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Research Article

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Effects of Physiotherapy-Based Training and Involvement of Informal Caregivers on Selected Rehabilitative Outcomes of Stroke Survivors

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Abstract

Background and Objectives: *The purpose of this study was to determine the effects of physiotherapy-based training and involvement of informal caregivers (ICGs) on selected rehabilitative outcomes of stroke survivors (SSs).*

Methods: *Seventy-one (71) pairs of ICGs and SSs, which is 142 participants, comprising 39 pairs in the study group (STG) and 32 pairs in the control group (CTG) completed the study. The mean ages of ICGs in the STG and the CTG were 38.82 ± 15.37 years and 39.16±15.01 years respectively, with no significant difference ($p > 0.05$) between them. The mean ages of SSs in the STG and the CTG were56.21±10.91 years and 60.03±12.11 years respectively, with no significant difference ($p > 0.05$) between them.*

The ICGs in the STG had a physiotherapy-based training the ICGs in the CTG had no such training. All the SSs in both groups received conventional physiotherapy. Barthel Index (BI}, Stroke Impact Scale (SIS), and Stroke Specific Quality of Life (SSQoL) were used to evaluate the SSs at baseline and after the 12thweek of treatment. Statistical analyses involved both descriptive and inferential statistics. The level of significance was set at $p<0.05$.

Results: *There was a higher significant improvement ($p= 0.001$) in the BI score of the STG than that of the CTG ($p= 0.012$). SIS scores showed significant improvement in the SSs' strength ($p= 0.001$); ability to use the hand ($p=0.004$); balance, and participation ($p=0.000$). SSQoL scores showed there were significant improvement in the SSs' family roles ($p= 0.002$); language ($p=0.005$); mobility ($p= 0.003$); self-care, social roles and upper limbs ($p=0.000$). The male ICGs had a positive impact on the SSQoL outcome ($p= 0.025$), strength ($p= 0.010$), and balance ($p= 0.013$) of the SSs. The ICGs' age had a positive relationship with the SSs' ability to use the hand ($p= 0.018$), and participation ($p= 0.020$). ICGs as family members had a positive impact on the SSs quality of life and activity level. In the CTG, SIS scores showed significant improvement in strength ($p= 0.005$); activity ($p=0.002$); balance ($p=0.019$); ability to use the hand ($p=0.003$) and participation ($p=0.001$). SSQoL scores showed there was significant improvement in the SSs' mobility ($p= 0.019$); self-care, social roles and upper limbs ($p= 0.000$).*

Conclusion: *The findings of this study reveal that physiotherapy-based training and involvement of Informal caregivers had significant effects on physical function such as walking, stair climbing, and bathing as well as the quality of life of stroke survivors.*

Keywords: Informal Caregivers, Physiotherapy-Based Training, Stroke Survivors, Rehabilitation Outcomes

Introduction

1.1 Background of the Study

Stroke is a neurological catastrophe characterized by impairment of individual's functioning and independence [1-3]. It has been reported as the leading cause of disability in the adult population and significantly affects the lives of individuals and their families [3]. The World Health Organisation defines stroke as rapidly developing clinical sign of focal (or global) disturbance of cerebral function with symptoms lasting longer than 24 hours or sometimes leading to death, with no apparent cause than of vascular origin [4, 5].

In Nigeria, where this study was undertaken, stroke is seen as a major cause of neurological admissions for acute management which requires the service of doctors, physiotherapists, nurses and other members of the rehabilitation team [6-8]. On discharge, stroke survivors (SSs) are left with functional loss, disability and tend to become dependent on other people, thus necessitating the services of caregivers for daily task performance [2]. Caregivers may be formal or informal caregivers (ICGs [9]. Although the involvement of caregivers has been shown to have positive effects on stroke survivors' outcome yet caregivers lack information, knowledge, experience, and skill [10-12]. Due to the communal lifestyle in a typical African setting informal caregivers (ICGs) tend to rally round and give support.

Hence, this study aimed at determining the effects of physiotherapy-based training and involvement of informal caregivers on selected rehabilitative outcomes of SSs.

Materials and Methods

This study involved 182 participants comprising 91 stroke informal caregivers and 91 stroke survivors who were undergoing physiotherapy rehabilitation at six different hospitals where ethical approvals were also obtained. Figure 1 is the chart depicting the participants' recruitment pattern, distribution and attrition profile for this study.

The Inclusion Criteria were:

i. Stroke survivors older than 18 years whose stroke diagnosis was confirmed by means of a CT scan and/or an MRI.
ii. Stroke survivors with first-time experience of having a stroke.
iii. Stroke survivors who did not have complications such as aspiration pneumonia, urinary tract infection, pressure ulcer, joint contracture, and recurrent stroke.
iv. Stroke survivors who were able to communicate verbally.
v. Informal caregivers, males or females, older than 18 years.
vi. Informal caregivers who were able to give consent to enrolment and willing to complete the study.
vii. Informal caregivers living in the same apartment with the stroke survivor.

Where as the Exclusion Criteria were:

i. Stroke survivors with comorbidities, such as cardiomyopathy.
ii. Stroke survivors who did not comply with anti-hypertensive medication.
iii. Informal caregivers who did not live with the stroke survivors.
iv. Informal caregivers who were stroke survivors or impaired by any other disease or injury.
v. Outcomes for stroke survivors were determined with the Barthel Stroke Specific Quality of Life Scale (SSQoL) [13].

Methods

A purposive sampling technique was used for the study based on the target population of ICGs and their respective SSs. Sample size determination was done using Cohen formula (Cohen, 1992) resulting a total of 100 participants though the eventual sample size rose to 142 which effectively took care of suggestion for attrition The research design was a pre-test and post-test [14].

Procedure for Data Collection

The participants were approached and all those who were willing to participate in the study signed the informed consent form. The purpose of the study was carefully explained to all the participants including the detail of the research procedures. Sociodemographic data such as name, gender, age, occupation, home address, contact phone number, premorbid health status and educational level were taken and documented for the participating stroke survivors. The same data were collected for the Informal caregivers, including their relationship with stroke survivor. Clinical data were collected from the individual stroke survivor's case note and from physical observation and assessment. At baseline the following were collected: diagnosis, side affected, onset of stroke, length of hospital stays, blood pressure, and comorbidities.

Assessments were carried out at baseline, at the end of 4 weeks, 8 weeks, and post-intervention at the end of the 12 weeks of study.

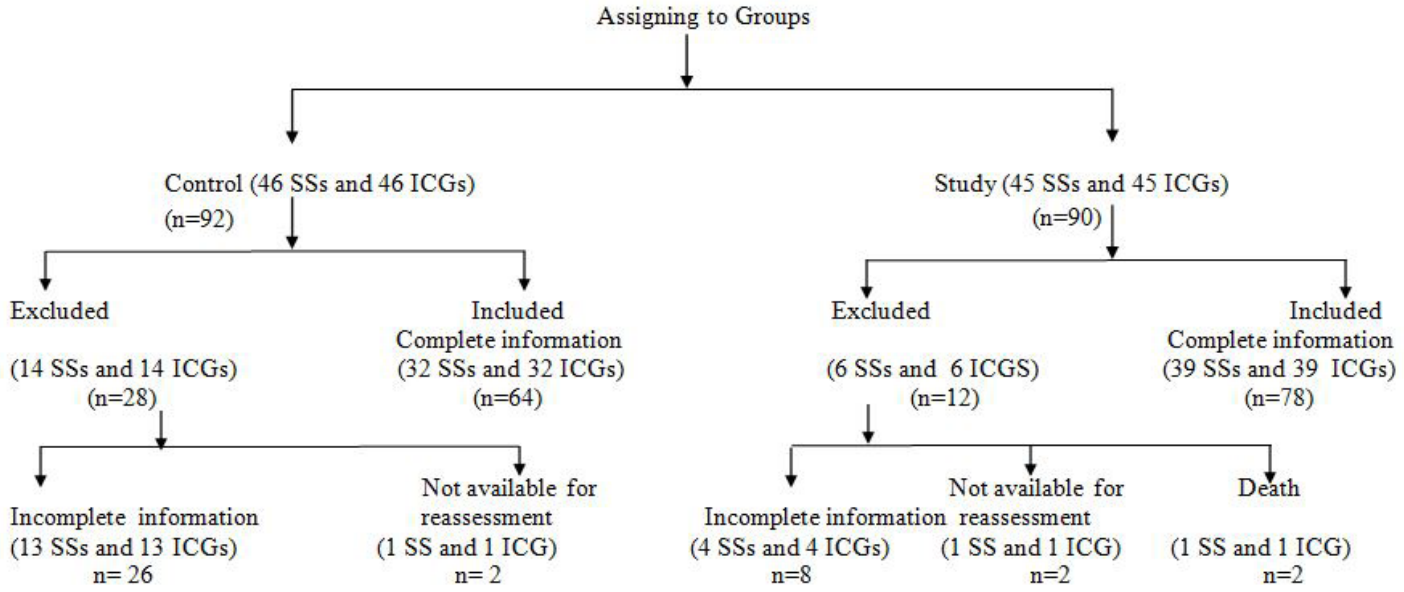

Figure 1: Recruitment Scheme for Participants.
Key:
SSs=Stroke survivors
IGCs= Informal caregiver

Intervention Procedures for Both the Study Group and Control Group

All the recruited stroke survivors in both the study group and control group received conventional physiotherapy administered at each hospital involved in this study. The conventional physiotherapy was diverse but basically included passive mobilisation, assisted free active exercises, free active exercises, pain relief, spasticity reduction, strength training, hand activities, class exercises, standing and walking re-education.

Intervention Procedures for Informal Caregivers in The Study Group

The informal caregivers in the intervention group received physiotherapy-based training on their in-dealing with their care recipients. They were trained with the assistance of practising physiotherapists who were recruited as research assistants. Some aspect of the training protocol was adapted from previous works, including as well as conventional physiotherapy practice [15].

This training lasted the whole period of the 12 weeks of study and phone conversations were used to monitor compliance and make modification based on changes in physical and health status of the SSs. The family caregivers were able to practice the skill until they felt confident about their performance.

The informal caregivers of stroke survivors were not given any formal physiotherapy-based training. However, all the recruited stroke survivors in the control group received their conventional physiotherapy at the study setting.

3.3 Data Analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 22.0 and summarised using descriptive statistics of percentages, mean and standard deviation for the demographic and physical characteristics of study participants and onset of stroke. Tables were used to present all the physical and socio-demographic characteristics of the participants such as gender, occupation, diagnosis, side of affectation as they related to the stroke survivors, as well as for the relevant aspects for informal caregivers. Statistics of t-test was used to compare the data obtained on the ratio scale, such as age. Categorical data such as diagnosis, gender, and side of affectation were summarised using percentages. Mann-Whitney U test was used to determine the significance of the difference between the baseline scores and post intervention scores of the outcome measures. Point biserial analysis was done. To satisfy the assumption of point biserial analysis, the categorical variable was recategorized into two serial levels as follows: Gender (0= male, 1= female), Occupation (0= employed, 1= unemployed), Relationship (0= familial, 1= non-familial), Education (0= formal, 1= non-formal), Spouse (0= male. 1= female). The multivariate linear regression test was also used to determine the strength and character of the relationship between the personal characteristics of the ICGs and the rehabilitative outcomes of the SSs, the variables were simplified and represented as such- occupational status: Employed and unemployed; Care setting: Home and others; Care Location : Upstairs and downstairs; Relationship: spouse, child, relative and others; Educational status: No formal, primary, secondary, post-secondary. The level of significance was set at $p \leq 0.05$.

Results

Relevant data analyses are as presented in Tables 2, 3, 4 and 5.

Table 1: General Characteristics of Participants and Test of Homogeneity (N=71)

Characteristics	Categories	Combined scores n (%) or x ± s	Study group (n=39) n (%) or x ± s	Control group (n=32) n (%) or x ± s	p
Caregivers (ICGs)					
Mean Age (years)			38.82±15.37	39.16± 15.01	0.927
Age range(years)					
Gender	Male	38(53.5)	21(53.8)	17(53.1)	
	Female	33(46.5)	18(46.2)	15(46.9)	
Occupation	Unemployed	4(10.8)	3(7.7)	1(3.1)	
	Employed	53(73.2)	29(74.4)	24(75.0)	
	Retired	13(18.3)	2(5.1)	1(3.1)	
	Student	70(98.6)	5(12.8)	6(18.8)	
Education	No Formal	1(1.4)	1(2.6)	0(0.0)	
	Primary	6(8.5)	4(10.3)	2(6.3)	
	Secondary	25(35.2)	14(35.9)	11(34.4)	
	Post-Secondary	39(54.9)	20(51.3)	19(59.4)	
Relationship	Spouse	25(35.2)	16(41.0)	9(28.1)	
	Child	29(40.8)	10(41.0)	13(40.6)	
	Friend	1(1.4)	1(2.6)	0(0.0)	
	Relative	9(12.7)	5(12.8)	4(12.5)	
	Others	6(8.5)	1(2.6)	5(15.6)	
	Grandchild	1(1.4)	0(0.0)	1(3.1)	
Setting	Home	59(84.3)	31(79.5)	28(87.5)	
	Others	1(1.4)	2(5.1)	1(3.1)	
	Hospital	7(9.9)	4(10.3)	3(9.4)	
	Nursing	1(1.4)	1(2.6)	0(0.0)	
	Home				
Type of apartment	Downstairs	52(73.2)	30(76.9)	22(68.8)	
	Upstairs	17(23.9)	9(23.1)	8(25.0)	
Stroke survivors (SSs)					
Mean Age(years)			56.21±10.91	60.03±12.11	0.166
Age range(years)			34-84	35-80	
Gender	Male	38(53.5)	21(53.8)	17(53.1)	
	Female	33(46.5)	18(46.2)	15(46.9)	
Occupation	Unemployed	5(8.5)	1(2.5)	5(15.6)	
	Employed	52(73.2)	32(82.1)	20(62.5)	
	Retired	13(18.3)	6(15.4)	7(21.9)	
Affected Side	Left	33(46.5)	19(48.7)	14(43.8)	
	Right	38(53.5)	20(51.3)	18(56.3)	
Frequency of BP measurement	Usually Taken	52(73.2)	30(76.9)	22(68.8)	
	Not Taken	18(25.4)	8(20.5)	10(31.3)	

BP status	High	13(18.3)	5(12.8)	8(25.0)	
	Moderate	18(25.4)	13(33.3)	5(15.6)	
	Stable	17(23.9)	8(20.5)	9(28.1)	
	Fluctuate	11(15.5)	5(12.8)	6(18.8)	
*Significant at p< 0.05					

Table 2: Comparison of Outcome Measures Scores at Baseline (N=71)

Outcomes	**Study group (n=39) x ± s**	**control group(n=32) x ± s**	**p value**	**Z**
Barthel Index	71.28±22.79	64.16±27.01	0.232	1.206
Stroke Impact Scale				
Strength	40.30±24.35	48.05±24.92	0.194	-1.313
Memory	78.48±25.10	73.66±26.85	0.441	-0.775
Mood	66.67±15.61	66.41±14.19	0.942	0.072
Communication	94.14±16.62	84.15±23.62	0.041*	2.086
Activity	52.24±20.61	53.59±26.20	0.809	-0.243
Balance	53.77±29.88	55.90±27.70	0.759	-0.308
Hand	32.05±35.22	34.53±34.25	0.766	-0.299
Participation	33.89±24.14	39.65±26.75	0.344	-0.952
Recovery	47.31±22.06	50.17±24.01	0.609	-0.514
SSQoL				
Energy	8.31±4.00	8.22±4.54	0.930	-0.088
Family roles	8.54±3.65	9.59±3.76	0.236	-1.197
Language	19.72±6.85	20.09±6.35	0.813	-0.238
Mobility	16.69±7.61	16.38±7.88	0.864	0.172
Mood	17.13±6.74	18.75±5.75	0.285	-1.077
Personality	10.69±4.06	10.69±3.05	0.996	0.006
Self-care	13.62±5.77	13.09±6.23	0.716	0.366
Social roles	10.77±6.02	9.09±5.75	0.238	1.190
Thinking	10.18±4.03	10.53±4.28	0.723	-0.356
Upper limbs	10.05±5.22	11.50±7.09	0.325	-0.991
Vision	12.87±3.77	13.25±2.82	0.640	-0.470
Work	7.64±3.77	6.81±3.39	0.339	-0.963

*Significant at p< 0.05
Key
BI: Barthel Index
SIS: Stroke Impact Scale
SSQOL: Stroke Specific Quality of Life Scale

Table 3: Within Group Comparison (Study Group)

Outcomes	Pre-test x ± s	Post -test x ± s	p	Z
Barthel Index	71.28±22.79	80.51±15.97	**0.001***	-3.782
Stroke Impact Scale				
Strength	40.30±24.35	58.85±24.44	**0.001***	-3.511
Memory	78.48±25.10	81.41±21.43	0.337	-0.973
Mood	66.67±15.61	77.49±13.01	**0.000***	-3.879
Communication	94.14±16.62	93.41±15.23	0.707	0.379
Activity	52.24±20.61	65.26±16.40	**0.000***	-4.924
Balance	53.77±29.88	73.36±20.59	**0.000***	-5.427
Hand	32.05±35.22	51.67±32.02	**0.004***	-3.100
Participation	33.89±24.14	55.29±24.27	**0.000***	-5.196
Recovery	47.31±22.06	70.77±14.71	**0.000***	-6.836
SSQOL				
Energy	8.31±4.00	9.95±3.55	0.068	-1.875
Family roles	8.54±3.65	10.77±2.88	**0.002***	-3.356
Language	19.72±6.85	22.88±4.33	**0.005***	-2.990
Mobility	16.69±7.61	30.41±6.02	**0.003***	-3.160
Mood	17.13±6.74	20.87±3.46	**0.001***	-3.727
Personality	10.69±3.05	11.41±3.28	0.316	-1.016
Self-care	13.62±5.77	17.97±4.96	**0.000***	-4.775
Social roles	10.77±6.02	14.33±5.82	**0.000***	-3.818
Thinking	10.18±4.06	11.23±3.73	0.061	-1.934
Upper limbs	10.05±5.22	15.85±6.12	**0.000***	-5.420
Vision	12.87±3.77	13.51±3.03	0.246	-1.178
Work	7.64±3.77	9.67±3.60	**0.001***	-3.578

*Significant at p< 0.05
Key
BI: Barthel Index
SIS: Stroke Impact Scale
SSQOL: Stroke Specific Quality of Life Scale

Table 4: Within Group Comparison (Control Group)

Outcomes	Pre-test x ± s	Post -test x ± s	p	Z
Barthel Index	64.16±27.01	75.78±25.62	**0.012***	-2.661
Stroke Impact Scale				
Strength	48.05±24.92	58.87±25.45	**0.005***	-3.026
Memory	73.66±26.85	73.62±25.25	0.809	-0.244
Mood	66.41±14.19	76.52±20.32	**0.000***	-3.919
Communication	84.15±23.62	87.56±19.92	0.312	-1.029
Activity	53.59±26.20	67.90±26.51	**0.002***	-3.340
Balance	55.90±27.70	66.40±27.02	**0.019***	-2.486
Hand	34.53±34.25	55.32±34.97	**0.003***	-3.182

Participation	39.65±26.75	64.92±28.59	**0.001***	-3.615
Recovery	50.17±24.01	66.00±20.93	**0.000***	-5.323
SSQOL				
Energy	8.22±4.54	10.28±3.97	0.016*	-2.552
Family roles	9.59±3.76	11.47±3.44	**0.014***	-2.601
Language	20.09±6.35	20.41±4.86	**0.755**	-0.314
Mobility	16.38±7.88	20.06±7.17	**0.019***	-2.481
Mood	18.75±5.75	20.72±5.13	**0.050**	-2.039
Personality	10.69±3.05	12.38±3.73	0.029*	-2.285
Self-care	13.09±6.23	17.50±5.68	**0.000***	-5.022
Social roles	9.09±5.75	15.59±5.76	**0.000***	-5.648
Thinking	10.53±4.28	10.88±3.78	0.549	-0.606
Upper limbs	11.50±7.09	15.66±7.20	**0.000***	-4.013
Vision	13.25±2.82	13.16±2.70	0.815	-0.236
Work	6.81±3.39	10.44±3.26	**0.000***	-5.397

*Significant at p< 0.05
Key
BI: Barthel Index
SIS: Stroke Impact Scale
SSQOL: Stroke Specific Quality of Life Scale

Table 5: Mean Difference Scores (n=71)

Outcomes	**study (n=39) Pre-test x ± s**	**control (n=32) Post -test x ± s**	**p value**	**Z**
Barthel Index	-9.23±15.24	- 11.63±24.71	**0.618**	0.500
Stroke Impact Scale				
Strength	-13.49±23.68	-11.69±21.51	**0.746**	-0.326
Memory	-3.38±21.43	-0.81±18.44	0.599	-0.529
Mood	-10.82±17.19	-10.84±15.41	**0.995**	0.006
Communication	0.733±12.08	-3.92±21.20	0.252	1.155
Activity	-13.01±16.51	-14.76±24.60	**0.724**	0.354
Balance	-19.59±22.54	-11.92±26.70	**0.197**	-1.303
Hand	-19.62±39.51	-26.00±35.00	**0.966**	0.043
Participation	-21.39±25.72	-25.71±39.59	**0.584**	0.550
Recovery	-23.46±21.43	-17.62±17.83	**0.238**	0.157
SSQOL				
Energy	-1.64±5.47	-2.06±4.08	0.729	0.348
Family roles	-2.23±4.15	-1.88±4.08	**0.718**	-0.362
Language	-2.56±5.36	-0.31±5.63	**0.089**	-1.723
Mobility	-3.72±7.35	-3.69±8.41	**0.987**	-0.016
Mood	-3.72±6.27	-1.97±5.46	**0.213**	-1.256
Personality	-0.72±4.41	-1.69±4.18	0.349	0.943
Self-care	-4.36±5.70	-4.41±4.96	**0.971**	0.037

Social roles	-3.56±5.83	-6.50±6.51	**0.049**	2.003
Thinking	-1.05±3.40	-0.34±3.21	0.374	-0.896
Upper limbs	-5.80±6.68	-4.16±5.86	**0.281**	-1.087
Vision	-0.641±3.40	0.09±2.25	0.298	-1.048
Work	-2.03±3.54	-3.63±3.80	**0.071**	1.834

*Significant at $p < 0.05$
Key
BI: Barthel Index
SIS: Stroke Impact Scale
SSQOL: Stroke Specific Quality of Life Scale

Discussion, Conclusion and Recommendations

At the end of the treatment session lasting 3 months, stroke survivors in the study group significantly improved in many areas of the outcome measures used. The training given to this category of patients which was based on the information – motivation - behavior change model might have influenced the skill and ability of the caregivers to provide adequate care to the care recipients [16]. There was no significant difference between the mean scores at baseline of the study and in the control group except in the communication domain of the stroke survivors when comparing the study and control groups.

The SSs in the study group improved their performance of activities of daily living (ADL) significantly, more than those in the control group, Barthel Index (BI). This significant positive change in activity level of patients in the study group can be attributed to the training that the ICGs received to improve care for their care recipients as studies have shown that educating the informal care givers of stroke survivors increases the rate of functional recovery [10, 11, 17, 18]. Yet, it is remarkable to note that the ADL of stroke survivors in the control group also got improved. This could be due to the fact that they were not ethically deprived from receiving physiotherapy care in the hospital during the period of study. In addition, these informal caregivers were not placed under information restriction on appropriate care procedures for their care recipients. Those of them who were literate and had access to the internet, could have sourced for pertinent information to improve their knowledge and skill.

Within the group comparison, there were significant improvements in the same number of domains (mainly physical functioning) in both the study and the control group. However, there were no significant changes in the SSs' language, communication, thinking. This could be due the fact that physiotherapy is mainly focused on the physical functioning aspect more than the emotional aspect of the stroke survivors. This statement was also supported by [19].

In the study group, there was a significant change in the SSs' quality of life and balance, in association with the ICGs' sex. This is not a common finding in novel studies, most studies have shown an association of SSs' sex with their quality of life and level of functional improvement; such that male SSs' record a higher level of functional improvement than their female counterparts [20, 21, 11, 28]. In the control group however, there were significant changes in the SSs' BI score, SSQol score, in association with the sex of their ICGs.

In the study group, there was a significant relationship between the age of the ICGs and the hand function of the SSs. There was a direct relationship between the age of the ICGs and the SSs' BI score, SSQoL score, strength, mood, activity, balance, hand and recovery. There is also an inverse relationship between the ICGs' age and the SSs' memory, communication, language, and participation.

There was a consistent relationship between the caregivers' social relationship as spouse (especially as husband) to the stroke survivor and the rehabilitative outcome of the stroke survivors. This is in line with studies that affirmed the importance of a spouse presence in the overall rehabilitation of stroke survivors [22].

The informal caregivers tended to be younger than the stroke survivors similar to studies by [23, 24]. This could be a point of advantage for them, for younger people potentially have more physical strength and stamina which would be needed to render care rather than elderly ones. Age has been associated with many vascular changes such as arteriosclerosis, hypertension that predisposes individuals to stroke. It is pertinent to note that the majority of stroke survivors in this study were either middle aged or elderly, depicting the age distribution of stroke incidence commonly recorded the majority of informal caregivers in this study were family members:

spouses or children [25, 26]. This demographic profile truly depicts the cultural milieu of the African setting such as Nigeria where this study was undertaken, because family members typically rally around people in need of care [27-43].

References

1. Concors A, Stagliano A (2018) The effects on gait speed and activity level of a novel body weight supported treadmill training program on a 39-year-old patient with

right hemiparesis. International Physical Medicine and Rehabilitation Journal 3: 253-260.
2. Olawale OA (2021) Understanding Stroke In: Life after stroke: A Concise Handbook for Stroke Survivors and the General Public. Medilag Press 2021: 1-77.
3. Sanchetee P (2021) Current trends in Stroke Rehabilitataion, intechopen www. IntechOpen.com
4. Sacco RL, Kasner SE, Broderick JP, Caplan LR, Connors JJ, Culebras A, Elkind MS, George MG, Hamdan AD, Higashida RT, Hoh B, et al. (2013) An updated definition of stroke for the 21st century: a statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke 44: 2064-2089.
5. Abbot AL, Silvestrini M, Topakian R, Golledge J, Brunser AM, de Borst GJ, et al. (2017) Optimizing the definitions of stroke, transient ischemic attack, and infarction for research and application in clinical practice. frontiers in neurology 8: 1-14.
6. Komolafe MA, Ogunlade O, Komolafe EO (2007) Stroke mortality in a teaching hospital in South Western Nigeria. Tropical Doctor 37: 186-188.
7. Alkali NH, Bwala SA, Akano AO, Osi Ogbu O, Alabi P, Ayeni OA, et al. (2013) Stroke risk factors, subtypes, and 30-day case fatality in abuja, nigeria. nigerian medical journal 54: 129.
8. Aiyejusunle CB, Olawale OA, Umeaku GO, Onuegbu NF (2019) Development and use of a tool for assessing upper and lower limb synergies in people with stroke. Romanian journal of neurology 18: 32-39.
9. Australian Institute of Health and Welfare (2018) Metadata Online Registry: Informal career- relationship to care patient.
10. Kalra L, Evans A, Perez I, Melbourn A, Patel A, Knapp M, et al. (2004) Training carers of stroke patients: Randomized controlled trial. British Medical Journal 328: 1099.
11. Hong SE, Kim CH, Kim EJ, Joa KL, Kim TH, Kim SK, Han HJ, Lee EC, Jung HY, et al. (2017) Effect of a caregiver's education program on stroke rehabilitation. Annals of Rehabilitation Medicine 41: 16-24.
12. Wang Y, Tyagi S, Hoenig H (2021) Burden of informal care in stroke survivors and its determinants: a prospective observational study in an Asian setting. BMC Public Health 21, 1945 (2021).
13. Duncan PW, Wallace D, Lai SM, Johnson D, Embretson S, Laster LJ, at al. (1999) The stroke impact scale version 2.0. evaluation of reliability, validity and sensitivity to change. Stroke 30: 2131-2140.
14. Dworzynski K, Rotchie G, Fenu E, MacDermott K, Playford ED (2013) Rehabilitation after stroke: summary of nice guidance. bmj clinical research 346: f3615.
15. Pitthayapong S, Thiangtam W, Powwattana A, Leelacharas S, Waters CM (2017) A community-based program for family caregivers for post stroke survivors in Thailand. Asian Nursing Research 11: 150-157.
16. Fisher JD, Fisher WA (2002) The information-motivation-behavioral skills model. A general social psychological approach to understanding and promoting health behavior.
17. Muhrodji P, Wicaksono HDA, Setyopranoto I, Vidyanti AN (2021) Roles and problems of stroke caregivers: A qualitative study in Yogyakarta, Indonesia. https://doi.org/10.5281/zenodo.4716264.
18. Yi X, Luo H, Zhou J (2020) Prevalence of stroke and stroke related risk factors: a population based cross sectional survey in southwestern China. BMC Neurol 20: 5.
19. Hamza AM, Al Sadat N, Loh SY, Jahan NK (2014) predictors of poststroke health-related quality of life in Nigerian stroke survivors: A 1-Year Follow-Up Study. Biomed Res Int 2014: 350281.
20. Gray LJ, Sprigg N, Bath PM (2007) Taist investigators. sex differences in quality of life in stroke survivors: data from the tinzaparin in acute ischaemic stroke trial (taist). troke 38: 2960-2964.
21. Gargano JW, Reeves MJ, Paul Coverdell (2007) National Acute Stroke Registry Michigan Prototype Investigators. Sex differences in stroke recovery and stroke-specific quality of life: results from a statewide stroke registry. Stroke 38: 2541-2548.
22. Jørgensen HS, Reith J, Nakayama H, Kammersgaard LP, Raaschou HO, Olsen TS (1999) What determines good recovery in patients with the most severe strokes? The Copenhagen study. Stroke 30 :2008-2012.
23. Gbiri CA, Olawale OA, Isaac SO (2015) Stroke management: informal caregivers' burdens and strains of caring for stroke survivors. Ann physrehabil med 58: 98-103.
24. Akosile CO, Banjo TO, Okoye EC (2018) Informal caregiving burden and perceived social support in an acute stroke care facility. Health and Quality of Life Outcomes16: 57.
25. Rudd J (2018) Average age of stroke victims is getting younger according to new figures released by PHE. www.bhf.org.uk
26. Akinyemi RO, Ovbiagele B, Adeniji OA (2021) Stroke in Africa: profile, progress, prospects and priorities. Nature Reviews Neurology 17: 634-656.
27. Khondowe 0, Mpofu R, Rhoda A (2006) Experiences of caregivers of stroke patients in Lusaka, Zambia. Journal of Community and Health Sciences http://hdl.handle.net/10566/2829
28. Winstein CJ, Stein J, Arena R, Bates B, Cherney LR, Cramer SC, Deruyter F, Eng JJ, Fisher B, Harvey RL, Lang CE, et al. (2016) On behalf of the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, and Council on Quality of Care and Outcomes Research. Guidelines for adult stroke rehabilitation and recovery: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke.
29. Ahmad SA, Supamdiman I, MArkam S, Estiasari R, Hankey G (2018) The effect of caregiver education program onf ucntional independence and mortality in first-ever stroke. Malaysian Journal of Medicinal Research 2: 57-67.

30. Allen CMC, Harrison MJ, Wade DT (1988) The management of acute stroke. John Hopkins University Press.
31. Byblow WD, Stinear CM, Barber PA, Petoe MA, Ackerley SJ (2015) Proportional recovery after stroke depends on corticomotor integrity. Annals of Neurology 78: 848-859.
32. Connoly BH, Montgomery PC (2003) A framework for examination, evaluation, and intervention. in: clinical applications for motor control (first edition). Slack incorporated 2003: 1-23.
33. Duncan PW, Goldstein LB, Horner RD, Landsman PB, Samsa GP, Matchar DB, et al. (1994) Similar motor recovery of upper and lower extremities after stroke. Stroke 25: 1181-1188.
34. Haan RD, Aaronson N, Limburg M, Hewer RL, Van Crevel H (1993) Measuring quality of life in stroke. Stroke 24: 320-327.
35. Kim P, Warren S, Madill H, Hadley M (1999) Quality of life of stroke survivors. Quality Life Res 8: 294-301.
36. Ojo O, Onyegiri CU (2017) Stroke admission in Kabwa General Hospital: A 30- month review. Sahel Medical Journal 20: 155.
37. Perna R, Temple J (2015) Rehabilitation Outcomes: Ischemic versus Hemorrhagic Strokes. Behavioural neurology 2015: 891651
38. Preveen RJD, Dsouza SA, Sitaram A, Umakanth S (2021) Effectiveness of caregiver education for Prevention of Shoulder pain in Acute Stroke survivors A randomized controlled trial. Disability, CBR and inclusive Development 33: 66-80.
39. Powers WJ, Rabinstein AA, Ackerson T, Adeoye OM, Bambakidis NC, Becker K, Biller J, Brown M, Demaerschalk BM, Hoh B, Jauch EC, et al. (2018) Guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke 49: 46-99.
40. Rahman Ms, Salek AK (2016) Training of caregiver for home care management of stroke survivors at low resource setting. Bangabandhu Sherkh Mujib Medical University Journal 9: 193-195.
41. Reid A, Chesson R (1998) Goal Attainment Scaling: is it appropriate for stroke patients and their physiotherapists? Physiotherapy 84: 136-144.
42. Stinear CM (2017) Prediction of motor recovery after stroke: Advances in biomarkers. Lancet Neurology 16: 826-836.
43. Ugur HG, Erci B (2019) The Effect of Home Care for Stroke Patients and Education of Caregivers on the Caregiver Burden and Quality of Life. Acta clinica Croatica 58: 321-322.