RESEARCH ARTICLE

Cognitive Impairments in Adults with Chronic Stroke

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Abstract:

This study was conducted to identify cognitive impairments presented, the associations factors of demographics variables and relationships between cognitive impairments among chronic stroke patients. 67 stroke patients with majority of male, 64% and female, 24% underwent assessments consisting demographics data and cognitive assessment using the Bahasa Malaysia version of Montreal Cognitive Asessments (BM MoCA). Cognitive impairments had been identified in adults with chronic stroke with minimum of one cognitive domain after six months post stroke. Cognitive performances also had been attenuated by certain factors of socio-demographic and medical variables. The correlations between domains of cognitive impairments also had been revealed. The findings of this outcomes might help better prognosis for stroke survivors in terms of cognitive functioning especially in long term phases and promote independent functioning in daily living.

Keywords: Adults, Chronic Stroke, Cognitive Impairments

1. INTRODUCTION

Stroke was a foremost conviction of death and dysfunction worldwide. World statistics shows that about 6.5 million stroke death recorded until 2013 and thus indicated stroke was the superior cause of death following the ischemic heart diseases [1]. Additionally, the records for developing countries such as Malaysia are not excluded from this chronic disease and is identified as the third cause of death among Malaysia population [2]. Thus, the incidence of stroke in adults was becoming salient issues as it will assemble the massive impact for them to continue the most productive years in future compared to older populations [3]. Moreover, the cognitive impairment was most common arisen as the long-term disability of post-stroke effect and conventionally being neglected until it became to dementia [4]. The abilities and quality of life (QoL) of stroke patients was found exacerbated by cognitive impairment after 6 months post-stroke [5].

Additionally, the escalate of stroke among younger ages and haemorrhagic stroke together with corresponding risk factors also required to be further investigated as suggested in previous study. The current available studies about post-stroke cognitive outcome are commonest and much more concentrated to an older stroke sufferer only [6]. Post-stroke cognitive impairment raised regularly among patients and the increasing statistics from 20% to 80% been shown for the post-stroke cognitive impairment cases and it was depended on various aspects including demographic, ethnic and diagnostic characteristics as well [7]. Thus, improvement in stroke care could be achieved if the risk factors controls and outcomes been recognized earlier. The outcomes of this study would become the guidance for healthcare providers and better treatment could be delivered and improved prognosis among stroke survivors in future.

2. MATERIALS AND METHODS

2.1 Sampling and Population

The cross-sectional study design was used, and correlation sample size had been calculated for number of sample size. The r value (r= 0.35) was taken from the previous study on the correlation between neuropsychological assessment (SIS) and the cognitive component (language) [8]. 67 adults of chronic stroke patients attending rehabilitation treatments as outpatient at Hospital Selayang, Selangor were recruited from January to April 2018 . The inclusion criterion comprised of stroke participants aged 60 years old and below, chronic stroke phase (6 months above) and able to understand Malay language. However, participants were excluded for aged above 60 years old and having aphasia.

2.3 Instruments

A set of validated questionnaires, Bahasa Malaysia Montreal Cognitive Assessment (BM MoCA) were distributed among the participants along with the demographics data comprises of the socio-demographic and the medical variables. BM MoCA was a simple screening tool for post-stroke cognitive impairment, and it was benefited by large group of stroke participants that used Bahasa Malaysia as their daily and medium for communications [9]. The internal consistency of MoCA-BM is moderate with Cronbach’s alpha score of 0.691 and concurrent validity is high. This assessment comprises of 30-point marks and was administered in 10 minutes. A score of 26 marks or above is considered normal cognitive functions.

2.4 Ethical approval

Ethical approvals were gained from the Research Ethics Committee (REC) of Universiti Teknologi MARA (UiTM) and National Medical Research Register, Ministry of Health, Malaysia.

2.5 Data analysis

Upon completion of the questionnaires, the forms were returned back to the researcher and the data obtained were entered into Statistical Package for the Social Sciences (SPSS) version 24. The MoCA score had been analysed using descriptive analysis in terms of median and interquartile range (IQR). The results of the normality test indicate the significant difference ($p < 0.05$), and this shows the data was not normally distributed. Hence, non-parametric testing was conducted. The Kruskal-Wallis H test and Mann-Whitney U test were used to compare median scores between the socio-demographic and medical data with the cognitive impairments. Meanwhile, Spearman correlation test been used to determine the relationship between the types of cognitive impairments based on the BM MoCA assessment. Finally, the hypotheses are to be accepted or rejected by using the 95% CI ($p<0.05$).

3. RESULTS AND DISCUSSION

3.1. Cognitive Impairments in Adults with Chronic Stroke

A total of 67 adults participated in this study. Table 1 shows the descriptions of BM MoCA of participants. The total median scores for BM MoCA (Mdn= 20.00), IQR= 6.00 of chronic stroke participants was recorded with the maximum scores of 25 and minimum scores of 11. The total cut off scores for BM MoCA less than 26 indicates cognitive impaired [10]. The findings of this study showed the cognitive impairments was presented in adults with chronic stroke.

Various factors including the deterioration of parts of brain structures, neurodegenerative disease, and other comorbid illnesses could leads to cognitive impaired [11]. The visuospatial/executive deficits was influenced by brain lesions located in posterior parietal cortex [12] and thus could affect daily activities of stroke participants such as difficulty to remember unfamiliar faces and new environments, difficult to drive vehicles, estimate the distance between two objects especially when parking a car and looking for maps.

The difficulty in the language and naming components occurred in chronic stroke patients which these could be developed beyond six months after a dominant hemisphere stroke [13]. In association, aphasia was possible in chronic stroke survivors and positively associated by right motor activation [14]. As for the attention components, majority of stroke patients (80%) reported with attention deficits and undergone a remarkable impairment in minimum one simple task [15] after stroke. Moreover, deficits in visuospatial skills and abstract reasoning were identified regardless of attention, memory, language, and orientation that are affected after stroke [16]. As for the memory, could be due to frontal lobe that account for short term and working memory had been disrupted in stroke participants [17]. However, perfect performance regarding orientation skills was shown which only minor percentage, 6% of stroke patients had declined in orientation after 6-month post-stroke [18].

Table 1. Descriptions of BM MoCA of Participants (*n=67)*

Variables	Median (IQR)
Visuospatial/Executive	3.00 (2.00)
Naming	2.00 (1.00)
Attention	3.00 (1.00)
Language	2.00 (1.00)
Abstraction	1.00 (1.00)
Delayed recall	3.00 (2.00)
Orientation	5.00 (2.00)
Total scores	20.00 (6.00)

3.2 Socio-Demographics Variables and Cognitive Impairments in Adults with Chronic Stroke

The significant differences between age groups χ^2 (2)= 54.40, p =0.00; marital status, χ^2 (2), p =0.00 and education level, χ^2 (3), p=0.00 with cognitive impairments were identified using non parametric Kruskal-Wallis analysis of variance test as shown in Table 2.

Dunn's pairwise tests were carried out and adjusted using the Bonferroni correction) of a significant difference, p=0.00, between participants with age group of 41-60 and 30-40 years old, and also significant difference, p= 0.00 between 41-60 and 18-29 years old on cognitive impairments. Post-hoc comparisons also indicates single participants was significantly different (p= 0.00) with married participants and significant difference between divorce participants (p=0.04). As for educations level, the significant differences (p=0.00) was showed between tertiary levels and primary levels. The significant difference also found between tertiary and secondary higher (p=0.00, *n*=30). Also, significant differences between tertiary and the secondary lower (p=0.02, n =11).

The results had identified the statistically significant differences (p=0.00) between cognitive impairments with pre-stroke and post-stroke occupations. Higher median scores recorded for employed pre-stroke occupations (Mdn= 22.00), IQR=7.00 than for unemployed (Mdn= 16.50), IQR=7.00. Also, higher median score for employed post-stroke (Mdn= 22.00), IQR=5.00 than for unemployed (Mdn= 16.50), IQR=6.00. The physical activities of lifestyle habits also had significant differences with cognitive impairments (p=0.00). The participants that engaged with physical activities was differed with those who are not engage in physical activities on cognitive impairments.

The age variables were constituted as a maverick predictor of cognitive decline in the first post-stroke year [19]. The result shows that younger subjects do achieve highest cognitive impairments and could be influenced by predictive factors such as depressions or stress [20] and also unhealthy nutrition intakes [21]. The singlehood and widowhood could increase the cognitive impairment compared to married participants due to wide range of factors such as social engagements [22]. The social seclusion and loneliness are related with increased cognitive limitations [23]. In addition, educations level had an effect on cognitive impairments. This study found that higher education levels could lead to cognitive impairments. However, contrast findings higher education level among stroke survivors were improbable affected in cognitive functioning, assumed due to larger brain reserve capacity which can encounter brain damage [24] and different pattern of cognitive decline and underlying brain pathology in stroke participants with higher educations that could disrupts their brain reserves capability [25].

Table 2. Socio-demographics of stroke participants with cognitive impairments (*n*=67)

		Cognitive impairments	
Variables	*n*	Median (IQR)	*p*
Age			
18-29	11	25.00 (1.00)	0.00
30-40	20	22.00 (1.00)	
41-60	36	17.00 (4.00)	
Marital Status			
Married	49	18.00 (6.00)	0.00
Single	14	24.50 (3.00)	
Divorce/Separated	4	17.00 (7.00)	
Education Level			
Primary	7	14.00 (2.00)	0.00
Secondary (lower)	11	19.00 (5.00)	
Secondary (Upper)	30	17.50 (6.00)	
Tertiary	19	23.00 (3.00)	
Occupations (Pre stroke)			
Employed	45	22.00 (7.00)	0.00
Unemployed	22	16.50 (7.00)	
Occupations (Post stroke)			
Employed	37	22.00 (5.00)	0.00
Unemployed	30	16.50 (6.00)	
Lifestyle habits			
Physical Activities			
Yes	12	25.00 (1.00)	0.00
No	55	18.00 (7.00)	

*sig.value <0.05
[a]Mann-Whitney U test
[b]Kruskal-Wallis H test

3.3 Factors of medical variables and cognitive impairments

There were significant differences of hypertension, undergone rehabilitation treatment, and medications on cognitive impairments as in Table 3. The present of hypertension as comorbid illness was appeared significantly on the cognitive impairments, which chronic hypertension is an extensive contributor to cognitive impaired [26] and caused the reduction of abstract reasoning (executive dysfunction), slowing of mental processing speed and memory deficits were allied with hypertension [27]. The functions related to daily activities and general mobilization of patients led to cognitive rehabilitations for patients specifically with acute types of cognitive deficit and traumatic brain damage [28]. Cognitive functioning was found to be influenced by medications as well. Some general medications were incorporated with poor cognitive performance and underlying diseases for which the medications were prescribed [29]. The adverse effect on cognition, risk for cognitive impairment through several potential mechanisms, leading to acute, subacute, and chronic changes in cognitive function by cardiovascular agents [30].

Table 3. Socio-demographics of stroke participants with cognitive impairments (n=67)

		Cognitive impairments	
Variables	*n*	Median (IQR)	*p*
Comorbid Illness			
Hypertension			
Yes	39	22.00 (6.00)	0.05
No	28	17.50 (8.00)	
Undergone rehabilitation treatments			
Yes	58	19.50 (6.00)	0.05
No	9	22.00 (6.00)	
Medications			
Yes	4	25.00 (0.00)	0.00
No	63	19.00 (6.00)	

*sig.value <0.05
[a]Mann-Whitney U test

3.4 Relationship between the types of cognitive impairments of participants.

Table 4 shows that visuospatial/executive variables were significantly correlated with other five variables. Visuospatial/executive was positively correlated with naming, r□ = 0.37 (p<0.01); attention, r□ =0 .37 (p<0.01); language, r□ = 0.44 (p<0.01); delayed recall, r□ = 0.33 (p<0.01) and also orientation, r□ = 0.29 (p<0.05). Naming variables was significantly had strongest positive correlation with language variables, r□ =0.86 (p<0.01). Also, positive fair correlations also were shown for the naming and attention variables, r□ = 0.26 (p<0.05); delayed recall, r□ = 0.29 (p<0.05). The abstraction and orientation variables show no significant difference with naming. The positive moderate correlation shown between attention with delayed recall, r□ = 0.35 (p<0.01); orientation, r□ = 0.36 (p<0.01); language, r□ = 0.27 (p<0.05) indicates there was evidence statistically significant difference between attention with language, delayed recall and orientation. Positive moderate correlation was also shown between language and delayed recall variables, r□ = 0.31 (p<0.05) and indicates statistically significant differences between them. Also, significantly difference shown for abstraction and orientation with positive correlation, r□ = 0.45 (p<0.01). Added with delayed recall and orientation, r□ = 0.36 (p<0.01) shows significantly difference and positive correlation.

The site of brain hemisphere involve could contributes relationship between types of cognitive impairments such as right brain hemisphere lesions in visuospatial with naming and language [31]. The impaired performance proved the strong association for right posterior lesion with the judgment involving orientation [32]. The crucial feature of speech and language was the ability to name objects or abstract entities and it being frequently considered a central component of normal neurologic function [33]. Thus, this

Table 4. Relationships between the types of cognitive impairments in adults with chronic stroke (*n*=67)

Variables / Executive		Visuospatial	Naming	Attention	Language	Abstraction	Delayed Recall	Orientation
Visuospatial/ Executive	Correlation Coefficient	1.00	0.37**	0.37**	0.44**	0.17	0.33**	0.29*
	Sig. (2-tailed)	.	0.00	0.00	0.00	0.16	0.00	0.02
	n	67	67	67	67	67	67	67
Naming	Correlation Coefficient	0.37**	1.00	0.26*	0.86**	0.03	0.29*	0.19
	Sig. (2-tailed)	0.00	.	0.03	0.00	0.79	0.02	0.13
	n	67	67	67	67	67	67	67
Attention	Correlation Coefficient	0.37**	0.26*	1.00	0.27*	0.24	0.35**	0.36**
	Sig. (2-tailed)	0.00	0.03	.	0.03	0.05	0.00	0.00
	n	67	67	67	67	67	67	67
Language	Correlation Coefficient	0.44**	0.86**	0.27*	1.00	0.08	0.31*	0.24
	Sig. (2-tailed)	0.00	0.00	0.03	.	0.52	0.01	0.05
	n	67	67	67	67	67	67	67
Abstraction	Correlation Coefficient	0.17	0.03	0.24	0.08	1.00	0.15	0.45**
	Sig. (2-tailed)	0.16	0.79	0.05	0.52	.	0.24	0.00
	n	67	67	67	67	67	67	67
Delayed Recall	Correlation Coefficient	0.33**	0.29*	0.35**	0.31*	0.15	1.00	0.36**
	Sig. (2-tailed)	0.01	0.02	0.01	0.01	0.24	.	0.00
	n	67	67	67	67	67	67	67
Orientation	Correlation Coefficient	0.29*	0.19	0.36**	0.24	0.45**	0.36**	1.00
	Sig. (2-tailed)	0.02	0.13	0.00	0.01	0.00	0.00	.
	n	67	67	67	67	67	67	67

component of normal neurologic function [33]. Thus, this indicates the association of naming components in the language skills. Moreover, correlation between attention and orientation was explained when distractibility and attention associated with post stroke balance and functional impairment [34].

4. CONCLUSION

The cognitive impairments were attenuated by both various factors of socio-demographic and medical variables. The positive correlation shown between the types of cognitive impairments presented. In consequences, the outcomes from this study would be beneficial to create and promote the awareness of stroke prevention in future.

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