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Original Article

Effectiveness of an Integrated Education for Self-Management in Stroke Rehabilitation in North-east Nigeria: A Randomized Controlled Trial

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Abstract

Objective: To investigate the effectiveness of a modeled community-based education (CBE) for self-management towards reducing disability and improving lower extremity functions among stroke survivors.
Study type, settings & duration: This single-blind randomized controlled trial (RCT) was conducted among stroke survivors attending outpatient Physiotherapy unit of Abubakar Tafawa Balewa University Teaching Hospital (ATBUTH), in the North-Eastern part of Nigeria from April 2016 to December 2016.
Methodology: Single-blind randomized controlled trial design was employed by grouping the participants into experimental and control groups. Participants were considered eligible if their stroke was due to cerebrovascular accident, able to walk 10 meters unsupported, at least 30 days' post-stroke and possessed cognition score of >24 on Mini-Mental State Examination. Sixty participants were assigned to either the intervention (n=31) or control group (n=29) and received intervention for 6 weeks after the baseline assessments. Modified Rankin Scale, Six-Minute Walk Test and Ten-Meter Walk Test were used to measure the degree of disability, walking distance and gait speed respectively.
Results: Groups did not differ significantly in terms of stroke related disability, walking distance and gait speed at baseline. Post-intervention assessments showed time effect on participants' walking distance across two test periods, indicating significant time effect (F =13.963, p =0.001) with an effect size of η2 =0.245. Disability was assessed using the modified ranking scale. The time effect of the participants' performance on the scale across the two test periods indicated significant time effect; (F =8.563, p =0.005) with effect size of η2 =0.166. However, non-significant time effect was reported on gait speed of the participants in the study groups.
Conclusion: The community-based education (CBE) programmes for chronic diseases like stroke could be effective toward reducing the degree of disability and improving lower extremity function.
Key words: Self-management, community-based education, disability, mobility, rehabilitation, cognition, Nigeria.

Introduction

Stroke or cerebrovascular accident is described as the sudden loss of cerebral function due to the lack of oxygen supply to the brain tissue, as a result of blockage or rupture of a blood vessel.[1] It is ranked the second major cause of mortality and the third major cause of disability worldwide.[2] Specifically, about one-third of individuals presenting with stroke die as a result of direct consequences or other complications of their stroke[3]. Thus, indicating its major contribution to global disease burden[4]. Over the past few decades, the incidence of stroke is decreasing in high-income countries, while in the low- and middle-income countries (LMIC), there is a dramatic increase in the incidence.[5-7] For instance, a prevalence rate of 819 and 963 per 100,000 population have been recently reported in Pakistan[8] and Egypt[9] respectively. One

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Authors Contribution

IUL & AUG conceptualized the project and did the statistical analysis. IUL, AUG, ATS, UMB, MS & DS did the data collection, literature search and the drafting, revision & writing of manuscript.

of the most important sequelae accompanying stroke is the associated disability. Advancement in medical care, increased prevalence of risk factors and an ageing population are all predicted to contribute to the number of people living with disability from stroke worldwide.[10]

One of the consequences of disability after stroke is the challenge encountered by patients on returning to their home environment. Stroke survivors face difficulty in both personal (such as dressing, feeding or toileting)and extended (such as mobility) activities of daily living[11] and also returning to a pre morbid lifestyle.[12] Rehabilitation of stroke survivors require a holistic approach and not purely impairment- centered approach, including community integration; taking into account the patient's physical and social environments.[13,14] This, therefore, necessitates the need for affordable and readily accessible rehabilitation services that are cost-effective[14] as well as self-managed programs with beneficial effects toward reducing the impact of stroke-related complications in the community setting.[15,16] The aim of self-management in stroke rehabilitation is to empower patients with skills that will enable them to reduce dependency, acquire motivation and develop self-efficacy in the management of their differing range of disabilities.[17] Evidence has demonstrated that continuing and targeted patient education can be promising toward stroke self-management[18-20] as well as improvement in quality of life.[21]

Quality of life of stroke survivors in developing countries like Nigeria is generally poor,[22,23] mainly due to deficient expenditure and lack of effective support services.[24] Self-management approaches for stroke survivors are rarely studied in Nigeria, despite evidence indicating majority of stroke survivors' preference for out-patient or home-based rehabilitation approaches.[25] Therefore, introducing therapeutic procedures that are cost effective and affordable will go a long way in reducing the impact of the stroke-related disability as well as improvement in the quality of life of stroke survivors in Nigeria. To our knowledge, there is only one published experimental study, which is termed SMART randomized multicenter clinical trial that examines the effect of an educational programme among stroke survivors in seven countries including Nigeria.[26] The present study aimed to investigate the effectiveness of a modelled community based education (CBE) for self-management in reducing disability and improving lower extremity functions among stroke survivors.

Methodology

This study follows the Consolidated Standards of Reporting Trials (CONSORT) 2010 guideline. A single-blind randomized controlled trial (RCT) was conducted (recruitment, intervention and overall assessment) among stroke survivors attending outpatient Physiotherapy unit of Abubakar Tafawa Balewa University Teaching Hospital (ATBUTH), in the North-Eastern part of Nigeria from of April 2016 to December 2016.

Participants were stroke survivors referred for physiotherapy by consulting physicians in ATBUTH. They were assigned to an intervention or control group if they met the following eligibility criteria: stroke was ascertained to be due to cerebrovascular accident that leads to unilateral motor deficit; aged ≥18 years with stroke duration of 30 days or greater; had the ability to sit unsupported and walk 10 meter independently; possessed sufficient cognition (a score of >24 on Mini-Mental State Examination) and understand the languages of communication for the study (either Hausa or English). Participants were considered ineligible if they suffer cerebellar lesion or other significant neurologic deficits other than stroke and/or those who required significant assistance for activities of daily living prior to and post onset of stroke.

The intervention group received a self-management Community-Based Education (CBE) (Table-1) in addition to the usual care given to all patients. The education program was an adopted model of Chronic Disease Self-Management Program (CDSMP),[17] which was modified to suit the participants' population and culture. The intervention program was administered to the participants in sub-groups, in order to educate and train them towards managing their condition. The program was designed and presented as a workshop for educating patients with chronic diseases with each session lasting for about an hour weekly for 6 weeks. The control group received only the usual care (UC), otherwise known as the standard physiotherapy care. The usual care treatment ranges from 1 to 3 physiotherapy sessions per week. To be specific, the standard physiotherapy comprises of impairment-centered mobilization techniques, exercise therapy and functional activities for both upper and lower extremities, which was administered by qualified physiotherapists for individual patients.

The population of stroke survivors visiting physiotherapy unit of ATBUTH at the time of the study was 108, after screening, 73 fully met the eligibility criteria, hence serve as the study sample size. Thirteen out of the 73 patients decline to

Table 1: Modified model of self-management program.

Key principle	Activity
Week 1 **Problem solving** Patient and proxy sat together and identify problems	Stroke patient's problems were categorised into three major groups based on International Classification of Functioning, Disability, and Health model; a. Physical limitation (body structure and function): The problem may be that they cannot lift their upper extremity or cannot move their lower extremity. b. Activity limitation: the problems include inability to hold a cup with the hand, carry a bag or put on cloth on their own. c. Participation restriction: the problem may be that the patient cannot do their previous job, cannot go to work or cannot attend worshipping places among others.
Week 2 **Physical activity** These are programs or exercises designed to improve patient's functional abilities and physical fitness	a. Flexibility exercises such as; • Active joints mobilization • Picking objects from distance • Squatting exercises b. Strengthening exercises such as; • Lifting objects of different weights • Pushing against a stationary object • Grip exercises with the hand c. Endurance exercises such as; • Figure of 8 walking • Shuttle walking
Week 3 **Understanding difficult emotion**	In this session the participants were asked to identify the triggers of their anger and frustration through brainstorming and paired discussion with partners.
Week 4 **Managing difficult emotion**	Participants' triggers for anger/frustration were discussed in detail and accordingly and assisted to identify ways of reducing and avoiding the influence of the triggers. The main purpose of this activity is to help people understand that the emotional ups and downs they experience living with stroke are normal, and to give people a chance to share and learn from others on the problems and approaches adopted in solving these issues.
Week 5 **Making an action plan**	Participants were assisted to plan what they want to achieve specifically through each activity and ultimately through the entire program. Strategies on how to achieve goals was individualized and guided. Participants were reminded that the plan should be something they *want* to do and should be realistic.
Week 6 **Working with health care professionals**	Participants were assessed on how they interact with their health care providers and their opinion or perceptions about their contributions towards making their lives better in coping and recovering from their stroke. Guidance on the importance of following clinical instructions was emphasized. Also, confidence of the patients in interacting with health care professionals was re-emphasised.

Participate in the study, while 60 consented to voluntarily participate in the study.

Stroke survivors who met the inclusion criteria were randomized into an intervention group (usual care + Community Based Education) or a control group (usual care only). Randomization was conducted using SNOSE (sequentially numbered opaque sealed envelopes) process, from which participants were allocated to either of the study groups by chance (Figure)

Assessment of participants was conducted in two stages (at baseline and after six weeks of intervention). At baseline, participants were assessed for socio-demographic characteristics which include personal demographic information and stroke-specific information. The personal demographic information includes age, sex, marital status, educational qualification and employment status (pre and post-stroke). The stroke-specific information includes the duration of onset of stroke and hemispheric side of the lesion. Modified Rankin Scale (mRS), Six-Minute Walk Test (6MWT) and Ten-Meter Walk Test (10MWT) were used to measure participants' severity of stroke in terms of the degree of disability, walking distance and gait speed respectively at baseline and after 6 weeks of intervention. Prior to the study, all participants were placed on individual physiotherapy visits (UC) by the hospital physiotherapy staff, which was maintained after initiating the study. The CBE intervention was administered once a week by the research team for 6 weeks. Participants were blinded to the intervention as both groups maintained their usual visits. The CBE intervention was administered to the intervention group on one of the days that corresponds to their usual care scheduled hospital visit within the week. Primary outcomes include lower extremity mobility function and degree of disability.

Descriptive statistics of median, percentages and frequency were used to summarize the socio-demographic attributes of the

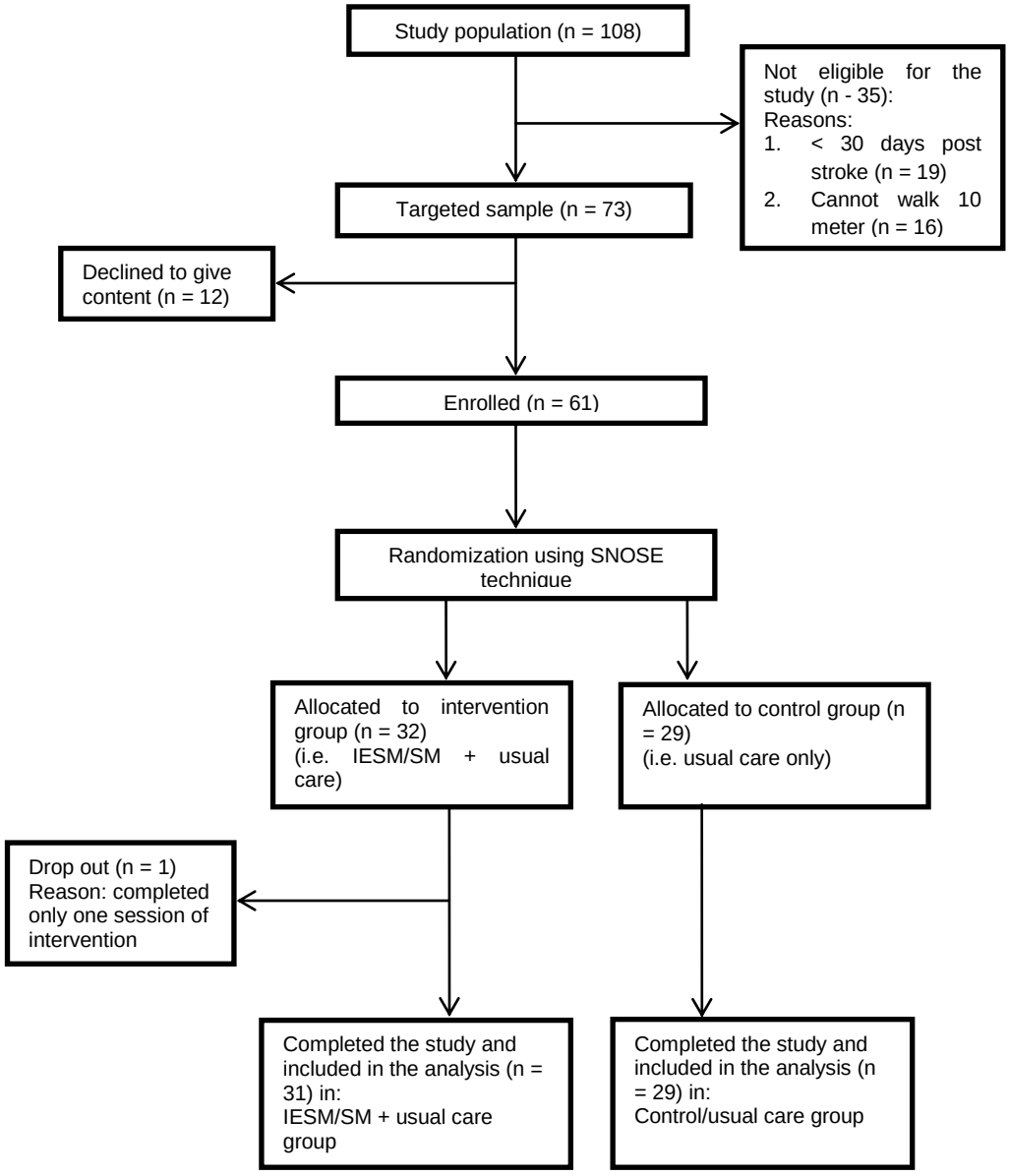

Figure: Study flow diagram.

Participants. Independent t-test was used to determine differences among the attributes of the participants in the intervention (CBE) and control group. Multivariate Analysis of Covariance (MANCOVA) was used to determine differences of clinical measures among the stroke survivors in the two study groups. Statistical Package for the Social Sciences (SPSS) version 16 was used for the data analysis. Level of statistical significance (α) for this study was set at $p < 0.05$.

The Ethical approval was obtained from the Human Research Ethics Committee of Abubakar Tafawa Balewa University Teaching Hospital (ATBUTH), Bauchi, Nigeria before commencement of the study.

Results

The analysis was based on the sixty-one (61) stroke survivors who fully participated in the study (31, intervention and 29, control group). None of the participants was lost to follow-up (Figure-1). Table-2 presents findings on the sociodemographic characteristics of the participants. The median ages

of the participants in the intervention (CBE) and control groups were 50.0 and 57.5 respectively. There were more males (n =32) than females in the study and most participants were married (n =42). Participants majorly attended a religious form of education [Intervention group, 18 (58.1%); Control group, 17 (58.6%)] compared to western education and were largely unemployed both before and after stroke onset. Importantly, there were no statistically significant differences between the intervention (CBE) and the control groups in terms of gender (*p* =0.81*),* educational status (*p* =0.84), marital status (*p* =0.58), pre-stroke employment status (*p* =0.26), post-stroke employment status (*p* =0.41) and hemispheric side of stroke (*p* =0.49).

Table-3 presents the baseline clinical characteristics of the study groups. The results showed that there was no statistically significant difference between participants' performance in the two groups, regarding degree of disability measured using modified ranking scale (*p* =0.089), gait speed assessed using 10-meter walk test (*p* =0.176) and walking distance measured using 6-minute walk test (*p* =0.348).

Table 2: Sociodemographic and clinical characteristics of participants.

Variable	*IESM Group (n = 31)*	*Control Group (n = 29)*	*p-value*
Gender n (%)			
Male	17 (54.8)	15 (51.7)	0.81
Female	14 (45.2)	14 (48.3)	
Age(years), Median	50.0	57.5	
Level of education n (%)			
Primary	2 (6.5)	3 (10.3)	0.84
Religious knowledge	18 (58.1)	17 (58.6)	
Secondary	4 (12.9)	2 (6.9)	
Tertiary	7 (22.6)	7 (24.1)	
Marital status n (%)			
Pre-stroke			
Married	22 (71)	20 (69)	0.58
Single	0 (0)	1 (3.4)	
Divorce	9 (29)	8 (27.6)	
Employment status n (%)			
Pre-stroke			
Employed	14 (45.2)	9 (31%)	0.26
Unemployed	17 (54.8)	20 (69%)	
Post-stroke			
Employed	5 (16.1)	7 (24.1)	0.41
Unemployed	26 (83.9)	22 (75.9)	
Hemispheric side of stroke			
Right	21 (67.7)	22 (75.9)	0.49
Left	10 (32.3)	7 (24.1)	
Duration of onset (months) (median)	10	9	

Abbreviation: Standard deviation, SD.

Table 3: Comparison of baseline clinical outcomes of the two study groups.

Outcome Measures	*IESM Group (Mean ± SD)*	*Control Group (Mean ± SD)*	*p-value*
mRS	2.7 ± 0.86	3.1 ± 0.9	0.089
10MWT (ms^{-1})	0.33 ± 0.15	0.29 ± 0.11	0.176
6MWT (m)	186.1 ± 108.2	160.7 ± 99.4	0.348

Abbreviations: SD, standard deviation; mRS, Modified Rankin Scale; 10MWT, Ten-Meter Walk Test and 6MWT, Six-Minute Walk Test.
Statistics: Independent t-test.

Table 4: Post-intervention clinical outcomes and comparison between the two study groups.

Outcome measures	*IESM group (Mean ± SD)*	*Control group (Mean ± SD)*	*p-value*
mRS	2.28 ± 0.89	3.1 ± 0.9	0.005
10MWT (ms^{-1})	0.7 ± 0.3	0.5 ± 0.3	0.083
6MWT (m)	219.2 ± 108.8	158.9 ± 9.3	0.001

Abbreviations: SD, standard deviation; mRS, Modified Rankin Scale; 10MWT, Ten-Meter Walk Test and 6MWT, Six-Minute Walk Test.
Statistics: Multivariate analysis of covariance (MANCOVA).

Table-4 shows the outcomes of the post-intervention assessment among the two study groups. Lower extremity functions were assessed using six-minute walk test and 10-meter walk test to determine walking distance and gait speed respectively. Univariate test statistics was used to determine time effect on participants' walking distance across two test periods, indicating significant time effect (F =13.963, p =0.001) with an effect size of η2 =0.245, which suggests a considerable improvement in walking distance across the two test periods. However, outcome shows non-significant time effect (F =*3.160, p =0.*083) with an effect size η2 =0.068 on gait speed of participants as measured using the 10-meter walk test which indicates lack of improvement in participants' gait speed over time across the two test periods.

Level of disability was assessed using the modified ranking scale. The time effect of the participants' performance on the scale across the two test periods indicated significant time effect; mRS (F =8.563, p =0.005) with effect size of η2 =0.166 (Table-4).

Discussion

This study investigated the effectiveness of a community-based education (CBE) in stroke rehabilitation. The trial outcome suggests that incorporating CBE into the usual care during rehabilitation of stroke survivors is effective over the adoption of only the usual care in decreasing stroke related disabilities and improving walking distance. However, both groups showed improvements in gait speed at post-intervention assessment but did not differ significantly in this variable.

The outcome revealed that CBE intervention had a significant positive impact on the participants' walking distance. Using six-minute walk test, it was observed that participants randomized to the CBE plus usual care group had improved walking distance after six weeks above the control group (only usual care).This finding was in agreement with the report of a previously conducted systematic review showing that self-management programs can significantly improve functional ability among stroke survivors.[27] However, regarding gait speed, the study groups did not show significant differences, which could be associated with fear of falling during walking; a peculiar limiting factor associated with gait deficit among stroke survivors.[28] Moreover, the lack of increase in gait speed among the participants was certainly unrelated to the cognitive problem since each participant scored at least 24 points on the Mini-Mental State Examination as an inclusion criterion of this study.

Participants' level of disability was further assessed using the modified Rankin Scale which indicated improved functioning among the intervention (CBE) group than the control group over time. The result suggests that after 6 weeks, the intervention (CBE) group had reduced level of disability. Consistent findings on reduction in stroke related disabilities due to the adoption of similar educational programs have been reported in studies from high-income[19] and low-middle-income countries.[7]

The main objectives of the education programme were to sensitize the patients to engage in self-management attitude to help reduce their level of dependence, disability and functional limitations. Importantly, neuro-rehabilitation involves maximizing recovery, adaptation to disability and enhance the choice of appropriate coping skills. Some evidence suggests that coping is likely to predict success in rehabilitation.[29] Rehabilitation after a stroke include more than functional recovery because, in tandem with physical disability, people often experience a variety of psychological sequelae such as depression, anxiety and emotional liability, which can compromise the rehabilitation process and affect long term adjustment.[30] Therefore, greater improvement in gait parameter and decrease in disability among the CBE group reported in our study could be linked with adoption of positive coping mechanisms and behavior modification which might have impacted on the patients'attitude towards the entire rehabilitation program. This is in line with the well documented central domains of self-management which include medical management, role or behavioural management and emotional management.[31]

This study has the strength of being the first published experimental study to investigate the impact of the educational programme among stroke survivors in Nigeria as well as concealment of allocation and participants' blinding, yet there are a number of limitations that need to be taken into consideration. Even though the assessors were blinded, it was not possible to blind the participants due largely to their level of education. There are chances therefore, that some of the participants in the intervention and control groups could meet and discuss their experiences during the 6 weeks' intervention period, even though they were blinded to what exactly constitutes the intervention.

Despite the limitations in this study, the outcome of this study will greatly contribute to the rehabilitation of stroke survivors in the African sub-

continent. It is thus concluded that community-based education (CBE) programmes for chronic diseases like stroke has a potential towards reducing the degree of disability and improving lower extremity functions.

Conflict of interest: None declared.

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