Characteristics Of Stroke Infarction Patients At Waled Regional General Hospital, Cirebon Regency 2023

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***Abstract**.*

Stroke is a leading cause of death and disability worldwide, with increasing prevalence in Indonesia driven by social and economic development. This study aims to characterize infarct stroke patients at Waled Regional General Hospital, Cirebon, in 2023. A descriptive quantitative study with a retrospective approach was conducted, utilizing secondary data from medical records and CT-Scan reports of all eligible infarct stroke patients, totaling 51 cases. Data collection involved medical record forms and radiology reports, analyzed univariately using frequency distribution and percentages via statistical software. The results showed that most patients were male (54.90%), elderly (60.78%), and predominantly had subcortical infarct lesions (47.06%). No significant association was found between hypertension and lesion location, while the prevalence of hypertension and diabetes mellitus was low at 7.84% and 9.80%, respectively. The study concludes that the primary characteristics of infarct stroke patients in this region are middle-aged to elderly men with subcortical lesions. These findings provide a foundation for developing community-based preventive and educational programs, especially targeting vulnerable age groups. This research is essential for informing local health strategies and strengthening efforts to control stroke risk factors.

Keywords: *Atherosclerosis; Demographics; Infarct Brain; Ischemic Stroke and Waled.*

I. INTRODUCTION

Research Phenomena

Stroke is a significant and growing global health challenge, recognized as the second leading cause of death worldwide, accounting for 11.6% of all deaths in 2019 (Feigin et al., 2021). Its incidence, particularly ischemic stroke, has been on the rise over the past decade in middle- to high-income countries, with reported rates of 85–94 per 100,000 people (Murray et al., 2020). In Indonesia, the situation is particularly concerning, as stroke is the leading cause of death (Kementerian Kesehatan Republik Indonesia, 2018). National data from the 2018 Basic Health Research (Riskesdas) show a national stroke prevalence of 10.9%, a notable increase from 8.3% in 2013 (Kementerian Kesehatan Republik Indonesia, 2018; Azzahra & Fitriyani, 2023). This trend underscores the urgent need for a deeper understanding of the disease's characteristics and risk factors to bolster public health strategies.

The rising prevalence of stroke is closely linked to rapid economic and social developments, which have led to an increased burden of cardiovascular disease (CVD) risk factors. These include unhealthy lifestyles, high sodium diets, smoking, and a sedentary lifestyle (Feigin et al., 2021). Furthermore, the global aging population and a higher prevalence of chronic comorbidities like hypertension and diabetes mellitus are major contributors to the growing incidence of stroke (Tsao et al., 2022). Specifically, ischemic stroke, which accounts for the majority of cases (62.4% globally in 2019), resulted in 77.19 million people living with the condition and 3.29 million deaths (Feigin et al., 2021; Pu et al., 2023). These statistics highlight the immense health and economic burden of stroke, emphasizing the critical need for effective prevention and management strategies.

Research Problems

Despite the known global and national trends, there remains a need for localized data to inform targeted public health interventions. The characteristics of stroke patients, including demographic profiles like age and gender, and clinical features such as lesion location and comorbidities, can vary based on regional factors and specific hospital populations (Lestari et al., 2020; Moosa et al., 2023). While

hypertension and diabetes mellitus are well-established modifiable risk factors for stroke (Rahmanda et al., 2019), the prevalence and specific contribution of these factors in different populations need further investigation (Basyir et al., 2021; Sina et al., 2023). The available national data often lack the granularity required to develop effective prevention and promotion programs at the local community level. One of the key challenges is to understand the specific characteristics of stroke patients in a regional context, such as at the Waled Regional General Hospital in Cirebon.

This is crucial because the demographic and clinical profiles in a specific hospital may differ from national averages. For instance, a recent study at the same hospital reported 30 cases of hemorrhagic stroke, which highlights a specific regional profile that needs to be explored further for infarct stroke (Rahmanda et al., 2019). The link between specific risk factors, like hypertension and diabetes, and the location of brain lesions is also a critical area of inquiry, as different risk factors may predispose patients to different types of stroke and lesion locations (Irsyam et al., 2022). Therefore, this study is essential to fill the knowledge gap regarding the specific characteristics of patients with infarct stroke at the Waled Regional General Hospital. The findings will provide a clear picture of the demographic and clinical profiles of these patients, which is currently lacking. By analyzing data on age, gender, location of brain lesions, and comorbidities like hypertension and diabetes, this research can provide a foundation for developing more effective, location-specific preventive and educational programs (Geneva & Usman, 2023).

Research Objectives, Urgency, and Novelty

This study aims to determine the characteristics of infarct stroke patients at the Waled Regional General Hospital in Cirebon District in 2023. This research is urgent because it will provide a critical baseline for developing and implementing targeted preventive and promotive efforts within the Cirebon community. The findings will directly inform healthcare providers and public health officials, enabling them to design tailored interventions that address the specific risk factors and patient profiles prevalent in the region. The novelty of this research lies in its specific focus on a single regional hospital, providing a granular, data-driven analysis that goes beyond general national statistics. It offers a unique insight into the local epidemiology of stroke, which can be a model for similar studies in other regional contexts to enhance community-based stroke prevention programs.

II. METHODS

Research Design and Approach

This study used a descriptive quantitative research design with a retrospective approach to investigate the characteristics of infarct stroke patients (Creswell & Creswell, 2023; Sugiyono, 2022). This design is suitable for describing and analyzing existing data without manipulating variables, as it relies on information previously collected and stored in medical records. The study employed a cross-sectional approach, where data were collected at a single point in time to examine the relationship between variables (Sudaryono, 2022; Utomo, 2022). This method allowed for an efficient analysis of patient characteristics, including age, gender, and comorbidities, as well as the location of brain lesions, from medical records and CT-Scan reports (Irsyam et al., 2022).

Population and Sample

The study's population consisted of all inpatients diagnosed with infarct stroke who underwent a head CT-Scan at the Waled Regional General Hospital in Cirebon District throughout 2023. The sample was selected using a total sampling technique, which included all patients from the defined population who met the study's inclusion and exclusion criteria (Sugiyono, 2022; Emzir, 2022). The inclusion criteria were: patients aged 19–78 years, diagnosed with infarct stroke at Waled Regional General Hospital in 2023, and who had undergone a head CT-Scan. Patients with vascular neoplasms such as hemangiomas were excluded. A total of 51 patients met these criteria and were included in the final sample from an initial pool of 73 available records. This sampling method ensures that the entire population under study is represented, providing a comprehensive overview of the patient characteristics within this specific setting (Geneva & Usman, 2023).

Data Collection and Analysis Procedures

The data were collected from secondary sources, specifically the medical records and head CT-Scan reports of the eligible patients (Basyir et al., 2021; Darmawan et al., 2024). Data collection took place at the Waled Regional General Hospital from January to June 2024. The variables examined in the study included patient age, gender, location of the brain infarct lesion (based on CT-Scan results), and a history of hypertension and diabetes mellitus. Data analysis was performed univariately using a statistical software application. The analysis involved calculating the frequency distribution and percentages for each variable, which were then presented in tables and narrative descriptions to characterize the study sample (Lestari et al., 2020; Sina et al., 2023). This systematic approach ensures a clear and structured presentation of the research findings, allowing for a thorough understanding of the patient demographics and clinical profiles.

III. RESULT AND DISCUSSION
Result
Gender

Table 1. Distribution of Patients by Gender

Gender	N	%
Male	28	54,90
Female	23	45,10
Total	**51**	**100,00**

Based on **Table 1**, it can be seen that the gender that dominated the study sample was male, which amounted to 28 patients (54.90%), while the female gender amounted to 23 patients (45.10%).

Table 2. Distribution of Brain Infarction Lesion Locations by Gender

Location of Brain Infarction Lesions	Gender				Total	
	Male		Female			
	N	%	N	%	N	%
Cortical	6	11,76	4	7,84	10	19,61
Subcortical	11	21,57	13	25,49	24	47,06
Multiple	11	21,57	6	11,76	17	33,33
Total	**28**	**54,90**	**23**	**45,10**	**51**	**100,00**

Based on **Table 2**, it is known that subcortical brain infarction lesions are the most common finding in both sexes. In male patients, subcortical lesions were found in 11 people (21.57%), while in female patients it was found in 13 people (25.49%). Multiple lesions were also found quite often, as many as 11 men (21.57%) and 6 women (11.76%) respectively. Meanwhile, cortical lesions were found in 6 male patients (11.76%) and 4 female patients (7.84%).

Age

Table 3. Distribution of Samples by Age Category

Age Category	N	%
Young Adult	2	3,92
Middle-aged Adult	18	19,60
Older Adult	31	60,78
Total	**51**	**100,00**

Description: N = total, % = percentage

Based on table 3, it can be seen that the age category that dominated the study sample was the old adult age category, which amounted to 31 patients (60.78%), while the least age category was the young adult age category with 2 patients (3.92%).

Table 4. Distribution of Brain Infarction Lesion Locations by Age Category

Location of Brain Infarction Lesions	Kategori Usia						Total	
	Young Adult		Middle-Aged Adult		Older Adult			
	N	%	N	%	N	%	N	%
Cortikal	0	0,00	2	3,92	8	15,69	10	19,61
Subcortical	1	1,96	10	19,61	13	25,48	24	47,06
Multipel	1	1,96	6	11,76	10	19,61	17	33,33
Total	**2**	**3,92**	**18**	**35,29**	**31**	**60,78**	**51**	**100,00**

Based on Table 4, in the young adult group no cortical lesions were found (0%), while in intermediate adults there were 2 patients (3.92%) and in older adults as many as 8 patients (15.69%). Subcortical lesions were found in 1 young adult patient (1.96%), 10 intermediate adult patients (19.61%), and 13 elderly adult patients (25.48%). Multiple lesions were found in 1 young adult patient (1.96%), 6 intermediate adult patients (11.76%), and 10 elderly adult patients (19.61%). These findings suggest that subcortical lesions are most prevalent in all age groups, particularly in older adults.

Table 5. Distribution of Samples Based on the Location of Brain Infarction Lesions

Location of Brain Infarction Lesions	N	%
Cortical Lesion	10	19,61
Subcortical Lesion	24	47,06
Multiple Lesion	17	33,33
Total	**51**	**100,00**

Description: N = total, % = percentage

Based on table 8, it was found that of 51 patients with infarction stroke, there were 10 patients with cortical lesions (19.61%), 24 patients with subcortical lesions (47.06%), and 17 patients with multiple lesions (33.33%).

Table 6. Distribution of Samples by Hypertensive Disease

Hypertensive Disease	N	%
Yes	4	7,84
No	47	92,16
Total	**51**	**100,00**

Description: N = total, % = percentage

Based on table 6, it was found that of the 51 patients with infarctive stroke, there were 4 patients with hypertension (7.84%), and 47 patients did not have hypertension (92.16%).

Table 7. Distribution of Brain Infarction Lesion Locations by Hypertensive Disease

Location of Brain Infarction Lesions	Hypertensive Disease				Total	
	Yes		No			
	N	%	N	%	N	%
Cortical	0	0,00	10	19,61	10	19,61
Subctical	2	3,92	22	43,14	24	47,06
Multiple	2	3,92	15	29,41	17	33,33
Total	**4**	**7,84**	**47**	**92,16**	**51**	**100,00**

Description: N = total, % = percentage

Based on **Table 7**, no patients with cortical lesions were found in the group with hypertension, while in the group without hypertension there were 10 patients (19.61%). Subcortical lesions were found in 2 patients with hypertension (3.92%) and 22 patients without hypertension (43.14%). Multiple lesions were found in 2 patients with hypertension (3.92%) and 15 patients without hypertension (29.41%). These findings suggest that subcortical lesions are most dominant in both patients with and without hypertension.

Diabetes Mellitus

Table 8. Sample Distribution by Diabetes Mellitus

Diabetes Mellitus	N	%
Yes	5	9,80
No	46	90,20
Total	**51**	**100,00**

Description: N = total, % = percentage

Based on table 11, it was found that of 51 patients with infarction stroke, there were 5 patients with diabetes mellitus (9.80%), and 46 patients did not have diabetes mellitus (90.20%).

Table 9. Distribution of Brain Infarction Lesion Locations by Diabetes Mellitus Disease

Location of Brain Infarction Lesions	Diabetes Mellitus				Total	
	Yes		No			
	N	%	N	%	N	%
Cortical	0	0,00	10	19,61	10	19,61
Subcortical	2	3,92	22	43,14	24	47,06
Multiple	3	5,88	14	27,45	17	33,33

Total	5	9,80	46	90,17	51	100,00

Description: N = total, % = percentage

Based on **Table 9**, no patients with cortical lesions were found in the group with diabetes mellitus, while in the group without diabetes mellitus there were 10 patients (19.61%). Subcortical lesions were found in 2 patients with diabetes mellitus (3.92%) and 22 patients without diabetes mellitus (43.14%). Multiple lesions were found in 3 patients with diabetes mellitus (5.88%) and 14 patients without diabetes mellitus (27.45%). These results suggest that subcortical lesions remain the most common finding in both groups, both with and without diabetes mellitus.

Discussion

Gender

The analysis of patient characteristics revealed that the majority of infarct stroke patients at Waled Regional General Hospital in 2023 were male, comprising 54.90% (n=28) of the sample, while females accounted for 45.10% (n=23). This finding aligns with research by Rahmanda et al. (2019), which also reported a higher prevalence of stroke among male patients. A key contributing factor is the protective effect of estrogen in premenopausal women. This hormone plays a vital role in the cardiovascular system by increasing high-density lipoprotein (HDL) cholesterol, decreasing low-density lipoprotein (LDL) cholesterol, and maintaining vascular wall elasticity.

Estrogen also supports endothelial function, reducing the risk of atherosclerotic plaque formation, which is a primary cause of heart disease and stroke. Furthermore, it possesses anti-inflammatory and antioxidant properties and enhances nitric oxide (NO) production, which helps dilate blood vessels.Before menopause, the high levels of estrogen provide this significant protective effect, resulting in a lower stroke risk for women compared to men. However, after menopause, estrogen levels decline sharply, leading to a loss of this protection and a subsequent increase in stroke risk to a level comparable to, or even higher than, that of men. This highlights the importance of managing risk factors such as hypertension, diabetes, obesity, and dyslipidemia in both genders, especially in postmenopausal women.

Age

The results indicate that the majority of infarct stroke patients in this study were in the elderly adult category, with 60.78% (n=31) of the sample. This was followed by middle-aged adults (19.60%, n=18) and young adults (3.92%, n=2). This finding is consistent with studies by Familah et al. (2024), who found that most stroke patients were over 50 years old, and Budi et al. (2022), who reported that the majority of ischemic strokes occurred in individuals older than 55. Similarly, Melisa et al. (2021) found the largest proportion of stroke patients to be elderly, aged over 75.

Advancing age is a major, non-modifiable risk factor for stroke, primarily due to atherosclerosis. This is a degenerative process where plaques made of fat, cholesterol, calcium, and other blood components accumulate and harden in arterial walls. Over time, this process narrows blood vessels, reducing elasticity and impairing blood flow to the brain, which can lead to both ischemic and hemorrhagic strokes. Although atherosclerosis is a part of natural aging that progresses slowly over many years, the presence of modifiable risk factors like hypertension, dyslipidemia, and diabetes accelerates this vascular damage. Therefore, early detection and preventive measures, including regular health screenings, blood pressure control, and a healthy lifestyle, are crucial to mitigate the risk of stroke in the elderly.

Location of Brain Infarction Lesion

The analysis of lesion location showed that the subcortical area was the most common site of infarction, found in 47.06% (n=24) of patients. This was followed by multiple lesions (33.33%, n=17) and cortical lesions (19.61%, n=10). This result is consistent with research by Irsyam et al. (2022), which also found a predominance of subcortical lesions.The high prevalence of subcortical lesions is strongly associated with lacunar stroke, a subtype of ischemic stroke that frequently affects deep brain structures. These areas are supplied by small, thin-walled perforating arteries, which are highly susceptible to damage. Chronic hypertension and diabetes mellitus are primary risk factors for these strokes, as they can cause lipohyalinosis and microatheroma, which narrow the vessel lumen and reduce blood flow, ultimately leading to infarction. Although lacunar lesions are small (<15 mm), their strategic location in the basal ganglia, thalamus, internal

capsule, or pons can result in significant neurological deficits. Recurrent lacunar strokes also contribute to leukoaraiosis and vascular dementia due to chronic damage to the subcortical white matter. This emphasizes the critical importance of controlling vascular risk factors to prevent subcortical lesions.

Hypertension and Diabetes Mellitus

Contrary to common literature that identifies hypertension as a major risk factor for stroke, particularly the lacunar type, our findings show that the majority of infarct stroke patients (92.16%, n=47) did not have a recorded history of hypertension. Only a small proportion (7.84%, n=4) had this comorbidity. This discrepancy may be due to limitations in the medical record keeping, patients being previously undiagnosed, or the specific characteristics of the hospital's patient population. Despite this, chronic hypertension plays a significant role in small vessel disease through lipohyalinosis and microatheroma, which stiffen small arterial walls and constrict their lumens.Similarly, the study found that most patients did not have a history of diabetes mellitus (90.20%, n=46), with only 9.80% (n=5) of patients having this condition.

However, it is important to note that chronic hyperglycemia in diabetic patients leads to endothelial dysfunction, increased oxidative stress, and the formation of advanced glycation end-products, all of which accelerate atherosclerosis in cerebral vessels. This process worsens the blood vessels' vulnerability to occlusion and reduces oxygen and nutrient supply to brain tissue. Moreover, diabetes is often linked to other synergistic risk factors such as hypertension, dyslipidemia, and obesity, further increasing stroke risk. The low prevalence of these comorbidities in our study does not diminish the urgency of preventive efforts. Early detection, strict control of blood glucose and blood pressure, and management of other cardiovascular risk factors remain essential to reduce the likelihood of stroke, especially in individuals with multiple risk factors.

IV.   CONCLUSION

Based on the data analysis, this study concludes that the primary characteristics of infarct stroke patients at Waled Regional General Hospital in 2023 were predominantly male (54.90%) and elderly. The most frequent ages were 57, 61, and 62 years, which aligns with existing literature indicating that gender (particularly male vulnerability) and age (due to the process of atherosclerosis) are significant risk factors. The most common location for infarct lesions was the subcortical area (47.06%), which points to a high prevalence of lacunar stroke. This finding reinforces the link between infarct stroke and small vessel disease, which is often caused by chronic vascular risk factors. However, the low proportion of patients with a history of hypertension (7.84%) and diabetes mellitus (9.80%) suggests potential limitations in the medical record data or a lack of prior diagnoses among these patients.

The main limitation of this study is its retrospective design, which relies heavily on the completeness of medical records. This may not accurately reflect the full clinical history of the patients. Therefore, the low numbers for hypertension and diabetes mellitus should be interpreted with caution. For future research, we recommend a prospective study with more comprehensive data collection, including detailed clinical histories, additional diagnostic tests, and patient follow-up. Furthermore, a study with a larger sample size from multiple hospitals would provide a more representative overview of infarct stroke patient characteristics. These findings serve as a crucial foundation for the hospital and public health authorities to plan more targeted preventive and educational programs, especially for the elderly, to reduce the incidence and impact of stroke in the community.

REFERENCES

[1]   Azzahra, S. D., & Fitriyani. (2023). Laporan Kasus: Stroke Non Hemoragik. *Jurnal Medika Malahayati*, *7*(1), 573–580.

[2]   Basyir, I. F., Nurkhalifah, N., & Linggabudi, I. G. B. W. (2021). Gambaran Radiologis pada Bidang Neurologis Stroke. *Syntax Fusion: Jurnal Nasional Indonesia*, *1*(10), 588–603.

[3]   Burgoyne, S. (2015). *Stroke: Pathogenesis.* The Calgary Guide to Understanding Disease.

[4]   Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches.* Sage Publications.

[5] Darmawan, I., Utami, I. T., & Pakarti, A. T. (2024). Penerapan Range Of Motion (ROM) Exercise Bola Karet Terhadap Kekuatan Otot Pasien Stroke Non Hemoragik. *Jurnal Cendikia Muda*, *4*(2), 246–254.

[6] Departemen Neurologi Fakultas Kedokteran Universitas Indonesia. (2017). *Buku Ajar Neurologi*. Buku 2.FK UI.

[7] Emzir. (2022). *Metodologi Penelitian Kualitatif: Analisis Data*. Rajawali Pers.

[8] Familah, A., Arifin, F. A., & Muchsin, A. H. (2024). Karakteristik Penderita Stroke Iskemik dan Stroke Hemoragik. *Fakumi Medical Journal*, *4*(6), 457–464.

[9] Feigin, V. L., Stark, B. A., Johnson, C. O., Roth, G. A., Bisignano, C., Abady, G. G., Abbasifard, M., Abbasi-Kangevari, M., Abd-Allah, F., Abedi, V., et al. (2021). Global, regional, and national burden of stroke and its risk factors, 1990-2019: A systematic analysis for the Global Burden of Disease Study 2019. *The Lancet Neurology*, *20*(10), 795–820. https://doi.org/10.1016/S1474-4422(21)00252-0

[10] Geneva, R., & Usman, S. (2023). Gambaran Karakteristik Individu dengan Kejadian Stroke pada Pasien Poliklinik Penyakit Saraf. *Jurnal Kedokteran STM*, *6*(2), 159–167.

[11] Handayani, F., Setyowati, & Pudjonarko, D. (2019). Association of functional outcome and post stroke depression among ischemic stroke patients after three months onset: A preliminary study. *Jurnal Kesehatan Soedirman*, *14*(1), 31–37.

[12] Hutagalung, M. S. (2021). *Mengenal Stroke Serta Karakteristik Penderita Stroke Hemoragik dan Non Hemoragik*. Nusamedia.

[13] Irsyam, M. A., Dewi, D. R. L., & Ilmiawan, M. I. (2022). Hubungan antara National Institute of Health Stroke Score (NIHSS) dan Letak Lesi pada Pasien Stroke Infark di Rumah Sakit Umum Daerah Dr. Soedarso Pontianak. *Jurnal Impresi Indonesia*, *1*(4), 397–404.

[14] Kementerian Kesehatan Republik Indonesia. (2018). *Hasil Utama Riskesdas 2018*. KEMENKES RI.

[15] Kuczynski, A., & Yao, Y. Y. (2018). *Ischemic Stroke: Impairment by localization*. The Calgary Guide to Understanding Disease.

[16] Lestari,L.M.,Pudjonarko, D., & Handayani, F. (2020).Characteristics of stroke patients: An analytical description of outpatient at the hospital in Semarang, Indonesia. *Jurnal Aisyah: Jurnal Ilmu Kesehatan*,*5*(1), 67–74.

[17] Lopez, M., & Kuczynski, A. (2017).*Ischemic Stroke:Pathogenesis*.The Calgary Guide to Understanding Disease.

[18] Moosa, A., Osama, D., & Alnidawi, F. (2023). Risk Factors, Incidence, and Outcome of Stroke: A Retrospective Cross-Sectional Hospital-Based Study Comparing Young Adults and Elderly. *Cureus*, *15*(6), 1-7.

[19] Murray, C. J. L., Aravkin, A. Y., Zheng, P., Abbafati, C., Abbas, K. M., Abbasi-Kangevari, M., Abd-Allah, F., Abdelalim, A., Abdollahi, M., & Abdollahpour, I. (2020). Global burden of 87 risk factors in 204 countries and territories, 1990-2019: A systematic analysis for the global burden of disease study 2019. *The Lancet*, *396*(10258), 1223-1249. https://doi.org/10.1016/S0140-6736(20)30752-2

[20] Murray, C. J. L., Abbafati, C., Abbas, K. M., Abbasi, M., Abbasi-Kangevari, M., Abd-Allah, F., Abdollahi, M., Abedi, P., Abedi, A., & Abolhassani, H. (2020). Five insights from the global burden of disease study 2019. *The Lancet*, *396*(10258), 1135–1159. https://doi.org/10.1016/S0140-6736(20)31404-5

[21] Murphy, S. J., & Werring, D. J. (2020). Stroke: Causes and clinical features. *British Journal of Hospital Medicine*, *81*(9), 561-566.

[22] Pu, L., Zhang, R., Zhao, T., et al. (2023). Projected Global Trends in Ischemic Stroke Incidence, Deaths and Disability-Adjusted Life Years From 2020 to 2030. *Journal of the American Heart Association*, *12*(10), 1330–1339.

[23] Rahmanda, V., Nurimaba, N., & Trisnadi, S. (2019). Gambaran Faktor Risiko Stroke pada Pasien Stroke Infark Aterotrombotik di RSUD Al Ihsan. *Prosiding Pendidikan Dokter*, *2*(2), 714–720.

[24] Sam, C. I. L., Awatara, B. M. P., & Samatra, D. P. (2019). Penentuan Stroke Hemorhagic dan Non-Hemorhagik Memakai Skor Stroke Nuartha. *Callosum Neurology Journal*, *1*(3), 97–102.

[25] Sina, M. I., Purwaningrum, R., & Fitriyani. (2023). Hubungan antara Jumlah Faktor Resiko dan Lokasi Infark Terhadap Derajat Keparahan Stroke Iskemik di RSPBA. *Jurnal Ilmu Kedokteran dan Kesehatan*, *10*(10), 2909–2915.

[26] Sugiyono. (2022). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.

[27] Sudaryono. (2022). *Metodologi Penelitian: Ilmu Kesehatan*. Candra Ilmu.

[28] Tsao, C. W. (2022). Correction to: Heart Disease and Stroke Statistics—2022 Update: A Report From the American Heart Association. *Circulation*, *145*(25), e1044–e1045.

[29] Utomo, T. Y. (2022). Karakteristik Faktor Risiko Stroke Hemoragik dan Stroke Non Hemoragik di RSUD Kota Bekasi. *Syntax Literate: Jurnal Ilmiah Indonesia*, *7*(9), 13584–13591.