


# Determinants of life satisfaction among stroke survivors 1 year post stroke

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## Abstract

Stroke is the major leading cause of death and severe long-term disability worldwide. The consequences of stroke, aside from diminished survival, have a significant impact on an individual's capability in maintaining self-autonomy and life satisfaction (LS). Thus, this study aimed to assess LS and other specific domains of LS in stroke survivors following their first-ever stroke, and to describe the relationship using socio-demographic and stroke-related variables.

This study recruited 376 stroke survivors (244 men and 132 women, mean age: 57 years) 1 year following stroke. Data on participants' LS (measured using the Life Satisfaction Questionnaire [LiSat-11]), socio-demographics, and stroke-related variables were collected.

Univariate analysis showed that LS and the 10 specific domains were not associated with the patients' gender or stroke type; however, age at onset, marital status, and vocational situation were significantly associated with some domains in LiSat-11 (Spearman's rho = 0.42–0.87; all  $P < 0.05$ ). Logistic regression revealed that verbal and cognitive dysfunction were the most negative predictors of LS (odds ratio 4.1 and 3.7, respectively).

LS is negatively affected in stroke survivors 1 year post onset. The results indicate that recovering social engagement is a positive predictor of higher LS in stroke survivors. More importantly, the findings revealed that cognitive and verbal dysfunctions were the most prominent negative predictors of the overall gross level of LS. Multidisciplinary rehabilitation for stroke survivors is therefore critical.

**Abbreviations:** ADL = activities of daily living, CI = confidence interval, LiSat = Life Satisfaction Questionnaire, LS = life satisfaction, OD = odds ratio.

**Keywords:** cognitive dysfunction, life satisfaction, rehabilitation, stroke, verbal dysfunction

## 1. Introduction

Stroke is the major leading cause of death and severe long-term disability worldwide.<sup>[1,2]</sup> Globally, stroke incidence was estimated to be 339 per 100,000 population per year.<sup>[3]</sup> Regionally, in a previous systematic review,<sup>[4,5]</sup> the incidence rate for all strokes in

the Middle East from 1980 to 2015 ranged between 22.7 and 250 per 100,000 per year, and the prevalence rate ranged between 508 and 777 per 100,000 population. The mean age of stroke survivors ranged between 60 and 70 years old, with 75% of reviewed studies reporting a high male-to-female ratio. Strokes may result in a wide range of impairments that can affect the physical, psychosocial, cognitive, and emotional domains of an individual's life.<sup>[3,6,7]</sup> The consequences of stroke, aside from diminished survival, have a significant impact on an individual's capability in maintaining self-autonomy and life satisfaction (LS).<sup>[6–9]</sup> A global measurement of LS has become 1 of the main healthcare outcome measurements, particularly for individuals with functional impairments.<sup>[10–13]</sup> LS can be defined as an overall measurement of quality of life that reflects a global subjective appraisal of life from the individual's perspective.<sup>[14,15]</sup> As a psychosocial indicator of a meaningful life, LS reflects the difference between an individual's ambition level and achievements.<sup>[16–18]</sup> Although LS is considered to be stable at an overall level, a well-established body of evidence shows that alterations in health, vocational status, and social relationships significantly reduce LS<sup>[19–22]</sup> and quality of life.<sup>[23,24]</sup>

Several studies have been conducted to evaluate global and domain-specific LS and quality of life in different neurological conditions such as stroke,<sup>[25–33]</sup> traumatic brain injury,<sup>[34–36]</sup> multiple sclerosis,<sup>[11,37]</sup> spinal cord injury,<sup>[38]</sup> and on the caregivers and spouses of stroke survivors.<sup>[21,23]</sup> Change in LS over time has been reported among stroke survivors. It has been found that 54% of stroke survivors were dissatisfied with their lives as a whole 1 year post stroke,<sup>[28,39]</sup> and 61% of stroke

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survivors had a low level of satisfaction with their lives 4 to 6 years post stroke.<sup>[27]</sup> Using the Life Satisfaction Questionnaire (LiSat-9), Bränholm et al<sup>[11]</sup> reported that lower satisfaction was not limited only to live as a whole but also included most of the specific domains of LS in stroke survivors compared to a healthy control group.

Numerous studies have investigated the effects of socio-demographic factors such as gender, age, and vocational and educational status on the levels of satisfaction within different domains of life.<sup>[25–30,35,36]</sup> For example, Jacobsson et al<sup>[36]</sup> show that gender is not associated with any domains in the Life Satisfaction Questionnaire (LiSat-11), but other covariates, such as age at the time of injury, marital status, and vocational situation, are significantly correlated with some of the life domains in patients with traumatic brain injury. Other studies have most often reported a lower LS in stroke survivors to be significantly associated with limitations in physical functioning and daily activities as well as with verbal impairment.<sup>[40–42]</sup> Moreover, a recent study that elucidated the impact of illness perceptions and self-efficacy on quality of life in post stroke showed evidence for the critical role of psychosocial factors in quality of life in stroke survivors.<sup>[32]</sup>

One of the crucial goals of rehabilitation is to achieve an individual's optimal LS.<sup>[10,13]</sup> Therefore, understanding the determinants of LS for stroke survivors is the gateway to achieving that goal. Most of the previous studies have focused on socio-demographic determinants, and only a few studies focused on stroke-related variables as determinants of LS post stroke. In the present study, therefore, the aim is to investigate the socio-demographic (gender, age, marital status, and vocational levels) and stroke-related (type of stroke, cognitive, and verbal functions) variables as determinants of stroke survivors' satisfaction with life as a whole and with the 10 different domains of LS using the LiSat-11 questionnaire 1 year post stroke.

## 2. Materials and methods

### 2.1. Participants

Participants within 1 year of a stroke were recruited, screened for criteria eligibility, and invited to participate. Initially, 460 stroke survivors from different acute stroke units and stroke rehabilitation centers who were 1 year post stroke were screened for eligibility. Three hundred seventy-six participants met the inclusion criteria (132 females; mean age  $\pm$  SD = 57  $\pm$  3 years) and were recruited. They were between 20 and 65 years of age at the time of data collection, with their first-ever stroke confirmed by diagnostic imaging, computed tomography, and/or magnetic resonance imaging, and clinically verified stroke symptoms. Participants were excluded if they had a psychiatric history, very severe cognitive or language impairments, or other coexisting neurological or psychiatric illnesses. All participants gave written, informed consent, which was approved by the local ethics committee of Imam Abdulrahman Bin Faisal University, city of Dammam, Kingdom of Saudi Arabia.

### 2.2. Questionnaires

LS was measured using the LiSat-11 questionnaire.<sup>[8]</sup> LiSat-11 has been commonly used for measuring LS in individuals with stroke or other neurological conditions.<sup>[13,39,43–45]</sup> LiSat-11 was

found to be a valid<sup>[10]</sup> and a reliable<sup>[45]</sup> outcome measurement for assessing LS post stroke. In the present study, the version of LiSat-11 was used, which was found to be a valid outcome measure for assessing an individual's LS<sup>[46]</sup> LiSat-11 is a self-reported checklist with 11 items, which is scored on a Likert-type questionnaire with 6 response levels: 1, very dissatisfied; 2, dissatisfied; 3, rather dissatisfied; 4, rather satisfied; 5, satisfied; and 6, very satisfied. Questionnaire items measure global LS in 1 item, and domain-specific LS in the remaining 10 items including the ability to manage self-care; contact with friends and acquaintances; partnership relationship; sexual life; physical and psychological health; family life; and vocational, financial, and leisure situations. Results are categorized into 2 levels: "satisfied" for scores ranging from 5 to 6 and "dissatisfied" for scores ranging from 1 to 4.<sup>[12]</sup>

### 2.3. Socio-demographics

Participants' socio-demographics (gender, age, marital status, and vocational and educational levels) were obtained from all participants at the time of data collection. To facilitate the analysis, marital status was dichotomized as (i) single or (ii) married. Furthermore, vocational level was dichotomized as (i) productive (ie, studying or working) or (ii) non-productive (ie, no work or full retirement). Data on stroke-related variables (type of stroke, cognitive, and verbal functions) were extracted from the medical files. The types of stroke were dichotomized as (i) ischemic stroke, (ii) hemorrhagic stroke, or (iii) others. The stroke survivors' cognitive impairments were dichotomized into (i) not impaired versus (ii) impaired (slight/moderate to severe). Finally, the stroke survivors' verbal (aphasia) impairments were dichotomized into (i) none present or (ii) present (slight/moderate to severe).

### 2.4. Data analysis

All data analyses were carried out using IBM SPSS version 22.0 software (IBM Corporation, Armonk, New York, NY). In the present study, the 11 items were dichotomized as "not satisfied" (from very dissatisfied to rather satisfied, response options 1–4) and "satisfied" (satisfied and very satisfied, response options 5 and 6). The validity of this dichotomy has been previously shown.<sup>[12]</sup> As the LiSat-11 measurement is considered an ordinal questionnaire with 6 categories, non-parametric statistics were used, and correlations between items in LiSat-11 were analyzed. Differences in levels of LS in relation to age, gender, and marital status, vocational levels, stroke type, and cognitive and verbal functions were detected and analyzed through univariate analysis, using a series of Spearman rank correlation coefficients ( $\rho$ ). These variables were chosen for their importance, as they have been investigated previously.<sup>[30,36]</sup>

As the global LS item, "life as a whole," was dichotomized into 2 response categories: not satisfied (1–4) and satisfied (5–6).<sup>[12]</sup> A logistic regression model was then performed, with LS "as a whole" as a dependent variable and others (marital status, vocational level, cognitive, and verbal functions) as independent variables, to test which variables were the most influential in predicting gross levels of LS. These variables were obtained from the univariate analysis.

The chosen level of significance was  $P < 0.01$ . Logistic (stepwise, backward) regression analysis was conducted to

**Table 1**  
**Participants' socio-demographics and stroke-related variables (n=376).**

Socio-demographics and stroke-related variables	Participants (n=376)
Age (years; mean [SD])	57 (3)
Gender; male, n (%)	244 (65)
Marital status	
Married, n (%)	323 (86)
Educational level	
Low, n (%)	173 (46)
High, n (%)	203 (54)
Vocational level	
Productive, n (%)	241 (64)
Non-productive, n (%)	135 (36)
Type of stroke	
Ischemic stroke, n (%)	252 (67)
Hemorrhagic stroke, n (%)	124 (33)
Cognitive function	
Not impaired, n (%)	117 (31)
Cognitively impaired	
Mild, n (%)	139 (37)
Moderate – severe, n (%)	120 (32)
Verbal dysfunction (Aphasia)	
None, n (%)	252 (67)
Present	
Mild, n (%)	45 (12)
Moderate – severe, n (%)	79 (21)
Need help to fill out the questionnaires (yes, %)	169 (45)

n = number, SD = standard deviation; (%), percentage.

predict the significance (odds ratios) of related variables on the gross level of satisfaction with life as a whole.

Sample size was calculated based on the calculation formula for cross-sectional studies.<sup>[47]</sup> The standard normal variate (z value) was set at a significance level of 5% and the effect at 2, as well as using the maximum standard deviation documented in related literature.<sup>[4]</sup> The required sample size was estimated to be 301 with an expected response rate of 80%; therefore, the sample size was estimated to be 376.

### 3. Results

A total of 376 participants 1 year post stroke enrolled in this study. The mean age was 57 years at the time of data collection;

65% were male. A majority (323 participants; 86%) were married or living with family, the remaining were single or divorced. Participants' socio-demographics and stroke-related variables are presented in Table 1.

Approximately 42% of the participants were satisfied to very satisfied with life as a whole, 27% were rather satisfied, and 31% were rather dissatisfied to very dissatisfied. More details of the participants' levels of satisfaction corresponding to each domain of the LiSat-11 are presented in Table 2.

Overall, all stroke survivors reported significantly lower satisfaction with most of the LiSat-11 domains; life as a whole, vocational situation, leisure, activities of daily living (ADL), sexual life, family life, and partner relationship, but with a satisfied to rather satisfied rate in response to the economic situation, contact with friends, and somatic and psychological health (Table 2).

In a series of Spearman ( $r_s$ ) analyses, the differences in levels of LS in relation to socio-demographic (gender, age, marital status, and vocational levels), and stroke-related (cognitive and verbal functions) variables were assessed. The coefficients varied from the lowest coefficient ( $r_s=0.42$ ) to the highest ( $r_s=0.87$ ), at a significance level of ( $P < 0.05-0.001$ ). There was no significant difference in gender for any item in the LiSat-11 (Table 3). Age at time of stroke onset (dichotomized as up to 45 years and more than 45 years) was related only to the economic domain. In contrast, those who were married were significantly more satisfied with their lives as a whole and with their sexual lives compared with those who were single. Furthermore, compared to non-productive participants, those who were productive (working or studying), were significantly more satisfied with life as a whole, leisure, sexual lives, ADL, family lives, partner relationships, and somatic health.

With regard to verbal dysfunction, those with mild-to-moderate verbal dysfunction had significantly lower satisfaction with life as a whole, contact with friends, partner relationships, somatic health, and psychological health. Furthermore, when the sample was divided into 2 groups, a significantly lower LS remained for the moderate-to-severe cognitive impairment group regarding life as a whole, contact with friends, somatic health, and psychological health. However, there was no significant difference between the ischemic and hemorrhagic stroke types for any LS item (Table 3).

Furthermore, a logistic regression analysis was carried out with socio-demographic variables (marital status and vocational level)

**Table 2**  
**Percentages and numbers of participants (n=376) responded to each domain of LiSat-11.**

LS domains	Participants (n=376)					
	n (%)					
	Very satisfied (6)	Satisfied (5)	Rather satisfied (4)	Rather dissatisfied (3)	Dissatisfied (2)	Very dissatisfied (1)
Life as a whole	63 (17)	94 (25)	103 (27)	56 (15)	30 (8)	30 (8)
Vocation	56 (15)	91 (24)	56 (15)	30 (8)	38 (10)	105 (28)
Economy	68 (28)	75 (30)	113 (20)	49 (13)	30 (8)	41 (11)
Leisure	75 (16)	86 (18)	83 (20)	53 (34)	41 (11)	38 (10)
Contacts with friends	98 (26)	117 (31)	94 (25)	15 (4)	7 (26)	26 (7)
Sexual life	41 (11)	105 (28)	79 (21)	38 (10)	38 (10)	75 (20)
Activities of daily living	49 (13)	79 (21)	135 (36)	64 (17)	23 (6)	26 (7)
Family life	245 (65)	49 (13)	41 (11)	11 (3)	11 (3)	19 (5)
Partner relationship	209 (56)	83 (22)	34 (9)	23 (6)	19 (5)	8 (2)
Somatic health	28 (10)	119 (32)	79 (21)	34 (9)	38 (10)	68 (18)
Psychological health	116 (31)	75 (20)	68 (18)	38 (10)	38 (10)	41 (11)

LiSat=Life Satisfaction Questionnaire, LS=life satisfaction.

**Table 3**

**Difference in self-rated levels of life satisfaction in relation to gender, age at the time of onset, marital status, vocational situation, and cognitive and verbal dysfunction in the 376 stroke survivors. Values in percentages represent 2 responses: “very satisfied” and “satisfied,” labeled as “satisfied.”<sup>[10]</sup>**

	Gender men/ women%	Age at stroke onset up to 45 years/ more than 45 years %	Marital status married/ single %	Vocational situation productive/non- productive %	Type of stroke ischemic/ hemorrhagic %	Cognitive dysfunction mild/moderate- to-severe %	Verbal dysfunction (aphasia) mild/ moderate-to-severe %
Life as a whole	58/51	55/50	74/43*	71/46*	55/51	70/48*	75/46*
Vocation	45/48	40/55	45/42	55/33	43/46	50/31	60/49
Economy	41/38	32/58*	31/46	39/38	45/41	40/36	57/50
Leisure	50/41	50/52	58/42	56/29*	51/44	52/45	60/51
Contact with friends	57/75	70/68	68/46	69/52	77/81	50/21*	51/24*
Sexual life	48/47	58/41	61/28*	67/28v*	46/43	65/55	65/50
Activities of daily living	89/85	91/85	90/80	94/55**	90/88	85/75	87/73
Family life	90/93	88/95	91/89	92/70	88/92	82/69	81/66
Partner relationship	91/99	93/95	85/80	90/84	93/95	79/66	56/30*
Somatic health	40/61	45/50	51/43	61/21**	41/39	65/41*	65/39*
Psychological health	75/58	68/78	86/61	78/61	77/76	50/22*	61/21**

\*  $P < 0.05$ .\*\*  $P < 0.001$ .

and stroke-related variables (cognitive and verbal dysfunctions) as independent variables and gross level of satisfaction with life as a whole as a dependent variable. Table 4 shows the odds ratio and 95% confidence intervals for these variables.

#### 4. Discussion

In this study, LS as a whole and 10 other domains of LS were assessed 1 year post stroke in stroke survivors with first-ever stroke. The majority of the stroke survivors were dissatisfied with life as a whole and with most of the LiSat-11 domains (vocation, leisure, daily activities, somatic health, and psychological health). This is in accord with the results of many studies on stroke survivors and others with neurological disorders.<sup>[19,23,24,48–50]</sup>

Furthermore, satisfaction with life as a whole and the 10 rated domains were not univariately associated with the patients' gender or type of stroke; however, age of onset, marital status, and vocational situation were associated with some of the LiSat-11 domains, which is in line with findings from other studies that used the LiSat-11.<sup>[51,52]</sup> In this study, only the data on stroke type based on mechanisms (ischemic and hemorrhagic) were included and analyzed, while the data on stroke type based on location (cortical and sub-cortical) were not involved. Such data, if included, would yield different results as evidence have shown that the LS items and the cognitive and language domains are affected by either cortical or subcortical type of stroke.<sup>[53]</sup>

In general, various factors that affect an individual's life – — such as being married or living with family, being employed, having a good income, and social participation – are also critical following a stroke.<sup>[13,54,55]</sup> Thus, in the present study, it was

expected that individuals with stroke who were married or living with family and vocationally productive would report a significantly higher LS. In contrast, those who were single had significantly lower satisfaction with their sexual life. With regard to vocational productivity, those who were vocationally productive (ie, working or studying) reported significantly higher satisfaction with life as a whole, leisure, sexual life, ADL, and somatic health. Similarly, Eriksson et al<sup>[56]</sup> reported that patients who were vocationally active, regardless of the severity of their injury, were more satisfied with life as a whole and psychological health domain. This identifies that being vocationally productive enhances social participation and positive engagement. In contrast, individuals who were not vocationally productive reported lower satisfaction with leisure activities and sexual life, which might indicate fewer social interactions and less participation. Moreover, a high degree of LS was reported to be positively correlated with participating in leisure activities.<sup>[36,57]</sup> The current findings reflect, in agreement with previous studies,<sup>[13,23,52,58–61]</sup> the significance of being socially active and productive as a predictor of high LS.

Considerable evidence suggests that neuropsychological realms (ie, cognitive and language) are highly important determinants of functional outcomes post stroke.<sup>[62–68]</sup> Moreover, stroke-related characteristics such as motor, cognitive, and verbal dysfunctions were associated with poor LS among stroke survivors.<sup>[69,70]</sup> When our sample was divided into 2 groups with regard to cognitive dysfunction, significant differences were prominent. Those with moderate-to-severe cognitive dysfunction reported lower LS for more domains than those with mild cognitive dysfunction. This implies that cognitive impairment might be a crucial factor that influences LS in stroke survivors. This comes in accordance with several studies that have reported cognitive dysfunction as a predictive factor of quality of life.<sup>[71–73]</sup> For example, cognitive impairment was shown as an independent predictor of reduced quality of life at 6 to 10 months post stroke.<sup>[71]</sup> Likewise, Cumming et al,<sup>[73]</sup> showed particularly poorer attention and visuospatial ability to be cognitive realms that were strongly correlated with lower quality of life at 12 months following stroke, even when other significant predictive variables were taken into account. Findings from this

**Table 4**

**Results of the logistic regression analysis; OR with 95% CI.**

Variable	OR	(95% CI)
Marital status	1.6	0.63–4.3
Vocational level	3.1	1.2–7.3
Cognitive dysfunction	3.7	1.7–8.1
Verbal dysfunction	4.1	1.85–11.2

CI=confidence interval, OR=odds ratio.

study reveal that cognitive impairment is of the strongest negative predicting factors of LS in stroke survivors.

This study found that those with moderate-to-severe verbal dysfunction (aphasia) were not satisfied with their LS in more domains than those with mild verbal dysfunction. This also shows that language impairment plays a significant role in determining gross levels of LS post stroke. These findings are in line with multiple studies that have shown that verbal dysfunction (presentation of aphasia) is a predictive factor for functional recovery and LS.<sup>[74–76]</sup> Aphasia is a predicting factor of functional motor outcome<sup>[75]</sup> and has been reported as a significant predictor of emotional distress,<sup>[77]</sup> loneliness, and social isolation.<sup>[78]</sup>

The strengths of this study were a large number of stroke survivors who were recruited and the inclusion of cognitive and language assessments. However, some limitations should be taken into account when interpreting the findings due to the potential for bias inherent to the study design. First, the study recruited stroke survivors who were admitted to hospitals and needed physical rehabilitation. Second, exclusion of those with severe cognitive or language deficits who were unable to respond to the questionnaire or assess the effect of stroke on their LS, limited the study's ability to generalize the findings. Finally, although the independent variables were chosen based on the results of previous studies, all possible variables have not been included in the regression analysis and were dichotomized, which resulted in the study covering a wide variety of subjects. Future research that includes longitudinal data on multiple independent factors would be beneficial to explore the relationship between these factors and LS domains in stroke-surviving patients.<sup>[79,80]</sup>

## 5. Conclusions

In conclusion, this study demonstrates that LS is negatively affected in stroke survivors 1-year post onset, but it is not associated with gender or type of stroke. Stroke survivors who were socially engaged, as indicated by living with family or marriage and being vocationally active, reported higher LS. This implicates social re-engagement as a positive predictor of higher LS in stroke survivors. More importantly, the findings of this study revealed that cognitive and verbal dysfunction were the most prominent negative predictors of an overall gross level of LS. Given this importance of cognitive and verbal impairments post stroke and its contribution to lower LS, cognitive rehabilitation is a critical component of stroke rehabilitation that should be considered. Therefore, a multidisciplinary and multifactorial approach in rehabilitation, including cognitive and speech-language therapy programs, is critical and has a significant impact on stroke survivors' lives.

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