

# Survey and Pathophysiology of stroke

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## Abstract :

Stroke remains one of the major causes of death worldwide. Approximately one-fifth of patients experiencing an acute stroke die within the first month, and nearly half of the survivors suffer from long-term physical disabilities. Therefore, early identification and proper management of risk factors are essential to reduce both mortality and morbidity associated with stroke.

## Methods:

A retrospective study was carried out to identify the various risk factors associated with stroke and to evaluate patients' awareness of these risk factors.

## Results:

The average age of the patients was  $59 \pm 13.06$  years, ranging from 25 to 90 years. The study included 73 male patients (mean age  $60.16 \pm 13.07$  years) and 23 female patients (mean age  $54.25 \pm 7.9$  years). About 33% of the participants (21 males and 12 females) were between 55 and 65 years of age. Analysis of risk factors based on stroke type showed that hypertension remained the most prevalent risk factor for both ischemic and hemorrhagic stroke. Other significant risk factors identified included smoking, diabetes mellitus, and dyslipidemia. Additionally, awareness regarding stroke risk factors among survivors was found to be low and varied according to their educational background.

## Conclusion:

The findings suggest that effective management of blood pressure and blood glucose levels, along with smoking cessation, are critical strategies for preventing stroke in this population.

**Keywords: Stroke, Risk Factors, Hypertension.**



## □ INTRODUCTION

### STROKE (1)

A stroke, sometimes called a brain attack, occurs when something blocks blood supply to part of the brain or when a blood vessel in the brain bursts. In either case, parts of the brain become damaged or die. A stroke can cause lasting brain damage, long-term disability, or even death.

### Scientific definition (WHO):

Stroke is a disease that affects the arteries leading to and within the brain. It is the fifth leading cause of death and a leading cause of disability in the United States. A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain either blocked by a clot or burst or (rupture).

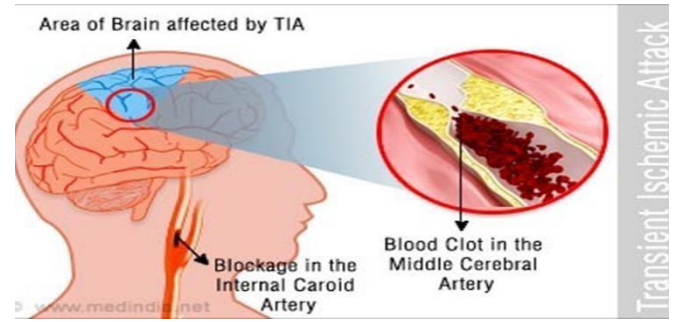
### TYPES OF STROKE

1. TRANSIENT ISCHEMIC ATTACK (TIA)
2. ISCHEMIC STROKE
3. HEMORRHAGIC STROKE

**TYPES:-**

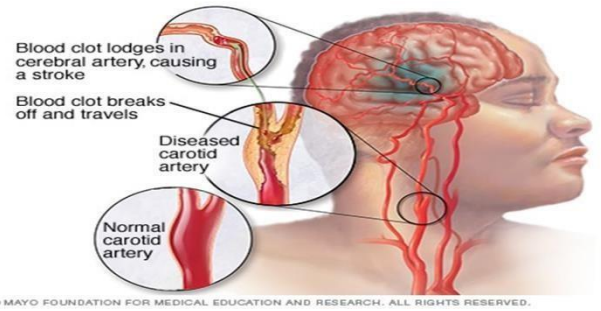
**1) TRANSIENTISCHEMICSTROKE:-**

Involves a blood clot that typically reverses on its own



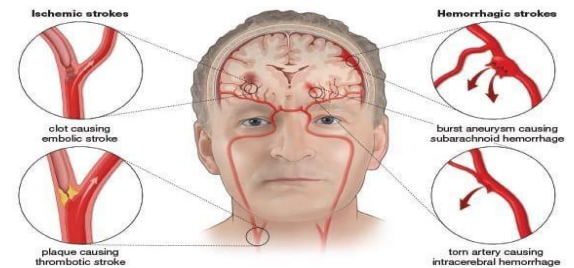
**2) ISCHEMICSTROKE:-**

Involves a blockage caused by either a clot or plaque in the artery. The symptoms and complication ischemic stroke can last longer than those of a TIA or may become permanent.



**3) HemorrhagicStroke:-**

It is caused by either a burst or leaking blood vessels that seeps into the brain.



**● ANATOMY OF BRAIN CIRCULATION(2):-**

**● Blood Vessels of the Brain**

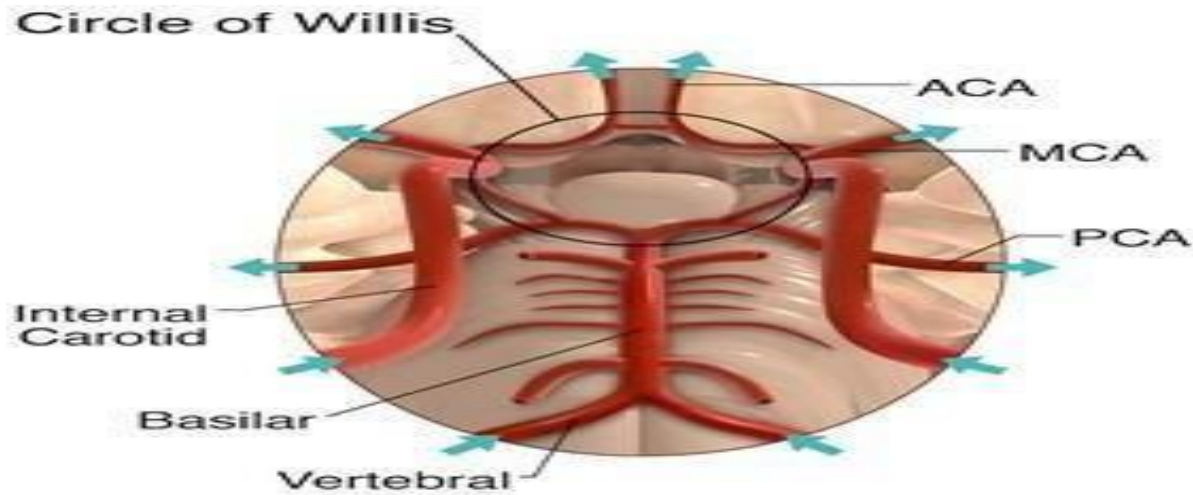
arteries:

Blood in the brain is supplied by two pairs of large blood vessels (arteries): the carotid arteries and the vertebral

**Carotid Arteries:** These vessels run along the front of the neck. There is a right-sided carotid and a left-sided carotid artery. If a stroke happens in this area, it can cause changes with speech, vision and sensation.

**Vertebral Arteries:** These vessels run along the back of your neck. There is a right-sided vertebral and a left-sided vertebral artery. The right and left vertebrals join to form one **basilar artery**. If a stroke happens in this area, it can cause changes with your level of awareness, problems with muscle movement and coordination, speech changes and vision problems.

At the base of the brain, the carotid arteries and vertebral arteries come together to form the Circle of Willis. This is a circle of arteries that provide many paths for blood to supply oxygen and nutrients to the brain.



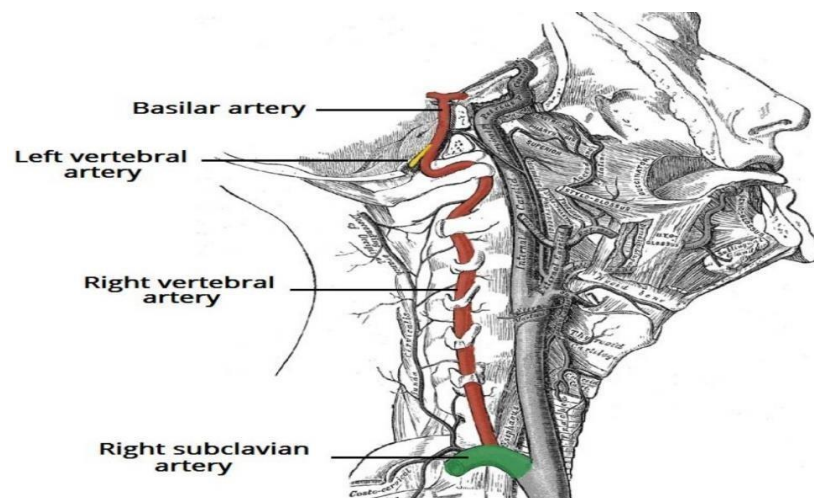
### Arterial Supply to the Brain.

There are two paired arteries which are responsible for the blood supply to the brain; the vertebral arteries, and the internal carotid arteries. These arteries arise in the neck, and ascend to the cranium. Within the cranial vault the terminal branches of these arteries form an anastomotic circle, called the Circle of Willis. From this circle, branches arise which supply the majority of the cerebrum. Other parts of the CNS, such as the pons and spinal cord, are supplied by smaller branches from the vertebral arteries.

### Internal Carotid Arteries

The internal carotid arteries (ICA) originate at the bifurcation of the left and right common carotid arteries, at the level of the fourth cervical vertebrae (C4). They move superiorly within the carotid sheath, and enter the brain via the carotid canal of the temporal bone. They do not supply any branches to the face or neck. Once in the cranial cavity, the internal carotids pass anteriorly through the cavernous sinus. Distal to the cavernous sinus, each ICA give a rise to:

- 1) Ophthalmic artery – supplies the structures of the orbit.
- 2) Posterior communicating artery – acts as an anastomotic, connecting vessel in the Circle of Willis.
- 3) Anterior choroidal artery – supplies structures in the brain important for motor control and vision
- 4) Anterior cerebral Artery – Supplies part of cerebrum
- 5) The internal carotid arteries then continue as the middle cerebral artery, which supplies the lateral portions of the cerebrum.



## Vertebral Arteries

The right and left vertebral arteries arise from the subclavian arteries, medial to the anterior scalene muscle. They then ascend the posterior aspect of the neck through holes in the transverse processes of the cervical vertebrae, known as the foramen transversarium.

The vertebral arteries enter the cranial cavity via the foramen magnum. Within the cranial vault, some branches are given off:

1. Meningeal branch – supplies the falx cerebelli, a sheet of dura mater.
2. Anterior and posterior spinal arteries – supply the spinal cord, spanning its entire length.
3. Posterior inferior cerebellar artery – supplies the cerebellum.

After this, the two vertebral arteries converge to form the basilar artery. Several branches from the basilar artery originate here and go on to supply the cerebellum and pons. The basilar artery terminates by bifurcating into the posterior cerebral arteries.

## Arterial Circle of Willis

The terminal branches of the vertebral and internal carotid arteries all anastomose to form a circular blood vessel called the Circle of Willis. There are three main (paired) constituents of the Circle of Willis:

1. Anterior cerebral arteries – terminal branches of the internal carotid arteries.
2. Internal carotid arteries – located immediately proximal to the origin of the middle cerebral arteries.
3. Posterior cerebral arteries – terminal branches of the basilar artery.

To complete the circle, two connecting vessels are also present:

1. Anterior communicating artery – connects the two anterior cerebral arteries.
2. Posterior communicating artery – a branch of the internal carotid artery; this artery connects the ICA to the posterior cerebral artery.

## NEED OF THE STUDY.

1. Promote the welfare and research education, by studying preventive measures, diagnosis, causes and treatment of stroke.
2. To provide compiled information on stroke disease useful for medical practitioners for providing better treatment to patient.
3. To provide comparative study of treatment plans used to treat stroke
4. To provide knowledge on triggering factors, disease process, different lines of treatment related to stroke

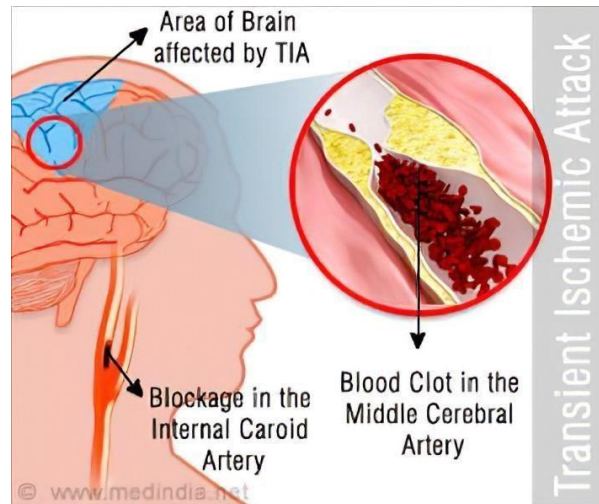
## 3. PATHOPHYSIOLOGY OF STROKE(3)

A stroke occurs when the blood supply to a part of the brain is disrupted, leading to varying levels of permanent neurological damage. The two main types of stroke are ischemic and hemorrhagic. (lack of blood and hence oxygen to an area of the brain) and hemorrhagic (bleeding from or leaking blood vessels in the brain) stroke.

### **PATHOPHYSIOLOGY OF TRANSIENT ISCHEMIC ATTACK AND ISCHEMIC STROKE LARGE ARTERY DISEASE (LAD)**

LAD is the leading cause of brain injury in developed countries. The main pathology is thrombosis secondary to atherosclerosis, but other disorders such as dissecting vasculitis and moyamoya disease occasionally occur. The process of atherosclerosis is a complex fibrous plaque. Observed in the aorta or internal carotid artery (ICAS) in many subjects under the age of 40 of age. Circulating lipids, especially low-density lipoproteins, enter the vessel wall and initiate the inflammatory process. Cholesterol-laden The proliferation of macrophages and smooth muscle cells eventually contributes to the formation of atheroma

Arteriosclerosis is likely to occur at bifurcations where turbulence of blood is expected. These commonly affected areas include the carotid bulb, carotid siphon, proximal segment of the middle cerebral artery (MCA), and the proximal vertebral artery. Atherosclerosis in these vessels may occur in extracranial (ECAS) as well as intracranial (ICAS) regions. In Caucasian populations, extracranial carotid artery disease—particularly involving the internal carotid artery (ICA)—is more frequently observed, whereas intracranial atherosclerosis is comparatively less common.



## **PATHOPHYSIOLOGY OF ISCHEMIC STROKE**

The common pathway of ischemic stroke is lack of sufficient blood flow to the perfused cerebral tissue due to the Ischemic stroke occurs when arteries supplying the brain become narrowed or blocked, reducing blood flow to brain tissue. It can be broadly classified into two types: thrombotic and embolic stroke.

Arterial narrowing most often results from atherosclerosis, a condition in which fatty deposits accumulate along the inner walls of blood vessels. As these plaques grow, they restrict blood flow to the affected area. If a plaque becomes unstable or ruptures, it can trigger the formation of a blood clot that obstructs the vessel, leading to a thrombotic stroke.

In contrast, an embolic stroke occurs when a blood clot or other debris forms elsewhere in the body—commonly in the heart—and travels through the bloodstream until it lodges in a cerebral artery, blocking blood flow. Through the circulatory system and block narrowed blood vessels. Based on the etiology of ischemic stroke, a more accurate sub classification is generally used.”

### **Large artery disease**

“Atherosclerosis of large vessels including the internal carotid artery, vertebral artery, basilar artery, and other major branches of the Circle of Willis.”

### **Small vessels disease**

Changes due to chronic diseases such as diabetes, hypertension, hyperlipidaemia, and smoking that lead to...”

“Reduced elasticity of arterial walls along with narrowing and possible blockage of the lumen in smaller blood vessels.”

### **Embolic stroke**

The most common cause of an embolic stroke is atrial fibrillation. Stroke of determined aetiology includes causes such as metabolic disorders and coagulopathies.

Stroke of undetermined aetiology is diagnosed after exclusion of all of the above causes.”

The tissue within the locale bordering the infarct center, known as the ischemic penumbra, is less seriously affected.”

This locale is rendered practically nonfunctional due to diminished blood flow but remains metabolically active. Cells in this zone are endangered but not yet irreversibly damaged.”

They may experience es missional after a few hours or days but in case blood stream and oxygen conveyanceandthereestablishedintheblinkofaneyeaftertheonsetofstrokethey are possibly recoverable

### The Ischemic cascada

After Moment to diminutive the cerebral ischaemia the ischemic cascade is the restrained this is oftenarrangementofthebiochemicalresponsewithinthebrainwithintheafterhigh-impacttissue which ordinarily goes on for two to three hours hours but can final for the

Day indeed after ordinary blood stream responses

Thegoleofachutestrokettreatmentistonormalizedperfusionandintercedewithinthecascadeofbiochemical disfunction to sewerage the penumbra sa much and as early as conceivable in spite of the fact that it is called cascade occasion are not continuously direct Inspiteofthefactthat ICAsstenosisishabituallyingestedinelderlypeopleitisregularlyasymptoticcertain **Atherosclerotic plaques** that are more likely to cause **embolism** tend to have certain features:

- Plaque **ulceration**
- A **soft, lipid-rich core**
- Presence of **intraplaque hemorrhage**
- A **thin fibrous cap**

### In-sitotromboticocclusion:

“Ultimately results in total occlusion of the vessel. In patient with ECAS the clelincal consequences of arterialocclusionarenotsogrovebecameoftheamplecollateralcirculationinthecircalofWillis Therefore the total arterial occlusion may remain asymptomatic or produse minor hamodynamic **TIAS or Stroke**

### RISK FACTORS

1. 1. Sex –  
Male sex increases the hazard for ischemic stroke. After menopause a few vascular hazard components get to be more predominant in ladies.
2. Hypertension  
Hypertension is most imperative treatable chance calculate for stroke. Hypertension is commonly identified among stroke patients beneath 55 years of age. Both systolic and diastolic BP is imperative for stroke hazard. Not as it were hypertension but too BP inside the ordinary range may be chance factor for stroke [45,46]. This may have implication for how BP will be measured and assessed in future and also impact which antihypertensive medicate are preferred.
3. Stroke / Transient ischemic stroke  
A previous stroke may be a capable hazard factor for a new stroke. The chance of modern stroke varies considerably depending on pathogenic component of the primary stroke.
4. Atrial fibrillation  
Atrial fibrillation could be a effective chance factor for stroke. The abnormal contraction of the atrium, the blood flow within the cleared out blood vessel member too ended up dispersed and general conclusion is the blood clots in AF more often than not develop within the cleared out atrial member.
5. Lipidchanges-  
Serumlipidlevelsdon'tplaysuchanimperativehazardfigurepartforIschemicStrokeasfor IHD Even so increased cholesterol level are related to ischemic stroke risk
6. Coagulation disorder–

Antiphospholipid antibodies including anticardiolipin antibodies, and lupus anticoagulant have been related with ischemic stroke

SeveralotherCoagulationclutterarerelatedwithexpandedchancevenousthrombosisbutismuch less clear how these influence blood vessel circumstance

### 7. Homocysteine:

Increased homocysteine levels have been watched in stroke patients. Even so, significance of increased homocysteine level for stroke risk has been debated.

8. Diabetes mellitus Diabetes mellitus has a deteriorating effect on arterial blood vessels and is a risk factor for ischemic stroke. Diabetes also increases the risk of stroke recurrence. The effect of diabetes may be partly mediated by other risk factors such as hypertension and lipid alteration.

9. Migraine The connection between migraine and stroke is complex. Migraine and ischemic stroke frequently happen in the same patients. Migraine-like.

### 3.2 DIAGNOSIS AND TREATMENT :-

#### A) Blood Tests

1. Complete blood count. This includes a check for your level of platelets, which are cells that help clot blood. A lab will also measure electrolyte Blood urea nitrogen (BUN) – another waste product.
2. Clotting time. A pair of tests called PT (prothrombin time) and PTT (partial thromboplastin time) can check how quickly your blood clots. If it takes longer than normal, it may indicate a possible bleeding disorder.

#### B) Imaging Tests

1. Computerized tomography. Your doctor takes several X-rays from different angles and puts them together to show if there is any bleeding in your brain or damage to brain cells. They may put dye in your vein first to look for an aneurysm, a thin or weak spot on an artery.
2. Magnetic resonance imaging (MRI). This uses powerful magnets and radio waves to make a detailed picture of your brain. It is sharper than a CT scan and can show injuries earlier than a traditional CT.
3. Carotid ultrasound. This uses sound waves to find fatty deposits that may have narrowed or blocked the arteries that carry blood to your brain.
4. Echocardiogram. Sometimes a clot forms in another part of the body (often the heart) and travels to the brain. This imaging test of the heart can help detect blood clots or identify enlarged areas of the heart.
5. Angiograms of your head and neck. Your doctor will put dye in your blood so they can see your blood vessels with X-rays. This can help find a blockage or aneurysm.

### 3.3 MANAGEMENT AND PREVENTION OF TRANSIENT ISCHEMIC ATTACK TREATMENT(7)

Acknowledgment and administration of TIA makes a difference to avoid crippling stroke. Up to 80% decrease in the chance of stroke after TIA with early usage of secondary stroke avoidance strategies.

It includes –

1. Revascularization of patients with symptomatic carotid course stenosis.
2. Anticoagulation of patients who have atrial fibrillation.
3. Treatment with antiplatelet drugs.
4. Administration of hypertension.

Fig. 1. Treatment with statins for most patients.

Fig. 2. Lifestyle interventions such as smoking or weight loss.

Early carotid revascularization for patient with 50% or more symptomatic carotid artery stenosis is an effective way of stroke avoidance when performed within the first 2 weeks after an event.

Fig. 3. MEDICATIONS:

TABLE I. Antiplatelet drugs: For most patients it will be a single antiplatelet more often than any other – ASPIRIN MONOTHERAPY. Dose – (81 mg/d to 325 mg/d).

TABLE II. Anticoagulant drugs for atrial fibrillation: Examples include apixaban (Eliquis), dabigatran (Pradaxa), edoxaban (Lixiana), rivaroxaban (Xarelto), and warfarin (Coumadin).

TABLE III. Management of hypertension: Maintain B.P. below 140/90 mm. Use antihypertensive drugs – LOSARTAN & RAMIPRIL.

TABLE IV. Other Combination: 75 mg/d CLOPIDOGREL or a combination of 25 mg ASPIRIN + 200 mg extended release DIPYRIDAMOLE two times a day.

Prevention Strategies:

- [1] Avoid Smoking
- [2] Stay on Healthy Diet
- [3] Regular Exercise
- [4] Avoid any mental or physical stress

### 3. Material and Method

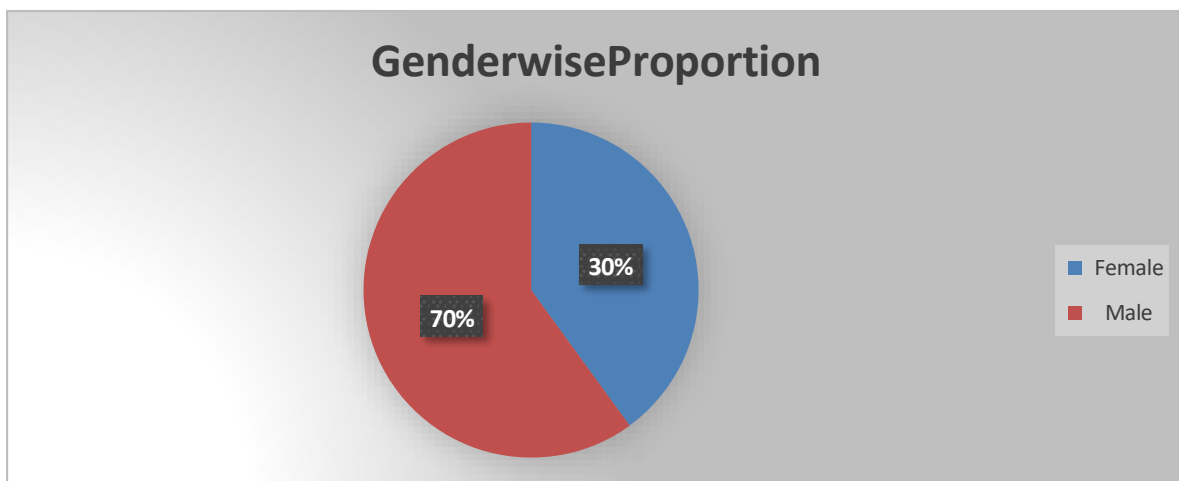
The survey was conducted at Kolhapur. First of all we have selected the hospital of survey which include physician, pharmacist and the patient. For the patient survey we had focused on various parameters and prepared a questionnaire. Later we had taken the print out and we asked that questions to patient, pharmacist, physician. Our main aim for conducting the survey was to segment the patient on the basis of their age, gender.

Sr.no	Activity	Rationale
1	Selection of disease category	Now days most population is suffering from Stroke disease for the study.
2	Selection of hospital	We have select the hospital where the stroke Patient are treated.
3	Questionnaire	Prepared question bank to collect the data for doctors. The question is related with patient.

### 3.4. Sstatistically Representation

#### A.According to Gender:-

When it comes to gender wise differentiation, we have found that mostly male suffering from this disease This is because of the more trace high levels of bad cholesterol can get symptoms of stroke. So that Stroke appears to be slightly more prevalent among men than among female.

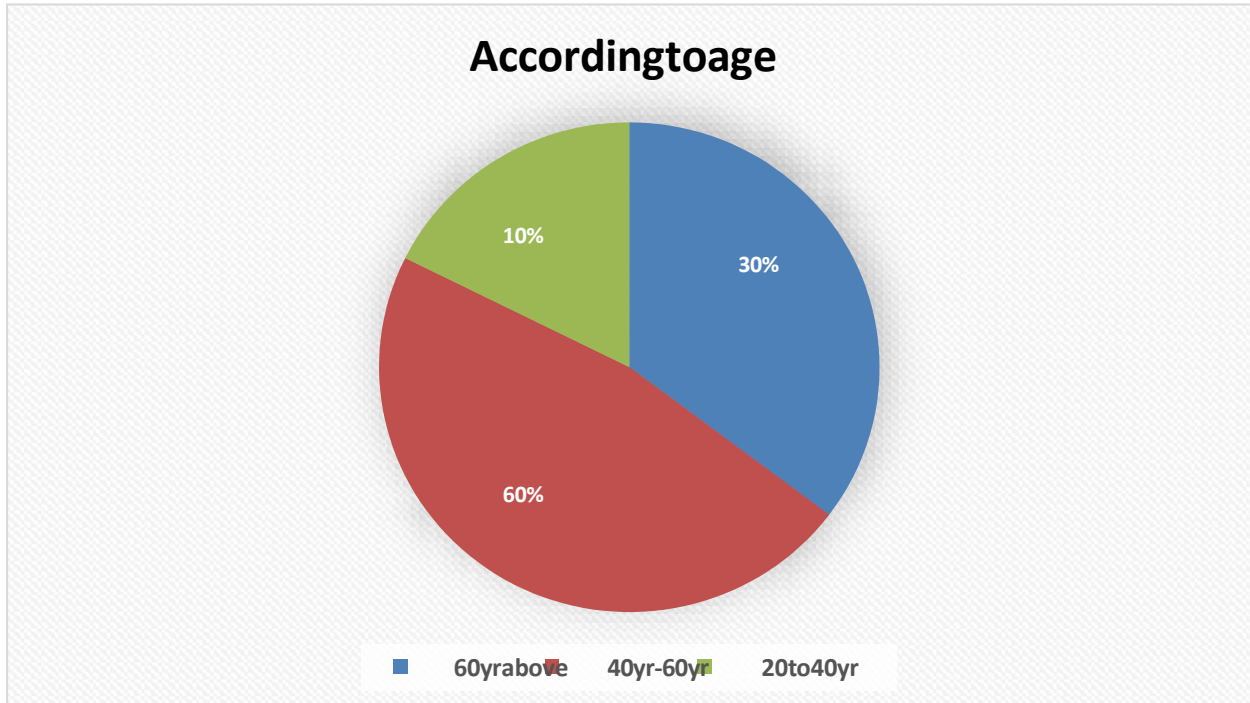


Sr.no.	Male	Female	Total
1	7	3	10

According to survey,  
 Stroke disease found in male than female patients

● **According to age:-**

According to survey, Stroke can begin at any age, stroke has two pics of onset, the first 40-60yrs and last later age 60yrs and above .Some patients are more prone to developing stroke especially If their family member with stroke. Stroke incidence increases with age.



● **3.4.2 RESULT:-**

From this above patient survey, we conclude that the maximum number of peoples suffering from stroke was above 40 -60 years & also it was found that more number of male's patients are suffering from stroke and also the stroke disease found in 47% of 40-60yr patient age, 35% of 60yr above patients and 18% in 20 to 40yr patients. According to survey study the stroke disease most common in middle age patients

**3.4.2. Conclusion:**

The findings of this study indicate that hypertension is the leading risk factor for stroke, followed by smoking, dyslipidemia, and cardiac disorders. Engaging in regular moderate physical activity and maintaining proper control of blood pressure, lipid levels, and diabetes can significantly reduce the risk of stroke.

Public health efforts should prioritize the prevention of hypertension through lifestyle modifications such as smoking cessation, reduced salt intake, regular exercise, and adoption of healthier habits. Additionally, limited awareness about stroke contributes to delays in seeking timely medical care. Therefore, implementing educational initiatives—including printed materials, audiovisual content, and organized stroke awareness programs—is essential to improve public understanding and promote early intervention.

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**REFERENCES**

- (1).<https://www.cdc.gov/stroke/aboutstroke>
- (1)healthline.com
- (2)Ross and Wilson Anatomy and physiology book
- (2)TatuL,MoulinT,DuvernoyH,BogousslavskyJ.Arterialterritoriesofhumanbrain: brainstem and cerebellum. Neurology. 1996 ; 47 ( 5 ): 1125–1135

5. (2).DunkerRO,HarrisAB.Surgicalanatomyoftheproximalanteriorcerebralartery. JNeurosurg . 1976; 44 ( 3 ): 359–367
6. (3) Klein IF , Lavallee PC , Touboul PJ , Schouman-Claeys E , Amarenco P. In vivo middlecerebral arteryplaque imagingbyhigh-resolution MRI. Neurology. 2006Jul 25; 67 ( 2 ): 327–329
7. (3). Swartz RH ,Bhuta SS , Farb RI, AgidR ,WillinskyRA, Terbrugge KG,etal Intracranialarterialwallimagingusinghigh-resolution3-teslacontrast-enhancedMRI. Neurology . 2009 Feb 17; 72 ( 7 ): 627–634 .
8. (3) Jorgensen L , Packham MA , Rowsell HC , Mustard JF. Deposition of formed elements of bloodontheintimaandsignsofintimalinjuryintheaortaofrabbit,pig,andman. Lab Invest. 1972; 27 ( 3 ): 341–350 .
9. (4) Davies AA , Smith GD , May MT , Ben-Shlomo Y. Association between birth weight and bloodpressureisrobust,amplifieswithage,andmaybeunderestimated.Hypertension.2006; 48 : 431–436.
10. (4)OsmondC,KajantieE,ForsenTJ ,ErikssonJG,BarkerDJ.Infantgrowthandstrokein adult life: the Helsinki birth cohort study. Stroke . 2007 ; 38 : 264–270.
- 11(4))WolfPA,BelangerAJ,D\*AgostinoRB.Quantifyingstrokeriskfactorsandpotentialsfor risk reduction. Cerebrovasc Dis . 1993 ; 3 ( Suppl 1 ): 7–14.
- 12.(5) Rothwell PM , Coull AJ , Giles MF , Howard SC , Silver LE , Bull LM , et al . Change in strokeincidence,mortality,case-fatality,severity,andriskfactorsinOxfordshire,UKfrom 1981 to 2004 (Oxford vascular study). Lancet . 2004 ; 363 : 1925–1933.
- 13.(5)[www.pacehospital.com](http://www.pacehospital.com)
- 14(6) . Jamrozik K, Broadhurst RJ, Anderson CS, Stewart-Wynne EG. “The role of lifestyle factors in the etiologyof stroke. A population-based case – control studyin Perth, Western Australia”. Stroke. 1994; 25: 51- 59.
- 15.(6)[www.mayoclinic.org](http://www.mayoclinic.org)
- 16(7)[www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov)
- 17(7)[www.nhs.uk](http://www.nhs.uk)
- 18(7).SubhashKaul.“StrokeinIndia:ArewedifferentfromtheWorld”,Pakistan Journal of neurological Sciences, Vol.2 (3), Jul –Sep 2007: PP 158-164.
- 19(7)DeLau LM , LeebeekFW ,deMaat MP,KoudstaalPJ ,DippelDW.Areviewof hereditaryandacquiredcoagulationdisordersintheaetiologyofischaemicstroke.IntJ Stroke . 2010 ; 5 : 385–394.
20. Kannel WB, Cupples LA, Ramaswami R, Stokes III J, Kreger BE, and Higgins M. “Regionalobesityandriskofcardiovascularisease:TheFraminghamStudy”.JClin Epidemiol. 1991; 44:183–190.

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