

A Comprehensive review of Brain Stroke: Causes, Risk factors, and prevention strategies

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ABSTRACT

Stroke is the second leading cause of death behind heart diseases and a major cause of permanent disability. Stroke is a clinically defines syndrome of acute, focal neurological deficit attributed to vascular injury of the Central Nervous system. The burden of stroke in terms of mortality, morbidity and disability is increasing across the world. Stroke is not a single disease but caused by a wide range of risk factors, disease processes and mechanisms. Neuroprotective drugs have become the core treatment, due to lack of awareness in people of hospitalization very soon after occurrence of symptoms leading to disability so, this study aims to discuss in detail on risk factors of stroke and management to achieve in effective treating and to prevent disability in stroke patients. Hypertension is the most important modifiable risk factor for stroke, although its contribution differs for different subtypes. Most 85% of strokes are ischaemic, predominantly caused by small vessel atherosclerosis. Approximately 15% of strokes worldwide are the result of intracerebral haemorrhage, which can be deep basal ganglia, brainstem, cerebellar. Follow up of the patient should be taken for the medication adherence and to prevent relapse. The people with good educational background had the awareness on early identification of stroke symptoms and its risk factors.

Key words:

Stroke, neuroprotective drugs, ischaemic stroke, haemorrhagic stroke, intracerebral haemorrhage, atherosclerosis, basal ganglia, brain stem, cerebellar, relapse.

I. INTRODUCTION

A stroke occurs when the blood supply to the part of brain is interrupted or reduced, preventing brain tissue from getting oxygen and nutrients. Brain cells begin to die in minutes. Stroke is ranked as second leading cause of mortality worldwide, only surpassed by ischemic heart disease. According to the world stroke organization, over 13.7 million stroke attacks are reported each year.

TYPES OF STROKES:

1. **ISCHAEMIC STROKE:** An ischaemic stroke occurs when a blood clot keeps blood from flowing to brain. The blood clot often due to atherosclerosis, which is a build up of fatty deposits on the inner lining of a blood vessel. A portion of these fatty deposits can break off and block blood flow in brain. An ischaemic stroke can be embolic, meaning the blood clot travels from another part of body to brain. An estimated 15 percent of embolic strokes are due to atrial fibrillation.

2. **HAEMORRHAGIC STROKE:** A haemorrhagic stroke results when a blood vessel in brain ruptures or breaks, spilling blood into the surroundings tissues. The first is an aneurysm, which causes a portion of the weakened blood vessel to balloon outward and sometimes rupture. The other is an arterio-venous malformation, which involves abnormally formed blood vessels. If such a blood vessel ruptures, it can cause a haemorrhagic stroke. Lastly very high blood pressure can cause weakening of the small blood vessels in the brain and result in bleeding into the brain.

3. **TRANSIENT ISCHEMIC ATTACK:** Transient ischemic attack TIA a warning or mini stroke. Anything that temporarily blocks flow to brain causes a TIA. The blood clot and TIA symptoms last for a short period of time.

CAUSES AND RISK FACTORS OF STROKE:
According to AMERICAN STROKE ASSOCIATION (ASA) Guidelines, there are two types of risk factors in stroke.

a) **RISK FACTORS** you can control treat and improve / Modifiable Risk factors.

b) **RISK FACTORS** not within your control / Non- modifiable Risk factors.

a. Risk factors you can control treat and improve:

1. **HYPERTENSION:** It is a leading cause of stroke and the most significant controllable risk factor. Uncontrolled high blood pressure causes damage and weakens blood vessels of brain leads to rupture or leak.

2. **SMOKING:** The nicotine and carbon monoxide in cigarette smoke damage the cardiovascular system and pave the way for a stroke. The use of birth control pills combined with cigarette smoking can greatly increases the risk of stroke.

3. **ALCOHOL CONSUMPTION:** Too much alcohol consumption raises your blood pressure. Atrial fibrillation increases your risk of stroke by five times, because it can cause blood clots to form in the heart. If these clots move up into the brain, it can lead to stroke.

4. **DIABETES:** Type 1 or Type 2 Diabetes mellitus is an independent risk factor for stroke. Many people with diabetes also have high blood pressure and high blood cholesterol and are overweight increasing their risk even more. While diabetes is treatable, the presence of the disease increases your risk of stroke.

5. **DIET:** Diets high in saturated fat, trans-fat and cholesterol can raise blood cholesterol levels. Diets high in sodium (salt) can increase blood pressure. Diets with high calories can lead to obesity. But a diet containing five or more servings of fruits and vegetables per day may reduce the risk of stroke.

6. **PHYSICAL INACTIVITY:** Physical inactivity can increase your risk of stroke, heart disease, overweight/obesity, high blood pressure, high blood cholesterol and diabetes.

7. **OBESITY:** Excess body weight and obesity are linked with an increased risk of high blood pressure, diabetes, heart disease and stroke.

8. **HIGH BLOOD CHOLESTEROL:** Large amounts of cholesterol in the blood can build up and cause blood clots leading to a stroke.

9. **CAROTID ARTERY DISEASE:** The carotid arteries in your neck supply blood to your brain. A carotid artery narrowed by fatty deposits form atherosclerosis (plaque buildups in artery walls) may become blocked by a blood clot causing a stroke.

10. **OTHER HEART DISEASES:** People who have coronary heart disease or heart failure are at higher risk of stroke than people who have healthy hearts. Dilated cardiomyopathy (an enlarged heart), heart valve disease and some types of congenital heart defects can also raise the risk of stroke. So work with your health care provider to manage these related conditions.

b. Risk factors not within control:

1. **AGE:** The likelihood of having a stroke increases with age for both males and females. Although stroke is more common among the elderly, a lot of people under 65 also have strokes. Even babies and children can have a stroke.

2. **FAMILY HISTORY:** If parent, grandparent, sister, or brother has had a stroke, especially before reaching age 65, you may be at greater risk. Sometimes strokes are caused by genetic disorders like CADASIL, which can block blood flow in the brain.

3. **RACE:** African-Americans have a much higher risk of death from a stroke than Caucasians do. This is partly because blacks have higher risks of high blood pressure, diabetes, and obesity. Visit our empowered to serve program to learn more. Hispanics and Latino's also have unique risk for stroke.

4. **PRIOR STROKE, TIA OR HEART ATTACK:** A person who has had a prior stroke has a much higher risk of having another stroke than a person who has never had one. A person who's had one or more transient ischemic attacks (TIAs) is almost 10 times more likely to have a stroke than someone of the same age and sex who hasn't. TIAs

are smaller, temporary blockages in the brain that can produce milder forms of stroke-like symptoms but may not leave lasting damage. A TIA is a medical emergency.

STANDARD TREATMENT GUIDELINES OF STROKE:

Acute treatment for ischaemic stroke usually involves medicines. The given steps are involved.

a) The benefit of intravenous (IV) tissue plasminogen activator (tPA) are time-dependent, and treatment for eligible patients should be initiated as quickly as possible.

b) IV tPA should be administered to all eligible acute stroke patients within 3 hours of last known normal and to a more selective group of eligible acute stroke patients within 4.5 hours of last known normal. Centres should attempt to achieve door-to-needle times of <60 minutes in >50% of stroke patients treated with IVtPA.

c) Prior to initiation of IV tPA in most patients, a non-contrast head computed tomography (CT) and glucose are the only required tests. An international normalized ratio, partial thromboplastin time, and platelet count do not need to have resulted prior to IV tPA initiation if there is no suspicion for underlying coagulopathy. Centres should attempt to obtain a non-contrast head CT within 20 minutes of arrival in >50% of stroke patients who may be candidates for IVtPA or mechanical thrombectomy.

d) For patients who may be candidates for mechanical thrombectomy, an urgent CT angiogram or magnetic resonance (MR) angiogram (to look for large vessel occlusion) is recommended, but this study should not delay treatment with IV tPA if indicated.

e) Patients >18 years should undergo mechanical thrombectomy with a stent retriever if they have minimal pre-stroke disability, have a causative occlusion of the internal carotid artery or proximal middle cerebral artery, have a National Institutes of Health stroke score of >6, have a reassuring non-contrast head CT and if they can be treated within 6 hours of last known normal. No perfusion imaging (CT-P or MR-P) is required in these patients.

f) As with IV tPA, treatment with mechanical thrombectomy should be initiated as quickly as possible.

g) Administration of aspirin is recommended in acute stroke patients within 24-48 hours after stroke onset. For patients treated with IV tPA, aspirin administration is generally delayed for 24

hours. Urgent coagulation (e.g., heparin drip) for most stroke patients is not indicated.

h) The use of stroke units that incorporate rehabilitation is recommended for all acute stroke patients.

i) If we cannot get the tPA medicine, you may get medicine that helps stop platelets from clumping together to form blood clots. Or you may get a blood thinner to keep existing clots from getting bigger.

Acute treatments for haemorrhagic stroke focus on stopping the bleeding. The first step is to find the cause of bleeding in the brain. The next step is to control it:

j) If high blood pressure is the cause of bleeding, you may be given blood pressure medicines.

k) If an aneurysm is the cause, you may need aneurysm clipping or coil embolization. These are surgeries to prevent further leaking of blood from the aneurysm. It also can prevent the aneurysm from bursting again.

l) If an arteriovenous malformation (AVM) is the cause of a stroke, you may need an AVM repair. An AVM is a tangle of faulty arteries and veins that can rupture within the brain. An AVM repair may be done through:

- Surgery
- Injecting a substance into the blood vessels of AVM to block blood flow,
- Radiation to shrink the blood vessels of the AVM.

m) Prevention better than cure comes true for hypertensive and diabetes mellitus patients to avoid the larger risk of stroke events. The drug utilization patterns of stroke contain drugs like:

- MANNITOL,
- ASPIRIN,
- CLOPIDOGREL,
- ATORVASTATIN,
- NIFEDIPINE,
- Multivitamin,
- ENOXAPARIN,
- PHENYTOIN,
- ATENOLOL,
- LOSARTAN,
- HEPARIN,
- RAMIPRIL,
- TELMISARTAN,
- HYDROCHLORTHIAZIDE.

n) STROKE REHABILITATION can help you relearn skills you lost because of the damage. The goal is to help you become as independent as

possible and to have the best possible quality of life.

II. CONCLUSION:

This study covers various aspects such as causes, risk factors and management strategies. Brain stroke can be caused by different factors, including blood clots, ruptured blood vessels, or reduced blood flow to the brain. Prevention is better than cure early identification and management of risk factors like hypertension, diabetes mellitus and change in lifestyle habits like smoking and alcohol consumption may reduce the risk of stroke. Meanwhile, several large clinical trials have provided evidence of the benefits of several medical and behavioural treatments in reducing stroke risk. Blood pressure reduction, statin therapy, antiplatelets, anticoagulants, carotid revascularization, and dietary changes have all been proven to reduce stroke risk in various patient population. Proper prescribing pattern and monitoring the patients may prevent the ADR's and the drug interactions occurring in stroke patients. Follow up of the patient should be taken for the medication adherence and to prevent relapse. The people with good educational background had the awareness on early identification of stroke symptoms and its risk factors.

REFERENCES:

- [1]. Stroke – symptoms and causes – Mayo clinic -8-december – 2023.
- [2]. What are the different types of strokes? Medically reviewed by Seunggu Han MD (may – 24 – 2018)
- [3]. Risk factors for stroke American Heart Association and American stroke Association guidelines – 2017.
- [4]. Indira Kumari N., Veera Raghavulu B. Risk factor assessment of stroke and its awareness among stroke survivors: A Retrospective study. International Journal of Research in health sciences. February 2015.
- [5]. O'Donnell M.J., Chin S.L., Rangarajan S., et al. Global and regional effects of potentially modifiable risk factors associated with acute stroke in 32 countries (interstroke): a case-control study. *Lancet*. 2016; 388:761– 775.
- [6]. K. Shrivani. Mihar Y. Pamar., Ramyasri Macharla., Oday Venkat Maketi., Srinivas Martha. Risk factors assessment of stroke and its awareness among stroke survivors: A prospective study. *Advances Biomedical Research*. August 2015.
- [7]. Shakir, R. The struggle for stroke reclassification. *Nat. Rev. Neurol*. 2018, 14, 447-448.
- [8]. Monaliza. Meena Aggarwal, Achal SriVastava. Awareness of risk factors and warning symptoms of stroke in General population. *Nursing and Midwifery Research journal*. April 2012.
- [9]. Kelly – Hayes, M. Influence of age and health behaviours on stroke risk: lessons from longitudinal studies. *J. Am. Geriatr. Soc*. 2010, 58, S325-S328.
- [10]. Kerr, G.D.; Higgins, P.; Walters, M.; Ghosh, S.K.; Wright, F.; Langhorne, P.; Scott, D.J. Socioeconomic status and transient ischaemic attack/stroke: A prospective observational study. *Cerebrovasc. Dis*. 2011, 31, 130-137.
- [11]. Wolf, P.A.; Abbott, R.D.; Kannel, W.B. Atrial fibrillation as an independent risk factor for stroke: The Framingham study. *Stroke* 1991, 22, 983-988.
- [12]. Gill, J.S.; Zezulka, A.V.; Shipley, M.J.; Gill, S.K.; Beevers, D.G. Stroke, and alcohol consumption. *N. Engl. J. Med*. 1986, 315, 1041- 1046.
- [13]. Fischer, U.; Kaesmacher, J.; Molina, C.A.; Selim, M.H.; Alexandrov, A.V.; Tsivgoulis, G. Primary Thrombectomy in tPA Eligible stroke patients with proximal intracranial Occlusions. *Stroke* 2018, 49, 265 – 269.
- [14]. Mohammed Yaseen Addasi., Md. Avez Ali. Prescribing patterns of drugs in stroke patients: A Prospective study. *Archives of pharmacy practice*. February 2013.
- [15]. Barreto, A.D. Intravenous thrombolytics for ischemic stroke. *Neurotherapeutics* 2011, 8, 388-399.
- [16]. The National Institute of Neurological Disorders and stroke rt-PA Stroke study group. Tissue Plasminogen activator for acute ischaemic stroke. *N. Engl. J. Med*. 1995, 333, 1581– 1587.
- [17]. Hackam, D.G.; Spence, J.D. Antiplatelet Therapy in ischaemic stroke and transient ischaemic attack. *Stroke* 2019, 50, 773 – 778.
- [18]. Dobkin, B.H. Strategies for stroke rehabilitation. *Lancet Neurol*. 2004, 3, 528 – 536.