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The Relationship between the Length of Seeking Help and the Severity of Stroke Patients

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Abstract
The length of time a stroke patient seeks help from health services plays an important role in the successful treatment of stroke patients. The golden period for stroke treatment is approximately only 3 hours from the start of the attack. Once an attack occurs, the patient must receive comprehensive therapy so that the degree of nerve damage is not severe. The aim of the research was to determine the relationship between the length of time seeking help and the severity of stroke patients at RSUD dr. Loekmono Hadi Kudus. This research is descriptive analytical with a cross-sectional approach. The research sample was taken using a purposive sampling technique. A sample of 65 respondents was obtained. The instruments used were observation sheets and the NIHSS questionnaire, while statistical tests used Spearman Rank. There is a significant relationship between the length of time seeking help and the severity of stroke patients (p-value <0.05). More than half of the respondents sought help from health services after the golden period (>3 hours), and more than half of the respondents experienced a serious stroke. Respondents' or families' ignorance of the signs and symptoms of stroke, as well as consideration of treatment costs, are the dominant factors in patients missing their golden years. Therefore, educating the public about stroke, especially the signs and symptoms of stroke, is very important so that the public can immediately take patients to the hospital. Future researchers are expected to conduct qualitative research to explore knowledge and responses to stroke attacks.

Keywords: length of seeking help; response time; severity of stroke

1. Introduction

Stroke is a neurological emergency that often happens to anyone with high rates of morbidity and mortality. A stroke will happen when a brain blood vessel ruptures or becomes blocked. As a result, part of the brain loses the blood supply that carries the necessary oxygen and causes cell and tissue death (Kementerian Kesehatan RI, 2018). Data from the World Stroke Organization shows that the global prevalence of stroke in 2019 reached 101.5 million (Feigin et al., 2022). For almost three decades (1990-2019), there has been an increase in stroke cases up to 70%, with mortality and disability-adjusted life-years lost (DALYs) rates of 34% and 143%, respectively (Feigin et al., 2022). Results of studies on basic health explain that the prevalence of stroke in Indonesia in 2018 was 10.9 % or 713,783 people (Kementerian Kesehatan RI, 2019). The prevalence of stroke in Central Java in the period of 2020-2021 has increased by 30.7% from 42,376 in 2020 to 55,412 in 2021 (Dinas Kesehatan Provinsi Jawa Tengah, 2022; Dinas Kesehatan Provinsi Jawa Tengah, 2023). The results of the preliminary study at the regional general hospital, RSUD Dr. Loekman Hadi Kudus, found a very significant increase in the number of stroke patients, reaching 89% from 493 patients (2021) to 932 (2022).

In 2019, stroke became the third leading cause of disability and the second leading cause of death in the world (Feigin et al., 2021). Some literature also confirmed that stroke is closely related to disability, decreased productivity, increased risk of depression, decreased quality of life, and economic burden (Hackett & Pickles, 2014; Lekander et al., 2017; Ramos-Lima et al., 2018; Sarfo et al., 2019; Vyas et al., 2016). The increasing economic burden due to stroke is not only felt by patients or their families but also by the government, especially regarding the burden of health financing. BPJS

Healthcare has claimed financing for 2.54 million stroke cases, with total claims reaching IDR 3,23 trillion (BPJS Kesehatan, 2023). This makes stroke classified as a catastrophic disease with the third largest financing after heart disease and cancer (BPJS Kesehatan).

Stroke is an acute neurological disease belonging to the group of cerebrovascular (CVD) (Olvera Lopez et al., 2023). A stroke is caused by a brain blood vessel disorder that suddenly occurs and turns out to be an emergency, and requires immediate treatment (Khaku & Tadi, 2023). The time spent bringing stroke patients to health services greatly determines the success of stroke patient treatment (Kusyani, 2019). The golden period in stroke treatment is approximately three hours from the beginning of the attack (Ishariani & Rachmania, 2021). Patients must also immediately get comprehensive and optimal therapy from the hospital emergency team to prevent more severe nerve damage (Kusyani, 2019).

There are some factors that make stroke patients come late to the hospital, one of which is the patients and their families (Ellis, 2013). Factors from patients and family include several things, such as a lack of knowledge about symptoms or signs of stroke, a lack of understanding of stroke as a medical emergency that needs immediate treatment, a long decision due to waiting for family agreement, and the availability of inadequate transportation (Rachmawati et al., 2017). The issue of the relationship between the length of time spent seeking help and the severity of stroke patients is quite interesting to study. It is important considering that the public rarely knows the response of stroke patients to seeking help. Most people usually seek help when the body's condition begins to deteriorate. This study is aimed at determining the relationship between the length of time spent seeking help and the severity of stroke patients.

2. Research Methods

This is a research study of analytical descriptiveness with a cross-sectional approach. The study was conducted at the emergency and Inpatient Installation of RSUD dr. Loekmono Hadi Kudus, Central Java Province. The population of this study was all stroke patients at RSUD dr. Loekmono Hadi Kudus in January – December 2022, totaling 932 patients. The sampling technique of this study used purposive sampling with the following inclusion criteria: patients with suspected stroke, hemorrhagic stroke, and ischemic stroke accompanied by family; stroke patients with infarction evidenced by CT-Scan photos; patients in treatment for no more than three days; willingness to be respondents; and ablility to join the research to the final stage. While the exclusion criteria are stroke patients or family members refusing to participate in the study. The Sample size in this study is 65 respondents.

Data was collected on April 4-18, 2023, and was carried using observation sheets and questionnaires. The observation sheets consist of complaints, time of attack, time to seek help from health service, and NIHSS conclusions. The questionnaire used in this study is the stroke severity questionnaire of the National Institute of Health Stroke Scale (NIHSS). There are 11 neurological examination items in the NIHSS questionnaire, such as level of consciousness, speech and language function, vision function, eyeball movement, facial symmetry, motor strength, sensation, and coordination (Wandira et al., 2018). The interpretation of the examination using the NIHSS instrument is as follows: a mild stroke when the NIHSS score is 0 – 8, a moderate stroke when the NIHSS score is 9-15, and a severe stroke when the NIHSS score is > 16 (Muchada et al., 2014). The validity and reliability test of the NIHSS was done by Saudin & Rajin (2017). The validity test of the NIHSS instrument yielded a value of 0.89, and more than 90 % of the NIHSS value is within 5 points with a high level of validity and a Cronbach alpha value of 0.81. It is all indicated that the NIHSS has proven reliable. Spearman Rank was used in the test of statistics. The Research Ethics Committee of STIKES Telogorejo Semarang has given ethical approval for this research as it was marked by the issuance of No. 001/III/KE/STIKES/2023.

3. Results and Discussion

3.1. Respondent Characteristics

Most of the respondents in this research were female (58.8%), elderly or in the range of 46-65 years (66.2%), an elementary school education level (73.3%), and had a history of hypertension (53.8%). These characteristics owned by the respondents are clearly shown in Table 1.

Table 1. Characteristics of Respondents

Variable	Frequency (f)	Percentage (%)
Gender		
Male	27	41.5
Female	38	58.8
Age		
Adult (36-45 years)	6	9.2
Elderly (46-65 years)	43	66.2
Old (> 65 years)	16	24.6
Education		
Elementary School	47	73.3
Junior High School	13	20.0
Senior High School	5	7.7
College/University	0	0
Medical History		
No history	7	10.8
Hypertension	35	53.8
Diabetes Mellitus	10	15.4
Hipertensi-Diabetes Mellitus	13	20.0
Total	**65**	**100**

Source: primer, 2023

The majority of respondents in this study were female (58.8%). In contrast to this study, results obtained from previous research show that men are more likely to suffer strokes (El Nahas et al., 2023; Keller et al., 2018; Mondal et al., 2022; Yi et al., 2020). Madsen et al. (2020) found that stroke cases in men increased at the age of 20-44 years. Some risk factors are associated with an increased incidence of stroke at a young age, such as hypertension, diabetes mellitus, alcohol consumption, stress, smoking, lack of physical activity, and obesity (Aigner et al., 2017; Aslam et al., 2022; Khan et al., 2023). Men have a higher risk of stroke incidence at certain ages. Despite this, women have a lifetime risk, a recurrent risk of stroke, a risk of disability, and a higher risk of death from stroke compared to men. (Arba et al., 2017; Girijala et al., 2017; Jacobs & Ellis, 2021). Referring to some research results, it was found that some unique factors may be the cause of the high-risk stroke in women. These factors include the following: women's life expectancy is higher (Girijala et al., 2017; Madsen et al., 2018); hypertension and atrial fibrillation (risk factors for stroke) are more prevalent in women (Corbière & Tettenborn, 2021; Rexrode et al., 2022); pregnancy, hypertension in pregnancy, gestational diabetes, use of oral contraceptive, menopause and hormone replacement therapy (Corbière & Tettenborn, 2021; Demel et al., 2018; Girijala et al., 2017).

The respondents of this study were mostly elderly group (46-65 years), as much as 66.2%. According to Yousufuddin & Young (2019), the risk of stroke will increase up to twice every ten years after passing the age of 55 years. The results of the previous studies even reported that the risk of stroke increased up to 23.58 times in the age group of 41-64 years compared to the age group of 15-40 years (Rahayu, 2016). This confirms that the risk of stroke increases with age. Age and gender are irreversible

risk factors for stroke. Women are generally 4-6 years older than men during the first stroke (Madsen et al., 2020; Rexrode et al., 2022).

As women age, their higher life expectancy causes them to suffer more strokes as well as more deaths from strokes compared to men. Along with age, the function of the body's organs decreases, such as in the organs of blood vessels. The elasticity of blood vessels that begins to decrease will cause the accumulation of atherosclerosis, amyloid, and hyalinizing plaques. As a result, the lumen in blood vessels narrows and causes stroke (Banerjee & Chimowitz, 2017). As they enter old age, women usually experience the stage of menopause, which results in decreased production of the hormone estrogen (Demel et al., 2018). One of the functions of estrogen hormones is to prevent the formation of atherosclerosis plaques in blood vessels, including cerebral blood vessels (Meng et al., 202; Xie et al., 2022). When estrogen levels decrease, its work becomes less optimal, and its protective function continuously weakens. As a result, more atherosclerosis plaques will form in the end. If the plaque ruptures, thrombosis will occur. It is a thrombogenic process that causes platelet activation and the formation of coagulation pathways that can cause blockage in the lumen of blood vessels and strokes.

Almost three-quarters of the total respondents in this research had elementary school education, as much as 73.3%. The results of this study are not much different from the results of Yi et al. (2020) in China, where the majority of respondents are elementary school graduates. A lower level of education is associated with an increased risk of stroke (Jackson et al., 2018). In contrast, a higher level of education has a reduced risk of stroke (Xiuyun et al., 2020). Higher education allows people to access a wide range of information about stroke, get a better job, have easy access to health services, and live a healthier lifestyle. This possibility has an indirect effect on reducing the risk of stroke. In the context of this research, where education is associated with the level of knowledge and understanding of a person regarding stroke, it indicates one thing: the higher a person's education, the better their knowledge related to stroke will be, so that if any a stroke occurs it any time, it can be immediately brought to health services so as not to worsen the severity of stroke.

It was found in this study that half of the respondents had a history of hypertension, as much as 53.8%. Hypertension increases the risk of hemorrhagic stroke by 3 – 4 times (Yi et al., 2020; Zhang et al., 2017). Li et al. (2022) reported that hypertensive patients face a cumulative risk probability of stroke of 78.9%. The risk is characterized by four distinct peaks, which occur at the age of 8, 15, 22, and 26 years after suffering from hypertension, with probabilities of 4.2%, 14.0, 6.0%, and 13.9%, respectively. The risk of stroke in women due to hypertension is higher than in men (Madsen et al., 2019).

Controlling blood pressure can decrease the risk of stroke and prevent recurrent strokes (McCarthy et al., 2021). The risk of stroke and ischemic heart disease was reduced by 30% and 23%, respectively, with a ten mmHg decrease in systolic blood pressure and four mmHg in diastolic (Li et al., 2022). McCarthy et al. (2021) explained that stroke patients with a history of hypertension account for half of stroke patients, but more than three-quarters of them have poor blood pressure control (McCarthy et al., 2021). Even elderly women with high risk also experience the same thing (Corbière & Tettenborn, 2021). This is the importance of education, monitoring, and evaluation of hypertension treatment by health workers to ensure the certainty of hypertension management working optimally as an effort to carry out effective secondary prevention of stroke in this vulnerable population.

Table 2. Distribution of frequency of respondents based on length of seeking help in stroke patients

Characteristics	Frequency (f)	Percentage (%)
Length of Seeking Help		
< 3 hours	26	40.0
> 3 hours	39	60.0
Severity		

Characteristics	Frequency (f)	Percentage (%)
Mild Stroke	20	30.8
Moderate Stroke	12	18.5
Severe Stroke	33	50.8
Total	65	100

Source: primer, 2023

Table 2 shows that more than half of respondents, as much as 60%, seek help from the health service after passing the golden period (>3 hours). Research in Saudi Arabia shows a similar thing, where more than half of stroke patients experience delays when arriving at the hospital to get treatment (Al Khathaami et al., 2018). According to Rizaldy Pinzon (2019), most patients come to the hospital more than 24 hours after a stroke. This is due to a lack of knowledge about stroke and its symptoms, so they misinterpret the visible symptoms, consider the symptoms not to be serious, and hope that the symptoms will soon disappear. It causes the patient not to immediately get medical treatment, which causes the severity of the patient's stroke to worsen. Previous studies reported similarly that a lack of family knowledge about risk factors and warning of stroke symptoms caused stroke patients not to be immediately taken to the hospital (Rachmawati et al., 2017). The delay in having treatment for stroke patients has an impact on the severity of the patient. The ignorance of respondents or their families related to signs and symptoms of stroke, as well as consideration of the cost of hospital care, is the cause of respondents' failure to miss the golden period. It was known that more than half of the respondents in the study (50.8%) had a major stroke.

Table 3. Analysis of the length of seeking help with the severity of stroke patients at RSUD dr. Loekmono Hadi Kudus

Variable	N	R	p-Value
Length of Seeking Help and Severity of Stroke Patients	65	0.896	0.000

Source: primer, 2023

The analysis using the statistical test Spearman Rank (as shown in Table 3) presented a significant relationship between the length of seeking help and the severity of stroke patients. With a p-value < 0.05 (0.000) and r = 0.896, a positive correlation was obtained, which means a very strong relationship exists between the length of seeking help and the severity of stroke patients. Examining the severity of stroke includes neurological examination such as level of consciousness, speech and language functions, vision function, eyeball movement, facial symmetry, motor strength, sensation, and coordination (Wandira et al., 2018). As a result of the length of time spent seeking help, which is not in accordance with the golden period of stroke, the degree of severity suffered by patients in this study is in the form of an inability to speak or communicate.

One of the important keys to decreasing mortality and minimizing brain damage caused by stroke is to provide prompt and appropriate treatment. Fassbender et al. (2013) stated that the most recommended time for stroke patients is 3 – 4 hours, called the golden period. The stroke treatment that is done in more than the golden period, depending on the severity of the patient, will be permanent. The main purpose of stroke treatment in the golden period is to save brain tissue that lacks nutrients and oxygen supplies. Drugs for stroke are right when given during the golden period as a blockage destroyer.

Some factors that delay stroke patients arriving at a hospital so that they miss the golden period are as follows: education level, perception of stroke, unavailability of ambulance transportation, a lack of knowledge, economic factors, and difficult access to health services. The importance of knowledge of the golden period can reduce mortality and disability in stroke patients. Doing treatment properly while still in the golden period can prevent the worsening of the severity of stroke patients.

4. Conclusion

There was a significant relationship between the length of time spent seeking help and the severity of stroke patients, with a p-value < 0.05 (0.000). More than half of respondents sought help with health care after passing the golden period, and more than half of respondents had a major stroke. The ignorance of respondents or family regarding the signs and symptoms of stroke, as well as consideration of the cost of hospital care, are the main factors of patients missing the golden period. Educating the public about stroke, especially signs of stroke symptoms is important so that they can immediately take patients to a hospital. This study was supposed to carry out this research in the emergency room only, but due to time constraints and to meet 65 respondents, it was conducted in the emergency room and the patient room. Research conducted in the emergency room faced difficulties digging deeper into the factors that slow patients from seeking help because respondents and families are in an anxious atmosphere. Many patients and families are closed, especially in the emergency room where documentation is impossible. For further researches, qualitative research on family knowledge and factors related to family response to stroke is suggested.

References

Aigner, A., Grittner, U., Rolfs, A., Norrving, B., Siegerink, B., & Busch, M. A. (2017). Contribution of Established Stroke Risk Factors to the Burden of Stroke in Young Adults. *Stroke*, *48*(7), 1744–1751. https://doi.org/10.1161/STROKEAHA.117.016599

Al Khathaami, A. M., Mohammad, Y. O., Alibrahim, F. S., & Jradi, H. A. (2018). Factors associated with late arrival of acute stroke patients to emergency department in Saudi Arabia. *SAGE Open Medicine*, *6*, 2050312118776719. https://doi.org/10.1177/2050312118776719

Arba, F., Quinn, T., Hankey, G. J., Inzitari, D., Ali, M., Lees, K. R., & VISTA Collaboration. (2017). Determinants of post-stroke cognitive impairment: Analysis from VISTA. *Acta Neurologica Scandinavica*, *135*(6), 603–607. https://doi.org/10.1111/ane.12637

Aslam, A., Khan, U., Niazi, F., & Anwar, I. (2022). Etiology and risk factors of stroke in young adults: A multicentric study. *Annals of Medicine and Surgery*, *82*, 104647. https://doi.org/10.1016/j.amsu.2022.104647

Banerjee, C., & Chimowitz, M. I. (2017). Stroke Caused by Atherosclerosis of the Major Intracranial Arteries. *Circulation Research*, *120*(3), 502–513. https://doi.org/10.1161/CIRCRESAHA.116.308441

BPJS Kesehatan. (2023). *Laporan Pengelolaan Program dan Keuangan BPJS Kesehatan Tahun 2022*. BPJS KEeehatan RI. https://web.bpjs-kesehatan.go.id/uploads/information/07082023034741-24f2a7ac-758a-48c5-99c1-d4e261418101.pdf

Corbière, S., & Tettenborn, B. (2021). Stroke in women: Is it different? *Clinical and Translational Neuroscience*, *5*(1), 2514183X211014514. https://doi.org/10.1177/2514183X211014514

Demel, S. L., Kittner, S., Ley, S. H., McDermott, M., & Rexrode, K. M. (2018). Stroke Risk Factors Unique to Women. *Stroke*, *49*(3), 518–523. https://doi.org/10.1161/STROKEAHA.117.018415

Dinas Kesehatan Provinsi Jawa Tengah. (2022). *Profil Kesehatan Jawa Tengah Tahun 2021*. https://dinkesjatengprov.go.id/v2018/dokumen/Profil_Kesehatan_2021/files/downloads/Profil%20Kesehatan%20Jateng%202021.pdf

Dinas Kesehatan Provinsi Jawa Tengah. (2023). *Profil Kesehatan Provinsi Jawa Tengah Tahun 2022*. Dinas Kesehatan Provinsi Jawa Tengah. https://jateng.bps.go.id/publication/2023/05/30/be07aa22ae941fcedfa8aeca/profil-kesehatan-provinsi-jawa-tengah-2022.html

El Nahas, N., Aref, H., Kenawy, F. F., Georgy, S., Abushady, E. M., Dawood, N. L., Hamdy, S., Abdelmohsen, N., Hassan Abdel Hamid, Y., Roushdy, T., & Shokri, H. (2023). Stroke in women: Experience in a developing country. *BMC Neurology*, *23*(1), 271. https://doi.org/10.1186/s12883-023-03314-3

Ellis, C. (2013). In-hospital delays for stroke care: Losing sight of patient-centered care. *European Journal for Person Centered Healthcare*, *1*(2), Article 2. https://doi.org/10.5750/ejpch.v1i2.673

Fassbender, K., Balucani, C., Walter, S., Levine, S. R., Haass, A., & Grotta, J. (2013). Streamlining of prehospital stroke management: The golden hour. *The Lancet. Neurology*, *12*(6), 585–596. https://doi.org/10.1016/S1474-4422(13)70100-5

Feigin, V. L., Brainin, M., Norrving, B., Martins, S., Sacco, R. L., Hacke, W., Fisher, M., Pandian, J., & Lindsay, P. (2022). World Stroke Organization (WSO): Global Stroke Fact Sheet 2022. *International Journal of Stroke*, *17*(1), 18–29. https://doi.org/10.1177/17474930211065917

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., Abualhasan, A., Abu-Rmeileh, N. M., Abushouk, A. I., Adebayo, O. M., Agarwal, G., Agasthi, P., Ahinkorah, B. O., Ahmad, S., Ahmadi, S., … Murray, C. J. L. (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

Girijala, R. L., Sohrabji, F., & Bush, R. L. (2017). Sex differences in stroke: Review of current knowledge and evidence. *Vascular Medicine*, *22*(2), 135–145. https://doi.org/10.1177/1358863X16668263

Hackett, M. L., & Pickles, K. (2014). Part I: Frequency of depression after stroke: an updated systematic review and meta-analysis of observational studies. *International Journal of Stroke: Official Journal of the International Stroke Society*, *9*(8), 1017–1025. https://doi.org/10.1111/ijs.12357

Ishariani, L., & Rachmania, D. (2021). Hubungan Respon Time Keluarga dalam Membawa Pasien Stroke ke Pelayanan Kesehatan dengan Tingkat Keparahan Pasien Stroke. *The Indonesian Journal of Health Science*, *13*(1), Article 1. https://doi.org/10.32528/ijhs.v13i1.5274

Jackson, C. A., Sudlow, C. L. M., & Mishra, G. D. (2018). Education, sex and risk of stroke: A prospective cohort study in New South Wales, Australia. *BMJ Open*, *8*(9), e024070. https://doi.org/10.1136/bmjopen-2018-024070

Jacobs, M. M., & Ellis, C. (2021). Heterogeneity among women with stroke: Health, demographic and healthcare utilization differentials. *BMC Women's Health*, *21*(1), 160. https://doi.org/10.1186/s12905-021-01305-5

Keller, K., Geyer, M., Münzel, T., & Ostad, M. A. (2018). Gender-differences in prevalence and outcome of ischemic stroke and promoting factors of atrial thrombi. *Artery Research*, *22*(C), 68. https://doi.org/10.1016/j.artres.2018.05.004

Kementerian Kesehatan RI. (2019). *Laporan Riskesdas 2018 Nasional*. Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan Kementerian KesehatanRI. https://kesmas.kemkes.go.id/assets/upload/dir_519d41d8cd98f00/files/Hasil-riskesdas-2018_1274.pdf

Kementerian Kesehatan RI. (2018, July 4). *Apa itu Stroke? - Direktorat P2PTM*. https://p2ptm.kemkes.go.id/infographic-p2ptm/stroke/apa-itu-stroke

Khaku, A. S., & Tadi, P. (2023). Cerebrovascular Disease. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK430927/

Khan, M., Wasay, M., O'Donnell, M. J., Iqbal, R., Langhorne, P., Rosengren, A., Damasceno, A., Oguz, A., Lanas, F., Pogosova, N., Alhussain, F., Oveisgharan, S., Czlonkowska, A., Ryglewicz, D., & Yusuf, S. (2023). Risk Factors for Stroke in the Young (18–45 Years): A Case-Control Analysis

of INTERSTROKE Data from 32 Countries. *Neuroepidemiology*, *57*(5), 275–283. https://doi.org/10.1159/000530675

Kusyani, A. (2019). Hubungan Pengetahuan Keluarga Dengan Lama Waktu Kedatangan Pasien Stroke Iskemik Ke Igd Rsud Jombang. *Well Being*, *4*(1), 21–28.

Lekander, I., Willers, C., Euler, M. von, Lilja, M., Sunnerhagen, K. S., Pessah-Rasmussen, H., & Borgström, F. (2017). Relationship between functional disability and costs one and two years post stroke. *PLOS ONE*, *12*(4), e0174861. https://doi.org/10.1371/journal.pone.0174861

Li, A., Ji, Y., Zhu, S., Hu, Z., Xu, X., Wang, Y., & Jian, X. (2022). Risk probability and influencing factors of stroke in followed-up hypertension patients. *BMC Cardiovascular Disorders*, *22*(1), 328. https://doi.org/10.1186/s12872-022-02780-w

Madsen, T. E., Howard, G., Kleindorfer, D. O., Furie, K. L., Oparil, S., Manson, J. E., Liu, S., & Howard, V. J. (2019). Sex Differences in Hypertension and Stroke Risk in the REGARDS Study. *Hypertension*, *74*(4), 749–755. https://doi.org/10.1161/HYPERTENSIONAHA.119.12729

Madsen, T. E., Howard, V. J., Jiménez, M., Rexrode, K. M., Acelajado, M. C., Kleindorfer, D., & Chaturvedi, S. (2018). Impact of Conventional Stroke Risk Factors on Stroke in Women. *Stroke*, *49*(3), 536–542. https://doi.org/10.1161/STROKEAHA.117.018418

Madsen, T. E., Khoury, J. C., Leppert, M., Alwell, K., Moomaw, C. J., Sucharew, H., Woo, D., Ferioli, S., Martini, S., Adeoye, O., Khatri, P., Flaherty, M., De Los Rios La Rosa, F., Mackey, J., Mistry, E., Demel, S. L., Coleman, E., Jasne, A., Slavin, S. J., … Kleindorfer, D. O. (2020). Temporal Trends in Stroke Incidence Over Time by Sex and Age in the GCNKSS. *Stroke*, *51*(4), 1070–1076. https://doi.org/10.1161/STROKEAHA.120.028910

McCarthy, J., Yang, J., Clissold, B., Young, M. J., Fuller, P. J., & Phan, T. (2021). Hypertension Management in Stroke Prevention. *Stroke*, *52*(10), e626–e634. https://doi.org/10.1161/STROKEAHA.120.033990

Meng, Q., Li, Y., Ji, T., Chao, Y., Li, J., Fu, Y., Wang, S., Chen, Q., Chen, W., Huang, F., Wang, Y., Zhang, Q., Wang, X., & Bian, H. (2021). Estrogen prevent atherosclerosis by attenuating endothelial cell pyroptosis via activation of estrogen receptor α-mediated autophagy. *Journal of Advanced Research*, *28*, 149–164. https://doi.org/10.1016/j.jare.2020.08.010

Mondal, M. B. A., Hasan, A. T. M. H., Khan, N., & Mohammad, Q. D. (2022). Prevalence and risk factors of stroke in Bangladesh: A nationwide population-based survey. *ENeurologicalSci*, *28*, 100414. https://doi.org/10.1016/j.ensci.2022.100414

Muchada, M., Rubiera, M., Rodriguez-Luna, D., Pagola, J., Flores, A., Kallas, J., Sanjuan, E., Meler, P., Alvarez-Sabin, J., Ribo, M., & Molina, C. A. (2014). Baseline National Institutes of Health Stroke Scale–Adjusted Time Window for Intravenous Tissue-Type Plasminogen Activator in Acute Ischemic Stroke. *Stroke*, *45*(4), 1059–1063. https://doi.org/10.1161/STROKEAHA.113.004307

Olvera Lopez, E., Ballard, B. D., & Jan, A. (2023). Cardiovascular Disease. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK535419/

Rachmawati, D., Andarini, S., & Ningsih, D. K. (2017). Pengetahuan Keluarga Berperan terhadap Keterlambatan Kedatangan Pasien Stroke Iskemik Akut di Instalasi Gawat Darurat. *Jurnal Kedokteran Brawijaya*, 369–376. https://doi.org/10.21776/ub.jkb.2017.029.04.15

Rahayu, E. O. (2016). Perbedaan Risiko Stroke Berdasarkan Faktor Risiko Biologi pada Usia Produktif. *Jurnal Berkala Epidemiologi*, *4*(September 2016), 113–125. https://doi.org/10.20473/jbe.v4i1.113-125

Ramos-Lima, M. J. M., Brasileiro, I. de C., de Lima, T. L., & Braga-Neto, P. (2018). Quality of life after stroke: Impact of clinical and sociodemographic factors. *Clinics*, *73*, e418. https://doi.org/10.6061/clinics/2017/e418

Rexrode, K. M., Madsen, T. E., Yu, A. Y. X., Carcel, C., Lichtman, J. H., & Miller, E. C. (2022). The Impact of Sex and Gender on Stroke. *Circulation Research*, *130*(4), 512–528. https://doi.org/10.1161/CIRCRESAHA.121.319915

Rizaldy Pinzon, L. A. (2019). *Awas stroke!: Pengertian, gejala tindakan, perawatan dan pencegahan* (1st ed.). Penerbit Andi. http://repo.upertis.ac.id/984/

Sarfo, F. S., Agbenorku, M., Adamu, S., Obese, V., Berchie, P., & Ovbiagele, B. (2019). The Dynamics of Poststroke Depression among Ghanaians. *Journal of the Neurological Sciences*, *405*, 116410. https://doi.org/10.1016/j.jns.2019.07.028

Saudin, D., & Rajin, M. (2017). *METODE PENGKAJIAN NEUROLOGIS MENGGUNAKAN NATIONAL INSTITUTES OF HEALTH STROKE SCALE (NIHSS) PADA PASIEN STROKE DI INSTALASI GAWAT DARURAT DI RSUD DR ISKAK TULUNGAGUNG*. *1*(1).

Vyas, M. V., Hackam, D. G., Silver, F. L., Laporte, A., & Kapral, M. K. (2016). Lost Productivity in Stroke Survivors: An Econometrics Analysis. *Neuroepidemiology*, *47*(3–4), 164–170. https://doi.org/10.1159/000454730

Wandira, R. D., Amalia, L., & Fuadi, I. (2018). HUBUNGAN ANTARA DERAJAT KEPARAHAN STROKE DENGAN KEJADIAN STROKE-ASSOCIATED PNEUMONIA. *Majalah Kedokteran Neurosains Perhimpunan Dokter Spesialis Saraf Indonesia*, *35*(2), Article 2. https://doi.org/10.52386/neurona.v35i2.20

Xie, F., Li, X., Xu, Y., Cheng, D., Xia, X., Lv, X., Yuan, G., & Peng, C. (2022). Estrogen Mediates an Atherosclerotic-Protective Action via Estrogen Receptor Alpha/SREBP-1 Signaling. *Frontiers in Cardiovascular Medicine*, *9*, 895916. https://doi.org/10.3389/fcvm.2022.895916

Xiuyun, W., Qian, W., Minjun, X., Weidong, L., & Lizhen, L. (2020). Education and stroke: Evidence from epidemiology and Mendelian randomization study. *Scientific Reports*, *10*(1), Article 1. https://doi.org/10.1038/s41598-020-78248-8

Yi, X., Luo, H., Zhou, J., Yu, M., Chen, X., Tan, L., Wei, W., & Li, J. (2020). Prevalence of stroke and stroke related risk factors: A population based cross sectional survey in southwestern China. *BMC Neurology*, *20*(1), 5. https://doi.org/10.1186/s12883-019-1592-z

Yousufuddin, M., & Young, N. (2019). Aging and ischemic stroke. *Aging (Albany NY)*, *11*(9), 2542–2544. https://doi.org/10.18632/aging.101931

Zhang, F.-L., Guo, Z.-N., Wu, Y.-H., Liu, H.-Y., Luo, Y., Sun, M.-S., Xing, Y.-Q., & Yang, Y. (2017). Prevalence of stroke and associated risk factors: A population based cross sectional study from northeast China. *BMJ Open*, *7*(9), e015758. https://doi.org/10.1136/bmjopen-2016-015758