

Evaluation of the health literacy in patients with stroke and relationship between health literacy and functional status on quality of life in patients with stroke

✉ Pınar Özge Başaran, ✉ Ayşe Gülşen Doğan

Department of Physical Medicine and Rehabilitation, Erol Olçok Training and Research Hospital, Hitit University, Çorum, Türkiye

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ABSTRACT

Aims: This study was aimed to evaluate the health literacy in patients with stroke and relationship between health literacy and functional status on quality of life.

Methods: This cross-sectional study was studied on 50 participants with stroke (mean age: 59.4±10.6 years) and 50 healthy controls (mean age: 61.7±10.1 years). Clinical and demographic and characteristics were recorded. Health literacy levels of the participants were assessed with the Turkish version of European Health Literacy Scale (EHLS-TR), Motor development for hand, upper and lower extremity with Brunnstrom staging, evaluation of health-related quality of life with Nottingham Health Profile (NHP), pain with assessed with numeric rating scale (NRS).

Results: Age, gender, marital status, education, job and residential area were similar between the groups. The EHLS-TR scores were significantly lower, in patients with stroke compared to the control group ($p=0.041\delta$). There was a statistically significant negative correlation between EHLS-TR scores, age and positive correlation with educational status. EHLS-TR scores were found to be higher in patients younger than 60 years old and university graduates. Health related quality of life levels are similar between the groups. EHLS-TR scores were found to be statistically effective on Nottingham Health Profile (NHP) total scores ($\rho:-0,357$ and $p=0,011$) and also physical activity sub domain and energy level sub domains. There was moderate negative correlation between the EHLS-TR scores and NHP energy sub domain ($p=0.002$, $r:-0.436$) and weak negative correlation between the EHLS-TR scores and NHP emotional, sleep, physical activity sub domains ($r:-0.279$ $p=0.049$, $r:-0.344$ $p=0.015$, $r:-0.288$ $p=0.043$). There was no correlation between the EHLS-TR scores and Brunnstrom staging, Functional ambulation and pain levels in patients with stroke.

Conclusion: Our study results suggest that healthy literacy level is lower in patients with stroke compared to healthy controls. In addition, healthy literacy is associated with age and education. Health literacy has been found to have an impact on quality of life and energy, emotional, sleep and physical activity subdomains of NHP. There was no association found between functional status on health literacy in this patient population.

Keywords: Stroke, health literacy, functional status, quality of life

INTRODUCTION

Stroke is one of the major causes of long-term neurological disability and functional disability. The reasons for this are that is common in the population and has gradually decreased in recent years it can be explained by mortality rates.¹⁻³ The consequences of stroke are usually complex and variable. This disease affects not only neurological and physical functions, but also in survivors it leads to addiction, cognitive and mental disorders in daily life activities.⁴

Health literacy is defined by World Health Organization (WHO) as individuals' health-related information

defined as cognitive and social skills in which the individuals have the ability to reach, understand, and use information.⁵ By the help of the high health literacy levels individuals can easily access, understand and evaluate the information and take the right steps for their health status. In the recent studies it has been shown that low or inadequate health literacy is associated with more severe health conditions and even earlier death.⁶⁻⁸ For powerful stroke rehabilitation, health literacy among patients is very important. For stroke survivors, low health literacy could attribute to longer hospital stay, worse clinical health outcomes, and ineffective health education.

Corresponding Author: Pınar Özge BAŞARAN, pinarozge@yahoo.com



Secondary prevention of stroke is crucial. Secondary stroke prevention includes managing modifiable risk factors such as smoking, dyslipidemia, hypertension, unhealthy diet, and physical inactivity.⁹ Hence, for the individual patient, the life after stroke may entail several lifestyle changes and new routines such as medication management, rehabilitation, and healthcare follow-ups including information and recommendations from healthcare professionals. Consequently, for people with stroke, the ability to understand and to use health information is important to prevent recurrent strokes and to regain functioning.

Improving the quality of life of patients with stroke is a priority not only for patients but also caregivers and clinicians. Improving the quality of life after stroke stands on the centre of the rehabilitation treatment. Quality of life takes into account the impact of a disease or condition and its treatments on the lives of individuals.¹⁰ Quality of life is multidimensional. If we can understand the factors that can affect the quality of life in patients with stroke, we can produce solutions to improve these factors in rehabilitation.

The aim of this study is to evaluate the health literacy in patients with stroke and relationship between health literacy and functional status on quality of life in patients with stroke.

METHODS

This study was approved by Hitit University Medical Faculty Clinical Researches Ethics Committee (Date: 21.08.2023 Decision No: 2023-85) and written informed consent was obtained from each participants. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Participants

This cross-sectional study was studied on 50 patients who were diagnosed with stroke by an experienced neurologist and 50 healthy controls who were admitted to the outpatient clinic for health check-up including physical examination and hemogram measurements between July 2023 and September 2023.

Patients over 18 years old, who was diagnosed with stroke for the first time according to the criteria of the World Health Organization (WHO) who were at least 1 month after the event and would be able to understand simple verbal commands were enrolled. Those with concomitant neurological disease; other systemic diseases that affects the functional status such as severe cardiopulmonary diseases, joint contractions, amputations; severe hearing or visual impairments and mental and cognitive impairments that affects the communication were excluded.

Clinical and demographic characteristics were recorded. Age, sex, income level (minimum salary or over), educational level (elementary, secondary, or university/college) were noted. The health literacy levels of the participants were assessed with the Turkish version of European Health Literacy Scale (EHLS-TR), motor development for hand, upper and lower extremity with Brunnstrom staging, evaluation of health-related quality of life with Nottingham Health Profile (NHP), pain levels with numeric rating scale (NRS).

The health literacy level of patients were assessed with The EHLS-TR. There is 47 questions in this scale. And the total score is calculated with a formula from 0 to 50 (Formula=(arithmetic mean -1) \times 50/3). Health literacy is evaluated in four groups according to the total score. Excellent health literacy level: 50-42, sufficient health literacy level: 42-33, limited health literacy level: 33-25 and insufficient health literacy level: 25-0.¹¹

Brunnstrom staging is a test that evaluates the motor development of hemiplegic patients. In this test, the recovery process of the hemiplegic patient is defined as 6 stages. At stage I there is no voluntary movement, flask phase and at stage VI there is isolated joint movement. The upper limb, lower limb and hand are evaluated separately. High brunnstrom stages indicate better motor development.¹²

The Turkish version of NHP was used in the evaluation of health-related quality of life. The NHP has subsections entitled physical mobility (pm), pain (p), sleep (sl), emotional reactions (em), social isolation (so) and energy (en) and distress (d). Each section is scored between 0-100.¹³ Higher scores shows greater severity of health problems.

Pain was assessed with the numeric rating scale (NRS). Patient rated the pain on a numerical scale 0-10 (no pain-worst pain).¹⁴

Statistical Analysis

The data were evaluated in the statistical package program IBM SPSS Statistics Standard Concurrent User V 26 (IBM Corp., Armonk, New York, USA). Descriptive statistics were given as number of units (n), percentage (%), mean \pm standard deviation, median and interquartile range values. Normal distribution of the data of numerical variables was evaluated with the Shapiro Wilk normality test. The homogeneity of variance of the groups was analyzed with the Levent test. Comparisons between two groups for numerical variables were made with independent samples t-test if the data showed a normal distribution, and with the Mann-Whitney U test if the data did not show a normal distribution. More than two group comparisons were made with Kruskal-Wallis analysis. Dunn-Bonferroni test was used in Kruskal

Wallis analysis. Chi-square analyzes (Pearson chi-square test, Continuity correction test, Fisher exact test) were used to compare groups with categorical variables. If the chi-square analysis results were found to be significant, subgroup analyzes were performed with a two-ratio Z test with Bonferroni correction. Relationships between numerical variables were evaluated with the Spearman correlation coefficient. The effect of health literacy on quality of life and functional status in stroke patients was evaluated by linear regression analysis. A value of $p < 0.05$ was considered statistically significant.

RESULTS

Our study consists of a group of 50 patients diagnosed with stroke and a control group of 50 healthy people. Age, gender, marital status, education and job and residential area were similar between the groups (Table 1).

	Patient Group (n=50)		Control group (n=50)		Test value	p value
Age (Mean± SD)	59.4±10.6		"		1.114	0.268 [‡]
Gender (F/M)	23/27		24/26		0.040	0.841 [†]
Married (n)	42		41		0.001	>0.999 [‡]
Single (n)	8		9			
Stroke duration (month) (Mean± SD)	8.0 (12.5)		-			
Education	n	%	n	%	3.704	0.157 [†]
Primary school	31	62.0	27	54.0		
Secondary school	9	18.0	5	10.0		
High school or higher	10	20.0	18	36.0		
Income level, n (%)	n	%	n	%	0.731	0.694 [†]
Minimum salary	25	50	21	42		
> Minimum salary	25	50	29	58		
Job					2.011	0.366 [†]
Worker	15	30.0	9	18		
Retired	17	34.0	19	38		
Housewife	18	36.0	22	44		
Residential Area					3.014	0.222 [†]
Village	5	10.0	10	20.0		
District	8	16.0	4	8.0		
City	37	74.0	36	72.0		

n= Number, %: Column percent, Numerical data are given as mean±standard deviation or median (interquartile range) values. †: Independent samples t test, ‡: Pearson chi-square test, ‡: Continuity correction test

EHLS-TR scores of the patient group are statistically significantly lower than the control group. The number of participants with insufficient health literacy in the patient group (%58 n=29) is statistically significantly higher than in the control group (%28 n=14). According to the NHP results in terms of interference in quality of life, no significant difference was observed between the groups. When the subgroups were evaluated, it was seen that the impact was significant only in the energy category (Table 2).

	Groups		Test statistics	
	Patients n=50	Controls n=50	Test value	p value
Brunnstrom				
Upper extremity	4.82±1.67			
Hand	4.48±1.55			
Lower extremity	4.64±1.27			
FAS	4.06±0.84			
NRS	4.5 (4.2)			
EHLS-TR (score)	24.0 (14.3)	29.0 (12.9)	2.048	0.041 ^δ
EHLS-TR classification (n,%)				
Insufficient	29 (58.0) ^a	14 (28.0) ^b	9.839	0.020 [†]
Limited	9 (18.0) ^a	17 (34.0) ^a		
Sufficient	8 (16.0) ^a	10 (20.0) ^a		
Excellent	4 (8.0) ^a	9 (18.0) ^a		
NHP				
Pain	20.5 (51.5)	34.1 (60.3)	0.631	0.528 ^δ
Emotional reactions	33.3 (70.7)	15.7 (63.5)	1.257	0.259 ^δ
Sleep	38.7 (77.6)	12.5 (55.9)	1.245	0.213 ^δ
Social isolation	22.0 (48.1)	0.0 (41.3)	0.947	0.343 ^δ
Physical activity	34.9 (67.0)	22.4 (50.1)	1.356	0.175 ^δ
Energy level	81.6 (66.4)	24.0 (100.0)	2.820	0.005 ^δ
Total	225.6 (298.1)	184.0 (271.6)	1.559	0.119 ^δ

n= Number, %: Column percent, Numerical data are given as mean±standard deviation or median (interquartile range) values, †: Pearson chi-square test, δ: Mann-Whitney U test, a and b superscripts indicate differences between groups at each rows. There is no statistically differences between groups with the same superscripts at each rows. FAS: Functional ambulation scale, NRS: numeric rating scale, NHP= Nottingham Health Profile, EHLS-TR: Turkish version of European Health Literacy Scale

In stroke group there was a statistically significant correlation between EHLS-TR scores, age and educational status. EHLS-TR scores were lower in patients over 60 years old than the younger ones ($p=0.015$). EHLS-TR scores are higher in the participant who are graduated from university than primary school graduates ($p=0.009$) (Table 3).

	EHLS-TR		Test statistics	
	Test value	p value	Test value	p value
Groups of Age, n (%)			2.436	0.015 ^δ
31-60	28.71	15.24		
>60	20.55	9.53		
Gender, n (%)			1.032	0.302 ^δ
Male	22.68	12.06		
Female	24.10	16.66		
Job, n (%)			0.208	0.901 ^η
Worker	24.37	9.93		
Retired	22.68	17.12		
Non worker	23.03	15.42		
Education Level, n (%)			9.468	0.009 ^η
Primary school	20.91 ^a	8.50		
High school	31.19 ^{ab}	24.93		
University	35.26 ^b	18.69		
Marital Status, n (%)			0.754	0.458 ^δ
Married	23.34	11.94		
Single	30.30	25.36		

Numerical data are given as median (interquartile range) values, δ: Mann-Whitney U test, η: Kruskal Wallis test, a and b superscripts indicate differences between. There is no statistically differences between groups with the same superscripts.

There was no statistically significant correlation between EHLS-TR scores and Brunnstrom staging, functional ambulation scores or pain levels. There was moderate negative correlation between the EHLS-TR scores and NHP energy sub domain and weak negative correlation between the EHLS-TR scores and NHP emotional, sleep, physical activity sub domains (Table 4).

Table 4. Correlation between EHLS-TR score and Brunnstrom, FAS, VAS, NHP in stroke patients

	EHLS-TR	
	rho	P
Brunnstrom		
Upper extremity	-0.014	0.924
Hand	-0.094	0.517
Lower extremity	0.059	0.682
FAS	0.104	0.471
NRS	-0.138	0.338
NHP		
Pain	-0.152	0.292
Emotional reactions	-0.279	0.049
Sleep	-0.344	0.015
Social isolation	-0.181	0.208
Physical activity	-0.288	0.043
Energy level	-0.436	0.002
Total	-0.357	0.011

rho: Spearman correlation coefficient, FAS: Functional ambulation scale, NRS: numeric rating scale, NHP= Nottingham Health Profile, EHLS-TR: Turkish version of European Health Literacy Scale

EHLS-TR scores were found to be statistically effective on Nottingham Health Profile (NHP) total scores and also physical activity sub domain and energy level sub domains. When the EHLS-TR score increases by one unit, there is a decrease of 0.955 points in NHP physical activity scores, 1.052 points in energy level scores and 4.163 points in total scores. There is no statistical effect of EHLS-TR scores on pain, emotional reactions, sleep and social isolation scores (Table 5).

DISCUSSION

In this study, health literacy level in stroke patients was found to be significantly lower than in the control group. The number of insufficient health literacy was detected significantly more in stroke patients. In our results there was a significant negative correlation between HL level and NHP emotional reactions, sleep, physical activity, energy and total scores, Stroke is a clinical syndrome characterized by focal loss of cerebral function and disruption of the complex internal circulation of the brain without any apparent cause other than vascular causes.¹⁵ Stroke ranks first in terms of frequency and importance among adult neurological diseases worldwide. Although recent studies have shown that the mortality rate has decreased, the neurological deficits it causes are still important causes of functional limitations. Stroke incidence increases with age, more common in men than women.^{16,17} In our study, the number of male patients was found to be higher in stroke patients, this is probably small sample size of our study. Some studies have found a reduced risk of stroke in married people, while others have found nonsignificant differences.¹⁸ However, there are studies that find that the risk of stroke increases in married people.¹⁹ In our results, approximately 90% of stroke patients were married. Low levels of education and socioeconomic status have been identified as stroke risk factors. Since people with high socioeconomic status have a higher probability of accessing health resources, predisposing factors such as hypertension and diabetes can be controlled, and healthy eating habits in these people can also reduce the risk of stroke.^{20,21} In our study, younger and university graduated stroke patients have higher health literacy levels but no difference was found in income levels, working status between stroke patients and the control group. In our study, 76% of stroke patients and 62% of healthy controls had insufficient or limited health literacy levels. Büyüksireci et al.²² were found

Table 5. Evaluation of the effect of health literacy on quality of life and functional status in stroke patients with linear regression analysis

Dependent Variables	Regression Coefficients*							
	β0	β1	se for β1	zβ1	t	p	95.0% CI for β1	
							LB	UB
Brunnstrom								
Upper extremity	4.478	0.021	0.022	0.151	0.940	0.352	-0.023	0.065
Hand	4.533	0.017	0.019	0.137	0.895	0.375	-0.022	0.056
Lower extremity	4.455	0.016	0.017	0.151	0.944	0.350	-0.018	0.049
FAS	3.830	0.010	0.011	0.152	0.931	0.357	-0.012	0.033
NRS	4.875	-0.028	0.034	-0.135	-0.824	0.415	-0.097	0.041
NHP								
Pain	48.188	-0.621	0.439	-0.231	-1.415	0.164	-1.504	0.263
Emotional reactions	61.644	-0.623	0.479	-0.210	-1.301	0.200	-1.588	0.342
Sleep	63.329	-0.524	0.436	-0.174	-1.202	0.236	-1.402	0.354
Social isolation	43.261	-0.027	0.444	-0.009	-0.061	0.952	-0.922	0.868
Physical activity	63.674	-0.955	0.406	-0.362	-2.352	0.023	-1.772	-0.137
Energy level	104.260	-1.052	0.465	-0.323	-2.259	0.029	-1.989	-0.114
Total	388.734	-4.163	1.986	-0.308	-2.096	0.042	-8.163	-0.162

*Adjusted for age groups and education levels, β0: Constant, β1: Non-standardized regression coefficient, zβ1: Standardized regression coefficient, CI: Confidence interval, LB: Lower bound, UB: Upper bound, FAS: Functional ambulation scale, NRS: numeric rating scale, NHP= Nottingham Health Profile.

higher health literacy levels in patients with fibromyalgia in Turkish population. Compared to this study, patients with stroke had a lower health literacy level. In our study patients are older and have more comorbid diseases this may be affect the health literacy levels.

Risk factors for stroke are divided into two groups: modifiable and non-modifiable risk factors. Modifiable risk factors include hypertension, diabetes, unhealthy diet, low socioeconomic and educational level, lack of physical activity, smoking and alcohol use.^{23,24} Health literacy involves obtaining, understanding, and using health information to make appropriate health decisions and follow treatment instructions.²⁵ Although there is no clear study explaining the relationship between stroke and HL, reducing certain modifiable risk factors with the level of HL may establish a strong link between stroke and HL.²⁶ Additionally, high HL levels are important for successful stroke management.²⁷ In a study by Pien et al.²⁸ low HL levels were found to be higher in patients with a history of stroke. Jeong et al.²⁹ showed that HL levels are an important factor affecting health status in stroke patients. Sanders et al.³⁰ showed that 59% of post-stroke patients had inadequate or marginal health literacy. In our results, HL level was found to be significantly lower in stroke patients. In addition, the number of insufficient HL was found to be significantly higher in stroke patients than in the control group.

The social, physical and psychological consequences of stroke cause social and economic burden all over the world. It is considered a global health problem due to impaired quality of life.³¹ Health literacy is an important factor in stroke prevention, management and rehabilitation. The American Heart Association clearly recommends that patients with a history of stroke learn the risk factors for this disease, warning signs, emergency medical aid systems, and information through post-treatment follow-up education.³² In the study of Flink et al.³³ a close relationship was observed between post-stroke health literacy level and quality of life 12 months later. In a study conducted by Pien et al.²⁸ in 7702 patients, a negative relationship was found between low HL level and quality of life in patients with a history of stroke. In a cross-sectional study in elderly the level of health literacy affects the level of quality of life.³⁴ According to our study results, a negative relationship was found between HL levels and NHP total scores. Regardless of the stroke patients functional status as health literacy increases quality of life increases. This is important because even if the patients functional status does not improve, improving the health literacy will improve quality of life.

Few studies have assessed the association between health literacy and quality of life after stroke. As our knowledge this is the first study evaluating the health literacy level and association between health literacy and functional

status or quality of life in patients with stroke in Turkish population.

In patients with stroke it is important to follow up the rehabilitation program not only for the improvement of the functional status but also adaptation to the social life and mental health. High health literacy levels helps to understand the importance of treatment strategies, rehabilitation programmes and improving self-care behaviours. As the level of health literacy increases, so does the level of quality of life. It is recommended to design policies that will help to increase the health literacy of the patients with stroke.

Limitations

In this study we had a relatively small sample and the majority of the patients have mild to moderate stroke. Persons who could not provide informed consent, because of severe aphasia and/or cognitive impairment was excluded from the study. More studies needed to explore associations between health literacy and relevant clinical outcomes in people with more severe symptoms after stroke. In the future well designed larger studies help us to firm a conclusion after stroke to explore the underlying reasons for these associations and other plausible variables of importance.

Sample Size

According to the results obtained from the power analysis conducted with the G* Power program³⁵ based on the mean±standard deviation values of the health literacy level scores obtained from the study to Huang et al.³⁶ the sample size was calculated as 50 patients in each group.

CONCLUSION

Our study results suggest that healthy literacy level is lower in patients with stroke compared to healthy controls. In addition, healthy literacy is associated with age, education and quality of life in stroke patients. There was no association between functional status and health literacy in stroke patients.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Hitit University Medical Faculty Clinical Researchs Ethics Committee (Date: 21.08.2023 Decision No: 2023-85).

Informed Consent

Written informed consent was obtained from all participants who participated in this study.

Referee Evaluation Process

Externally peer reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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