The health-related quality of life in stroke survivors: clinical, functional, and psychosocial correlate

Safaa A. Mahran[a,b], Mohamad A. Abdulrahman[b], Fadwa S. Janbi[b], Rawabi A. Jamalellail[b]

[a]Department of Physical Medicine, Rheumatology and Rehabilitation, Faculty of Medicine, Assiut University, Assiut, Egypt, [b]Department of Physical Medicine and Rehabilitation, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

Correspondence to Safaa A. Mahran, MD, King Abdul-Aziz University Hospital, Aljame'a District, Jeddah, Saudi Arabia
Tel: +96612 6408222 (10025); fax: +966126952538; e-mail: safaa69@yahoo.com

Received 03 May 2015
Accepted 01 June 2015

Egyptian Rheumatology & Rehabilitation 2015, 42:188–195

Aim

The aims of this study were to examine the health-related quality of life (HRQOL) in stroke survivors attending an outpatient rehabilitation clinic and to examine the relation between some clinical variables and HRQOL.

Participants and methods

Sixty-four stroke survivors were enrolled. Demographic data were obtained using a structured questionnaire. The functional level of the patients was assessed using the Barthel Index (BI). HRQOL was measured by the short-form 36 (SF-36) and the stroke-specific quality-of-life (SSQOL) scale.

Results

Our patients' ages ranged from 42 to 95 years (mean 60.81 years), and men represented 81.2% of the participants. Low mean scores of all the eight domains of SF-36 were found. The 12 domains of SSQOL showed different degrees of deterioration in their means. Statistically significant differences between the means of the mobility level, and upper-limb and lower-limb voluntary control with the means of both SF-36 and SSQOL were found in favor of functional independency and full control of the limbs ($P < 0.05$). Voluntary control of the limbs and BI showed a significant positive correlation with both SSQOL and the physical component of SF-36. Multiple regression analysis showed that the BI score, the nature of stroke, and the comorbidities are the most significant predictors of SSQOL, with P values of 0.004, 0.013, and 0.047, respectively.

Conclusion

It was concluded that HRQOL is impaired in stroke survivors, and that the functional independency level is its most significant predictor. We recommend considering the assessment of HRQOL in stroke survivors undergoing rehabilitation management as it is more relevant to the patients.

Keywords:
quality of life, short-form 36 scale, stroke, stroke-specific quality-of-life scale

Egypt Rheumatol Rehabil 42:188–195

1110-161X

Introduction

Stroke is a chronic neurological disease with immense impact on the patients' lives. Most of stroke studies focused on the mortality rates, which were found to be decreasing [1]. Although high disability rates were found with its distinct burden on the patients [2], few studies focused on the quality of life (QOL) of such patients [3].

The objectives of this study were to examine the global and stroke-specific health-related quality of life (HRQOL) in stroke survivors attending an outpatient physical medicine and rehabilitation clinic and to examine the relationship between some clinical variables and the HRQOL.

Patients and methods

Patients

This prospective observational study was carried out on 64 stroke survivors who were consecutively presented, consented, and managed at the Physical Medicine and Rehabilitation Unit of King Abdulaziz University Hospital (Jeddah, Saudi Arabia) between November 2012 and April 2014. Adult stroke patients who had survived up to 3 months after the stroke were included in the study. Brain computed tomography scan was used for the clinical definition of stroke. Criteria for exclusion from the study were patients under 18 years of age, a stroke duration of less than 3 months, aphasia, cognitive defects preventing the patients from fluent communication, malignancies, rheumatic diseases, and/or other musculoskeletal conditions that may affect the patient's physical ability. The study was approved by the Ethics Committee on Human Research of King

Abdulaziz University. Verbal informed consents were obtained from all participants.

Methods

After case identification and verification, demographic data, including their age, sex, marital status, poststroke duration, formal education, comorbidities, stroke nature, weak side, mobility status, and voluntary control level of the limbs, were obtained from the patients and medical records using a structured questionnaire. Participants were asked to identify conditions diagnosed since the last medical record entry. A self-report was used to supplement comorbidity data as a strong agreement has been reported between self-reported chronic diseases and physician records [4].

The functional level of the patients was assessed using the Barthel Index (BI) [5], which was used to assess the degree of dependence in ten of the activities of daily living for each patient; these activities included feeding, bathing, grooming, dressing, bowel control, bladder control, toileting, chair transfer, ambulation, and stair climbing. Each performance item is rated on this scale with a given number of points (0–10 points). The scores for each of the items are summed to create a total score. The higher the score, the more 'independent' the person. For statistical reasons, the level of dependency was divided into five levels as follows: 0–49 as severe dependency, 50–74 as moderate dependency, 75–90 as mild dependency, 91–99 as minimal dependency, and 100 as independency. The BI is among the most widely used measurements of functional status, providing considerable validity, reliability, and sensitivity. Because it was the first measurement developed to assess the rehabilitation process, it has been a benchmark with which to judge other measurements.

The HRQOL of each patient was measured by two scales: the short-form 36 (SF-36) and the stroke-specific quality-of-life (SSQOL) scale.

The SF-36 questionnaire is one of the most widely used of the HRQOL measures. It consists of 36 questions (items) measuring the physical and mental health status in relation to eight health concepts: physical functioning (PF), role limitations due to physical health (RP), bodily pain (BP), general health perceptions (GH), vitality (energy/fatigue) (VT), social functioning (SF), role limitations due to emotional problem (RE), and general mental health (MH) (psychological distress/wellbeing). The eight scales are hypothesized to form two distinct clusters due to the physical and mental health variance that they have in common. The scales of PF, RP, and BP correlate most highly with the physical component, and contribute most to the scoring of the physical component summary (PCS) measure. The scales MH, RE, and SF correlate most highly with the mental component, and contribute most to the scoring of the mental component summary (MCS). Three of the scales (VT, GH, and SF) have noteworthy correlations with both components. Responses to each of the SF-36 items are scored and put in the online scoring page [6,7] for the calculation of the total score of each item. The MCS and the PCS are also calculated.

In contrast, SSQOL [8] is a self-report questionnaire consisting of 49 items in the 12 subscales of energy, family roles, language, mobility, mood, personality, self-care, social roles, thinking, upper-extremity function, vision, and work/productivity. The subscales are scored separately, and a total score is also provided. Scoring of the SSQOL concerns the past week and is rated on a five-point Likert scale. Response options are scored as 5 (no help needed/no trouble at all/strongly disagree), 4 (a little help/a little trouble/moderately disagree), 3 (some help/some trouble/neither agree nor disagree), 2 (a lot of help/a lot of trouble/moderately agree), and 1 (total help/could not do it at all/strongly agree). Psychometric properties of the SSQOL have been validated in patients with ischemic stroke and intracranial hemorrhage [9–11].

Statistical analysis

Data were analyzed with the statistical package for the social sciences (SPSS, version 16.0; SPSS Inc., Chicago, Illinois, USA) software. Descriptive data were shown as the mean and SD or as frequency tables. One-way ANOVA and the independent *t*-test were used to compare the mean difference between demographic data and clinical characteristic with HRQOL. For the correlation analysis, the Pearson correlation was used to analyze parametric data of the SSQOL score and the clinical and demographic parameters, whereas the Spearman and Kendal correlation was used to analyze nonparametric data. A multiple linear regression analysis using the enter method was performed for the determination of QOL predictors. Significance was considered at P value less than 0.05.

Results

Over about a 17-month period, 100 stroke patients were screened for their eligibility to participate in this research. Of them, only 64 patients were eligible for the study.

The ages of our patients ranged from 42 to 95 years (mean ± SD 60.81 ± 12.04 years), and the majority

of them (81.2%) were male. Among the total number of patients, 90.6% had ischemic stroke, whereas only 9.4% had hemorrhagic stroke. In terms of the side of the body affected, 46.9% had left-sided and 53.1% had right-sided hemiplegia. Family support seemed to be strong because all of the studied patients were married and lived with their families. Table 1 summarizes the descriptive and clinical data of the 64 participants in this study.

Table 1 Descriptive and clinical data of the studied stroke patients (*n* = 64)

Clinical parameters	*N* (%)
Age (years)	
Range	42–95
Mean ± SD	60.81 ± 12.04
Sex	
Male	52 (81.2)
Female	12 (18.8)
Duration (years)	
Range	0.3–7.5
Mean ± SD	3.9 ± 3.06
Education level	
Illiterate	4 (6.2)
Less than high school	40 (62.5)
High school and more	20 (31.2)
Nature of the stroke	
Ischemic	58 (90.6)
Hemorrhagic	6 (9.4)
Weak side	
Right	34 (53.1)
Left	30 (46.9)
Dominated hand	
Right	62 (96.9)
Left	2 (3.1)
Comorbidities	
Yes	54 (84.4)
No	10 (15.6)
Mobility	
Independent	18 (28.1)
With assistance	38 (59.4)
Immobile	8 (12.5)
ULVC	
No control	2 (3.1)
Mild control	10 (15.6)
Moderate control	23 (35.9)
Full control	29 (45.3)
LLVC	
No control	2 (3.1)
Mild control	6 (9.4)
Moderate control	19 (29.7)
Full control	37 (57.8)
Barthel Index score	
Severely dependent	16 (25)
Moderately dependent	30 (46.9)
Mildly dependent	14 (21.9)
Minimally dependent	2 (3.1)
Independent	2 (3.1)

LLVC, lower-limb voluntary control; ULVC, upper-limb voluntary control.

Table 2 shows that our patients had low mean scores in all the eight domains of SF-36, with RP having of the lowest mean (14.06 ± 29.50), and MH the best mean score (54.13 ± 22.10). SSQOL means are shown in Table 3, with the mobility subscale being the most impaired one (mean ± SD 12.12 ± 4.81, out of a maximal attainable score of 30), whereas the vision was the least affected subscale (mean ± SD 11.09 ± 3.51, out of the maximal attainable score of 15).

A comparison of means using the independent *t*-test shows that there were statistically significant differences between the means of the sex, the nature of the stroke, the poststroke duration, comorbidities, and HRQOL in favor of the female sex, hemorrhagic stroke, a poststroke duration over 2 years, and the absence of comorbidities, respectively. Using the ANOVA method, we found statistically significant differences between the means of mobility, upper-limb voluntary control (ULVC), and lower-limb voluntary control (LLVC) with the means of the HRQOL as demonstrated in Table 4.

As shown in Table 5, voluntary control of the limbs and the Barthel independence index had a significant positive correlation with both the SSQOL and the PCS of SF-36. The MCS was significantly correlated with the comorbidity and the ULVC only. After establishing the significant correlations, we used the significantly correlated variables in the multiple linear regression analysis to detect the predictors of QOL in stroke cases. In Table 6, we studied the influence of the disease duration, mobility, voluntary control of both upper and lower limbs and the BI score, as independent variables, on the PCS of SF-36. We also studied the influence of comorbidity and ULVC on the MCS of SF-36. We found a nonsignificant difference in the influence of these variables on the SF-36 components (all with $P>0.05$). In contrast, the nature of the stroke, comorbidity, and the BI score were found to be significant predictors of the SSQOL in our patients, with *P* values of 0.013, 0.047, and 0.004, respectively, as demonstrated in Table 7.

Discussion

This study investigated HRQOL among adult stroke survivors and the factors associated with it. It also investigated the determinants that influence the HRQOL most significantly.

Our results show that HRQOL is impaired in stroke survivors as assessed by both generic and stroke-specific scales. We found that the most affected domains of SF-36 were RP and PF. Similar results were found

Table 2 Mean scores on the short-form 36 domains

Short-form 36 domains (*N* = 64)	Mean	SD
PF	28.28	28.13
RP	14.06	29.50
BP	43.97	28.45
GH	49.75	16.40
VT	38.59	24.08
SF	42.56	29.34
RE	20.83	36.37
MH	54.13	22.10
PCS	31.37	8.05
MCS	38.42	12.73

BP, bodily pain; GH, general health perceptions; MCS, mental component summary; MH, mental health; PCS, physical component summary; PF, physical functioning; RE, role limitations due to emotional problems; RP, role limitations due to physical health problems; SF, social functioning; VT, vitality (energy/fatigue).

Table 3 Mean scores on the stroke-specific quality-of-life subscales

SSQOL subscales (*N* = 64)	Mean	SD
Energy	7.06	2.38
Family role	7.06	2.08
Language	16.97	6.43
Mobility	12.12	4.81
Mood	14.22	4.92
Personality	6.97	3.65
Self-care	12.41	5.90
Social role	12.47	4.51
Thinking	9.22	2.78
UL function	12.66	5.80
Vision	11.09	3.51
Productivity	7.06	3.660
Total SSQOL	129.31	29.26989

SSQOL, stroke-specific quality of life; UL, upper-limb.

by Fróes *et al*. [12]. Assessing HRQOL is difficult in stroke, as patients have heterogeneous symptoms and deficits and commonly suffer from psychological and social sequeals of stroke. Isolated measures of the physical domains of health, such as the BI, are not adequate to study the full impact of the long-term disability that stroke produces.

Generic scales do not screen important aspects in stroke patients' lives. The short-form health survey (SF-36), for example, has no assessment of language. Thus, patients with severe aphasia may be classified as having a misleading 'good' outcome if they scored 'good' in other domains of SF-36 despite their outstanding disability. Other domains often neglected in stroke outcome assessments are vision and cognitive, psychological, and social function.

Disease-specific tools are considered more helpful in providing information about the difficulties that patients with stroke may experience [9,13–15]. In our patients, the mean values of the 12 subscales of SSQOL showed variable degrees of affection, with the mobility subscale being the most affected (mean ± SD 12.12 ± 4.81, out of maximal attainable score of 30), whereas the vision was the least affected subscale (mean 11.09, out of maximal attainable score of 15). Chou [16] reported similar results when he used SSQOL in investigating 134 stroke survivors and found the fewest problems with vision.

In this study, hemorrhagic stroke type was associated with better SSQOL scores compared with ischemic stroke. In accordance to our findings, Haacke *et al.* [17] found that patients with hemorrhagic stroke have better HRQOL compared with patients with ischemic stroke; however, the incidence of ischemic stroke is more frequent than hemorrhagic stroke. Franke *et al.* [18] reported that hemorrhagic stroke results in a greater initial mortality, but longer-term mortality (>1 year), and the functional status of these patients appears to be comparable to those of the survivors of a cerebral infarction.

Literature about the role of the influence of the sex on QOL after stroke is contradictory. Our study shows that women have better SSQOL compared with men. However, most of the studies found that women had a poorer QOL both physically and psychologically when compared with men [19,20].

In contrast, some other studies found that sex differences do not have a significant impact on HRQOL [21–23]. The reasons for this contradiction are unknown, but factors such as sex-related differences in stroke characteristics [24], severity [25], or depression [26] have all been suggested. Nevertheless, QOL questionnaires depend on the subjective evaluation of the importance of the selected domain. Men and women may have the same domain differently. For example, if women value 'the need for help to prepare food' more highly than men, a difference in SSQOL 'self-care' domain scores could be observed even if objective measures of self-care function were equal. This ability to identify value-based differences, which would be undetectable using objective or physiological measures, is a hallmark of QOL instruments.

In the current study, patients with higher education had a better mental component of SF-36 compared with patients with a lower education level. Similar findings were reported by Aprile *et al.* [27], who found that disability will increase in patients with a lower educational level. This could be explained by the international evidences that education is strongly linked to health and to determinants of health such as health behaviors, risky contexts, and preventative

Table 4 Comparison of means between short-form 36 components, the stroke-specific quality-of-life total score, and demographic and clinical parameters in stroke patients

Parameters (*N* = 64)	*N*	SF-36 components (mean ± SD)		SSQOL (mean ± SD)
		PCS	MCS	
Sex				
Male	52	31.99 ± 8.53	37.01 ± 12.91	125.85 ± 26.42
Female	12	28.65 ± 4.83	44.50 ± 10.25	144.33 ± 36.96
P value		0.196	0.066	0.048
Nature				
Hemorrhagic	6	36.60 ± 14	42.26 ± 17.04	154.33 ± 39.50
Ischemic	58	30.82 ± 7.15	38.02 ± 12.32	126.72 ± 27.15
P value		0.095	0.442	0.027
Duration (months)				
<24	48	29.79 ± 7.10	38.71 ± 12.70	128.67 ± 26.85
≥24	16	36.11 ± 9.05	37.55 ± 13.18	131.13 ± 36.53
P value		0.006	0.755	0.763
Weak side				
Right	34	32.78 ± 7.63	38.14 ± 14.14	124.65 ± 27.74
Left	30	29.76 ± 8.33	38.74 ± 11.14	134.60 ± 30.50
P value		0.136	0.853	0.177
Dominant hand				
Right	62	31.43 ± 8.16	38.44 ± 12.93	128.19 ± 29.05
Left	2	29.20 ± 0.000	37.80 ± 0.000	164.00 ± 0.00
P value		0.702	0.945	0.089
Comorbidity				
Yes	54	30.73 ± 8.25	36.70 ± 12.54	125.04 ± 24.72
No	10	34.78 ± 6.03	47.72 ± 9.68	152.40 ± 41.15
P value		0.146	0.011	0.006
Education				
Illiterate	4	35.40 ± 6.12	42.85 ± 12.87	125.50 ± 21.36
More than high school	40	32.10 ± 8.55	35.19 ± 11.30	126.95 ± 23.77
High school or more	20	29.10 ± 6.97	44.00 ± 13.80	134.80 ± 39.53
P value		0.235	0.029	0.604
Mobility				
Independent	18	35.18 ± 6.54	41.96 ± 16.88	156.672 ± 32.31
With assistance	38	31.24 ± 8.20	35.38 ± 9.82	116.42 ± 19.04
Immobile	8	23.40 ± 3.66	44 ± 13.80	129.00 ± 20.80
P value		0.001	0.157	0.000
ULVC				
No control	2	29.60 ± 0.00	41.80 ± 0.00	112.00 ± 0.00
Mild control	10	25.48 ± 4.84	37.22 ± 13.76	116.20 ± 14.29
Moderate control	23	30.48 ± 8.03	31.41 ± 8.63	123.35 ± 23.92
Full control	29	34.22 ± 8.11	44.16 ± 13.02	139.76 ± 34.46
P value		0.021	0.003	0.057
LLVC				
No control	2	29.60 ± 0.00	41.80 ± 0.00	112 ± 0.00
Mild control	6	23.67 ± 4.29	49 ± 9.87	130.33 ± 24.43
Moderate control	19	31.11 ± 10.37	32.41 ± 9.35	112.89 ± 12.88
Full control	37	32.85 ± 6.68	39.61 ± 13.66	138.51 ± 32.97
P value		0.073	0.027	0.013

LLVC, lower-limb voluntary control; MCS, mental component summary; PCS, physical component summary; SF-36, short-form 36; SSQOL, stroke-specific quality of life; ULVC, upper-limb voluntary control.

service use. Moreover, education significantly reduces the risks of adult depression [28]. In contrast, a more recent study [29] found no influence of the educational level on the QOL of stroke survivors. Their use of the 'average duration of formal education' instead of categorizing the degrees of education level could be an explanation for this finding.

In the studied group of patients, the presence of a comorbidity had resulted in a worse MCS and SSQOL mean scores. Many literatures reported the negative influence of comorbidities on the HRQOL in stroke cases [30,31]. However, this was not found by Carod-Artal *et al.* [32], who concluded that comorbid conditions, diabetes, hypertension, or

Table 5 Correlation between the short-form 36 domains, the stroke-specific quality-of-life total score, and some of the demographic and clinical features of stroke patients

Parameters	*r* (*P*)		
	PCS	MCS	SSQOL
Duration	0.353 (0.004)	−0.020 (0.878)	0.018 (0.888)
Education level	−0.187 (0.139)	0.230 (0.068)	0.120 (0.344)
Nature of stroke	−0.168 (0.183)	−0.099 (0.068)	−0.277 (0.027)
Weak side	−0.214 (0.090)	0.020 (0.438)	0.171 (0.177)
Dominant hand	−0.029 (0.819)	0.010 (0.873)	0.215 (0.089)
Comorbidity	0.191 (0.130)	317 (0.011)	0.342 (0.006)
mobility	−0.455 (0.000)	026 (0.836)	−0.431 (0.000)
ULVC	0.359 (0.004)	0.307 (0.014)	0.329 (0.008)
LLVC	0.318 (0.010)	−0.071 (0.578)	0.276 (0.027)
Barthel Index score	0.396 (0.001)	0.157 (0.216)	0.514 (0.000)

LLVC, lower-limb voluntary control; MCS, mental component summary; PCS, physical component summary; SSQOL, stroke-specific quality of life; ULVC, upper-limb voluntary control.

Table 6 Short-form 36 quality-of-life predictors among stroke patients (*n* = 64)

SF36	*β*	*t*	*P*	95% CI for *β*
PCS predictors				
Constant	42.344	3.070	0.003	14.737–69.952
Duration/month	0.054	1.366	0.177	−0.025–0.133
Mobility	−6.225	−1.643	0.106	−13.809–1.359
ULVC	1.728	1.172	0.246	−1.223–4.679
LLVC	−0.537	−0.331	0.742	−3.783–2.709
Barthel Index	−0.051	−0.475	0.637	−0.267–0.165
Model				
R^2			0.23	
F			3.53	
P			<0.01 (significant = 0.007)	
MCS predictors				
Constant	23.066	4.117	0.000	11.87–34.27
Comorbidity	9.018	1.976	0.053	−0.11–18.15
ULVC	2.206	1.097	0.277	−1.8–6.23
Model				
R^2			0.12	
F			4.10	
P			0.05 (significant = 0.022)	

CI, confidence interval; *F*, ANOVA value; LLVC, lower-limb voluntary control; MCS, mental component summary; PCS, physical component summary; R^2, coefficient of multiple determinations for multiple regressions; *t*, the ratio between the coefficient and its standard error; ULVC, upper-limb voluntary control.

other vascular risk factors did not decrease the global QOL. Although they did not provide an explanation, the population culture and the healthcare facilities provided for patients with chronic conditions could be an explanation.

Other determinants of the patient's HRQOL could be identified including the functional disability. We found that independently mobile patients had better PCS and SSQOL as compared with patients with different degrees of dependency. Better ULVC was associated with better scores in both domains of SF-36, whereas better LLVC was associated with better MCS and SSQOL. These findings concur with the results of several studies that reported that stroke disability causes a reduced QOL among stroke survivors, and the greater the disability, the lower the QOL [32–36]. Lai *et al*. [37] found that stroke causes sufficient decrease in the QOL even among those who have no poststroke disability. Perhaps the plausible explanation is that physical disability is the main concern of stroke patients because of its direct effect on the daily activities and hence the QOL. Both SF-36 and SSQOL depend mainly on the subjective assessment of patients' QOL, which does not always correlate with the objective measures [38]. In terms of correlations, our study showed that the SSQOL total score and PCS of SF-36 had a statistically significant positive correlation with the BI and voluntary control of the limbs, whereas they had a statistically significant negative correlation with the dependence in mobility. This could be explained by the well-documented negative influence of the physical disability on the HRQOL of patients [32–36].

Of additional interest is the positive correlation found between MCS of SF-36 and ULVC, which could be explained by the subjective perception of patients with an impaired ULVC of their QOL, where the loss of upper-limb function, especially the use of the hands, is one of the most significant and devastating losses an individual can experience. The use of the upper extremities is critical in completing basic activities of daily living such as self-feeding, dressing, bathing, and toileting. Mobility needs such as the use of walking-adaptive devises and wheeled mobility are also completed using the arms [39]. Moreover, we found a significant positive correlation between the poststroke duration and the PCS of SF-36, wherein a better physical domain was encountered with an increased chronicity of stroke. One explanation for this could be that patients with a long duration of the disease were the ones who had better accommodation and coping with the disease.

In identifying predictors for the HRQOL domains, the multivariate regression analysis showed that the BI of independency was the most significant predictor, followed by comorbidities and the nature of the stroke. The study of Chou [16] supported this when he found that BI is a very important factor that influences the SSQOL score.

Our study has a number of limitations. First, the study group was relatively small because of the selection criteria, which excluded patients with dementia and aphasia, wherein the methodology for measuring QOL in these patients is difficult and may be better analyzed

Table 7 Stroke-specific quality-of-life predictors among stroke patients (*n* = 64)

SSQOL	β	*t*	*P*	95% CI for β
Constant	81.049	1.794	0.078	−9.428–171.526
Nature of stroke	−29.565	−2.562	0.013	−52.670 to −6.461
Comorbidity	18.301	2.028	0.047	0.232–36.371
Mobility	13.818	1.137	0.260	−10.518–38.154
ULVC	−5.691	−1.060	0.294	−16.446–5.063
LLVC	4.248	0.770	0.444	−6.796–15.292
Barthel Index	1.015	2.969	0.004	0.330–1.699
Model				
R^2			0.40	
F			6.20	
P			0.00 (significant = 0.00)	

CI, confidence interval; *F*, ANOVA value; LLVC, lower-limb voluntary control; R^2, coefficient of multiple determinations for multiple regressions; SSQOL, stroke-specific quality of life; *t*, the ratio between the coefficient and its standard error; ULVC, upper-limb voluntary control.

by caregivers or proxy. The second limitation was the lack of a comparison group of healthy adults. However, it is possible to compare the findings with the same QOL instruments in a normal population in whom scales were validated [40,41]. Lastly, it is a monocenter experience. To make stronger generalizations, the study group should be larger and patients from multiple hospitals should be interviewed.

In conclusion, the current study shows that both global and disease-specific QOL were impaired in stroke patients. It also provides useful information about the significance of disability measurements as the predictive factor of HRQOL in stroke survivors. Further longitudinal studies in patients after stroke using standardized instruments that are accepted in most rehabilitation units are needed. We also recommend considering the routine measuring of HRQOL in stroke patients attending rehabilitation units to monitor the impact of the rehabilitation program on the patients' QOL.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 Lavados PM, Hennis AJ, Fernandes JG, Medina MT, Legetic B, Hoppe A, *et al.* Stroke epidemiology, prevention, and management strategies at a regional level: Latin America and the Caribbean. Lancet Neurol 2007; **6**:362–372.

2 Mar J, Sainz-Ezkerra M, Moler-Cuiral JA. Calculation of prevalence estimates through differential equations: application to stroke-related disability. Neuroepidemiology. 2008; **31**:57–66.

3 Wilkinson PR, Wolfe CDA, Warburton FG, Rudd AG, Howard RS, Ross-Russell RW, Beech RR, *et al.* A long-term follow up of stroke patients. Stroke 1997; **28**:507–512.

4 Bush TL, Miller SR, Golden AL, Hale WE. Self-report and medical record report agreement of selected medical conditions in the elderly. Am J Public Health 1989; **79**:1554–1556.

5 Mahoney FD, Barthel DW. Functional evaluation: the Barthel index. Md State Med J 1965; **14**:61–63.

6 Scoring demonstration. Available at: *http://www.sf-36.org/demos/SF-36.html*. [Accessed on 2013 Jan 2].

7 Online scoring service. Available at: *http://www.sf-36.org/demos/SF-36.html* [Accessed on 2013 Jan 2].

8 Williams LS, Weinberger M, Harris LE, Biller J. Measuring quality of life in a way that is meaningful to stroke patients. Neurology 1999; **53**:1839–1843.

9 Lima RCM, Teixeira-Salmela LF, Magalhaes LC, Gomes-Neto M. Psychometric properties of the Brazilian version of the Stroke Specific Quality of Life Scale: application of the Rasch model. Rev Bras Fisioter 2008; **12**:149–156.

10 Muus I, Williams LS, Ringsberg KC. Validation of the Stroke Specific Quality of Life Scale (SS-QOL): test of reliability and validity of the Danish version (SS-QOL-DK). Clin Rehabil 2007; **21**:620–627.

11 Ewert T, Stucki G. Validity of the SS-QOL in Germany and in survivors of hemorrhagic or ischemic stroke. Neurorehabil Neural Repair 2007; **21**:161–168.

12 Fróes KS, Valdés MT, Lopes Dde P, Silva CE. Factors associated with health-related quality of life for adults with stroke sequelae. Arq Neuropsiquiatr 2011; **69**:371–376.

13 Noble AJ, Schenk T. Which variables help explain the poor health-related quality of life after subarachnoid hemorrhage? A meta-analysis. Neurosurgery 2010; **66**:772–783.

14 Carod-Artal FJ, Egido JA. Quality of life after stroke: the importance of a good recovery. Cerebrovasc Dis 2009; **27(Suppl 1)**:204–214.

15 Graham A. Measurement in stroke: activity and quality of life. In: Barnes MP, Dobkin BH, Bogusslavsky J, editors. *Recovery after stroke*. New York: Cambridge University Press; 2005. 135–160.

16 Chou CY. Determinants of the health-related quality of life for stroke survivors. J Stroke Cerebrovasc Dis 2015; **24**:655–662.

17 Haacke C, Althaus A, Spottke A, Siebert U, Back T, Dodel R. Long-term outcome after stroke: evaluating health-related quality of life using utility measurements. Stroke 2006; **37**:193–198.

18 Franke CL, Van Swieten JC, Algra A, Van Gijn J. Prognostic factors in patients with intracerebral hematoma. J Neurol Neurosurg Psychiatry 1992; **55**:653–657.

19 Kapral MK, Fang J, Hill MD, Silver F, Richards J, Jaigobin C, Cheung AM, Investigators of the Registry of the Canadian Stroke Network. Sex differences in stroke care and outcomes: results from the Registry of the Canadian Stroke Network. Stroke 2005; **36**:809–814.

20 Paolucci S, Bragoni M, Coiro P, De Angelis D, Fusco FR, Morelli D, *et al.* Is sex a prognostic factor in stroke rehabilitation? A matched comparison. Stroke 2006; **37**:2989–2994.

21 Xie J, Wu EQ, Zheng ZJ, Croft JB, Greenlund KJ, Mensah GA, Labarthe DR. Impact of stroke on health-related quality of life in the noninstitutionalized population in the United States. Stroke 2006; **37**:2567–2572.

22 Hooi LN. What are the clinical factors that affect quality of life in adult asthmatics? Med J Malaysia 2003; **58**:506–515.

23 Kalantar-Zadeh K, Kopple JD, Block G, Humphreys MH. Association among SF36 quality of life measures and nutrition, hospitalization, and mortality in hemodialysis. J Am Soc Nephrol 2001; **12**:2797–2806.

24 Labiche LA, Chan W, Saldin KR, Morgenstern LB. Sex and acute stroke presentation. Ann Emerg Med 2002; **40**:453–460.

25 Sturm JW, Donnan GA, Dewey HM, Macdonell RA, Gilligan AK, *et al.* Quality of life after stroke: the North East Melbourne Stroke Incidence Study (NEMESIS). Stroke 2004; **35**:2340–2345.

26 Herrmann N, Black SE, Lawrence J, Szekely C, Szalai JP. The Sunnybrook Stroke Study: a prospective study of depressive symptoms and functional outcome. Stroke 1998; **29**:618–624.

27 Aprile L, Piazzini DB, Bertolini C, Caliandro C, Pazzaglia C, Tonali P, Padua L. Predictive variable on disability and quality of life in stroke outpatients undergoing rehabilitation. Neurol Sci 2006; **27**:40–46.

28 Lin KC, Fu T, Wu CY, Hsieh CJ. Assessing the stroke-specific quality of life for outcome measurement in stroke rehabilitation: minimal detectable change and clinically important difference. Health Qual Life Outcomes 2011; **9**:5.

29 Abubakar SA, Isezuo SA. Health related quality of life of stroke survivors: experience of a stroke unit. Int J Biomed Sci 2012; **8**:183–187.

30 Sturm JW, Donnan GA, Dewey HM, Macdonell RA, Gilligan AK, Thrift AG. Determinants of handicap after stroke: the North East Melbourne Stroke Incidence Study (NEMESIS). Stroke 2004; **35**: 715–720.

31 Rochette A, Desrosiers J, Norrau L. Associated between personal and environmental factors and occurrence of handicap situation following a stroke. Disabil Rehabil 2001; **23**:559–569.

32 Carod-Artal J, Egido JA, González JL, Varela de Seijas E. Quality of life among stroke survivors evaluated 1 year after stroke: experience of a stroke unit. Stroke 2000; **31**:2995–3000.

33 Muus I, Petzold M, Ringsberg KC. Health-related quality of life among Danish patients 3 and 12 months after TIA or mild stroke. Scand J Caring Sci2010; **24**:211–218.

34 Díaz-Tapia V, Gana J, Sobarzo M, Jaramillo-Muñoz A, Illanes-Díez S. Estudio sobre la calidad de vida en pacientes con accidente vascular cerebral isquémico. Rev Neurol 2008; **46**:652–655.

35 Aprile I, Piazzini DB, Bertolini C, Caliandro P, Pazzaglia C, Tonali P, Padua L. Predictive variables on disability and quality of life in stroke outpatients undergoing rehabilitation. Neurol Sci 2006; **27**:40–46.

36 Jönsson AC, Lindgren I, Hallstrom B, Norrving B, Lindgren A. Determinants of quality of life in stroke survivors and their informal caregivers. Stroke 2005; **36**:803–808.

37 Lai SM, Studenski S, Duncan PW, Perera S. Persisting consequences of stroke measured by the Stroke Impact Scale. Stroke 2002; **33**:1840–1844.

38 Addington-Hall J, Kalra L. Who should measure quality of life? BMJ 2001; **322**:1417–1420.

39 Snoek GJ, Ijzerman MJ, Hermens HJ, Maxwell D, Biering-Sorensen F. Survey of the needs of patients with spinal cord injury: impact and priority for improvement in hand function in tetraplegics. Spinal Cord 2004; **42**:526–532.

40 Badía X, Alonso J. Validity and reproducibility of the Spanish Version of the Sickness Impact Profile. J Clin Epidemiol 1996; **49**:359–365.

41 Alonso J, Prieto L, Antó JM. La versión española del SF-36 Health Survey (Cuestionario de Salud SF-36): un instrumento para la medida de los resultados clínicos. Med Clin (Barc) 1995; **104**:771–776.