

Original Article



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Received: Aug 18, 2023

Revised: Nov 1, 2023

Accepted: Nov 9, 2023

Published online: Dec 22, 2023

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HIGHLIGHTS

- Health-related quality of life (HRQoL) differs in different living arrangements.
- HRQoL was related to activities of daily living (ADLs) and mental health.
- The modified Rankin Scale, living arrangement, and ADLs affect HRQoL.

Original Article



Health-Related Quality of Life of Post-Stroke Patients in a Public Hospital

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ABSTRACT

This study aimed to identify the correlation between influencing factors of activities of daily living (ADLs), mental health, and health-related quality of life (HRQoL) among post-stroke patients who enrolled in a transitional care service in a public hospital. This cross-sectional study involved 67 stroke patients who were enrolled in a transitional care service and visited the outpatient clinic at a public hospital in Seoul between March and December 2022. Their general characteristics, ADLs, mental health, and HRQoL were assessed. The data were analyzed using independent samples t-tests, analysis of variance, and Pearson correlation analysis, and the influencing factors were analyzed using regression analysis. HRQoL showed a statistically significant difference between patients living in different types of arrangements ($t = 2.50, p = 0.015$), and patients scores on the modified Rankin Scale ($t = 7.08, p < 0.001$). HRQoL was also significantly correlated with ADLs and mental health in stroke patients ($r = -0.59, p < 0.001$; $r = -0.41, p < 0.001$, respectively). Meanwhile, stroke severity ($\beta = -0.30, p = 0.002$), living arrangements ($\beta = -0.30, p = 0.009$) and ADLs ($\beta = -0.45, p < 0.001$) were found to influence HRQoL ($F = 6.87, p < 0.001, R^2 = 0.47$). Reduced dependence for ADLs, improvements in symptoms consequent to stroke, and support related to living arrangements contributed to improved HRQoL and interventions for post-stroke patients in the transitional care service of a public hospital.

Keywords: Stroke; Health-Related Quality of Life; Activities of Daily Living; Mental Health

INTRODUCTION

Stroke is one of the leading causes of death after cancer, heart disease, and pneumonia. In South Korea, it is the fourth leading cause of death, and the number of cases increased by 29.7% between 2014 and 2019 [1]. As a result of stroke, patients may experience hemiplegia, functional impairment, cognitive impairment, and mental health problems, all of which hinder their engagement in activities of daily living (ADLs) [2,3]. Moreover, as patients' physical functioning declines and their dependence on others increases, these conditions can become psychologically debilitating [4]. This process reduces their health-related quality of life (HRQoL). It can also negatively affect their mental health and lead to depressive symptoms.

Funding

This study was supported by the Seoul Medical Center (No. 2022-01).

Conflict of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Jang M, Kim K; Data curation: Jang M, Kim M, Kang G, Shin H, Shin D; Formal analysis: Jang M, Kim M, Kang G, Shin H, Shin D; Writing - original draft: Jang M, Park H, Kim K; Writing - review & editing: Jang M, Park H, Kim K.

Previous studies have shown that in addition to depressive symptoms, marital status, stress, and limitations in ADLs are factors that affect the HRQoL of stroke patients [5]. Reduced ADLs due to stroke can lead to decreased HRQoL and the development of depressive symptoms. These factors can negatively affect recovery and, consequently, the ability of patients to live independently [6]. Thus, ADLs and mental health are important factors affecting the HRQoL of stroke patients.

Mental health problems are common in stroke patients. Therefore, they require proper diagnosis and treatment, as mental health problems can negatively affect rehabilitation outcomes [7]. They also have a high recurrence rate and cause problems long after the stroke, affecting more than half of all stroke patients [8]. Furthermore, they affect not only the rehabilitation of stroke patients but also their lives and those of their caregivers. They also increase mortality and suicide rates [9]. Interventions for depression, which is associated with increased disability rates, are necessary [10]. In addition, the impact of mental health problems on ADLs and HRQoL among stroke patients presenting to community health centers needs to be confirmed [11-13].

The current study involved post-stroke patients who enrolled in a transitional care service in a public hospital. This service is a part of the Ministry of Health and Welfare's comprehensive plan to develop public healthcare. The service designates regional and locally responsible medical institutions among medical institutions nationwide to provide public healthcare services. It also involves creating a personalized care plan for each patient (**Supplementary Fig. 1**). The goal of the service is to connect patients with the community resources that they need to help them return to their normal lives as quickly as possible. The ultimate goal is the improvement of the quality of life of stroke patients. Understanding these factors makes it easier to implement a transitional care program.

Although transitional care services have been provided nationwide since 2020, the research on these programs is limited. Previous studies have indeed examined the relationship between ADLs, mental health problems, and HRQoL in post-stroke patients. However, few have evaluated patients who have enrolled in transitional care services in a public hospital. In addition, there are few studies currently being conducted in Korea that include patients who have participated in transitional care services. It is important to understand what factors influence the quality of life of these patients to provide better transitional care services.

This study aimed to determine the relationship between ADLs, mental health, and HRQoL in post-stroke patients enrolled in transitional care services in a public hospital in Korea. In addition, we aimed to identify the factors affecting HRQoL and provide a basis for interventions to improve ADLs and HRQoL among patients participating in the program.

MATERIALS AND METHODS

Study design

This research is a cross-sectional descriptive study aimed at providing a basis for the rehabilitation and intervention of patients participating in transitional care services.

Study participants

This study included 67 outpatients with a primary stroke diagnosis at a public hospital. Post-stroke patients in northeastern Seoul who required transitional care services were surveyed before linkage. The inclusion criteria were individuals with no disabilities and who could communicate at the time of the survey. The exclusion criteria were as follows: patients whose primary diagnosis was not stroke, those hospitalized for a short period for simple tests, residents and prospective residents of institutions, and those unable to communicate. The sample size needed to achieve the purpose of this study was calculated as 55 people (power = 80%, effect size = 0.3, $\alpha = 0.05$). Statistical power analysis was performed using the G*Power 3 program. Based on previous studies, we expected a dropout rate of approximately 30%. Therefore, we recruited 80 participants, among which 13 participants dropped out for reasons such as relocation.

Measurements

General characteristics

General characteristics were categorized as sex, age, marital status, living arrangement, alcohol consumption, smoking status, and exercise status. Living arrangements were categorized as single or living with other family members. The participants were also asked whether they were currently engaged in the following: alcohol consumption, smoking, and exercise. The modified Rankin Scale was used to measure stroke severity. Higher modified Rankin Scale scores indicate a higher degree of severity. The modified Rankin Scale's scores are as follows: 0 is asymptomatic, 1 is the ability to perform all tasks and ADLs prior to onset of disability, 2 is mild disability, 3 is moderate disability, 4 is severe disability, 5 is severe disability requiring ongoing care, and 6 is dead.

ADLs

We used the ADLs scale developed by Lawton and Brody [14] and modified for the Korean context by Won et al. [15]. The scale consists of 7 items: dressing, washing, bathing, eating, mobility, toileting, and bowel control. Each item is rated on a scale of 1, 2, and 3 indicating complete independence, partial dependence, and total dependence, respectively. The tool's maximum total score is 21. Higher scores indicate greater dependence. The reliability (Cronbach's alpha) of this scale was 0.89 in this study.

HRQoL

HRQoL is directly affected by changing health and was measured in this study using the Korean version of the 5-level EuroQol 5-dimensional questionnaire (EQ-5D-5L) [16], an instrument developed by the EuroQol Group. The 5-level EuroQol 5-dimensional questionnaire is used to measure general HRQoL and consists of 5 multiple-choice questions that correspond to different domains—mobility, self-care, usual activities, pain/discomfort, and anxiety/depression—with 5 levels of response. The measures in each domain are weighted to produce an EuroQol 5-dimensional questionnaire index, which provides the HRQoL score. The resulting scores range from 1 to -1. According to the weighting criteria of the Centers for Disease Control and Prevention, 5 items were analyzed and calculated in this study [17]. A score of 1 indicates perfect health. Moreover, the higher the HRQoL, the closer the score is to 1 [18]. The reliability (Cronbach's alpha) of this scale was 0.88.

Mental health

Mental health was measured using the Korean-adapted version of the Patient Health Questionnaire-4, which was standardized and approved for use by the authors [19]. The

Patient Health Questionnaire-4 is a brief questionnaire comprising a depression scale (Patient Health Questionnaire-2) and an anxiety scale (Generalized Anxiety Disorder-2). The sum of the scores is a measure of the severity of depression and anxiety symptoms over the past 2 weeks. Four questions pertain to the frequency of symptoms. Responses include 0 for “never,” 1 for “less than a week,” 2 for “more than a week,” and 3 for “almost every day.” The total score is 12. Higher scores indicate greater severity. The reliability (Cronbach’s alpha) of this scale was 0.92.

Data collection

This study was conducted between March and December 2022. The patients visited Seoul Medical Center, a regional healthcare provider in northeastern Seoul that participates in the Ministry of Health and Welfare’s transitional care service program. In this study, the physician linked a patient to a project representative at the point of care, and the project representative visited the patient to conduct the study. As the participants faced difficulties in completing the questionnaire, a researcher read the questionnaire to them and recorded their responses. The completion time for the questionnaire was approximately 20 minutes.

Written informed consent was obtained directly from the participants, and the study was approved by the Institutional Review Board (IRB) of Seoul Medical Center (IRB No. 2022-03-003). The participants were informed of the purpose and procedures of the study, and their anonymity was guaranteed. Moreover, their participation was voluntary, and they were allowed to withdraw from the study at any time without penalties.

Data analysis

Descriptive statistics were used to analyze the participants’ general characteristics. Independent samples t-tests and analysis of variance were used to analyze the differences in ADLs, mental health, and HRQoL. Pearson correlation analysis was performed to evaluate the correlations between ADLs, mental health, and HRQoL. Multiple linear regression analysis was conducted to assess the HRQoL factors. The significance level was set at less than 0.05 ($p < 0.05$). The results were analyzed using SPSS/WIN 26.0 (IBM Corp., Armonk, NY, USA).

RESULTS

General characteristics

This study included 37 men and 30 women. The mean age was 63.1 ± 11.3 years. The median score on the modified Rankin Scale was 2, with 79.1% of the patients receiving score of 2 or less (i.e., asymptomatic or mild disability). Among the participants, 82.1% had no spouse while 55.2% lived in single-family homes. Regarding medical coverage, 70.1% had health insurance, and 22.4% had medical assistance. Regarding health-related behaviors, 34.3% reported drinking alcohol, 40.3% reported smoking, and 3.0% reported exercising (Table 1).

Differences in ADLs, mental health, and HRQoL by participant characteristics

According to the participants’ general characteristics, the mean scores of overall ADLs, mental health, and HRQoL were 8.9 ± 2.8 , 3.6 ± 3.5 , and 0.8 ± 0.1 , respectively. Moreover, HRQoL showed a statistically significant difference in regard to the participants’ living arrangements ($t = 2.50$, $p = 0.015$), and modified Rankin Scale score ($t = 7.08$, $p < 0.001$) (Table 2).

Table 1. Participants' general characteristics (n = 67)

Variables	No. (%)
Sex	
Male	37 (55.2)
Female	30 (44.8)
Age (yr)	63.1 ± 11.3
Modified Rankin Scale	
0	12 (17.9)
1	21 (31.3)
2	20 (29.9)
3	10 (14.9)
4	4 (6.0)
Marital status	
Yes	12 (17.9)
No	55 (82.1)
Living arrangement	
With others	30 (44.8)
Alone	37 (55.2)
Alcohol consumption	
No	44 (65.7)
Yes	23 (34.3)
Smoking	
No	40 (59.7)
Yes	27 (40.3)
Exercise	
No	65 (97.0)
Yes	2 (3.0)

Values are presented as mean ± standard deviation or number (%).

Table 2. Differences in activities of daily living, mental health and health-related quality of life by participants' characteristics

Variables	Activities of daily living		Mental health		Health-related quality of life	
	Mean ± SD	t or F	Mean ± SD	t or F	Mean ± SD	t or F
Sex		0.80		1.88		-1.88
Male	9.2 ± 2.9		4.3 ± 3.9		0.7 ± 0.1	
Female	8.6 ± 2.9		2.7 ± 2.9		0.8 ± 0.1	
Modified Rankin Scale		11.7 [†]		1.16		7.08 [†]
0	7.9 ± 2.9		2.8 ± 3.8		0.9 ± 0.1	
1	7.5 ± 0.8		2.7 ± 2.4		0.8 ± 0.1	
2	8.8 ± 2.0		3.9 ± 4.1		0.7 ± 0.1	
3	11.5 ± 3.3		5.4 ± 3.7		0.7 ± 0.1	
4	14.0 ± 2.6		3.8 ± 4.5		0.7 ± 0.1	
Marital status		0.31		1.97		-0.49
Yes	9.2 ± 3.1		5.3 ± 4.0		0.7 ± 0.1	
No	8.9 ± 2.8		3.2 ± 3.3		0.8 ± 0.1	
Living arrangement		-0.54		-1.01		2.50 [*]
With	8.7 ± 3.0		3.1 ± 3.2		0.8 ± 0.1	
Alone	9.1 ± 2.7		4.0 ± 3.8		0.7 ± 0.1	
Alcohol consumption		-1.51		-0.38		0.64
No	8.6 ± 2.3		3.4 ± 3.2		0.8 ± 0.1	
Yes	9.7 ± 3.6		3.8 ± 4.2		0.7 ± 0.2	
Smoking		-0.32		-1.35		1.11
No	8.9 ± 2.7		3.1 ± 3.1		0.8 ± 0.1	
Yes	9.1 ± 3.1		4.3 ± 4.1		0.7 ± 0.2	
Exercise		0.22		-0.18		0.11
No	9.0 ± 2.9		3.5 ± 3.6		0.8 ± 0.1	
Yes	8.5 ± 0.7		4.0 ± 4.2		0.8 ± 0.1	
Mean ± SD		8.9 ± 2.8		3.6 ± 3.5		0.8 ± 0.1

Values are presented as mean ± SD or number. Activities of daily living tool's maximum total score is 21; higher activities of daily living scores indicate greater dependency; higher health-related quality of life scores are closer to 1; higher mental health total scores indicate greater severity. SD, standard deviation.

*p < 0.05, statistically significant by analysis of variance; [†]p < 0.001, statistically significant by t-test.

Correlation between ADLs, mental health, and HRQoL

The analysis of the correlation between ADLs, mental health, and HRQoL in stroke patients revealed a significant negative correlation between HRQoL and ADLs ($r = -0.59$, $p < 0.001$), indicating that patients who were less dependent on ADLs had higher HRQoL. A negative correlation ($r = -0.41$, $p < 0.001$) was observed between HRQoL and mental health. Specifically, lower levels of depression and anxiety were associated with higher HRQoL (Table 3).

Factors influencing HRQoL

Regression analyses were performed to identify the factors influencing HRQoL in stroke patients (Table 4). Independent variables included sex, age, modified Rankin Scale, marital status, living arrangements, alcohol consumption, smoking status, exercise, ADLs, and mental health. Due to the small sample size, some variables were not significant. However, all independent variables that could affect the dependent variable, HRQoL, were included. To test for multicollinearity between independent variables, tolerance and variance inflation factor were used. The variance inflation factor was also less than 10, indicating the absence of multicollinearity problems. Additionally, the Durbin–Watson statistic was 1.86, which is close to 2. Therefore, the assumption of the independence of the residuals was not challenged.

Multiple regression analysis with HRQoL as the dependent variable showed that stroke severity ($\beta = -0.30$, $p = 0.002$), living arrangements ($\beta = -0.30$, $p = 0.009$) and ADLs ($\beta = -0.45$, $p < 0.001$) influenced HRQoL ($F = 6.87$, $p < 0.001$, $R^2 = 0.47$). The standardized regression coefficients β represent each independent variable's influence on quality of life. That is, higher levels of dependency, stroke severity, and living alone were associated with lower quality of life among stroke patients in a public hospital.

Table 3. Correlation between activities of daily living, mental health, and health-related quality of life

Variables	r		
	Activities of daily living	Mental health	Health-related quality of life
Activities of daily living	1.00		
Mental health	0.47*	1.00	
Health-related quality of life	-0.59*	-0.41*	1.00

* $p < 0.001$, statistically significant by Pearson correlation analysis.

Table 4. Factors influencing health-related quality of life

Variables	B	SE	β	t	p
Constant	1.12	0.08		13.95	< 0.001
Sex	0.02	0.03	0.09	0.77	0.449
Age	-0.01	< 0.01	-0.07	-0.73	0.469
Modified Rankin Scale	-0.01	0.03	-0.30	-3.25	0.002*
Marital status	-0.10	0.03	-0.03	-0.30	0.773
Living arrangement	-0.06	0.02	-0.30	-2.72	0.009*
Alcohol consumption	0.02	0.03	0.08	0.72	0.475
Smoking	-0.03	0.03	-0.10	-0.92	0.362
Exercise	-0.02	0.07	-0.03	-0.27	0.786
Activities of daily living	-0.02	0.01	-0.45	-4.15	< 0.001**
Mental health	0.01	0.01	-0.13	-1.20	0.250
Adjusted $R^2 = 0.47$, $F = 6.87$, $p < 0.001$					

Reference: Sex (male), Modified Rankin Scale (0), Marital status (yes), Living arrangement (with others), Alcohol consumption (no), Smoking (no), Exercise (no).

SE, standard error.

* $p < 0.05$, ** $p < 0.001$, statistically significant by multiple regression analysis between health-related quality of life and potential influencing factor.

DISCUSSION

This study mainly aimed to provide a basis for the rehabilitation and intervention of patients participating in transitional care services. In line with this objective, we examined ADLs and depression and anxiety as factors affecting HRQoL in stroke patients who participated in a transitional care service after being discharged from a public hospital.

The purpose of transitional care services is to provide a continuum of care in the community after patients are discharged from hospitals. Their primary objective is to comprehensively identify patients' treatment and socio-economic needs, and to connect them with and receive appropriate services. Consequently, improving patients' quality of life, which is the focus of public hospitals' transitional care services.

To identify appropriate linkage methods, this study aimed to understand the characteristics of patients who use public hospitals' transitional services, and therefore, examined patients who visited public hospitals. The results demonstrated that the patients were often elderly or vulnerable due to the nature of public hospitals. It was found that to improve the participants' quality of life, it is necessary to pay attention not only to their health condition, such as managing their symptoms and promoting ADLs, but also to social factors, such as living arrangements.

Participants' mean overall HRQoL score was 0.8 ± 0.1 . This score is higher than that in a study of stroke patients using the same tool (0.51 ± 0.31) [20] and is similar to that in another study of patients with disabilities, in which the mean HRQoL score was 0.75 [21]. Meanwhile, the current study's HRQoL score is lower than that in a study on patients with diabetes, with the mean score being 0.95 [22]. Other studies have reported a decline in HRQoL over time in stroke patients [23]. These results suggest that the HRQoL of stroke patients may vary according to their characteristics.

In this study, the mean overall ADLs score in stroke patients was 8.9 ± 2.8 . This result indicates that approximately 50.7% of the patients, including those with partial dependency, required assistance with ADLs. This study's overall ADLs score is similar to those of other studies involving stroke patients and is lower than the score of 12.88 ± 3.55 found in a study of stroke patients using the same tool [24,25].

Meanwhile, the mean score for mental health in the current study was 3.6 ± 3.5 . Another study that administered the Patient Health Questionnaire-4 to stroke patients reported a mean score of 3.64 ± 1.18 , which is similar to our findings [26]. In a study on Korean patients with depression using the same tool, the score was 6.52 ± 3.45 , which is higher than that observed in the current study [19].

The modified Rankin Scale is a stroke outcome scale that assesses stroke patients' level of dependency. In this study, 79.1% of the patients had mild disability, which was found to be correlated with HRQoL, mental health, and ADLs. Additionally, HRQoL and ADLs were significantly negatively correlated. That is, HRQoL was higher when ADLs dependence were lower. In addition, a negative correlation was noted between HRQoL and mental health, with lower depression and anxiety associated with better HRQoL. These findings are consistent with those of other studies showing that ADLs and depression and anxiety are negatively correlated with HRQoL [27]. Post-stroke patients experience physical and psychological problems as their ADLs and HRQoL decline. This condition seems to affect their mental health as well.

The results of the multiple linear regression analysis showed that the modified Rankin Scale, living arrangements, and ADLs affected HRQoL. This result is consistent with the findings of previous studies and investigations on stroke patients [28,29]. In a longitudinal study, the quality of life of patients with stroke was associated with the modified Rankin Scale score. The modified Rankin Scale score decreased with ADLs independence and improvements in the functional domains of the 5-level EuroQol 5-dimensional questionnaire. This study concluded that differences in the modified Rankin Scale, even when mild, may be due to differences in patient characteristics and the environment [30].

The current study supports the findings of previous research showing that ADLs are an influential factor in the HRQoL of post-stroke patients. Specifically, the lower the HRQoL of stroke patients, the shorter the duration of activity restriction and the greater the ADLs dependence [21,24,25]. Early intervention is necessary to prevent disease progression.

Another factor, living arrangements, has been described in other studies as one of the factors, along with financial stability, that affect mental health, return to work, and rehabilitation in people with chronic stroke [31,32]. In other words, one's living arrangement is a social environment that is related to marital status and self-management through social support [33,34]. Hence, interventions that are related to living arrangements are needed to connect discharged patients with the community. In this study, 55 of the 67 patients had no spouse, and 37 lived alone. Improving physical living arrangements is not an easy undertaking. As with ADLs, social interventions are needed within the community to create a supportive environment for post-stroke patients.

Assessing the HRQoL of stroke patients using transitional care services in public hospitals and identifying influencing factors can be systematically used to prepare for the transition from hospital to home care. The collected data can be used to provide appropriate support through collaboration with various community resources and help improve patients' quality of life after hospital discharge. Stroke severity, living arrangements, and ADLs, which were found to be factors that affect the HRQoL of stroke patients, should be examined. Furthermore, community interventions should be implemented to improve stroke patients' HRQoL.

The advantage of this study is that the specificity of the institution and the target population can be applied in the implementation of transitional care services, even though it is based on a small sample size. Nevertheless, this study has several limitations that should be addressed in future research. First, the results of this study are not easily generalizable because it was based on a small number of stroke patients who visited a single hospital. Second, this work is a cross-sectional study; hence, causal relationships are difficult to explain. Therefore, further studies using mediation effects and longitudinal data are required. Third, this study was conducted only on patients who visited the hospital. The findings may thus be subject to selection bias and should be interpreted with caution. Finally, the Barthel index is commonly used to measure ADLs in stroke patients. However, in this study, we used the Korean ADLs scale, which might have reduced the response rate owing to the long questionnaire time during the interview. In addition, the Patient Health Questionnaire-9 is commonly used to assess mental health. However, similar to the Korean ADLs scale, the revised Patient Health Questionnaire-4 may not accurately reflect patients' depression and anxiety because of its long questionnaire duration. These limitations should be addressed in future research.

ADLs and mental health were found to be correlated with the HRQoL of stroke patients who participated in a transitional care service. In addition, the modified Rankin Scale, living arrangements, and ADLs were identified as factors influencing HRQoL. Support of patients in the management of these factors is an important part of the intervention. Therefore, if a transitional care service is to be implemented in a public hospital, the interventions should target patients with high modified Rankin Scale scores, those who live alone, and those who require assistance with ADLs. This can be achieved through the careful planning of measures to improve ADLs and reduce depression and anxiety.

ACKNOWLEDGMENT

The authors thank Seoul Medical Center for their support.

SUPPLEMENTARY MATERIAL

Supplementary Fig. 1

Steps for transitional care service.

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