ORIGINAL ARTICLE

Smart Medical Journal

Smart Medical Journal (SMedJour) December 2023, Vol. 6, No.3, pp:132-139
DOI: https://doi.org/10.13057/smj.v6i3.71300
E-ISSN: 2621-0916 | P-ISSN: 2621-1408

Correlation Between Acute Phase Delta NIHSS and Quality of Life Score in Post Thrombotic Infarct Stroke Patient in Dr. Moewardi General Hospital via Tele-Stroke Specific Quality of Life-12 Questionnaire (SSQOL-12)

Raden Andi Ario Tedjo*, Martha Oktavia Dewi Savitri, Stefanus Erdana Putra

*Coresponding author: andi.tedjo@staff.uns.ac.id

Affiliation:
Department of Neurology
Faculty of Medicine,
Universitas Sebelas Maret,
Surakarta, Indonesia

Recived: 07/02/2023
Accepted: 28/12/2023
Published: 30/12/2023

ABSTRACT

Introduction: Stroke is one of the most common diseases causing disability. Stroke severity assessed using National Institute Health Stroke Scale (NIHSS) was recognized affecting quality of life in stroke patients. This study evaluated the NIHSS delta as a predictor of quality of life in thrombotic stroke patients

Methods: This study was conducted from January to September 2022 with cross-sectional approach. At inpatient setting, NIHSS was assessed at admission, first 24 hours, and discharge. Patient's quality of life was evaluated using the SSQOL-12 questionnaire via telephone. Bivariate linear regression analysis was used to assess this correlation.

Results: Demographic data of 61 patients showed that 65.4% of patients were male, 54.1% of patients aged <60 years, and 67.2% had moderate stroke (NIHSS 6-15). The results of bivariate analysis using linear regression showed that both the 24 hour-delta NIHSS and the delta NIHSS-admission-discharge were positively related to SSQOL-12 score (p = 0.000).

Conclusion: Delta NIHSS can be used as clinical improvement predictor with positive correlation to the quality of life in thrombotic stroke patients.

Keywords: delta NIHSS; tele-SSQOL-12; thrombotic stroke

INTRODUCTION

Stroke is number two leading cause of death worldwide with mortality reaching 5,5 million lives every year. Stroke also cause significant chronic morbidities in over 50% of patients. Stroke burden transiently increasing in developing countries especially East Europe, Middle Africa, Northern Asia and Southern Pacific[1]. In earlier studies, stroke patient had substantially decrease in quality of life because of the stroke sequale[2]. Quality of life attributed to severity of clinical outcome especially disability that impacting everyday routine[1].

National Institute Health Stroke Scale (NIHSS) is one of systematic measures in stroke severity linked to neurologic deficit. NIHSS could be one of parameter in predicting stroke outcome[3]. Change in NIHSS (delta NIHSS) as marker in difference of stroke severity is considered as predictive value to stroke patient's functional outcome[4]. Degree of severity in stroke, disability and outcome known to have proportional correlation with patient's quality of life[5].

Patient quality of life can be generally or specifically measured. Stroke-specific Quality of Life Scale (SSQOL) is one of specific quality of life measurement[1]. There are two version of this test, long version (49 items) and short version (12 items). In this research we use short version of SSQOL

questionnaire modified by-telephone interview since it has good criterion validity for all subsets of stroke and easy to use in short form[6].

This study aims to measure correlation between change in NIHSS score (delta NIHSS) and post thrombotic infarct stroke patient's quality of life score with modified questionnaire by-telephone. Delta NIHSS considered as stroke outcome and quality of life predictor.

METHOD

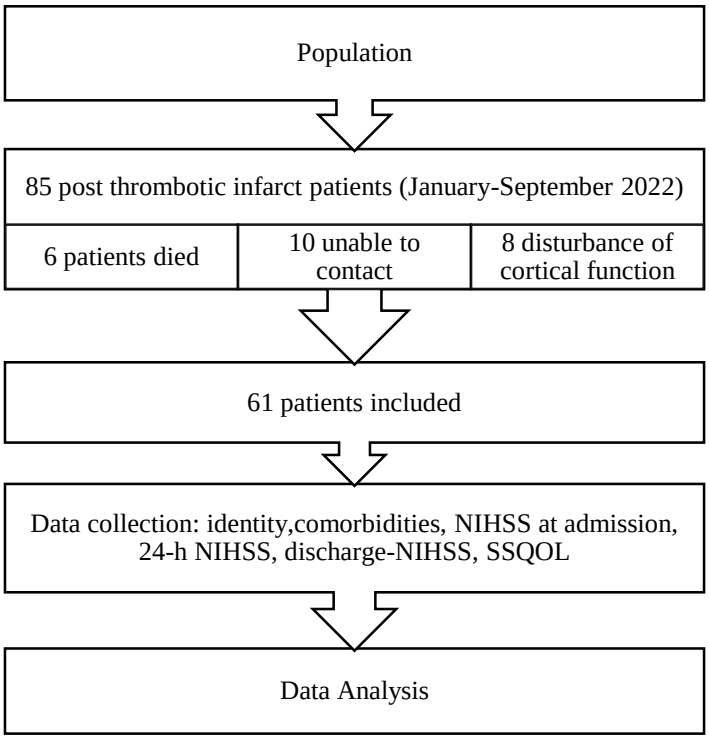

Figure 1. Research algorithm

This was an analytic observational study with cross-sectional approach. The study was done during January-September 2022. The independent variable was delta NIHSS score (numeric scale) and the dependent variable was SSQOL score (numeric scale).

The research participants were selected by purposive sampling. Thrombotic infarct stroke patients who previously underwent treatment in Dr. Moewardi General Hospital fulfilling the inclusion and exclusion criteria were included in this study. The inclusion criteria were age over 18 years old, patients who agreed to participate, cooperative, thrombotic infarct stroke diagnosed by non-contrast CT scan, and patient discarded alive from hospital. The exclusion criteria were patient with disturbance in higher cortical functions, unreachable phone contact, and patient who died when contacted. Sample size was calculated using multivariate sample analysis approximately 10-15 sample every independent variable, so total sample size used in this study were 40-60 samples.

NIHSS score data and patient demography were obtained from medical record and stroke registry as a secondary data. The NIHSS score was always recorded in all stroke patients at admission and discharge. Stroke-specific Quality of Life Scale (SSQOL) questionnaire interview was taken by phone call or WhatsApp™ video call as primary data during March-October 2022.

Absolute delta NIHSS was defined as difference between two NIHSS score measurement in different time. In this study, delta NIHSS was classified into 24-hour-delta NIHSS (admission NIHSS – NIHSS at 24 hour) and delta NIHSS admission-discarded (admission NIHSS – discarded NIHSS).

We also measured the percentage of the delta NIHSS. The percentage (%) of 24-hour delta NIHSS was defined as 24-hour-delta NIHSS divided by admission-NIHSS. The percentage (%) of

admission-discarded delta NIHSS was defined as admission-discarded delta NIHSS divided by admission-NIHSS.

Descriptive statistical method was conducted to identify percentage, mean and standard deviation. This research used bivariate linear regression analysis method to analyze the correlation between delta NIHSS and SSQOL score in thrombotic infarct stroke patient. Statistical analysis was done using SPSS for Windows version 26.

RESULT

Table 1. Patient's characteristic

Characteristics	N = 61	%
Sex		
Male	40	65,57%
Female	21	34,43%
Age		
<60 years old	33	54,1%
>60 years old	28	49,0%
Comorbidities		
Diabetes Mellitus	8	13,10%
Hypertension	19	31,14%
Diabetes Mellitus + Hypertension	9	14,75%
Non-comorbidities	25	40,91%
Admitting NIHSS		
1-5 (minor stroke)	20	32,78%
6-15 (moderate)	41	67,22%
16-20 (moderate-severe)	0	0
24-hours NIHSS		
1-5 (minor stroke)	37	60,66%
6-15 (moderate)	24	39,34%
16-20 (moderate-severe)	0	0
Discarded NIHSS		
1-5 (minor stroke)	49	80,32%
6-15 (moderate)	12	19,68%
16-20 (moderate-severe)	0	0
24-hours Delta NIHSS	61	100%
Admitting-Discarded Delta NIHSS	61	100%
Total SSQOL		
36-48 (high)	51	83,60%
24-35 (moderate)	10	16,40%
12-23 (low)	0	0

Patients Characteristic

The study was conducted in nine months from January to September 2022 with total of 61 patients fulfilling inclusion criteria. Male dominance was found (65,57%) and 33 patients (54,1%) were below 60 years old of age. During admission, most of the patients diagnosed with moderate stroke (NIHSS 6-15). There were 36 patients with comorbidities, 8 patients with diabetes mellitus, 19 patients with hypertension and 9 patients with diabetes mellitus and hypertension. These two comorbidities were chosen because diabetes mellitus and hypertension were the most common comorbidities found in post ischemic stroke patient causing major devastating burden for health system[1,7]. The mean 24-hour delta NIHSS was 1,39 ± 0,82 and the mean delta NIHSS admitted-discarded was 2,90 ± 1,17. Mean SSQOL score was 41,11± 4,76, in which most of the patients had high quality of life (83,60%).

Data Analysis

Bivariate linear regression test was done to find correlation between NIHSS and SSQOL score. From statistical analysis, we found very strong correlation between delta NIHSS admitted-discarded and SSQL-12 (r=0,825) and strong causal relationship between delta NIHSS 24-hours and SSQOL-12 (r=0,495) with every p=0,000 (Table 2). Delta NIHSS 24-hour percentage admitted and delta NIHSS admitted-discarded percentage with NIHSS had positive linear correlation with total SSQOL (p=0,012 and p=0,000). Significant was concluded when p value less than 0,05.

Table 2. Bivariate analysis for correlation between delta NIHSS and total SSQOL score

Variable	b	R	R^2	*p*
24-hour ΔNIHSS	2,866	0,495	0,245	0,000
% 24-hour ΔNIHSS/ admission NIHSS	10,588	0,319	0,102	0,012
admission-discarded ΔNIHSS	3,374	0,825	0,681	0,000
% admission-discarded ΔNIHSS / admission NIHSS	17,994	0,597	0,356	0,000

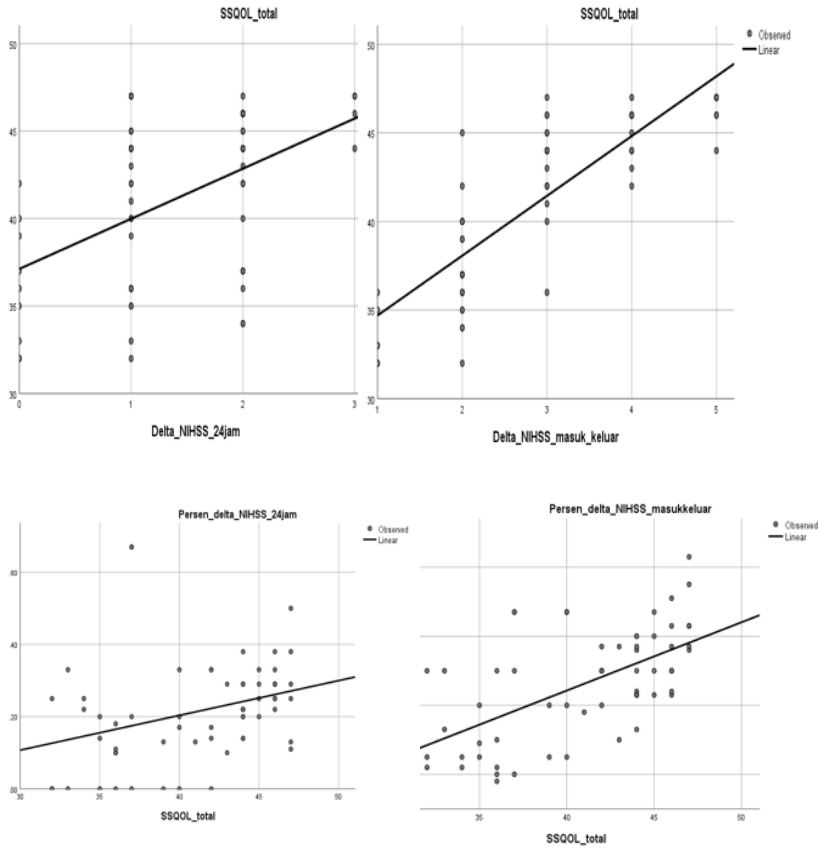

Figure 2. Correlation graphic showing relationship between delta NIHSS 24-hour (A) and delta NIHSS admission-discarded (B) with total SSQOL; percentage of delta NIHSS 24-hour/ NIHSS admitted (C) and 24-hours admitted delta NIHSS percentage (D) with total SSQOL

Figure 2 shows upward angle linear line. It showed positive linear correlation between delta NIHSS (24-hour delta NIHSS and admitted-discarded delta NIHSS) with patient's quality of life based on SSQOL-12. Upward angle line means the larger delta NIHSS score, the better patient's SSQOL score is.

Bivariate linear regression analysis was also done to find correlation between delta NIHSS as independent variable and physical aspect of SSQOL as dependent variable. From statistical analysis, we found strong correlation between admission-discarded delta NIHSS with physical aspect of SSQOL (r=0,738) and strong correlation between 24-hour delta NIHSS with physical aspect of SSQOL (r-0,522), with each p=0,000 (Table 3).

Table 3. Bivariate analysis of correlation between delta NIHSS with physical aspect of SSQOL score

Variable	b	R	R^2	*p*
24-hour ΔNIHSS	1,673	0,522	0,272	0,000
% 24-hour ΔNIHSS/ admission NIHSS	6,923	0,377	0,142	0,003
admission-discarded ΔNIHSS	1,671	0,738	0,545	0,000
% admission-discarded ΔNIHSS / admission NIHSS	8,580	0,513	0,264	0,000

Table 4 showed bivariate analysis of correlation between delta NIHSS and psychosocial aspect of SSQOL. We found quite strong correlation between 24-hour delta NIHSS with psychosocial aspect of SSQOL (r=0,390) and very strong correlation between admission-discarded delta NIHSS with psychosocial SSQOL (r=0,752), with significance p<0,05.

Table 4. Bivariate analysis of correlation between delta NIHSS with psychosocial aspect of SSQOL score.

Variable	b	R	R2	*p*
24-hour ΔNIHSS	1,164	0,390	0,152	0,002
% 24-hour ΔNIHSS/ admission NIHSS	3,833	0,224	0,050	0,082
admission-discarded ΔNIHSS	1,584	0,752	0,565	0,000
% admission-discarded ΔNIHSS / admission NIHSS	8,515	0,548	0,300	0,000

DISCUSSION

Stroke is one of leading cause of worldwide morbidity and mortality, including in Indonesia. Indonesia known to have high stroke-age-related disability rate between any other southeast Asia countries, almost 3.382 per 100.000 population. Because of its high prevalence causing significant disability, clinician has important roles in assessing degree of severity and outcome of stroke patients[1,7].

Stroke severity is an important predictor for functional outcome related to quality of life. NIHSS is designed as a clinical evaluation tool for stroke severity, selecting appropriate management and to predict patient outcomes[4,5]. This is a standardized scale use worldwide[3,8].

Stroke-specific Quality of Life Scale (SSQOL) is a specific standardized quality of life measurement tools that can be used in stroke. The original SSQOL consist of 49 items in 12 domains with approximately 15 minutes to finish. This version has some drawback in terms of concentration and attention aspect needed that most of the stroke patient might have those disturbances. Short version of SSQOL, called SSQOL-12, consists of psychosocial aspect (traditional quality of life based on social and psychological) and stroke-specific aspect (language, mobility, vision, upper extremity function).[9] Validity of Indonesia version of SSQOL-12 shows overall reliability 0,92 based on Cronbach alpha and intra class correlation 0,984[10]. Besides, during previous reliability testing held in South Korea during COVID-19 pandemic, the Tele-SSQOL-12 showed Cronbach α of 0.98 and Cronbach α for the all subdomains were all 0.70 or greater[11]. Measurement of SSQOL-12 by telephone call is a modified version of conventional SSQOL-49 and innovation in this study.

Previous studies only focused on the relationship between baseline NIHSS at admission and patient's quality of life. NIHSS is a major predictor of quality of life[8,12]. Another innovation in this study was assessment of change in NIHSS score (delta NIHSS, ΔNIHSS). In our study, delta NIHSS was assessed at admission, 24-hour, and at discarded time.

Bivariate statistical analysis showed the bigger delta NIHSS (delta 24-hour NIHSS and delta admission-discarded NIHSS), the better patient SSQOL score is. Delta NIHSS is able to show clinical improvement that positively correlated with stroke patient's quality of life. In previous studies, 24-hour delta NIHSS with more than 2 changes in score was a good predictor for functional outcome of stroke patient until three months[13].

Prior studies suggested that the first 24 hour of stroke onset was clinically important and relevant radiological findings could be seen on this timeframe[16]. So this research assessed delta NIHSS in the first 24-hour. In study that previously assessed 24-hour delta NIHSS after alteplase procedure, shown that 24-hour delta NIHSS could be a good clinical predictor[16,17].

Change in admission-discarded NIHSS score showed functional outcome differences of patient during hospitalization. The major improvement was observed in delta NIHSS > 4 points[14]. Most of the stroke patients had physical disability that resulted in dependency and limiting patient's social interaction, considerably impact physical and social domain in quality-of-life assessment[15]. Sablot *et al* previously analyzed 154 patients with NIHSS <5 at admission and improvement in neurological symptom was a good clinical predictor. This research also suggested that NIHSS <5 also correlates with better quality of life[18].

There are some drawbacks in using absolute delta NIHSS, which are dramatic improvement in low score-patient, and same change in delta NIHSS in severe stroke patient that might be not significantly impact functional outcome. Therefore, delta NIHSS measurement using percentage of delta NIHSS divided by admission NIHSS shows more actual changes in clinical outcome compared to absolute delta NIHSS[17].

This study has limitations in having patient with mild and moderate degree of stroke, because most of the severe stroke patient had disturbances in higher cortical functions and had difficulties in answering questionnaire by telephone. This tele-SSQOL12 questionnaire was a modified version of conventional system to help predict clinical outcome in post stroke patients, but it was limited due to patient must be cooperative especially in communication. This study showed that delta NIHSS able to predict clinical outcome that positively correlates with post stroke patients' quality of life. More advanced studies based on community in larger aspect need to be done.

CONCLUSION

Stroke severity and symptom progression were important predictors for functional outcome related to quality of life. Assessment using tele- SSQOL12 is a more applicable, but limited to patients with higher cortical function deficits. At the end, delta NIHSS could be proposed as a good predictor for quality of life in thrombotic infarct stroke patient.

ACKNOWLEDGEMENT

The authors would like to thank to Dr. Moewardi General Hospital Surakarta for giving permission to collect the data

CONFLICT OF INTEREST

The authors reported no competing interests.

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