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ORIGINAL RESEARCH

Analysis of Factors Affecting Quality of Life (QoL) in Middle-Aged Stroke Patients (Under 65 Years Old) in the Rehabilitation Phase: Multivariate Regression Analysis

Valentina Belinda M Lumbantobing[1,2,*], Mukti Priastomo[1], Cecep Eli Kosasih[3], Putri Rhamelani[4], Kusnandar Anggadiredja[1], I Ketut Adnyana[1,*]

[1]Department of Pharmacology and Clinical Pharmacy, School of Pharmacy, Institut Teknologi Bandung, Bandung, West Java, Indonesia; [2]Department of Fundamental Nursing, Faculty of Nursing, Universitas Padjadjaran, Bandung, West Java, Indonesia; [3]Department of Critical Nursing, Faculty of Nursing, Universitas Padjadjaran, Bandung, West Java, Indonesia; [4]Faculty of Nursing, Universitas Padjadjaran, Sumedang, West Java, Indonesia

*These authors contributed equally to this work

Correspondence: Valentina Belinda M Lumbantobing; I Ketut Adnyana, Department of Pharmacology and Clinical Pharmacy, School of Pharmacy, Institut Teknologi Bandung, Bandung, West Java, Indonesia, Email valentina@unpad.ac.id; ketut@itb.ac.id

Purpose: This study analyzed factors influencing the quality of life (QoL) in stroke patients during the rehabilitation phase so that rehabilitation professionals, caregivers, and stroke patients can pay attention to all aspects that contribute significantly to a better QoL and can design appropriate interventions to improve patient welfare and support a more significant recovery process.

Patients and Methods: A non-experimental quantitative approach with a cross-sectional design was conducted with 76 adult stroke patients in the rehabilitation phase. Data were collected using an interval-scale paper-based questionnaire and analyzed using univariate analysis techniques and multivariate regression analysis.

Results: The results showed that social support, sleep quality, self-esteem, hardiness, spirituality, and psychological well-being affected patients' QoL in all domains (P = 0.000). More specifically, the physical domain was significantly affected by sleep quality (P = 0.000), spirituality (P = 0.004), and psychological well-being (P = 0.000). The psychological domain was significantly affected by social support (P = 0.000), sleep quality (P = 0.017), hardiness (P = 0.000), and spirituality (P = 0.007). The social domain was significantly influenced by social support (P = 0.002), sleep quality (P = 0.044), and self-esteem (P = 0.000). Finally, the environmental domain was significantly influenced by social support (P = 0.002) and self-esteem (P = 0.000).

Conclusion: The success of stroke patient recovery in the rehabilitation phase is marked by the goodness of all domains of QoL. This study obtained the analysis result of specific factors affecting each domain in QoL. Therefore, patients, families, nurses, and other health care providers have a crucial role in efforts to create a better QoL in stroke patients in the rehabilitation phase by considering the factors that have the most significant influence.

Plain Language Summary: This study was conducted to determine the factors that influence the QoL of stroke patients in the rehabilitation phase. As stroke recovery can be a long and challenging process, understanding these factors is essential for improving patient care and recovery outcomes. The study involved 76 adult stroke patients and used multivariate regression analysis to explore how social support, sleep quality, self-esteem, spirituality, and psychological well-being impact QoL. The findings matter because they show how different factors influence various aspects of QoL. For instance, sleep quality, spirituality, and psychological well-being impact the physical aspect of QoL, while social support, sleep quality, and spirituality affect the psychological aspect. Social support, sleep quality, and self-esteem are key to improving the social aspect, while social support and self-esteem also influence the environmental aspect. These results can be applied in clinical settings by guiding healthcare providers to focus on these specific factors during the rehabilitation phase. By addressing social support, improving sleep, and enhancing psychological well-being, healthcare providers, patients, and families can work together to optimize recovery, improve QoL, and ultimately lead to better long-term outcomes for stroke patients.

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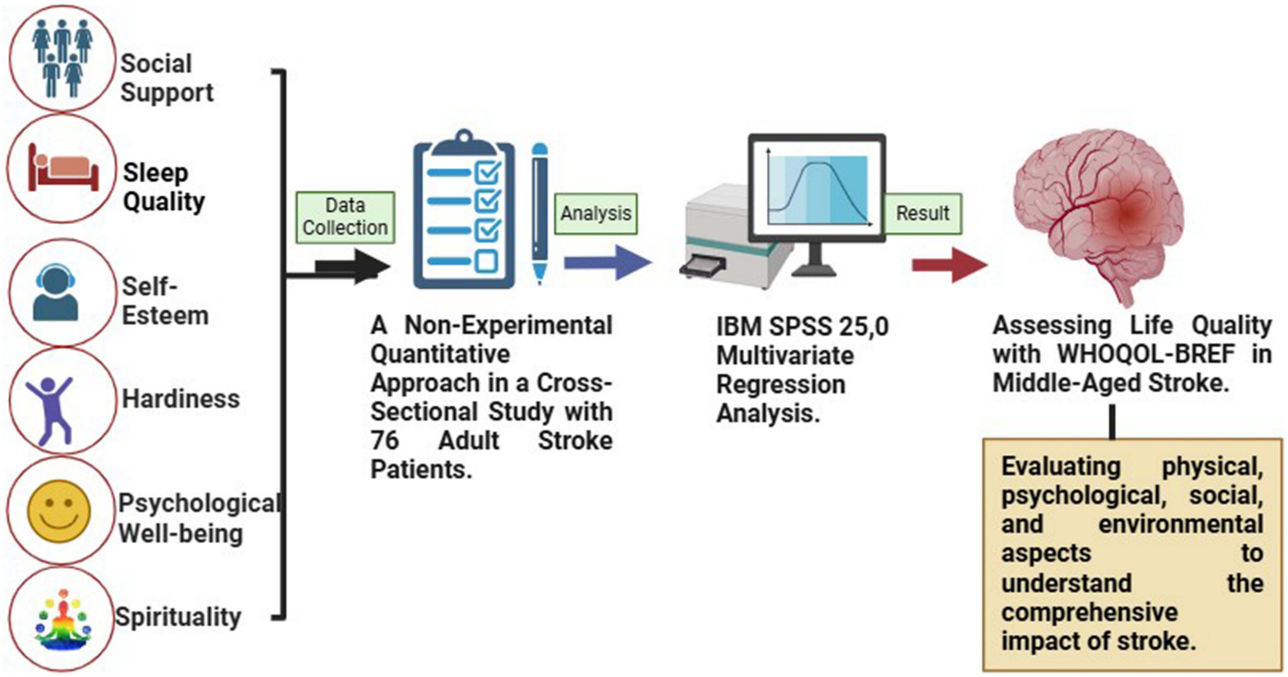
Graphical Abstract



Introduction

Stroke is a blood circulation disorder in the brain due to rupture or blockage of blood vessels that causes death of brain tissue, resulting in decreased physical and cognitive function. Globally, stroke remains the third leading cause of disability and the second leading cause of death.[1] World Health Organization (WHO) data shows approximately 12.2 million people in the world suffer from strokes annually, with a morbidity rate of 5.5 million and a mortality rate of 6.5 million.[2] In Indonesia, the number of stroke cases reaches 10.9% of the population each year.[3] Data indicate that 80% of stroke patients experience motor difficulties in the extremities as well as cognitive and communication disorders, which impact QoL due to the difficulty in carrying out daily life activities.[2]

The symptoms experienced by each stroke patient vary depending on the location and severity of the initial brain lesion, making the stroke recovery process highly complex and unique for each individual.[4] Stroke patients can have a profound impact on multiple aspects of life, leading to conditions such as hemiplegia and hemiparesis, which restrict Activity Daily Living (ADL), as well as pain, speech and swallowing disorders (aphasia), cognitive impairments, and psychosocial disorders.[5–7]

Beyond physical impairments, stroke survivors often face psychological challenges, with approximately 31% experiencing post-stroke depression within five years.[8] Post-stroke depression is one of the most significant issues during the rehabilitation phase, influenced by multiple factors and closely linked to a decreased QoL, as it increases the risk of mortality.[9] Therefore, stroke patients should be supported in a positive environment during the rehabilitation phase.

It is common that significant lifestyle changes in stroke patients' life ultimately impacts their level of QoL.[10] Studies have shown that stroke survivors have a lower QoL than healthy individuals.[11] Research conducted in Indonesia found

that male patients have a lower QoL than female patients.[12] Additionally, another study revealed that stroke patient who participate in medical rehabilitation generally experience a better QoL compared to those who do not.[13]

Nevertheless, QoL still plays vital role in supporting recovery, particularly during the rehabilitation phase, which includes acute, sub-acute, and chronic post-stroke recovery stages.[5] During this period, the patient's functional level within three to six months is strongly related to long-term outcomes.[14] Maintaining a good QoL in stroke patients can improve patients' ability to manage secondary prevention independently, thereby reducing the risk of recurrent strokes.[15] An effective stroke rehabilitation phase is very important to addressing all patient needs, physical, social, cognitive, and psychological aspects, to improve their overall QoL.[9]

However, during the rehabilitation phase, patients often focus primarily on improving motor skills while neglecting psychological and behavioral aspects.[16] The lack of a comprehensive approach to addressing all patient needs ultimately results in a poorer QoL during rehabilitation.[17] This condition is further exacerbated by the lack of rehabilitation resources and limited access to services, especially in low- and middle-income countries.[18] The shortage of rehabilitation facilities, infrastructure, skilled healthcare providers, evidence-based interventions and health insurance can lead to delays in stroke management. These delays can contribute to prolonged recovery and increased burden of disease.[19] Furthermore, many patients and their families lack knowledge about the factors that influence QoL during stroke rehabilitation, also leading to less comprehensive care and poorer outcomes.[15]

Despite these challenges, it remains crucial for stroke patients to overcome not only physical challenges but also cognitive, behavioral, and psychological difficulties.[8] Stroke has a complex effect on all aspects of a patient's life, making it essential for rehabilitation professionals, caregivers and patients to collaborate in fostering a better QoL by understanding the influenced factors.[20] To achieve this, further research is needed to explore specific factors that influence the QoL.

Recent research has focused on the effectiveness of interventions targeting various aspects of lives in relation to QoL. For example, it is widely known that social support positively influences the development of adaptive coping, while sleep quality plays a crucial role in psychological well-being.[21] Spirituality has been shown to help individuals cope with new situations in various populations, and research has found that self-esteem in chronic patients influences QoL.[22,23] Additionally, hardiness contributes to resilience in facing health challenges, and psychological well-being is a key factor in overall recovery.[24] However, among the various existing studies, there is still limited research on those specific factors influencing QoL during the rehabilitation phase of stroke patients.

While previous research has highlighted the impact of these factors on adaptation and recovery, there remains a gap in understanding how they collectively shape QoL in stroke rehabilitation. This study aims to address this gap by examining and analyzing how social support, sleep quality, self-esteem, hardiness, spirituality, and psychological well-being impact the QoL of stroke patients during the rehabilitation phase, considering the significant role of QoL in the recovery process. By understanding these factors, rehabilitation professionals and caregivers can design more comprehensive and effective interventions that not only focus on physical recovery but also address the psychosocial needs of stroke patients, ultimately improving the patient's welfare in the rehabilitation process.

Materials and Methods

This study used a non-experimental quantitative approach with a cross-sectional design to analyze factors that influence quality of life (QOL) in stroke patients in the rehabilitation phase. This design is to identify the relationship between independent variables, namely social support, sleep quality, self-esteem, hardiness, spiritual, and psychological well-being, with the dependent variable in the form of quality of life measured in four domains: physical, psychological, social, and environmental.

The study population consisted of stroke patients in the rehabilitation phase residing in Cibeureum Village, Cimahi Regency, Bandung, West Java, Indonesia, with a sample size of 76 respondents selected based on specific criteria, inclusion and exclusion. The inclusion criteria are adult patients aged 18–65 years, diagnosed with ischemic stroke by a neurologist based on CT-scan results, following Indonesian medical protocols; in the chronic rehabilitation phase (≥3 months post-stroke); experiencing mild-to-moderate stroke severity, as determined by the National Institutes of Health Stroke Scale (NIHSS) score of 1–15; not experiencing acute medical complications, such as recurrent stroke, severe

infections, or other conditions requiring intensive care; cognitively capable of understanding and answering the questionnaire; and willing to participate in the study. While the exclusion criteria are patients with severe stroke and experiencing significant neurological deficits such as total hemiparesis, global aphasia, or impaired consciousness; and patients with psychiatric disorders, experiencing significant sensory impairments.

Data collection was conducted for two months through direct contact with respondents, using socio-demographic questionnaires, Multidimensional Scale of Perceived Social Support (MSPSS), Pittsburgh Sleep Quality Index (PSQI), Rosenberg Self-Esteem Scale (RSES), hardiness questionnaire developed based on the concept of Kobasa (1982), Spiritual Transcendence Scale (STS), Psychological Well-Being (PWB), and The World Health Organization Quality of Life (WHOQOL-BREF). To ensure cultural appropriateness, all instruments were translated using the forward-backward translation method.

The collected data were analyzed using univariate analysis techniques to describe the characteristics of the variables descriptively through frequency and proportion distributions based on the results of the normality test and the cut-off point value of each variable along with multivariate regression analysis to analyze the effect of all independent variables on quality of life in each domain. The Statistical software used in this study was IBM Statistics 25.0. The reliability of the instrument was tested using Cronbach's Alpha, with results showing a value of ≥0.70 for all instruments, indicating good internal consistency.

This study received ethical approval from the Health Research Ethics Committee of STIKEP PPNI West Java, adhering to the standards of the World Health Organization (2011) and the Council for International Organizations of Medical Sciences (CIOMS) (2016). Additionally, it complied with the Declaration of Helsinki, with ethics approval number No. III/059/KEPK-SLE/STIKEP/PPNI/JABAR/V/2024. All respondents provided informed consent before participating, with strict confidentiality measures in place for data protection.

Results

Descriptive Statistics

Respondent characteristics based on demographic data were analyzed using descriptive statistics, including frequency distribution and proportions (Table 1). Table 1 shows the characteristics of respondents based on demographic data. The table shows that less than half of the respondents are aged 50–59 years (50%), the last education is junior high school (28.9%), have a marriage age of 20–34 years (73.7%), work as private employees (26.3%) and the spouse works as a laborer or housewife (28.9%), has a family income of less than Rp. 1,000,000.00 (39.5%), and has a rental residence (46.1%); more than half of the respondents are male (59.2%), have 3–4 children (57.9%); and most respondents are Muslim (90.8%).

Table 1 Respondent Characteristics (n = 76)

Characteristics	Frequency (n)	Percentage (%)
Age		
< 40 years	1	1.3%
40–49 years	20	26.3%
50–59 years	38	50%
> 60 years	17	22.4%
Gender		
Male	45	59.2%
Female	31	40.8%
Religion		
Muslim	69	90.8%
Christian	7	9.2%

(*Continued*)

Table 1 (Continued).

Characteristics	Frequency (n)	Percentage (%)
Last Education		
Elementary School	17	22.4%
Junior High School	22	28.9%
High School Equivalent	19	25%
Diploma	14	18.4%
Bachelor	4	5.3%
Age of Marriage		
< 20 years	6	7.9%
20–34 years	56	73.7%
> 34 years	14	18.4%
Occupation		
Not Working	10	13.2%
Housewife	15	19.7%
Farmer	1	1.3%
Laborer	16	21.1%
State Civil Apparatus	5	6.6%
Private Employee	20	26.3%
Self-Employed	9	11.8%
Couple's Job		
Not Working	1	1.3%
Housewife	22	28.9%
Farmer	6	7.9%
Laborer	22	28.9%
State Civil Apparatus	5	6.6%
Private Employee	8	10.5%
Self-Employed	12	15.8%
Number of Children		
No children yet	3	3.9%
1–2 children	19	25%
3–4 children	44	57.9%
> 5 children	10	13.1%
Family Income		
< Rp.1.000.000,00	30	39.5%
Rp.1.000.000,00 - Rp.2.900.000,00	27	35.5%
Rp.3.000.000,00 – Rp.4.900.000,00	17	22.4%
Rp.5.000.000,00 - Rp.9.900.000,00	2	2.6%
> Rp.10.000.000,00	0	0%
Residence Status		
Rental	35	46.1%
Shared house	16	21.1%
Owned	25	32.9%

Of the 76 respondents, they have different health behaviors (Table 2). In (Table 2) shows a picture of the health behavior of respondents where more than half of the respondents have active smoking partners (73.7%) with the majority of cigarettes per day being 11–20 cigarettes (40.7%), respondents do not carry out routine checks (63.2%), respondents consume vitamins (60.5%); most respondents had experienced a stroke once (81.6%), respondents did not do a medical check-up (86.8%); and all respondents did not do additional physiotherapy (100%).

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Table 2 Overview of Respondents' Health Behavior (n = 76)

Health Behavior	Frequency (n)	Percentage (%)
Smoking Behavior		
Active Smoking Partner		
Yes	56	73.7%
No	20	26.3%
Number of Cigarettes Per Day		
None	24	31.6%
1–10 cigarettes	16	21%
11–20 cigarettes	31	40.7%
> 20 cigarettes	5	6.6%
Routine Control		
Yes	28	36.8%
No	48	63.2%
Vitamin Consumption		
Yes	46	60.5%
No	30	39.5%
Additional Physiotherapy		
Yes	0	0%
No	76	100%
History of Stroke		
Number of Stroke Attacks		
Once	62	81.6%
Twice	14	18.4%
Medical Check Up		
Yes	66	86.8%
No	10	13.2%

The descriptive statistical analysis of the dependent variables (*Y*) and independent variables (*X*) along with their sub-variables includes the average values and standard deviations. In this study, a frequency distribution was also obtained for the dependent variable and independent variables, along with their sub-variables (Table 3). In (Table 3), it shows that more than half of the respondents have good QoL in the physical domain (53.9%), psychological domain (50%), social

Table 3 Descriptive Statistics of Dependent and Independent Variables (n = 76)

Variabel (Sub-Variabel)	Mean	SD	Results (n (%))	
			More than Mean	Less than Mean
Quality of Life (QoL)				
QoL Physical Domain (Y_1)	54.43	13.02	41 (53.9%)	35 (46.1%)
QoL Psychological Domain (Y_2)	54.38	16.10	38 (50%)	38 (50%)
QoL Social Domain (Y_3)	65.94	13.01	45 (59.2%)	31 (40.8%)
QoL Environmental Domain (Y_4)	59.84	10.07	56 (73.7%)	20 (26.3%)
Social Support (X_1)	**29.05**	**6.56**	**39 (51.3%)**	**37 (48.7%)**
Family	9.56	2.33	50 (65.8%)	26 (34.2%)
Friends	9.84	2.36	42 (55.3%)	34 (44.7%)
Significant Other	9.64	2.48	38 (50%)	38 (50%)

(*Continued*)

Table 3 (Continued).

Variabel (Sub-Variabel)	Mean	SD	Results (n (%))	
			More than Mean	Less than Mean
Sleep Quality (X_2)	**39.85**	**5.90**	**43 (56.6%)**	**33 (43.4%)**
Subjective Sleep Quality	1.09	0.49	67 (88.2%)	9 (11.8%)
Sleep Latency	1.36	0.97	34 (44.7%)	42 (55.3%)
Sleep Duration	1.37	1.05	45 (59.2%)	31 (40.8%)
Effective Sleep Time in Bed	0.61	1.19	60 (78.9%)	16 (21.1%)
Sleep Disorders	1.20	0.40	15 (19.7%)	61 (80.3%)
Use of Sleeping Medications	0.01	1.11	75 (98.7%)	1 (1.3%)
Difficulty Concentrating During the Day	1.93	0.41	67 (88.2%)	9 (11.8%)
Self Esteem (X_3)	**26.51**	**2.29**	**40 (52.6%)**	**36 (47.4%)**
Hardiness (X_4)	**83.89**	**6.36**	**41 (53.9%)**	**35 (46.1%)**
Commitment	33.15	3.73	37 (48.7%)	39 (51.3%)
Control	30.76	3.66	38 (50%)	38 (50%)
Challenge	19.76	2.78	43 (56.6%)	33 (43.4%)
Spirituality (X_5)	**63.18**	**9.28**	**35 (46.1%)**	**41 (53.9%)**
Fulfillment of Prayer	26.40	3.72	47 (61.8%)	29 (38.2%)
Connectedness	14.46	1.79	39 (51.3%)	37 (48.7)
Universality	22.31	5.11	39 (51.3%)	37 (48.7)
Psychological Well-being (X_6)	**149.34**	**8.21**	**38 (50%)**	**38 (50%)**
Autonomy	25.42	2.92	40 (52.6%)	36 (47.4%)
Environmental Mastery	24.85	3.24	35 (46.1%)	41 (53.9%)
Personal Growth	24.31	3.15	32 (42.1%)	44 (57.9%)
Positive Relations	26.32	2.69	34 (44.7%)	42 (55.3%)
Purpose in Life	23.18	2.57	29 (38.3%)	47 (61.8%)
Self-acceptance	25.23	3.11	42 (55.3%)	34 (44.7%)

Note: Bold formatting indicates the total value of each independent variable.

domain (59.2%), and environmental domain (73.7%). The majority of respondents have good social support (51.3%) with the highest percentage in the family sub-variable (65.8%), good sleep quality (56.6%) with the highest percentage in the no use of sleeping pills sub-variable (98.7%), good self-esteem (52.6%), good hardiness (53.9%) with the highest percentage in the challenge sub-variable (56.6%), poor spirituality (53.9%) with the highest percentage in the connectedness and universality sub-variable (48.7%), and good psychological well-being (50%) with the highest percentage in the self-acceptance sub-variable (55.3%) and poor psychological well-being (50%) with the highest percentage in the personal growth sub-variable (57.9%).

Multivariate Regression Analysis

Multivariate regression data analysis in this study was conducted using the enter method, which analyzes all variables simultaneously without considering specific assumption values and using ANOVA analysis because the results of the normality test showed a normal data distribution. The normality test was conducted using the Kolmogorov–Smirnov test and continued by looking at the results of the normal probability plot showing a normal data distribution ($p > 0.05$) and the normal probability plot graph showing the distribution of points following the direction of the diagonal line. The variables studied include social support, sleep quality, self-esteem, hardiness, spirituality, and psychological well-being as independent variables that affect the QoL in the physical, psychological, social, and environmental domains as dependent variables. The following are the results of the multivariate regression analysis (Table 4).

Table 4 Multivariate Regression Analysis Results

Model		β	Adjusted R Square	ANOVA (Regression)		t-statistik	Prob. t value
				F-statistic	P-value		
Y_1	Constant	125.208	0.592	18.914	0.000	8.164	0.000
	X_1	0.004				0.027	0.979
	X_2	−0.475				−3.657	0.000
	X_3	−0.498				−1.206	0.232
	X_4	0.237				1.671	0.099
	X_5	0.281				2.994	0.004
	X_6	0.481				5.032	0.000
Y_2	Constant	177.898	0.731	34.549	0.000	6.404	0.000
	X_1	0.798				6.332	0.000
	X_2	0.385				2.454	0.017
	X_3	−0.192				−0.458	0.648
	X_4	0.553				4.404	0.000
	X_5	0.259				2.785	0.007
	X_6	−0.039				−0.336	0.738
Y_3	Constant	127.246	0.954	262.437	0.000	19.264	0.000
	X_1	0.162				3.143	0.002
	X_2	−0.129				−2.051	0.044
	X_3	1.691				16.058	0.000
	X_4	0.027				0.594	0.554
	X_5	−0.012				−0.323	0.748
	X_6	−0.054				−1.167	0.247
Y_4	Constant	113.645	0.926	158.196	0.000	16.729	0.000
	X_1	0.162				3.294	0.002
	X_2	−0.028				−0.557	0.579
	X_3	1.751				19.138	0.000
	X_4	−0.015				−0.293	0.771
	X_5	0.002				0.074	0.942
	X_6	−0.003				−0.076	0.940

In (Table 4) the coefficient of determination is obtained from the results of Adjusted R Square on $Y_1 = 0.592$, which shows that the proportion of the influence of the independent variable on Y_1 is 59.2%. The results of Adjusted R Square on $Y_2 = 0.731$, which shows that the proportion of the influence of the independent variable on Y_2 is 73.1%. The results of Adjusted R Square

on $Y_3 = 0.954$, which shows that the proportion of the influence of the independent variable on Y_3 is 95.4%. Finally, the results of the Adjusted R Square on $Y_4 = 0.926$ show that the proportion of the influence of the independent variable on Y_4 is 92,6%.

The results of the model reliability test (*F*-test) have a $F_{statistic}$ value of $Y_1 = 18.914$, $Y_2 = 34.549$, $Y_3 = 262.437$, $Y_4 = 158.196$, and all ANOVA regression results have a p-value of 0.000 (p-value <0.05) which means that the independent variables simultaneously influence the dependent variable. Based on the Prob. t value calculated in the regression coefficient test (*t*-test) shows that X_2, X_5, X_6 have a significant influence on Y_1 ($P.X_2 = 0.000 < 0.05$, $P.X_5 = 0.004 < 0.05$, $P.X_6 = 0.000 < 0.05$); X_1, X_2, X_4, X_5 have a significant influence on Y_2 ($P.X_1 = 0.000 < 0.05$, $P.X_2 = 0.017 < 0.05$, $P.X_4 = 0.000 < 0.05$, $P.X_5 = 0.007 < 0.05$); X_1, X_2, X_3 have a significant influence on Y_3 ($P.X_1 = 0.002 < 0.05$, $P.X_2 = 0.044 < 0.05$, $P.X_3 = 0.000 < 0.05$); and X_1, X_3 have a significant influence on Y_4 ($P.X_1 = 0.002 < 0.05$, $P.X_3 = 0.000 < 0.05$).

Discussion

Stroke can cause long-term symptoms such as hemiplegia, hemiparesis, speech and swallowing difficulties, cognitive impairment, and psychosocial disorders. According to the World Health Organization (WHO), 5.5 million people suffer from stroke-related morbidity, with 80% experiencing a reduced QoL, often leading to post-stroke depression.[2] QoL encompasses physical, mental, and social well-being, shaped by cultural, environmental, and value-based factors.[17] A good QoL is essential for patients with diseases, like stroke, characterized by satisfaction and happiness derived from cognitive and emotional factors.[25] These conditions motivate patients to improve their health, enhancing their well-being. During rehabilitation, a stroke patient's QoL largely depends on their perception of physical, mental, and social functioning.[26]

The role of the family and health workers, especially nurses, is crucial in educating patients and guiding them to maintain daily life. This support helps prevent disease progression, which leads to poor QoL.[6] Caring for stroke in the rehabilitation phase must be personalized, addressing each patient's unique characteristics and needs.[27] However, analyzing the factors that influence stroke patients' QoL during the rehabilitation phase is important, as it provides a foundation for improving care during this stage. The following is an explanation of factors that influence the QoL of stroke patients in each domain during the rehabilitation phase.

Factors Affecting Quality of Life in Physical Domain in Stroke Patients in the Rehabilitation Phase

The physical health domain is a key factor in determining a patient's QoL. It influences the ability to perform daily activities and includes aspects such as independence in daily tasks, reliance on medication and medical assistance, sleep and rest affecting energy levels and fatigue, pain and discomfort, and work capacity.[28] In this study, 53.9% of the 76 respondents reported a good QoL in the physical domain. Although this percentage was high, the poor QoL in the physical domain was the second highest among all domains. This finding aligns with previous studies, which indicated that stroke patients often experience the lowest QoL, particularly in the physical and psychological domains.[17]

This study also indicates that social support, sleep quality, self-esteem, hardiness, spirituality, and psychological well-being collectively influence the QoL in the physical domain ($P = 0.000 < 0.05$). However, three key factors have a significant direct impact on the physical domain: sleep quality ($P = 0.000 < 0.05$), spirituality ($P = 0.004 < 0.05$), and psychological well-being ($P = 0.000 < 0.05$). Each of these factors plays a distinct role in shaping the QoL in the physical domain.

The sleep quality of stroke patients during the rehabilitation phase is closely related to functional outcomes and mood.[29] The majority of respondents (56.6%) reported good sleep quality. This study found a negative relationship between sleep quality and physical domain QoL (Regression Coef. −0.475). Other studies suggest that stroke increases the risk of obstructive sleep apnea and insomnia, which negatively impact post-stroke recovery by reducing sleep duration.[30] Apart from disturbed sleep time, stroke patients often engage in more physical activity, which positively impacts their QoL in the physical domain.[31] Improved functionality through regular physical activity contributes to better overall well-being.[32] However, sleep disorders must be addressed to improve the post-stroke recovery process across rehabilitation phases.[30] This is because persistent poor sleep quality negatively affects daily activities, mobility, hand function, and overall health participation during the first year after stroke.[30]

Another factor is spirituality, as a strong spiritual foundation can enhance physical function and promote healthier behaviors in stroke patients, positively impacting the physical domain.[25] The respondents of this study had a good level of spirituality within 46.1, which showed a positive correlation with the QoL in the physical domain (Regression Coef. +0.281). This is similar to previous studies, which proved that spirituality can encourage a better self-care practice in stroke patients during rehabilitation.[22] Meeting patients' spiritual needs is essential, as it provides emotional support that helps them engage in daily physical activities, ultimately improving their physical well-being.[33]

Emotional support plays a vital role in enhancing psychological well-being in stroke patients during rehabilitation. One of the efforts is returning to work, which promotes social reintegration and improves QoL.[27] Half of the respondents of this study reported good psychological well-being (50%), which had a positive relationship with the physical domain QoL (Regression Coef. +0.481). Similar to these results, other studies reported that stroke patients who return to their pre-stroke jobs tend to have greater independence in daily activities, leading to a higher QoL, especially in the physical domain.17,[34] Additionally, psychological well-being is strengthened through social participation in activities with family, friends, peers, and the community, which has been shown to positively impact physical health.[35]

Factors Affecting the Quality of Life in the Psychological Domain in Stroke Patients in the Rehabilitation Phase

QoL is influenced by a patient's psychological state, which reflects their mental ability to adapt to various internal and external demands.[36] Post-stroke depression is the most common psychiatric complication in stroke patients, affecting nearly one-third of cases.[37] Depression is more common in patients with injuries to the left and right dorsolateral prefrontal cortex. Hypoactivity in the left hemisphere is associated with poorer emotional judgment, while hyperactivity in the right hemisphere is associated with more severe depressive symptoms.[37]

The results of this study showed that out of 76 respondents, only half (50%) had a good QoL in the psychological domain. However, among all domains, the highest percentage of poor QoL was in the psychological domain. This is in accordance with previous studies showing that the majority of stroke patients with the lowest QoL in the psychological domain.[17]

This study found that social support, sleep quality, self-esteem, hardiness, spirituality, and psychological well-being influenced the psychological domain of QoL ($P = 0.000 < 0.05$). However, four key factors have a direct and significant impact: social support ($P = 0.000 < 0.05$), sleep quality ($P = 0.017 < 0.05$), hardiness ($P = 0.000 < 0.05$), and spirituality ($P = 0.007 < 0.05$). Each of these factors plays a distinct role in shaping the psychological well-being of stroke patients.

Psychological stress in stroke patients can disrupt rehabilitation compliance, impacting the patient's prognosis, injury recovery, and neurorehabilitation outcomes.[26] This study found that social support positively influences the psychological domain of QoL (Regression Coef. +0.798), with 51.3% of respondents reporting good social support. This is in accordance with previous research that higher levels of social support are associated with better psychological well-being.[17] Social support provides positive emotional strength, helping stroke patients feel calmer and psychologically stable.[38,39]

Previous research has shown that stroke patients often experience emotional stress within the first six months post-stroke, with a higher level of severity occurring in the first month.[40] Psychological conditions like depression, due to anxiety and pain in stroke patients in the rehabilitation phase, contribute to lower QoL.[32] Sleep quality plays a crucial role in enhancing positive emotional levels.[38] This study found a positive relationship between sleep quality and the psychological domain of QoL (Regression Coef. +0.385). This is aligned with previous research showing that a better emotional level improves the psychological domain of stroke patients.[17] Therefore, addressing sleep disorders in the rehabilitation phase, particularly in the subacute and chronic stages, is essential, as poor sleep has been proven to impair memory, cognitive function, mood, and emotional regulation, negatively impacting the psychological domain.[30]

Furthermore, hardiness also has an essential role in reducing depression among stroke patients in the rehabilitation phase.[41] In this study, 53.9% of respondents had good hardiness, which showed a positive correlation with the psychological domain of QoL (Regression Coef. +0.553). Hardiness refers to a patient's ability to adapt to stressful situations, trauma, or other chronic difficulties, making it a key factor in influencing the QoL.[42] It occurs when patients construct their bad experiences by reconfiguring elements of their experiences using their memories.[32] This process involves the learning process, representation, and contextual differentiation consolidated at the neuronal reorganization

and level of memory.[42] In this process, patients must evaluate all internal and external stimuli, the subject's location, spatial and temporal parameters, and possible environmental threats so that they can choose the most appropriate strategy in the rehabilitation phase.[42] Stroke patients with strong hardiness tend to have a higher QoL compared to those who avoid, withdraw, or deny their challenges.[39]

Stroke patients with effective coping strategies and high levels of self-efficacy, hope, and optimism tend to have a better QoL than those with negative personality traits such as temperament issues, personality dysfunction, and neuroticism.[26] Spirituality is associated with greater levels of hope, providing meaning and essential coping mechanisms to improve the psychological domain in stroke patients during the rehabilitation phase.[22] Therefore, spirituality has a significant influence on the psychological domain according to the results of this study. This study also found that spirituality has a positive relationship with the QoL of the psychological domain (Regression Coef. +0.259), aligning with previous studies indicating that good spirituality helps reduce anxiety and depression, leading to better psychological outcomes.[22] Previous research has proven that spirituality has been shown to enhance self-esteem and positive emotions in stroke patients during rehabilitation.[43]

Factors Affecting Social Domain Quality of Life in Stroke Patients in the Rehabilitation Phase

The social domain of QoL is closely related to interpersonal relationships that influence, change, or improve behavior.[18] In this study, 59.2% of the 76 respondents had a good social domain of QoL. Personal relationship is one of the crucial factors in this aspect. All respondents have a life partner, and the highest percentage of the age of marriage is 20–34 years (73.7%). Similar with this, previous studies showed that stroke patients who are married and live with their partners tend to have a higher social domain of QoL compared to those who are married but live separately, single, divorced, or divorced by death.[17]

This study showed that social support, sleep quality, self-esteem, hardiness, spirituality, and psychological well-being collectively affect the social domain of QoL ($P = 0.000 < 0.05$). However, there are three main factors that directly have a significant effect on the social domain, which are social support ($P = 0.002 < 0.05$), sleep quality ($P = 0.044 < 0.05$), and self-esteem ($P = 0.000 < 0.05$). These three factors each have their own distinct effects on the social domain of QoL.

Social support from patients' social networks is an essential factor in helping them adapt to life after a stroke.[17] Previous research has shown that physical exercise and positive social interactions can improve emotional well-being, functional ability, and psychoemotional well-being post-stroke.[44] However, in stroke patients undergoing rehabilitation, difficulty swallowing poses a significant challenge in declining their QoL.[4] The family's role as a primary source of social support is vital, particularly in food preparation. Caregivers and family members can improve stroke patients' overall health and well-being by ensuring proper nutrition, especially for those with dysphagia, ultimately enhancing their QoL.[45]

This study found that social support significantly influences the social domain of QoL, with a positive relationship (Regression Coef.+0.162). These findings align with other studies indicating that social support has a more substantial impact than stroke severity or other environmental factors on the social domain during the rehabilitation phase.[20] This is because social support serves as a key predictor for encouraging patients to re-engage in social participation.[46] The social well-being of stroke patients has a vital role in determining patient's QoL, fostering positive emotions, active involvement in daily activities, strong social relationships, self-esteem, and confidence in their abilities.[8]

In addition to increased participation in social activities during rehabilitation, patients with good sleep quality experience fewer symptoms of depression, contributing to a better QoL.[47] Sleep quality is one of the factors that influences the social domain and both have a negative relationship (Regression Coef. −0.129). This finding is consistent with previous research, which suggests that poor sleep quality can contribute to fatigue, negatively affecting psychosocial well-being.[40] Fatigue in stroke patients is a major concern, as it can hinder the rehabilitation process and thus ultimately impacting QoL.[48]

Stroke patients often experience lifestyle changes that lead to dependence on people around them due to limitations in Activity Daily Living (ADL), causing self-esteem issues, increasing feelings of depression, anxiety, lack of sleep, and helplessness.[7] These changes result in decreasing of patient's self-esteem and self-efficacy, and causing physiological pain, which ends in a disturbed QoL.[49] The majority of respondents in this study had good self-esteem (52.6%). This

study also showed that self-esteem influences on the social domain, and both of them had positive relationship (Regression Coef. +1.691), where other studies have proven that self-esteem related to disability and dependence on other people is a significant risk factor determining the poor QoL of post-stroke patients.[39] The inability of stroke patients in the rehabilitation phase to regain the level of functional independence they had before the stroke has a negative impact on psychosocial well-being.[50]

Good self-esteem in patients can involve a high sense of coherence in stroke patients, and this is very important to increase the level of psychosocial well-being, which has an impact on better social domain.[40] In general, stroke recovery is better when stroke patients have strong self-efficacy, self-esteem, and hope.[8] Patients become more motivated to continue following treatment after a stroke, leading to improved ADL levels during the rehabilitation phase and ultimately contributing to a higher QoL.[5]

Factors Affecting Environmental Domain Quality of Life in Stroke Patients in the Rehabilitation Phase

The environment is one of the domains of QoL related to the individual's residence consist of the availability of housing and facilities and infrastructure that support the patient's life. The environmental domain has several aspects in it including financial resources; physical security and comfort; home environment; health and social care; accessibility of information; physical environment; and transportation.[20] The results of this study showed that out of 76 respondents, with 73.7% reported having good environmental domain.

The QoL in good environmental domain was found to have the highest percentage among other domains, which is likely supported by the respondents' adequate environmental aspects. In this study, 86.8% of respondents were still employed, and 98.7% of married respondents worked, with the highest family income ranging from Rp.1,000,000.00 - Rp.2,900,000.00 is 35.5%. This study aligns with previous studies that suggest an increase in income adequacy leads to improved QoL across all domains, including the environment (p value < 0.001).[17] Additionally, all respondents had a place to live, whether rented, shared, or owned, further supporting the positive environmental conditions.

This study revealed that social support, sleep quality, self-esteem, hardiness, spirituality, and psychological well-being influence environmental domain ($P = 0.000 < 0.05$). However, two main factors stand out as having direct and significant effect on the physical domain: social support ($P = 0.002 < 0.05$) and self-esteem ($P = 0.000 < 0.05$). These factors each play a key role in shaping the environmental QoL for stroke patients.

In this study, social support significantly influences the environmental domain and both have a positive relationship (Regression Coef. +0.162). The community environment can create a functional and natural communication, which benefits the QoL for stroke patients.[45] Stroke patients, especially those with aphasia, need special attention from the surrounding environment because they have more symptoms of anxiety and depression.[51] Social support from the patient's environment is vital for the accuracy of selecting therapy, control, and rationalization of health care costs as well as high efficiency in achieving optimal results in stroke patients in the rehabilitation phase, which can significantly improve the QoL.[27] Moreover, higher level of financial support also indicates a better QoL in the environmental domain.[17]

In addition, self-esteem has an influence on the environmental domain, and both have a positive relationship (Regression Coef. +1.751). The self-esteem of each stroke patient can create the patient's perception of their health status, including how the experience pain, discomfort, anxiety or depression. These factors can significantly impact their QoL, as in this study.[5] Stroke patients with good self-esteem tend to develop better self-management strategies, which significantly contribute to improved QoL during the rehabilitation phase.[52] Also, stroke patients with high self-esteem, functionally independent, are more likely to have a more positive outlook on the future.[33] This positive outlook makes patients optimistic about facing challenges in their environment related to their illness.[33,53]

Limitations

This study was conducted among stroke patients in Cibeureum Village, where the majority of participants were Muslim and of Sundanese ethnicity. As a result, the findings may not be fully generalizable to the broader population of stroke patients in Indonesia, particularly those in regions with different healthcare access or cultural backgrounds.

Although cultural factors and family involvement were considered in this study, variations in cultural values across individuals and communities may not have been fully controlled. This could introduce Self-Report Bias, where respondents' perceptions and subjective experiences influence their answers, potentially affecting the study's accuracy.

Conclusion

The success of stroke recovery in the rehabilitation phase is reflected in a high QoL, which is influenced by various factors, such as demographic factors, comorbidities, stroke severity, disability, and psychosocial factors. This study identifies key factors that collectively impact QoL in all domains, including social support, sleep quality, self-esteem, hardiness, spirituality, and psychological well-being.

In the physical domain of QoL, the most significant factors are sleep quality, spirituality, and psychological well-being. Next, psychological domain, social support, sleep quality, hardiness, and spirituality play important roles. The social domain is most influenced by social support, sleep quality, and self-esteem. Finally, the environmental domain is primarily affected by social support and self-esteem.

Patients, families, nurses, and other health care providers can use this research as a reference to modify interventions that enhance the QoL in stroke patients in the rehabilitation phase, focusing on the most significant influencing factors. As key caregivers, nurses should implement appropriate interventions to support patient's recovery and maximize rehabilitation results. Further research should explore comprehensive interventions that address all QoL in all domains, considering the contributing factors for a more holistic approach.

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Disclosure

The authors report no conflicts of interest in this work.

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