Research Article

Analysis of Risk Factors Influencing the Incidence of Stroke at RS Otak DR. Drs. M. Hatta Bukittinggi

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Abstract. Stroke is one of the leading causes of death and disability worldwide, including in Indonesia, with a national prevalence of 10.9 per 1,000 population. The incidence at DR Brain Hospital Drs. M. Hatta Bukittinggi shows an increasing trend each year, indicating that both modifiable and non-modifiable risk factors have not been optimally managed. The objective of this study was to analyze the characteristics of stroke patients, non-modifiable risk factors, modifiable risk factors, and the most dominant factors influencing the incidence of stroke. This study was conducted at RS Otak Dr. Drs. M. Hatta Bukittinggi from May to August 2025. It was designed using a quantitative method with a cross-sectional design and a descriptive-analytic approach. The study population consisted of 150 individuals, with a sample size of 60 respondents selected through simple random sampling. The instrument used was a questionnaire. Data analysis was performed using univariate, bivariate (Chi-square), and multivariate (binary logistic regression) analyses. The results showed that risk factors significantly associated with stroke incidence included age ($p = 0.034$), hypertension ($p = 0.042$), diabetes mellitus ($p = 0.030$), and dyslipidemia ($p = 0.046$), smoking ($p = 0.035$), physical activity ($p = 0.035$), dietary patterns ($p = 0.047$) while factors not associated with stroke incidence included sex, family history, heart disease. The most dominant risk factor was dyslipidemia with an OR = 3.378. Based on the findings, primary prevention programs through risk factor screening in the productive age group, education on healthy lifestyles, regular monitoring of blood pressure and blood glucose levels, and health campaigns. Integrated interventions from healthcare providers, government, and the community are expected to reduce stroke incidence and mitigate its long-term impacts.

Keywords: Health Outcomes; Incidence Level; Prevention; Risk Factors; Stroke.

1. Background

Stroke is one of the world's biggest public health problems, causing high mortality and disability rates and placing a large socio-economic burden on families and the health system.(Donkor, 2018)It is estimated that around 15 million people experience strokes each year, of which approximately 5 million die and 5 million suffer permanent disabilities. These figures make stroke prevention, early detection, and treatment a global health priority.(Feigin et al., 2019);(Dwilaksosno et al., 2023).

In Indonesia, the prevalence of stroke reportedly increased significantly between 2013 and 2018. The 2018 Basic Health Research (Riskesdas) showed a stroke prevalence of 10.9 per 1,000 population, an increase compared to the 2013 Riskesdas, and stroke is a major contributor to death and disability nationally. The increasing trend in stroke burden reflected in national data underscores the need for local studies to understand contextual determinants.(Rahayu, 2023);(Efremova et al., 2023).

At the provincial and referral hospital levels, the clinical burden of stroke is also significant. In West Sumatra Province, stroke prevalence has increased over the past five years, with several local publications reporting a provincial prevalence increase approaching the national average. Furthermore, inpatient data at the Dr. Drs. M. Hatta Brain Hospital in

Bukittinggi indicates a large number of stroke patients, with 2,083 reported in 2024, and many patients arrive in advanced condition or receive delayed acute care. This situation highlights the urgency of research examining local risk factors that influence stroke incidence and clinical outcomes.(Amalia et al., 2024);(Septafani & Komariyah, 2025).

Based on the literature, stroke risk factors can be divided into two groups, namely non-modifiable risk factors and modifiable risk factors.(Feigin et al., 2014);(Feigin et al., 2017)Modifiable factors include hypertension, diabetes mellitus, dyslipidemia, smoking habits, low physical activity, unhealthy diet, and low socioeconomic status.(Sacco et al., 1997) (Sacco et al., 2013). Non-modifiable factors include age, gender and family history.(O'Donnell et al., 2016). Study(Shravani et al., 2015)found that hypertension was the dominant factor, followed by smoking habits and diabetes mellitus. Another study by(Sutcu et al., 2025)emphasized that modifiable risk factors often interact with non-modifiable factors, cumulatively increasing the risk of stroke.

The research gap arises because although research related to stroke risk factors has been conducted extensively in various regions, there has been no local study in West Sumatra that comprehensively analyzes both groups of risk factors simultaneously, while identifying the most dominant factors using multivariate analysis. Existing studies generally focus on only one group of risk factors, or are conducted in different populations, making the results less relevant to the population at Dr. Drs. M. Hatta Brain Hospital, Bukittinggi. Given that social, cultural, and lifestyle characteristics can influence the distribution of risk factors, local data-based studies are urgently needed to provide more effective prevention recommendations.

Based on this description, this study aims to analyze non-modifiable and modifiable risk factors for stroke and determine the most dominant factors. The results of this study will provide a basis for health policymakers in designing targeted stroke prevention and management strategies in West Sumatra.

2. Research Methods

This study is a quantitative study with a descriptive analytical cross-sectional design, where the measurement of independent and dependent variables is carried out at the same time (one-time approach). The population in this study were all stroke patients treated in the Singgalang Ward of DR. Drs. M. Hatta Brain Hospital, Bukittinggi, from May to August 2025. The sampling technique used probability sampling with a simple random sampling method, namely every member of the population who meets the inclusion criteria has an equal opportunity to be selected as a respondent. The sample selection process was carried out by identifying patients according to the criteria, then given a serial number based on the date and time of hospital admission, and randomization was carried out until the sample size was met. The number of samples in this study was 60 respondents.

The research instrument used was a structured questionnaire containing questions regarding modifiable and non-modifiable risk factors associated with stroke. Data analysis was conducted in stages, including univariate analysis to describe the frequency distribution, percentage, minimum-maximum value, and mean of each variable; bivariate analysis using the Chi-Square test to determine the relationship between the independent and dependent variables; and multivariate analysis using logistic regression to determine the most dominant factors influencing stroke incidence after controlling for other variables.

3. Results and Discussion

Table 1. Distribution of Stroke Incidence Based on the Timing of Risk Factor Identification.

Timing of Risk Factor Identification	Frequency (n)	Percentage (%)
Pre-stroke	45	75.0
At the time of stroke	15	25.0
Total	**60**	**100**

Table 2. Characteristics of Respondents.

Characteristics	Category	Frequency (n)	Percentage (%)
Age	< 55 years	49	81.7
	≥ 55 years	11	18.3
Sex	Male	41	68.3
	Female	19	31.7
Education level	Junior high school	32	53.3
	Others	28	46.7
Socioeconomic status	Low–middle	40	66.7
	High	20	33.3
Occupation	Self-employed	34	56.7
	Others	26	43.3

Table 3. Distribution of Stroke Risk Factors.

Risk Factors	Frequency (n)	Percentage (%)
Hypertension	39	65.0
Diabetes mellitus	38	63.3
Family history	38	63.3
Dyslipidemia	37	61.7
Unhealthy dietary pattern	34	56.7
Heart disease	18	30.0

Table 4. Association Between Age and Stroke Incidence Based on Timing of Risk Factor Identification.

Age Group	Pre-stroke n (%)	At Stroke n (%)	Total	p-value	OR
< 55 years	34 (69.4)	15 (30.6)	49	0.034	0.000
≥ 55 years	11 (100.0)	0 (0.0)	11		
Total	**45**	**15**	**60**		

Note: Chi-square test

Table 5. Summary of Key Findings.

Variable	Main Findings
Proportion of pre-stroke risk factors	75%
Most affected age group	< 55 years (81.7%)
Most common risk factor	Hypertension (65%)
Most dominant risk factor	Dyslipidemia (OR = 3.378)
Significant associated variable	Age (p = 0.034)

Discusion

Analysis of the incidence rate of stroke is differentiated based on the discovery of risk factors before a stroke attack (such as hypertension already existing before a stroke) and at the time of a stroke (such as hypertension diagnosed at the time of a stroke). Based on the results of the study, the incidence rate of stroke in patients at the DR. Drs. M. Hatta Bukittinggi Brain Hospital, strokes with pre-stroke risk factors were found to be 75% and at the time of a stroke were 25%.

Based on the results of research conducted on 60 respondents, the results obtained were the individual characteristics of respondents who were aged <55 years (81.7%), male (68.3%). The highest level of education of respondents was junior high school graduates, 32

people (53.3%), respondents with a socioeconomic status of more or less, namely 40 people (66.7%). The majority of respondents' occupations were self-employed, 34 people (56.7%).

Based on the research results, the most common risk factors were unhealthy diet patterns in 34 people (56.7%), hypertension in 39 people (65%), followed by diabetes mellitus in 38 people (63.3%), family history in 38 people (63.3%), dyslipidemia in 37 people (61.7%) and heart disorders in 18 people (30%). Other risk factors related to lifestyle were found in the data that most respondents did not smoke, did not consume alcohol, never did physical exercise and did not follow an unhealthy diet.

The results of the analysis of the relationship between age and stroke incidence showed that 34 respondents aged <55 years (69.4%) had known risk factors before having a stroke and 15 people (30.6%) had known risk factors during the stroke. The statistical test results obtained a p value = 0.034, so it can be concluded that there is a significant relationship between age and stroke incidence. The OR value = 0.000 indicates that there were no cases of stroke with risk factors during stroke in respondents ≥55 years, meaning that in this group the possibility of stroke is much lower than in respondents <55 years.

This study showed that of the total 60 respondents, 45 respondents (75%) experienced stroke with pre-existing risk factors (pre-stroke), while 15 respondents (25%) had risk factors that were only discovered at the time of the stroke. These findings indicate that the majority of stroke patients at the DR. Drs. M. Hatta Brain Hospital in Bukittinggi were already at risk before the acute event occurred, which should provide a significant opportunity for primary prevention.

The results of this study indicate that of the 60 respondents, 38 (63.3%) had risk factors for dyslipidemia. This finding is consistent with epidemiological facts in Indonesia that show an increasing prevalence of diabetes. Based on the 2018 Basic Health Research (Riskesdas), the prevalence of diabetes mellitus based on blood sugar tests increased from 6.9% in 2013 to 10.9% in 2018. This condition has direct implications for the increased risk of stroke in the community, considering that diabetes mellitus has long been recognized as a major risk factor for both ischemic and hemorrhagic strokes (Ministry of Health, 2018b).

The results of this study indicate that the largest proportion of stroke sufferers were in the age group <55 years, namely 49 people (81.7%), while in the age group ≥55 years there were 11 people (18.3%). This finding is interesting, because it contrasts with the general trend that often reports an increasing risk of stroke with increasing age, however, in this study, the majority of cases occurred in the younger age group. This indicates that modifiable risk factors are likely to have played a role earlier, so that stroke incidents occur before old age.

4. Conclusion and Suggestions

The analysis results showed a significant association between age and stroke incidence. Conversely, no significant association was found between gender or family history of stroke. This study also showed a significant association between hypertension, diabetes mellitus, and dyslipidemia with stroke incidence. Furthermore, lifestyle factors such as smoking, physical activity, and diet also had a significant association with stroke incidence. Among all the risk factors studied, dyslipidemia was the most dominant factor influencing stroke incidence.

Based on the research results, the researchers provide several suggestions, namely hospitals are expected to increase health promotion that focuses on communities with low levels of education through easy-to-understand media such as illustrated posters, educational videos, and direct counseling, as well as integrating early detection programs and healthy lifestyle education into outpatient and inpatient services, especially for patients at risk of stroke. The community is also expected to increase awareness of the importance of health education and the implementation of a healthy lifestyle, especially in controlling stroke risk factors such as unhealthy diets, smoking habits, and lack of physical activity. In addition, the government needs to develop community-based intervention programs that target community groups with low education and unhealthy lifestyles to reduce the burden of stroke, as well as establish cross-sectoral policies that support prevention efforts, such as controlling tobacco consumption, promoting physical activity, and increasing public health literacy.

Reference List

Amalia, E., Maidaliza, M., Fradisa, L., Sesrianty, V., & … (2024). Edukasi pencegahan dan penatalaksanaan stroke pada masyarakat di Kecamatan Batipuh Selatan Tanah Datar. Journal of Human and ….

Donkor, E. S. (2018). Stroke in the 21st century: A snapshot of the burden, epidemiology, and quality of life. 2018. https://doi.org/10.1155/2018/3238165

Dwilaksosno, D., Fau, T. E., Siahaan, S., Siahaan, C., Karo, K. S. P. B., & Nababan, T. (2023). Faktor-faktor yang berhubungan dengan terjadinya stroke iskemik pada penderita rawat inap. Jurnal Penelitian Perawat Profesional, 5, 449–458.

Efremova, D., Ciolac, D., Zota, E., Glavan, D., Ciobanu, N., Aulitzky, W., Nics, A. M., Trinka, E., Yamada, C., Movila, A., & Groppa, S. A. (2023). Dissecting the spectrum of stroke risk factors in an apparently healthy population: Paving the roadmap to primary stroke prevention. Journal of Cardiovascular Development and Disease. https://doi.org/10.3390/jcdd10010014

Feigin, V. L., Abajobir, A. A., Abate, K. H., Abd-Allah, F., & … (2017). Global, regional, and national burden of neurological disorders during 1990–2015: A systematic analysis for the Global Burden of Disease Study 2015. The Lancet. https://thelancet.com

Feigin, V. L., Forouzanfar, M. H., Krishnamurthi, R., & … (2014). Global burden of stroke: An underestimate–Authors' reply. The Lancet. https://thelancet.com

Feigin, V. L., Nichols, E., Alam, T., Bannick, M. S., & … (2019). Global, regional, and national burden of neurological disorders, 1990–2016: A systematic analysis for the Global Burden of Disease Study 2016. The Lancet. https://thelancet.com

O'Donnell, M. J., Chin, S. L., Rangarajan, S., Xavier, D., Liu, L., & … (2016). Global and regional effects of potentially modifiable risk factors associated with acute stroke in 32 countries (Interstroke): A case-control study. The Lancet. https://doi.org/10.1016/S0140-6736(15)60470-9

Rahayu, T. G. (2023). Analisis faktor risiko terjadinya stroke serta tipe stroke. Faletehan Health Journal, 10(01), 48–53. https://doi.org/10.33746/fhj.v10i01.410

Sacco, R. L., Benjamin, E. J., Broderick, J. P., Dyken, M., & … (1997). Risk factors. Stroke. https://doi.org/10.1161/01.STR.28.7.1507

Sacco, R. L., Kasner, S. E., Broderick, J. P., Caplan, L. R., & … (2013). An updated definition of stroke for the 21st century: A statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. https://doi.org/10.1161/STR.0b013e318296aeca

Septafani, O. W., & Komariyah, S. (2025). Jurnal pengabdian kepada masyarakat bidang ilmu keperawatan optimal. Jurnal Pengabdian Kepada Masyarakat Bidang Ilmu Keperawatan Optimal, 1(2), 186–190.

Shravani, K., Parmar, M. Y., Macharla, R., Mateti, U. V., & Martha, S. (2015). Risk factor assessment of stroke and its awareness among stroke survivors: A prospective study. 1–4. https://doi.org/10.4103/2277-9175.164011

Sutcu, M., Jouda, D., Yildiz, B., & Katrib, J. (2025). Predicting stroke risk using machine learning: A data-driven approach to early detection and prevention. 2025.