



Characteristics of Post-Stroke Pain

Sitti Zhahirah Khairunnisah¹, Achmad Harun Muchsin², Mardiana²

¹General Practitioner Professional Education Study Program, Faculty of Medicine, Muslim University of Indonesia

²Neurology, Faculty of Medicine, Muslim University of Indonesia

*Corresponding Author: Sitti Zhahirah Khairunnisah

E-mail: zhahirahzhisi@gmail.com



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Abstract

Stroke is a global health problem in the world as it is the leading cause of disability in adults. Stroke is a disease or functional disorder of the brain in the form of nerve paralysis caused by impaired blood flow to one part of the brain. Stroke globally ranks third in mortality after coronary heart disease (13%) and cancer (12%) in developed countries. The method used is literature review with Narrative Review design. The results obtained in this literature are that there are 8 articles obtained with restrictions from 2020 - 2023 and in-depth analysis of the strengths and limitations of each article on post-stroke pain characteristics has been carried out. 8 articles that discuss post-stroke pain characteristics, 4 articles mention post-stroke pain characteristics based on gender, 3 articles mention post-stroke pain characteristics based on pain. Based on the results of the identification and review of several in this literature review, it can be concluded that there are several characteristics of post-stroke pain including central post-stroke pain, spasticity-related pain, poststroke complex regional pain syndrome and shoulder pain. Early recognition of post-stroke pain is very important, as the prognosis will be better if the pain is treated early and aggressively.

Introduction

Stroke is a global health problem in the world because it is the leading cause of disability in adults. It is important to know that stroke and transient ischemic attack (TIA) are clinical syndromes and underlying vascular brain injury can have many different mechanisms (related to different risk factors and disease processes) (Lumbantobing et al., 2024).

Stroke is a disease or functional disorder of the brain in the form of nerve paralysis caused by impaired blood flow in one part of the brain. Nerve disorders and paralysis that occur depend on which part of the brain is affected. The disease can be completely cured, cured by disability or death. Stroke globally ranks third in mortality after coronary heart disease (13%) and cancer (12%) in developed countries. The prevalence of stroke in the United States ranges around 7 million (3.0%). China has a high mortality rate from stroke (19.9%) of all deaths along with Africa and North America. Basic Health Research Data in 2013 in Indonesia the prevalence of stroke reached (7%) and increased to (10.9%) in 2018. The prevalence of stroke in Aceh Province in 2013 (6.6%) and increased (7.8%) in 2018 (Bariroh et al., 2016; Ariani et al., 2023).

This disease can affect all ages. As we get older, the proportion of deaths from stroke increases. Increasing age is the dominant risk factor for the basic cause of death from stroke. Risk factors for stroke can be in the form of modifiable and non-modifiable risk factors. These risk factors include hypercholesterol, diabetes mellitus, and hypertension, unhealthy lifestyles (such as

drinking alcohol, lack of exercise, exposure to a lot of pollution, frequent eating of junk food, smoking), oral contraceptives and obesity. While factors that cannot be modified include age, gender, race/ethnicity and family history of stroke (Juliana & Yuwono, 2021; Noviyanti & Rosnawati, 2022).

Vascular stroke mechanisms can be divided into two main types, namely hemorrhagic stroke and ischemic stroke.¹¹ Ischemic stroke is a non-communicable disease that is the leading cause of disability and death in the world. Ischemia will cause disruption in cell function, and if left unchecked, brain cells will undergo necrosis within minutes, accompanied by irreversible alterations in brain function and structure (*infarction*) (Melvianda & Rahmi, 2023). Hemorrhagic stroke occurs in the brain that experiences leakage or rupture of blood vessels in the brain, so that blood floods or covers the spaces of cell tissue in the brain. Hemorrhagic stroke is generally preceded by hypertensive disease (Buston et al., 2022).

Stroke patients are likely to experience paralysis of half the body, difficulty talking to others (aphasia), mouth gougung (facial drop), impaired body coordination, mental changes, emotional disorders, communication disorders, and loss of sense of taste. The causes of poststroke pain can arise from a variety of sources, ranging from musculoskeletal problems to the peripheral laden system as well as the central nervous system. Pain in the shoulder that has hemiplegi, pain due to spasm or spasticity, post-stroke headache, post-stroke central pain (NSPS) and (Utami et al., 2013) *complex regional pain syndrome* are various forms of pain that can be found in post-stroke patients. Early recognition of post-stroke pain is very important, as the prognosis will be better if pain is treated early and aggressively. The following are the types of post-stroke pain that often occur (Meivita, 2020).

Hemiplegic shoulder pain is shoulder pain that appears at rest, during passive and active movements on the hemiplegic side after a stroke without direct association with trauma or injury. Hemiplegic shoulder pain is one of the 4 most frequent complications of stroke, with the others being depression, falls, and urinarial tract infections. Previous studies reported that the frequency of HSP after stroke reached quite high at around 65% - 70%. Spasticity is a motor disorder characterized by an increase in the speed of muscle stretching reflexes and an increase in tendon pounding resulting from hyperexcitability as an upper motor neuron syndrome (UMN). Spasticity in the extremities increased up to 4-fold in the first year after stroke and the prevalence of spasticity after 12 months of stroke was 46% (Anita et al., 2018; Hanum et al., 2018).

Headache is a common complication of ischemic stroke (IS), it can also cause the disorder through severe attacks or when accompanied by other disorders. Depending on the course of the headache, headaches are divided into acute (new onset and usually acute) and persistent (lasting more than 3 months after the stroke becomes stable) subtypes. Acute headaches usually heal on their own. However, persistent headaches can be a hallmark of ischemic stroke, resulting in painful conditions and even leading to disability in daily life. According (Abdu et al., 2022) *to the International Association for the Study of Pain (IASP)*, post-stroke central pain (NSPS) is central neuro-pathic pain that arises, as a result of direct cerebrovascular lesions of the central nervous somatosensory system. Post-stroke central pain is a post-stroke complication that is not uncommon. The prevalence of NSPS itself varies between studies, with incidence rates ranging from 1% to 12% (Felicia & Jaya, 2023).

Complex Regional Pain Syndrome (CRPS) is a syndrome in the form of spontaneous pain or pain that is triggered, arises continuously, and is felt in certain regions with intensity and time disproportionate to pain due to trauma or lesions in general. The pain felt is also not in accordance with dermatomes or certain nerve territories. In addition, complaints were also obtained in the distal of disturbed nerves, in the form of motor, sensory, sudomotor, vasomotor edema, and trophic disorders. This syndrome has a progression that varies over time. There are

2 types of CRPS, namely type 1 and 2. CRPS type 1 is preceded by a minor jejas or fracture in the previous extremity, while CRPS type 2 appears after a major fracture of the peripheral nerves. The aim of the authors was to look at the characteristics of post-stroke pain (Sriyanti et al., 2016).

Methods

This study used a literature review study to write this article. The author uses several journals both international and national obtained from various sites such as *Google Scholar*, *Pubmed* and *Science Direct*. The keywords used for the literature search process are "characteristics" "post-stroke pain". The journal used in this study must meet the inclusion criteria, namely patients diagnosed post-stroke, publication year since 2020, the study population is post-stroke patients. Meanwhile, the exclusion criteria are the year of publication before 2020 and the population other than post-stroke diagnosis, and has recovered. From the search results on Google Scholar, we found as many as 98 articles using the keywords we chose. Then, after we sort according to the inclusion and exclusion criteria, we get 3 articles that we will review. Meanwhile, in Sciencedirect, 32 journal articles were found which were then sorted again so that there were 18 journals that were in accordance with the criteria, then on Pubmed there were 2 journal articles, and there were 6 journals. The total number of journals that we will review is 8 journals.

Result and Discussion

Stroke is the second highest cause of death and is the third leading cause of combined death and disability in the world based on the Global Burden of Disease (GBD) 2019. The results of Basic Health Research (Riskesdas) in 2018 show that the prevalence of stroke in Indonesia is still quite high, which is 10.9 per mile with the highest prevalence in East Kalimantan province (14.7 per mile). One of the complications often found in poststroke patients is the onset of pain experienced by 11-55% of stroke survivors (Wowiling et al., 2016).

This article aims to look at the characteristics of post-stroke pain. Based on the results of a literature search, 8 journals were found that mentioned several types and characteristics of post-stroke pain. From the results of the study above, there are several variables mentioned between central post-stroke pain, spasticity-related pain, poststroke complex regional pain syndrome and shoulder pain (Ariyanti et al., 2023).

Eight articles were analyzed using synthesis tables to look at the variables studied by each study regarding post-stroke pain characteristics. Of the 8 articles that discuss the characteristics of post-stroke pain, Ramadhini et al. (2020) , Vellyana & Rahmawati (2021) Mentions central post-stroke pain, mentions poststroke complex regional pain syndrome, mentions spasticity-related pain, and 1 article mentions shoulder pain. The research was dominated by design Manurung et al. (2023) Purba & Utama (2019) Wahyuni & Dewi (2019) *Cross sectional*.

Table 1. Frequency of Central Post-Stroke Pain and Its Impact on Quality of Life

No	Title	Article Info	Design	Abstract	Year
1.	Frequency of Central Post-Stroke Pain and Its Impact on Quality of Life	Dissecting central post-stroke pain: (2022)	Observational research	The average age of patients was 67±11.5 years, 54.7% male, and 45.3% female. CPSP was evaluated in 15.3% of patients. There was no significant difference between the affected side of the body and the patient's age, gender,	2022

				time since onset, BI score, and ambulation status according to their CPSP status ($p>0.05$). There was no statistically significant difference between the SIS sub-parameter score and the presence of CPSP ($p>0.05$). In correlation analysis, a significant relationship was found between the Barthel Index and all SIS domains except memory and emotion ($p<0.01$).	
2.	<i>Dissecting central post-stroke pain: a controlled symptom- psychophysical characterization</i>	Evaluation of central neuropathic pain and its relationship with quality of life in patients with stroke: a cross-sectional study cross-sectional (2022)	Studi cross-sectional terkontrol	While central post-stroke pain is mostly located in the face and limbs, non-neuropathic pain is mostly axial and located in the neck, shoulders, and knees ($P, 0.05$). The Neuropathic Pain Symptom Inventory group that burned (82.1%, $n = 32$, $P, 0.001$), tingling (66.7%, $n = 26$, $P, 0.001$) and induced by cold (64.1%, $n = 25$, $P, 0.001$) occurred more frequently in central post-stroke pain. Hyperpathia, thermal and mechanical allodynia also occurred more frequently in this group ($P, 0.001$), which also showed a higher degree of deafferentation ($P, 0.012$) with more asymmetrical cold and warm detection thresholds compared to controls. Partially, cold hypoesthesia (considered when the affected side threshold is, 41% of the contralateral threshold) odds ratio (OR) is 12 (95% CI: 3.8-41.6) for neuropathic pain.	2022
3.	<i>Evaluation of central neuropathic pain and its relationship with quality of life in patients with stroke: a cross-sectional study</i>	Prevalence and Management Challenges in Central	No	Heading	Name of Researcher.

		Post-Stroke Neuropathic Pain: A Systematic Review and Meta-analysis (2022)			
Design	Result	Pressure pain threshold and somatosensory abnormalities in different ages and functional (2020)	1.	Frequency of Central Post-Stroke Pain and Its Impact on Quality of Life	Sibel Ösken, Afıtap İçağasioğlu, Bekir Durmuş, Sinem Sağ, Ercan Madenci (2022)
Observational research	<i>The median age of patients was 67±11.5 years, 54.7% male, and 45.3% female. CPSP was evaluated in 15.3% of patients. There were no significant differences between the affected side of the body with the age, sex, time since onset, BI score, and ambulation status of patients according to their CPSP status (p>0.05). There was no statistically significant difference between the SIS sub-parameter score and the presence of CPSP (p>0.05). In the correlation analysis, a significant relationship was found between the Barthel Index and all SIS domains except memory and emotion (p<0.01). abnormalities in different ages and functional conditions of post-stroke elderly</i>	Post-Stroke Complex Regional Pain Syndrome and Upper Limb Inactivity in Hemiplegic Patients: (2022)	2.	Dissecting central post-stroke pain:	Luciana Mendonça Barbosa, Valquíria Aparecida da Silva, Antônia (2022)
Controlled	<i>While central post-stroke pain is located mostly in the face and limbs, non-neuropathic pain is mostly axial and located in the neck, shoulders, and knees (P, 0.05). The Neuropathic Pain Symptom Inventory group that burned (82.1%, n = 32, P, 0.001), tingling (66.7%, n = 26, P, 0.001) and was generated by cold (64.1%, n = 25, P, 0.001) occurred more frequently in central post-stroke pain. Hyperpathia, thermal and</i>	A Meta-Analysis and Meta-Regression of Frequency and Risk Factors for Poststroke Complex Regional Pain Syndrome (2022)	3.	Evaluation of central neuropathic pain and its relationship with quality of life in patients with stroke: a cross-sectional study	Uğur Ertem, Jale İrdesel (2022)

	<p><i>mechanical allodynia also occurred more frequently in this group (P, 0.001), which also showed higher levels of deafferentation (P, 0.012) with more asymmetric cold and warm detection thresholds compared to controls. Partially, the cold hypothesis (considered when the affected side threshold is, 41% of the contralateral threshold) odds ratio (OR) is 12 (95% CI: 3.8-41.6) for neuropathic pain. A Cross-Sectional Study</i></p>				
Cross sectional.	<p><i>CPSP was detected in 23 (16.5%) of the 140 patients. CPSP was statistically significantly higher in female patients (p = 0.006). There were no statistically significant differences between the two groups in terms of other demographic characteristics (p <0.05). There were no significant differences between the two groups in terms of brain region affected and type of stroke (p <0.05), but CPSP was found to be statistically significantly higher in patients with left hemisphere involvement (p = 0.003). Emotional role restriction, body pain, social functioning, general health and SF-36 mental health subcategory scores were found to be significantly lower in group 1 versus group 2 (p>0.05). In addition, when the two groups were compared in terms of ambulation rates, the rate of patients with FAC 2 and below was 73% in group 1, while this rate was 34.1% in group 2.</i></p>	Prevalence , risk factor and outcome in middle-aged and elderly population affected by hemiplegic shoulder pain: An observational study (2021)	4.	Prevalence and Management Challenges in Central Post-Stroke Neuropathic Pain: A Systematic Review and Meta-analysis	Andreas Liampas, Nikolaos Velidakis, Tiffany, Georgiou (2020)
The type of research is Systematic Review	<p><i>The prevalence of CPSP collected in patients with stroke at any site is 11% (95% CI 7-18%), which can increase to more than 50% in subgroups of patients with medullary stroke or thalamic stroke. The onset of CPSP coincides with the incidence of stroke in 26% of patients (95% CI 18-35%); CPSP manifests within one month of symptom onset in 31% of</i></p>	2023 (2023)	5.	Pressure pain threshold and somatosensory	Yong-Hui Zhang, Hao-Ran Xu, Yu-Chen Wang, et al (2022)

<p>patients (95% CI 22-42%), and occurs between the first month and first year in 41% of patients (95% CI 33.9-49.0%). CPSP develops more than 12 months after the onset of stroke in 5% of patients (95% CI 3-8%).</p>				
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One of the strengths of some of these articles is the use of internationally representative data with the latest edition as well as the large sample numbers adequate to analyze the characteristics of post-stroke pain. In addition, several variables may be significant risk factors for post-stroke pain. This is important so that interventions can be made to reduce the risk of post-stroke pain and can be known whether these factors affect the occurrence of post-stroke pain (Ismatika & Soleha, 2018).

One limitation that needs to be noted in some of these articles is the use of data *Literature Review* may experience bias in the selection of data sources used. Researchers may tend to choose data that fits their hypothesis, which can influence the results of the study and cause bias in the study. The data sources available in the literature study may not be complete to answer all research questions. In addition, some articles use less population coverage. Thus, the authors suggest future research with better methodologies, larger sample sizes, and more variables. More research is needed to discuss the characteristics of post-stroke patients by intervening to reduce risk factors (Karunia, 2016).

Next, the authors identified 4 articles that discussed post-stroke pain with gender. The author identifies that there are some similarities from the article, namely journals that are still very up-to-date, although there are some journals with less population, but some of these studies mention a greater scope of variables (Utama & Nainggolan, 2022).

There are 3 articles that discuss post-stroke pain with the location of the pain. The author identified several differences from the article, namely where the results of the analysis there are differences regarding the location of pain of post-stroke patients, this can be caused by different locations and sample populations. One of the strengths of some of these articles is that the discussion is very detailed and detailed, arranged using certain procedures or stages, presenting abstracts and conclusions that are easy to understand.

Conclusion

Based on the results of identification and review of several in *this literature review*, it can be concluded that there are several characteristics of post-stroke pain including central post-stroke pain, spasticity-related pain, *poststroke complex regional pain syndrome* and shoulder pain. Post-stroke pain is a common condition. Some epidemiological studies report the incidence rate reaching 10-45.8% of the total cases. Early recognition of post-stroke pain is very important, as the prognosis will be better if pain is treated early and aggressively.

References

- Abdu, S., Satti, Y. C., Payung, F., & Soputan, H. A. (2022). Analisis Kualitas Hidup Pasien Pasca Stroke Berdasarkan Karakteristik. *Jurnal Keperawatan Florence Nightingale*, 5(2), 50–59. <https://doi.org/10.52774/jkfn.v5i2.107>
- Anita, F., Pongantung, H., Ada, P. V., & Hingkam, V. (2018). Pengaruh Latihan Range of Motion Terhadap Rentang Gerak Sendi Ekstremitas atas Pada Pasien Pasca Stroke di Makassar. *Journal of Islamic Nursing*, 3(1), 97–99. <https://doi.org/10.24252/JOIN.V3I1.5703>
- Ariani, R. R., Amalia, L., Gunadharma, S., & Anggadiredja, K. (2023). Studi Efikasi dan Pemantauan Reaksi Obat Merugikan dari Antiplatelet pada Pasien Pasca Stroke

- Iskemik di RSUP dr. Hasan Sadikin Bandung. *Jurnal Sains Dan Kesehatan*, 5(5), 850–859.
- Ariyanti, I., Tarigan, M., Hasnida, H., & Hasnida, H. (2023). Hubungan Status Fungsional dengan Kualitas Hidup Pasien Pasca Stroke. *Journal of Telenursing (JOTING)*, 5(2), 2001–2009. <https://doi.org/10.31539/joting.v5i2.6793>
- Barbosa, L. M., da Silva, V. A., de Lima Rodrigues, A. L., Mendes Fernandes, D. T. R., de Oliveira, R. A. A., Galhardoni, R., Yeng, L. T., Junior, J. R., Conforto, A. B., Lucato, L. T., Lemos, M. D., Peyron, R., Garcia-Larrea, L., Teixeira, M. J., & Ciampi de Andrade, D. (2022). Dissecting Central Post-Stroke Pain: A Controlled Symptom-Psychophysical Characterization. *Brain Communications*, 4(3). <https://doi.org/10.1093/braincomms/fcac090>
- Bariroh, U., Susanto, H. S., & Adi, M. S. (2016). Kualitas Hidup Berdasarkan Karakteristik Pasien Pasca Stroke (Studi di RSUD Tugurejo Kota Semarang). *Jurnal Kesehatan Masyarakat*, 4(4), 486–495. <https://doi.org/10.14710/JKM.V4I4.14276>
- Buston, E., Pardosi, S., & Winda, W. (2022). Pengaruh Slow Stroke Back Massage terhadap Penurunan Depresi pada Pasien Pasca Stroke di RS. Harapan dan Doa Kota Bengkulu. *Gorontalo Journal of Public Health*, 5(2), 145–152. <https://doi.org/10.32662/GJPH.V5I2.2380>
- Ertem, U., & İrdeseli, J. (2022). Evaluation Of Central Neuropathic Pain and Its Relationship with Quality of Life in Patients with Stroke: A Cross-Sectional Study. *The European Research Journal*, 8(4), 468–474. <https://doi.org/10.18621/eurj.977242>
- Felicia, F., & Jaya, M. (2023). Identifikasi dan Manajemen pada Nyeri Sentral Paska Stroke. *Damianus Journal of Medicine*, 22(1), 69–75. <https://doi.org/10.25170/djm.v22i1.3943>
- Hanum, P., Lubis, R., & Rasmaliah, R. (2018). Hubungan Karakteristik dan Dukungan Keluarga Lansia Dengan Kejadian Stroke pada Lansia Hipertensi di Rumah Sakit Umum Pusat Haji Adam Malik Medan. *JUMANTIK (Jurnal Ilmiah Penelitian Kesehatan)*, 3(1), 72–88. <https://doi.org/10.30829/JUMANTIK.V3I1.1377>
- Ismatika, I., & Soleha, U. (2018). Hubungan Self Efficacy Dengan Perilaku Self Care Pasien Pasca Stroke di Rumah Sakit Islam Surabaya. *Journal of Health Sciences*, 10(2), 139–148. <https://doi.org/10.33086/jhs.v10i2.140>
- Juliana, J., & Yuwono, W. (2021). Analisis Future Perception, Self Control, Dan Debit Card Use Terhadap Saving Behavior Dengan Cost Saving Sebagai Variabel Mediasi Pada Mahasiswa Di Kota Batam. *YUME: Journal of Management*, 4(3). <https://doi.org/10.37531/YUM.V4I3.1296>
- Karunia, E. (2016). Hubungan Antara Dukungan Keluarga Dengan Kemandirian Activity of Daily Living Pasca Stroke. *Jurnal Berkala Epidemiologi*, 4(2), 213–224.
- Liampas, A., Velidakis, N., Georgiou, T., Vadalouca, A., Varrassi, G., Hadjigeorgiou, G. M., Tsivgoulis, G., & Zis, P. (2020). Prevalence and Management Challenges in Central Post-Stroke Neuropathic Pain: A Systematic Review and Meta-Analysis. *Advances in Therapy*, 37, 3278–3291.
- Lumbantobing, L. A., Lopez, C. da, Nathaniel, F., & Wijaya, D. A. (2024). Karakteristik Demografi dan Radiologi Pada Pasien Stroke Hemoragik. *Jurnal Ners*, 8(1), 352–357. <https://doi.org/10.31004/JN.V8I1.19715>
- Manurung, J., Lampah, C., & Gessal, J. (2023). Rehabilitasi Medik pada Nyeri Bahu Hemiplegia Pasca Stroke. *E-CliniC*, 11(3), 306–315.

<https://doi.org/10.35790/ecl.v1i1i3.45280>

- Meivita, D. (2020). Penerapan Massase Abdomen untuk Mengatasi Konstipasi Pada Pasien Stroke Non Haemoragik di SUD Adhyatma Semarang. *Jurnal Manajemen Asuhan Keperawatan*, 4(2), 79–84.
- Melvianda, U., & Rahmi, E. (2023). Pengaruh Bimbingan Orang Tua dan Self Control Terhadap Perilaku Menabung Mahasiswa. *Jurnal Ecogen*, 6(4), 576–586. <https://doi.org/10.24036/jmpe.v6i4.15409>
- Noviyanti, H., & Rosnawati, R. (2022). Penerapan Range Of Motion (ROM) terhadap Kekuatan Otot pada Ny. T Pasca Stroke di Paseh Kota Tasikmalaya. *HealthCare Nursing Journal*, 4(2b), 49–52. <https://journal.umtas.ac.id/index.php/healthcare/article/view/2583>
- Ösken, S., Icagasioglu, A., Durmus, B., Sag, S., & Madenci, E. (2022). Frequency of Central Post-Stroke Pain and Its Impact on Quality of Life. *Sakarya Medical Journal*. <https://doi.org/10.31832/smj.1197365>
- Purba, M. M., & Utama, N. R. (2019). Disabilitas Klien Pasca Stroke terhadap Depresi. *Jurnal Kesehatan*, 10(3), 346–353. <https://doi.org/10.26630/jk.v10i3.1539>
- Ramadhini, A., Syafrita, Y., & Russilawati, R. (2020). Gambaran gangguan tidur pada pasien pasca stroke iskemik. *Jurnal Ilmu Kesehatan Indonesia*, 1(3), 336–342.
- Sriyanti, N. P., Warjiman, W., & Basit, M. (2016). Hubungan Kesejahteraan Spiritual Dengan Kualitas Hidup Pasien Pasca Stroke. *JURNAL KEPERAWATAN SUAKA INSAN (JKSI)*, 1(2), 1–8. <https://doi.org/10.51143/JKSI.V1I2.43>
- Utama, Y. A., & Nainggolan, S. S. (2022). Karakteristik Kualitas Hidup Pasien Stroke. *Jurnal Kesehatan Lentera 'Aisyiyah*, 5(1), 539–550. <https://jurnal.politasambar.ac.id/index.php/jl/article/view/131>
- Utami, P., Ikawati, Z., & Setyaningsih, S. (2013). Perbandingan Efek Terapi Gabapentin dan Amitriptilin pada Pasien Stroke dengan Nyeri Neuropati. *Mutiara Medika: Jurnal Kedokteran Dan Kesehatan*, 13(2), 89–97. <https://doi.org/10.18196/MMJKK.V13I2.1059>
- Vellyana, D., & Rahmawati, A. (2021). Dukungan Keluarga Pada Pelaksanaan Mobilisasi Dini Pasien Pasca Stroke Iskemik. *Jurnal Kesehatan Indonesia*, 11(2), 94–99. <http://www.journal.stikeshb.ac.id/index.php/jurkessia/article/view/361>
- Wahyuni, S., & Dewi, C. (2019). Faktor-Faktor yang Berhubungan Dengan Efikasi Diri Pasien Pasca Stroke: Studi Cross Sectional di RSUD Gambiran Kediri. *Jurnal Wiyata: Penelitian Sains Dan Kesehatan*, 5(2), 85–92. <https://doi.org/10.56710/WIYATA.V5I2.214>
- Wowiling, P. E., Sengkey, L. S., & Lolombulan, J. H. (2016). Pengaruh Latihan Core-Strengthening Terhadap Stabilitas Trunkus dan Keseimbangan Pasien Pasca Stroke. *JURNAL BIOMEDIK (JBM)*, 8(1), 43–50. <https://doi.org/10.35790/jbm.8.1.2016.12334>
- Zhang, Y.-H., Xu, H.-R., Wang, Y.-C., Hu, G.-W., Ding, X.-Q., Shen, X.-H., Yang, H., Rong, J.-F., & Wang, X.-Q. (2022). Pressure Pain Threshold and Somatosensory Abnormalities in Different Ages and Functional Conditions of Post-Stroke Elderly. *BMC Geriatrics*, 22(1), 830.