

Editorial**Ischemic Stroke Prevention and its Management****Prof. Dr. Azhar Masud Bhatti**

Editor-in-Chief

Introduction

An ischemic stroke is a serious medical emergency that happens when a blood clot blocks or plugs a blood vessel in the brain. It accounts for about 87% of all stroke cases. Without blood and oxygen, brain cells begin to die in minutes.

Stroke is a debilitating illness rendering thousands disabled and leading a significant proportion of people to death worldwide. Its incidence in Asia, according to a rough estimate, has been increasing recently. Among Asian countries, Pakistan shares a significant burden of this devastating disease contributing towards an exponential expenditure of resources, finances, community manpower, health services and the economy as a whole.^{1,2}

Recent global research highlights that ischemic stroke remains a leading cause of death and long-term disability worldwide, with absolute case numbers rising due to population aging, while clinical trials advance treatment windows and prevention therapies.

Recent research on ischemic stroke in Pakistan highlights a high burden of cardiometabolic risk factors, significant treatment delays. Ischemic stroke accounts for roughly 44% of regional stroke presentations, driven primarily by uncontrolled hypertension and diabetes.

Main Causes

Thrombosis: A blood clot forms right inside a narrowed artery in the brain.

Embolism: A blood clot or fatty piece breaks off from another body part (like the heart) and travels to the brain.

Atherosclerosis: Hard fatty deposits build up inside the walls of blood vessels.

Common Signs and Symptoms

Sudden weakness or numbness in the face, arm, or leg, usually on one side.

Trouble speaking, slurred words, or difficulty understanding speech.

Sudden confusion or dizziness.

Sudden vision changes in one or both eyes.

Fast medical treatment can clear the blocked vessel and save brain tissue.

Epidemiology of stroke

Stroke is a major global health crisis, characterized by ischemic and hemorrhagic subtypes, and driven predominantly by modifiable risk factors like hypertension. Globally, it accounts for nearly 12 million new cases annually and stands as a leading cause of long-term adult disability and death.

Global Incidence and Prevalence

New cases: ~11.9 to 12.2 million new strokes occur globally each year.

Lifetime risk: 1 in 4 adults over age 25 will experience a stroke in their lifetime.

Total burden: Over 93 million people globally live with the effects of a stroke.

Twenty per cent of the world's population resides in South Asia. This region has the most dense concentration of cardiovascular diseases. As stroke affects the elderly exceedingly, an increase in the average lifespan has automatically led to an increased number of stroke cases reported.³

Stroke and transient ischemic stroke are rampant in Pakistan. The risk of stroke has plumped by 100% or more in the past decade, especially in third world countries where it accounts for more than 85% of all stroke-related mortality. The mean population age of patients with stroke in developing countries like Pakistan is a decade or younger than that of their western counterparts. This leads to an increased overall lifetime burden of functional disability and consequent economic losses.⁴

Data from Punjab Pakistan emergency departments report an overall stroke incidence rate of 1.03%, with aged 60–69 years and provincial surveys in KPK estimate a stroke prevalence of 1.2%.

Diabetes, hypertension and Obesity are major problem in South Asians and their body mass index has been estimated to have lower cut-off values for quantification of diseases. Obesity has a prevalence ranging from 20% to 30% in South Asia.⁵

Types of Stroke

Ischemic stroke: Accounts for roughly 87% of all cases, caused by blocked cerebral blood flow.

Hemorrhagic stroke: Accounts for 10% to 15% of cases, caused by ruptured blood vessels, carrying a higher acute mortality rate.

Prevention

In the regard of prevention of stroke, you can classify it as primary and secondary stroke prevention.

Primary Stroke Prevention: Primary stroke prevention includes early diagnosis and management of hypertension, diabetes, dyslipidemia, obesity and coronary heart disease, as well as life style modification like physical activity, cessation of tobacco and smoking and adopting good dietary habits.⁶

Benefits of primary stroke prevention are given in tabulated form below

Hypertension	Maintain healthy lifestyle with regular exercise, balanced diet, low in sodium, and early diagnosis and management of hypertension
Diabetes	Manage blood sugar levels through diet, medication and

	healthy lifestyle, with regular monitoring
High Cholesterol	Adopt a low cholesterol diet, exercise regularly, and take medications to lower cholesterol as indicated
Obesity	Aim for a healthy weight, through a combination of diet and exercise
Physical inactivity	Engage in regular physical activity, aiming for at least 150 minutes of moderate intensity exercise per week
Smoking and Tobacco use	All forms of tobacco use increases risk of stroke and should be avoided. smoking, This includes chewed tobacco, and second-hand smoke
Atrial Fibrillation/Cor onary heart Disease	If heart disease has been identified, it must be appropriately treated. Rhythm disorders like Atrial fibrillation are risk factors for future stroke and risk must be calculated and treatment should be given accordingly.
Unhealthy Diet	Diet rich in saturated fats and red meat increases risk of stroke. Adopt a balanced diet rich in fruits, vegetables, whole grains and lean proteins.
Sleep Apnea	Sleep apnea should be screened for when suspected and once diagnosed must be treated to reduce risk of stroke
Aspirin use	Use of low dose Aspirin in healthy older people has shown an increase in risk of intracranial hemorrhage without a difference in incidence of ischemic stroke. Therefore, its use for primary prevention cannot be justified given the current level of evidence

Secondary Stroke Prevention

A) Lifestyle modifications:

1) Smoking / Tobacco:

Healthcare providers should strongly advise every patient with stroke or TIA who has smoked in the past year to quit active smoking, chewing tobacco like paan, gutka, naswar and avoid environmental tobacco smoke. Counseling, nicotine products, and oral smoking cessation medications all are effective in helping smokers to quit.⁷

2) Physical activity

For patients with ischemic stroke or TIA should participate in at least three to four sessions per week of moderate- to vigorous-intensity aerobic physical exercise to reduce stroke risk factors. Sessions should last for about 40 minutes. Moderate-intensity exercise

is typically defined as sufficient to break a sweat or noticeably raise heart rate (e.g., walking briskly, using an exercise bicycle). Vigorous-intensity exercise includes activities such as jogging.⁸

3) Obesity

All patients with TIA or stroke should be screened for obesity with measurement of BMI and waist to hip ratio. Life style modifications, healthy dietary habits, exercise and medicines should be considered to reduce weight.⁹

4) Diet

It is important to counsel patients with a history of stroke or TIA to follow diet rich in vegetables, fruits, whole grains, low-fat dairy products, poultry, fish, legumes, olive oil, and nuts and to limit intake of sweets and red meats. Two such diets are Mediterranean-type diet and DASH diet.¹⁰ Patients with a history of stroke or TIA should also reduce their sodium intake to less than ≈ 2.4 g/d.

5) Air pollution and climate change

The environment has recently been identified as a strong risk factor for ischemic stroke. The brain is most affected by the body organ due to the environment. Strong advocacy efforts are needed at community and society level to decrease air pollution (acceptable air quality index less than 50) and limit use of greenhouse gases for climate change.

6) Obstructive Sleep Apnea (OSA)

In patients with an ischemic stroke or TIA and OSA, treatment with continuous positive airway pressure (CPAP) can be beneficial for improved sleep apnea, hypertension control, prevention of arrhythmias, sleepiness, and other apnea related outcomes.

B) Antiplatelet:

For long-term prevention of vascular events in people with non-cardioembolic ischemic stroke or TIA, antiplatelet agents should be started within the first 12 to 24 hours of symptom onset.

C) Hypertension:

In patients with acute ischemic stroke or TIA, and who are known with hypertension, anti-hypertensive medications should be resumed or started to achieve a clinic blood pressure target of $<130/80$ mm Hg.

In the last, prevention is one of the most effective and opt efficient ways to reduce the increasing stroke burden which has divesting impacts on individual and societal level.

Management and Treatment of Stroke

The following aspects of Ischemic stroke management:

General Management of Stroke

The following measures apply care of all ischemic stroke patients, irrespective of whether they have received thrombolysis or thrombectomy. The care of stroke patients should be carried out in an organized unit, called a stroke unit.

1) Oxygen during acute phase of stroke

Maintaining adequate tissue oxygen saturation of $>94\%$

is important during periods of acute cerebral ischemia to prevent hypoxia and potential worsening of the neurologic injury. Supplemental oxygen should be administered only if there is evidence of hypoxia.

2) Blood pressure management

Blood pressure may be elevated for the first 24–48 hours in patients with acute stroke. This is due to acute hypertensive response which takes 7-10 days to recover. Antihypertensive agents should be withheld unless the diastolic blood pressure is above 120 mmHg, or the systolic blood pressure is above 220 mmHg in those patients who are not candidate for IV thrombolytic therapy.

3) Hyperglycemia and hypoglycemia

It is reasonable to treat hyperglycemia to achieve blood glucose levels in a range of 140 to 180 mg/dL and to closely monitor to prevent hypoglycemia in patients with AIS. Hypoglycemia of < 60 mg should be treated in acute stroke patients. Insulin sliding scale is recommended to manage hyperglycemia before, during and after thrombolytic therapy. Intravenous insulin infusion can be used cautiously in patients with very high glucose levels.

4) Antithrombotic Agents

After IV thrombolysis with Alteplase antiplatelet will be started after 24 hours. If patient is not a candidate for thrombolysis, antiplatelet should be initiated as early as possible, ideally within 12-24 hours of symptom onset, after an intracranial hemorrhage has been ruled out. Details of which agents are recommended are discussed in secondary prevention section.

If the patient is a candidate for anticoagulation, the timing of anticoagulation will depend on the size of ischemic infarct and risk of hemorrhagic transformation.

5) Lipid Lowering Agents

Patients with ischemic stroke and TIA without a proven cardioembolic mechanism, and an LDL cholesterol above 100mg/dL should be started on Atorvastatin 80mg daily. Target LDL in patients with atherosclerotic etiology of stroke, is <70 mg/dL and Ezetimibe 10 mg daily may be added to achieve this target.

6) Nutrition and Hydration

Patients should receive isotonic hydration and free fluids should be avoided. Nutritional supplementation is not necessary. However, an evaluation for aspiration is needed prior to initiation of diet and the diet should be modified accordingly.

7) Dysphagia and aspiration

Incidence of dysphagia varies among stroke patients. Dysphagia can lead to complications, such as aspiration pneumonia; dehydration; and malnutrition which in turn can lead to prolonged hospital stay; psychological disorders such as stress, anxiety, and depression; decreased quality of life; increased health costs; increased mortality and decreased patient outcomes after stroke.¹¹

8) Prevention of bed sores

The stroke patients who are unable to mobilize are at

the risk of developing bed sores. Ideally, they should be provided with a pressure-relieving mattress as an alternative to a standard hospital mattress. There should be standing instructions for re-positioning these patients every two hours to avoid pressure sores.

9) Deep vein thrombosis

Avoidance of deep vein thrombosis in immobilized patients via frequent movements and the use of low dose s/c heparin.

10) Corticosteroids

Steroids do not appear to have any beneficial role in management of patients with presumed acute stroke. Usage of steroids in these cases may elicit unwanted adverse effects such as hyperglycemia and infections.²¹ Steroid should be avoided in patients with acute stroke or intracranial hemorrhage.

Acute Management of Stroke

Pre-hospital Stroke Care: The concept of pre-hospital care is not well established in Pakistan. Currently, Pakistan lacks an organized and a unified emergency medical service (EMS) that can provide a fast and responsive service in urban and rural areas. A coordinated and organized participation of EMS with public and private hospitals and increased levels of stroke awareness in general public will help to optimize stroke management in Pakistan.¹²

In-Hospital Management

Stroke is a medical emergency and there should be no delay in its diagnosis and treatment. Any patient with acute onset of focal neurological deficit, should be managed in a priority setting, with focus on immediate resuscitation if unstable. Once on the ED bed, a rapid airway, breathing and circulation assessment should be performed and treatment of life-threatening conditions initiated. Supplemental oxygen should be given only if patient is hypoxemic.¹³ Hypotension and hypovolemia should be corrected for adequate organ perfusion. Treating physician must identify the time of onset of stroke symptoms, which is the most crucial step in determining therapy.

Emergency Department Management:

Airway, breathing, circulation	Ensure stability of airway, breathing and circulation Supplemental oxygen if Saturation <95%
Blood Sugar	Check Blood Sugar: Dextrose 25%, if RBS <50 mg/dL
History with special focus on Time Last Seen Normal	SAMPLE questions
Neurological Examination	Patient with suspected acute stroke should ideally be assessed by a specialist clinician (trained in acute stroke assessment)
Lab Tests	NIH Stroke Scale should be used to assess stroke severity
For all patients	• Blood glucose • Serum electrolytes • Renal function tests • ECG Markers of cardiac ischemia

	• Complete blood count, including platelet count • Coagulation profile including Prothrombin time/international normalized ratio (INR) Activated partial thromboplastin time.
For Selected patients	• Hepatic function tests • Toxicology screen • Blood alcohol level • Pregnancy test • Arterial blood gas tests (if hypoxia is suspected) • Chest radiography (if lung disease is suspected) • Lumbar puncture (if subarachnoid hemorrhage is suspected and CT scan is negative for blood) • Electroencephalogram (if seizures are suspected)
Imaging	Patients with suspected acute stroke should receive brain imaging as soon as possible
CT brain	• CT/MR Perfusion • CT brain plain is the investigation of choice • Interpretation of CT brain to take reperfusion decision should only be undertaken by healthcare personnel who have received appropriate training for this
CT Angiogram	• In centers capable of performing mechanical thrombectomy, patients with ischemic stroke who are potentially eligible for the procedure must undergo CT angiogram from arch of the aorta to skull vertex as soon as possible. This should not delay administration of thrombolysis. • CT angiogram should also be performed without delay in centers that can transfer patients to thrombectomy capable centers
MRI Brain	• For patients with unknown time of onset and those with wake-up stroke, MRI Brain with stroke specific sequences (DWI-FLAIR) can be done to select patients within window for thrombolysis (4.5 hours)
CT/MR Perfusion	• Patients with acute ischemic stroke and large vessel occlusion in the delayed window (6-24) can undergo CT/MR perfusion to determine their eligibility for endovascular therapy in the extended window up to 24 hours.

Identification of stroke is encouraged to be made at the community level worldwide. There is no national awareness campaign or educational platform for the general public to get awareness about the signs of early stroke. It is only at the level of medical specialists or

neurologists that most of these patients are quickly and correctly diagnosed and treatment of acute ischaemic strokes and TIAs as the window period for administering thrombolysis is just 4.5 hours of symptom onset and timely mechanical thrombectomy may be done.

REFERENCES

1. Khealani BA, Hameed B, Mapari UU. Stroke in Pakistan. *J Pak Med Assoc* 2008;58:400–3.
2. Kamal AK, Itrat A, Murtaza M, et al. The burden of stroke and transient ischemic attack in Pakistan: a community-based prevalence study. *BMC Neurol* 2009;9:58.
3. World Health Organization (WHO). The Atlas of Heart Disease and Stroke. http://www.who.int/cardiovascular_diseases/resources/atlas/en/
4. Nomani AZ, Iqbal M, Jamil U, et al. Etiology of stroke in young Pakistani adults; results of a single center study. *Pak J Neurol Sci* 2015;10:18–22.
5. Qureshi MS, Iqbal M, Nomani AZ. Rapidly increasing prevalence and associations of diabetes mellitus in a rural community of Pakistan. *J Diabetol* 2014;3:3.
6. Ezekowitz JA, Straus SE, Majumdar SR, McAlister FA. Stroke: strategies for primary prevention. *Am Fam Physician* 2003;68: 2379-87.
7. Kernan WN, Viera AJ, Billinger SA, Bravata DM, Stark SL, Kasner SE, et al. Primary Care of Adult Patients After Stroke: A Scientific Statement from the American Heart Association/American Stroke Association. *Stroke* 2021;52(9):e558-e71.
8. Gallanagh S, Quinn TJ, Alexander J, Walters MR. Physical activity in the prevention and treatment of stroke. *ISRN Neurol* 2011;2011:953818.
9. Oza R, Rundell K, Garcellano M. Recurrent ischemic stroke: strategies for prevention. *Am Fam Phys.* 2017; 96: 436-40.
10. Dearborn JL, Urrutia VC, Kernan WN. The case for diet: a safe and efficacious strategy for secondary stroke prevention. *Front Neurol.* 2015; 6: 1.
11. Eltringham SA, Kilner K, Gee M, Sage K, Bray BD, Pownall S, et al. Impact of Dysphagia Assessment and Management on Risk of Stroke-Associated Pneumonia: A Systematic Review. *Cerebrovasc Dis.* 2018;46(3-4):99-107.
12. Mergenthaler P, Meisel A. Do stroke models model stroke? *Dis Model Mech.* 2012;5(6):718-25.
13. Veazie MA, Galloway JM, Matson-Koffman D, LaBarthe DR, Brownstein JN, Emr M, et al. Taking the initiative: implementing the American Heart Association Guide for Improving Cardiovascular Health at the Community Level: Healthy People 2010 Heart Disease and Stroke Partnership Community Guideline Implementation and Best Practices Workgroup. *Circulation* 2005;112(16):2538-54.