Early Predictors of Long-Term Participation in Stroke Survivors – A Survey of a Rehabilitation Cohort in Nigeria

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Abstract
This study sought to identify early predictors of long-term participation among stroke survivors using the International Classification of Functioning, Disability and Health as the conceptual framework. Individuals diagnosed with first-ever stroke were recruited from medical wards of a university teaching hospital in Nigeria. Data on age, gender, pre-stroke employment and marital status, stroke sub-type, laterality and severity (personal factors) were obtained. Motor function (body function) and functional activity (activity) were also assessed within the first month of stroke onset using the short-form Fugl Meyer Scale and the motor sub-scale of the Functional Independence Measure respectively. Participation was assessed at one year with the London Handicap Scale at each stroke survivor's residence. Multivariable regression analysis was performed to identify significant predictors of participation at an alpha value of 0.05. Fifty-five stroke survivors were assessed with a male majority (60%). Age (β = -0.33; P = < 0.05) emerged as the only significant predictor of participation. The negative beta (β) for age indicated that increasing age predicted poorer participation outcome. With an adjusted R^2 = 0.40, the regression model explained only 40% of the variance in participation. Age was identified as the sole predictor of participation at one year. This finding has implications for planning and providing participation-enhancing care for elderly stroke survivors while also relevant for setting realistic rehabilitation goals for enhancing long-term post-stroke participation.
Keywords: age; aging; Nigeria; participation; predictors; stroke; stroke survivors

1. Introduction

Participation, defined as involvement in life roles, is an important component of human functioning (WHO, 2001). Based on the World Health Organization's International Classification of Functioning, Disability and Health (ICF) framework, participation can be described in the dimensions of learning and applying knowledge, general tasks and demand, communication, mobility, self care, domestic life, interpersonal interactions and relationships, major life areas, and community, social and civic life (WHO, 2001). Going by the various dimensions of the participation construct, enhanced participation is expectedly essential for health promotion, general well-being and optimal quality of life across diverse populations (Peters & Hamzat 2009; Richards et al. 2005).

In spite of its many benefits and centrality to human existence, participation may be restricted following disease conditions especially those that are characterized by multiple impairments as is the case in stroke (D'Alisa et al. 2005). With the long lasting and often severe effect of the stroke aftermath, participation enhancing interventions become important requirements in patient-centered stroke rehabilitation. While available data on factors that predict participation post-stroke can be expected to facilitate the design, plan and provision of appropriate rehabilitative interventions, the applicability of such information (D'Alisa et al 2005; Desrosiers et al. 2005; Desrosiers et al. 2006) to the diverse cultures and health care environments in various regions and countries of the world may be limited. Furthermore, participation after stroke, as in other disease conditions, will be better explored in the context of the environment, including the physical and socio-cultural environments, in which the stroke survivor dwells (WHO 2001; Desrosiers et al. 2005). For instance in Nigeria, a developing country and the most populous on the African continent, participation in employment activities has been observed to be restricted following stroke often due to barriers in the physical and social environments (Peters et al. 2013). Similarly, low level engagement in leisure activities has been identified as one of the challenges of residing in low resource countries even in the absence of disease conditions (Holmes & Joseph 2011). Hence, identifying setting-specific predictors of post-stroke participation is essential to plan and provide participation-enhancing interventions that are compatible with the needs and unique situations of stroke survivors.

Although stroke can be considered as the most common adult neurological disease in Nigeria accounting for majority of neurologic admissions (Ekenze et al, 2010; Talabi 2003), only few studies have explored participation of individuals who survive the disease (Peters & Hamzat, 2009; Hamzat and Peters 2009; Vincent-Onabajo 2013). While currently lacking in the country, information on early predictors of participation would be particularly important for patient education which among other benefits, may help mitigate common issues of non-compliance with post-hospital discharge therapies. Early prediction may also assist in identifying those stroke survivors at risk of poor participation outcomes on the long term which in turn will assist in the timely provision of needed care while also assisting in the planning of interventions capable of sustaining

participation in those survivors that are likely to have better participation.

To fill the existing gap in knowledge therefore, this study utilized the World Health Organization's International Classification of Functioning, Disability and Health (ICF) framework to identify predictors of participation one year after stroke. The ICF has been identified as a framework that has the potential of providing insight into variables that are associated with participation (Hoyle et al. 2012; Davis et al. 2012). The components of the functioning according to the ICF are body function and structure, activity and participation with personal factors and environmental factors as contextual factors (WHO 2001). We assessed the influence of personal factors namely age, gender, pre-stroke employment and marital status, stroke sub-type, laterality and severity; motor function (body function) and functional activities (activity), all assessed within the first four weeks after stroke, on one year post-stroke participation. It was hypothesized that these variables being components and contextual factors of functioning will significantly predict participation which is also a component of functioning albeit a higher level of functioning.

2. Materials and Methods

2.1 Study Design

This was a longitudinal study of an inception cohort. The study was approved by the relevant institutional ethics committees.

2.2 Participants

Eighty-three individuals with a diagnosis of stroke were consecutively recruited into the study. Inclusion criteria: first-ever stroke, age older than 18 years, willingness to participate in the study by provision of informed consent, and consciousness at the time of recruitment. Exclusion criteria: pre-morbid physical disabilities.

2.3 Study Settings

Stroke survivors were recruited from the medical wards of a University teaching hospital in northern Nigeria. At the centre, all stroke patients on acute-care admission receive medical, nursing and physiotherapy care similar to what obtains in most tertiary health-care facilities in the country. Due to lack of in-patient rehabilitation facilities and other rehabilitation professionals, rehabilitation following hospital discharge majorly entails out-patient physiotherapy.

Follow-up assessment at one year was conducted at the domicile of the stroke survivors which was either their own homes or homes of their relatives.

2.4 Procedure

The study was conducted between 2010 and 2012. Recruitment of participants was carried within 4 weeks of stroke onset by trained research assistants. Data on age, sex, marital status, prestroke employment, stroke sub-type and laterality were obtained from the participants and their clinical notes in addition to home addresses, and telephone numbers where available, for purposes of post-discharge follow-up. Severity of stroke, motor function and functional activity were assessed using the Stroke Levity Scale, the Simplified Fugl-Meyer Assessment and the Motor Functional Independence Measure respectively. Participation was assessed at one year with the London Handicap Scale.

2.5 Instruments

The Stroke Levity Scale (SLS)

The SLS is a brief, clinician-administered, stroke-specific measure comprising of 4 items on motor power of the dominant upper extremity, motor power of the affected lower extremity, presence or absence of aphasia and mobility status. Upper and lower extremity motor power and mobility status are scored on a five point scale (1-5), while absence of aphasia is graded as 0, or minus 1 if present. Total obtainable score on the SLS is 15 and high score depicts less severity. The SLS is a valid and reliable measure (Owolabi & Platz 2009).

The Simplified Fugl-Meyer Assessment (S-FM)

The S-FM is the short version of the motor sub-scale of the Fugl-Meyer Assessment (FMA). Comprising 12 items (6 upper extremity and 6 lower extremity items), the S-FM is clinician-administered and scored on a 3-point ordinal scale ranging from 0 (cannot perform) to 2 (performs fully) based on actual performance of specified movements. Overall score on the S-FM is obtained by simple summation of item scores and higher score depicts better motor function. The overall raw score was transformed to a scale of 0 to 100 in this present study as has been previously established. The S-FM has a high concurrent validity with the motor scale of the FMA ($r = 0.93$) (Hsieh et al. 2007).

The Motor Functional Independence Measure (Motor-FIM)

The motor subscale of the Functional Independence Measure (Motor-FIM) is made up of 13 items in 4 domains of functional activity namely self-care, sphincter control, transfers, and locomotion. The Motor-FIM is scored on

a 7-point scale from 1 (total assistance) to 7 (complete independence) and total score is obtained by summation of the item scores with higher scores indicative of better functional independence. Validity and reliability of the Motor-FIM have been established in stroke survivors (Hsueh et al. 2002).

The London Handicap Scale (LHS)

The LHS assesses handicap or what is now regarded as participation restriction in six dimensions namely mobility, physical independence, occupation, social integration, orientation and economic self-sufficiency, and each dimension is scored on a 6-point scale ranging from 1 (no restriction) to 6 (extreme restriction) (Harwood et al. 1994). Developed based on the International Classification of Impairment, Disability and Handicap (ICIDH), the LHS is valid for evaluating participation concept that replaced handicap in the more recent International Classification of Functioning, Disability and Health (ICF) (Jenkinson et al. 2000). The unweighted scoring method of the LHS was utilized in this study (Jenkinson et al. 2000) and scores for each dimension was reversed to range from 0 (extreme) to 5 (none) so that high scores depicted better participation. The total score was obtained by summing scores for each dimension which was converted to a scale of 100. The LHS is one of the most commonly used scales in assessing participation in stroke studies (Tse et al. 2013).

2.6 Data Analyses

Data were summarized using frequencies, percentages, mean and standard deviation. Bivariate analyses (Spearman rank order correlation for continuous variables and Kruskal-Wallis test for categorical variables) were carried out to identify the associations between participation and the socio-demographic (age, sex, and marital status) and clinical (stroke severity, motor function (S-FM score) and functional activity (motor-FIM score), stroke laterality and type) attributes of the stroke survivors. The continuous variables were age, stroke severity, S-FM score (motor function) and motor-FIM score (functional activity) while sex, marital status, side, and type of stroke were the categorical variables.

Multivariable linear regression ('enter' method) analysis was used to examine the independent influence of socio-demographic and clinical variables that emerged significant in the bivariate analyses, on participation at one year poststroke. Level of statistical significance was set at 0.05.

3. Results

Eighty-three stroke survivors were recruited into the study. Seven died, 2 opted out of the study and 19 could not be located for follow-up leaving 55 stroke survivors available for one year follow-up. There were however no significant differences between completers, those who died and those who dropped out of the study in terms of age (P = 0.36, One-way ANOVA = 1.03); sex, stroke sub-type, laterality and severity ($P \geq 0.1$, Fisher's exact test of 1.81, 1.26, 5.88 and 2.31 respectively). Baseline demographic and clinical characteristics of completers are presented in Table 1.

3.1 Bivariate analyses

Age, stroke severity, motor function and functional activity were found to have significant associations with participation in the respective bivariate analyses. Associations between participation and each of stroke severity and motor function were significant at $P < 0.0001$, while the associations between participation, and functional activity and age were significant at $P < 0.01$ and $P < 0.05$ respectively.

3.2 Multivariate regression analysis

Variables that were statistically significant in the bivariate analyses namely age, stroke severity, motor function and functional activity were imputed into the regression analysis using the 'enter' method. The regression model explained 40% of the variance in participation (adjusted R^2 = 0.40) with only age at one month poststroke emerging as the independent predictor of participation one-year poststroke (Table 2).

4. Discussion

Enhancing participation in individuals who suffer a stroke should be seen as a central goal of patient-centered stroke rehabilitation, and understanding the impact of co-existing variables early after stroke on long-term participation is essential for planning appropriate rehabilitation programmes. This study represents the first on early predictors of long-term social participation in stroke survivors in Nigeria. Patterns of participation across 12 months in the same group of stroke survivors have been reported elsewhere (Vincent-Onabajo 2013).

Several potential predictors of one-year participation were examined, however, only age at stroke onset emerged as a significant variable, with older age predictive of poorer participation. The predictive value of age in post-stroke participation has been previously reported (Desrosiers et al. 2005) and it can be expected that the effect of age on post-stroke participation is likely to be mediated by physiological and social changes that accompany aging independent of stroke-related morbidities (Bukov et al. 2002; Harris & Wolbers 2012). The negative impact of age on post-stroke participation therefore implies that extra efforts may be required to

enhance participation in older stroke survivors. Exploring pre-stroke participation of older stroke survivors may also assist in identifying the shortfall in their participation even before the stroke event. This may in turn assist in setting realistic rehabilitation goals and providing feasible interventions especially as uptake of new life roles and activities might pose some challenges in the elderly.

It is important to point out that our findings may also be due to the higher likelihood of more profound debilitation after stroke in the elderly although initial stroke severity did not independently predict participation of stroke survivors in the study. Strategies that are capable of encouraging and ensuring the involvement of the elderly in life activities and roles - which the participation construct entails – may be helpful especially in the Nigerian context where certain activities are deemed culturally inappropriate in this population.

Components of physical functioning namely motor function and functional activity, assessed at one month post-stroke, did not significantly and independently predict long-term post-stroke participation. This finding may be viewed as unexpected because the three variables are all components of functioning and especially as some previous studies reported contrary findings (Desrosiers et al. 2006; Desrosiers et al. 2008; Hoyle et al. 2012). This disparity between our findings and those of the previous studies may be due to differences in study settings, timing of assessment and statistical analysis employed. For instance, none of the available studies evaluated the impact of motor function and functional activity within four weeks of stroke on long-term participation. While our study examined the impact of some components of physical functioning on participation, the fact that the predictive value of early mental/psychological functions such as cognition, mood, and self-efficacy on participation post-stroke was not assessed constitute a key shortcoming of our study. In a study by Vicogliosi et al. (2011), cognitive status was found to affect level of participation post-stroke while depression has also being linked with post-stroke participation (Desrosiers et al. 2008).

That this study's regression model explained only 40% of the variance in social participation indicates the need to explore in this environment, other potential predictors that have been identified in stroke literature such as mood disorders (D'Alisa et al. 2005). It is however equally possible that due to changes in rehabilitation needs of stroke survivors over time, predicting long-term outcomes on the basis of early data alone as was done in this study may be inadequate (Luker & Grimmer-Somers 2009). It is also important to note that applicability of these findings to individuals who do not report for hospital care within four weeks of stroke onset may be limited as this study evaluated the impact of variables assessed in-hospital on long-term participation. The small size of the sample of stroke survivors studied is another limitation of the study. Despite these limitations, identifying early variables that predict long-term social participation as was done in this present study, as against variables assessed at later periods, may assist in timely identification of stroke survivors at risk of poor outcomes in long-term participation. This may in turn facilitate patient education, and enable planning and provision of appropriate participating-enhancing interventions. Early prediction is especially important in developing countries where compliance with rehabilitation and long-term therapies is particularly poor (WHO 2003; Adeniyi & Zandam 2009; Al-Hadeed et al. 2010).

5. Conclusion

The outcome of this study showed that among the variables assessed within four weeks of stroke onset, only age significantly predicted participation one year after stroke. There is therefore the need to give particular attention to, and devise means of enhancing post-stroke participation in older individuals especially as the pre-morbid participation of such individuals may be sub-optimal. That the regression model in this study explained only 40% of the variance in one-year participation suggests the need for further research on other early predictors of long-term participation after stroke in our setting aside from variables assessed in this study.

Conflict of interest: None

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Table 1: Baseline socio-demographic and clinical attributes of stroke survivors

Attribute	F	%
Gender		
Male	33	60
Female	22	40
Stroke Sub-type		
Ischemic	39	70.9
Hemorrhagic	14	25.5
Unknown	2	3.6
Stroke Laterality		
Right	33	60
Left	22	40
Marital Status		
Living with spouse	47	85.5
Living without spouse	8	14.5
Pre-stroke Employment		
Employed	35	63.6
Unemployed	20	36.4
	Mean ± SD	**Range**
Age (years)	58.0 ± 12.78	31-85
Motor Function (S-FM)	28.13 ± 33.86	0-96
Functional Activity (M-FIM)	43.85 ± 16.54	12-85
Stroke Severity	4.8 ± 4.18	0-13

F - frequency; *S-FM: Simplified Fugl-Meyer Assessment (scored over 100); M-FIM: Motor subscale of Functional Independence Measure (scored over 91)*

Table 2: Multivariable analysis for early predictors of participation one year poststroke

Predictors	β	*P* value
Age	-0.33	0.02[a]
Stroke severity	0.40	0.15
Motor performance	0.24	0.41
Functional activity	-0.02	0.92

[a] significant at $P < 0.05$
$R^2 = 0.46$; Adjusted $R^2 = 0.40$