

Prevalence of Elderly High Risk of Stroke and Related Risk Factors: Data From Elderly Screening in West Sumatera Indonesia

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The European Conference on Aging & Gerontology 2026
Official Conference Proceedings

Abstract

Stroke is the second leading cause of death globally and a major contributor to long-term disability, with risk increasing markedly in older adults. In Indonesia, particularly in West Sumatra Province, the prevalence of stroke among the elderly is higher than the national rate, highlighting the need for early risk detection. This study aimed to identify stroke risk factors and determine their relationship with stroke risk levels among the elderly in Nagari Gurun Panjang Utara, Pesisir Selatan Regency. An analytical cross-sectional design was used involving 100 elderly participants selected through purposive random sampling. Data were collected using the Stroke Risk Scorecard from the National Stroke Association, assessing blood pressure, atrial fibrillation, smoking, cholesterol, diabetes, physical activity, body weight, and family history. Statistical analysis examined associations and odds ratios (OR) between risk factors and stroke risk level. Results showed that 55% of respondents were at high risk of stroke. Significant factors associated with stroke risk included high blood pressure (OR = 7.875), atrial fibrillation (OR = 4.861), smoking (OR = 3.756), high cholesterol (OR = 4.500), lack of exercise (OR = 7.292), obesity (OR = 9.220), and family history (OR = 7.980), while diabetes was not significant ($p = 0.198$). These findings emphasize the importance of early screening and lifestyle modification to prevent stroke in the elderly.

Keywords: stroke, elderly, risk scorecard questionnaire, risk factors

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Introduction

Every year, 14.5 million people experience a stroke, 5.5 million people die, and 80 million people suffer from post-stroke disability. One in four people experience a stroke in their lifetime (Kharaba et al., 2024). Half of strokes occur in those over the age of 65 (Hastuti et al., n.d.). Stroke is the fifth leading cause of death and disability in United States (Ferrone et al., 2022). Stroke is one of the non-communicable diseases that causes death and disability in Indonesia (Elendu et al., 2023). In addition to causing death and disability, stroke can increase the burden of health costs borne by families and the state, including treatment that is often long and expensive. In the United States, the average lifetime cost of ischemic stroke per person, which includes inpatient care, rehabilitation, and follow-up care, is estimated to reach \$140,048 (Kleindorfer et al., 2021).

In Indonesia, from BPJS data in 2016, the Jaminan Kesehatan Nasional (JKN) which is National Health Insurance cost burden for stroke in 2015 was IDR 1.15 trillion and increased to IDR 1.27 trillion in 2016. There was a 10.4% increase in financing for stroke within a period of 1 year (Hasnah et al., 2023). The world's elderly population is increasing rapidly. In 2019, the number of elderly people in the world was 1 billion, projected to be 1.4 billion in 2030 and 2.1 billion in 2050 (P2PTM Kemenkes RI, 2018).

Indonesia is entering an aging population structure, where 10% of the population is aged 60 years and over P2PTM Kemenkes RI, (2018). The number of elderly population is projected to increase from 27.1 million people (10.7%) in 2020, to 33.7 million people (12.5%) in 2025 and to 48.2 million people (16.6%) in 2035. There are 9.92% or 26.82 million elderly people in 2020 in Indonesia, and in West Sumatra there are 10.07% or 524.2 thousand elderly people, an increase from 9.3% or 476.5 thousand people in 2017 (Rahayu et al., 2022). The increase in the elderly population is accompanied by an increase in non-communicable diseases, chronic diseases and degenerative diseases. According to Indonesia's Basic Health Research or Riset Kesehatan Dasar (RISKESDAS) 2018 the 10 most common non-communicable diseases suffered by the elderly are hypertension, arthritis, stroke, COPD, diabetes mellitus, cancer, coronary heart disease, kidney stones, heart failure, and kidney fail. Several non-communicable diseases are risk factors for stroke such as hypertension, diabetes mellitus, dyslipidemia (high cholesterol), heart disease (atrial fibrillation). The most effective strategy for stroke prevention currently proposed is the strategy of all populations and high-risk individuals. The main priorities for effective primary stroke prevention are a comprehensive approach to people with all levels of risk of cardiovascular disease (CVD) events, a focus on behavioral and lifestyle risk factors, providing incentives to health professionals and patients, implementing mobile technology (electronic health information technology) for use by health professionals and lay people, and implementing culturally appropriate education from an early age (Feigin et al., 2023).

In Indonesia, for stroke control, the government provides pre-stroke services available at the Puskesmas (Pusat Kesehatan Masyarakat) or Community Health Center) Posbindu PTM (Pos Pembinaan Terpadu Penyakit Tidak Menular) or Integrated Guidance Post for Non Communicable Diseases, and health clinic, which are served by general practitioners, nurses and health cadres. Pre-stroke services are early detection activities, discovery, and monitoring of stroke risk factors in healthy and at-risk individuals in the community (Candelaresi et al., 2023). Screening for stroke risk factors is important in the elderly to prevent them from having a stroke. Therefore, this study aimed to identify stroke risk factors among older adults (≥ 60

years), determine the prevalence of high stroke risk, and assess the strength of associations between each factor and risk level.

Methodology

The Stroke Risk Scorecard from the National Stroke Association is a stratification tool or assessment tool of stroke risk factors that self reported, or self-reported-stroke-risk-function (SRSRF) that used for primary stroke prevention. SRSRF has the advantage of being explicitly used to find high-risk patients/subjects. This SRSRF instrument can be used clinically to easily identify individuals at high risk for stroke and scientifically as part of a primary stroke prevention trial by identifying subpopulations rich in stroke risk. The risk factors assessed in this Stroke Risk Scorecard are blood pressure, symptoms of atrial fibrillation, smoking, cholesterol, history of diabetes, exercise/physical activity, weight, and family history of stroke.

The study was conducted for six months, starting from July to December 2024 in Nagari Gurun Panjang Utara, Kecamatan Bayang, Kabupaten Pesisir Selatan, Province Sumatera Barat. This study is a quantitative analytical study with a cross-sectional design. The population is all elderly people living in Nagari, totalling 485 elderly people. The sample size is calculated using the Slovin' formula of 83 elderly people. To ensure greater representativeness, the number of samples is rounded up to 100 elderly people.

The data collection was carried out by five medical students trained as enumerators. In the first stage, risk factor data was collected using the Stroke Risk Scorecard questionnaire from the National Stroke Association which had been modified. There are eight risk factor data asked: 1) blood pressure, (2) atrial fibrillation/heart rate, (3) smoking, (4) cholesterol, (5) diabetes, (6) exercise, (7) diet/weight, and (8) family history of stroke.

Indicators at this stage have collected 100 elderly data by trained enumerators. In the second stage, data input, editing and coding of data were carried out. In the third stage, data analysis was carried out.

The research data analyzed using the Statistical Product and Service Solution (SPSS) program version 26.0. Univariate analysis was conducted to describe the characteristics of the elderly, risk factors and risk levels in frequency distribution with percentage measures. Bivariate analysis was conducted to explain whether there was a relationship between each risk factor and risk level using the Chi-square statistical test with a 95% confidence level. Furthermore, an analysis of the strength of the relationship between each risk factor and risk level was conducted using the Odds Ratio (OR). To obtain the Odds Ratio (OR) value, the risk factor and risk level data were used as qualitative binary data.

This study received approval from the Health Research Ethics Committee of the Faculty of Medicine, University of Baiturrahmah Padang with a certificate number 066/ETIK-FKUNBRAH/03/08/2024.

Results and Discussion

Characteristis of the Elderly

By using a sociodemographic questionnaire conducted with structured interviews, the following characteristics of the elderly were obtained.

Table 1*Characteristics of the Elderly (n = 100)*

Characteristics	F*	(%)	95% CI*
Age			
• Young elderly (60–69 years)	59	59	47.7–69.9
• Middle elderly (70–79 years)	28	28	16.6–38.9
• Old elderly (80 ≥ years).	13	13	5.6–19.4
Gender			
• Male	28	28	19.0–36.0
• Female	72	72	64.0–81.0
Education			
• Elementary school	67	67	59.0–77.0
• Junior high school	16	16	9.6–23.9
• High school	15	15	8.6–23.0
• University	2	2	0.0–5.0
Previous occupation			
• Civil servant	3	3	0.0–6.0
• Private employee	7	7	3.0–11.9
• Selling/Farming	64	64	54.0–75.4
• Not working	26	26	15.0–35.0
Lives with			
• Alone	28	28	19.1–40.4
• With children	59	59	49.0–67.4
• With neighbors	0	0	--
• With distant relatives	13	13	8.0–21.0
Living expenses covered:			
• Alone	37	37	26.6–49.4
• Children	55	55	42.0–64.3
• Village assistance	4	4	1.0–8.0
• Relatives assistance	4	4	0.6–8.0

Note. *f = frequency, CI = Confidence Interval

Based on table 1, it can be conclude that the characteristics of 100 elderly people living in Nagari-Gurun-Panjang-Utara, Kabupaten-Pesisir-Selatan, West Sumatra Province are as follows: The characteristics of the elderly are age 60-69 (59%), female (72%), low education (elementary school) (67%), previous occupations in selling/farming (64%), living with children (59%), and living expenses borne by children (55%). These results are in line with Badan Pusat Statistik (BPS) or Central Statistics Agency, Elderly Population Statistics data in 2022 where the majority of Indonesian elderly people are classified as young elderly (60–69 years) as much as 65.56% female elderly people are more numerous than male (51.81 percent compared to 48.19%). About half of the elderly have a low level of education, consisting of elementary school graduates/equivalent (33.39%) or not graduated from elementary school/equivalent (28.42%), more than half of the elderly (54.18%) work in the agricultural sector. Most of the elderly meet their living needs from their own income or from fellow household members who

live together (82.99 % percent), the majority of the elderly live in their own homes or fellow children's household members (93.00%).

Frequency Distribution of Stroke Risk Factors in the Elderly

By using the modified Stroke Risk Scorecard questionnaire, the frequency distribution of stroke risk factors in the elderly is as follows.

Table 2
Frequency Distribution of Stroke Risk Factors in the Elderly

Stroke Risk Factors	<i>f</i> *	(%)	95% CI*
1. Blood pressure			
A. High or ($\geq 140/90$) or Don't know	50	50	39.6–60.4
B. Normal or (120–139 /80–89)	40	40	27.7–50.3
C. Low or $< 120/80$	10	10	5.0–17.3
2. Atrial Fibrillation / Heartbeat			
A. Irregular heartbeat	37	37	27.0–47.7
B. Don't know	6	6	1.6–11.4
C. Regular heartbeat	57	57	45.7–69.0
3. Smoking			
A. Smoker	18	18	10.6–26.9
B. Trying to Quit	5	5	1.0–10.0
C. Non-smoker	77	77	68.1–84.4
4. Cholesterol			
A. High or (≥ 240) or don't know	77	77	66.6–84.0
B. Slightly high or (200–239)	10	10	4.6–16.4
C. Normal or (< 200)	13	13	7.0–20.0
5. Diabetes			
A. Yes	7	7	2.6–13.0
B. Uncertain	4	4	1.0–9.0
C. None	89	89	81.1–94.0
6. Exercise			
A. None	52	52	41.0–62.0
B. 1-2x per week	39	39	29.0–49.4
C. 3-4x per week	9	9	3.6–16.0
7. Weight			
A. Overweight / Obesity	7	7	2.0–12.4
B. Slightly overweight	16	16	9.0–24.4
C. Normal weight	77	77	67.6–85.0
8. Family history of stroke			
A. Yes	10	10	4.6–16.0
B. Uncertain	2	2	0.0–5.0
C. None	88	88	82.1–94.0

Note. **f*= frequency, CI = Confidence Interval

Based on table 2 above, it can be concluded that the risk factors for stroke in 100 elderly people living in Nagari-Gurun-Panjang-Utara, Kabupaten-Pesisir-Selatan, West Sumatra Province, in order of the most risk factors as follows: 1) high cholesterol (dyslipidemia) 77%, 2) no exercise or physical activity 52%, 3) high blood pressure 50%, 4) atrial fibrillation / irregular heartbeat 37%, 5) smokers 18%, 6) family history of stroke 10%, 7) obesity 7%, and 8) diabetes 7%. These results are in accordance with the research of Zhang F.L. (2017) which found 3 dominant cerebrovascular risk factors in residents of Dehui City, Jilin Province 1) dyslipidemia 62.1%, smoking 61.8%, and hypertension 57.3%. The difference in Nagari Gurun Panjang Utara, Kabupaten Pesisir Selatan, West Sumatra Province, the second rank is the risk factor of no exercise or physical activity 52%. Smoking is the 5th ranked risk factor in Nagari-Gurun-Panjang-Utara, Kabupaten-Pesisir-Selatan, West Sumatra Province. We estimate that this is due to the lifestyle of the residents of Dehui City, Jilin Province (city/smokers) and the residents of in Nagari-Gurun-Panjang-Utara, Kabupaten-Pesisir-Selatan, West Sumatra Province.

In contrast to the research of Ganguly et al., 2021 on 255 patients at Sultan Qaboos University Hospital and Muscat Royal Hospital, Oman, which found that 3 dominant risk factors were a family history of stroke, followed by hypertension and dyslipidemia. In Nagari Gurun Panjang Utara, Kabupaten Pesisir Selatan, West Sumatra Province, the risk factor for a family history of stroke was 10% in sixth place. Meanwhile, the risk factors for hypertension and dyslipidemia were both in the top 3 in Oman and in Nagari Gurun Panjang Utara, Kabupaten-Pesisir-Selatan, West Sumatra Province. We estimate that this is because in addition to differences in genetic factors, there are differences in family life style kinship ties. In Nagari-Gurun-Panjang-Utara, Kabupaten Pesisir Selatan, West Sumatra Province, when children are adults, many do 'marantau', a West Sumatera language meaning go to the city leaving their families in village to work. Elderly people who live in the village due to age factors are lazy to do activities outside the house. That is why the risk factor of no exercise or physical activity is ranked second among the risk factors of the elderly in Nagari Gurun Panjang Utara, Kabupaten Pesisir Selatan, West Sumatra Province.

Prevalence of RISTI Elderly

Using the modified Stroke Risk Scorecard questionnaire, the prevalence of RISTI elderly was obtained as follows.

Table 3

Prevalence of RISTI Elderly

Stroke Risk Levels in the Elderly	<i>f</i> *	(%)	95%CI*
A. Low Risk Elderly	38	38	27.6–46.9
B. Medium Risk Elderly (Alert)	7	7	2.0–13.4
C. High Risk Elderly (RISTI Elderly)	55	55	45.1–65.0

Note. **f*= frequency, CI = Convindence Interval

Based on table 5.3 above, it can be seen the level of stroke risk owned by 100 elderly people living in Nagari Gurun Panjang Utara, Kabupaten Pesisir Selatan, West Sumatra Province, is as follows: the majority of elderly people have a high risk level (RISTI) of 55 people (55%). The results of this study are the same as the results of the study by Sultradewi Kesuma et al. (2019) at Klungkung Hospital, Bali, which studied risk factors and risk levels of stroke also used the Stroke Risk Scorecard from the National Stroke Association, with the results that

78.5% of respondents were at high risk¹⁹. This is different from the study by Srywahyuni et al. (2019) entitled Use of Scorecards for Stroke Risk Factor Analysis in West Sumatra, Indonesia, which found that high-risk respondents were only 20.5%. ²⁰

Relationship of Risk Factors With Stroke Risk Level in the Elderly and Strength of Relationship Using Odds Ratio

Bivariate analysis was performed to assess the relationship between each risk factor and the risk level using the Chi-Square test (95% CI) and the strength of the relationship using the Odds Ratio (OR). To obtain the Odds Ratio (OR) value, the risk factor and risk level data were used as qualitative binary data. The results of the bivariate analysis are as follows.

Table 4

Relationship Between Risk Factors and Risk Levels of Stroke in the Elderly

Stroke Risk Factors	Stroke Risk Levels		<i>p-value</i>	OR 95% CI Lower-Upper
	High <i>f</i> %	Low <i>f</i> %		
1. Blood pressure				
A. High or ($\geq 140/90$) or don't know	42 67.7	8 21.1	0.0001	7.875
B. Normal or ($\geq 140/90$)	20 32.3	30 78.9		3.063–20.247
2. AF/Heartbeat				
A. Irregular heartbeat	35 56.5	8 21.1	0.001	4.861
B. Regular heartbeat	27 43.5	30 78.9		1.923–12.290
3. Smoking				
A. Smoker	19 30.6	4 10.5	0.038	3.756
B. Non-smoker	43 69.4	34 89.5		1.168–12.080
4. Cholesterol				
A. High or (≥ 240) or don't know	58 93.5	29 76.3	0.028	4.500
B. Normal or (< 240)	4 6.5	9 23.7		1.277–15.854
5. Diabetes				
A. Yes	9 14.5	2 5.3	0.198	Not Related
B. No	53 85.5	36 94.7		
6. Exercise/Physical Activity				
A. No.	43 69.4	9 23.7	0.000	7.292
B. Yes	19 30.6	29 76.3		2.899–18.343

7. Weight				
A. Overweight / Obese	21	2		9.220
	33.9	5.3		
B. Normal weight	41	36	0.002	2.021–42.066
	66.1	94.7		
8. Family History of Stroke				
A. Yes	11	1		7.890
	17.7	2.6%		
B. No	51	37	0.027	0.987–64.547
	82.3	97.4		

Of the 8 stroke risk factors, only Diabetes Mellitus showed no significant relationship with stroke risk level ($p = 0.198$). The other risk factors were significantly related to stroke risk level: 1) blood pressure ($p = 0.000$, OR = 7.875), 2) atrial fibrillation ($p = 0.001$, OR = 4.861), 3) smoking ($p = 0.038$, OR = 3.756), 4) cholesterol ($p = 0.028$, OR = 4.500), 5) physical inactivity ($p = 0.000$, OR = 7.292), 6) body weight ($p = 0.002$, OR = 9.220), and 7) family history of stroke ($p = 0.027$, OR = 7.980).

Zhang et al. (2017) study found that the 3 most influential risk factors were family history of stroke, obesity and hypertension with odds ratios of 7.177, 4.389 and 3.647 respectively.²¹ In contrast to Bierbower et al. (2023) found that risk factors associated with stroke in the elderly with Heart Failure were in the following order: 1) age, 2) gender, 3) race (HR 1.64, 95% CI 1.21–2.25). 4) tobacco, 5) alcohol, 6) physical activity (HR 1.63, 95% CI 1.21–2.24), 7) hypertension, 8) atrial fibrillation, 9) myocardial infarction, and 10) diabetes mellitus (HR 1.26, 95% CI 0.92 to 1.72).²² Yi X. et al (2020) study on 17,413 Chinese residents aged ≥ 40 found that RISTI was 17.1%, and the largest contributing stroke risk factors were hypertension (23.6%), followed by dyslipidemia, lack of physical activity, family history of stroke, diabetes, and overweight. Similar to this study, Yi et al. (2020) study also found 3 dominant risk factors, namely hypertension, dyslipidemia, and lack of exercise.

In this study, of the 8 risk factors for stroke, only the risk factor for Diabetes Mellitus had no relationship with the risk level of stroke in the elderly with a p -value = 0.198. In our opinion, in addition to being caused by genetic factors, the lifestyle factors of the residents of Nagari Gurun Panjang Utara, Kabupaten Pesisir Selatan, West Sumatra Province, such as their preference for coconut milk-based foods over sweet foods, may contribute to the high prevalence of dyslipidemia. This observation is based on local dietary habits, and further research is needed to explore this relationship in more detail.

Conclusion

The results of screening 100 elderly people living in Nagari-Gurun-Panjang-Utara, Kabupaten-Pesisir-Selatan, West Sumatra Province are as follows: Characteristics of the elderly: the majority of the elderly are in the age group of 60–69 years (Young Elderly), female, have a low level of education (elementary school), previous occupations were selling/farming, live with children, and living expenses are borne by children. The risk factors for stroke in the elderly in order from the most common risk factors are 1) high cholesterol, 2) no exercise or physical activity, 3) high blood pressure, 4) Atrial Fibrillation/irregular heartbeat, 5) smokers, 6) family history of stroke, 7) obesity, and 8) diabetes. Prevalence of elderly RISTI 55%. The relationship between risk factors and stroke risk levels shows that 7 out of 8 risk factors are significantly associated with stroke risk in the elderly. These factors include: 1) high blood

pressure ($p = 0.000$, $OR = 7.875$), 2) atrial fibrillation ($p = 0.001$, $OR = 4.861$), 3) smoking ($p = 0.038$, $OR = 3.756$), 4) cholesterol ($p = 0.028$, $OR = 4.500$), 5) physical inactivity ($p = 0.000$, $OR = 7.292$), 6) body weight ($p = 0.002$, $OR = 9.220$), and 7) family history of stroke ($p = 0.027$, $OR = 7.980$). In contrast, Diabetes Mellitus showed no significant relationship with stroke risk ($p = 0.198$).

Acknowledgements

The authors would like to express their sincere gratitude to the elderly participants of Nagari Gurun Panjang Utara for their cooperation and willingness to take part in this study. Appreciation is also extended to the local health workers, Posbindu cadres, and community leaders who provided valuable support during the data collection process. The authors acknowledge the contribution of the trained enumerators and medical students for their assistance in fieldwork. Finally, the authors thank the Faculty of Public Health and all parties who contributed directly or indirectly to the completion of this research.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The author declares that no AI or AI-assisted technologies have been used to generate, refine, or correct the content in the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

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