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Influence of health education and physiotherapy on functional independence among Nigerian stroke survivors

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Abstract

This study was carried out to compare the effectiveness of physiotherapy and combined health education and physiotherapy intervention on functional independence among Nigerian stroke survivors. A total of 50 stroke survivors in University of Benin Teaching Hospital (UBTH) and Irrua Specialist Teaching Hospital (ISTH) were divided into the control (ISTH) and experimental group (UBTH) which were made up of 25 participants each. The experimental group were administered a combination of health education and structured physiotherapy programme while the control group were administered only structured physiotherapy programme. Analysis of co-variance (ANCOVA) was used to test the hypothesis. Bonferroni post-hoc test was used to identify the source of the difference between the groups. Statistical significance was accepted for p value of <0.05. Findings showed that there was improvement in the Functional Independence Measure (FIM) following combined health education and physiotherapy from 32.08 ± 1.10 to 112 ± 1.75. Also, there was improvement in FIM following only physiotherapy from 33.20 ± 1.15 to 55.64 ± 1.81. However, there was an adjusted mean difference of 57.031 ± 2.53 in FIM between the experimental and control group. A variance of 91.5% in FIM was accounted for health education. It is therefore concluded that a combination of physiotherapy with health education is the best approach to substantially optimize the functional independence of Nigerian stroke survivors.

Keywords: *Health education, physiotherapy, functional independence, stroke*

Introduction

Stroke is a cardiovascular accident involving the damage or loss of brain tissue due to a lack of oxygen. It is defined as a brain attack caused by the obstruction of blood supply to part of the brain, due to a blockage in a blood vessel connected to the brain or an internal bleed. The interruption of blood flow to the brain will have an immediately detrimental effect on the normal operation of cerebrovascular regions. This leads to a destabilization of global function within the centre of the cerebrum that prevents healthy cognitive brain function (Akinyemi et al., 2021; Martin, 2014). Stroke rehabilitation starts in the hospital but continues after the individual has returned to the community. It can be described in stages such as the hyperacute/acute, inpatient, outpatient and community reintegration. The goal of the first three stages is to maintain or increase the stroke survivor's capacity for functional independence. As rehabilitation moves towards the community, there is a greater emphasis on the individual's activities and participation in pre-stroke and/or new life roles and enhancing their performance in these areas. The reintegration into community life marks the end point of stroke patient rehabilitation (Young & Forster, 2007, Swinton, 2007, Hammed & Agwubike, 2018).

Moreover, patient health education after stroke is an organized activity for both the patient and their family members in order to help support and encourage health behaviour for active partic-

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ipation in all aspects of self-care leading to improved outcomes and better health status (Sanders et al., 2014; Bastable, 2008). Morbidity and mortality arising from stroke is considered the main cause of death among stroke survivors. Thus, physiotherapists and health educators exposed to stroke survivors have always thought that health education does improves the functional independence of stroke patient but little or no real empirical study has been carried out to confirm this claim. Although, Martin (2014) established the value of quality education to improvement in the activity performance of stroke, he did not consider community and health education effort. Although, patient health education is part of treatment of every patient, health educators are not always directly involved as part of the rehabilitation team. The need for alternative to just physiotherapy has become necessary and involving health education professionals is being experimented. This account for the rational for the study. It is thus pertinent to investigate if there would be significant difference in the measures of functional independence of stroke survivors who receive structured physiotherapy programme and stroke survivors who receive a combination of health education and structured physiotherapy programme. It is therefore hypothesized that, there would be no significant difference between the functional independence of structured physiotherapy programme and a combination of health education information and structured physiotherapy programme.

Methods

Research design

A pretest–posttest control-group design was adopted in this study. This study is a true experimental design concerning the place of health education and structured physiotherapy programme as determinants of functional independence among stroke survivors.

Population

A total population of 129 stroke survivors participated in this study. This consists of 68 stroke survivors attending physiotherapy in University of Benin Teaching Hospital (UBTH) and 61 stroke survivors attending physiotherapy at Irrua Specialist Teaching Hospital (ISTH).

Sample size and sampling technique

Simple random sampling technique was used to obtain the sample size. Sixty-eight stroke survivors in UBTH, Physiotherapy Department who qualified for the study were serialized and a random table was used to obtain 25 participants for the study. The same method was applied to control group at ISTH, Physiotherapy Department that had 61 stroke survivors that met the criteria for the study. Therefore, a total of fifty (50) stroke patients were selected for the study using a sampling intensity of 37% and 41% for the experimental group (UBTH) and control group (ISTH).

Intervention and instruments

The health education programme involves education on the importance of community re-integration and community skills programme. Equally, the physiotherapy programme included strength and balance training of hemiplegic limbs.

However, functional independence measure (FIM) is a measurement instrument that was used to measure the functional independence. FIM was developed in 1987, as a response to criticism of the Barthel Index. It was intended to address issues of sensitivity and comprehensiveness, as well as provide a uniform measurement system for disability for use in the medical remuneration system (McDowell & Newell, 1996). Rather than independence or dependence, the FIM assesses physical and cognitive disability in terms of burden of care. It is a composite measure consisting of 18 items assessing 6 areas of function (self-care, sphincter control, mobility, locomotion, communication and social cognition). These fall into 2 basic domains; physical (13 items) and cognitive (5 items). The 13 physical items are based on those found on the Barthel Index, while the cognitive items are intended to assess social interaction, problem-solving and memory. The physical items are collectively referred to as the motor-FIM while the remaining 5 items are referred to as the cognitive-FIM. Each item is scored on a 7-point Likert scale indicative of the amount of assistance required to perform each item (1=total assistance, 7 = total independence). A simple summed score of 18–126 is obtained where 18 represents complete dependence/total assistance and 126 represents complete independence. Subscale scores for the physical and cognitive domains was used and may yield more useful information than combining them into a single FIM score (Linacre et al. 1994).

Reliability of instruments

The FIM has been found to be effective in predicting burden of care following stroke and thus could be used to determine the amount of physical assistance a person might need at home following a stroke (Granger et al. 1993). The FIM can be weighted to possess interval properties, potentially allowing more accurate analysis of change. The FIM has been compared to the Barthel Index to determine its validity and reliability and ease of use in two groups of 25 patients undergoing neurorehabilitation. The FIM was considered to be more valid than Barthel Index, and equally reliable in assessment of disability. The FIM total, domain and subscale score interclass correlation coefficients (ICC) were calculated using ANOVA; FIM item score agreement was assessed with unweighted Kappa coefficient. Total FIM ICC was 0.96; motor domain 0.96 and cognitive domain 0.91; subscale score range: 0.89 (social cognition) to 0.94 (self-care). FIM item Kappa range: 0.53 (memory) to 0.66 (stair climbing). It is concluded that FIM is reliable to determine functional independence of stroke survivors when used by medical rehabilitation clinicians (Dickson, 1995).

Ethics and study approval

An approval letter from the Ethical Committee of UBTH, Benin-City was obtained for permission to conduct this study (ADM/E 22/A/VOL. VII/14830948). All participants were serialized for use consecutively through their hospital files at the Physiotherapy Department, UBTH, Benin-City and ISTH, Irrua. Also, an informed consent form was issued to each of the participants before participating in this study and the objectives of the study were explained to them before they sign the consent form. In addition, the demographic data such as gender, age, ethnicity and marital status were obtained through interview and patients' hospital files. The FIM was administered to both groups (experimental and control groups) to measure their functional independence prior to and following 10-weeks of physiotherapy programme and health education information as interventions.

Physiotherapy intervention protocols

The experimental and control groups went through physiotherapy programme of a frequency of 3 times per week (Monday, Wednesday, and Friday) with each session duration of 1 hour in 10 weeks. The programme included strength, balance and gait speed training aimed at improving the functional independence of the participants, in order to increase their functional status to meet up with their daily challenges.

Upper limb strength training protocol:

Aim:-To improve the strength of the upper limb muscles.

Equipment: - Standard weight (2kg), overhead pulley and an armless chair.

Procedure:-Participants were instructed to sit upright on the chair. The affected upper limb to be strengthened was suspended on one arm of the pulley, while the weight was suspended on the other arm of the pulley.

Instruction: - Each participant was instructed to pull the weight up, by pulling the hand down as much as he/she could. Thereafter, the hand was returned to the starting position. The process was repeated 10 times (10 repetitions) for each participant.

Lower limb strength training protocol:

Aim:-To improve the strength of the lower limb muscles.

Equipment:- A stationary bicycle ergometer

Procedure:-Participants were instructed to sit up right on the bicycle ergometer, with the feet on the pedals. Where the weak limb could not stay on the pedal, it was strapped to it by using a crepe bandage.

Instruction:- The participants were instructed to ride the bicycle as fast as he/she could for 10 minutes.

Balance Training -

Aim:- To improve the static balance of the participant.

Equipment: One leg stance and a parallel bar.

Procedure: - Participants were instructed to stand on one leg within the parallel bar until balance is lost.

Instruction:- Participants were instructed to stand on his/her affected leg with or without holding on to the parallel bar until he/she is tired or about to fall.

Gait Speed Training -

Aim:-To increase the mobility of the participants.

Equipment: - An open space within the gymnasium/the department and a stopwatch.

Procedure:- Each participant was made to walk a distance of 10 meters from one end of the gymnasium to the other.

Instruction: - From the starting point, each participant was instructed to walk without a walking aid as fast as he/she could without running, to the end point. The process was repeated three times with three minutes rest between the sets. Time taken to cover each 10 meters (distance) was recorded in seconds.

Scoring:- The total distance covered (30 meters) by each participant was divided by the total time taken. The result was recorded as the gait speed.

Health education information intervention protocols

For experimental group, in addition to the physiotherapy programme, they were given health education information on importance of community integration. The health education information also include education on the importance of community re-integration and community skills programme. This health education was carried out in group for 30 minutes per session, 3 times a week (Mondays, Wednesdays and Fridays) for a period of 10-weeks.

Measurement instrument

FIM was used to measure functional independence of the participants. It was administered by means of interviews with each participant late in the morning. The FIM contains 18 items, grouped into six dimensions: self-care, locomotion, transfers, communication, sphincter control and social cognition. Each item was scored 1-7, corresponding to complete dependence and complete independence, respectively. Each dimension is analyzed by the sum of the items that comprise it. The total FIM score is the sum of the scores for each dimension, and can range between 18-126 points. Dependence levels are classified according to the total FIM score: 18: complete dependence; 19-60: modified dependence (assistance for up to 50% of tasks); 61-103: modified dependence (assistance for up to 25% of tasks); and 104-126: complete/ modified independence.

Method of data analysis

Inferential statistics of analysis of co-variance (ANCOVA) was used to test the hypothesis. ANCOVA which is a hybrid of ANOVA and regression was used to find out the relationship between the post-test variables of experimental and control group while holding the pre-test variables constant. Bonferroni post-hoc test was used to identify the source of the difference between the groups. Statistical significance was accepted for p value of <0.05. All the analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 23.

Results

The results are presented in Tables 1 and 2.

Table 1. ANCOVA Tests on the difference in the effect of the control and experimental Treatment Measure

Dependent Variable: post						
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	40393.082a	2	20196.541	255.114	<0.001	0.916
Intercept	8307.826	1	8307.826	104.941	<0.001	0.691
Pre-FIM	65.082	1	65.082	.822	0.369	0.017
Treatment SSbetween	40243.250	1	40243.250	508.335	<0.001	0.915
Error SSwithin	3720.838	47	79.167			
Total	397250.000	50				
Corrected Total	44113.920	49				

a. R Squared = .916 (Adjusted R Squared = .912)

Table 1 shows F (1,47) = 508.34, ($p < 0.0005$) < $\alpha = 0.05$. Hence, there was a significant difference in post-FIM between the experimental and control group while adjusting for pre-FIM. This means that the null hypothesis was rejected. The partial Eta Squared (0.92) when compared with Cohen's guidelines shows that the effect of this difference is large on the functional independence of stroke survivors. Furthermore, 92% variance in functional independence was accounted for by health education.

The adjusted mean difference (57.03 ± 2.53) between the experimental and control group is presented in Table 2. There was a significant difference (($p < 0.0005$) < $\alpha = 0.05$) between the adjusted means of the experimental and control group while adjusting for the covariate 'pre-FIM'. Thus, stroke patients rehabilitated with professional health education and structured physiotherapy programme (experimental group) were more functionally independent than those rehabilitated with structured physiotherapy programme (control group).

Table 2. Pairwise comparisons of the adjusted means of the effect of the control and experimental treatment measure

Dependent Variable: post						
(I) treatment	(J) treatment	Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Differenceb	
					Lower Bound	Upper Bound
1.00	2.00	57.03*	2.530	<0.001	51.94	62.12
2.00	1.00	-57.03*	2.530	<0.001	-62.12	-51.94

Based on estimated marginal means *. The mean difference is significant at the 0.05 level. b. Adjustment for multiple comparisons: Bonferroni.

Discussion

The main finding of this study indicates that a combination of health education information and structured physiotherapy programme have a stronger effect than structured physiotherapy programme alone in the functional independence of stroke survivors. Therefore, stroke survivors who have combination of physiotherapy and health education could regain functional independence faster and prevent the occurrence of complications that are associated with immobility than those who have physiotherapy or health education alone.

The post control and post experimental levels of functional independence was 34.85% (55.64) and 87.44% (112.44). This means that at the end of the study the control group were still being assisted to carry out up to 50% of their tasks (modified dependence) while the experimental group had complete/ modified independence. Thus, the experimental treatment measure was 52.59% more effective than the control treatment intervention in improving the functional independence of the patients. Furthermore, results of ANCOVA of the hypothesis tested showed that the adjusted mean of the experimental group was significantly different from that of the control group. A variance of 92% in functional independence was accounted for the combination of health education and structures physiotherapy programme. Thus, stroke patients rehabilitated with professional health education and structured physiotherapy programme (experimental group) were more functionally independent than those rehabilitated with only structured physiotherapy programme (control group). This is supported by Olawale, Appiah and Jones-Okai (2007) who suggest that a supervised training programme when combined with conventional physiotherapy was more effective than only conventional physiotherapy in improving walking function of stroke patient. Immadi, Achyutha, Reddy and Tatakuntla (2015) assessed the effectiveness of the motor relearning approach to the conventional physiotherapy approach in promoting the physical function of the upper limb after a stroke. After the treatment sessions patients who received motor relearning programme showed significantly better functional ability when assessing their functional status by task-oriented performance than the conventional physiotherapy programme. Also, in a study done by Pollock, Baer, Langhorne and Pomeroy (2007) to determine the functional independence of stroke patients with different approaches, a mixed approach of physiotherapy and health education was found to have a more significant effect on functional independence of stroke survivors than physiotherapy or health education alone. Thus, physiotherapy intervention, using a 'mix' of components from different 'approaches' with health education inclusive is more effective in attaining functional independence following stroke. This is because health education with its power to create awareness is the number one strategy in stroke rehabilitation and prevention to enhance clinical outcomes (Travis, 2003).

Conclusion

Physiotherapy together with health education substantially improves the functional independence of Nigerian stroke survivors better than only physiotherapy. Therefore, those working on stroke survivors should foster health education as one of the referral strategies in stroke rehabilitation engagement in order to fast-track the survivors' functional independence. That is, in order for a better outcome in functional independence, health education should be combined with the conventional structured physiotherapy programme.

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