care **(Summers et al., 2017).** It has been observed in neurologic and psychatric department at Benha University Hospital that there were many patients with stroke disease approximately 350 patients admitted during one year according to **(Benha University Hospital Census, 2021)**. In addition, the motor dysfunction is one of the most frequently encountered and therapeutically persistent problems after stroke. Therefore, recovery of motor function is a major emphasis in almost all physical training efforts for stroke patients **(Kabita & Ajish, 2016).**

Aim of the study

This study aimed to evaluate the effectiveness of physical training program on quality of muscles and activity level among stroke patients.

Research Hypotheses: The following research hypotheses are formulated to achieve the aim of the study:-

Hypothesis (1) Activity level among patients receiving physical training program will be significantly enhanced after program implementation.

Hypothesis (2) Quality of muscles among patients receiving physical training program will be significantly enhanced after program implementation.

Subjects and methods

Research Design:

Quasi-experimental research design was used in this study.

Setting:

The study was carried out in Neurologic and Psychiatric department, and Physiotherapy unit at Benha University Hospital**.**

Subjects:

Purposive sample of 60 adult conscious patients from both sexes ranged from 20-60 years old, able to comprehend and communicate and willing to participate in the study. It was approached over a period of 6 months from the beginning of September 2020 till the end of February 2021.

Exclusion criteria of the patients:

1. Past history of seizures, severe multi infract sites and traumatic brain injuries.
2. Compromised diseases such as heart failure and myocardial infarction.
3. Visual-perceptual problems.
4. Any other disorders affect on muscle quality.

Tools for data collection:

To achieve the purpose of the study four tools were used:

Tool (1): **Interview questionnaire:** It was developed by the researcher based on review of relevant literature**.** It was included two parts as following:

- **Part one: Personal data of patient;** it was developed to assess personal data of the studied patients. and included seven questions about age, sex, marital status, level of education, occupation , and nature of life style.

- **Part two: Medical history;** it was included data related to current medical history and past medical history about chronic diseases related to studied patients.

Tool (2): Barthel Index Scale:

Barthel Index modified by **Shah et al., 1992** to measure independency in activity of daily living (ADL) for patient after stroke. It consists of 10 weighted items: feeding, bathing, grooming, dressing, bladder control, bowel control, toileting, chair/bed transfer, mobility and stair climbing.

Scoring system for Barthel Index Scale:

0-50 severely disabled (dependent)

51-94, moderately disabled (interdependent) 95-100, (independent).

Tool 3: Muscle quality questionnaire: it contained three scales:

A - Berg Balance Scale: For measure body balance. It consisted of 14 tasks common in everyday life.

Scoring system for Berg balance:

1. 0-20 (dependent).
2. 21-40 (with assistance).
3. 41-56 (independent).

B - Oxford Scale: For measuring muscle strength. This scale was consisted of 6 items with score ranged from 0 to 5 for each muscle assessed.

C - Modified Ashworth Scale (MAS): For measuring muscle tone. This scale was consisted of 6 items with score ranged from 0 to 5 for each muscle assessed.

Scoring system for Oxford Scale and Modified Ashworth Scale: This scale was consisted of 6 items with score ranged from 0 to 5 for each muscle assessed.

0. No increase in muscle tone.
1. Slight increase in tone with a catch and release or minimal resistance at end of range.
2. As 1 but with minimal resistance through range following catch.
3. More marked increase tone through ROM.
4. Considerable increase in tone, passive movement difficult.
5. Affected part rigid.

Tool 4: Simplified Stroke Rehabilitation Assessment of Movement Scale (S- STREAM):

It was used to measure voluntary movement and basic mobility. The scale consisted of three subscales as the following :

1. Upper-limb movements and it contained five items, each item with score ranged from 0 to 2 scores (total scores 10).
2. Lower-limb movements and it contained five items, each item scored from 0 to 2 scores (total scores 10).
3. Basic mobility and it contained five items, each item scored from 0 to 3 scores (total scores 15).

Scoring system for Simplified Stroke Rehabilitation Assessment of Movement Scale:

1- Minimal movement: <l0 % of normal movement.
2- Partial movement: >10%-<90%.
3- Complete movement: at least 90% of full movement.

Physical Training Program:-

A guide booklet prepared by the researcher and provided for each patient; it included theoretical information about the stroke disease and included the procedure of physical training**.** The practical content included physical training exercise such as range of motion exercises for upper limb, range of motion exercises for lower limb, weight bearing exercise and strengthening exercises.

Content Validity:

It was ascertained by (5) jury of expertise (1 Professor of Medical Surgical Nursing and 4 Assistant professor of Medical Surgical Nursing) who reviewed the four tools 1, 2, 3, 4 for clarity, relevance, comprehension, understanding and applicability.

Reliability:

The researcher used test – retest – methods to test the internal consistency of the tools, by administration of the same tools to the same subjects under similar condition on two different occasions. The reliability of tool one was 0.90, tool two was 0.95, tool three was 0.88 and tool four was 0. 86.

Ethical consideration:

Approval consent obtained from research ethical committee. The aim of this study explained to patients and they assured that all information were confidential and it used only for their benefit and every patient can withdraw from research at any time.

Pilot study:

Pilot study was conducted on 10% of the study sample (6) patients to test feasibility, clarity and applicability of the tools then necessary modifications were carried out. Patients involved in pilot study were excluded from the main study samples.

Field work:

This was implemented through four successive phases, namely preparatory phase, assessment, implementation, and evaluation phase.

1- Assessment Phase:

1. Before the program, patients was interviewed individually to collect base line data using tool 1 to assess the Patients' demographic and medical past history.
2. Patients' activity of daily living, muscle strength, tone, voluntary mobility and balance was assessed or evaluated for patients by using tool (2), tool (3) and tool (4).

2- Planning phase:

The researcher collected data about the study setting to put plan for carrying out the study. The program was developed by the researcher to detect needs, deficiencies and this was carried out to achieve the aim and the objective of the program. Moreover, teaching material was prepared e.g. discussion, demonstration and booklet was helped in covering theoretical and practical information.

2- Implementation phase:

The total number of the studied sample was 60 patients. It divided to 12 groups. Each group contains five patients in every session. The researcher was attended two days/week (Saturday-Tuesday from 9 A.M o'clock to 4 P.M o'clock).

The researcher met each group for four sessions: The first session for theory, the second and the third session to perform the training and the fourth session for demonstration. Each session take about (30:40 minutes), including the period of discussion. The program have been implemented through (48) sessions and total hours for sessions (24:32 hours). The patients presented all the time of program sessions.

Each patient was given sessions about range of motion exercise and weight bearing exercises to improve muscle tone and muscle strength and they were asked to repeat exercises at home for 15 to 20 times daily.

4- Evaluation phase:

Evaluation of patients were done after 3 months of physical training program by using tool (2), tool (3) and tool (4) to evaluate the effectiveness of program.

Statistical Analysis:

Results were collected, statistically analyzed by personal Computer using Statistical Package of Social Science (SPSS) version 22 (program on computer) and tabulated. Data were presented using descriptive statistics in the form frequencies and percentage (%) and mean (x) and standard deviation (SD) for quantitative variables.

- Chi-square test (x^2): was used to study association between two qualitative variables.
- The Wilcoxon test of significant (equivalent to paired t test which used in case of normal distributed data).
- Likelihood Ratio (LR) test (if the table was more than 4 cells).
- P-value of <0.0001 was considered for high statistically significant.

Result:

Table (1): Shows that, the most of 70% of the studied patients aged between 50 to 60 years with a mean of 55.3 ± 6.1 years. Regarding sex 60% of them were male. Regarding education level 40% of the studied patients were illiterate, and 50% of their work required physical effort. As regards marital status 90% of the studied patients were married.

Table (2): Shows that there were statistically significant differences between studied patients in relation to level of activities of daily livings pre and post program implementation (P< 0.0001). Regarding feeding, the percentage of studied patients who were independent preprogram implementation was 16% which improved to become 90% post program implementation. Regarding bathing, the percentage of studied patients who were independent preprogram implementation was 10% which improved to become 90% post program implementation. In relation to dressing, the percentage of studied patients who were independent increased from 0% preprogram implementation to 80% post program implementation.

Table (3): Shows that there were statistically significant differences between studied patients in relation to body balance pre and post program implementation (P< 0.001). Regarding sitting unsupported feet on floor, the percentage of studied patients who were independent preprogram implementation was 0% which improved to become 80% post program implementation. In relation to turning to look behind/over left and right shoulders, the percentage of studied patients who were independent preprogram implementation was 10 % which improved to become 60% post program implementation, and this difference was high statistically significant (P<0.0001). **Regarding standing un supported with feet together,** percentage of studied patients who were independent preprogram implementation was 0 % which improved to become 30% post program implementation, and this difference was high statistically significant (P<0.0001).

Table (4): Shows a high significant enhancement in post program implementation of mean muscle tone score of the four muscles than preprogram implementation (3.6 ±1.29 for biceps), 4.10 ±0.12 for flexor, 4.30±0.46 for quadriceps, and 4.30 ± 0.46 for tibialis preprogram vs 0.78 ±0.23 for biceps), 2.0±0.11 for flexor, 2.02 ±0.13 for quadriceps, and 2.03 ± 0.25 for tibialis post program respectively with P<0.0001 for each.

Table (5): Shows a high significant enhancement in post program implementation of mean muscle strength score of the four muscles than the preprogram implementation, (3.5 ±1.21 for biceps), 4.0 ±1.32 for flexor, 4.2 ±0.4 for quadriceps, and 4.40 ± 0.49 for tibialis preprogram vs 0.78 ±0.22 for biceps), 2.0±0.80 for flexor, 2.02 ±0.12 for quadriceps, and 2.03 ± 0.25 for tibialis post program respectively with P<0.0001 for each.

Figure (1): Illustrates that, the percentage of studied patients who had complete movement increased from 1.7% preprogram to 56.7% post program implementation.

Table (6): Shows that there were positive strong significant correlation between activities of daily living and each of body balance (r=0.67, P<0.0001), muscle movement (r=0.63, P<0.0001), and muscle strength (r=0.47, P<0.0001).

Table (1): Distribution of studied patients regarding personal data (N = 60).

personal data	Patient data	Frequency	
		No	%
Age (Years)	• 20<30years.	6	10
	• 30<40years.	6	10
	• 40<50years.	6	10
	• 50-60 years.	42	70
Mean ± SD (age)	**55.3 ± 6.1 Years**		
sex	• Male.	36	60
	• Female.	24	40
Educational Level	• Illiterate.	24	40
	• Read & Write	13	21.7
	• Secondary school.	15	25
	• University.	8	13.3
Marital status	• Married.	54	90
	• Widow.	6	10
Occupation	• House wife.	24	40
	• Manual work.	24	40
	• Professional work.	12	20
Life style	• Required physical effort.	30	50
	• Sedentary.	30	50

Table (2): Distribution and significance differences of studied patients regarding level of activities of daily livings pre and post program implementation (N=60).

Items		Pre program		Post 3 months program		X^2	p-value
		No	%	No	%		
Feeding	• Dependent. • Interdependent. • Independent.	24 26 10	40 43 16	0 6 54	0 10 90	99.4	<0.0001 **
Bathing	• Dependent. • Independent.	54 6	90 10	6 54	10 90	76.8	<0.0001 **
Grooming	• Dependent. • Independent.	48 12	80 20	6 54	10 90	59.4	<0.0001 **
Dressing	• Dependent. • Interdependent. • Independent.	24 36 0	40 60 0	0 12 48	0 20 80	84.0	<0.0001 **
Bowels habits	• Dependent. • Interdependent. • Independent.	12 42 6	20 70 10	0 6 54	0 10 90	77.6	<0.0001 **
Bladder habits	• Dependent. • Interdependent. • Independent.	18 36 6	30 60 10	0 12 48	0 20 80	84.0	<0.0001 **
Toilet use	• Dependent. • Interdependent. • Independent.	36 19 5	60 31 8	0 6 54	0 10 90	77.6	<0.0001 **
Transfers (bed to chair and back)	• Dependent. • Interdependent. • Independent.	34 14 12	56 23 20	0 24 36	0 40 60	84.0	<0.0001 **
Mobility (on level surfaces)	• Dependent. • Interdependent. • Independent.	12 30 18	20 50 30	0 24 36	0 40 60	48	<0.0001 **
Using stairs	• Dependent. • Interdependent. • Independent.	12 42 6	20 70 10	0 6 54	0 10 90	77.4	<0.0001 **

**** Highly significant ($p< 0.0001$) X^2 (Chi square test)**

Table (3): Distribution of studied patients regarding body balance pre and post program implementation (N=60).

Items		Pre program		Post 3 months program		X^2	p-value
		No	%	No	%		
Sitting to standing	• Dependent. • With assistant. • Independent.	30 30 0	50 50 0	0 48 12	0 80 20	98.7	<0.0001**
Standing unsupported	• Dependent. • With assistant. • Independent.	30 30 0	50 50 0	0 54 6	0 90 10	99.4	<0.0001**
Sitting unsupported feet on floor	• Dependent. • With assistant. • Independent.	24 36 0	40 60 0	0 12 48	0 20 80	99.2	<0.0001**
Standing to sitting	• Dependent. • With assistant. • Independent.	35 20 5	58 33 8	0 30 30	0 50 50	60.9	<0.0001**
Transfers	• Dependent. • With assistant. • Independent.	38 18 4	63 30 6	10 14 36	16 23 60	72.4	<0.0001**
Standing unsupported with eyes closed	• Dependent. • With assistant. • Independent.	36 20 4	60 33 6	0 36 24	0 60 40	72	<0.0001**
Standing unsupported with feet together	• Dependent. • With assistant. • Independent.	36 24 0	60 40 0	0 24 18	0 70 30	99	<0.0001**
Reaching forward with outstretched arms	• Dependent. • With assistant. • Independent.	30 30 0	50 50 0	0 36 24	0 60 40	99.4	<0.0001**
Pick up object from the floor	• Dependent. • With assistant. • Independent.	12 42 6	20 70 10	5 20 35	8 33 58	60	<0.0001**
Turning to look behind/over left and right shoulders	• Dependent. • With assistant. • Independent.	30 20 10	50 33 16	0 24 36	0 40 60	72	<0.0001**
Turn 360 degrees	• Dependent. • With assistant. • Independent.	36 19 5	60 31 8	5 25 30	8.3 41.6 50	74.2	<0.0001**
Count number of times step touch measured stool	• Dependent. • With assistant. • Independent.	24 26 10	40 43 16	0 10 50	0 16 83	77.7	<0.0001**
Standing unsupported, one foot in front	• Dependent. • With assistant. • Independent.	36 24 0	60 40 0	0 54 6	0 90 10	80.7	<0.0001**
Standing on one leg	• Dependent. • With assistant. • Independent.	36 24 0	60 40 0	0 54 6	0 90 10	80.7	<0.0001**

**** Highly significant ($p< 0.0001$) X^2 (Chi square test)**

Table (4): Distribution of studied patients regarding their mean total score of muscle tone pre and post program implementation (N=60).

Muscle tone	Program		Wilcoxon test	P value
	Pre Program	Post 3 months Program		
	Mean ± SD	Mean ± SD		
Biceps	0.78±0.23	3.60±1.29	13.4	P<0.0001**
Flexor digitorum	2.0±0.11	4.10±0.12	23.8	P<0.0001**
Quadricps	2.02±0.13	4.30±0.46	36.8	P<0.0001**
Tibialis	2.03±0.25	4.30±0.46	33.2	P<0.0001**

****Highly significant (p< 0.0001)**

Table (5): Distribution of studied patients regarding their muscle strength pre and post program implementation (N=60).

Muscle strength	Program		Wilcoxon test	P- value
	Pre program	Post 3 months program		
	Mean ± SD	Mean ± SD		
Biceps muscle	0.78±0.22	3.50±1.21	13.4	P<0.0001**
Flexor digitorum muscle	2.0±0.80	4.00±1.32	9.6	P<0.0001**
Quadriceps muscle	2.02 ± 0.12	4.2±0.40	39.9	P<0.0001**
Tibialis muscle	2.03±0.25	4.40±0.49	32.8	P<0.0001**

**** Highly significant (p< 0.0001)**

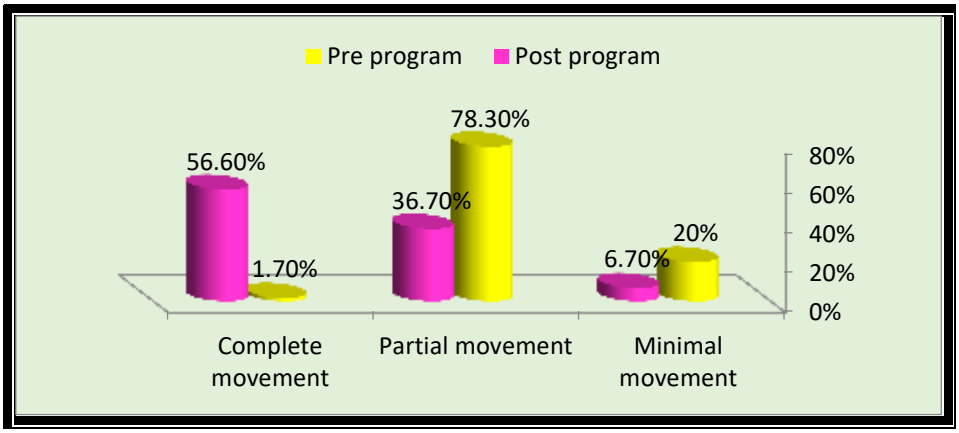

Figure (1): Total score of studied patients regarding their voluntary movement and basic mobility pre and post implementation (N=60).

Table (6): Correlation between activities of daily living and each of body balance, muscle movements and muscle strength post program implementation among studied patients (N=60).

Activities of daily living	ADL		body balance		muscle movements		muscle strength	
	r	p	r	p	r	p	r	p
	1	1.0	0.67	<0.0001	0.63	<0.0001	0.47	<0.0001

*** Significant (p< 0.05) **Highly significant (p< 0.0001)**

Discussion

Concerning the personal data of the studied patients, this study showed that the majority of their age was from 50-60 years old. This may be due to the fact that physiological and health life changes in older adults make them the most vulnerable group for chronic diseases which may be a risk for stroke. This also was congruent with the result of **Wonsetler and Bowden (2020),** they conducted a study about "A systematic review of mechanisms of gait speed change post-stroke, part 2: exercise capacity, muscle activation, kinetics, and kinematics". They stated that the majority of patients' age in their study was from 50 to 60 years old.

Disagreement with this finding was by the result of **Hosseini et al., (2019),** they performed a study about the "Effect of early passive range of motion exercise on motor function of people with stroke"; they stated that the majority of patients' age in their study was more than 60 years old. From the researcher point of view, this difference may be related to factors like hormonal causes, dietary pattern, geographic and genetic variations.

Concerning sex, This result could be related to the fact that more than half of the studied patients were males. This result also was consistent with the result of **Daly,(2019),** whose study about "a randomized controlled trial of functional neuromuscular stimulation in chronic stroke subjects", and stated that more than two third of the sample were males. Disagreement with this finding was by the result of **Ahmad, et al. (2017),** whose study about "strategies of daily living rehabilitative activities for post stroke patients. Doctorate thesis at Minia University Hospital, Egypt, and stated that more than half of study group were females.

Regarding educational level; the results of the present study stated that two fifths of the studied patients were illiterate. This was agreed with the result of **Cramp, et al. (2018),** whose study about "Effectiveness of a community-based low intensity exercise program for ambulatory stroke survivors" and stated that less than half of the studied patients were illiterate. Disagreement with this finding was by **Wonsetler and Bowden (2020),** they stated that the majority of patients were illiterate. From the researcher point of view this may be related to factors like geographic factors and different sample

Pertaining to marital status, the findings of the current study revealed that most of studied patients were married. From the researcher point of view, it may be due to that marriage is closely related to the Egyptian culture.This result also was consistent with the result of **Pohl, (2017),** whose study about "repetitive locomotors training and physiotherapy improve walking and basic activities of daily

living after stroke", and stated that the majority of patients were married.

Regarding occupation; the findings of the current study showed that two fifth of studied patients had a manual work and two fifth of them had no work or housewife. This was in agreement with the result of **Ada, (2018),** whose study about "strengthening interventions increase strength and improves activity after stroke"; and stated that about two fifth of study groups had a manual work. **Regarding life style;** results of the current study indicated that half of the studied patients had a sedentary life style. From the researcher point of view, sedentary life helps in obesity and coronary artery diseases that is predisposing to stroke. This was in agreement with the result of **Stefan and Peter (2020),** whose study about "Rehabilitation after Stroke" and stated that, the half of the studied groups had a sedentary life style.

The study findings showed that there were significant statistical improvements in activity of daily living of the patients regarding feeding, bathing, grooming, dressing, bowels, bladder, toilet use, transfers, mobility, ascending and descending stairs, post 3 months from implementation of physical training program. This improvement in patients' activities of daily living may be due to the positive effect of physical training program that were scientifically prepared according to the type of stroke patients' disability and nursing activities carried out in a standard manner and depended on evidence-based practice that will contribute to improve patients' outcomes, also may be due to continuous communication and encouragement of the researcher to the studied patients.

This result was compatible with the result of **Zaky and Mohammad (2018),** whose study about "strategies of daily living rehabilitative activities for post stroke patients" at Minia University Hospital, Egypt, and stated that the result of their study showed increase in studied patients' activities of daily living that are determined by Barthel index activities of daily living scale post implementation of training activities.

The findings of the current study stated that there was a statistically significant increase in the mean scores of body balance post 3 months of program implementation compared to preprogram. This improvement in patients' body balance may be due to the positive effect of training program that were scientifically prepared according to the type of stroke patients' disability and nursing activities carried out in a standard manner and depended on evidence-based practice.

The result also was in the same line with the result of **Abd EL-Lateef, et al. (2019),** whose study about "strategies of daily living rehabilitative activities for post stroke", and stated that there was a statistically significant difference between studied patients as regards body balance post program implementation. Disagreement with this finding was by **Debbie and Janice (2015),** whose study about "disparity between functional recovery and daily use of the upper and lower extremities post stroke". They examined the effect of physical training on balance in elderly women with right side hemiparetic for 4 weeks of physical training implementation. They, stated that no statistically significant improvement in total body balance during sitting and standing between preprogram implementation and post program implementation. A possible explanation of the study finding may be due to that women with right side hemiparetic were totally dependent due to their advanced ages. Also, may be due to short duration of the program.

The finding of the present study supported the study hypothesis that, there was a statistically significant increase in the mean scores of muscle strength post 3 months of program compared with preprogram. According to the muscle strength of upper and lower limb, the current study showed that there was increase in the muscle strength of upper and lower limbs post 3 months of the implementation of physical training program compared with the preprogram, which includes biceps muscle, flexor digitorum muscles, quadriceps, and tibialis muscle.

The study finding was congruent with the result of **Bale et al., (2019),** whose study about "the effect of physical training and lower-intensity treadmill exercise on improving muscle strength in patients with stroke", and stated that there was a statistically significant increase in the muscle strength of biceps muscle and tibialis scores post three months of physical training program implementation compared with pre physical training program implementation. This means that the implementation of physical training program has a positive effect in increase muscle strength.

There was a significant improvement in muscle tone of the biceps, flexor digitorum, quadriceps, and tibialis muscles among the studied patients post 3 months of physical training program implementation. On the same line, the current study was in agreement with the result of **Yang, et al. (2018),** whose study about "the effect of physical training program with partial weight treadmill exercise on improving muscle tone", and stated that there was a statistically significant increase in muscle tone, especially biceps muscle and flexor digitorum muscle scores, post physical training program intervention compared with pre physical training program intervention.

The findings of the current study reported that there were a statistically significant increase in scores of voluntary movement and basic mobility post three months of physical training program. This improvement in patients' voluntary movement and basic mobility may be due to the efficiency of training program that were scientifically prepared according to the type of stroke patients' disability and nursing activities that carried out in a standard manner and depended on evidence-based practice. The findings of the current study were also congruent with the result of **Monger, et al. (2018);** whose study about "evaluation of a home-based exercise and training program to improve sit-to-stand in patients with chronic stroke" and stated that there was a statistically significant improvement in voluntary movement and basic mobility score post physical training program implementation.

The findings of the current study reported that there were highly positive significant correlations between activities of daily living and each of body balance, muscle movement and muscle strength post physical training program implementation. From the researcher point of view, this result may be due to when the body balance increase, the muscle strength will increase and the adequate joints will increase the ability of body movement in performing activities such as standing, walking, dressing up, bathing and toilet activities.

This was congruent with the result of **Kligyte et al., (2018),** whose study about "Relationship between lower extremity muscle strength and dynamic balance in people post-stroke", and reported that there was a highly strong positive significant correlation between activities of daily living and each of body balance, muscle movement and muscle strength.

Conclusion

There were statistically significant improvement among studied patients in

relation to level of ADL**,** body balance**,** muscle strength, muscle tone and muscle movement (upper, lower, basic mobility) post program implementation. There was a significant positive statistical correlation between activities of daily livings and each of body balance, muscle movement and muscle strength post physical training program implementation.

Recommendations

1. Manual booklet should be available and distributed for each stroke patients, with colored pictures about physical training exercise to improve muscle quality and level of daily activities.
2. Applying a physical training program for stroke patients to help them to prevent and manage disability that is associated with stroke.
3. The study period should be extended more than 6 months. Extending the follow-up period to more than 6 months will provide more comprehensive information about the effect of physical training exercise on the improvement of all clinical outcomes.
4. Replication of this study on a larger sample from different geographic area e.g. (Menoufia and Tanta city) for generalization of the results.

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تأثير البرنامج التدريبى البدنى على جودة العضلات ومستوى النشاط بين مرضى السكتة الدماغية

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السكتة الدماغية هي السبب الرئيسي لضعف المشي، مما يؤدي إلى إعاقة طويلة الأجل بين البالغين، وغالبا ما يؤدي إلى ضعف الحركة أو الوظيفة الحركية. لذلك هدفت الدراسة الي تقييم البرنامج التدريبى البدنى على جودة العضلات ومستوى النشاط لمرضى السكتة الدماغية. أجريت هذه الدراسة في قسم النفسية والعصبية ووحدة العلاج الطبيعي بمستشفى بنها الجامعي، مصر. تم تطبيق هذه الدراسة على ٦٠ مريضا بالغا مصابا بالسكتة الدماغية. حيث كشفت النتائج أن تنفيذ برنامج التدريب البدني أدى الى تحسن ذو دلالة إحصائية في متوسط درجة أنشطة الحياة اليومية، وتوازن الجسم، والحركة الإرادية للطرف العلوي والسفلي والحركة الأساسية، وقوة العضلات. كما اوصت الدراسة بتطبيق برنامج تدريب بدني لمرضى السكتة الدماغية لمساعدتهم على منع وكيفية التعامل مع العجز المصاحب للسكتة الدماغية.