Functional limitation and health-related quality of life, and associated factors among long term stroke survivors in a Malaysian community

Nor Azlin Mohd Nordin, PhD[1], Noor Azah Abd Aziz, MPhil[2], Saperi Sulong, PhD[2], Syed Mohamed Aljunid, PhD[3,4]

[1]School of Rehabilitation Sciences, Faculty of Health Sciences, Universiti Kebangsaan Malaysia, [2]Universiti Kebangsaan Malaysia Medical Centre, [3]International Center for Casemix and Clinical Coding, Universiti Kebangsaan Malaysia, [4]Department of Health Policy and Management, Faculty of Public Health, Kuwait University, Kuwait

ABSTRACT

Purpose: This study aimed to evaluate function and quality of life (QoL) and associated factors among long term stroke survivors in the Malaysian community.

Methods: A cross-sectional study was conducted involving stroke survivors living in the community at two or more years post-stroke. Eligible participants with the diagnosis of stroke were identified from 2005-2010 Case mix database of a tertiary hospital. The patients' medical records were analysed and data on demographic and clinical profiles were collected. Telephone interviews were conducted to assess existing stroke-related impairments, comorbidities, stroke recurrences, current level of function and QoL, with the usage of Rivermead mobility index (RMI), Barthel index (BI) and Stroke specific quality of life scale (SSQOL).

Results: A total of 203 stroke survivors; mean age 64.5 (Standard Deviation(SD) 12.2) years, 45.3% males, stroke duration 44.7 (SD 13.8) months completed the interviews. Mean RMI was 11.7 (SD 3.4) and BI was 89.8 (SD 19.8). Forty three percent and 99% had difficulty in ascending/descending stairs and fast walking, respectively. Up to 20% had limitations in most of the BI subsets. Mean SSQOL was 207.6 (SD 37.2), with domains mostly affected were 'energy' and 'social role'. Function and QOL were both influenced by age ($p<0.01$) and stroke related impairments ($p<0.05$), but not by co-morbidities or stroke recurrence. QoL and function (both mobility and ADL) were strongly positively correlated with each other ($p<0.01$).

Conclusions: It was observed that functional limitations especially mobility, remains post-stroke major problem and were attributed mainly to stroke-related impairments.

KEY WORDS:
Long term stroke, function, quality of life

INTRODUCTION

Stroke is a complex neurological illness which is commonly associated with multiple and long standing impairments.[1] Although reduction of stroke mortality mirrors success in the care of individuals with a stroke, managing post-stroke consequences in those who survive remains a challenge. Survival from stroke frequently means living with some forms of disabilities. The number of people with stroke-related physical disabilities is escalating worldwide parallel to the growth of ageing population and increased lifestyle diseases such as hypertension and diabetes, which are known risk factors for stroke.[2]

Physical dysfunction is one of the dominant aspects of post-stroke disability, often associated with stroke-specific impairments such as motor impairment, fatigue, spasticity and balance problem.[3,4] A past study showed that up to 33% of stroke survivors demonstrated worsening in function within four months of hospital discharge.[5] As stroke becomes chronic, there is a heightened risk of decline in physical function at a rate of 9% annually, with the peak decline begins at three years post-stroke.[6] Added to this, being mostly in the older aged group, individuals with stroke is exposed to age-related acceleration in functional decline. In a longer term, persistent physical dysfunction may impose greater disability-related burden to the stroke survivors, the family and the society. Its impact on health-related quality of life (HRQoL) of stroke survivors has been found to be substantial [7-10] and demonstrated across multiple domains of functioning.[11]

In most developing countries including Malaysia, rehabilitation services for people with stroke are organised in a hospital out-patient unit and provided for less than one year post-stroke due to resource constraints. The limited number of community-based rehabilitation centres to provide continuous support for people with stroke following discharge from hospital care has resulted in stroke survivors being left to manage long term post-stroke impact on their own. There is also limited access to post-stroke care and monitoring at primary health care settings. As such, little is known on how stroke survivors cope with the consequences of stroke in the later phase, and whether they would require further rehabilitation to function optimally in the community. Therefore, in this study, we sought to determine functional status and quality of life of long term stroke survivors living in the community, and to identify factors that influence function and health-related quality of life (HRQoL) amongst them. To the best of our knowledge,

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Corresponding Author: Nor Azlin Mohd Nordin, Physiotherapy Program, School of Rehabilitation Sciences, Faculty of Health Sciences, Universiti Kebangsaan Malaysia, Jalan Raja Muda Abdul Aziz, 50300 Kuala Lumpur, Malaysia
Email: norazlin8@ukm.edu.my

published research information involving Malaysian stroke survivors in this topic area is unavailable to date.

MATERIALS AND METHODS

This was a cross-sectional mixed-method study involving long term stroke survivors living in a community in Malaysia. The study received its ethical approval from the Research and Ethics Secretariat of University Kebangsaan Malaysia.

Setting and timescale

This study was conducted from June 2012 to January 2013 at University Kebangsaan Malaysia Medical Centre (UKMMC) a university-based tertiary level hospital located at the Klang Valley, one of the most populated regions in Malaysia.

Participants

We identified eligible participants with a diagnosis of cerebrovascular accident (CVA) ICD-10 code I61 to I69 from patients' database years 2006 to 2010 maintained by the Case mix unit of the UKMMC. Admission records from these years were selected assuming that the stroke patients would have been discharged from the care and rehabilitation at the hospital. The standard of practice in UKMMC is that all stroke patients will be seen for rehabilitation for a maximum duration of two years before they are discharged, regardless of their functional status. We excluded patients who 1) had a transient ischemic attack without progression to stroke, 2) were aged 18 years and below at the time of stroke diagnosis, 3) had mobility problems due to conditions other than stroke such as Parkinson's disease and severe arthritis, 4) had cognitive dysfunction measured on a Mini mental state examination (MMSE <24), 5) were institutionalised post-discharged from the hospital. Screening of subjects was done twice; during reviews of medical records and during one-to-one interviews.

Data collection

Data was collected in two stages; analyses of medical record followed by one-to-one interviews with the stroke survivors.

Analyses of medical record

We first traced medical records of 813 patients after excluding Transient Ischemic Attack and patients below age 18 years from the list of discharge. Of this, 164 records could not be located and 92 records were classified as deaths, leaving 557 records available for analysis. A proforma was used in retrieving data from selected medical records. Two physiotherapists who were trained in the use of the proforma retrieved demography and clinical data from the individual patients' medical record which includes date of diagnosis, date of birth, gender, race, social background, stroke subtype, side of stroke and comorbidities. The categorisations of pathological type of stroke and side of stroke were based on findings from brain imaging (computerised tomography or magnetic resonance imaging); a routine investigation performed within 24 hours of stroke onset. Cases without pathological confirmation of stroke subtype were classified as unspecified. We excluded a further 41 records with incomplete data, thus reducing the number for one-to-one interviews to 516 subjects.

One-to-one interviews

We conducted one-to-one interviews with the subjects to collect data on post-discharge rehabilitation, current involvement in physical activities, existing stroke-related impairment (motor impairment, sensory symptoms, speech problems, memory deficit and post-stroke depression), and present functional status and HRQoL. We first called the patients to obtain verbal consent for the interview. Subjects who agreed to participate were asked either to visit the outpatient physiotherapy unit or, if they were unable to attend, to allow for a telephone interview. The interviews were conducted by the same physiotherapists who were involved in the patients' medical record reviews. Individual patient's functional status was determined using two parameters; mobility level and independence in activities of daily living (ADL). Mobility level was recorded with the Rivermead mobility index (RMI)[12] and independence in ADL was identified with the Barthel's index (BI).[13] RMI consists of 15 parameters of mobility (from turning in bed to running or fast walking), with total score ranges from 0-15 and 15 indicating full mobility. BI is a questionnaire consists of 10 items which include feeding, transferring from wheelchair to bed and return, grooming, transferring to and from a toilet, bathing, walking on level surface, going up and down stairs, dressing, continence of bowels and bladder. The total score for BI ranges from 0-100, with lower scores below 20 indicating total dependency and higher scores of 91 to 100 demonstrating mild dependency.[13]

We assessed HRQoL with the use of Stroke-specific QoL scale (SSQOL).[14] The SSQOL has 12 main subdomains with a total of 49 items: Energy (four items), family roles (eight items), language (seven items), motility (12 items), mood (eight items), personality (four items), self-care (eight items), social roles (seven items), thinking (four items), upper extremity function (nine items), vision (four items) and work/productivity (three items). Each item was scored with a Likert scale 1 to 5, with the lowest score indicating 'strongly agree/ could not do it at all/ total help' and the highest score indicating 'strongly disagree/ no trouble / no help at all. The highest possible total score for HRQoL using the scale is 245. A pilot testing of the questionnaire was conducted on 15 subjects following which minor amendments on questions related to social background and post-stroke rehabilitation were made. Each interview took 15 minutes to complete.

Statistical analysis

All data were analysed with SPSS version 19.0. Categorical data were presented as percentages and scores for RMI, BI and SSQOL shown as mean and median. For further analysis, we categorised BI total score into '91 and above' (favourable), and '90 and below' (unfavourable). A score of '91 and above' indicates slight dependence in ADL activities which are included in BI.[13] There is no standardised cut off point score for good mobility and good QoL on the RMI and SSQOL scale, respectively. We selected the score of '10 or more' on the RMI to represent 'good mobility' considering that respondents who obtain this score are independent in two-third of the mobility tasks and most likely require assistance only in the high-level activities as illustrated in questions 11 to 15 of the index. We selected the total score of '196 and above' on the SSQOL to indicate good QoL because it represents score of at least four (a little help/ a little trouble / moderately disagree)

for most of the 49 items of the scale. Using these criteria, we categorised RMI total score into ≥10 (good mobility), and <10 (poor mobility) and total score for SSQOL into ≥196 (good QoL) and <196 (poor QoL). We used Chi-square test and Spearman-rho correlation to identify variables that were associated or correlated with functional status and HRQoL. Significant p values were set at <0.05.

RESULTS

Of 516 stroke survivors who were approached for the interviews, a total of 221 survivors could not be contacted due to invalid telephone numbers. A further 82 from the remaining 295 stroke survivors had died and 10 survivors refused to participate. We were able to complete the interviews in 203 stroke survivors (mean age 64.5 years and mean stroke duration 44.7 months), mostly with telephone interview (95%) as preferred by the survivors. At the time of interview, all survivors were no longer attending rehabilitation at UKMMC. The characteristics of the subjects are shown in Table I.

Table II shows the existing stroke-related problems, the levels of function and QoL among the stroke survivors. Up to 23% of the stroke survivors had at least one episode of stroke recurrence following hospital discharge, 52% reported weakness of limbs, 35% had balance problems and 15% had speech limitation. Mean RMI score was 11.7 (Standard Deviation (SD) 3.4), with 18.2% of stroke survivors had RMI score below 10. A total of 43.3% and 99% survivors could not manage stairs without assistance and walk fast over 10 metres without limping, respectively. In term of walking, 26% could not walk outdoor without help, 23% survivors could not walk indoor independently without aids and 21% could not retrieve objects from floors during walking. The mean BI score was 89.8 (SD: 19.8), with 29.6% of the stroke survivors had BI score below 91. A significant proportion of the survivors have not regained independence in manoeuvring stairs (44%), and up to 20% were still not fully independent in BI sub-sets related to self-care. The mean SSQOL score was 207.6 (SD 37.2), with 29.6% of the survivors had SSQOL score below 196. The domains which mostly affected were 'energy' (mean 10.2, SD 3.7) and 'social role' (mean 18.5, SD 5.6), followed by 'mobility' (mean 26.5, SD 5.7).

Table III demonstrates the results of the Spearman's correlation test. Age (p<0.01) and number of stroke-related impairments (p=0.02) were both inversely correlated with function. Duration of stroke was found to correlate with QoL but not function. Number of co-morbid conditions was found to be correlated with QoL and independence in ADL. The SSQOL, RMI and BI were strongly positively correlated with each other (p<0.01).

Variables that are associated with levels of mobility, independence in ADL and QoL are presented in Table IV and Table V. Stroke survivors of younger than 60 years reported better mobility (p=0.02) and independency in ADL (p<0.01), however their QoL scores were not significantly higher than older stroke survivors. Gender, stroke subtypes, side of stroke and presence of co-morbidities were not associated with post-stroke function and QoL. Duration of stroke had no association with function but was associated with QoL (p=0.04); QoL scores were higher in more chronic stroke survivors. The existence of stroke-related problems, namely joint stiffness, limb weakness, balance problem and speech problem significantly associated with lower function and QoL (all p<0.01). Presence of stroke recurrences although were significantly associated with function (p>0.01), did not seem to influence QoL (p=0.06).

Table I: Demography and clinical profile of the participants (n=203)

Variables	N (%) or Mean ± SD (median)
Age, years	64.5 ±12.2 (65.0)
Gender:	
Male	92 (45.3)
Female	111 (54.7)
Stroke side:	
Right	75 (36.9)
Left	90 (44.3)
Unspecified	38 (18.7)
Stroke subtypes:	
Ischemic	141 (69.5)
Haemorrhagic	34 (16.7)
Unspecified	28 (13.8)
Duration since onset:	44.7 ± 13.8 (46.0)
24 to 35 months	67 (33.0)
36 to 47 months	41 (20.2)
48 to 59 months	64 (31.5)
60 months and above	31 (15.3)
Co-morbidities:	
Hypertension	186 (91.6)
Diabetes	104 (51.2)
Heart condition	43 (21.2)
Arthritis	31 (15.3)
Pulmonary disease	7 (3.4)

Table II: Stroke-related problems, functional and quality of life scores among subjects

Variables	n(%) or Mean ± SD (Median)
Existing stroke-related problems:	
Stroke recurrences	47 (23.2)
Spasticity	7 (3.4)
Joint stiffness	16 (7.9)
Sensory impairment	9 (4.4)
Limb weakness	106 (52.2)
Balance problems	71 (35.0)
Speech problems	30 (14.8)
Rivermead Mobility Index (RMI) (Total score=15)	11.7 ± 3.4 (13.0)
RMI items which <80% of survivors could perform:	
Manage a flight of stairs without help	150 (73.9)
Walk outside, uneven ground with help	151 (74.4)
Walk inside without aid and no stand-by help	156 (76.8)
Picking off floor	162 (79.8)
Walk outside, uneven ground without help	148 (72.9)
Up and down 4 steps without rail and help, but with aid	115 (56.7)
Fast walking 4 meters without limping in 4 secs	2 (1.0)
Barthel Index (BI) (Total score = 100)	89.8 ± 19.8 (100)
Achieved full independence in BI items:	
Feeding self	181 (89.2)
Bathing	180 (88.7)
Grooming	186 (91.6)
Get dressed	164 (80.8)
Bowel function	184 (90.6)
Bladder function	181 (89.2)
Toilet use	173 (85.2)
Transfer bed to chair and bed	178 (87.7)
Mobility on level surfaces	172 (84.7)
Walking up and down stairs	113 (55.7)
Stroke Specific Quality of Life (SSQOL) (Total score=245)	207.6 ± 37.2 (218)
Scores by SSQOL sub-domains:	
Energy (Total score =15)	10.2 ± 3.6
Family role (Total score =15)	12.2 ± 3.2
Mood (Total score =25)	21.4 ± 4.4
Personality (Total score =15)	11.3 ± 3.7
Social role (Total score =25)	18.5 ± 5.6
Thinking (Total score =15)	12.2 ± 3.3
Language (Total score =25)	23.8 ± 3.3
Mobility (Total score =30)	26.5 ± 5.7
Upper extremity (Total score =25)	22.3 ± 5.0
Vision (Total score =15)	14.0 ± 2.4
Work productivity (Total score =15)	13.2 ± 3.2
Self-care (Total score =25)	22.4 ± 4.7

Table III: Variables correlated with function and quality of life

Variables	Spearman's rho correlation (p-value)		
	Rivermead Mobility Index (RMI)	Barthel Index (BI)	Stroke Specific Quality of Life (SSQOL)
Age, year	-0.3 (<0.01)*	-0.3, (<0.01)*	-0.3 (<0.01)*
Duration of stroke, months	-0.0 (0.95)	0.0, (0.70)	0.2 (<0.01)*
No of comorbid conditions	-0.1 (0.13)	-0.2, (0.02)*	-0.2 (0.01)*
No of stroke-related impairment	-0.2 (0.02)*	-0.2, (0.01)*	-0.1 (0.05)
Mobility status, RMI	-	0.8, (<0.01)*	0.6 (<0.01)*
Activity of daily living, BI	0.8 (<0.01)*	-	0.6 (<0.01)*

*p-value is significant at <0.05

Table IV: Association of demography and stroke profile variables with mobility, Barthel index and quality of life score

	Rivermead Mobility Index			Barthel Index			Stroke Specific Quality of Life		
	≥10 n (%)	<10 n (%)	p-value	≥91 n (%)	<91 n (%)	p-value	≥196 n (%)	<196 n (%)	p-value
Total	166(81.8)	37(18.2)	-	143(70.4)	60(29.6)	-	143(70.4)	60(29.6)	
Age			0.02*			<0.01*			0.40
<60	54(91.5)	5(8.5)		51(86.4.2)	8(13.6)		44(74.6)	15(25.4)	
≥60	112(77.8)	32(22.2)		92(63.9)	52(36.1)		99(68.8)	45(31.2)	
Gender			0.31			0.32			0.10
Male	78(84.8)	14(15.2)		68(73.9)	24(26.1)		70(76.1)	22(23.9)	
Female	88(79.3)	23(20.7)		75(67.6)	36(32.4)		73(65.8)	38(34.2)	
Stroke side			0.98			0.12			0.47
Right	61(81.3)	14(18.7)		56(74.7)	19(25.3)		49(65.3)	26(34.7)	
Left	74(82.2)	16(16.8)		78(86.7)	12(13.3)		66(73.3)	24(26.7)	
Unspecified	31(81.8)	7(18.2)		32(84.2)	6(15.8)		28(73.7)	10(26.3)	
Stroke subtypes			0.74			0.92			0.25
Ischemic	117(83.0)	24(17.0)		99(70.2)	42(29.8)		101(72.1)	40(27.9)	
Haemorrhagic	26(76.5)	8(23.5)		24(70.6)	10(29.4)		20(58.8)	14(41.2)	
Unspecified	21(80.7)	5(19.3)		20(71.5)	8(28.5)		22(84.6)	6(15.4)	
Duration since onset, months			0.66			0.65			0.04*
24 to 35	55(82.1)	12(17.9)		44(65.7)	23(34.3)		41(61.2)	26(38.8)	
36 to 47	36(87.8)	5(12.2)		31(75.6)	10(24.4)		26(63.4)	15(36.6)	
48 to 59	50(80.6)	14(19.4)		47(73.4)	17(26.6)		51(79.7)	13(20.3)	
60 and above	25(81.8)	6(18.2)		21(67.7)	10(32.3)		25(80.6)	6(19.4)	

*p-value is significant at <0.05

Table V: Association of presence or absence of co-morbidities and post-stroke problems with mobility, Barthel index and quality of life

Co-morbidities / Post-stroke problems	Rivermead Mobility Index			Barthel Index			Stroke Specific Quality of Life		
	≥10 n (%)	<10 n (%)	p-value	≥91 n (%)	<91 n (%)	p-value	≥196 n (%)	<196 n (%)	p-value
Hypertension									
- Yes	150(80.6)	36(19.4)	0.17	129(69.4)	57(30.6)	0.26	128(68.8)	58(31.2)	0.09
- No	16(94.1)	1(5.9)		14(82.4)	3(17.6)		15(88.2)	2(11.7)	
Diabetes									
- Yes	80(76.9)	24(23.1)	0.07	63(60.6)	41(39.4)	<0.01*	71(68.2)	33(31.8)	0.48
- No	86(86.9)	13(13.1)		80(80.8)	19(19.2)		72(72.7)	27(27.2)	
Heart conditions									
- Yes	32(74.4)	11(25.6)	0.15	25(58.1)	18(41.9)	0.04*	26(60.4)	17(39.6)	0.10
- No	134(83.8)	26(16.3)		118(73.8)	42(26.2)		117(73.1)	43(26.8)	
Stroke recurrences									
- Yes	31(66.0)	16(34.0)	<0.01*	25(53.2)	22(46.8)	<0.01*	28(59.6)	19 (40.4)	0.06
- No	135(86.5)	21(13.5)		118(75.6)	38(24.4)		115(73.7)	41(26.3)	
Joint stiffness									
- Yes	8(50.0)	8(50.0)	<0.01*	13(18.8)	13(81.2)	<0.01*	2(12.5)	14(87.5)	<0.01*
- No	158(84.5)	29(15.5)		140(74.9)	47(25.1)		141(75.4)	46(24.6)	
Limb weakness									
- Yes	75(70.8)	31(29.2)	<0.01*	58(54.7)	48(45.3)	<0.01*	52(49.1)	54 (50.9)	<0.01*
- No	91(93.8)	6(6.2)		85(87.6)	12(12.4)		91(93.8)	6(6.2)	
Balance problem									
- Yes	51(71.8)	20(28.2)	<0.01*	35(49.3)	36(50.7)	<0.01*	36(50.7)	35(49.3)	<0.01*
- No	115(87.1)	17(12.9)		108(81.8)	24(18.2)		107(81.1)	25(18.9)	
Speech problem									
- Yes	18(60.0)	12(40.0)	<0.01*	14 (46.7)	16(53.3)	<0.01*	12(40.4)	18(59.6)	<0.01*
- No	148(85.5)	25(14.5)		129(74.6)	44(25.4)		131(75.2)	42(24.8)	

*p-value is significant at <0.05

DISCUSSION

Responses from the 203 stroke survivors who participated in the telephone interview provided some insights into the functional and quality of life impact of long-term stroke.

Mobility and ADL

Our study results indicate that a significant proportion of stroke survivors had not regained full mobility and independence in ADL after two or more years post-stroke, with up to one-fifth of the survivors demonstrating unfavourable scores for mobility and ADL. These findings agree with those of Anderson and colleagues,[15] who observed that 19% of stroke survivors in New Zealand still required assistance with daily activities when evaluated at many years post-stroke. Similar findings were observed in another study involving 277 Australian stroke survivors who were still alive five years post-stroke onset. In the study, as much as 36% were found to be physically disabled, and 14% required institutional care.[16] In our study, the most affected mobility tasks were those requiring high-level balance and strength including fast walking, outdoor walking, and manoeuvring stairs.

Walking impairment can interfere with an individual's ability to participate in ADL and create social disadvantages due to limitation in community participation.[17] In our study, one fourth of the stroke survivors had problems walking indoor without aids, and approximately 30% of them could not perform independent outdoor walking, which illustrates limitation in social participation. These results are in agreement with a study by Lord and colleagues[18] who reported that nearly one third of stroke survivors could not manage unsupervised walking in the community despite gaining good mobility outcomes. Failure to mobilise from inside to outside the house increases the risk of stroke survivors for becoming isolated and housebound, propagating the risk of depression in some survivors. Training of walking outside the walls of the stroke survivors' homes is therefore important and should include managing crowded environments and fast walking as well as selective manual handling skills, such as carrying a shopping bag, to allow further advancement in the level of community walking.[17]

Manoeuvring stairs is mechanically different from level walking in terms of muscle actions, joint movement and the level of energy required. The major challenge in ascending stairs is conservation of energy, whereas descending stairs requires one to focus on safety. There are increased demands on muscle activities, balance and joint movement.[17] Ability to manoeuvre stairs was affected in more than 40% of the stroke survivors in our study. This finding was not surprising, as the majority of the survivors still reported limb weakness, and balance problems, forcing them to avoid stairs or to use handrails when walking up and down stairs. The ADL tasks that were still significantly affected include managing stairs, getting dressed and using toilet. While managing stairs and using a toilet are closely related to walking ability, balance and lower limb strength, getting dressed has different pre-requisites. Previous investigations on dressing ability following stroke reported that dressing the lower half of the body was influenced strongly by the motor function of the affected lower limb, while dressing the upper half of the body was associated with cognitive impairments, such as poor sustained attention and the inability to learn dressing procedures.[19,20]

Health-related Quality of Life

HRQoL of stroke survivors has been reported as lower than that of the average population.[21] Our study observed that the majority of the stroke survivors achieved a reasonable score of HRQoL when measured with a SSQOL. However, in nearly one third of the survivors, HRQoL could be further enhanced. In general, the survivors' HRQoL was affected in the domain of social role and in the energy domain. These findings are consistent with previous studies that have highlighted the reduction of social participation and the issue of fatigue among people with long-term stroke. Northcott and Hilari[22] reported that individuals with stroke have difficulty keeping in contact with friends due to various reasons including environmental barriers. Naess and colleagues,[23] in a study of 405 Norwegian stroke survivors, observed that QoL was reduced in the social and physical role and function, mainly due to fatigue. Post-stroke fatigue, reported to occur in 40% of post-stroke patients, is an important symptom requiring attention.[24] Being mostly in older age groups, fatigue in stroke survivors is assumed to be associated with the normal process of ageing; hence, it was not readily detected by their treating physicians.

Stroke-related sequels and variables associated with function and QoL

Balance problems and limb weakness are two main impairments affecting function and QoL in our study participants. An increased number of impairments were observed to be inversely correlated with function and QoL. These results were expected and further support previous findings on the effect of post-stroke impairments on functions.[25]

Balance impairment following stroke is common. Previous studies have reported that stroke survivors had a significantly decreased trunk performance when compared with age and sex-matched healthy persons. Impairment in balance and self-control of falls leads to reduced participation in ADL among the stroke survivors, consequently placing them at risk for deterioration of functional performance and HRQoL.[26] One important prerequisite for balance and ADL is good trunk control; the reported variance of functional recovery explained by trunk control alone ranges from 45 to 71% following a stroke.[27,28] Trunk control was observed to strongly affect walking speed and independence in ADL.[28,29] As people age, age-related factors such as cognitive decline and a reduction in general strength complicate post-stroke balance ability, thus increasing stroke survivors' susceptibility for falls.[30]

More than half of the stroke survivors in our study still experience limb weakness at many years post-stroke. Previous studies have documented the negative effect of stroke on muscle properties and functions.[31] Structural and metabolic changes have been observed; both resulted in altered muscle function.[31] Apart from the direct impact of stroke, weakness of limbs is also a result of the relative

inactivity that is caused by post-stroke disabilities. Physical inactivity commonly leads to reduced muscle mass and function, which is consistent with age-related functional decline.[32] This condition worsens after stroke, in which without adequate rehabilitation, muscle mass and function deteriorate even more rapidly. In our study, persistent post-stroke muscle weakness is not surprising given that more than 45.0% of the stroke survivors had no regular involvement in physical activities, following discharge from hospital care. The low percentage of physical activity participation among the stroke survivors in our study supports previous reports on high percentage of sedentary behaviour in this population.[33]

Individuals with stroke are at risk of another stroke at the rate of 5% per year, with the cumulative risk of first recurrence ranges between 16.6% and 19.3% at five years.[34] The prevalence of stroke recurrences at 23.2% among the stroke survivors in our study is consistent with the rate documented in the literature. Because of its association with mobility and ADL as found in our study, there is an urgent need to further strengthen secondary prevention strategies in the health care system in our country. Efforts could target controls of diabetes and cardiac conditions, the main contributors to stroke recurrences,[34] along with promoting physical activities to overcome post-stroke impairments. These two medical conditions were also observed to be significantly prevalent among the stroke survivors in our study, documented as 51.2% and 21.2% for diabetes and cardiac diseases, respectively.

Stroke chronicity notably had a positive effect on QoL among the stroke survivors in our study. There is a possibility that as the stroke becomes more chronic, the stroke survivors are able to better adapt to their post-stroke disabilities. Such finding has been documented by Darlington and colleagues,[35] who concluded that more than five months post-stroke, coping abilities increased and became a powerful determinant of QoL. The variance of QoL explained by coping strategies alone was reported as 44.0%. Of the demography variables assessed in our study, only age was observed to influence function and QoL, with increasing age being inversely correlated with function and QoL. This finding supports the predictive ability of age on function and QoL, as reported in past studies.[17, 36]

Functional status has significant association with QoL. Previous studies have demonstrated the role of function in determining QoL; the presence of physical dysfunction significantly correlated with a low HRQoL score.[7-9,37] On the other hand, the state of well-being was observed to significantly increase performance of function.[38] This study, in which RMI, BI and SSQOL scores were observed to be positively and strongly correlated with each other, further supports the relationship between function and QoL, indicating the dominant role of mobility and ADL independence in the attainment of good QoL following stroke.

Our study findings add to knowledge regarding the long-term impact of stroke in our country and demonstrate the need for longer-term management strategies for this population. Currently, this aspect of stroke care has not been established, and what happen to a stroke survivor following hospital discharge is not known until the survivor is re-hospitalised due to another stroke or comorbidities. Several options can be considered in fulfilling this need. Post-stroke care at the neurology or stroke clinic can be extended to enable long-term monitoring of function and post-stroke complications, and continuous management of stroke risk factors. These are crucial in post-stroke care, more so in our community due to high prevalence of post-stroke deaths and stroke recurrence, but which have often been neglected.[39]

Owing to an inadequacy of neurology specialists in the country, care for long term stroke survivors may be organised at primary care settings and provided by a general practitioner-led team. The quality of follow-up services with a general practitioner have been found to be comparable with services provided by a specialist-led stroke care team in a recent controlled trial.[40] Long-term care for stroke survivors must also include opportunities for further rehabilitation and strategies for community reintegration, so that stroke survivors can return to their pre-stroke lives.

In conclusion, we found that at two years and more post-stroke, function and QoL were not adequately regained among a significant proportion of stroke survivors. Limitation in function and QoL were mainly attributed to stroke-specific impairments. Prolongation of care to post-stroke survivors may enable further functional recovery and achievement of QoL among stroke survivors in the country.

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AUTHORS' CONTRIBUTION

NAMN conducted the study, analysed the data and drafted the manuscript. NAA revised the manuscript. SS assisted in data collection and data analysis. SMA advised on the design of the study.

DISCLOSURE

The authors declare no conflict of interests.

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