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Characteristics of Infarct and Hemorrhagic Stroke Patients Who Died at RSUD Bayu Asih Purwakarta, January–December 2024

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ABSTRACT
Stroke is the leading cause of death globally, including in Indonesia, with two main types, namely infarctive stroke and hemorrhagic stroke. This research aims to determine the risk factors for stroke, infarction, and hemorrhagic patients who die at Bayu Asih Purwakarta Hospital. This research was an observational analytical study with a cross-sectional retrospective design using medical record data of stroke patients who died during the period January–December 2024. Data were analyzed univariately using Microsoft Excel and SPSS v30.1. Results: Of the 227 stroke patients who died, 117 (51.5%) had infarctive stroke and 110 (48.5%) had hemorrhagic stroke. The age of >66 years dominates infarction deaths, while the age of 46–55 years is most commonly found in hemorrhagic strokes. Women die more from both types of stroke. Stage 2 hypertension dominates infarctive stroke, while hypertension crisis is most common in hemorrhagic stroke. The majority of heart attack patients have a history of diabetes mellitus, while hemorrhagic strokes are more common without a history of DM. NIHSS scores indicate that most patients have very severe neurological deficits. Conclusion: Most of the deaths due to stroke at Bayu Asih Purwakarta Hospital most occur in elderly patients, especially in infarct stroke cases. While hemorrhagic strokes are more common at younger ages with very high blood pressure and higher NIHSS scores. The female gender also shows a higher mortality trend, in line with national findings. These factors can be used to prioritize early management and secondary prevention of stroke, especially in high-risk groups.

Introduction

Stroke is one of the leading causes of death worldwide, including in *Indonesia*. Based on data from the World Health Organization (WHO), stroke causes around 6 million deaths per year, with an increasing prevalence, especially in developing countries such as *Indonesia*. Factors such as hypertension, diabetes, unhealthy diet, and lack of physical activity have been identified as the

main causes of the increased incidence of stroke in developing countries. In *Indonesia*, stroke is a serious health problem, with an increasing incidence and mortality rate (World Health Organization, 2020).

Stroke is divided into two main types, namely *infarctive* (ischemic) stroke and hemorrhagic stroke. *Infarction* stroke occurs due to occlusion or blockage of blood vessels that block blood flow to the brain, while hemorrhagic stroke is caused by the rupture of blood vessels that leads to bleeding in the brain. These two types of stroke have different pathophysiological mechanisms, which affect the management and prognosis of the patient. Treatment of *infarctive* stroke generally involves reperfusion therapies, such as intravenous thrombolysis and mechanical thrombectomy, whereas hemorrhagic stroke often requires surgery or conservative therapy (Prabowo et al., 2021; Lestari & Permana, 2022).

Various studies have shown that although advances in reperfusion therapy have succeeded in lowering the death rate from ischemic stroke, hemorrhagic stroke still has a higher mortality rate. Research by Putra et al. (2022) shows that patients with hemorrhagic stroke, especially those who experience intracerebral hemorrhage, have a worse prognosis compared to *infarctive* stroke, especially in those who get treatment late. In addition, a study by Sari et al. (2023) reveals that factors such as age, comorbidities, and timing of treatment play a major role in determining the prognosis of stroke patients.

One of the important instruments in assessing the severity of stroke is the National Institutes of Health Stroke Scale (NIHSS), which has been widely used in clinical practice as well as research. The NIHSS provides an objective assessment of the neurological deficits of stroke patients, and the initial NIHSS scores have been shown to have a strong correlation with functional outcomes and the risk of death in patients. Research by Kharbuja et al. (2022) showed that a significant increase in NIHSS scores is related to increased mortality and functional dependence in ischemic and hemorrhagic stroke patients. In *Indonesia*, the systematic use of NIHSS is still uneven, especially in regional hospitals. In fact, the implementation of this scoring can help medical personnel in making more precise and faster clinical decisions, as well as in predicting the prognosis of stroke patients more accurately (Arifin et al., 2023).

Research on the characteristics of risk factors for patients with *infarctive* stroke and hemorrhagic stroke who die in regional hospitals is still very limited. At the *Bayu Asih Purwakarta Regional General Hospital (RSUD)*, although there is an increase in the number of stroke cases, data on the mortality rate between the two types of stroke have not been systematically explored. Therefore, this study aims to determine the risk factors in *infarction* stroke and hemorrhagic stroke patients who die at the hospital. The results of this study are expected to provide an overview of the characteristics of risk factors for stroke patients who die in the region, as well as help in designing more effective and targeted treatment strategies (Setiawan et al., 2023).

Materials and Methods

This research is an analytical observational study with a retrospective cross-sectional design. Data were collected through the review of the medical records of stroke patients who died at *Bayu*

Asih Purwakarta Hospital during the January–December 2024 period. The subjects of the study were patients with a diagnosis of *infarctive* stroke and hemorrhagic stroke who died based on clinical examination as well as brain imaging (*CT-scan*). This research was conducted at *Bayu Asih Hospital*, a district-level referral hospital located in *Purwakarta Regency, West Java*.

The sample selection was carried out by total sampling of all patients who met the inclusion criteria, namely patients who died due to *infarction* stroke or hemorrhagic stroke with complete medical records. The final sample comprised 227 individuals, consisting of 117 *infarction* stroke patients and 110 hemorrhagic stroke patients, with data collected using a univariate approach.

The variables studied included demographic characteristics (age, gender), type of stroke, NIHSS score upon the patient's first arrival at the Emergency Department (*IGD*), blood pressure at the time of initial admission to the emergency room, comorbidities (hypertension and *diabetes mellitus*), and clinical outcomes in the form of patient mortality during the treatment period.

This research acknowledges several limitations inherent to its design. As a secondary data analysis, it was constrained by the availability and completeness of medical records, potentially omitting critical variables such as lifestyle factors (smoking, physical activity) and medication adherence patterns, which could influence stroke outcomes. Additionally, being a single-center study conducted at a regional hospital, the findings may not fully represent stroke mortality patterns in other healthcare settings with different patient demographics or treatment protocols. The one-year study period also limits the ability to assess long-term trends or seasonal variations in stroke mortality. Despite these limitations, the study provides valuable insights into the characteristics of fatal stroke cases in this specific hospital context, while highlighting the need for future research incorporating primary data collection to address these gaps. This research has received approval from the Research Ethics Committee of the *Indonesian University of Education*, with the number of the ethics approval letter: No. 30/UN40.K/PT.01.01/2025. All patient data are kept confidential and are used solely for scientific purposes in accordance with research ethics principles.

Results and Discussions

To characterize each variable studied, the data was analyzed univariately using Microsoft Excel and SPSS software version 30.

Table 1. Distribution of Frequency of Stroke Patients Who Died by Age at Bayu Asih Regional General Hospital Purwakarta.

Age Group	Stroke Infarct		Hemorrhagic Stroke	
	N	%	N	%
Late Teens (17-25 Years)	2	0,9	0	0
Early Adult (26-35 years)	1	0,4	3	1,3
Late Adult (36-45 years)	8	3,5	6	2,6
Early Elderly (46-55 Years)	27	11,9	35	15,4
Late Elderly (56-65 Years)	36	15,9	32	14,1
Senior Period (>66 years)	43	18,9	34	15
Total	**117**	**51,5 %**	**110**	**48,5 %**

Source: Hospital Medical Records Database, Bayu Asih Purwakarta (2024)

Table 1 above shows that elderly patients >66 years old are the majority of stroke patients who died at Bayu Asih Purwakarta Hospital who suffered a heart attack (18.9%), followed by the elderly at the end of age 56-65 years (15.9%) and the early elderly aged 46-55 years (11.9%). However, patients who die in hemorrhagic stroke patients are most often in the category of early elderly people aged 46-55 years (15.4%), followed by seniors >66 years old (15%) and the late elderly aged 56-65 years (14.1%).

Table 2. Distribution of Frequency of Stroke Patients Who Died by Gender at Bayu Asih Regional General Hospital Purwakarta.

Gender	Stroke Infarct		Hemorrhagic Stroke	
	N	%	N	%
Woman	60	26,4	58	25,6
Man	57	25,1	52	22,9
Total	**117**	**51,5 %**	**110**	**48,5 %**

Source: Patient Admission Registry, Neurology Department (2024)

Table 2 above shows that women die the most from both infarction stroke (26.4%) and hemorrhagic stroke (25.6%).

Table 3. Distribution of Frequency of Stroke Patients Who Died from Infarction and Hemorrhagic Stroke Based on Blood Pressure Category at Bayu Asih Regional General Hospital Purwakarta

Blood Pressure Categories	Stroke Infarct		Hemorrhagic Stroke	
	N	%	N	%
Normal	15	6,6	5	2,2
Pre-Hypertension	8	3,5	1	0,4
Stage 1 Hypertension	11	4,8	4	1,8
Stage 2 Hypertension	57	25,1	34	15
Hypertension Crisis	26	11,5	66	29,1
Total	**117**	**51,5 %**	**110**	**48,5 %**

Source: Emergency Department Vital Signs Database (2024)

Table 3 shows that there is a difference in the majority of blood pressure categories in patients who die between patients with infarctive stroke and hemorrhagic stroke, namely infarction stroke with the stage 2 hypertension category (25.1%) and hemorrhagic stroke with the hypertensive crisis category (29.1%).

Table 4. Distribution of Frequency of Stroke Patients with Infarction and Hemorrhagic Stroke Who Died Based on History of Diabetes Mellitus at Bayu Asih Regional General Hospital Purwakarta.

DM History	Stroke Infarct		Hemorrhagic Stroke	
	N	%	N	%
Ada	48	21,1	8	3,5

DM History	Stroke Infarct		Hemorrhagic Stroke	
	N	%	N	%
None	69	30,4	102	44,9
Total	**117**	**51,5 %**	**110**	**48,5 %**

Source: Electronic Health Records, Endocrinology Unit (2024)

Table 4 above shows that most stroke patients who died at Bayu Asih Purwakarta Hospital did not have a history of diabetes mellitus. This applies to patients with infarction stroke (30.4%) and hemorrhagic stroke (48.5%).

Table 5. Distribution of Frequency of Stroke Patients Infarction and Hemorrhagic Stroke Who Died Based on History of Hypertension at Bayu Asih Regional General Hospital Purwakarta.

History of HT	Stroke Infarct		Bleeding Stroke	
	N	%	N	%
Ada	96	42,3	101	44,5
None	21	9,3	9	4
Total	**117**	**51,5 %**	**110**	**48,5 %**

Source: Outpatient Chronic Disease Registry (2024)

Table 5 above shows that most of the stroke patients who died at Bayu Asih Purwakarta Hospital had a history of hypertension. This is true for patients with infarction stroke (42.3%) and hemorrhagic stroke (44.5%).

Table 6. Distribution of Frequency of Stroke Patients Who Died from Infarction and Hemorrhagic Stroke Based on NIHSS Category at Bayu Asih Regional General Hospital Purwakarta.

Category NIHSS	Stroke Infarct		Hemorrhagic Stroke	
	N	%	N	%
Mild Neurological Deficits	3	1,3	0	0
Moderate Neurological Deficits	9	4	0	0
Severe Neurological Deficits	39	17,2	6	2,6
Neurological deficits are very severe	66	29,1	104	45,8
Total	**117**	**51,5 %**	**110**	**48,5 %**

Source: Neurology Clinical Assessment Sheets (2024)

Table 6 above shows that most of the stroke patients who died at Bayu Asih Purwakarta Hospital were in the NIHSS category with very severe neurological deficits. This is true for patients with infarction stroke (29.1%) and hemorrhagic stroke (48.5%).

Discussion

Based on the results of a univariate analysis of 227 cases of death due to stroke at Bayu Asih Purwakarta Hospital, it can be seen that infarction strokes occur more than hemorrhagic strokes

(51.5% vs 48.5%). The distribution of stroke death cases based on several clinical variables provides an important picture of risk factors and patient characteristics. In general, ischemic stroke is indeed more common than hemorrhagic stroke. A study at Dr. Cipto Mangunkusumo Hospital noted that about 68% of treated stroke cases were ischemic strokes, while the rest were hemorrhagic strokes.15 Similar results were also reported at Dr. Moewardi Hospital, where ischemic stroke accounted for about 70% of all stroke cases.16 This suggests that ischemic stroke is still the most dominant form of stroke, although hemorrhagic stroke has a higher risk of death.

Age

The most deceased infarction stroke patients were in the elderly age group (>66 years) at 18.9%, while the highest hemorrhagic stroke occurred in the early elderly group (46–55 years) at 15.4%. These findings are in line with a study by Tolefac et al. (2020) which reported that old age is a major risk factor for mortality in stroke patients, particularly ischemic stroke, due to the accumulation of comorbidities such as hypertension and diabetes mellitus.[9] These findings are also in line with research conducted by Saputro et al. (2022) showing that ischemic stroke is more common in old age, especially over 65 years old, due to the progressive process of atherosclerosis. In contrast, hemorrhagic strokes are more commonly found in younger age patients, usually in the 40–60 age group, which is often associated with a hypertensive crisis or sudden rupture of brain blood vessels.

Gender

In both types of stroke, death is more common in women. This is in line with research by Gall et al. (2019) which found that although men have a higher incidence of stroke, women show higher mortality rates, especially in old age, which may be due to hormonal factors and delays in treatment.10 This study is also in line with a study conducted by Lestari et al. (2023), which found that women have a higher risk of dying after stroke, especially in the elderly. This is suspected to be related to delays in treatment, hormonal factors, and the severity of the stroke when first admitted to the hospital.

Blood pressure

The blood pressure category shows that the majority of heart attack patients who die are in the category of stage 2 hypertension (25.1%), while in hemorrhagic strokes the most are in the category of hypertensive crisis (29.1%). A study by Sheth et al. (2021) reinforces these findings by stating that the hypertensive crisis plays a major role in triggering the rupture of brain blood vessels and increasing the risk of death from hemorrhagic stroke.

Riwayat Diabetes Mellitus

Most of the infarction stroke patients who died had a history of diabetes mellitus (21.1%), compared to only 3.5% in hemorrhagic stroke. Diabetes is a major risk factor for ischemic stroke because it accelerates atherosclerosis, as evidenced by a study by Huo et al. (2020), which showed a two-fold increased risk of ischemic stroke in patients with DM.

History of Hypertension

The data showed that most patients had a history of hypertension, both in infarction stroke (42.3%) and hemorrhagic stroke (44.5%). Hypertension has long been known to be the most significant risk factor for stroke incidence and mortality. Research by O'Donnell et al. (2016) in the global INTERSTROKE study also confirmed that hypertension accounts for more than 50% of the risk of stroke occurring worldwide.

Score NIHSS

Most of the patients who died were classified as very severe neurological deficits according to the NIHSS, both in infarctive stroke (29.1%) and hemorrhagic stroke (45.8%). NIHSS has been widely used as an early predictor of stroke prognosis. High scores are closely correlated with the likelihood of severe complications and death, as stated by Sato et al. (2019) who mentioned that patients with a NIHSS score of ≥20 have a much higher risk of death compared to low scores.14

CONCLUSION

This research concluded that most deaths due to stroke at *Bayu Asih Purwakarta Hospital* occurred in elderly patients, especially in cases of *infarctive* stroke. Hemorrhagic strokes were more common at younger ages, with very high blood pressure and higher NIHSS scores. The female gender also showed a higher mortality trend. These factors can be used to prioritize early management and secondary prevention of stroke, particularly in high-risk groups. To improve stroke management, several concrete steps are recommended. At the clinical level, it is necessary to implement emergency hypertension management protocols and routine NIHSS monitoring. Hospitals are advised to develop a gender-based stroke registry and triage system. At the community level, it is important to carry out focused hypertension screening and public education about stroke symptoms. Follow-up research should examine lifestyle factors and conduct multi-center studies to reinforce these findings. The implementation of these recommendations is expected to help reduce the stroke death rate in the *Purwakarta* area.

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