

IDENTIFICATION RISK FACTORS OF STROKE: LITERATURE REVIEW

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Abstract:

State spending to deal with stroke is quite large every year due to the high incidence of stroke. Data from the Ministry of Health of Indonesia mentions an increasing number in health financing every year, the country financed stroke services by 2.56 trillion in 2018. The magnitude of the incidence of stroke can be lowered by controlling the risk factors of stroke. This study aimed to identify stroke risk factors, both those modifiable risk factors and irreversible risk factors. Research is conducted with a literature review using descriptive study methods or correlation analysis with cross sectional approaches. Sixteen articles identified from Google scholars and Garuda databases in the 2015-2020 range, and were analysed using JBI critical appraisal tools-checklist for analytical cross-sectional studies and JBI critical appraisal tools-checklist for prevalence studies. Synthesis narrative was used to analyse the articles. Out of 16 articles examined the modifiable risk factors were hypertension, dyslipidemia, diabetes mellitus, lack of physical activity, blood sugar levels, cholesterol levels in blood, alcohol and drug consumption, kidney disease, tuberculosis, heart disease, heart failure, obesity, central obesity, atrial fibrillation and also smoking are declared associated with the incidence of stroke. The irreversible risk factors are age, gender, education, family history, income employment, previous stroke history, and rural and urban distribution. Risk factors divided into two categories modifiable risk factors and irreversible risk factors. It is important to know the risk factors of stroke in order prevent the occurrence of stroke as early as possible by avoiding modifiable stroke risk factors. Hypertension, smoking, diabetes mellitus obesity, dyslipidemia, and lack of activity are the most modifiable stroke risk factors identified in the articles. The most irreversible risk factors identified in the article are age, gender, and level of education.

Keywords: Stroke; CVA; Risk factors

Introduction

Stroke occurs due to inhibition of blood flow to the brain caused by rupture of blood vessels in the brain or blockage of blood vessels to the brain which eventually causes impaired brain function for more than 24 hours or resulted in death due to vascular death.^{1,2} Stroke is one of the highest prevalence non-communicable diseases in the world, 795,000 people die per year.³ Likewise, Indonesia reached the first position in Asia in contributing to deaths due to stroke.

The high incidence of stroke affects state financing. The article published by the Ministry of Health in 2019 mentioned that in 2016 BPJS spent 1.43 trillion, in 2017 it spent 2.18 trillion and in 2018 again increased to 2.56 trillion for stroke services.⁴ About 85% of stroke events can be avoided by preventing the occurrence of risk factors.⁵ There are many risk factors related stroke attack. Early identification of the risk factors are necessary to prevent the stroke attack. Articles published in various risk factors depend on their study site. However, researchers need to identify stroke risk factors to prevent the event and minimize the incidence.

Research Method

Inclusion Criteria

Researchers used article that have descriptive study methods or correlation analysis with cross sectional approaches in this study. The population of this study was a society that has risk factors for stroke, and patients with stroke, aged over 15 years, both male or female. Sixteen articles identified from Google scholars and Garuda databases in the 2015-2020 range, and were analysed using JBI critical appraisal tools-checklist for analytical cross-sectional studies and JBI critical appraisal tools-checklist for

prevalence studies. Synthesis narrative was used to analyse the articles.

The articles must be a complete manuscript and used Indonesian or English. The keywords were "Stroke" OR "CVA" AND "Faktor Risiko" OR "Risk Factors".

Literature Search Techniques

Researchers searched the articles through a predetermined electronic database by entering keywords in the search field and also adjusting the range of years according to inclusion criteria. Then, all article titles that appear in the database are contained in the article title list table. Articles that do not fit the inclusion criteria were excluded from the research.

Researchers used the guideline to review the quality of articles. JBI critical appraisal tools-checklist was used to review it. The value of quality article analysis with JBI score below 50% will be excluded.⁶ Obtained 16 articles have a rating score above 50%. Then continued in the final stage of data extraction to make the data collection process easier.

Results

The stages that researchers do in searching for literature analyzed based on keywords that have been determined to be seen in figure 1 below.

Risk Factors of Stroke

Risk factors consist of two categories, namely modifiable factors and irreversible factors that can be seen in table 1 and table 2. Four articles in the analysis of data in the form of percentages mentioned that each respondent had hypertension with the highest percentage as an identified risk factor.^{7,8,9,10} Similarly, in articles whose data analysis used statistical tests, hypertension, smoking, diabetes mellitus, obesity, dyslipidemia, and lack of activity are the most modifiable stroke risk factors identified.

Risk factors for heart disease, alcohol, hypercholesterolemia, and a history of hypertension were declared associated with stroke in two different articles. While heart failure, tuberculosis, central obesity, atrial fibrillation, kidney disease, pulse pressure, flat arterial pressure, average systolic blood pressure, and total low cholesterol levels were declared associated with the incidence of stroke in just 1 article.

The age, gender, education, family history and residence of the study respondents were the most identifiable irreversible risk factors than the risk factors of income, employment, prior stroke history, and rural and urban distribution in the research article.^{8, 9, 12, 13}

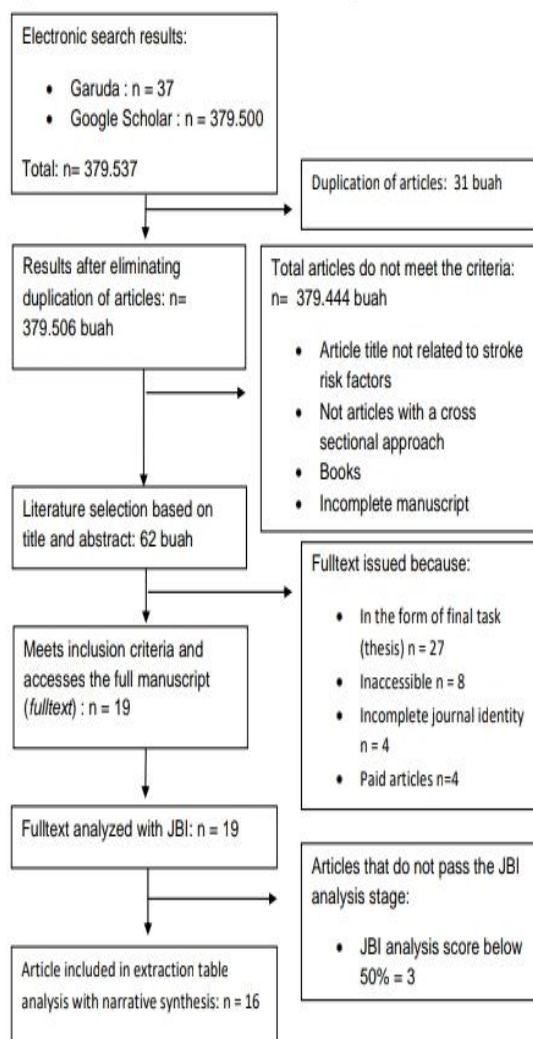


Figure 1 Literature Search Framework

Discussion

Modifiable risk factors

Diabetes Mellitus and Blood Sugar Levels

The relative risk of stroke in people with DM ranges from 1.8-6 with a tendency to occur in young patients.⁹ The explanation of diabetes mellitus also states that DM triggers atherosclerosis and increases hypertension event because of the 2-fold risk of cerebral infarction resulting in changes in the vascular system.⁸

Hypertension

Respondents who have a history of hypertension are at risk of 7.5 strokes.¹¹ High blood pressure can cause severity in atherosclerosis and cause intracerebral lesions due to affected autoregulation of blood flow to the brain.⁸ Hypertension is also one of the most severe stroke risk factors encountered in stroke patients.⁹

Smoking

Smoking is one of the bad lifestyles and can increase the risk of stroke by 1.5 times.^{12,7} Smoking also results in atherosclerosis, thus increasing the occurrence of thrombus.¹¹ In addition, smoking can cause blood viscosity, fibrinogen, and platelet aggregation as well as lower HDL cholesterol and raise blood pressure.⁹

Dyslipidemia and Cholesterol Levels

Plasma lipids and proteins increase the risk of cerebral infarction.⁹ LDL levels exceeding 150 mg/dL increase the risk of brain blood vessel blockage.¹¹

Physical Activity

Physical activity is associated with an increased risk of stroke.¹³ The increased risk even reaches 50%. This is due to the build-up of fatty substances, cholesterol, calcium and others in the blood vessels so as to decrease

the flow of blood supply to the brain and heart.¹¹ Physical activity acts as a protective effect that positively affects stroke prevention.⁷

Obesity

Overweight can accelerate the occurrence of atherosclerosis, thus increasing the risk of stroke 2-fold.⁷ Obesity also affects high blood pressure and blood sugar levels, making the heart pump more extra the blood, triggering a stroke.¹¹

Alcohol

One of an unhealthy lifestyle is consuming alcohol. Alcohol consumed will enter the blood and damage body tissues, especially the liver, trigger stress, thrombosis in the blood circulation, atherosclerosis, the rhythm of sirkardian is disrupted causing sleep disturbances, decreased memory, and increasing the sugar and fat levels.¹⁴

Heart Disease

Heart defects cause embolism at risk of 3-4 strokes. Embolism is one of the triggers of the occurrence of atrial fibrillation non valvuler.¹¹ Heart disease atrial fibrillation is also a direct cause of stroke. In addition to myocard infarction and arrhythmia also play a role in the incidence of stroke.⁷

Tuberculosis

Tuberculosis disease is 1.51 times more at risk of stroke than non-sufferers. The results of this study are reinforced by the support of Sheu who for 3 years has followed up his patients who suffer from tuberculosis.

15

Irreversible risk factors

Age

Stroke not only affects people with advanced age but can also strike young people due to unhealthy lifestyle and diet.^{10,13} As you get older, the body's immunity to a disease weakens so that the risk of stroke.⁷

Gender

Men have a more tendency towards the occurrence of stroke, temporary suspicion resulting from smoking behavior and alcoholic beverages consumed.¹¹ However, young women also have the same risk as men because it is related to pregnancy, postpartum conditions and hormonal factors such as the use of hormonal contraceptives.⁹

Education and Knowledge Level

Knowledge can be influenced by many factors such as age, education, employment, interests, experience, and culture as well as information obtained.⁷ Knowledge that is sufficient to know a disease is quite helpful in efforts to prevent and improve health status.

Family History

The American Heart Association explains that the mechanisms in family history are genetic factors, genetic sensitivity factors, culture/environmental and lifestyle factors and interactions between genetic and environmental factors.⁸ A person who has a hereditary history of stroke tends to have a higher average blood pressure.¹⁶

Table 1 Article extraction of modifiable risk factors

No.	Article Title	Authors	Year	Population	Research Design	Research Instrument	Results
1	<i>Family History of Stroke Among African Americans and Its Association With Risk Factors, Knowledge, Perceptions, and Exercise</i>	Fajar M.Aycock, Kenya D. Kirkendoll, Kisha C. Coleman, Patricia C. Clark, Karen C. Albright, Anne W. Alexandrov	2015	The study's population was a resident who visited gradid mobile health clinics in 4 counties in rural Alabama's Black Belt region.	<i>Cross sectional</i>	The instrument uses a stroke risk assessment form adapted from the American Stroke Association	<p>Research results of modifiable factors:</p> <ol style="list-style-type: none"> 1. Having health insurance has a p value of 0.323 2. The average modifiable risk factor has a p value of 0.089 3. Average body mass index has a p value of 0.085 4. High cholesterol has a p value of 1,000 5. Smoker has a p value of 0.800 6. History of diabetes has a p value of 0.122 7. Average blood glucose does not fast has a p value of 0.105 8. History of hypertension has a p value of 0.026 9. Average systolic blood pressure has a p value of 0.174 10. Average diastolic blood pressure has a p value of 0.218
2	The level of stroke risk factors with community knowledge to early detection of stroke	Haris Faisal, Kurnia Rachmawati, Musafaah	2015	Community working area of Cempaka Inpatient Health Center	<i>Cross sectional</i>	Fast instrument and stroke risk assessment instrument	<p>Stroke risk factors from the study include:</p> <ol style="list-style-type: none"> 1. Blood pressure: <ol style="list-style-type: none"> 1) Normal blood pressure 35% 2) Pre-hypertension 17.5% 3) Hypertension 47.5% 2. Blood sugar levels: <ol style="list-style-type: none"> 1) Blood sugar is not diabetes mellitus 30% 2) Normal blood sugar 50% 3) Diabetes mellitus 20% 3. Cholesterol levels: <ol style="list-style-type: none"> 1) Normal cholesterol 20% 2) Cholesterol is at a limit of 25% 3) Hypercholesterolemia 55% 4. History of heart disease: <ol style="list-style-type: none"> 1) No history and low risk of 60% 2) Have no history and moderate risk of 22.5% 3) Have a history and a high risk of 17.5% 5. Body time index: <ol style="list-style-type: none"> 1) Normal 75% 2) Overweight 20% 3) Obesity 5% 6. Smoking: <ol style="list-style-type: none"> 1) Not smoking 57% 2) Moderate 30%

No.	Article Title	Authors	Year	Population	Research Design	Research Instrument	Results
3	<i>Stroke risk factors among participants of a world stroke day awareness program in South-Western Nigeria</i>	MA Komolafe, MOB Olaogun, AM Adebisi, AO Obembe, MB Fawele, AA Adebowale	2015	Communities in southwestern Nigerian cities	Cross Sectional	The examination is carried out by a professional and a valid physical examination tool.	<p>3) Heavy smokers 12.5%</p> <p>7. Physical activity:</p> <p>1) Routine 15%</p> <p>2) Sometimes 30%</p> <p>3) Never 55%</p> <p>The level of stroke risk with a level of knowledge of early detection of stroke has a p value of 0.66</p> <p>The results of this study state modifiable risk factors:</p> <p>1. Blood pressure has an association with age, p value 0.011</p> <p>Blood pressure has no association with body mass index, p value 0.371</p>
4	Factors related stroke event in Indramayu Hospital	Wayunah, Muhammad saefulloh	2016	Inpatients at Indramayu Hospital with medical diagnosis of stroke are treated in the ICU room and internal medicine room.	Cross sectional	Questionnaire about risk factors associated with stroke incidence	<p>Based on the characteristics of modifiable risk factors:</p> <p>1. Primary School educated respondents by 73.8%</p> <p>2. Respondents who have worked by 67.0%</p> <p>3. Respondents had no history of heart disease as much as 95.1%</p> <p>4. Respondents had a history of hypertension as much as 84.5%</p> <p>5. Respondents had no history of DM disease by 72.8%</p> <p>6. Respondents did not commit smoking behavior by 52.4%</p> <p>7. Respondents had no history of obesity at 68.9%</p> <p>8. Respondents had normal blood cholesterol levels of 71.8%</p> <p>9. Respondents had a moderate activity history of 74.8%</p> <p>Based on an analysis of the relationship of modifiable risk factors:</p> <p>1. Respondents with a history of hypertension have a p value of 0.035</p> <p>2. Respondents with diabetes mellitus have a p value of 0.512</p> <p>3. Respondents with a history of heart have a p value of 0.627</p> <p>4. Respondents with low cholesterol levels have a p value of 0.051</p>

No.	Article Title	Authors	Year	Population	Research Design	Research Instrument	Results
5	<i>Prevalence, pattern, risk factors and outcome of stroke in women: a clinical study of 100 cases from a tertiary care center in South India</i>	Sandhya Manorej, Snehalatha Inturi, B. Jyotsna, V. Sai Savya, Devender Areli, O. Balarami Reddy.	2016	Female patient who was admitted to Hyderabad State Insurance Corporation Special Hospital, tertiary referral center in South India.	<i>Cross Sectional</i>	The research instrument is the modified Rankin scale (mRS).	5. Respondents with smoking behavior have a p value of 1,000 6. Respondents with physical activity have a p value of 0.011 7. Respondents with obesity have a p value of 0.307 The results of a comparison of the frequency of research modifiable risk factors in women and men: 1. Smoking has a p value of 0.0013 2. Alcohol has a p <0.0001 3. Hypertension has a p value of 0.67 4. Diabetes mellitus has a p value of 0.50 5. Physical inactivity has a p value of 0.0001 6. Dyslipidemia has a p value of 0.7241 7. Heart disease has a p value of 0.06 8. Obesity has a p value of 0.786 9. Accompanying disease has a p value of 0.5189 Previous stroke had a p value of 0.853
6	<i>Dyslipidaemia as a risk factor in the occurrence of stroke in Nigeria: prevalence and patterns</i>	Michael Adeye o., Akinyele Taofiq Akinlade, Michael Bimbola Fawale, Dan Anthonia Okeghene Ogbera	2016	Patients were recruited from the Medical departments of Lautech, Ogbomoso, and OrileAgege General Hospital, Lagos.	<i>Cross Sectional descriptive retro spective</i>	Research uses atherogenic index formulas and lipid ratios.	Research results of modifiable risk factors: 1. Systolic blood pressure (SBP) has a p value of 0.001 2. Diastolic blood pressure (DBP) has a p value of 0.065 3. Hypertension has a p value of 0.054 4. Pulse Pressure (PP) has a p value of 0.019 5. Average Arterial Pressure (MAP) has a p value of 0.008 6. Blood Glucose has a p value of 0.495 7. Total cholesterol (TC) has a p value of 0.140 8. LDL-Chol has a p value of 0.179 9. HDL-Chol has a p value of 0.791 10. Triglyceride (TG) levels have a p value of 0.308 11. Dyslipidemia has a p value of 0.475 12. CR-I has a p value of 0.143 13. CR-II has a p value of 0.098 14. Theragenic coefficient (AC) has a p value of 0.143 15. Plasma Atherogenic Index (AIP) has a p value of 0.253 16. Cholesterol Index has a p value of 0.192 17. History of hypertension has a p value of 0.441 18. History of diabetes has a p value of 0.417 19. History of cerebri infarction has p 0.396

No.	Article Title	Authors	Year	Population	Research Design	Research Instrument	Results
7	Risk factors identification for stroke event in Bima Hospital	A. Haris martiningsih	2016	Stroke patients at BIMA Hospital	Cross Sectional	Questionnaire about stroke risk factors	Stroke risk factors measured from questionnaires shared with patients at Bima Hospital: <ol style="list-style-type: none"> 1. Hypertension 90.6% 2. DM 61.2% 3. Smoking 1-12 cigarettes per day 44.7% 4. Smoking 13-24 cigarettes per day 12.9% Smoking 25 cigarettes per day 10.6%
8	The dominant risk factors among stroke patients in Indonesia	Lannywati Ghani, Laurentia K. Mihardja & Delima	2016	All household members aged 15 years and above	Cross Sectional	Interview guideline	The results of this study stated that hypertension, obesity, central obesity, tuberculosis, diabetes mellitus, coroner's heart disease and heart failure are associated with the incidence of stroke. <ol style="list-style-type: none"> 1. Hypertension has a p value of 0.0001 2. Obesity has a p value of 0.0001 3. Central obesity has a p value of 0.0001 4. TB has a p value of 0.0001 5. Diabetes mellitus has a p value of 0.0001 6. Coroner's heart disease has a p value of 0.0001 Heart failure has a p value of 0.0001
9	<i>Prevalence of stroke and associated risk factors: a population based cross sectional study from northeast China</i>	Fu-Liang Zhang, Zhen-Ni Gou, Yan-Hua Wu, Hao-Yuan Liu, Yun Lou, Ming-Shou Sun, Ying-Qi Xing, dan Yi Yang.	2017	Chinese people aged 40 years or older	Cross Sectional	Interview guideline, questionnaires designed by the Stroke Screening and Prevention Program of China's National Health and Family Planning Commission and physical and laboratory examinations	The results of the study explain the risk factors that can be changed: Risk factors for ischemic stroke: <ol style="list-style-type: none"> 1. Atrial fibrillation has a p value of 0.613 2. Hypertension has a p value of <0.001 3. Dyslipidemia has a p value of 0.021 4. Diabetes mellitus has a p value of 0.093 5. Smoker has a p value of 0.115 6. Lack of exercise has a p value of 0.043 7. Family history of stroke has a p value of <0.001 8. Fruit consumption (day/week) has a p value of 0.114 Risk factors for hemorrhagic stroke: <ol style="list-style-type: none"> 1. Age has a p value of 0.166 2. Gender has a p value of 0.365 3. Hypertension has a p value of 0.012 High total cholesterol levels have a p value of 0.102
10	Factors analysis related to stroke event among stroke patients at emergency room Klaten Hospital	Romadhani Tri Purnomo, Edi W, & Ika Sulistyarini	2017	Stroke patients who were first taken to ER Klaten Hospital in	Cross Sectional	Checklist sheet	The results of this study state modifiable risk factors: <ol style="list-style-type: none"> 1. Hypertension is associated with the incidence of acute stroke, p value 0.022 2. Hypertension in men is associated with the incidence of acute stroke, p value 0.007 3. Hypertension in women is not associated with the

No.	Article Title	Authors	Year	Population	Research Design	Research Instrument	Results
				the period January 1, 2015-June 30, 2016			incidence of acute stroke, p 0,697 4. Hyperglycemia is associated with the incidence of acute stroke, p value 0,000 5. Hyperglycemia in both men and women is associated with the incidence of acute stroke, p values respectively 0.000 and 0.0004 6. History of heart disease unrelated to the incidence of acute stroke, p value 0.812 7. History of heart disease in both men and women is not associated with the incidence of acute stroke, p values are sequentially 0, 920 and 0.947 8. Total cholesterol levels are not associated with the incidence of acute stroke, p value 0.879 9. Total cholesterol levels in men are not associated with the incidence of acute stroke, p value 0.0088 4. Total cholesterol levels in women associated with the incidence of acute stroke, a p value of 0.032
11	Smoking factor related to stroke event at Santa Elisabeth Hospital Medan	Pomarida simbolon, nagoklan simbolon, magda siringo-ringo	2018	All stroke patients at Elisabeth Medan Hospital	Cross sectional	Questionnaire	10. The results of the study obtained respondents as much as 70.6% of smoking factors cause the incidence of stroke and 29.4% of non-smoking factors cause the incidence of stroke. Smoking factors with the incidence of stroke have a p value of 0.008.
11	Smoking factor related to stroke event at Santa Elisabeth Hospital Medan	Pomarida simbolon, nagoklan simbolon, magda siringo-ringo	2018	All stroke patients at Elisabeth Medan Hospital	Cross sectional	Questionnaire	The results of the study obtained respondents as much as 70.6% of smoking factors cause the incidence of stroke and 29.4% of non-smoking factors cause the incidence of stroke. Smoking factors with the incidence of stroke have a p value of 0.008.
12	Stroke patient's profile at Arifin Achmad Hospital, Riau	Dimas Pramita Nugraha, Eka Bebasari, Yulia Wardani	2018	Outpatients diagnosed with stroke as many as 397 people.	Cross sectional	Interviews and questionnaires from sedentary behavior questionnaire (SBQ)	Groups of patients with: 1. Overweight by 35.50% 2. Grade 1 obesity by 23.70% 3. Grade 2 obesity by 9.20% 4. History of hypertension by 90.8%. 5. History of dyslipidemia by 63.20%. 6. DM history by 7.90% 7. Smoking by 21.10% 8. Sedentary living behavior by 73.70%.
13	Using Scorecard To Analyse Risk Factors Of Stroke In West Sumatera Indoensia	Ade Srywahyuni, Dona Amelia, Liza Merianti, Senci	2019	People aged 18-45 years who are not	Cross Sectional	Stroke risk scorecard questionnaire	Research results of modifiable risk factors: 1. Blood pressure above 140/90mmHg 22.4%; range 120-139/80-89mmHG 30.4%' and below

No.	Article Title	Authors	Year	Population	Research Design	Research Instrument	Results
		Napeli Wulandari.		diagnosed with stroke and live in Bukittinggi			<p>120/80mmHg 47.2%</p> <ol style="list-style-type: none"> 2. Atrial fibrillation category irregular heart rate 8.1%; unknown category 16.5%; and the regular heart rate category of 75.5% 3. Active smoking 10.2%; start smoking cessation 14.3%; and nonsmokers 75.5% 4. Cholesterol above 240mg/dL 3.7%; range 200-239mg/dL 22.7%; and below 200mg/dL 73% 5. Have diabetes 18.6%; not have diabetes 73.6%; And among them 7.8% 6. Diet over weight 19.6%; ideal body weight diet 60.6%; and a skinny weight diet of 19.9% <p>With the end result the people of Bukit Tinggi has a low risk of stroke 83.23%.</p>
14	<i>Ischemic stroke: prevalence of modifiable risk factors in the Saudi population</i>	Muhannad Noor laharbi, Atheer Khalid Alharbi, Mousa Atqan Alamri, Abdulmalik Ayedh Saad Alharthi, Abdulrahman Moneer Alqerafi, & Mohamed Noor Alharbi.	2019	People who live in the city of Medina both who have suffered strokes and those who have not.	<i>Cross Sectional</i>	Questionnaire	<p>The results of this study show risk factors that can be changed:</p> <ol style="list-style-type: none"> 1. Respondents who are on a 40% diet and do not go on a 60% diet 2. Respondents who had had a stroke before 20% and had never had a stroke before 80% 3. Respondents who have a family history of stroke 30% 4. Respondents suffering from hypertension 64%, diabetes 59%, smoking 29%, dyslipidemia 70%, obesity 75%, lack of exercise 90%, and coroner artery disease 10% <p>The association of ischemic stroke risk factors to the sex of the study population is:</p> <ol style="list-style-type: none"> 1. Dyslipidemia has a p value of 0.01 2. Diabetes mellitus has a p value of 0.001 3. Coroner artery disease has a p value of 0.7 4. Previous stroke had a p value of 0.06 5. Smoking has a p value of 0.02 6. Obesity has a p value of 0.01
15	<i>Prevalence of stroke and stroke related risk factors: a population based cross sectional survey in southwestern China</i>	Xingyang Yi, Hua Lou, Ju Zhou, Ming Yu, Xiaorong Chen, Lili Tan, Wei Wei, & Jie Lie	2020	People who have lived in Sichuan Province for more than 6	<i>Cross Sectional</i>	Questionnaires and Interviews	<p>The results of research modifiable risk factors are:</p> <ol style="list-style-type: none"> 1. Obesity The frequency is 17.9% and not 16.3%. Obesity has a p value of 0.001. 2. Smoking

No.	Article Title	Authors	Year	Population	Research Design	Research Instrument	Results
				months.			<p>The frequency is 20.3% and not 16.2%. Smoking has a p <0.001.</p> <p>3. Lack of physical activity The frequency is 21.3% and not 13.2%. Lack of physical activity has a value of p <0.001.</p> <p>4. Hypertension The frequency is 29.7% and not 8.2%. Hypertension has a p< value of 0.001.</p> <p>5. Diabetes The frequency is 28.3% and not 14.9%. Diabetes has a p value of 0.013.</p> <p>6. Dyslipidemia The frequency is 25.4% and not 15.2%. Dyslipidemia has a p value of <0.001.</p> <p>7. Atrial fibrillation The frequency is 31% and not 17.1%. Atrial fibrillation has a p value of 0.009.</p> <p>Research results of modifiable risk factors:</p> <ol style="list-style-type: none"> 1. Hypertension has a p value of <0.0001 2. Diabetes mellitus has a p<0.0001 value 3. Heart disease has a p value of <0.0001 4. Smoking has a p value of <0.0001 5. Alcohol and drug use have a p <0.0001 6. Kidney disease has a p value of 0.0002 7. Obesity has a p value of 0.0005 <p>Hypercholeoleolemia has a p value of 0.0065</p>
16	<i>Comparative Analysis of Associated Risk Factors Amongst Young and Old Stroke Survivors</i>	Joshi Madhura S, & Kanase Suraj B.	2020	Stroke patients at KIMSDU, Karad.	Cross Sectional	Interviews	

Table 2 Article extraction of irreversible risk factors

No.	Article Title	Researchers	Year	Population Type	Research Design	Research Instruments	Results
1	<i>Family History of Stroke Among African Americans and Its Association With Risk Factors, Knowledge, Perceptions, and Exercise</i>	Fajar M.Aycock, Kenya D. Kirkendoll, Kisha C. Coleman, Patricia C. Clark, Karen C. Albright, Anne W.	2015	The study's population was a resident who visited gratid health clinics in 4 counties in rural Alabama's Black Belt region.	Cross sectional	The instrument uses a stroke risk assessment form adapted from the American Stroke Association	<p>The results of the study have irreversible risk based on a family history of stroke:</p> <ol style="list-style-type: none"> 1. Age has a p value of 0.679% 2. Length of school, average has a p grade of 0.313 3. Female gender 0.057% 4. Not working has a p value of 0.005

No.	Article Title	Researchers	Year	Population Type	Research Design	Research Instruments	Results
2	The level of stroke risk factors with community knowledge to early detection of stroke	Alexandrov Haris Faisal, Kurnia Rachmawati, Musafaah	2015	Community working area of Cempaka Inpatient Health Center	Cross sectional	Fast instrument and stroke risk assessment instrument	Respondents aged 55 years have low stroke risk factors (65%), ages 55-64 years have moderate stroke risk factors (15%), and ages 65 years and above have high stroke risk factors (20%).
3	Stroke risk factors among participants of a world stroke day awareness program in South-Western Nigeria	MA Komolafe, MOB Olaogun, AM Adebisi, AO Obembe, MB Fawele, AA Adebowale	2015	Communities in southwestern Nigerian cities	Cross Sectional	The examination is carried out by a professional and a valid physical examination tool.	The results showed that: 1. Gender has no association with blood pressure, p value 0.146 2. Gender has a relationship with body mass index, p value <0.0001
4	Factors related stroke event in Indramayu Hospital	Wayunah, Muhammad saefulloh	2016	Inpatients at Indramayu Hospital with medical diagnosis of stroke are treated in the ICU room and internal medicine room.	Cross sectional	Questionnaire about risk factors associated with stroke incidence	Results based on the characteristics of irreversible risk factors: 1. Respondents have a history of 73.8.1% 2. Adult category respondents (age <55 years) as much as 50.5% 3. Male respondents as much as 55.3% Based on an analysis of the relationship of irreversible risk factors: 1. Age has a p value of 0.059 2. Gender has a p value of 0.631 3. Family history has a p value of 0.868
5	Prevalence, pattern, risk factors and outcome of stroke in women: a clinical study of 100 cases from a tertiary care center in South India	Sandhya Manorej, Snehalatha Inturi, B. Jyotsna, V. Sai Savya, Devender Areli, O. Balarami Reddy.	2016	The study population was a female patient who was admitted to hyderabad State Insurance Corporation Special Hospital, tertiary referral center in South India.	Cross Sectional	The research instrument is the modified Rankin scale (mRS).	The results of the study of irreversible risk factors: 1. Age has a p value of 0.3074 2. Education has a p value of 0.0001 3. Rural and urban distribution has a p value of 0.0446 4. Income has a p value of 0.6892
6	Dyslipidaemia as a risk factor in the occurrence of stroke in Nigeria: prevalence and	Michael Adeye o., Akinyele Taofiq Akinlade,	2016	Patients were recruited from the Medical departments of Lautech,	Cross Sectional deskriptif retrospektif	Research uses atherogenic index formulas and lipid ratios.	The results of the study of irreversible risk factors: 1. Age has a p value of 0.001 2. Gender has a p value of 0.287

No.	Article Title	Researchers	Year	Population Type	Research Design	Research Instruments	Results
	<i>patterns</i>	Michael Bimbola Fawale,. Dan Anthonia Okeghene Ogbera		Ogbomoso, and OrileAgege General Hospital, Lagos.			
7	Risk factors identification for stroke event in Bima Hospital	A. Haris martiningsih	2016	Stroke patients at BIMA Hospital	Cross Sectional	Questionnaire about stroke risk factors	Research results from irreversible risk factors: 1. Family history 76.5% 2. Age >55 years with a percentage of 72.9% and <55 years with a percentage of 27.1% Male gender is 67.1% more than female 32.9%
8	The dominant risk factors among stroke patients in Indonesia	Lannywati Ghani, Laurentia K. Mihardja & Delima	2016	All household members aged 15 years and above	Cross Sectional	Interview	The results of this study suggest there is a link between age and educational status to stroke: 1. Age (45-54) and (>55) have a p value of 0.00001 2. Gender has a p value of 0.695 Educational status with high school graduation and junior high school finish and below has a value of p 0.0001
9	<i>Prevalence of stroke and associated risk factors: a population based cross sectional study from northeast China</i>	Fu-Liang Zhang, Zhen-Ni Gou, Yan-Hua Wu, Hao-Yuan Liu, Yun Lou, Ming-Shou Sun, Ying-Qi Xing, dan Yi Yang.	2017	Chinese people aged 40 years or older	Cross Sectional	Interviews, questionnaires designed by the Stroke Screening and Prevention Program of China's National Health and Family Planning Commission and physical and laboratory examinations	The results of the study of irreversible stroke risk factors according to demographic characteristics: 1. Age has a value of p<0.001 2. Male is 8.8% higher than female 5.7% with a value of p = 0.001 3. Residence has a p value of 0.318 4. Education level has a p <0.001
10	Factors analysis related to stroke event among stroke patients at emergency room Klaten Hospital	Romadhani Tri Purnomo, Edi W, & Ika Sulistyarini	2017	Stroke patients who were first taken to IGD RSI Klaten in the period January 1, 2015-June 30, 2016	Cross Sectional	Checklist sheet	The results of a study of irreversible risk factors suggested gender had an association with the incidence of acute stroke, a p value of 0.02. The percentage of gender, occupation and education of study respondents is as follows: 1. Women 46.3% 2. Men 53.7% 3. Pensioner/civil servant 4.2% 4. Private 54.7% 5. Farmers 9% 6. Not working/IRT 21.6%

No.	Article Title	Researchers	Year	Population Type	Research Design	Research Instruments	Results
							7. Other jobs 10.5% 8. No school 5.3% 9. SD 37.9% 10. SLTP 16.3% 11. SLTA 33.7% 12. PT/akademik 6.8%
11	Smoking factor related to stroke event at Santa Elisabeth Hospital Medan	Pomarida simbolon, nagoklan simbolon, magda siringo-ringo	2018	All stroke patients at Elisabeth Medan Hospital	Cross sectional	Questionnaire	Irreversible stroke risk factors in the study were the highest respondent age (41-60 years) at 50.0% and the gender of the highest male respondents at 61.8%.
12	Stroke patient's profile at Arifin Achmad Hospital, Riau	Dimas Pramita Nugraha, Eka Bebasari, Yulia Wardani	2018	Outpatients diagnosed with stroke as many as 397 people.	Cross sectional	Interviews and questionnaires from sedentary behavior questionnaire (SBQ)	The results showed a tendency for stroke incidence to increase in patients with <60 years of age by 65.80% and more in the male group by 64.50%.
13	Using Scorecard to Analyze Risk Factors of Stroke In West Sumatera Indoensia	Ade Srywahyuni, Dona Amelia, Liza Merianti, Senci Napeli Wulandari.	2019	People aged 18-45 years who are not diagnosed with stroke and live in Bukittinggi	Cross Sectional	Stroke risk scorecard questionnaire	The results of the study of risk factors that cannot be changed are having a family history of stroke 49.1%; not sure 12.4%; It doesn't have 38.5%. With the end result of the high society has a low risk of stroke 83.23%.
14	Ischemic stroke: prevalence of modifiable risk factors in the Saudi population	Muhannad Noor laharbi, Atheer Khalid Alharbi, Mousa Atqan Alamri, Abdulmalik Ayedh Saad Alharthi, Abdulrahman Moneer	2019	People who live in the city of Medina both who have suffered strokes and those who have not.	Cross Sectional	Questionnaire	The results of the study of irreversible risk factors are: 1. Male 75% and female 25% Middle-level graduates 10%, 30% university-level graduates, and after university 60%

No.	Article Title	Researchers	Year	Population Type	Research Design	Research Instruments	Results
		Alqerafi, & Mohamed Noor Alharbi.					
15	<i>Prevalence of stroke and stroke related risk factors: a population based cross sectional survey in southwestern China</i>	Xinyang Yi, Hua Lou, Ju Zhou, Ming Yu, Xiaorong Chen, Lili Tan, Wei Wei, & Jie Lie	2020	People who have lived in Sichuan Province for more than 6 months.	<i>Cross Sectional</i>	Questionnaires and Interviews	<p>The results of the study of irreversible risk factors are:</p> <ol style="list-style-type: none"> 1. Gender Male frequency 25.3% and female 13.3%. Gender has a p value of 0.003. 2. Age Frequency range 40-49 years 9%, range 50-59 years 13.4%, range 60-69 years 19.4%, range 70-79 years 28.8%, and 80 years and above 48.9%. Age has a value of p <0.001. 3. Residence Rural frequency 19.1% and urban 15.3%. The residence has a value of p 0.186. 4. Education Frequency of elementary graduates 23.4%, junior high school graduates 17.1%, high school graduates 7.3%, and college graduates 0.7%. Education has a p <0.001. 5. Family history The frequency is 23.7% and not 16.1%. Family history has a value of p 0.027.
16	<i>Comparative Analysis of Associated Risk Factors Amongst Young and Old Stroke Survivors</i>	Joshi Madhura S, & Kanase Suraj B.	2020	Stroke patients at KIMSDU, Karad.	<i>Cross Sectional</i>	Interviews	<p>The results of the study of irreversible risk factors:</p> <ol style="list-style-type: none"> 1. Men 62% 2. Women 38% 3. Age 20-50 years 48% Age 50-96 years 52%

Conclusions

The results of a review of 16 research articles on modifiable and irreversible stroke risk factors are very diverse. Risk factors for hypertension, diabetes mellitus, cholesterol levels, obesity, physical activity and smoking are the most widely identified risk factors to have an association with the incidence of stroke from the entire article. Similarly, the age, gender, and education level of the respondents also influenced the incidence of stroke, these three irreversible risk factors were otherwise associated throughout the article.

Further research would be expended to conduct research related to preventive interventions that can be done to reduce the incidence of stroke. The topic of research is healthy living movements more regular healthy lifestyle from as early as possible in order to avoid the occurrence of risk factors from stroke.

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