Relationship between Age and Activities of Daily Living using Modified Shah Barthel Index on Stroke Patient in Chronic Phase

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Abstract
Background: *Stroke is the chief cause of long-term disability in the world. Predominantly, the disease is known as a degenerative disease on geriatrics age group, yet several studies have proven that incidence on productive ages are also increasing.*
Objective: *The study aimed to know whether there are any difference in Modified Shah Barthel Index (MSBI) score in different age group, geriatric and productive age group and to know independence score in daily activities based on age.*
Method: *The study utilized the cross-sectional design and analytical observational method. Twenty five samples of chronic stroke patients was recruited and grouped into two groups productive and geriatric age group. MSBI score was calculated and compared between two groups.*
Result: *Bivariate analysis proves that there is a significant association between MSBI score and age of stroke patients on chronic phase (p=0.017). Discussion: There is a significant association between age and MSBI score on stroke patients in chronic phase.*
Conclusion: *There was a significance difference between productive and geriatric age with daily activities using MSBI in chronic stroke patients. The productive age group has a higher Modified Shah Barthel Index score than the geriatric age group.*

Keywords: *stroke, age, Modified Shah Barthel Index*

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Hubungan antara Usia dan Aktivitas Kehidupan Sehari-hari Menggunakan Indeks Barthel Modifikasi Shah pada Stroke Fase Kronik

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Abstrak

Latar Belakang: *Stroke merupakan penyebab utama disabilitas jangka panjang di dunia. Penyakit ini dikenal secara luas sebagai penyakit degeneratif pada kelompok usia geriatri, namun beberapa studi membuktikan bahwa insidensi stroke pada usia produktif juga meningkat.*

Tujuan: *Penelitian ini bertujuan untuk mengetahui hubungan antara usia dengan aktivitas sehari-hari pasien stroke fase kronik dengan menggunakan instrumen Modified Shah Barthel Index (MSBI) dan skor kemandirian berdasarkan usia.*

Metode: *Penelitian ini menggunakan desain potong lintang dengan metode observasional analitik. Dua puluh lima sampel terbagi menjadi kelompok usia produktif (17-60 tahun) dan usia geriatri (>60 tahun). Skor MSBI dihitung dan dibandingkan antara dua kelompok.*

Hasil: *Analisis bivariat menunjukan bahwa terdapat hubungan bermakna antara nilai MSBI dan usia pasien stroke fase kronis (P=0.017)*

Diskusi: Adanya hubungan bermakna antara usia dan nilai MSBI pasien stroke fase kronis.

Kesimpulan: *Terdapat perbedaan yang bermakna antara usia dan nilai aktivitas sehari-hari menggunakan MSBI pada pasien stroke fase kronik. Kelompok usia produktif memiliki nilai MSBI yang lebih tinggi jika dibandingkan dengan kelompok usia geriatri.*

Kata kunci: *stroke, usia, Indeks Barthel Modifikasi Shah*

Background

Stroke is the major cause of death (17,7%) in 15 cities of Indonesia.[1] Stroke is also the first cause of functional disability in the world.[2] The functional disability also restricts patients' independence on doing daily activities. One of the scale that is used to assess the independence on patients' daily living is Modified Shah Barthel Index (MSBI).[3]

MSBI is the newest and accurate scale to assess activity daily living with the highest sensitivity and reliability compared to other version of Barthel Index. Barthel Index was found by Maloney, et al.[4] in 1965. It is a scale that measure daily activities. There are ten (10) scale, such as transfer, ambulation, climbing stairs, using toilet, urinary control, defecation control, bathing, clothing, and higiene,eating. MSBI also has the interpretation of independent or predictive value divided into 4: less than 40, 40-60, 60-80, and more than 80. Other strength of 10 items MSBI is that 2 ways of ambulation assessment, namely ambulation with wheelchair and without wheelchair (without and with walking aid such as canes, crutches, walker). Both of these ambulations have each kind of different assessment. Ambulation using a wheelchair has a maximum score of 5 while ambulation without the use of a wheelchair has a maximum score of 15. Between these two assessments, there is 10 points score gap.

Age is one of unmodified risk factor caused stroke because human age will continue to increase over time. Epidemiology shows stroke prevalence increase with advancing age, it reach the top at above 75 years of age. Stroke is formerly known as degenerative disease on geriatric patients. Recent studies yet have shown that incidence of stroke in productive age group of patients also occurs. Al Ameri, et al.[5] conducted a retrospective study which proves that 16% stroke patients came from productive age group.

However, the prognosis of the productive age group patients compared to geriatric age group is better due to brain cell plasticity and collateral circulation in the productive ones are higher, so that the infarct incidence could be minimalized. Prognosis could be examined in chronic stroke patients' ability on doing the usual daily activities just like before being diagnosed of stroke. So in this study,

age itself should be divided into 2 groups: productive age and geriatric age group.

This study aims to know whether there are any difference in msbi score in different age group, geriatric and productive age group and to know independence score in daily activities based on age. Based on the former studies that are mentioned before, this study will analyze the relationship between stroke patients' age and their ability on doing daily activities using MSBI scale. Function in Physical Medicine and Rehabilitation mean a person can do its daily activities wether at home or office , can communicate, etc. Standard activities was bath, clothing, eat, toileting control, transfer, ambulation. Patients that are involved in this study are the chronic phase stroke patients that are being treated in medical rehabilitation department.

Methods and Materials

The study was conducted in Medical Rehabilitation Department in Cipto Mangunkusumo Teaching Hospital, Jakarta, Indonesia. Ethical clearance was obtained from Faculty of Medicine Universitas Indonesia number 466.UN2.F1.D1/KBK/PDP.01/2016. The study was done from January 2016 until February 2017.

Design of the study was cross-sectional. The samples that were involved are stroke patients that fulfill the inclusion criteria. Selection of the sample used the nonprobability sampling technique: quota sampling. The inclusions criteria of the subjects were coming from productive age group (17-60 years old) and geriatric age group (>60 years old), being treated in Medical Rehabilitation Department, Cipto Mangunkusumo Hospital, and patients in chronic stroke phase. Whereas the exclusion criteria was the subject's age is below 17 years old. After calculating the sample size with formula of independent categorical variable, there are differences between the number of age groups above 60 and the age group below 60 (17-60) which is (n = 9) for the geriatric age group and (n = 16) for the productive age group. Twenty-five patients who fulfilled the inclusion criteria and not having the exclusion criteria were enrolled into the study.

Data from the samples was analyzed by the application named SPSS 20.0 for Mac. Both variables were analyzed by categorical comparative bivariate to analyze the significance. The obtained data was categorized as nominal categorical data so that the significance was tested by Chi Square. If the pre-requisite of chi-square was not accomplished, the fisher's exact test could be used.

Results

Characteristic of The Subject

The study involved 25 samples of chronic phase that fulfilled inclusion criteria. The characteristic of the subjects that was collected are hemiparetic side, gender, and risk factor (Table 1).

Table 1. Distribution of Respondents Based on Hemiparetic Side, Gender and Risk Factor

Variable	Amount (n)	Precentage (%)
Hemiparetic side		
Dextra	8	32
Sinistra	10	40
Duplex	6	24
None	1	4
Gender		
Men	18	72
Women	7	28
Comorbidity Disease		
Hypertension	7	28
Diabetes Mellitus	6	24
Hypertension and Dia betes Mellitus	9	36
None	3	5
Age		
Productive Age Group (17-60 years)	16	64
Geriatric Age Group (>60 years)	9	36

Age of The Subjects of The Study

According to the principle of cross-sectional study, the age of the subjects was obtained from the reduction of the date of MSBI examination and the birth date of the subjects. Age of patients that were involved range from 27 until 76 years. Age was also classified with other characteristics such as gender, hemiparetic side and comorbidity disease. (Table 2, Table 3, and Table 4)

Table 2. Subjects' Age Based on Hemiparetic Side

	Hemiparetic Side				Total
	Dextra	Sinistra	Duplex	None	
Productive Age Group (17-60 years)	5	7	4	0	16
	31.3%	43.8%	25%	0%	100%
Geriatric Age Group (>60 years)	3	3	2	1	9
	33.3%	33.3%	22.2%	11.1%	100%

Table 3. Subjects' Age Based on Comorbidity Disease

	Comorbidity Disease				**Total**
	DM	**Hypertension**	**DM and Hypertension**	**None**	
Productive Age Group (17-60 years)	3	5	7	1	16
	18.8%	31.3%	43.8%	6.3%	100%
Geriatric Age Group (>60 years)	3	2	2	2	9
	33.3%	22.2%	22.2%	22.2%	100%

Table 4. Subjects' Age Based on Gender

	Sex		**Total**
	L	**P**	
Productive Age Group (17-60 years)	14	2	16
	87.5%	12.5%	100%
Geriatric Age Group (>60 years)	4	5	9
	44.4%	55.6%	100%

MSBI Scores of The Subjects of The Study

MSBI score was obtained from the examination in the hospital. MSBI score was divided as severe dependence with score 0 -60 and mild dependence with score 61 -100 (Table 5). The score 60 was the cut-off based on study conducted by Granger et al.[6]

Table 5. MSBI Score Research Subject

MSBI Score	Amount (n)	Percentage (%)
Severe Dependence	15	60
Mild Dependence	10	40

Relationship between age and MSBI score

To observe the relationship between age and MSBI score, a comparative statistical study was conducted between two variables. Both data are categorical data. Data that were analyzed are nominal categorical data with the amount more than 20 and in every table there is no data with the amount 0. However there was one cell that has expected value <5 with the percentage 25% or more than 20% so Fisher's Exact Test was used. From the test the result was observed that there was a statistically significant association ($p<0,05$) between age and MSBI score (Table 6).

The p score that is obtained from the study is 0,017 that could be interpreted as there is a significant association on MSBI score between productive age group and geriatric age group of stroke patients in chronic phase.

Discussion

After conducted a statistical Fisher exact test on both variables, there is a significant relationship ($p=0,017$) between chronic phase stroke patients age with the daily activities using Modified Shah Barthel Index. Age and gender are risk factor in stroke , that can not be modified. hipertension and diabetes are risk factor that can be modified. Moreover, in every points assessed except wheelchair ambulation, productive age group always domi-

Table.6 Fisher's Exact Test Result between MSBI Score and Age

		MSBI Score				p
		Mild Dependence		Severe Dependence		
		n	%	n	%	
Age	Productive	10	90.9	6	42.9	0.017
	Geriatric	1	9.1	8	57.1	
Total		11	100	14	100	

nate the highest score.

This result is in accordance with a prospective cohort study by Varona et al,[7] which showed that 90% patients from productive age group could do the daily activities independently, and 53% of them could go back to work.

The causes of the low score of geriatric age group patients have been analyzed by previous studies. Bagg, et al.[8] argued that there are two reasons. First, the healthcare providers tend to underestimate the geriatric age group's potential. This condition could lead to differentiation of rehabilitation input toward geriatric patients in intensity aspect. Second, patients from geriatric age group have a lower functional ability caused by limited physical tolerance of intensive rehabilitation or longer duration of recovery.

Neuronal degeneration of stroke triggers regenerative reaction that could be seen on molecular level. Degeneration increases molecules that trigger the cell viability, proliferation and remodeling of dendritic structure, axon and synapse. Inhibitory growth molecules that normally inhibit axon plasticity of the brain decrease, and the viable neuron will release the new collateral axon to re-innervate on denervated region. The neuronal growth happens in glial, vascular, and extracellular matrix inter-coordination. Glial morphology, function and neuron-glial interaction that also called as neuronal plasticity is degrading in harmony to aging.[9,10]

The molecular aspects of brain regeneration process have been analyzed in the trial animal. The behavior of older animals is worse than the younger one, moreover there is a decrement of recovery in functional and structural aspects. The most important difference that is happened between two age group is cytological response toward stroke, its acceleration of glial scar forming on old-aged-animal. Infarct on old animal is associated with the premature accumulation from microglia and astrocyte, persistent active oligodendrocyte, high incidence of neuronal degeneration and apoptosis acceleration. In old-aged animal, neuroepithel cell quickly perform phagocytosis and becomes the glial scar. Response to protein that has a role on brain plasticity, MAP1B, also becomes late on older aged animal. Moreover, the recovery of the tissue also delayed caused by increment of neurotoxic c-terminal fragment that comes from beta-amyloid precursor protein.[7,11,12]

The strength of this study is the first research in Indonesia to find the relation between age and MSBI in chronic stroke. While, there is a limitation in the design of this study. The cross-sectional design only see the variables one time (once).

Conclusion

In conclusion, there was a significance difference between productive and geriatric age with daily activities using MSBI in chronic stroke patients. The productive age group has a higher Modified Shah Barthel Index score caused by the better neuronal plasticity ability that is affecting the motoric ability of the patients, so they can do the daily activity more independently. However, this conclusion could not be proven yet because of bias factors as limitation of this study.

In productive age, MSBI value were more higher since it had better neuronal plasticity that impact to motor activity (brunstrom stage of recovery) , had better independence in daily activities. Since age is a risk factor that cannot be modified. Increase motivation in geriatric age to modified risk factor such as hipertension control, DM control, body mass index/ bmi control, stop smoking. Future studies with the same theme could be conducted in another design such as retrospective or prospective cohort to observe the progressivity from the functional ability of post-rehabilitation patients. Further studies that observe the effectivity of rehabilitation based on onset of therapy, time of post-stroke, location and severity of the lesion could also be conducted.

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