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A Comprehensive Review on Stroke and It's Management

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Abstract- Stroke is heterogeneous cerebrovascular disorder characterized by a sudden loss of neurological function resulting from disruption of cerebral blood flow, either due to ischemia(approximately85%of cases) or haemorrhage (about 15%). This comprehensive review focuses on the risk factors that affect the stroke and subtypes for young ischemic stroke patients and their outcomes at the time of discharge. as well as the correlation between these risk factors and stroke subtypes based on the TOAST classification of young strokes. The TOAST classification divides patients with ischemic stroke into five sub groups According to the presume detiological mechanism. The aims of the present study were to evaluate the distribution of the different etiological stroke subtypes in a hospital-based sample of stroke patients, and to investigate the association between important risk factors and stroke subtypes. Stroke prevention strategies is to identify subjects who are at increased risk for stroke and to modify the risk if possible. Although some risk factors are non-modifiable such as Age, gender, family history and race or ethnicity are considered markers for increased stroke risk. Modifiable risk factors for stroke include hypertension, cardiac disease (particularly atrial fibrillation), diabetes, hyper lipidemia, smoking and alcohol consumption. Men have greater stroke incidence than women. This review mainly underlines the need for further research to identify risk for stroke also stroke subtypes and emerging therapies are used to reduce the morbidity and mortality of stroke. Recognition of stroke and its sub types provide the basis for primary, secondary, and tertiary stroke prevention strategies.

Keywords- Stroke, stroke subtypes, risk factors, hyperlipidemia, TOAST classification, ischemia, haemorrhage.

I. INTRODUCTION

Stroke is a clinically defined syndrome of acute, focal neurological deficit attributed to vascular injury (infarction, haemorrhage) of the central nervous system. Stroke is the second leading cause of death and disability worldwide. Stroke is not a single disease but can be caused by a wide range of risk factors, disease processes and mechanisms. Hypertension is the most important modifiable risk factor for stroke, although its contribution differs for different subtypes. Most (85%) strokes are ischaemic, predominantly caused by small vessel arteriolosclerosis, cardioembolic and large artery Athero-thrombo embolism. Approximately 15% of strokes worldwide are the result of intracerebral haemorrhage, which can be deep (basal ganglia, brainstem), cerebellar or lobar. Deep haemorrhages usually result from deep perforator (hypertensive) arteriopathy (arteriolosclerosis), while lobar haemorrhages are mainly caused by cerebral amyloid angiopathy or arteriolosclerosis[1].

Compared with stroke in older adults ,stroke in the young adults has significantly large social and economic impact by leaving victims disabled during their most productive years and create a long term burden on them, their families and the community. Stroke is one of the commonest causes of mortality and disability across the world affecting around 11million people each year[1]. Although traditionally believed to be common in elderly, about 10% to 20%ofstrokesoccurinyoungadultsaged18to 45 years. This study aim edto investigatethe risk factors and subtypes of ischemic strokes in young adults between 18 and 45 years[1].

Defining stroke subtypes

All patients of ischemic stroke were grouped into 5 subtypes, according to the Trial of ORG 10172 in acute stroke treatment (TOAST) system into large artery atherosclerosis, lacunar stroke ,cardio embolic stroke, stroke of other determine edetiology, and stroke of undetermined etiology. Patients were classified into stroke subtypes based on the review of investigations and clinical assessment by neurologists trained in stroke diagnosis of subtypes. Minimum two neurologists reviewed the data of every patient to determine the mechanism of stroke subtypes .The study was approved by the Institutional Ethics Committee of Krishna Institute of Medical Sciences. Distinct subtypes, etiologies, and epidemiological patterns consequently, vascular risk profiles may differ according to stroke subtype and age [4].

Transient Ischaemic Attack and Stroke: A TIA is traditionally defined as a brief episode of focal neurological dysfunction not associated with permanent cerebral The Trialof Org10172 inAcute Stroke Treatment (TOAST) classification system is the most widely used sub- classification system for patients with cerebral ischaemia, defining five subtypes

- Large artery atherosclerosis
- Cardio embolic
- Small vessel occlusion,
- Stroke of other determine edetiology ,and
- Stroke of undetermined edetiology[5].

Large Vessel Atherothrombosis: It refers to the formation of lipid-laden atherosclerotic plaques on the inner wall of a large vessel and can affect both extra crania land intracranial larteries. The most common sites for formation of atherosclerotic plaques include where the common carotid arteries split, the start of the vertebral arteries and the course of the middle cerebral artery[7,8].

Cardio Embolism: It occurs as a result of blood clots, which may have formed within the heart, breaking loose, entering the circulation and then becoming lodged downstream in a cerebral artery. Clots can form within the heart because of intra cardiac stasis of blood [9].

Small-vessel Disease: Refers to occlusive disease involving the microcirculation of the brain. Common locations for small-vessel disease include deep areas of the hemispheric white matter; the region of white matter known as the internal capsule, next to the proximal middle cerebral artery and supplied with blood by its penetrating branches; the pons in the midbrain stem, supplied by penetrators arising from the infarction, and lasting less than 24 hours. Stroke is defined as focal neurological deficit of sudden onset ,with symptoms lasting more than 24hours (or resulting in death before 24hours). With the increasing availability of MRI, it is likely that imaging-based definitions of TIA and stroke will take precedence in the future [4].

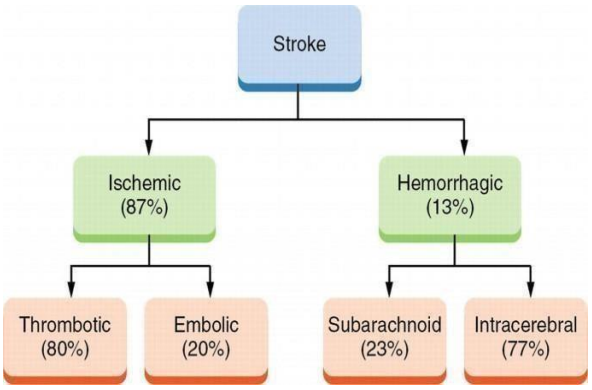
Other Determined Causes: Include strokes caused by extra cranial arterial dissections, non atherosclerotic vasculo pathies, hyper coagulable states or haematologic disorders[11].

Undetermined Causes: Include patients in whom a complete screening workup for cardiac conduction or structural abnormalities, intracranial or extra cranial large-artery stenosis, coagulopathy the stroke may be considered to be cryptogenic after standard assessments[12]

Classification of Stroke:[6]

Strokes can be classified into two main types: ischaemic (caused by a clot in a blood vessel in the brain), or haemorrhagic (caused by a bleed in the

brain). Basil artery ;and the thalamus ,reliant primarily on branches of the posterior cerebral arteries[10].



II. ETIOLOGY

1. Ischemic Stroke Causes

The vast majority of strokes occur when blood flow to the brain is blocked by a clot. This can happen in several ways

- Atherosclerosis: Fatty deposits (plaques) build up in arteries, narrowing them and making it easier for clots to form.
- Embolism: A blood clot or debris forms elsewhere in the body (often in the heart, as with atrial fibrillation) and travels to the brain, lodging in an artery.
- Thrombosis: A clot forms directly in one of the brain's arteries, often where plaque has narrowed the vessel[14].

2. Haemorrhagic Stroke Causes

Bleeding strokes happen when a blood vessel bursts ,spilling blood into brain tissue. The main culprits are

- High blood pressure (hypertension): The single greatest risk factor, as constant pressure weakens artery walls. [12]
- Aneurysm: a balloon-like bulge in a blood vessel that can rupture.
- Arterio venous malformation(AVM):at angle of abnormally formed blood vessels that can burst.
- Trauma: head injuries can trigger bleeding strokes[14].

Epidemiology

Stroke is the second leading cause of death globally. It acts roughly 13.7 million people and kills around 5.5 million annually. Approximately 87% of strokes are ischemic infarctions, a prevalence which Increased substantially between 1990 and 2016, attributed to decreased mortality and improved clinical Interventions. Primary (first-time) haemorrhages comprise the majority of strokes, with secondary (second-time) haemorrhages constituting an estimated 10-25%.

Age specific stroke: The incidence of stroke increases with age, doubling after the age of 55 years. However, in an alarming trend, strokes in people aged 20-54 years increased from12.9% to 18.6% of all cases globally between 1990 and 2016. Nevertheless, age- standardized attributable death rates Decreased by 36.2% over the same period.

Gender-specific stroke: The occurrence of stroke in men and women also depends on age. It is higher at younger ages in women, whereas incidence increases slightly with older age in men. The higher Risk for stroke in women is due to factors related to pregnancy, such as preeclampsia, contraceptive Use and hormonal therapy, as well as migraine with aura.

Atrialfibrillationincreasesstrokeriskinwomenover75y ears by 20%.

Geographic and racial variation: As noted earlier, stroke incidence varies considerably across the Globe .A global population-based study of the prevalence of stroke and related risks examined Demography, behaviour, physical characteristics, medical history and laboratory reports, and revealed The contribution of exposure to air pollution and particulate matter to stroke mortality [15, 16, 17, 18, 19].

III. PATHOPHYSIOLOGY

Stroke is defined as an abrupt neurological outburst caused by impaired perfusion through the blood vessels to the brain. It is important to understand the neurovascular anatomy to study the clinical

manifestation of the stroke. The blood flow to the brain is managed by two internal carotids anterior and two vertebral arteries posteriorly (thecircleof Willis). Ischemic stroke is caused by deficient blood and oxygen supply to the brain; haemorrhagic stroke is caused by bleeding or leaky blood vessels. Ischemic occlusions contribute to around 85% of casualties in stroke patients, with the reminder due to intracerebral bleeding. Ischemic occlusion generates thrombotic and embolic conditions in the brain. In thrombosis, the blood flow is acted by narrowing of vessels due to atherosclerosis. The build-up of plaque will eventually constrict the vascular chamber and form clots, causing thrombotic stroke. In an embolic stroke, decreased

blood flow to the brain region causes an embolism; the blood flow to the brain reduces, causing severe stress and untimely cell death (necrosis).

In this condition ,stress in the brain tissue and internal injury cause blood vessels to rupture. It produces toxic effects in the vascular system, resulting in infarction. It is classified into intracerebral and subarachnoid haemorrhage. In ICH, blood vessels rupture and cause abnormal accumulation of blood within the brain. The main reasons for ICH are hypertension, disrupted vasculature, excessive use of anticoagulants and thrombolytic agents. In subarachnoid haemorrhage, blood accumulates in the subarachnoid space of the brain due to haemorrhage[20,21,22].

Signs & Symptoms

- Sudden numbness or weakness in the face, arm, or leg, especially on one side of the body.
- Sudden confusion ,trouble speaking, or difficulty understanding speech. Sudden trouble seeing none or bothe yes.
- Sudden trouble walking ,dizziness ,loss of balance ,or lack of coordination.
- Sudden severe headache with no known cause Act

F.A.S.T. to help stroke patients get the treatments they need.

The stroke treatments that work best area vailable only if the stroke is recognized and diagnosed within 3 hours of the first symptoms. Stroke patients may not be eligible for these treatments if they don't arrive at the hospital in time.

If you think someone may be having a stroke, act F.A.S.T. and do the following test.

- F Face:Ask the person to smile. Does one side of the face droop?
- A Arms:Ask the person to raise both arms. Does one arm drift downward?
- S Speech:Ask the person to repeat a simple phrase. Is the speech slurred or strange? T Time:If you see any of these signs, call 9-1-1 right away

Risk Factors

The risk of stroke increases with age and doubles over the age of 55 years in both men and women. Risk is increased further when an individual has an existing medical condition like hypertension, coronary artery disease or hyperlipidaemia. Nearly 60% of strokes are in patients with a history of transient ischemic attack (TIA). Some of the risk factors for stroke are modifiable, and some are non-modifiable.

Non-modifiable Risk Factors

- Age: this is the most important contributor to stroke risk. The incidence doubles for each decade after age55years.
- Sex: because of the risks of pregnancy and oral contraceptive use, pre-menopausal women have a stroke risk that is a high as or higher than the risk in men.
- Ethnicity: African Caribbean individuals in the UK and USA have twice the risk of incident stroke compared with their white counterparts. In younger black adults the risk of ICH is twice that of agematched white people. This may in part relate to the increased prevalence of stroke risk factors, such as uncontrolled hypertension, obesity and diabetes, among African Caribbean populations. Other ethnicity-related risks contributing to stroke include carotid stenosis in white individuals.

- Genetics: In addition to the single-gene disorders that are associated with stroke (CADASIL,

CARASIL, Fabry's disease, homo- cyst inuria, sickle cell disease, connective tissue disorders [23,24].
Modifiablerisk factors

Hypertension: This is the most important modifiable risk factor overall for stroke. Approximately half of all stroke patients, and an even greater proportion of those with ICH ,have a history of hypertension .Even among those not defined as hypertensive, the higher the blood pressure, the higher the risk of stroke. This makes the diagnosis and control of hypertension paramount for primary and secondary prevention of strokes. The attributable risk from hypertension declines afterage60 years, where it confers relative risk of 3.5, to a non- significant contribution at age 80.

Diabetic mellitus: This is an independent risk factor for stroke, associated with a 2-fold increased risk. Stroke accounts for 20% of all deaths in people with diabetes.

Cardiac factors: Cardio embolic infarction (mainly from atrial fibrillation(AF)is the most severe ischemic stroke subtype, with high disability and mortality. The presence of AF increases with age, causing 20-25% of strokes in patients >80 years old. Anticoagulation is extremely effective in preventing stroke in people with Atrial fibrillation.

Smoking: This doubles the risk of stroke. Smoking cessation rapidly reduces the risk, with excess risk nearly disappearing 2-4 years after stopping.

Alcohol consumption and substance abuse :Light and moderate alcohol consumption (<4units/day) has been reported to be associated with a lower risk of ischaemic stroke, whereas higher quantities are clearly associated with increased stroke risk. Alcohol consumption has a linear relationship with ICH risk. Recreational drugs including cocaine, heroin, amphetamines, cannabis and ecstasy are associated with an increased risk of stroke.

Obesity and sedentary behavior: Most of the effect of body mass index on stroke risk is mediated by blood pressure ,cholesterol and glucose concentrations .People who are physically active have a lower risk of stroke and overall stroke mortality than those who are in active.

Inflammation: Raised inflammatory biomarkers have a modest association with increased risk of arteriosclerosis and stroke. Infection can trigger stroke, and there is evidence that stroke rates are lower in individuals vaccinated against influenza. Corona virus disease (COVID-19) has been linked to large vessel occlusions in association with a hyper inflammatory and hyper- coagulable state [25,26,27].

Treatment: Stroke prevention involves modifying risk factors within a population or individuals, while stroke management depends on treating its pathophysiology.

Emergency treatment of ischemic stroke
Clot-busting drugs (Thrombolytic): The drugt PA (tissue plasminogen activator)can dissolve clots if given within 3-4.5 hours of symptom onset. It dramatically improves chances of recovery but carries a risk of bleeding.

Mechanical Thrombectomy: A surgeon inserts a catheter into an artery, usually in the groin, threads it to the brain ,and removes the clot. This can be effective up to 24 hours after onset in certain patients[36].

Emergency treatment to haemorrhagic stroke
Controlling bleeding and pressure :Medications may reduce blood pressure, prevent seizures, or counteract blood-thinning drugs.
PharmacologicalTherapy

Tissue plasminogen activator (tpa): Alteplase - 0.9mg/kg Anti-platelet therapy:
Aspirin-325mg within 24- 48hours.

Secondary preventions: Secondary treatment addresses the prevention of recurrences by

controlling metabolic risk factors, namely blood pressure and lipids.

Gamma amino butyric acid(GABA)agonists: Clomethiazole.
Sodium (Na+) channel blockers Calcium channel blockers Reperfusion therapy The intravenous thrombolytics (IVT) Fibrinogen depleting agents Intra-arterial thrombolysis.

Others
Stem cell therapy: Stem cell therapy enhances the proliferation of neural stem cells and neurogenesis. Neuronal repair: It is used to rejuvenate the tissue when the damage is already done and is therefore not time-bound but is most effective when administered 24h after stroke attack[28,29,30,31]

Surgery: In cases of aneurysms or large bleeds, surgeons may repair blood vessels, remove clots, or relieve pressure inside the skull [36].

Supportive care: In both types, patients may need breathing support, IV fluids, nutrition, or intensive care monitoring[36].

Preventing Stroke

- Control blood pressure: High blood pressure is the leading cause of both ischemic and haemorrhagic strokes.
- Quit smoking: Tobacco damages blood vessels and promotes clotting.
- Eat a balanced diet: Fruits, vegetables, whole grains, and lean proteins support vascular health.
- Exercise regularly: Even moderate physical activity lowers risk.
- Manage diabetes and cholesterol: Keep blood sugar and lipids under control.
- Limit alcohol and avoid drug abuse: Excessive drinking or cocaine use dramatically increases stroke risk.
- Monitor heart rhythm: Treat atrial fibrillation with medication or procedures if necessary [36].

IV. CONCLUSION

Traditional vascular risk factors, especially hypertension, diabetes mellitus, dyslipidaemia, and smoking are currently popular even in younger adults, which means that atherosclerotic disease in the population occurs earlier. The most common forms of stroke have become large-artery atherosclerosis (then smallvessel occlusion and cardio embolic) whereas a significant proportion of stroke remains of undetermined etiology because of either incomplete diagnostic studies or a multifactorial etiology. This similarity of risk factors between the young and aged youths is an indication of the necessity to expand preventive efforts not only to the seniors but to the entire population. Identification and vigorous management of the modifiable vascular risks early, lifestyle interventions and better diagnostic assessment is critical in reducing the increasing burden of stroke among all age groups.

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