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Cognitive function and quality of life of stroke survivors: A cross-sectional study

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Abstract:

Stroke is a neurological deficit due to an acute focal injury of the Central Nervous System (CNS) by a vascular cause. It is a major cause of disability and death worldwide. Stroke survivors have to face difficulties in life due to physical disabilities, cognitive impairments and the risk of emotional disturbances that also lead to a reduction of quality of life. Multiple studies have suggested that cognitive decline influences the reduction of quality of life among stroke survivors. There is a limited study on the magnitude of relationship between cognitive functions and quality of life among stroke survivors in Malaysia. Thus, this study aimed to determine relationship of cognitive functions and quality of life of stroke survivors. A cross-sectional study was conducted in three different branches of the National Stroke Association of Malaysia (NASAM) involving 55 individuals who were diagnosed with stroke. To evaluate the cognitive functions and quality of life of the survivors, the St Louis University Mental Exam (SLUMS) and Short version Stroke Specific Quality of Life (SS-QOL) were used. A good positive correlation was observed between SLUMS with SS-QOL psychosocial domain. There was no significant difference in socio-demographic characteristics with cognitive functions and quality of life. The finding suggested that cognitive functions play a role in perceived quality of life as there was a positive correlation between SLUMS and SS-QOL physical domain.

Keywords: Cognitive, quality of life, SLUMS, SS-QOL, stroke

1. INTRODUCTION

Stroke is a cerebrovascular disease which becomes the third leading cause of death in Malaysia after ischemic heart disease and pneumonia [1]. Recent studies showed that there is increasing trends of incidents and prevalence of ischemic and haemorrhagic stroke in Malaysia which is by 29.5% and 18.7% respectively per annum [2]. Stroke survivors faced a lot of difficulties in life due to physical disabilities, cognitive impairment and the risk of emotional disturbance that also lead to a reduction in the quality of life. The prevalence of cognitive impairment and dementia after the stroke ranged from 16% to 32 %, [4,5].

Current evidence suggests that 25–30% of individuals with ischemic strokes develop immediate or delayed vascular cognitive impairment or vascular dementia and the risk factors varies, including older age, family history, genetic variants, low academic status, vascular comorbidities, history of transient ischaemic attack or recurrent stroke and depressive illness [5]. A study reported that the prevalence of post-stroke dementia was about 20% to 30%, and the incidence of new-onset dementia after stroke has increased from 7% after one year to 48% after 25 years [3]. A cross-sectional study conducted by Fatoye et al. [6] had postulated that cognitive functions of stroke survivors have a significant positive relationship with all domains of quality of life.

However, there are limited studies on the magnitude of the relationship between cognitive functions and quality of life among stroke survivor in Malaysia. Hence, this study was conducted to identify the correlation between cognitive functions and quality of life of stroke survivors. This study also aimed to identify the association between socio-demographic variables with cognitive functions and quality of life of stroke survivors.

2. MATERIALS AND METHODS

2.1 Samples

This study was conducted on 55 individuals with stroke ranging from 29 to 83 years old. The sample size was calculated using the correlation coefficient (r= 0.47) formula based on a previous [6]. To detect a significant difference at $p<0.05$ with a power of 80%, 55 stroke survivors were needed. All participants included in this study was recruited from three National Stroke Association Malaysia (NASAM) branches located in (a) Petaling Jaya, Selangor, (b) Ipoh, Perak and (c) Georgetown, Penang. The respondent must be a Malaysian citizen that was diagnosed with a cerebrovascular accident, able to give response and consent and able to understand and communicate either in English or Bahasa Malaysia to be included in this study. Stroke survivors with aphasia, had history of a subdural hematoma or another form of brain injury and also survivors with history of haemorrhage or history of central nervous system disease such as tumour, hydrocephalus, trauma or Parkinson's diseases (secondary stroke due to other illnesses) were excluded from this study.

2.2 Study design

A cross-sectional study was conducted between March 2019 and April 2019. Among the 100 participants who were screened, only 55 of the participants met the inclusion criteria, agreed to participate in the study and completed all two assessments. Meanwhile, the other 45 participants were excluded from the study primarily due aphasia or unable to communicate either in Bahasa Malaysia or English. All 55 participants consented to participate after being explained regarding the purposes and benefits of this study. SLUMS and SS-QOL were finally administered in one to one interview after socio-demographic characteristic of the participants were recorded. Approval to conduct this study was granted from Ethic Committee of Universiti Teknologi MARA (Approval no.: 600-IRMI (5/1/6).

2.3 Instruments

St. Louis University Mental Status Exam. This assessment was developed by Syed Tariq (M.D) and John Morley (M.D) as a screening tool of cognitive functions and to identify changes in cognition over time. SLUMS is an assessment which comprises 11 items with 30 points; a clinician-administered screening questionnaire that assesses various cognitive domains. It includes attention, calculation, immediate and delayed recall, animal naming, abstract thinking, and visuospatial skills in the short duration [7]. SLUMS has higher sensitivity and specificity in determining dementia as compared to Mini Mental State Examination (MMSE). SLUMS identified 98.3% to 99.8% of individuals with dementia and 92.7% to 94.1% of individuals with a mild neurocognitive deficit (MNCD). In comparison, MMSE identified 91.5% to 94.1% of individuals with dementia and 64.3% to 67.1% of individuals with MNCD [8].

Short version Stroke Specific Quality of Life (SS-QOL). SS-QOL is a self-reported questionnaire based on the original Stroke Specific Quality of Life developed by Williams et al. [9]. Short version SS-QOL contains 12 items that were further divided into two domains which are physical domain and psychosocial domain. The items were selected from 12 domains of original version namely energy, family roles, language, mobility, mood, personality, self-care, social roles, thinking, upper extremity function, vision, and work or productivity [10]. The items were scored based on a five-point Likert Scale and the total score of the questionnaire ranges from 12 to 60. The short version of SS-QOL is easier and practical to use in a clinical setting as it only consists of 12 questions. SS-QOL-12 have good criterion validity for all items that were selected from the original version [9].

2.4 Data analysis

SPSS version 21.0 was used to analyse the data. Normality tests were conducted using the Shapiro-Wilk test to determine the normal distribution of the data. Non-parametric Mann-Whitney U and Kruskal-Wallis test was conducted to determine the association between sociodemographic variables with cognitive functions or quality of life. The correlation between SLUMS and SS-QOL physical and psychosocial domain were analysed using Spearman's Rho Correlation Test with significance difference was set at $p<0.05$.

3. RESULTS

A total of N=55 participants from three NASAM branches were involved in this study. The participants in this study were ranged between 29 and 83 years old with median age of 62.00 (IQR=17.00). Among the total of the participants, 52.7% were male while 47.3% were female. The majority of the participants consisted of Chinese (n=37, 67.3%). 45 of the participants are married and 10 of them are either single, divorced or widowed. More than half of the participants (61.8%) received primary and secondary education and 38.2% received higher education. Among the total number of participants, nearly all the participants (n=50, 90.9%) were unemployed and 9.1% of them were working after the stroke. Pre-morbidly, 78.2% of the participants were working, while 21.8% of them were unemployed. 28 (50.9%) of the total participants had stroke within 12 months while 27 (49.1%) of the participants had stroke for more than 12 months. Most of the participants diagnosed with an ischemic stroke (n=40, 72.7%) as compared to haemorrhagic stroke (n=15, 27.3%). More than half (n=29, 52.7%) of the participants were having left lesion, meanwhile, 47.3% of them were having the right lesion. Table 1 shows the socio-demographic characteristic of the participants in this study.

Table 1: Socio-demographic characteristics of participants.

Sociodemographic Characteristic	Category group	n	%	Median (IQR)
Age	29-83 years old	55	-	62.00 (17.00)
Gender	Male	29	52.7	
	Female	26	47.3	
Race	Malay	13	23.6	
	Chinese	37	67.3	
	Indian	5	9.1	
Marital status	Married	45	81.8	
	Single/Separated/widower	10	18.2	
Educational Status	Primary and secondary education	34	61.8	
	Higher education	21	38.2	
Occupation Status (premorbid)	Employed	43	78.2	
	Unemployed	12	21.8	
Occupation Status (morbid)	Employed	5	9.1	
	Unemployed	50	90.9	
Duration of stroke	Within 12 months	28	50.9	
	More than 12 months	27	49.1	
Stroke Subtypes	Ischemic	40	72.7	
	Haemorrhagic	15	27.3	
Site of lesion	Left	29	52.7	
	Right	26	47.3	

Table 2: Association between socio-demographic variables with cognitive functions and quality of life.

Variables		**SLUMS Score**		**SS-QOL (Physical domain)**		**SS-QOL (Psychosocial domain)**	
		Median (IQR)	P-value	Median (IQR)	P-value	Median (IQR)	P-value
Gender	Male	23.00(6.50)		23.00(4.75)		21.00(11.00)	
	Females	23.50(5.25)	0.302	25.00(6.00)	0.22	20.50(10.75)	0.437
Races	Malay	24.00(6.00)		20.00(7.00)		24.00(8.00	
	Chinese	24.00(4.5)	0.55	27.00(5.50)	0.16	21.00(12.50)	0.63
	Indian	21.00(16.00)		21.00(10.50)		21.00(8.50)	
Education Background	Primary and secondary	23.00(5.25)		26.50(8.25)		21.00(10.00)	
	Higher education	25.00(4.00)	0.178	23.00(9.00)	0.384	25.00(10.50)	0.326
Post-stroke occupation statuses	Employed	23.00(6.50)		28.00(6.5)		26.00(9.00)	
	Unemployed	23.50(4.25)	0.49	25.50(9.00)	0.87	21.00(11.00)	0.17
Type of stroke	Ischemic	23.00(4.75)		26.50(8.00)		21.00(10.75)	
	Hemorrhage	25.00(6.00)	0.221	23.00(9.00)	0.471	21.00(11.00)	0.691
Site of lesion	Left	23.00(5.00)		25.00(8.00)		20.00 (9.50)	
	Right	24.00(6.00)	0.184	27.00(9.25)	0.310	21.00(14.25)	0.716

Table 3: Correlation between cognitive functions with quality of life.

		SS-QOL physical domain	**SS-QOL psychosocial domain**
SLUMS score	r	0.51	0.24
	P-value	0.00**	0.07

Level of quality of life and cognitive function was obtained by summing up the score of SLUMS and SS-QOL Physical and SS-QOL psychosocial domain. The Median (IQR) of SLUMS total score was 23.00 (4.00), while the Median (IQR) of SS-QOL physical and psychosocial domains was 26.00 (8.00) and 21.00 (10.00) respectively. A Mann-Whitney U test was used to determine the association in the gender, educational backgrounds, occupational statuses, duration of a stroke, stroke subtypes, and site of lesion with cognitive functions and quality of life. The association between races with cognitive functions and quality of life was determined using Kruskal Wallis test. Results showed that there were no association between socio-demographic data with cognitive functions. The difference between median (IQR) of each sociodemographic variable was not statistically significant as p-value >0.05 hence failed to reject the null hypothesis. Similarly, the results showed that there were no association between socio-demographic variables with quality of life of both physical and psychosocial domains. Table 2 shows the results of the association between socio-demographic variables with cognitive functions and quality of life.

Spearman correlation analysis was computed to examine the magnitude of the relationship between cognitive functions with quality of life. Cognitive function (SLUMS) was statistically has positive, good correlation with SS-QOL physical domain (r= 0.51, p=0.00). However, there was no correlation found between SLUMS total score with quality of life psychosocial domain. Table 3 shows the correlation between SLUMS total score with total score of quality of life in both the physical and psychosocial domain.

4. DISCUSSION

Results of the present study demonstrated that the level of cognitive functions was impaired after the stroke. 21.8% of the participants were identified as dementia and 60% of the participants were identified as MNCD while the rest have a normal cognitive function. These findings were differed from a previous research carried out by Mohd Zulkifly et al. [3] where 76% of the stroke survivors with a mean age between 29-81 stroke survivors in a daycare centre were cognitively impaired. The difference in the result may due to the outcome measures used to screen cognitive impairment.

Finding of this study found that there was a higher level of quality of life in the physical domain as compared to the psychosocial domain. It can be said that the individuals with strokes has less quality of life in the psychosocial domain. This finding was in agreement with a study that pointed out that presence anxiety, depression, and functional dependence were associated with reduction of QOL [7].

Based on the result of this study, there was no association between ages with cognitive function. Previous findings found that age is positively associated with the cognitive functions of stroke survivors. Douiri et al. [8] reported higher cognitive impairments were observed within the acute onset of stroke survivors aged >65 years old. Another study stated that age is not only a risk factor of stroke, but also cognitive decline as there is evidence suggesting that the prevalence of the cognitive decline after stroke would increase exponentially as age increases after 65 years old [9].

There was no significant difference found between education background and cognitive functions. This again was contradicted with the findings from Sun et al. [9] as the study identified that education background could influence the expression of cognitive impairment in a stroke survivors. It is postulated that higher education was associated with better cognitive performance. The discrepancies of the result might be due to the different socio-demographic backgrounds of the participants and the types of outcome measures used in this study.

Test of correlation between age and quality of life in this study resulted in no significant difference in both domains. Similarly, a study conducted by Javier et al. [10] also found no significant difference between age and quality of life. However, another study stated that increment of age would result in a lower quality of life of stroke survivors [11]. A wide range of age (29 years old- 83 years old) for a small sample (N=55) might affect the outcome of the study. A different perspective of quality of life in different ages also might play a role in no association of age and quality of life in this study.

A previous study carried out by Jeon et al. [11] found that marital status of the stroke survivors and quality of life are not statistically significant. It is in agreement with the finding of this study as there was no association between marital status with both physical and psychological domain of quality of life. However, according to another study, marital status is one of the predictors of the quality of life of individuals with stroke along with the income of the family as it is positively correlated [12].

It is also found that type of stroke has no association with the quality of life of the stroke survivors. Previous findings however, stated that ischemic stroke has reported having a lower quality of life as compared to the haemorrhagic stroke which the study further explains could be due to the disparity of ischemic stroke versus haemorrhagic stroke (189 versus 27) in their study [13].

A good positive correlation between SLUMS total score with SS-QOL physical domain was observed in this study. Although the correlation for the physical domain exists, the correlation between SLUMS total score with SS-QOL psychosocial domain was not significant. Contradict findings

found in the study by Fatoye et al. [6] that revealed significant positive correlations of MMSE score with all six aspects of QOL (physical health, psychological health, social relationships, environment, overall QOL, overall health) in the stroke population. Another study using MMSE and QOL questionnaire found that there was a weak positive correlation between these two variables [14].

There were a few limitations of this study. First, the conclusions were based on a small range of sample thus does not represent all stroke survivors in Malaysia. Besides, the study only used short screening tools instead of using neuropsychological testing in determining the cognitive functions of the participants. For future study, it is recommended that the samples should be diverse and larger to reflect the population of stroke in Malaysia. It is recommended to conduct a comparison study between cognitive impaired and non-cognitive impaired stroke survivors in perceiving the quality of life for future study.

5. CONCLUSION

In conclusion, 21.8% of the participants were identified as dementia, and 60% of the participants were identified as MNCD while the rest has normal cognitive function thus proved the presence of cognitive impairment after the stroke. Level of quality of life in the physical domain was higher than the quality of life in the psychosocial domain. This present study found that there was no association between socio-demographic variables with cognitive functions and quality of life. However, the finding showed that there is a good positive correlation between cognitive functions with quality of life in the physical domain of stroke survivors.

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