

Risk Factors of Stroke in Indonesian Population: Literature Review

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ABSTRACT

Background: Stroke is a major cause of death and disability in Indonesia. Stroke requires high-quality, fast, and precise management to prevent and avoid disability and death. Stroke can be prevented by adequately controlling the risk factors and encouraging healthy lifestyles. Efforts are needed to organize health promotion programs at the community level. More and a better distribution of neurologists and neuro interventionists is needed.

Purpose: The purpose of this research is to review risk factors of stroke patient.

Methods: We included English materials published between Science Direct, PubMed, Research Gate, and Google Scholar that were used to find studies related to stroke dan risk- factor between 2016- 2022.

Results: In general, risk factor of stroke are sosiodemographic factor, biological factor, lifestyle factor, other condition and other factor can cause stroke. Stroke divide into stroke infark and stroke hemoragic. Risk factor of stroke infark are non- modifiable factor (age, sex, ethnicity, genetic) and modifiable risk factors (hypertension, current smoking, waist to hip ratio, diet, alcohol consumption). Risk factor of stroke hemoragic are non- modifiable factor (age, sex, ethnicity, genetic) and modifiable risk factors (hypertension, current smoking, waist to hip ratio, diet, alcohol consumption, physical inactivity, hyperlipidemia, diabetes, cardiac causes, apolipoprotein B to A1).

Conclusion: Review of discharge planning can be influenced by several factors: individual characteristics (clients' potential with special needs early, motivation), family factors (social resources, home environment), health care system (teaching home care skills with community/hospital professionals. These factors will affect the implementation of discharge planning in health services which is hospital accreditation.

Keywords: hemoragic, infark, risk factor, stroke

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BACKGROUND

Stroke defined as a clinical syndrome characterized by an acute loss of focal brain function with symptoms lasting more than 24 hours or leading to death and its due inadequate blood supply to a part of the brain (primary intra cerebral hemorrhagic). Hemorrhagic stroke is caused by bleeding of blood vessel supplying the brain. Hemorrhagic stroke most commonly occur in association with hypertension. Several factors identified as associated with an increased risk of stroke (Ma, 2018). Stroke is a disease caused by brain blood circulation disorders which is influenced by many risk factors consisting of those that cannot be changed in the form of age and gender and those that can be changed such as hypertension, increased blood sugar levels, dyslipidemia, and work. Reducing the incidence of stroke is done by efforts including stroke treatment and prevention of stroke risk factors. Stroke is the third most common disease after heart disease and cancer and is the highest cause of disability in the world. According to the American Heart Association (AHA) the death rate for stroke patients in America (Javadzade et al., 2018; Spikes et al., 2019).

Stroke is caused by an ischemic condition or hemorrhagic process which often begins with a lesion or injury to the arteries. Of all stroke events, two-thirds are ischemic strokes and one-third are hemorrhagic strokes. Ischemic stroke is caused by a blockage of blood vessels by thromboembolic which results in the blood under the blockage experiencing ischemic. This is different from a hemorrhagic stroke which occurs due to a ruptured aneurysm.

The hospital mortality and morbidity rate of patient with acute stroke ranges from 7,6% to 30%. From these, neurological death about 80% and non-neurological death about 17%. Neurological death such as progressive increased intracranial pressure and subsequent herniation were the most common causes of death in both groups within the first days of admission.

Factors that can cause stroke are divided into risk factors that cannot be changed or cannot be modified and risk factors that can be changed or modified. Modifiable risk factors include hypertension, diabetes mellitus, and dyslipidemia. Hypertension is defined as a condition in which a person's blood pressure exceeds normal blood pressure limits. Hypertension is a potential risk factor for stroke because hypertension can cause rupture of the blood vessels in the brain or cause narrowing of the blood vessels in the brain. Rupture of the blood vessels of the brain will result in blood vessels of the brain or narrowing of the blood vessels of the brain. Rupture of the blood vessels of the brain will result in brain bleeding, whereas if there is narrowing of the blood vessels of the brain it will interfere with blood flow to the brain which ultimately causes the death of brain cells.

Table 1 Classification of blood pressure according to JNC VII

Category	Systole		Diastole
normal	< 120	and	< 80
Hypertension grade	120- 139	or	80- 89
Hypertension grade 1	140- 159	or	90- 99
Hypertension grade 2	>160	or	>100

Diabetes mellitus is a condition characterized by hyperglycemia that occurs due to impaired insulin secretion or insulin action or both and is included in a group of metabolic diseases. The diagnosis of diabetes mellitus is made if the blood concentration (venous plasma) is >200 mg/dl or the fasting blood glucose concentration is >126 mg/dl or the blood glucose concentration is >200 mg/dl 2 hours after a 75 gram glucose load on the OGTT (Oral Glucose Tolerance Test). Diabetes mellitus causes stroke through its ability to thicken large brain blood

vessels. This thickening will cause the blood vessels to shrink which in turn causes disruption of blood flow to the brain which leads to brain cell death.

LDL cholesterol carries cholesterol from the liver into cells. If the cholesterol level is high, it can lead to the accumulation of cholesterol in the cells which can lead to hardening of the walls of the arteries known as atherosclerosis. Meanwhile, HDL cholesterol works in the opposite direction to LDL cholesterol, namely carrying cholesterol from cells to the liver. Low HDL levels actually have an adverse effect, triggering the formation of plaque on the walls of the arteries.

Medical complications after stroke are common, present barriers to optimal recovery or related to poor outcomes and are potential to prevention or treatment. Estimates of frequency complication range from 40- 96% of patients, with severity of stroke as the most important risk factor. The complication have been fatal in some cases, contributing to the hospital mortality.

METHODS

As shown in supplementary table 1, this investigation followed the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 checklist.

Data Sources and Searches

The database searched from Science Direct, PubMed, Research Gate, and Google Scholar provide studies on identifying risk factors of stroke, determined from 2016- 2023. In addition, we checked the reference lists of all included papers and conducted a systematic evaluation of the literature.

Study Selection

An inclusion criteria was used to select the studies. Selected inclusion criteria were open access, cohort, cross-sectional, pre-experiment, experiment and randomized control trial, qualitative study about risk of stroke (2) studies reporting risk factor of stroke with effect measures and 95% confidence interval and used multivariable data analysis, (3) data collected among adult patients aged 18 years old and older, (4) studies whose participant were clinically diagnosed with stroke as defined WHO criteria, (5) article published in English from 2016 to 2022, (6) studies from both community and hospital- based settings of first- ever as well as recurrent stroke. We included quantitative and qualitative papers that described intervention efforts. We considered studies that reported on risk factor of stroke.

The exclusion criteria were as follows: (1) the original article didn't have relevant information about risk factors stroke, (2) duplicate report; (3) results presented only as abstracts, (4) studies include children, (5) studies with unclear or no available information on risk factors in all stroke or individual stroke types or data inconsistencies. Full text of paper for all studies appearing to meet inclusion criteria based on screening of the abstract final selection was made by two independent reviewers.

Data collection and analysis

Two writers independently examined the titles and abstracts of the obtained records to find potentially eligible studies.

Data Extraction

All citations were imported into the Mendeley Desktop Program from an electronic database. To select potentially relevant research, reviewers independently assessed the titles and abstracts of each study found through a literature search. For additional investigation, the complete text of the remaining studies was collected. In this article, the authors carry out a systematic review of relevant data using the keywords "risk factors" AND "stroke" OR "cerebrovascular accident." The same two reviewers collected the first author's name, year of publication, sample size, study design, trial duration, and general characteristics of participants.

RESULTS

Study Size

We conducted identification of 1025 studies in database sources. Seven duplicate studies were excluded, continued by 538 studies due to non-participants, irrelevant studies, and study protocols. The six remaining studies are included in the current literature review.

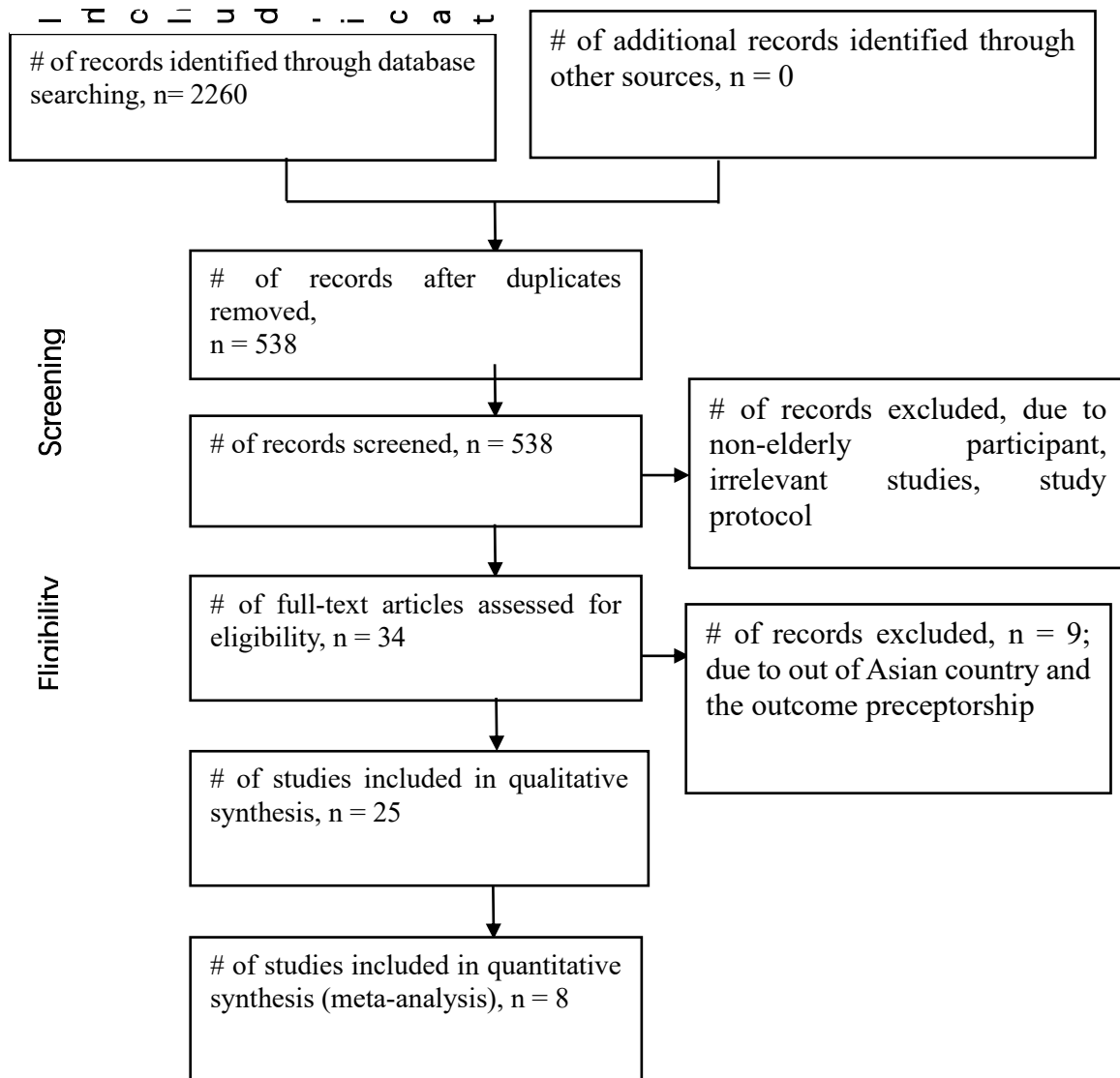


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Flowchart

3.2 Study Characteristics

Data were extracted from each study that needed the requirements. The extracted data included the characteristics of the study, parts of an age-friendly health system, activity in daily living, attributes of the results, and a summary of results.

The Standard protocol for selecting studies is suggested in the systematic review method guide, PRISMA. The steps taken are:

1. Removal of duplication

2. Examination independently of titles, abstracts, and keywords and delete citations that were not relevant according to the inclusion criteria
3. If the title and abstract are likely to follow the inclusion criteria and the objectives of the systematic review, the next step was the selection of journals with full text
4. The final step was the selection of articles

Authors and years	Study design, sample, variable, instrument, analysis	Summary of result
	Design: cross sectional study Sample: 13.605 subjects age ≥ 20 years old. Variable: history of stroke, prevalence of stroke and risk factors, hormonal receptivitive use and hisgh risk dietary Instrument: self- report diagnosis using demographic health survey HDSS 2016 Analysis: regression	<ol style="list-style-type: none"> 1. The survey included 4,996 households composed of 20,465 individuals. Data regarding stroke incidents were available from 13,605 subjects aged ≥ 20 years old. Among them, a total of 4,884 subjects also have data regarding stroke risk factors. The overall prevalence of stroke in Sleman District was 1.4% (0.5% men and 0.90% women). 2. The prevalence of stroke increased with additional decades of age ($p < 0.001$). In a multivariable model, increasing age, self-reported history of hypertension (OR=8.37, 95% CI: 4.76 to 14.69), and self-reported history of diabetes mellitus (OR=2.87, 95% CI: 1.54 to 5.35) were significantly associated with stroke.
Prevalence and risk factors of stroke in elderly in Northen China: Data from the National Stroke Screening Survey	Design: cross sectional study Sample: Variable: Instrument: National Stroke Screening Survey in 2023 and the 2010 Chinese from Sixth National Census of Populations to calculate a standardized (by age, gender, and education), stroke prevalence, risk factors and management of stroke were compared by gender, age and site Analysis: univariate (frequencies and percentages) and poisson model	<ol style="list-style-type: none"> 1. Prevalence rate of survival stroke patients in study population aged 60 and older was 4.94% total. 2. Hypertension was the most prevalent risk factor for stroke. 3. Compare to men, women were likely to have diabetes, obesity, elevated low density lipoprotein cholesterol (LDL- C), and atrial fibrillation ($p < 0,05$). Men were far more like drink and smoke than women ($p < 0,05$). The rates of diabetes and atrial fibrillation were substantially higher in urban those in urban those in rural stroke survivors ($p < 0,05$). Rural stroke survivors exhibited higher rates of smoking and alcohol consumption

than urban stroke survivors
($p < 0.05$)

Risk factors for hemorrhagic and ischemic stroke	Design: case series in cross sectional study Sample: Variable: risk factor for hemorrhagic and ischemic stroke Instrument: SSA questionnaire Analysis:	Risk factor of all stroke are from six factor diabetes ($p=0.02$), alcohol use ($p=0.46$), hypertension (0.19), smoking ($p=0.93$), HIV infection ($p=0.01$), hypercholesterolemia ($p=0.32$). Subvariable of risk factor in stroke show that only diabetes, alcohol use, hypertension, HIV infection and hypercholesterolemia can cause stroke hemorrhagic and infark.
Risk factor and Predictors for Hemoragic Transformation in Patients with Acute Ischemic Stroke	Design: cross- sectional study Sample: 288 subject patient of stroke Variable: risk factor; predictor hemoragic Instrument: Analysis: STATA analysis	Risk factor of stroke are hypertension followed by diabetes mellitus are the major risk factors for hemoragic stroke. Risk factor of hemorrhagic stroke are hypertension 75.3%, diabetes mellitus 26.3%, smoker 31.9%, alcohol 30.5 and obese 5.5%. Proportion of hypertension in men 62.1% and women 64.7% Complication after occurrence of stroke was 75%, among these death 47.2%, loss of muscle control 38.9% and speech problem 35.7% were the major complication following occurrence of stroke.
Temporal trend and attributable risk factors of stroke burden in China: an analysis for the Global Burden of Disease Study 2019	Design: cross- sectional study Sample: patient stroke in China on 2019 Variable: incidence, prevalence, mortality and risk assessment of stroke cases (ischemic stroke and intracerebral hemorrhagic) Instrument: DALYs Analysis:	Incidence rate of stroke increased 32,3%. High systolic blood pressure, ambient particulate matter pollution exposure, smoking and diet high in sodium were four major risk factors for stroke burden in 2019.

The literature search identified 617 publications from PubMed, EMBASE, google scholar and Wiley Online and summarize from literature about risk factors of stroke.

Evidence Synthesis

There are many risk factors for stroke. Patient can threat or control some of your risk factors, such as high blood pressure and smoking. But patient cannot control others such as your age or sudden changes in your health—for example, if patient have an aneurysm. It called by modifiable factors. The major risk factors for stroke include high blood pressure, diabetes, heart and blood vessel diseases, high LDL cholesterol levels, smoking, brain aneurisme or arteriovenous malformations (AVMs), viral infection or conditions that cause inflammation, age, sex, race and ethnicity, family history and genetics.

The risk factors for stroke, some of which you can control include anxiety, depression, and high stress levels, as well as working long hours contact with friends, family, or others outside the home. Living or working in areas with air pollution, other medical condition such as certain bleeding disorders, sleep apnea, migrain headaches and sickle cell disease; blood-thinners or other medicine that can lead to bleeding; other unhealthy lifestyle habits, including eating unhealthy; not getting regular physical activity, drinking alcohol, getting to much sleep (more than 9 hours), and using illegal drugs such as cocaine; overweight and obesity or carrying extra weight around your waist and stomach.

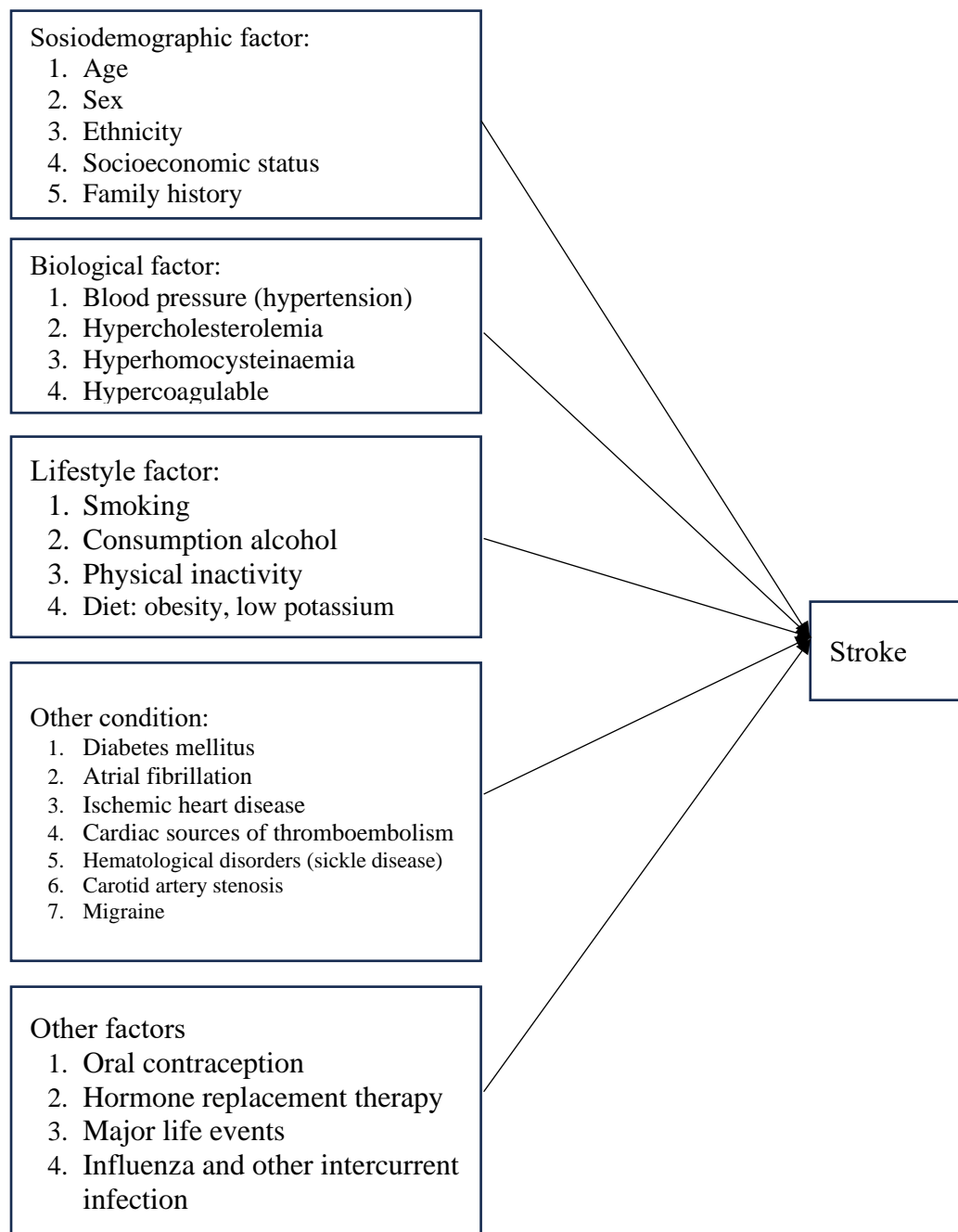


Figure 1 Risk Factors of stroke

Stroke risk factors can be categorized as modifiable and non-modifiable. Age, sex, and race/ethnicity are non-modifiable risk factors for ischemic and hemorrhagic stroke, while hypertension, smoking, diet, and physical activity are some of the more commonly reported modifiable risk factors. Recently described risk factors and triggers for stroke include inflammatory disorders, infections, pollution, and atrial fibrillation independent of atrial fibrillation. Single gene disorders can cause rare hereditary disorders of which stroke is the main manifestation. Recent studies have also shown that common and rare genetic polymorphisms can influence the risk of more common causes of stroke. due to other risk factors and specific stroke mechanisms, such as atrial fibrillation.

Genetic factors, particularly those with environmental interactions, may be more modifiable than previously known. Stroke prevention generally focuses on modifiable risk factors. Lifestyle and behavior modifications, such as dietary changes or quitting smoking, not only reduce the risk of stroke, they also reduce the risk of other cardiovascular diseases. Other prevention strategies include identifying and treating medical conditions, such as hypertension and diabetes, that increase the risk of stroke (Khorsandi et al., 2017; Qu et al., 2019; Risso-Gill et al., 2015).

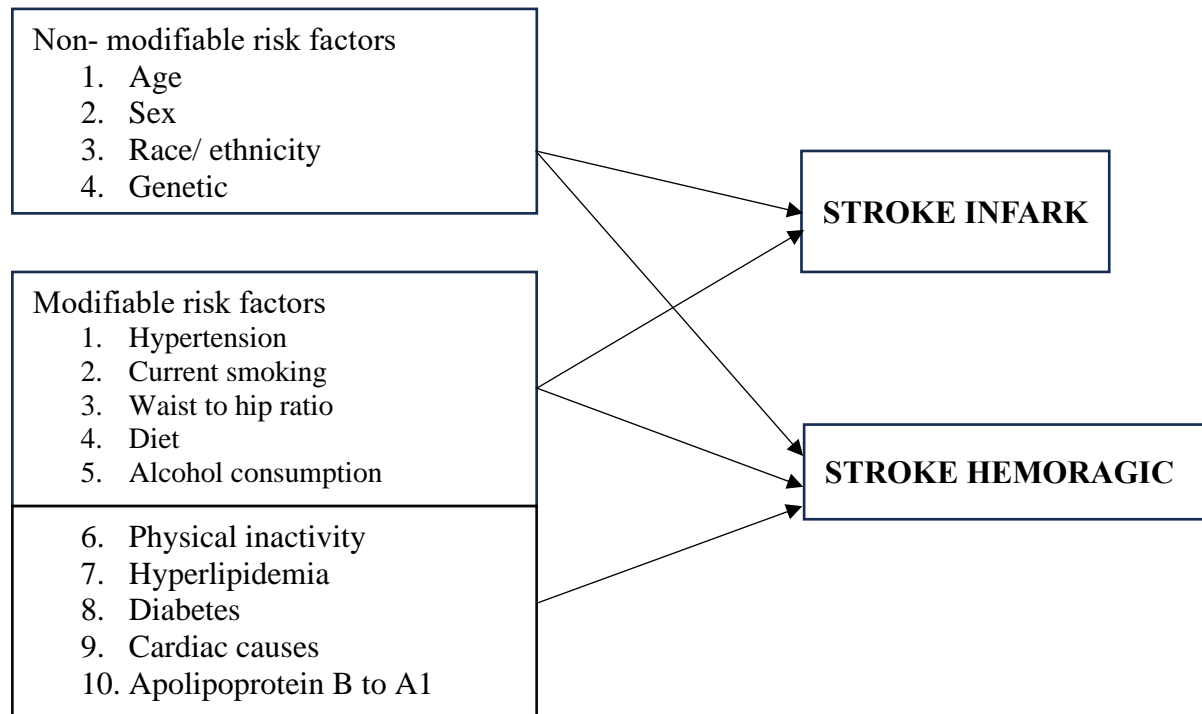


Figure 2 Risk Factors of Stroke Infark and Hemoragic

Recent research on stroke risk factors and genetics has not only identified those at risk for stroke, but also identified ways to target at-risk populations for stroke prevention. such as atrial fibrillation. Genetic factors, particularly those with environmental interactions, may be more modifiable than previously known. Stroke prevention generally focuses on modifiable risk factors. Lifestyle and behavior modifications, such as dietary changes or quitting smoking, not only reduce the risk of stroke, they also reduce the risk of other cardiovascular diseases. Other prevention strategies include identifying and treating medical conditions, such as hypertension and diabetes, that increase the risk of stroke. Recent research on stroke risk factors and genetics has not only identified those at risk for stroke, but also identified ways to target at-risk populations for stroke prevention. such as atrial fibrillation. Genetic factors, particularly those with environmental interactions, may be more modifiable than previously known. Stroke prevention generally focuses on modifiable risk factors. Lifestyle and behavior modifications, such as dietary changes or quitting smoking, not only reduce the risk of stroke, they also reduce the risk of other cardiovascular diseases. Other prevention strategies include identifying and treating medical conditions, such as hypertension and diabetes, that increase the risk of stroke. Recent research on stroke risk factors and genetics has not only identified those at risk for stroke, but also identified ways to target at-risk populations for stroke prevention. Stroke prevention generally focuses on modifiable risk factors. Lifestyle and behavior modifications,

such as dietary changes or quitting smoking, not only reduce the risk of stroke, they also reduce the risk of other cardiovascular diseases. Other prevention strategies include identifying and treating medical conditions, such as hypertension and diabetes, that increase the risk of stroke. Recent research on stroke risk factors and genetics has not only identified those at risk for stroke, but also identified ways to target at-risk populations for stroke prevention. Stroke prevention generally focuses on modifiable risk factors. Lifestyle and behavior modifications, such as dietary changes or quitting smoking, not only reduce the risk of stroke, they also reduce the risk of other cardiovascular diseases .

DISCUSSION

Risk factors important in stroke prevention can be divided into non-modifiable and modifiable risk factors. Non-modifiable risk factors include age (increased risk with increasing age); race and ethnicity (higher risk of strokes in Africans than whites), gender (higher risk for men, but this trend disappears beyond the mid-80s), family history (especially of cerebral arterial disease), genetic risk factors (for example, hypercoagulable states, sickle cell disease, cerebral amyloid angiopathy). Modifiable risk factors: hypertension, diabetes mellitus, obesity, impaired lipid profile, atrial fibrillation, structural heart disease, carotid artery stenosis, lifestyle choices- Diet, Exercise, Smoking, Alcohol, etc.

In most cases, the patient has a combination of modifiable risk factors, i.e., hypertension, diabetes, high cholesterol (Hastuti et al., 2021; Hastuti & Kep, 2020; Hastuti & Mufarokhah, 2019).

Hypertension is a major risk factor for both ischemic and hemorrhagic stroke. Hypertension is an identified risk factor in up to 90% of all strokes, and it is estimated that up to 40% of all strokes can be prevented with good blood pressure control. Higher blood pressures are associated with a higher risk of stroke, even in the normotensive range. The term 'prehypertension' has been eliminated in the recent guidelines, and normal BP is considered to be less than 120/80 mm Hg. BP over 130/80 mm Hg should be treated in all symptomatic atherosclerotic cardiovascular disease (ASCVD) individuals and asymptomatic individuals with over 10% risk of 10-year ASCVD risk. For secondary prevention of stroke, antihypertensive treatment should be initiated for BP more than 140/90 mm Hg. Lower BP target (SBP < 130 mm Hg) is recommended only after lacunar stroke. Lifestyle modifications like salt restriction, weight loss, and regular exercise should be a part of comprehensive antihypertensive therapy. The choice of antihypertensive should be individualized based on patient demographics and comorbid conditions.

Diabetes is a major risk factor for ischemic stroke, especially lacunar stroke and large artery stroke. The risk of stroke is tripled in patients with diabetes mellitus of duration over 10 years. Diabetes is a strong risk factor for ischemic stroke and is further associated with other stroke risk factors such as hypertension, abnormal lipid profile, and obesity. So far, there is no proven direct risk between diabetes and primary hemorrhagic stroke. Nevertheless, aggressive diabetic control is prudent. Lifestyle modifications and pharmacological treatment should be initiated for a target glycated hemoglobin of less than 6.5% (48 mmol), along with optimal lipid and blood pressure targets. Aspirin is recommended for diabetic patients with higher ASCVD risk for primary prevention of cardiovascular disease (CVD), although its role in primary stroke prevention is unclear. Metformin - the first-line medication for type 2 diabetes mellitus patients also has potential benefits for clinical atherosclerotic disease. Some other hypoglycemic agents like SGLT2 inhibitors- empagliflozin, canagliflozin, GLP-1 receptor agonist- liraglutide, thiazolidinedione- pioglitazone, have shown efficacy for reduction of carotid atherosclerosis, and when appropriate diabetic patients with atherosclerotic stroke

should receive therapy with such agents. Existing guidelines for glycemic control and lipid and BP targets should be used in diabetic patients who have had a stroke or TIA.

Dyslipidemia- Ischemic stroke risk is increased by high cholesterol levels, whereas low cholesterol levels may increase the risk of hemorrhagic stroke (*Kernan-et-al-2014-Guidelines-for-the-Prevention-of-Stroke-in-Patients-with-Stroke-and-Transient-Ischemic-Attack*, n.d.). Statin treatment reduces the risk of stroke in patients with or at high risk of atherosclerotic disease and even in healthy individuals with LDL < 130 mg/dL and high sensitivity CRP levels > 2mg/L. Despite initial concerns, statin treatment does not increase the risk of hemorrhagic CVA. Estimating total cardiovascular risk is the first step in the medical management of dyslipidemia. Clinical ASCVD, including stroke and TIA, is the major determinant of an individual's CVD risk. LDL targets are based on risk factors or 10-year risk of ASCVD. American college of endocrinology 2017 guidelines for management of dyslipidemia and prevention of cardiovascular disease recommend LDL target of < 55 mg/dL for extreme risk, < 70 mg/dL for very high risk, < 100 mg/dL for high and moderate risk and < 130 mg/dL for low-risk individuals. Fibrates are recommended for triglycerides >200 mg/dL and HDL < 40 mg/dL. Proprotein Convertase Subtilisin Kexin 9 (PCSK9) inhibitors are recommended for very high-risk individuals unable to reach LDL target of <140 mg/dL or < 100 mg/dL for those with multivessel or rapidly progressive atherosclerotic disease, despite statin therapy with or without ezetimibe therapy or because of inability to tolerate at least three statin medications (*Kernan-et-al-2014-Guidelines-for-the-Prevention-of-Stroke-in-Patients-with-Stroke-and-Transient-Ischemic-Attack*, n.d.). A meta-analysis from Cholesterol Treatment Trialists' (CTT) Collaboration has shown that "in individuals with a 5-year risk of major vascular events lower than 10%, each one mmol/L reduction in LDL cholesterol produced an absolute reduction in major vascular events of about 11 per 1000 over 5 years."^[9] For secondary prevention, SPARCL trial showed that the use of high-dose atorvastatin (80 mg) for cardioembolic stroke/TIA patients led to a 43% reduction in the risk of fatal recurrent stroke and a 26% reduction in any cardiovascular events (Article, 2017a, 2017b; Himmelfarb et al., 2016; Manzini & Simonetti, 2009; Waluya et al., 2019).

Smoking has been associated with a two to four-time increased risk of ischemic stroke and intracranial bleeds. It is one of the leading preventable risk factors for stroke. It takes two to four years after smoking cessation for the excess risk to go down. Smoking cessation options such as counseling, nicotine replacement therapy, or agents such as bupropion should be offered to all appropriate patients. Passive tobacco smoking should be avoided (*Kernan-et-al-2014-Guidelines-for-the-Prevention-of-Stroke-in-Patients-with-Stroke-and-Transient-Ischemic-Attack*, n.d.).

Regular exercise Burning 2000 to 3000 calories per week has been shown to reduce stroke risk by half.

Obesity- The risk of ischemic stroke is increased by 22% for overweight individuals and by 64% in obese individuals as compared to normal-weight individuals.

Diet- American heart association recommends a diet that has increased intake of fruits, vegetables, and whole grains and limited intake of sugar, saturated fat, trans-fat and red meat. Most Mediterranean diets advocate increased consumption of vegetables, whole grains, fruits, nuts, and olive oil. Moderate amounts of fish, poultry, and dairy products are allowed, whereas red meat is avoided. It is uncertain whether the health benefits are due to the consumption of the before mentioned food items or an under-consumption of red meats (and subsequently decreased intake of saturated fats). Absolute risk reduction is approximately three cardiovascular events per 1000 person-years treated (PREDIMED study).

Alcohol- Chronic alcohol use and heavy drinking are risk factors for stroke. J-shaped association between alcohol and ischemic stroke risk has been suggested by most studies. There is a protective effect from light to moderate consumption (likely due to an increase in HDL and a decrease in platelet aggregation) and increased risk of stroke with heavy alcohol consumption (due to a hypercoagulable state, alcohol-induced hypertension, cardiomyopathy, and Afib). Stopping or reducing alcohol consumption is recommended for patients with ischemic stroke or TIA.

Lower socioeconomic status, including low income, lower education level, is associated with an increased risk of stroke recurrence.

Sleep disorders have been identified as a risk for stroke in some recent studies. It is a potentially modifiable risk factor. Proper screening and appropriate therapeutic intervention are recommended.

Atrial fibrillation by itself is a risk factor for embolic stroke events - atrial fibrillation leads to about a 1.9% risk of stroke per year and is responsible for as many as one in six strokes, with a further risk depending on factors such as diabetes, hypertension, age group, previous strokes, heart failure, peripheral vascular disease, previous ischemic cardiac event and gender (higher for females). If all of these risk factors are present along with atrial fibrillation, the risk of embolic stroke is as high as 17% per year. Obviously, anticoagulation is recommended, but that leads to an increased bleeding risk. There are various tools (CHA₂DS₂VASc score, HAS-BLED score) that can help decide about treating atrial fibrillation with anticoagulation, balancing the benefit and harm of treatment (Risso-Gill et al., 2015; Shen et al., 2020; Song et al., 2019). There is growing evidence that the new NOACs (Novel Oral Anticoagulants) are as effective, if not superior, to warfarin and possibly carry fewer bleeding risks. They are now considered first-line therapies for stroke risk reduction in an appropriately selected patient with nonvalvular AF.

Vitamin B therapy helps in small vessel brain injury (due to a reduction in Homocysteine) but not large artery disease or cardioembolic disease. B-vitamins have a role in primary stroke prevention and are associated with a reduction in primary stroke risk between 7% to 11% in high vascular risk patients (but no reduction in cardiac events is reported). VITATOPS study showed secondary prevention benefits: a reduction in small artery ischemic strokes from 17% to 14% after intervention, reduction in intracerebral hemorrhage from 18% to 12% after intervention, reduction in recurrent TIAs from 14% to 10% after intervention, and reduction in milder strokes from 22% to 18% after intervention (Abdelhalim et al., 2019; Luder et al., 2016; Ma, 2018; Qu et al., 2019).

Antiplatelet therapy is preferred for primary and secondary prevention of atherosclerotic stroke prevention. Daily aspirin has been shown to be beneficial in primary prevention for ischemic cardiac disease, but the data is not so robust for primary prevention in strokes. The data for secondary prevention in ischemic strokes is much more convincing. A significant reduction in stroke recurrence within 2 weeks has been reported if aspirin is initiated within 48 hours of an ischemic stroke. Clopidogrel has shown better outcomes for patients with poly vascular disease and could be considered for secondary stroke prevention of atherosclerotic ischemic stroke patients already on aspirin. Dual antiplatelet therapy (aspirin and clopidogrel) has shown efficacy but has significantly more bleeding complications than aspirin alone. Increased mortality has been reported with long-term dual antiplatelet therapy after lacunar stroke. Ticagrelor plus aspirin reduced stroke recurrence in patients with ischemic stroke with symptomatic atherosclerotic stenosis of ipsilateral intra or extracranial stenosis as compared to aspirin alone. Antiplatelet therapy is recommended for primary and secondary prevention of stroke; however, it should be weighed against the risk of bleed, and treatment

should always be individualized, taking into account all risk factors (Long et al., 2017; Mizutani et al., 2016; Spikes et al., 2019).

Anticoagulation therapy - COMPASS trial published in 2017 compared three antiplatelet regimens- rivaroxaban (2.5 mg twice daily) plus aspirin (100 mg once daily), rivaroxaban (5 mg twice daily), and aspirin (100 mg once daily) in patients with stable atherosclerotic disease (peripheral, coronary, symptomatic carotid artery disease, >50% asymptomatic carotid disease) and found the combination treatment group had a significantly lower risk of major adverse cardiovascular events than with aspirin alone, but a significantly higher risk of major bleeding. Combination treatment is not yet added to guidelines, but there is a possibility that this could soon be part of treatment guidelines on secondary prevention of atherosclerotic stroke in select patients. Caution is recommended in patients with a high risk of bleeding (Otsuka et al., 2019; Wan et al., 2018).

Structural Interventions Considered in Secondary Prevention

The structural cardiac disease can sometimes be corrected, though not all structural defect correction is beneficial for stroke prevention. Antiplatelet therapy is reasonable for patients with PFO and ischemic stroke or TIA. Data regarding the recommendation of PFO closure in patients with ischemic stroke is insufficient. Patent foramen ovale correction may be considered in very select patients (high risk on echo, multi-territory infarcts, absence of other significant predisposing risk factors, and recurrent strokes despite anticoagulation) (Wan et al., 2018).

In patients with symptomatic ICA stenosis of >70%, Carotid endarterectomy (CEA) or Carotid Artery Stenosis (CAS) is shown to be beneficial in the first two weeks after an ipsilateral stroke or TIA. CEA is preferred over CAS in older patients (>70 years). Studies have shown a higher procedural risk with CAS than CEA. Women have a less favorable benefit to risk ratio. Guidelines recommend intervention only if estimated perioperative mortality and morbidity risk is <6% for men and <4% for women. Guidelines recommend considering CEA in asymptomatic patients with over 70% ICA stenosis; if their perioperative risk is estimated to be less than 3%, CAS may be considered for high-risk patients. The benefit of carotid intervention for moderate symptomatic and asymptomatic ICA stenosis is unclear so far. There is no benefit in carotid endarterectomy if the carotid is 100% blocked.

Stroke in Women

The lifetime risk of stroke and mortality due to stroke is higher in women than men. Some factors that contribute to an increased risk of stroke in women include pregnancy, oral contraceptive use (especially when combined with smoking), preeclampsia/eclampsia, gestational diabetes, migraine with aura, increased risk of atrial fibrillation, hormonal replacement therapy.

Low-dose aspirin (from the 12th week of gestation until delivery) and calcium supplementation are recommended for women with hypertension before pregnancy or with a history of pregnancy-related hypertension to prevent preeclampsia risk. The risk of stroke is increased two folds and hypertension by four folds in women with preeclampsia.

OCPs may be harmful in women, especially in women with additional risk factors like smoking and a history of thromboembolic events. Aggressive risk factor modification is recommended in women using OCPs. Women should be screened for hypertension before starting hormonal contraception.

CONCLUSION

The results of this literature review answer the research question that the effect of discharge planning has positive effects on the quality of life of stroke patients through changes

in activity, motivation, family support, and knowledge of stroke patients. Then, it can conclude that discharge planning is effective for changes in activity, quality of life, motivation, family support, and knowledge of stroke patients. Discharge planning at the beginning of admission to hospitalized, during the treatment, and by the time before the patients leave the hospital is very effective in improving the patient's readiness because there is a two-way communication effectively between the giver of discharge planning and the patient that gives a chance to the patient to participate in the problem-solving process. Therefore, the use of discharge planning can be recommended as an intervention that can be developed so that can help nurses provide good nursing care.

Recommendation**Supplementary Information***Acknowledgments*

None

Authors information

None

Availability of data and materials

This is a systematic review, and the findings elaborate on all of the included studies/data.

Declarations*Ethics approval and consent to participate*

This is a quick examination of what's already out there, and it doesn't require ethics approval.

Consent for Publication

The study's authors have all given their permission for it to be published.

Competing interest

None

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