International
Journal of Medical and Exercise Science
(Multidisciplinary, Peer Reviewed and Indexed Journal)

ORIGINAL ARTICLE

THE DESCRIPTION OF INDEPENDENCE LEVEL OF POST-STROKE PATIENTS

Search engine:
www.ijmaes.org

James W H Manik[1*], Citra Puspa Juwita[2], Ali Akbar[3]

Authors:
[1,2,3] Physiotherapy Program, Fakultas Vokasi, Universitas Kristen Indonesia

Corresponding Author:
[1*]Physiotherapy Program, FakultasVokasi, Universitas Kristen Indonesia Email: jamesmanik@uki.ac.id

ABSTRACT

Background: The main source of disability that prevents individuals from being independent in doing everyday activities is functional movement disorders caused by bodily weakness in stroke conditions. This study aims to find out the level of independence of post-stroke patients. **Methods**: This study employs a descriptive quantitative approach based on the level of independence, type of stroke, and the side of the brain that is affected by stroke patients in Jakarta. Physiotherapists served as the enumerators for the study, which lasted for two months. The data were collected by observing and interviewing patients using the Functional Independent Measure (FIM) instrument. **Results:** A total of 101 stroke patients, including 78 ischemic stroke patients and 23 hemorrhagic stroke patients, were included in this study. A total of 40 individuals have left hemispheric lesions, of which 35 have ischemic types and 5 have hemorrhagic types. The overall number of patients with right hemisphere lesions is 61; of these, 43 have ischemic types and 18 have hemorrhagic types. Hemorrhagic stroke has a level of independence of 4.16 (SD + 1.06), while the ischemic stroke has a level of independence of 4.69 (SD +0.80). Ischemic stroke patients have a higher total FIM score than hemorrhagic stroke patients. **Conclusion**: Patients with ischemic stroke have a better level of independence than those with hemorrhagic stroke.

Keywords: Stroke; Functional Independence Measure; Ischemic; Hemorrhagic; hemisphere

Received on 22nd September 2022, Revised on 24th October 2022, Accepted on 19th November 2022
DOI:10.36678/IJMAES.2022.V08I04.001

INTRODUCTION

The disruption of the brain's blood arteries, which can happen suddenly or gradually and be either temporary or permanent, results in a loss in the central nervous system's capacity to control movement. The primary clinical symptom of cerebral vascular diseases, both blockage and bleeding types, is the weakness of the limbs. The term "stroke" refers to this condition [1]. Stroke is the primary cause of long-term disability and the second greatest cause of death worldwide. For stroke patients, there are three outcomes possible: death, recovery without disability, and recovery with disability[2].

There was a decrease of 0.31% in the number of patients worldwide who had a disability caused by a stroke in 2019 compared to the data from the year before. Smoking, a bad diet, and little exercise were the behavioural causes of 66.3% [59.3-73.1] of strokes, whereas lead exposure and air pollution were the main environmental risks at 28.1%.

The primary cause of disability in people in developed countries is functional mobility disorders caused by bodily weakness following stroke conditions, with two-thirds of stroke patients experiencing varying degrees of disability. The severity of both ischemic and hemorrhagic stroke plays an important role in recovery, even though the patient's social situation, life experiences, and personality play a role. This condition can lead to significant activity limitations that need urgent private rehabilitation[3].

Rehabilitation plays an important role in enabling people with functional limitations to remain or return to society, live independently, participate in education, work, and community life. Those with greater independence can maintain it for up to five years after a stroke.[4]This is due to the fact that brain neuroplasticity occurs naturally and continuously throughout life[5].

20% of people experience both movement and cognitive impairment three months after having a minor stroke, while 30–40% do not. Memory, executive function, and general cognitive abilities are linked to motor performance. To prevent functional deterioration, identifying the full scope of the disorder may be relevant[6].

Following therapy, recovery moves very quickly for the first four weeks before slowing between three and six months later. Greater recovery was seen in the lower limbs and posture control than in the upper limbs.[7]One of the key objectives for everyone associated with stroke patients is achieving functional independence[8].

Stroke can disrupt the part of the brain responsible for neurobehavioral activities, which can result in mental symptoms such post-stroke depression. Depression is a post-stroke condition that develops as a result of one of the stroke's complications and is associated to reduced cognitive, social, and healing function.[9]

The location and size of the blockage or bleeding area are used to categorize stroke types and predict stroke severity, but the National Institutes of Health Stroke Scale (NIHSS), a quantitative measurement instrument for stroke-related neurological deficits, is used to assess stroke severity based on clinical manifestations. In the meanwhile, the modified Rankin Scale (mRS) can be used to assess the degree of dependency or disability in everyday tasks in stroke or other neurological diseases[10]About 55%-75% of

stroke survivors who survive death are permanently unable to use their upper limbs months after the attack, which can lead to dependence on others to do everyday tasks and a poor quality of life[11].

Differences in care for stroke patients between different countries which may be influenced by the organization of the health care system or the cultural characteristics of the health system and rehabilitation methods are factors that affect the level of independence of post-stroke patients.[12]Examining the patient's capability adequately can help estimate the level of independence stroke patients will have in carrying out everyday tasks when they are in the chronic phase.

Based on motor and cognitive abilities, stroke acquisition on the FIM can be discovered by observation, patient interviews, telephone interviews, or medical records. The Barthel Index, Modified Rankin Scale, and Disability Rating Scale have excellent correlations with the FIM. The amount of required home care was discovered to be predicted by the FIM score. Based on the severity of the spinal cord injury and stroke, the existence of comorbid diseases at both admission and discharge, and the FIM scores, groups were differentiated. On admission and discharge, it has also been found to differentiate between patients with and without neglect of weak limbs and with and without aphasia13[13]

METHODS

This study used a quantitative approach with a descriptive design regarding the level of independence of stroke patients in DKI Jakarta, the capital of Indonesia. The data were collected for 2 months from January to February 2021. Respondents were 101 patients who received physiotherapy services at hospitals or clinics in Jakarta. Enumerators were chosen from physiotherapists who have received training and work in hospitals or clinics in Jakarta as part of the data collection process. The dependent status of post-stroke patients will be evaluated using a questionnaire administered using a google form or a form sheet as part of this study's Instrument Functional Independent Measure (FIM).The inclusion criteria for respondents were being diagnosed with a stroke by a neurologist, having undergone a cranial CT scan, having experienced their first stroke or more than six months before to participating, and being compos mentis and cooperative patients.

In this study, a random sample of all stroke patients who received physiotherapy treatments and met the inclusion criteria in the hospital or clinic was selected. The FIM is a tool for assessing the level of independence in older people with central and peripheral neurological diseases. Six functional domains—self-care, sphincter control, transfer, locomotion, communication, and social cognition—are evaluated by the FIM and are divided into two domains (motor and cognitive). There are 18 elements in the FIM component, 13 of which are connected to motor function and 5 to cognitive abilities. Each response is rated and given a score between 1 and 7, where 1 equals total dependence and 7 equals total independence.

RESULTS

Characteristics of Respondents: The expected number of respondents for this study was 164, but that number was not reached because of the implementation of Community Activity Restrictions during data collection. Table 1 provides information about the respondents' characteristics.

Variables	Total	Percentage
Age		
17-25	3	2,9
26-35	2	1,9
36-45	1	0,9
46-55	25	24,7
56-65	35	34,6
≥66	35	34,6
Gender		
Males	54	53,4
Females	47	46,5
Education		
Elementary School	9	8,9
Junior High School	3	2,9
Senior High School	31	30,6
Diploma	9	8,9
Undergraduate	47	46,5
Postgraduate	0	0
BMI		
Normal	57	56,4
Low BM	2	1,9
Extremely low BM	2	1,9
Obese	21	20,7
Extremely obese	19	18,8

Table 1 Characteristic of Respondents

101 post-stroke patients who experienced blockage and bleeding after 6 months made the whole sample. With an average age of 60 years old and a range of ages between 22 and 82, the majority of respondents (53%, or 54 people) in table 1 were men. Respondents with recent degrees (46.5%) were bachelor's degrees.

56.4% of respondents come into the normal Body Mass Index (BMI) category for Body Mass Index (BMI), while 18.8% are classified as extremely obese.

Ischemic and Hemorrhagic Stroke Incidence Rates: Table 2 shows ischemic and hemorrhagic strokes by age, gender, level of education, and body mass index (BMI).

Variables		Stroke (n=101)			
		Ischemic n=78		Hemorrhagic n=23	
		n	%	n	%
Age	17-25	2	2,5	1	4,3
	26-35	1	1,2	1	4,3
	36-45	1	1,2	0	0
	46-55	20	25,6	5	21,7
	56-65	26	33,3	9	39,1
	≥66	28	35,8	7	30,4
Gender	Males	39	50	15	65,2
	Females	39	50	8	34,7
Education	Elementary School	8	10,2	1	4,3
	Junior High School	3	3,8	0	0
	Senior High School	27	34,6	4	17,3
	Diploma	6	7,6	3	13
	Undergraduate	33	42.3	14	60.8
Body Massa Index	Normal	47	62,2	10	43,4
	Low BM	2	2,5	0	0
	Extremely low BM	1	1,2	1	4,3
	Obese	13	16,6	8	34,7
	Extremely obese	15	19,2	4	17,3

Table 2 Stroke Incidence Rate

According to table 2, the majority of those with bleeding (hemorrhagic) were aged 56 to 75 years old and had an occluded stroke (ischemic) in 77.2% of cases. There were 54 men who suffered from a stroke, including 39 ischemic stroke patients and 15 hemorrhagic patients. 47 patients, including 39 ischemic and 8 hemorrhagic patients, were female. According to the grouping of education levels, the majority of undergraduates who had strokes were either ischemic (33 subjects/42%) or hemorrhagic (14 subjects/60.8%). In the body mass index category, 47 individuals (62.25 % ischemic) and 10 individuals (43.47 % hemorrhagic) out of a total of 57 individuals

had an optimal body mass index (normal) after six months.

Sides of the Brain lesion: The afflicted or lesion hemisphere of the brain was on opposite the side of the paralyzed limb. Table 3 compares the number of lesions in the left and right hemispheres.

Variabel		Stroke			
		Ischemic N=78		Hemorrhagic N=23	
		n	%	n	%
Lesioned Sides	Left	35	44.87%	5	21.73%
	Right	43	55,12%	18	78,26%

Table 3 Sides of the Brain Lesion

From 101 stroke patients, 40 had lesions in the left hemisphere, consisting of 35 ischemic lesions (44.87%) and 5 hemorrhagic lesions (21.73%), while 61 had lesions in the right hemisphere, consisting of 43 ischemic lesions (55.12%) and 18 hemorrhagic lesions (78.26%)

Level of Independence of Post-Stroke Patients : Measurement of the level of independence in stroke conditions with a functional independent measure (FIM) instrument in ischemic or hemorrhagic stroke patients can be seen in table 4.

Variables	Stroke (N=101)	
	Ischemic(78) Mean/SD	Haemorrhagic (23) Mean/SD
Self-care	4.06±1.79	3,39±1,83
Sphincter Control		
Transfers		
Locomotion	4.50±2.01	3,67±1,88
Communication	4.31±2.05	3,59±1,95
Social Cognition	3.88±2.05	3,28±1,93
	5,68±1,37	5,65±1,58
	5,71±1,41	5,40±1,74
Total FIM	4,69±0,80	4,16±1,06

Table 4 Level of Independence of Post-Stroke Patients by Functional Independent Measure (FIM).

In the self-care variable, the ischemia type's mean was 4.061.795 and the hemorrhagic type's mean was 3.391.83. Spinchter control has a mean value of 4.50 2.05 in patients with ischemic stroke and 3.67 1.88 in patients with hemorrhagic type. In patients with ischemic stroke, variable transfer (activity at home) has a mean value of 4.3162.053, but for hemorrhagic stroke, it is 3.591.953.

The ability to move around by walking or stair climbing (locomotion) was on average 3.884 2.05 in cases of ischemic strokes and 3.282 1.935 in cases of hemorrhagic strokes.In the variable of communication, the average value of in ischemic stroke type is 5.685±1.374 and the average value of hemorrhagic stroke type is 5.652±1.584. Meanwhile, in the variable of social cognition, the mean value for ischemic stroke is 5.713±1.416 and the mean value of hemorrhagic stroke is 5.405±1.740.

Overall, the total functional independence measure (FIM) score was 4.69 ± 0.80 for ischemic stroke and 4.16 ± 1.06 for hemorrhagic stroke. It demonstrates that the total FIM score in patients with ischemic stroke is higher than in patients with hemorrhagic, which means the level of independence of patients with ischemic stroke is higher than patients with hemorrhagic stroke.

DISCUSSION

According to disability-adjusted life-years lost (DALYs), stroke is still the second most common cause of death worldwide and the third most common cause of death and disability combined. 14 After age 55, the incidence of stroke doubles. Stroke incidence rises with age. But a worrying trend emerged between 1990 and 2016: the percentage of stroke cases worldwide among adults aged 20 to 54 rose from 12.9% to 18.6%. The age-standardized death rate, however, fell by 36.2% throughout that time[15,16].

From the results of this study, the majority of people who experienced a stroke were found to be 66 years of age or older. This is in line with the results of research by Zhang et al[17] from East China which blockage stroke patients were an average of 68 years old with a range of 65 to 85 years old while bleeding stroke patients were an average of 62 years old with a range of 55 to 75 years. Along with family history linked to genetic and environmental variables, age is one of the risk factors for stroke[15].

Ischemic and Hemorrhagic Stroke Incidence:

According to this study, ischemic strokes were much more common than hemorrhagic strokes. Numerous Several studies with an estimate of more than 75% of ischemic stroke types came to similar conclusions as this study[18,19,20,21].

Hemorrhagic stroke patients worldwide die more frequently than ischemic stroke patients. This is because, during a hemorrhagic stroke, a blood vessel in the brain bursts, causing a build-up of blood around the head cavity, increasing intracranial pressure, irritating brain cells, and swelling the tissues around the brain, all of which can cause a reduction in consciousness[23].

When compared to other types of strokes, an ischemic stroke of the basilar artery, a major

artery, is present in roughly two-thirds of cases and appears to have a progressive onset[24].

Cardio-embolism was determined to be the primary cause of stroke in a quarter of cases, and small vessel disease in the other cases. About 85% of stroke cases are caused by ischemic occlusion, with the other 15% coming from intracerebral bleeding. Thrombotic and embolic disorders in the brain are brought on by ischemic occlusion[25].

Side of Lesioned Brain: Hemiparesis, or weakness in one limb, is a common indication and symptom of stroke disorders. After a stroke, the brain is damaged, which affects the tone of the muscles on the opposite side, impairing mobility. According to the findings of the study, the right hemisphere of the brain has more lesions than the left. This is in line with the study done on 317 stroke patients by Hedna et al[26].

It was discovered that left hemispheric strokes predominated in large vessels, especially the middle cerebral artery, and were more common (54%) than right hemispheric strokes (46%) But strokes were discovered in both the left and right hemispheres at the same time, despite the low incidence[20].

According to studies done on babies and young children, the left hemisphere has a higher metabolic demand than the right hemisphere. [27] These hemispheric differences may indicate that the left hemisphere is more vulnerable to functional decline with decreased blood flow, and the different metabolic needs of each hemisphere may have an impact on neuroplasticity during both the early and later stages of poststroke recovery in adults. It is likely that these age-related changes also affect the risk of stroke and the prognosis for recovery because studies have shown that the blood supply to the brain and neuroplasticity change with aging[28,29]. Ischemic strokes frequently result in worse prognoses than right hemisphere strokes.

Description of the Level of Independence of Stroke Patients: In several research, the functional independence measure (FIM) instrument is used to assess the degree of independence linked to everyday activities. Based on the total FIM score in this study, the level of independence in patients with ischemic stroke was higher than that in patients with hemorrhagic stroke. This is in line with the findings of the study by Nugraha et al[30].

which demonstrated that patients with ischemic stroke had a higher total FIM score than patients with hemorrhagic stroke. So that ischemic stroke patients have a higher level of independence than hemorrhagic stroke patients. Research by Kelly et al[31]also concluded that ischemic stroke patients had a higher level of independence because ischemic stroke patients had less severe functional impairment than hemorrhagic stroke patients did.

Patients who had hemorrhagic strokes appeared to be less independent in terms of self-care than those who had ischemic strokes. The greater severity of hemorrhagic stroke patients or insufficient post-stroke treatment are the most likely causes of this. One of the things that affects how independent stroke patients are is patients' neglect of weak body parts. Previous research has demonstrated that neglecting the body's weak side (unilateral spatial) significantly increases the risk of falling

and prevents the improvement of FIM motor scores[32].

Additionally, the self-care variable in this study demonstrates that the independence of toileting is poor, particularly when they are wearing pants. Transferring to the toilet, wiping the buttocks, and taking off and changing clothes are just a few of the different components of toileting tasks that vary in complexity, according to Kawanabe et al[33]. An exercise with a reasonably high level of difficulty is pulling back and taking off the pants.

The findings of our study's section on cognition (communication & social) indicated that, after 6 months, poor cognition in ischemic and hemorrhagic stroke fell into the category of moderate impairment. According to research by Branvo et al [34], the overall findings in the cognitive area indicated mild cognitive impairment.

In stroke patients, problems with the priest muscles have a significant impact on their independence in daily activities. After a stroke, functional capacity was substantially correlated with abnormalities of the tonus muscles in the trunk posterior, particularly the quadratus lumborum (QL), on both the weak and healthy sides[35,36].

In ischemic stroke patients with moderate or severe severity requirements, a moderate level of independence (requiring little support) is needed six months following the stroke. [37] This demonstrates that the increased independence of post-stroke patients will persist for a considerable amount of time along with an improvement in the body's functional abilities due to the brain's inherent neuroplasticity, which lasts naturally and throughout one's lifetime, and an increase in contralateral hemisphere activity in the chronic phase of stroke [38], which occurred as a compensatory response of the function of the lesioned hemisphere

The Limitation of the Study: The fact that data collection was done during the pandemic period, which limited interaction with post-stroke patients, resulted in a limited number of respondents for this study.

Ethical Clearance: Ethical Clearance obtained from the Ethical Institutional Universitas Kristen Indonesia with reference number 552/UKI.F8.D/PPM.1.6/2021.

Conflict of Interest: The researcher stated that there was no conflicts of interest to conduct or publish this study.

CONCLUSION

Patients with ischemic stroke have higher FIM total scores than patients with hemorrhagic stroke, indicating that they are more independent than the patients with hemorrhagic. The severity of brain lesions and physiotherapy treatment for motion and function restoration both have an impact on the level of independence of daily functional activities in post-stroke patients.

Acknowledgement: We woud ike to thank Universitas Kristen Indonesia for the reseach funding and Indonesian Physiotherapy Association.

REFERENCE

1. Kuriakose, D. & Xiao, Z. Pathophysiology

and Treatment of Stroke: Present Status and Future Perspectives. 2020: Int. J. Mol. Sci.21.
2. Roger, V. L. et al. Heart disease and stroke statistics--2011 update: a report from the American Heart Association. Circulation123, 2011: e18–e209.
3. Gittins, M. et al. Stroke impairment categories: A new way to classify the effects of stroke based on stroke-related impairments. Clin. Rehabil.35, 2021: 446-458.
4. Rejnö, Å., Nasic, S., Bjälkefur, K., Bertholds, E. & Jood, K. Changes in functional outcome over five years after stroke. Brain Behav. 2019: 9: 1–8.
5. Su, F. & Xu, W. Enhancing Brain Plasticity to Promote Stroke Recovery . Frontiers in Neurology 2020: vol. 11.
6. Einstad, M. S. et al. Associations between post-stroke motor and cognitive function: a cross-sectional study. BMC Geriatr. 2021: 21, 103.
7. Lee, K. B. et al. Six-month functional recovery of stroke patients: A multi-time-point study. Int. J. Rehabil. 2015: Res.38, 173–180 .
8. Wood, J. P., Connelly, D. M. & Maly, M. R. Getting back to real living: A qualitative study of the process of community reintegration after stroke. Clin. Rehabil.24, 2010: 1045–1056.
9. Sebestova, M., Lackner, I., Inayat, M., Ademaj, A. & Mikutta, C. Post stroke depression. Ther. Umschau78, 2021: 299–304.
10. Bruno, A., Saha, C. & Williams, L. S. Percent change on the National Institutes of Health Stroke Scale: a useful acute stroke outcome measure. J. Stroke Cerebrovasc. 2009: Dis.18 1, 56–59 .
11. de Diego, C., Puig, S. & Navarro, X. A sensorimotor stimulation program for rehabilitation of chronic stroke patients. Restor. Neurol. Neurosci.31, 2013: 361-371.
12. Vieira, A., Soares, P. & Nunes, C. Predicting Independence 6 and 18 Months after Ischemic Stroke Considering Differences in 12 Countries : A Secondary Analysis of the IST-3 2021: Trial. 2021.
13. Zeltzer, L. Functional Independence Measure (FIM).
14. Feigin, V. L. et al. World Stroke Organization (WSO): Global Stroke Fact Sheet 2022. Int. J. stroke Off. J. Int. Stroke Soc.17, 2022: 18–29.
15. Boehme, A. K., Esenwa, C. & Elkind, M. S. V. Stroke Risk Factors, Genetics, and Prevention. Circ. Res.120, 472–495 (2017).
16. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet (London, England) 388, 2016: 1545–1602.
17. Zhang, J. Clinical factors in patients with ischemic versus hemorrhagic stroke in East China. World J. Emerg. 2011: Med.2, 18.
18. Nadhifah, T. A. & Sjarqiah, U. Overview of Stroke Patients in the Elderly at the Islamic Hospital in Jakarta Sukapura in 2019. 2022: 3, 23-30.
19. Sofyan, A. M., Sihombing, I. Y. & Hamra, Y. Corelation of Age, Gender, and Hypert-ension with Stroke,2015.
20. Furuta, H. et al. Functional Independence Measure Subtypes among Inpatients with Subacute Stroke: Classification via Latent Class Analysis. Prog. Rehabil. Med.7, 2022: n/a.
21. Wu, S. et al. Stroke in China: advances and challenges in epidemiology, prevention, and management. Lancet Neurol. 2019; 18, 394–405.
22. Global, regional, and national burden of stroke, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet. Neurol. 2019; 18, 439–458.
23. Tareke, A. A. et al. Magnitude and Predictors of In-Hospital Stroke Mortality in Ethiopia: A Systematic Review and Meta-Analysis. Stroke Res. Treat.2022, 2022: 1–13.
24. Schonewille, W. J. et al. Treatment and outcomes of acute basilar artery occlusion

in the Basilar Artery International Cooperation Study (BASICS): a prospective registry study. Lancet Neurol.8, 2009: 724–730.
25. Musuka, T. D., Wilton, S. B., Traboulsi, M. & Hill, M. D. Diagnosis and management of acute ischemic stroke: speed is critical. C. Can. Med. Assoc. J. = J. l'Association medicale Can.187, 2015: 887–893.
26. Hedna, V. S. et al. Hemispheric differences in ischemic stroke: is left-hemisfer stroke more common? J. Clin. Neurol. 2013: 9, 97–102.
27. Arditi, H., Feldman, R., Hammerman, C. & Eidelman, A. I. Cerebral blood flow velocity asymmetry, neurobehavioral maturation, and the cognitive development of premature infants across the first two years. J. Dev. Behav. Pediatr. 2007: 28, 362–368 .
28. DeCarli, C. et al. Session II: Mechanisms of age-related cognitive change and targets for intervention: neural circuits, networks, and plasticity. J. Gerontol. A. Biol. Sci. Med. Sci. 2012: 67, 747–753.
29. Ances, B. M. et al. Effects of aging on cerebral blood flow, oxygen metabolism, and blood oxygenation level dependent responses to visual stimulation. Hum. Brain Mapp. 2009: 30, 1120–1132.
30. Nugraha, P. H. P., Bantolo, S., Kurniati, A., Erlinawati, N. D. & Nasution, A. A. Perbedaan Skor Functional Independence Measure (FIM) pada Pasien Rawat Inap dengan Stroke Iskemik dan Stroke Hemoragik di Rumah Sakit di Kota Bengkulu Tahun 2018. Sriwij. J. Med. 20181: 163-175.
31. Kelly, P. J. et al. Functional recovery following rehabilitation after hemorrhagic and ischemic stroke. Arch. Phys. Med. Rehabil 2003; 84: 968–972.
32. Yoshida, T., Mizuno, K., Miyamoto, A., Kondo, K. & Liu, M. Influence of right versus left unilateral spatial neglect on the functional recovery after rehabilitation in sub-acute stroke patients. Neuropsychol. Rehabil. 2022: 32, 640–661.
33. Kawanabe, E., Suzuki, M., Tanaka, S., Sasaki, S. & Hamaguchi, T. Impairment in toileting behavior after a stroke. Geriatr. Gerontol. Int. 2018: 18, 1166–1172.
34. Branvo, J. P., Oliveira, S., Sargento-Freitas, J., Laíns, J. & Pinheiro, J. Assessing functional recovery in the first six months after acute ischemic stroke: A prospective, observational study. Eur. J. Phys. Rehabil. Med. 2019: 55, 1–7.
35. Suh, J. H., Lee, E. C., Kim, J. S. & Yoon, S. Y. Association between trunk core muscle thickness and functional ability in subacute hemiplegic stroke patients: an exploratory cross-sectional study. Top. Stroke Rehabil. 2022: 29, 163–172.
36. Kim, J.-H. & Park, E.-Y. Balance self-efficacy in relation to balance and activities of daily living in community residents with stroke. Disabil. Rehabil. 2014: 36, 295–299.
37. Cross, M. et al. The global burden of hip and knee osteoarthritis: estimates from the global burden of disease 2010 study. Ann. Rheum. Dis. 2014: 73, 1323–1330.
38. Yourganov, G., Stark, B. C., Fridriksson, J., Bonilha, L. & Rorden, C. Effect of Stroke on Contralateral Functional Connectivity. Brain Connect. 2021: 11, 543–552.

Citation:
James W H Manik, Citra Puspa Juwita, Ali Akbar (2022). The Description of Independence Level of Post-Stroke Patients, ijmaes; 8 (4); 1361-1371.