“COMPARATIVE STUDY OF PLASMA FIBRINOGEN LEVELS AND LIPID PROFILE IN PATIENTS WITH ISCHEMIC STROKE IN GVMCH”

A DISSERTATION SUBMITTED TO

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

In partial fulfilment of the regulations for the award of the degree

of

M.D. GENERAL MEDICINE – BRANCH I

DEPARTMENT OF GENERAL MEDICINE

GOVERNMENT VELLORE MEDICAL COLLEGE AND HOSPITAL

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

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APRIL-2020

CERTIFICATE

This is to certify that the dissertation titled "**COMPARATIVE STUDY OF PLASMA FIBRINOGEN LEVELS AND LIPID PROFILE IN PATIENTS WITH ISCHEMIC STROKE IN GVMCH"** is a genuine work done **BY DR.R.K.RENISH,** Post Graduate student (2017-2020) in the Department of General Medicine, Government Vellore Medical College, Vellore under the guidance of **Prof. Dr.H.SRIPRIYA. M.D.,** in partial fulfilment of the regulations laid down by the Tamilnadu Dr.M.G.R. Medical University, Chennai, for M.D., General Medicine Degree Examination.

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Title of the Study	–	Comparative study of plasma fibrinogen levels and lipid profile in patients with ischemic stroke on tertiary care centre.
Principal Investigator	–	Dr.R.K.Renish, I year PG,General Medicine.
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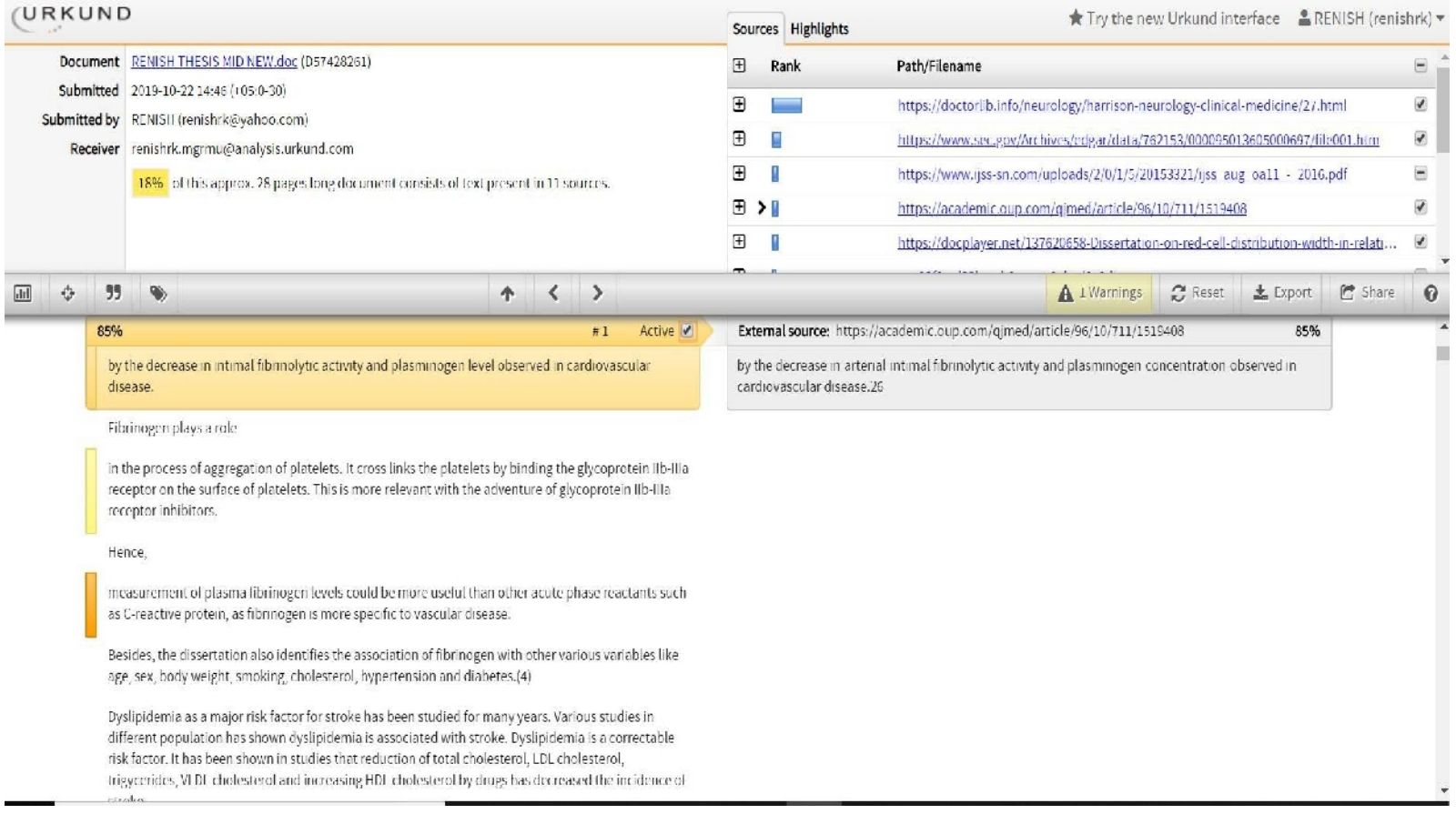
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Fibrinogen plays a role
in the process of aggregation of platelets. It cross links the platelets by binding the glycoprotein IIb-IIIa receptor on the surface of platelets. This is more relevant with the adventure of glycoprotein IIb-IIIa receptor inhibitors.
Hence,
measurement of plasma fibrinogen levels could be more useful than other acute phase reactants such as C-reactive protein, as fibrinogen is more specific to vascular disease.
Besides, the dissertation also identifies the association of fibrinogen with other various variables like age, sex, body weight, smoking, cholesterol, hypertension and diabetes.(4)
Dyslipidemia as a major risk factor for stroke has been studied for many years. Various studies in different population has shown dyslipidemia is associated with stroke. Dyslipidemia is a correctable risk factor. It has been shown in studies that reduction of total cholesterol, LDL cholesterol, triglycerides, VLDL cholesterol and increasing HDL cholesterol by drugs has decreased the incidence of

DECLARATION

I, **DR.R.K.RENISH** solemnly declare that this dissertation titled '**COMPARATIVE STUDY OF PLASMA FIBRINOGEN LEVELS AND LIPID PROFILE IN PATIENTS WITH ISCHEMIC STROKE IN GVMCH'is** a bonafide work done by me in Department of General Medicine, Government Vellore Medical College And Hospital, Vellore under the guidance and supervision of **Prof.Dr.H.SRIPRIYA M.D.,**

This dissertation is submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the university regulation for the award of M.D., Degree in General Medicine (Branch – 1).

Place : Vellore

Date : **Dr. R.K.RENISH**

SPECIAL ACKNOWLEDGEMENT

I gratefully acknowledge and thank

Prof. Dr.R.SELVI M.D.,

DEAN

GOVERNMENT VELLORE MEDICAL COLLEGE AND

HOSPITAL, VELLORE

For granting me permission to utilise the resources of this institution for my study.

ACKNOWLEDGEMENT

It gives immense pleasure for me to thank everyone who has helped me during the course of my study and in preparing dissertation.

I am very thankful to the Chairman of the Ethical Committee and members of the Ethical Committee, Government Vellore Medical College and Hospital for their guidance and help in getting the ethical clearance for this work.

I consider it a privilege to have done this study under the supervision of my beloved teacher, guide and unit chief **Prof. Dr. H. SRIPRIYA M.D**. and my former teacher, guide and Head of the Department **Prof. Dr. D. ANBARASU M.D.,** who has been a source of constant inspiration and encouragement to accomplish this work.

I express my deepest sense of thankfulness to my Assistant Professors **Dr.S.KARTHIKEYAN M.D., Dr. S. BALACHANDER M.D., Dr. RAMESH M.D., Dr. V. SATHI M.D., Dr. GOWRIPATHY M.D., Dr.VIJAYKUMAR M.D**, for their valuable inputs and constant encouragement without which this dissertation could not have been completed.

I express my sincere gratitude to **Prof. Dr. S.P. KUMARESAN M.D. (G.M.) DCH.,** Professor & Head of the Department of General Medicine. I also thank **Prof.Dr.M. RANGASWAMI M.D.(G.M.),DMRD.**, Associate Professor of

General Medicine and **Prof. Dr.D.ANBARASU M.D.**, Former Professor & Head of the Department of General Medicine

I am particularly thankful to my fellow postgraduate colleagues **Dr. L. Vasanth** and **Dr. N.Bhargavi Sindhuja** for their valuable support in the time of need throughout the study.

I thank my junior Post Graduates & CRRIs for helping me in the preparation of this dissertation. It is my earnest duty to thank my wife and family members without them accomplishing this task would have been impossible. I am extremely thankful to my patients who consented and participated to make this study possible.

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ABBREVIATIONS

FBS	FASTING BLOOD SUGAR
DM	DIABETES MELLITUS
HT	HYPERTENSION
RFT	RENAL FUNCTION TEST
TIA	TRANSIENT ISCHEMIC ATTACK
CT	COMPUTERISED TOMOGRAPHY
MRI	MAGNETIC RESONANCE IMAGING
CAD	CORONARY ARTERY DISEASE
ICAM	INTERCELLULAR ADHESION MOLECULE
TGL	TRIGLYCERIDES
LDL	LOW DENSITY LIPOPROTEINS
ATP	ADENOSINE TRIPHOSPHATE
HDL	HIGH DENSITY LIPOPROTEINS
VLDL	VERY LOW DENSITY LIPOPROTEINS
IDL	INTERMEDIATE DENSITY LIPOPROTEINS
AMPA-R	AMINO METHYL PROPIONIC ACID RECEPTOR
INR	INTERNATIONAL NORMALISED RATIO
APTT	ACTIVATED PARTIAL THROMBOPLASTIN TIME
PT	PROTHROMBIN TIME
TT	THROMBIN TIME
CVD	CARDIO VASCULAR DISEASE

INTRODUCTION

STROKE (cerebrovascular disease) is the most common cause of death after ischemic heart disease and cancer. It is the most common cause of social and economic burden because of increased morbidity and mortality in middle aged and elderly. Stroke is the major cause of disability in India with more than millions of adult affected yearly and have to adapt a life with disability and require other people to assist their activity of daily living [(1)]

India is developing into a stroke epidemic country like the other developing countries recently. The estimated adjusted prevalence rate of stroke range is 84-260/100,000 in rural and 332-420/100,000 in urban areas. The incidence rate is 120-150/100,000 based on the recent population based studies. There is huge variation in the burden of stroke regionally across India .Stroke units, rehabilitation facilities and thrombolysis are predominantly available in urban areas, particularly in private corporate hospitals.[(2)(6)]

The Government of India had started the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases & Stroke (NPCDCS). It is mainly focusing on early diagnosis, treatment, infrastructure, awareness among public, and capacity building at different levels of health care for all the Non-Communicable Diseases (NCD) including stroke, CAD etc. Public-Private Partnership from both the government and the private sector is required to tackle the stroke burden in India.[(6)]

In acute phase of stroke the mortality rate is as high as 25% thus it is important to establish the risk factors to prevent the complications.

Fibrinogen plays a key role in clotting of blood. The main association of fibrinogen with increased incidence of stroke is related in its ability to promote thrombosis and clot formation by causing platelets to clump the blood vessels. The interaction between monocytes / macrophages and fibrinogen is thought to play a important role in microvascular changes and atherogenesis. This interaction also play a role in triggering the procoagulant activities. Normal serum fibrinogen level is between 150 to 400 mg/dl. Fibrinogen is involved in pathogenesis by bridging adjacent platelets together leading to aggregation of platelets and resulting in arterial thrombosis thereby finally leading to ischemic stroke.[3]

Fibrinogen is an independent risk factor for recurrences of stroke apart from age, diabetes, hypertension, alcoholism, smoking, and other risk factors. It is also a predictor of future stroke recurrence and adverse cardiovascular events such as acute coronary syndrome. Hence, fibrinogen levels should be measured at the earliest and to be managed. [3]

Fibrinogen plays an sentinel role in a number of physiological and pathological processes like inflammation, thrombogenesis and atherogenesis. This is due to infiltration of tunica intima of blood vessels by fibrinogen, increase in blood viscosity and its, hemorrhagic effects, increased platelet aggregation and subsequently thrombus formation. The binding of fibrinogen to ICAM-1 receptors on endothelium mediates platelet adhesion. A variety of mechanisms causes

damage of endothelium and its dysfunction. This is substantiated by the decrease in intimal fibrinolytic activity and plasminogen level observed in cardiovascular disease. Fibrinogen plays a role in the process of aggregation of platelets. It cross links the platelets by binding the glycoprotein IIb-IIIa receptor on the surface of platelets. This is more relevant with the advent of glycoprotein IIb-IIIa receptor inhibitors. Hence, measurement of plasma fibrinogen levels could be more useful than other acute phase reactants such as C-reactive protein, as fibrinogen is more specific to vascular disease. Besides, the dissertation also identifies the association of fibrinogen with other various variables like age, sex, body weight, smoking, cholesterol, hypertension and diabetes. [4]

Dyslipidemia as a major risk factor for stroke has been studied for many years. Various studies in different population has shown dyslipidemia is associated with stroke. Dyslipidemia is a correctable risk factor. It has been shown in studies that reduction of total cholesterol, LDL cholesterol, trigycerides, VLDL cholesterol and increasing HDL cholesterol by drugs has decreased the incidence of stroke

AIMS AND OBJECTIVES

- To study the plasma fibrinogen levels in patients with stroke and compare it with lipid profile.
- To investigate whether fibrinogen levels increase if the patient has additional risk factors like diabetes, hypertension, and smoking.
- To study the correlation between plasma fibrinogen levels and severity of stroke.

REVIEW OF LITERATURE

STROKE:

A stroke, or cerebrovascular accident, is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause. Thus, the definition of stroke is clinical, and laboratory studies including brain imaging are used to support the diagnosis. The clinical manifestations of stroke are highly variable because of the complex anatomy of the brain and its vasculature.[55]

Cerebral ischemia is caused by a reduction in blood flow that lasts longer than several seconds. Neurologic symptoms manifest within seconds because neurons lack glycogen, so energy failure is rapid. If the cessation of flow lasts for more than a few minutes, *infarction* or death of brain tissue results.

When blood flow is quickly restored, brain tissue can recover fully and the patient's symptoms are only transient: this is called a *transient ischemic attack* (TIA).[5]

TIA: (TRANSIENT ISCHEMIC ATTACK)

When blood flow is quickly restored, brain tissue can recover fully and the patient's symptoms are only transient: this is called a *transient ischemic attack* (TIA) [5]. The definition of TIA requires that all neurologic signs and symptoms resolve within 24 h without evidence of brain infarction on brain imaging. Stroke has occurred if the neurologic signs and symptoms last for >24 h or brain infarction is demonstrated. A generalized reduction in cerebral blood flow due to systemic

hypotension (e.g., cardiac arrhythmia, myocardial infarction, or hemorrhagic shock) usually produces syncope.

Focal ischemia or infarction, conversely, is usually caused by thrombosis of the cerebral vessels themselves or by emboli from a proximal arterial source or the heart.

RIND(REVERSIBLE ISCHEMIC NEUROLOGICAL DEFICIT)

Refers to complete resolution neurological symptoms within 7 days

ANATOMY OF CEREBRAL CIRCULATION

The brain receives it arterial supply from two pairs of vessels, the vertebral and internal carotid arteries, which are interconnected in the cranial cavity to produce an arterial circle (of Willis). The two vertebral arteries enter the cranial cavity through the foramen magnum and just inferior to the pons fuse to form the basilar artery.

The two internal carotid arteries enter the cranial cavity through the carotid canals on either side.

Vertebral arteries:

Each vertebral artery arises from the first part of each subclavian artery in the lower part of the neck, and passes superiorly through the transverse foramina of the upper six cervical vertebrae. On entering the cranial cavity through the foramen magnum each vertebral artery gives off a small meningeal branch. Continuing forward, the vertebral artery gives rise to three additional branches before joining

with its companion vessel to form the basilar artery. One branch joins with its companion from the other side to form the single anterior spinal artery, which then descends in the anterior median fissure of the spinal cord; a second branch is the posterior spinal artery, which passes posteriorly around the medulla then descends on the posterior surface of the spinal cord in the area of the attachment of the posterior roots-there are two posterior spinal arteries, one on each side; just before the two vertebral arteries join, each gives off a posterior inferior cerebellar artery.

The basilar artery travels in a rostral direction along the anterior aspect of the pons. Its branches in a caudal to rostral direction include the anterior inferior cerebellar arteries, several small pontine arteries, and the superior cerebellar arteries. The basilar artery ends as a bifurcation, giving rise to two posterior cerebral arteries.

Internal carotid arteries

The two internal carotid arteries arise as one of the two terminal branches of the common carotid arteries. They proceed superiorly to the base of the skull where they enter the carotid canal. Entering the cranial cavity each internal carotid artery gives off the ophthalmic artery, the posterior communicating artery, the middle cerebral artery, and the anterior cerebral artery.

ARTERIAL CIRCLE / CIRCLE OF WILLIS :

The cerebral arterial circle (of Willis) is formed at the base of the brain by the interconnecting vertebrobasilar and internal carotid systems of vessels (Fig.8.37). This anastomotic interconnection is accomplished by:

1) Anterior communicating artery connecting the left and right anterior cerebral arteries to each other.
2) Two posterior communicating arteries, one on each side, connecting the internal carotid artery with the posterior cerebral artery.

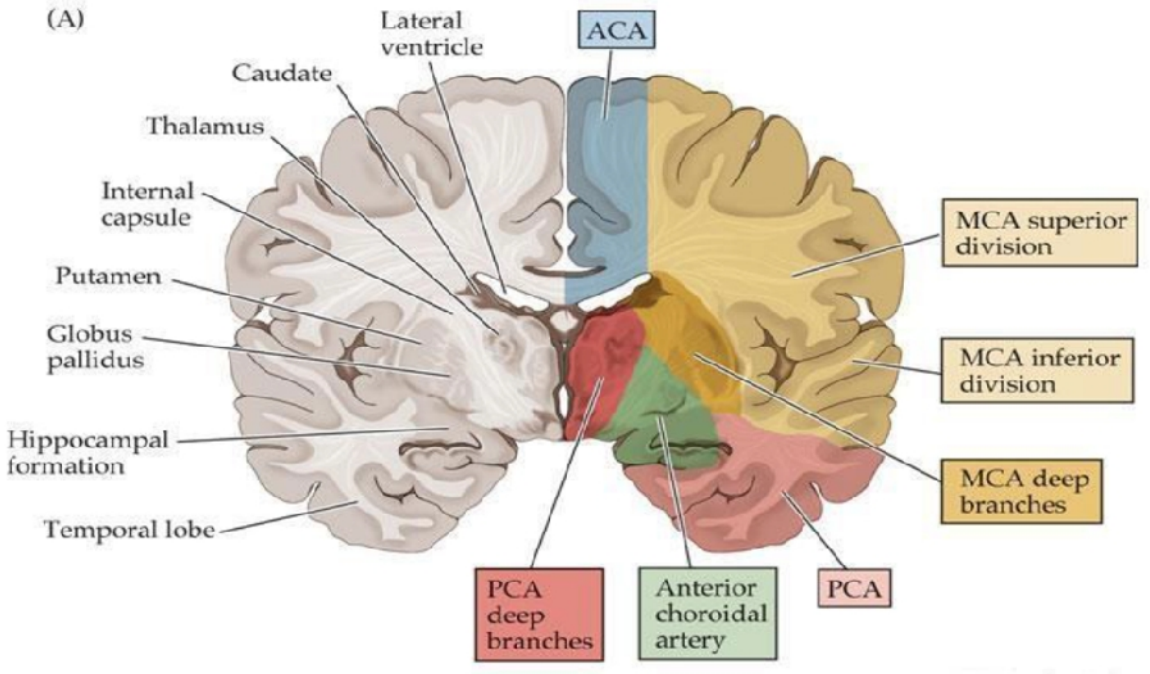

Figure-1: Blood Supply of Brain

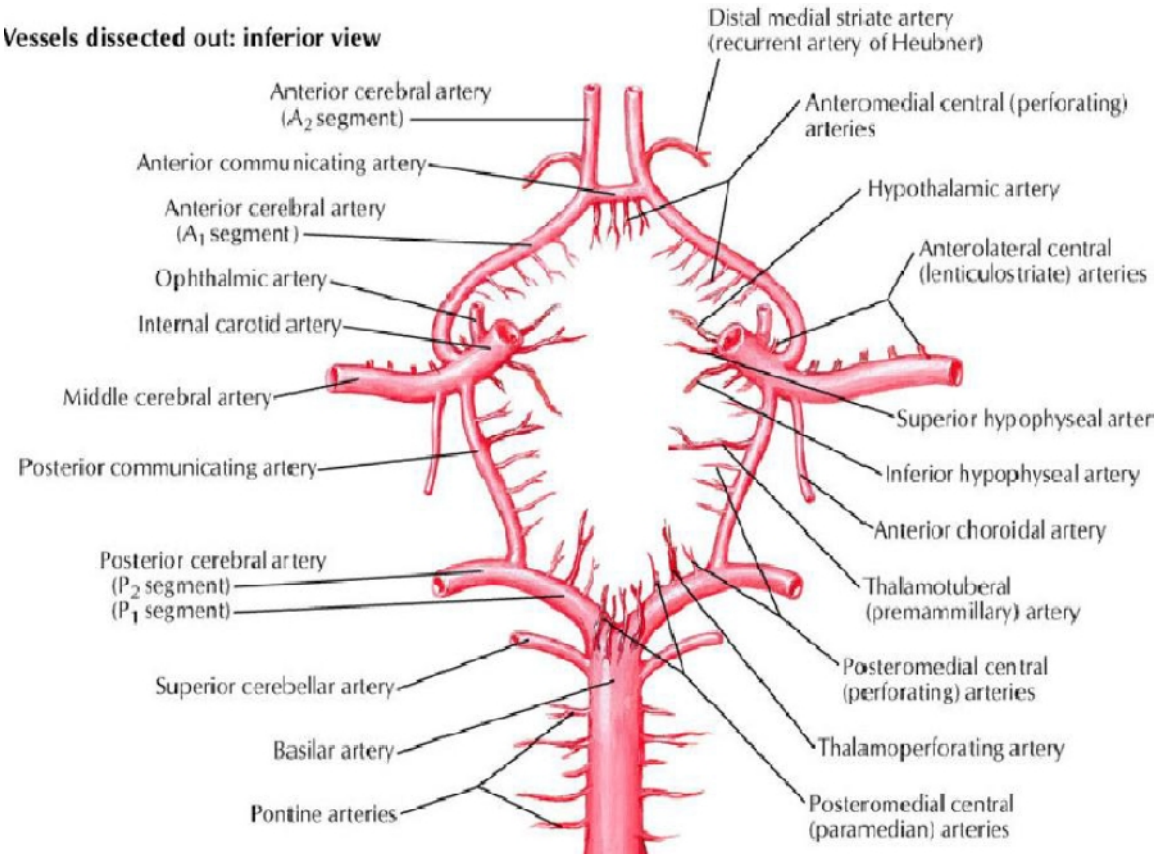

Figure-2: Circle of Willis

TYPES OF STROKE :

Stroke can be classified into two types.

1) ISCHEMIC STROKE

2) HEMORRHAGIC STROKE

ISCHEMIC STROKE (INFARCTION):

PATHOPHYSIOLOGY OF ISCHEMIC STROKE

Acute occlusion of an intracranial vessel causes reduction in blood flow to the brain region it supplies. The magnitude of flow reduction is a function of collateral blood flow, and this depends on individual vascular anatomy (which may

be altered by disease), the site of occlusion, and systemic blood pressure. A decrease in cerebral blood flow to zero causes death of brain tissue within 4–10 min; values <16–18 mL/100 g tissue per minute cause infarction within an hour; and values <20 mL/100 g tissue per minute cause ischemia without infarction unless prolonged for several hours or days. If blood flow is restored to ischemic tissue before significant infarction develops, the patient may experience only transient symptoms, and the clinical syndrome is called a transient ischemic attack (TIA). [7.8]

Another important concept is the *ischemic penumbra*, defined as the ischemic but reversibly dysfunctional tissue surrounding a core area of infarction. The penumbra can be imaged by perfusion imaging using MRI or CT. The ischemic penumbra will eventually progress to infarction if no change in flow occurs, and hence saving the ischemic penumbra is the goal of revascularization therapies.

Focal cerebral infarction occurs via two distinct pathways :

(1) A necrotic pathway in which cellular cytoskeletal breakdown is rapid, due to the energy failure of the cell.

(2) An apoptotic pathway in which cells become programmed to die. Ischemia produces necrosis by starving neurons of glucose and oxygen, which in turn results in failure of mitochondria to produce ATP. Without ATP, membrane ion pumps stop functioning and neurons depolarize, allowing intracellular calcium to rise. Cellular depolarization also causes glutamate release from

synaptic terminals; excess extracellular glutamate produces neurotoxicity by activating postsynaptic glutamate receptors that increase neuronal calcium influx. Lesser degrees of ischemia, as are seen within the ischemic penumbra, favor apoptotic cellular death causing cells to die days to weeks later. Fever dramatically worsens brain injury during ischemia, as does hyperglycemia (glucose >11.1 mmol/L [200 mg/dL]), so it is reasonable to suppress fever and prevent hyperglycemia as much as possible. The value of induced mild hypothermia to improve stroke outcomes is the subject of continuing clinical research.

ETIOLOGY OF ISCHEMIC STROKE:

1. Thrombosis
2. Lacunar stroke (small vessel)
3. Large-vessel thrombosis
4. Dehydration
5. Embolic occlusion
6. Artery-to-artery
7. Carotid bifurcation
8. Aortic arch atheroma
9. Arterial dissection
10. Cardioembolic
11. Atrial fibrillation
12. Mural thrombus

13. Myocardial infarction
14. Dilated cardiomyopathy
15. Valvular heart diseases
16. Mechanical valve
17. Bacterial endocarditis
18. Paradoxical embolus
19. Atrial septal defect
20. Patent foramen ovale
21. Atrial septal aneurysm
22. Spontaneous echo contrast
23. Stimulant drugs: cocaine, amphetamine

HEMORRHAGIC STROKE:

Intracranial hemorrhage is a form of stroke. Compared to ischemic stroke, patients with intracranial hemorrhage are more likely to present with headache; however, brain imaging is required to distinguish these entities. CT imaging of the head is highly sensitive and specific for intracranial hemorrhage and determines the location(s) of bleeding. Hemorrhages are classified by their location and the underlying vascular pathology. Hemorrhage directly into the brain parenchyma, also known as intracerebral hemorrhage (ICH), and arteriovenous malformations (AVMs) of the brain will be considered.

PATHOPHYSIOLOGY OF STROKE:

CEREBRAL AUTOREGULATION:

Under normal circumstances, cerebral blood flow depends upon the amount of vascular resistance within cerebral blood vessels, which is directly related to their diameter[8]. Dilatation of blood vessels increases cerebral blood flow, whereas constriction of vessels has the opposite effect. Cerebral perfusion pressure also determines the cerebral blood flow.

Cerebral autoregulation maintains the cerebral blood flow at a relatively constant rate inspite of variations in perfusion pressure. The mechanism by which autoregulation occurs is not well understood, which involves multiple pathways. There are evidences which suggest that the smooth muscle in cerebral vasculature can respond directly to changes in perfusion pressure, by contracting when pressure increases and relaxing when pressure decreases. Reductions in cerebral blood flow may lead to cerebral vasodilatation as a result of release of vasoactive substances. Nitric oxide released from vascular endothelium appears to play a major role in autoregulation.[9,10]

Cerebral blood flow is maintained by autoregulation which occurs within a range of 60 to 150 mmHg of mean arterial pressure. The upper and lower limits vary between individuals, However beyond this range, the brain is not able to compensate for changes in perfusion pressure, and the cerebral blood flow increases or decreases passively with corresponding changes in pressure, resulting in the risk of edema at high pressures and ischemia at low pressures.

CEREBRAL AUTOREGULATION DURING STROKE

Cerebral auto regulation is impaired in some disease conditions, which includes ischemic stroke also. When cerebral perfusion pressure decreases there will be cerebral vascular dilatation and when it falls below the compensatory capacity of the brain it will lead to decrease in the cerebral blood flow. Initially, the oxygen extraction fraction will be increased in order to maintain levels of oxygen delivery to the brain. As the cerebral blood flow continues to fall, other mechanisms come into play. [36]

ISCHEMIC BRAIN OEDEMA:

Ischemic brain oedema involves two distinct processes, the first process occurs during the initial phase of infarction and before the occurrence of structural damage. It involves an increase in tissue Na^+ and water content accompanying increased pinocytosis and Na^+K^+ ATPase activity across the endothelium. This phenomenon is augmented by reperfusion. A second process occurs after infarction of both the parenchyma and vasculature after the disruption of blood brain barrier with extravasation of serum proteases apart from the major osmotic action of sodium.

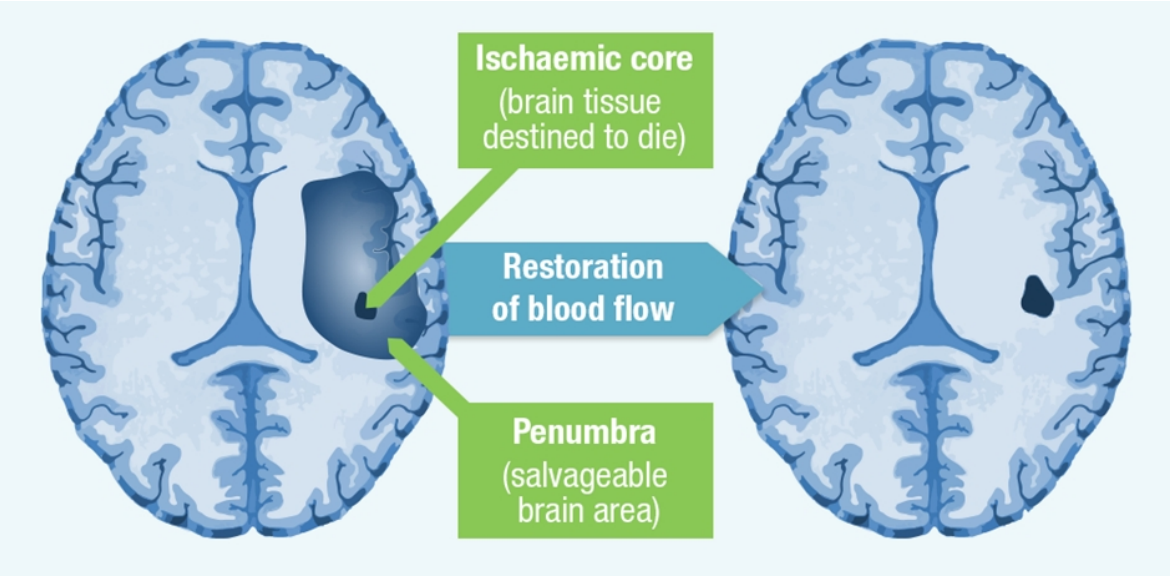

Figure-3: Ischemic Penumbra

ISCHEMIC PENUMBRA:

The ischemic penumbra can be defined as area surrounding the ischemic zone which is functionally silent due to reduced blood flow and metabolically active, hence they are salvageable if blood flow to the penumbra region is restored.

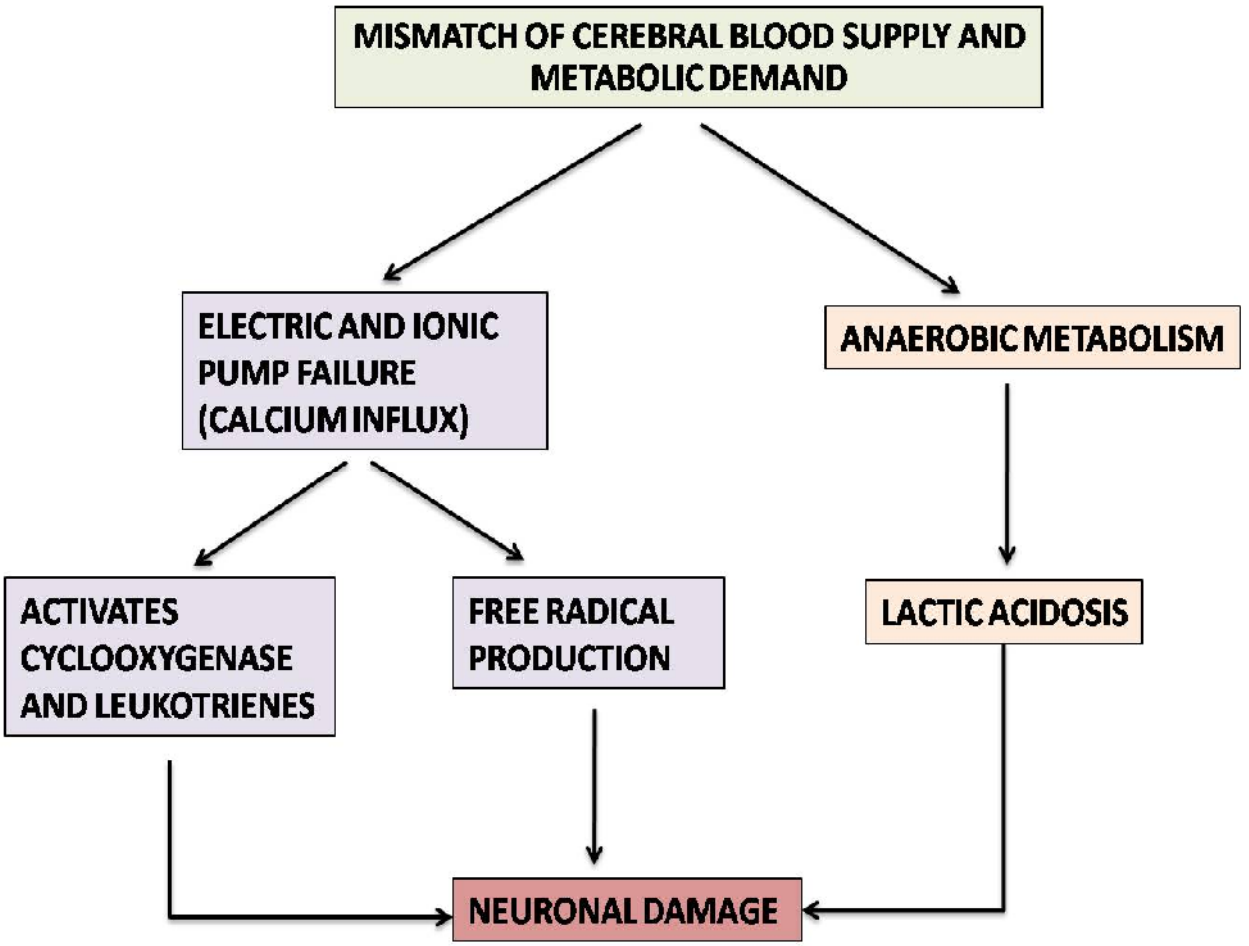

Figure-4: Flowchart of Ischemic Cascade

RISK FACTORS OF STROKE:

AGE:

Age is a non-modifiable risk factor. Studies have shown that the increase in age has been associated with increased incidence of stroke. Although age is not related to the type of stroke, age independently influences stroke outcome in terms of activity of DALY and QALY but not in terms of neurological aspect suggesting a poor compensatory ability in elderly patients with stroke . [11,40]

SEX:

Male patients are associated with increased risk of stroke than females.

RACE:

Black race has been associated with increased risk of stroke than the whites as the prevalence of hypertension and diabetes mellitus were more than white population.

HYPERTENSION:

Hypertension is one of the most important risk factor for stroke (ischemic and haemorrhagic). In India, ICMR multicentric study on risk factors for stroke found hypertension, diabetes, smoking, and low haemoglobin as risk factors.

According to the study, 40% of stroke can be attributed to systolic blood pressure more than 140 mm of Hg. A large Chinese study consisting of 2253 patients suggested that over 49.5 percent of patients with stroke are hypertensive. Studies from this also shows the benefit of stroke in hypertensive patients treated with anti-hypertensive drugs. [12,42]

DIABETES MELLITUS:

Diabetes is one of the strong risk factor for stroke. Diabetes influences stroke in several aspects, in terms of age, in subtype, in speed of recovery, and in mortality. Hyperglycemia on admission independently increase mortality from stroke [13,45,46,47].

SMOKING:

The risk of stroke increases as the number of cigarettes smoked increases. The relative risk of stroke in heavy smokers (>40 cigarettes per day) was twice that of light smokers (fewer than ten cigarettes per day).

Lapsed smokers has a stroke risk at the same level as non-smokers soon after stopping. Stroke risk decreased significantly at the end of two years and was at the level of non-smokers by five years after cessation of cigarette smoking. [14,43]

ATRIAL FIBRILLATION:

Framingham study examined the incidence of stroke in non rheumatic atrial fibrillation, coronary heart disease, hypertension and cardiac failure patients, the age-adjusted stroke incidence was more than twice in the presence of coronary heart disease and thrice in the presence of hypertension. The risk quadrupled in subjects with cardiac failure and a near fivefold excess when atrial fibrillation was present. In persons with coronary heart disease or cardiac failure, atrial fibrillation doubles the stroke risk in men and tripled the risk in women. Data suggest that the elderly persons are more prone to stroke in the presence of atrial fibrillation. [15]

DIAGNOSIS OF STROKE SUBTYPE USING IMAGING [19][20]

CT Scan:

CT radiographic images identify or exclude hemorrhage as the cause of stroke, and they identify extraparenchymal hemorrhages, neoplasms, abscesses, and other conditions masquerading infarction generally show no abnormality, and the infarct may not be seen reliably for 24–48 h. CT may fail to show small ischemic

strokes in the posterior fossa because of bone artifact; small infarcts on the cortical surface may also be missed. Contrast-enhanced CT scans add specificity by showing contrast enhancement of subacute infarcts and allow visualization of venous structures. Coupled with multidetector scanners, CT angiography can be performed with administration of IV iodinated contrast allowing visualization of the cervical and intracranial arteries, intracranial veins, \ aortic arch, and even the coronary arteries in one imaging session. Carotid disease and intracranial vascular occlusions are readily identified with this method. After an IV bolus of contrast, deficits in brain perfusion produced by vascular occlusion can also be demonstrated and used to predict the region of infracted brain and the brain at risk of further infarction. CT imaging is also sensitive for detecting SAH (although by itself does not rule it out), and CTA can readily identify intracranial aneurysms. Because of its speed and wide availability, noncontrast head CT is the imaging modality of choice in patients with acute stroke and CTA and CT perfusion imaging may also be useful and convenient adjuncts.

MRI

MRI reliably documents the extent and location of infarction in all areas of the brain, including the posterior fossa and cortical surface. It also identifies intracranial hemorrhage and other abnormalities and, using special sequences, can be as sensitive as CT for detecting acute intracerebral hemorrhage. MRI scanners with magnets of higher field strength produce more reliable and precise images. Diffusion-weighted imaging is more sensitive for early brain infarction than standard MR sequences or CT, as is fluid-attenuated inversion recovery (FLAIR)

imaging. Using IV administration of gadolinium contrast, MR perfusion studies can be performed. Brain regions showing poor perfusion but no abnormality on diffusion provide, compared to CT, an equivalent measure of the ischemic penumbra. MR angiography is highly sensitive for stenosis of extracranial internal carotid arteries and of large intracranial vessels. With higher degrees of stenosis, MR angiography tends to overestimate the degree of stenosis when compared to conventional x-ray angiography. MRI with fat saturation is an imaging sequence used to visualize extra or intracranial arterial dissection. This sensitive technique images clotted blood within the dissected vessel wall. Iron-sensitive imaging (ISI) is helpful to detect cerebral microbleeds that may be present in cerebral amyloid angiopathy and other hemorrhagic disorders. MRI is more expensive and time consuming than CT and less readily available. Claustrophobia and the logistics of imaging acutely critically ill patients also limit its application. Most acute stroke protocols use CT because of these limitations. However, MRI is useful outside the acute period by more clearly defining the extent of tissue injury and discriminating new from old regions of brain infarction. MRI may have utility in patients with TIA, because it is also more likely to identify new infarction, which is a strong predictor of subsequent stroke.

TREATMENT OF ACUTE ISCHEMIC STROKE [19][21]

- Early evaluation of diagnosis and supportive treatment
- Reperfusion strategies
- Neuroprotective agents
- Supportive care

If the patient develops cerebral oedema it should be treated with mannitol (20%) solution 1g/kg over 30 min. bolus, followed by 0.25 - 0.5 gm/kg over 30 - 60 min every 4 - 6 hours. The usual maximal dose is 2 g/kg.

Patients in whom are eligible for thrombolysis with intravenous rtPA and with elevated blood pressure, the blood pressure should be lowered so that their systolic blood pressure is <185 mmHg and their diastolic blood pressure is <110 mmHg before fibrinolytic therapy is initiated.

Airway support and ventilator assistance are recommended for the treatment of patients with acute stroke who have diminished consciousness or who have bulbar dysfunction that causes compromise of the airway. As hyperthermia (temperature >38°C) has poor outcome source of hyperthermia should be diagnosed and treatment should be and treated accordingly.

Hypovolemia should be corrected with intravenous normal saline, and cardiac arrhythmias which reduces cardiac output should be corrected.

Glycemic levels are to be maintained for good outcome in stroke patients. Hypoglycaemia (blood glucose <60 mg/dL) should be treated in patients with acute ischemic stroke with glucose containing solutions.

ANTITHROMBOTIC AND ANTIPLATELET DRUGS,

Heparin:

Both unfractionated heparin and low molecular weight heparin has no benefit in the outcome and has associated with neurological worsening of acute ischemic stroke.

Aspirin:

Aspirin acts by inactivation of cyclooxygenase there by causing irreversible inhibition of platelet function. Oral therapy of aspirin (initial dose is 325 mg) within 24 to 48 hours after stroke onset is recommended for treatment of most patients.

Surgical Therapy:

Carotid Endarterectomy:

Symptomatic carotid artery stenosis with intraluminal or sessile or mobile thrombus is associated with an atherosclerotic plaque at the carotid bifurcation. The indication for this is controversial. The morbidity associated with surgery appears to be high among patients who already have intraluminal thrombus demonstrated by cerebral angiography.

FIBRINOGEN:

SYNTHESIS OF FIBRINOGEN:

Fibrinogen is exclusively synthesised in liver by hepatocytes. Three genes located separately on chromosome-4 (Ch4q23-q32) under coordinated control synthesize the 3 chains. This is followed by subsequent assembly of these chains

and carbohydrate side chain attachment, after which the mature molecule is secreted into circulation(50) The half life is 72-108 hrs (average 100 hr) and the catabolic rate is 25% per day. The fibrinogen turnover rate is 1.7 to 5 gram per day or 30 – 60 mg per kilogram per day. [22]

FUNCTIONS OF FIBRINOGEN:

Fibrinogen plays an important role in three major processes which are as follows:

1) During the coagulation process, soluble fibrinogen is converted into insoluble fibrin.
2) The polymerised fibrin acts as a template and activates fibrinolytic system, which modulates fibrin deposition and clot dissolution.
3) Fibrinogen binds to Gp IIb/IIIa receptor on platelets and cause platelet aggregation and also endothelial cells where it participate in tissue repair.

There are three distinct phases in conversion of fibrinogen to fibrin which is insoluble. They are:

a) Thrombin mediated enzymatic cleavage of fibrinopeptide.
b) Polymerization of fibrin.
c) Stabilisation of fibrin through covalent cross linking which is mediated by factor XIIIa.

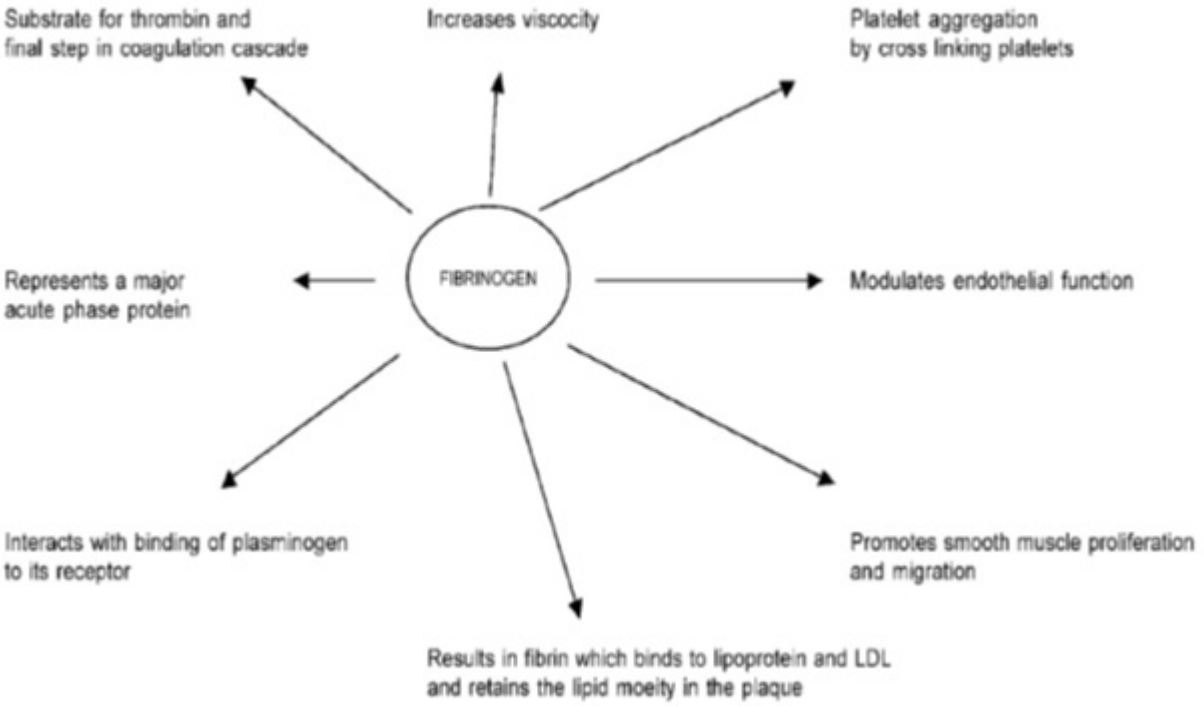

Figure 5

Plasma Fibrinogen, Thrombogenesis, Atherogenesis

FIBRINOGEN ABNORMALITIES:

The fibrinogen abnormalities can be either congenital or acquired. In both cases there may be a qualitative or quantitative abnormality in fibrinogen. In certain cases both abnormalities can be present in the same patient.

a) CONGENITAL DISORDERS:

i) CONGENITAL AFIBRINOGENEMIA:

It is inherited as autosomal recessive disorder with both parents acting as carriers. Usually the fibrinogen level is less than0.1 gram per liter of plasma. The

clinical manifestation includes cutaneous bleeding, umbilical cord bleeding, gastrointestinal haemorrhage intracranial bleed (rarely) and intra-articular bleed. The laboratory evaluation shows prolongation of PT, a PTT and thrombin time with zero or trace plasma fibrinogen levels. It can be treated by transfusion of cryoprecipitate or fibrinogen concentrates and anti fibrinolytic agents. [23][24]

ii) CONGENITAL HYPOFIBRINOGENEMIA:

It is inherited as an autosomal dominant or autosomal recessive disorder. The plasma fibrinogen level is between 0.1 gram per liter and lower limit of normal reference range for that laboratory. It manifests as umbilical cord bleeding, cutaneous bleeding, gastrointestinal haemorrhage, intracranial bleed (rarely) and intra-articular bleed. The investigations will show normal aPTT, prolonged PT and mildly prolonged TT. They are treated with cryoprecipitate or fibrinogen concentrates and anti fibrinolytic agents. [23][24]

iii) CONGENITAL DYSFIBRINOGENEMIA:

It is inherited as autosomal dominant or recessive disorder. This is characterised by synthesis of abnormal fibrinogen molecule which exhibits altered functional properties and altered thrombin conversion to fibrin. It manifests clinically as thrombosis and there will be no evidence of hemorrhage. There will be increased thrombin time and reptilase time. . The investigations will show normal aPTT and PT. The fibrin assay is normal. There will be higher fibrinogen for immunogenic than thrombin clotting method.

They are treated with cryoprecipitate or fibrinogen concentrates with anticoagulants for thrombosis. [23][24][25]

b) ACQUIRED DISORDERS

i)HYPOFIBRINOGENEMIA:

It occurs as a result of one of the following causes:

a) Decreased biosynthesis of fibrinogen by hepatocyte due to decompensated liver disease and fulminant hepatic failure.
b) Disseminated intravascular coagulation due to increased consumption.
c) Drugs like valproic acid and L-Asparaginase
d) Fibrinolytic therapy will reduce fibrinogen level for one or two days.
e) Alcohol consumption- it decreases fibrinogen level by 0.78% for each 10 gram of alcohol consumed.

ii) DYSFIBRINOGENEMIA:

It can be due to:

a) Idiopathic.
b) Liver disease- 50% of patients with cirrhosis, hepatitis and hepatomas show functional abnormality in fibrin polymerization.
c) Multiple myeloma - Abnormal fibrin monomer polymerization.
d) Paraneoplastic syndrome in association with hypernephroma.
e) Autoimmunity – antibody mediated functional abnormality in SLE, Ulcerative colitis and post- necrotic cirrhosis.

iii) HYPERFIBRINOGENEMIA:

1) **Age** :

As age advances there will be increase in fibrinogen level. [26][27]

2) **Sex** :

It is more in males compared to females. [26]

3) **Race** :

Fibrinogen levels are more in blacks than whites. [26]

4) **Smoking** :

It is has a positive correlation with plasma fibrinogen level. [26]

The high fibrinogen level in heavy smokers is usually due to:

- Endothelial injury by leading to activation of coagulation system. [28]
- Release of interleukin-6 by lung macrophages which increase the hepatocyte fibrinogen synthesis. [29]

5) Physical activity:

The fibrinogen concentration is inversely proportional to physical activity.[29][30]

6) Diet :

Increased carbohydrate and fat, decreased ω-3 and ω-6 PUFA's increase fibrinogen level.

7) Obesity :

Obesity results in increased viscosity and fibrinogen levels.

8) Hypertension :

Fibrinogen levels are more in hypertensives than normotensive persons.

9) Diabetes mellitus:

There is positive correlation between serum fibrinogen, hyperglycemia and increased glycated haemoglobin. Hence it will be more in diabetics than non – diabetic individuals.

10) **Hyperlipidemia** :

High cholesterol, LDL, Lp(a) and elevated triglycerides are associated with high fibrinogen levels which in turn consistent with increased thrombotic complications in dyslipidemias.

11) **Ischemic heart disease**:

There is a positive correlation with fibrinogen level and severity of coronary artery disease.

12) **Atrial fibrillation**:

Increased in chronic atrial fibrillation

13) **Left ventricular dysfunction**:

The increased fibrinogen level seen in left ventricular dysfunction is responsible for intra cardiac thrombus and systemic thromboembolism. [31]

14) **Psychological and mental stress**

Increases fibrinogen level.

15) **Cerebrovascular disease**:

Increased fibrinogen level is associated with stroke, TIA incidence and carotid atherosclerotic progression and peripheral vascular disease.

16) **Family history of IHD**

17) **Social class**:

Fibrinogen levels are higher in low socioeconomic class individuals.

18) **Dental disease**:

Chronic inflammatory gingival and periodontal infections.

19) **Elevated leukocyte counts**:

20) **Acute inflammation and infections**:

As an acute phase reactant fibrinogen is elevated by three fold in acute inflammation and infections.

21) **Genetics**:

The plasma fibrinogen formation is significantly influenced by genetics. Variation occurring in β fibrinogen locus affects fibrinogen concentration. The β gene controls the formation of Bβ chain, the rate limiting step in synthesis of fibrinogen. [32]

LIPID METABOLISM

Lipoprotein Complex :

Lipids in plasma are in the form of lipoprotein complexes. Complex of lipid and protein makes it soluble and travel in blood as lipoprotein complexes.

Table 1:Lipoprotein in plasma

LIPOPROTEINS	MAJORCORE LIPIDS	MAJOR APOLIPOPROTEINS
Chylomicrons	Dietary triglyceride	B-48, C, E
HDL	Cholesterol	A1, A-II
LDL	Cholesterol	B-100
VLDL	Endogenous triglyceride	B-100, C, E
Remnants	Triglyceride, Cholesterol	B-100, E

Lipoprotein Metabolism :-

Lipoprotein system is used to transport lipids in exogenous system. Triglycerides are converted to chylomicrons rich in cholesterol by Lipoprotein lipase. In the endogenous system, VLDL is secreted by the liver and converted to IDL. IDL is converted to LDL which is rich in cholesterol.

Chylomicrons :

Chylomicrons are derived from cholesterol and dietary fats which is absorbed from the intestine. Chylomicrons are secreted into the lymph, travels through thoracic duct and enter the systemic circulation. Chylomicrons interact with lipoprotein lipase leading to hydrolysis of triglyceride to fatty acid and glycerol. After lipolysis, chylomicrons remnant is released back into circulation which is cleared rapidly by liver by recognition of apoprotein E. Newly secreted chylomicrons are rich in apoproteins B48 and A1.

VLDL Metabolism

VLDL is synthesized by the liver endogenously, the main core lipid is triglyceride, apoprotein B100, C, E are present. Metabolism of VLDL and chylomicrons are similar VLDL transports triglyceride to the tissues which is used as fuel in adipose tissues the transported triglyceride may be used for storage. VLDL interacts with lipoprotein lipase, VLDL remnant. This remnant produced is converted to LDL or cleared by liver by identifying apoprotein E.

LDL Metabolism :

Major component of LDL is cholesterol LDL delivers cholesterol to tissue through as specific high affinity LDL receptor which controls uptake of cholesterol by the cells. LDL receptor controls intra cellular synthesis of cholesterol. Function of LDL is to supply cholesterol to extra hepatic cells like adrenal cortical cells. Lymphocytes muscles cells and renal cells. They have LDL receptor on the surface. So cholesterol is used and is available to the cell for membranes synthesis. Most

cholesterol released from extra hepatic tissue is then transported to the liver for excretion.

HDL Metabolism :

HDL is needed for removing cholesterol from peripheral tissue to the liver and for metabolising VLDL chylomicrons. Enzyme LCAT -Lecithin cholesterol acyl transferase transforms HDL3 to HDL2. HDL2 transfers cholesterol to VLDL or cholesterol directly to liver after conversion to HDL3 by hepatic triglyceride lipase enzyme.

MATERIALS AND METHODS

STUDY DESIGN: Single centre observational hospital based study

PLACE OF STUDY:

This study was conducted in General Medicine Wards of Government Vellore Medical College Hospital, Vellore

SAMPLE SIZE:

A total sample of 100 patients will be studied using carefully prepared proforma.

PERIOD OF STUDY :

October 2018 to September 2019

ETHICAL CLEARANCE:

This study was approved by the ethical committee of GOVERNMENT VELLORE MEDICAL COLLEGE AND HOSPITAL, VELLORE

METHODOLOGY

Subject selection

INCLUSION CRITERIA

1) Patients with ischemic stroke confirmed by CT scan or MRI brain.
2) Patients age more than 18 years

EXCLUSION CRITERIA:

1) Patients having evidence of renal disease, active hepatic disease, history of prior MI or surgery within preceding 3 months.
2) Patients with prior history of stroke

3) Patients with history of any infection in prior 4 weeks.
4) Patients on any lipid lowering agents including fibrates

DATA COLLECTION

After obtaining the verbal consent either from the patient or the relatives, all patients were evaluated by complete medical history, full neurological examination, standardized blood tests imaging studies and data was recorded in a standardized sheet.

Clinical history was obtained from the patient, his/her relatives or past records. History regarding diabetic status, hypertension, TIA, smoking, alcoholism, coronary artery disease was obtained.

Clinical examination was done to assess the side of the stroke, NIHSS score, presence of gaze palsy, plantar reflex, facial palsy, speech difficulty, admission blood pressure.

Electrocardiography, blood sugar, urea, creatinine, lipid profile, serum fibrinogen and CT/MRI-brain were done after admission.

All relevant data were fed into a computer and results were calculated.

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DEFINITIONS:

Hypertension was diagnosed as present if the patients exhibited a systolic blood pressure 140 mm Hg or a diastolic blood pressure 90 mm Hg, or had a history of diagnosis of hypertension and anti-hypertensive medications.

DIABETES:

Diabetes was defined if patients exhibited a fasting glucose level 7.0 mmol/L (126 mg/dL) or had a history of diabetes diagnosis and anti-diabetic medications.

DYSLIPIDEMIA

A diagnosis of hypercholesterolemia was made for patients with a history of using cholesterol-lowering agents or who had a cut off of fasting serum total cholesterol level (200 mg/dL) on admission and LDL cholesterol >130 mg/dl. Hypertriglyceridemia when the level of Triglycerides ≥ 150 mg/dl.

SMOKING:

A patient was labelled smoker when he had smoked at least 10 cigarettes per day for more six month / more or if he had smoked daily for more than a year regardless of the number [5].

OBESITY:

A patient was defined as obese when his or her BMI was more than or equal to 24.9 kg/m2.

STATISTICAL TOOLS (To be included at the end of Materials and Methods)

The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer using **SPSS 20**

STATISTICAL ANALYSER.

Using this software range, frequencies, percentages, means, standard deviations, chi square and 'p' values were calculated. PEARSON chi- square test was used to test the significance of difference between quantitative variables. A 'p' value less than 0.05 is taken to denote significant relationship.

OBSERVATION AND RESULTS

Table 2: Descriptive analysis of age group in study population (N=100)

Age Group	Frequency	Percentage
<60	25	25%
≥ 60	75	75%
Total	100	100%

Table shows age distribution among stroke patients in which 25% belong to age less than 60 and 75% belong to age more than 60.The mean age is 66.48

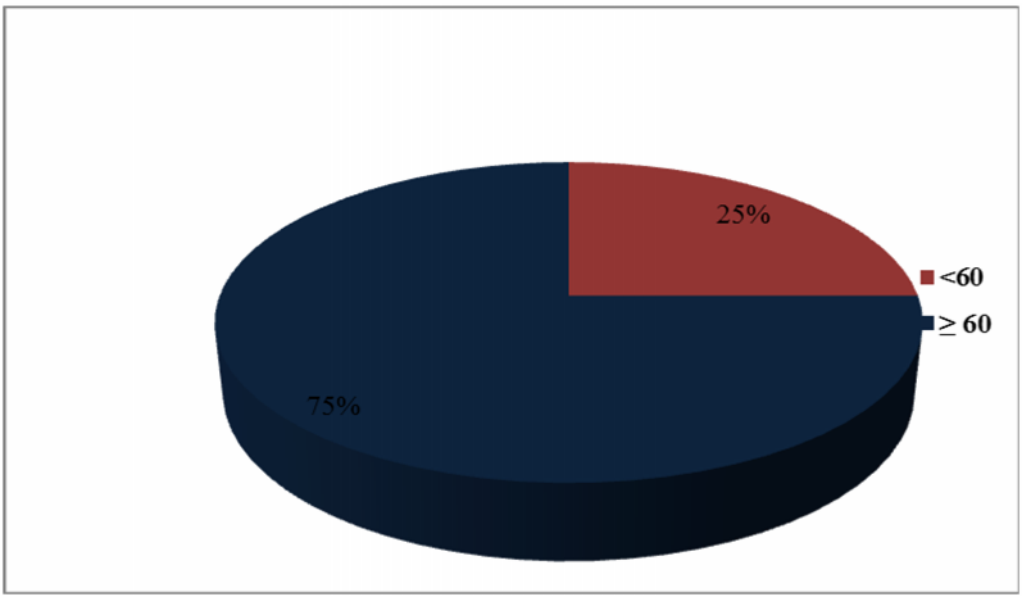

Figure 6: Pie chart of age distribution in study population (N=100)

Table 3: Descriptive analysis of gender in study population (N=100)

Gender	Frequency	Percentage
Male	58	58%
Female	42	42%
Total	100	100%

This Table shows gender distribution,in which 58% are males and 42% are females.

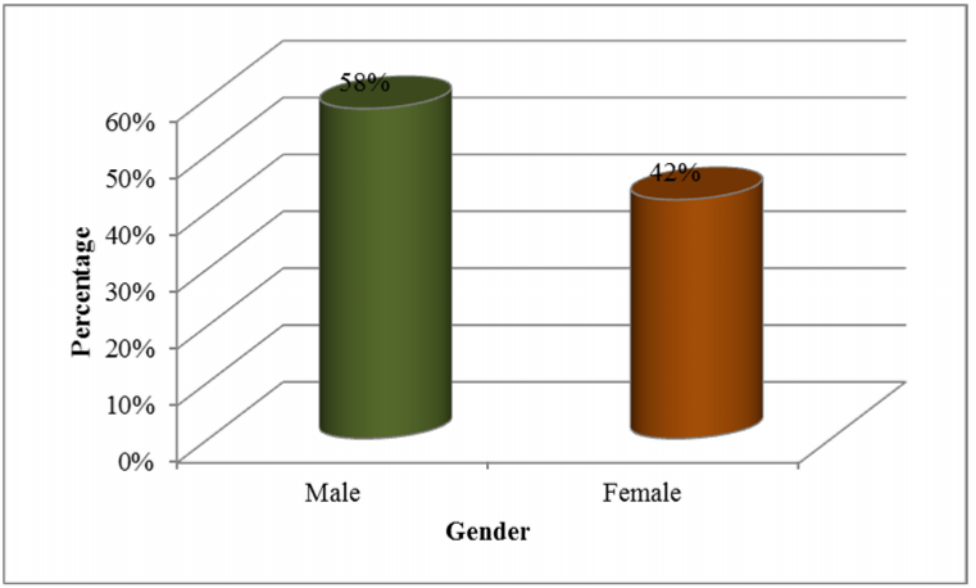

Figure 7: Bar chart of gender distribution in study population (N=100)

Table 4: Descriptive analysis of hypertension in study population (N=100)

Hypertension	Frequency	Percentage
Yes	46	46%
No	54	54%
Total	100	100%

This table shows 46% of patients among the study population have hypertension.

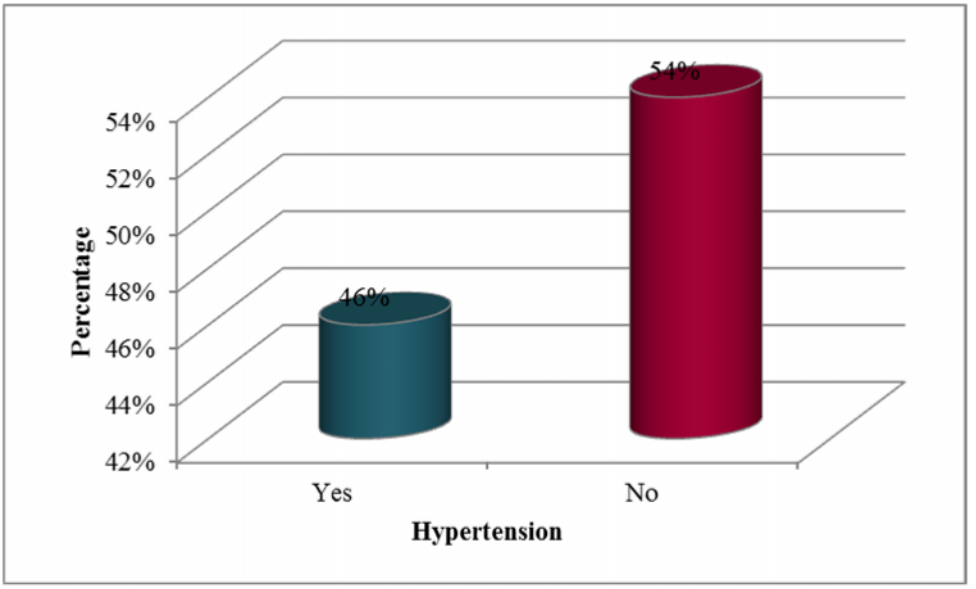

Figure 8: Bar chart of hypertension distribution in study population (N=100)

Table 5: Descriptive analysis of diabetic mellitus in study population(N=100)

Diabetic mellitus	Frequency	Percentage
Yes	31	31%
No	69	69%
Total	100	100%

This table shows 31% of patients among the study population have Diabetes mellitus.

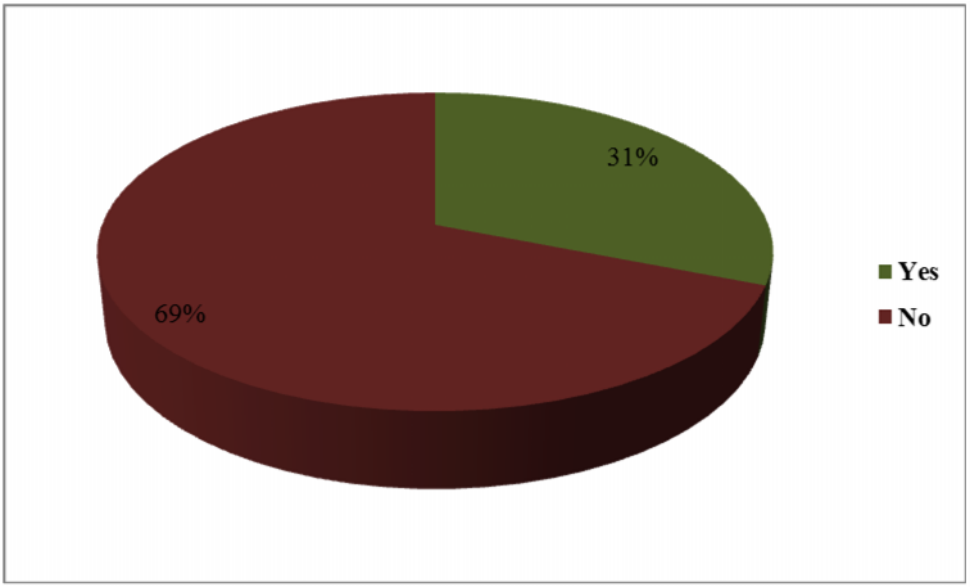

Figure 9: Pie chart of diabetic mellitus distribution in study population (N=100)

Table 6: Descriptive analysis of smoking in study population (N=100)

Smoking	Frequency	Percentage
Yes	39	39%
No	61	61%
Total	100	100%

This table shows 39% of patients among study population are smokers.

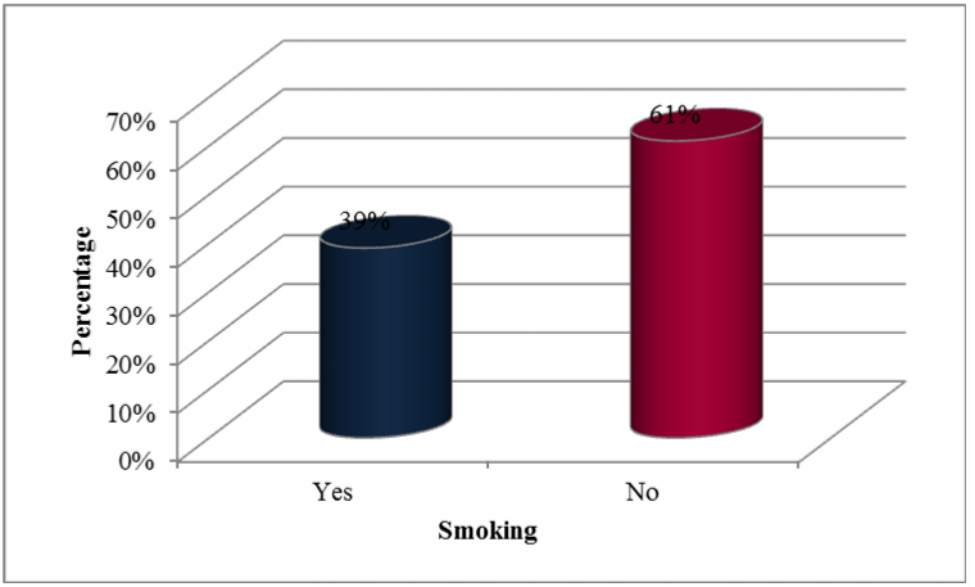

Figure 10: Bar chart of smoking distribution in study population (N=100)

Table 7: Descriptive analysis of alcohol in study population (N=100)

Alcohol	Frequency	Percentage
Yes	20	20%
No	80	80%
Total	100	100%

This table shows 20% of patients among study population are alcoholics

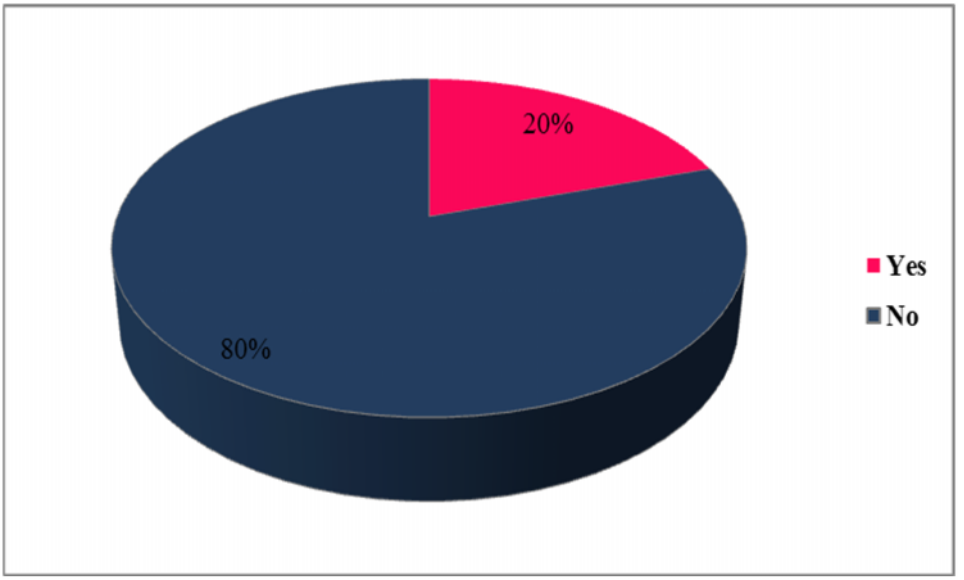

Figure 11: Pie chart of alcohol distribution in study population (N=100)

Table 8: Descriptive analysis of fibrinogen in study population (N=100)

Fibrinogen	Frequency	Percentage
Normal (150 to 400)	49	49%
Abnormal (400 and above)	51	51%
Total	100	100%

This table shows 51% of patients among study population have higher fibrinogen levels

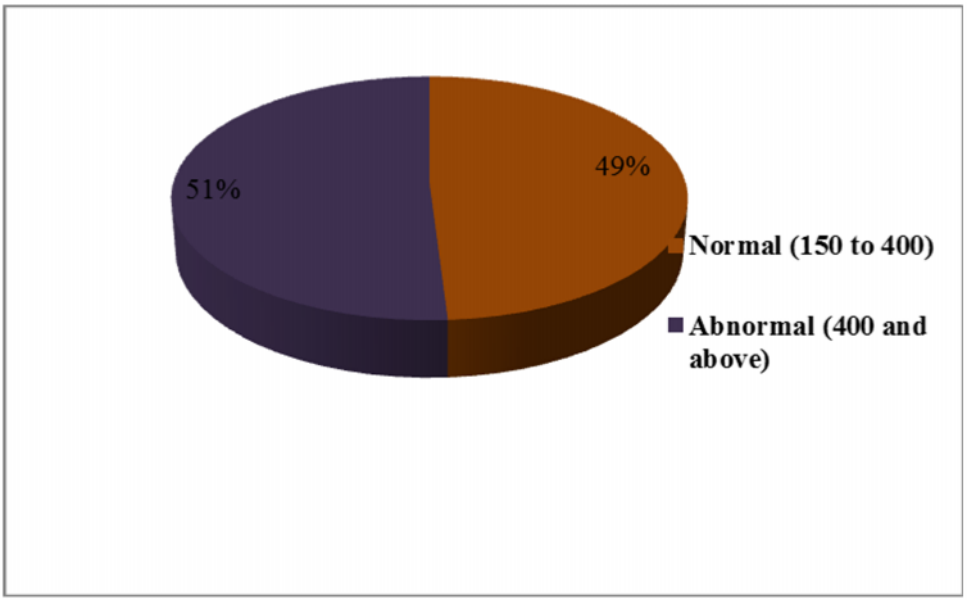

Figure 12: Pie chart of fibrinogen distribution in study population (N=100)

Table 9: Comparison of age group with fibrinogen levels (N=100)

Age group	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
<60	14	11	25
Percentage	28.6%	21.6%	25%
≥ 60	35	40	75
Percentage	71.4%	78.4%	75%
Total	49	51	100
Chi square	36.416		
P value	<0.001		

This table shows age has significant relation with fibrinogen levels.

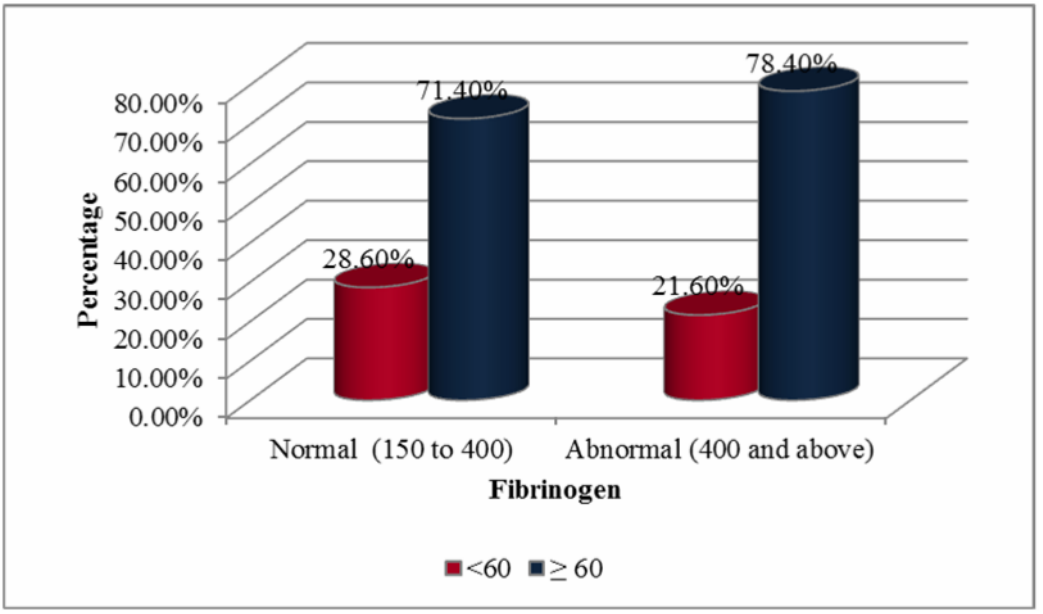

Figure 13: Cluster bar chart of comparison of age group with fibrinogen levels (N=100)

Table 10: Comparison of gender with fibrinogen levels (N=100)

Gender	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
Male	28	30	58
Percentage	57.1%	58.8%	58%
Female	21	21	42
Percentage	42.9%	41.2%	42%
Total	49	51	100
Chi square	0.029		
P value	0.865		

This table shows that there is no significant relation between gender and fibrinogen levels

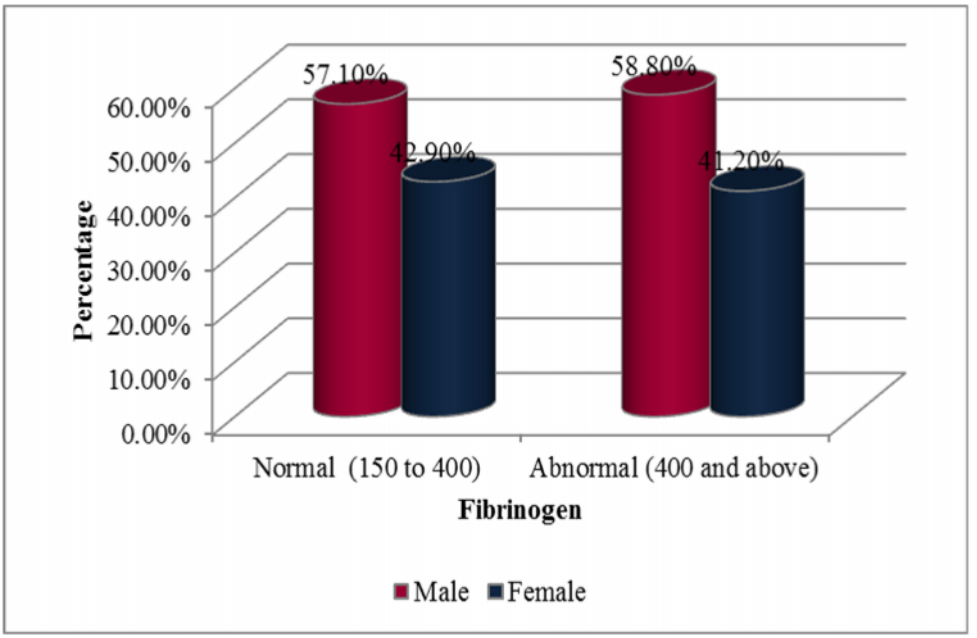

Figure 14: Cluster bar chart of comparison of gender with fibrinogen levels (N=100)

Table11: Comparison of hypertension with fibrinogen levels (N=100)

Hypertension	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
Yes	12	34	46
Percentage	24.5%	66.7%	46%
No	37	17	54
Percentage	75.5%	33.3%	54%
Total	49	51	100
Chi square	17.896		
P value	<0.001		

This table shows that there is significant relationship between hypertension and fibrinogen levels.

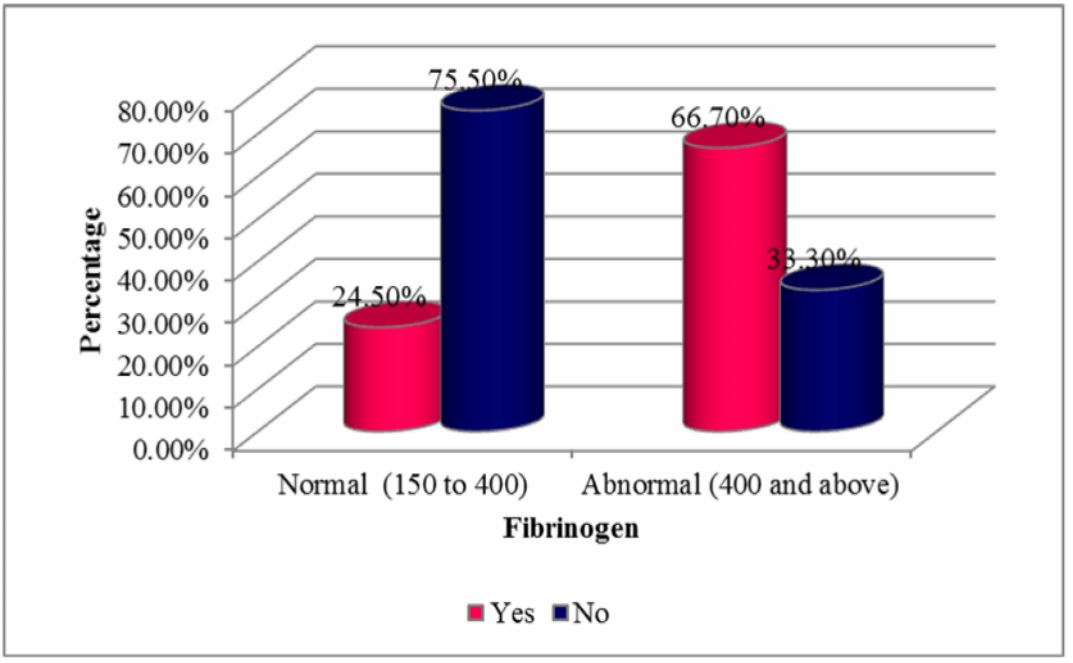

Figure 15: Cluster bar chart of comparison of hypertension with fibrinogen levels (N=100)

Table 12: Comparison of DM with fibrinogen levels (N=100)

Diabetic mellitus	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
Yes	8	23	31
Percentage	16.3%	45.1%	31%
No	41	28	69
Percentage	83.7%	54.9%	69%
Total	49	51	100
Chi square	9.671		
P value	0.002		

This table shows that there is significant relationship between diabetes mellitus and fibrinogen levels.

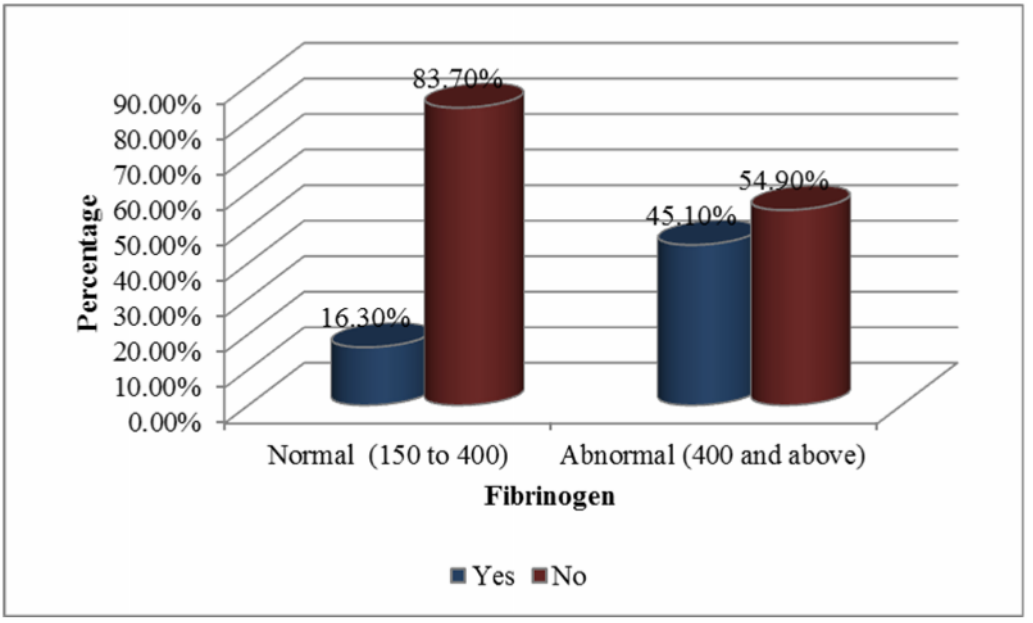

Figure 16: Cluster bar chart of comparison of DM with fibrinogen levels (N=100)

Table 13: Comparison of smoking with fibrinogen levels (N=100)

Smoking	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
Yes	15	24	39
Percentage	30.6%	47.1%	39%
No	34	27	61
Percentage	69.4%	52.9%	61%
Total	49	51	100
Chi square	2.841		
P value	0.092		

This table shows that there is no significant relationship between smoking and fibrinogen levels.

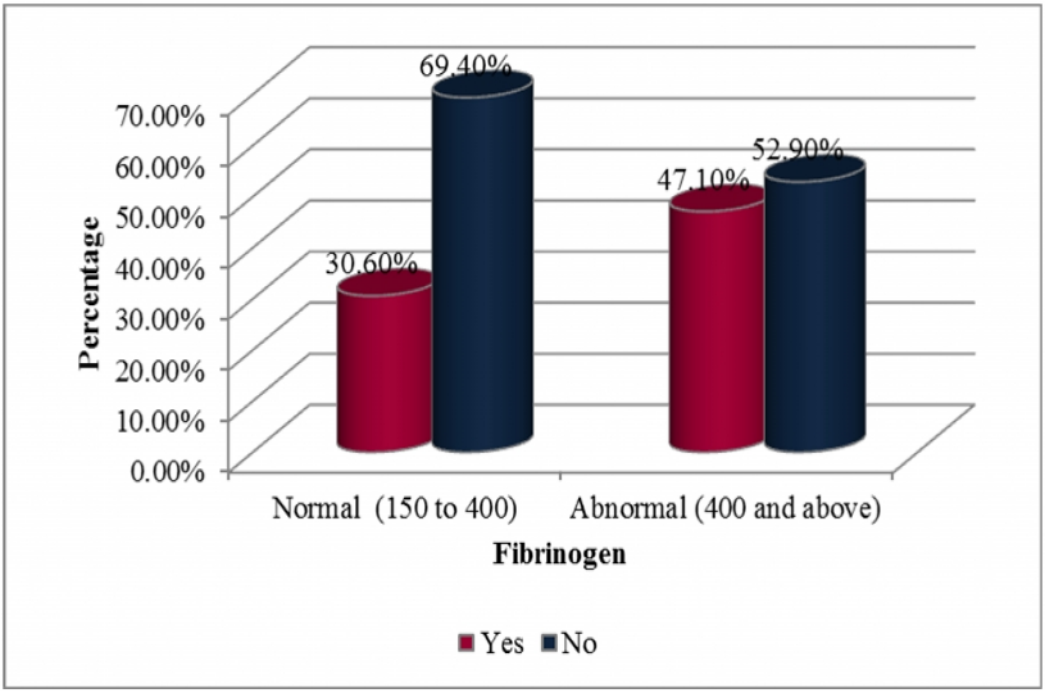

Figure 17 : Cluster bar chart of comparison of smoking with fibrinogen levels (N=100)

Table 14:Comparison of alcohol with fibrinogen levels (N=100)

Alcohol	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
Yes	5	15	20
Percentage	10.2%	29.4%	20%
No	44	36	80
Percentage	89.8%	70.6%	80%
Total	49	51	100
Chi square	5.762		
P value	0.016		

This table shows that there is significant relationship between alcohol and fibrinogen levels

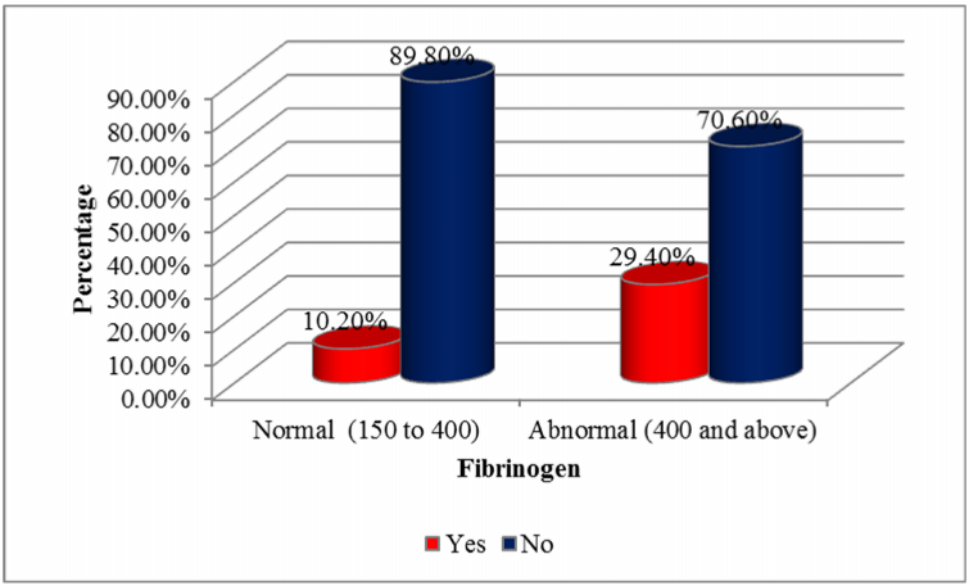

Figure 18: Cluster bar chart of comparison of alcohol with fibrinogen levels (N=100)

Table 15: Comparison of mean systolic blood pressure between fibrinogen levels (N=100)

Parameter	Fibrinogen		Un paired t test P value
	Normal (150 to 400)	Abnormal (400 and above)	
Systolic blood pressure (Mean ± SD)	132.86 ± 22.64	149.22 ± 26.90	0.001

This table shows that there is significant relationship between systolic BP and fibrinogen levels.

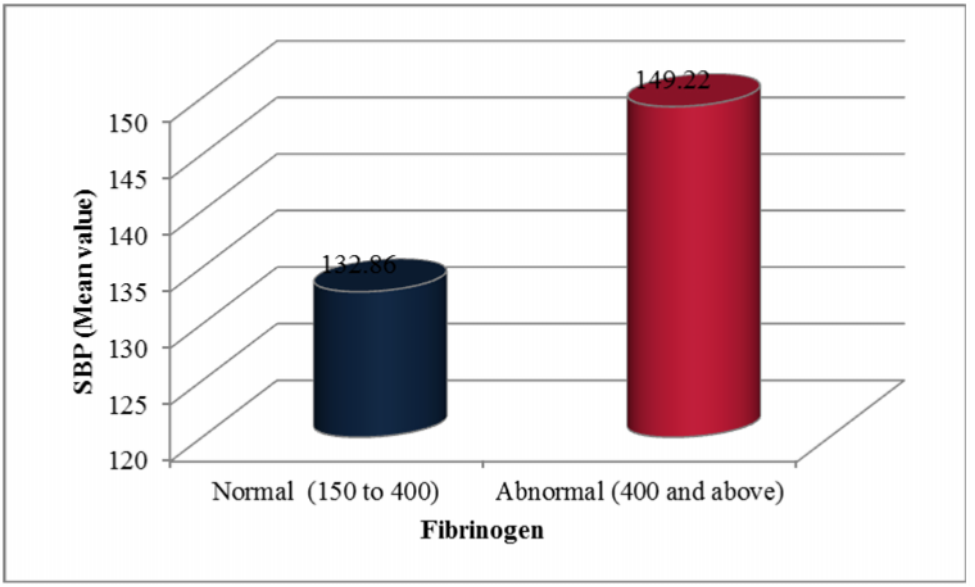

Figure 19: Bar chart of comparison of mean systolic blood pressure between fibrinogen levels (N=100)

Table 16: Comparison of mean diastolic blood pressure between fibrinogen levels (N=100)

Parameter	Fibrinogen		Un paired t test P value
	Normal (150 to 400)	Abnormal (400 and above)	
Diastolic blood pressure (Mean ± SD)	83.88 ± 14.26	90.39 ± 15.74	0.033

Table16: This table shows that there is significant relationship between diastolic BP and fibrinogen levels.

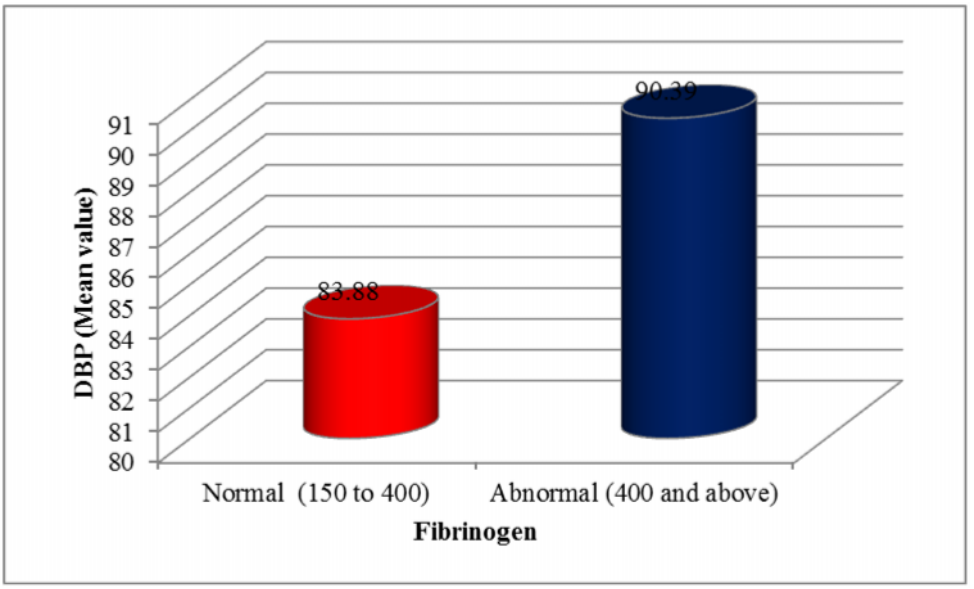

Figure 20: Bar chart of comparison of mean diastolic blood pressure between fibrinogen levels (N=100)

Table 17: Comparison of mean FBS between fibrinogen levels (N=100)

Parameter	Fibrinogen		Un paired t test P value
	Normal (150 to 400)	Abnormal (400 and above)	
FBS (Mean ± SD)	143.90 ± 46.23	165.24 ± 72.14	0.083

This table shows that there is no significant relationship between FBS and Fibrinogen levels.

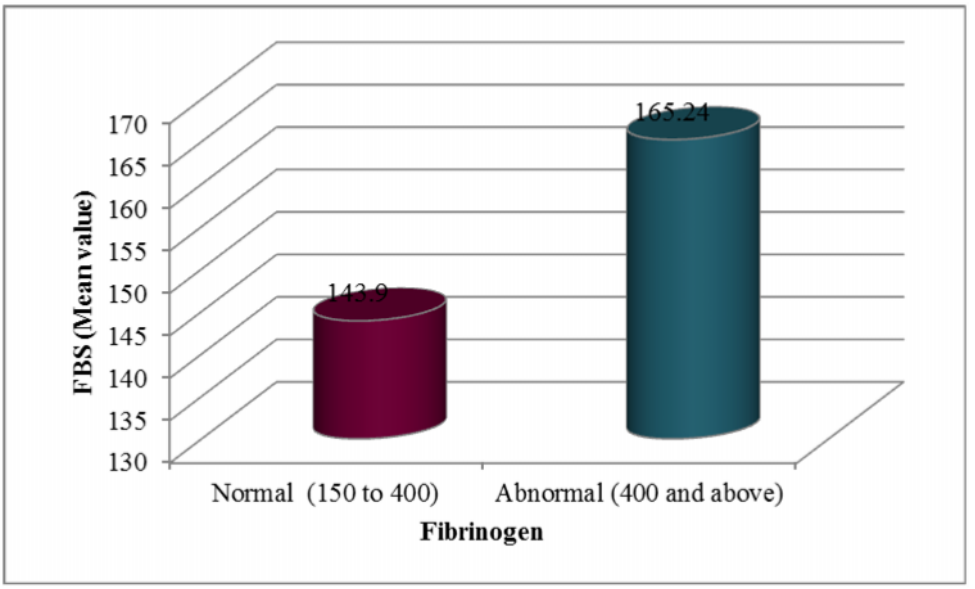

Figure 21: Bar chart of comparison of mean FBS between fibrinogen levels (N=100)

Table 18: Comparison of mean urea between fibrinogen levels (N=100)

Parameter	Fibrinogen		Un paired t test P value
	Normal (150 to 400)	Abnormal (400 and above)	
Urea (Mean ± SD)	33.45 ± 32.42	28.57 ± 15.78	0.338

This table shows that there is no significant relationship between urea and fibrinogen levels.

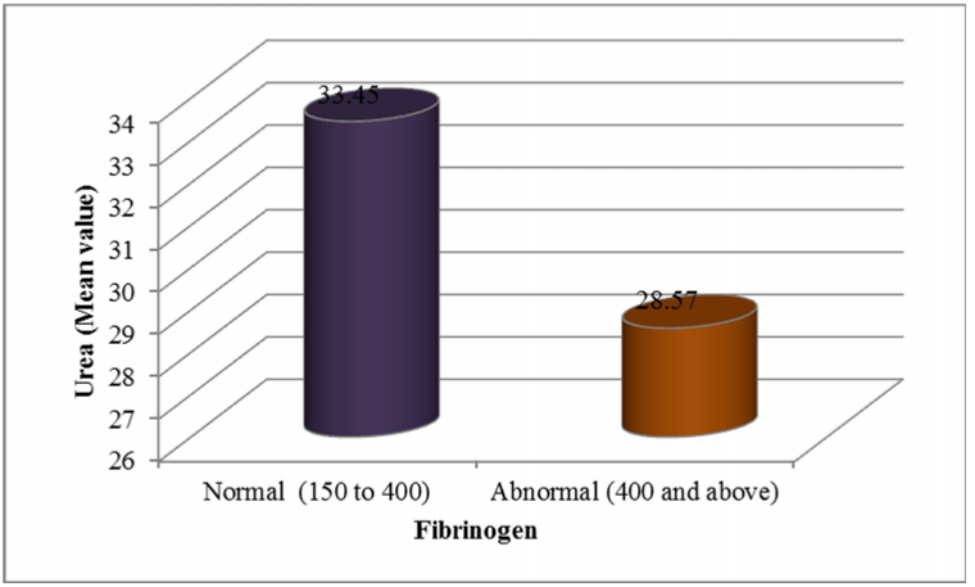

Figure 22: Bar chart of comparison of mean urea between fibrinogen levels (N=100)

Table 19: Comparison of mean creatinine between fibrinogen levels (N=100)

Parameter	Fibrinogen		Un paired t test P value
	Normal (150 to 400)	Abnormal (400 and above)	
Creatinine (Mean ± SD)	1.34 ± 1.14	1.17 ± 0.36	0.315

This table shows that there is no significant relationship between creatinine and fibrinogen levels.

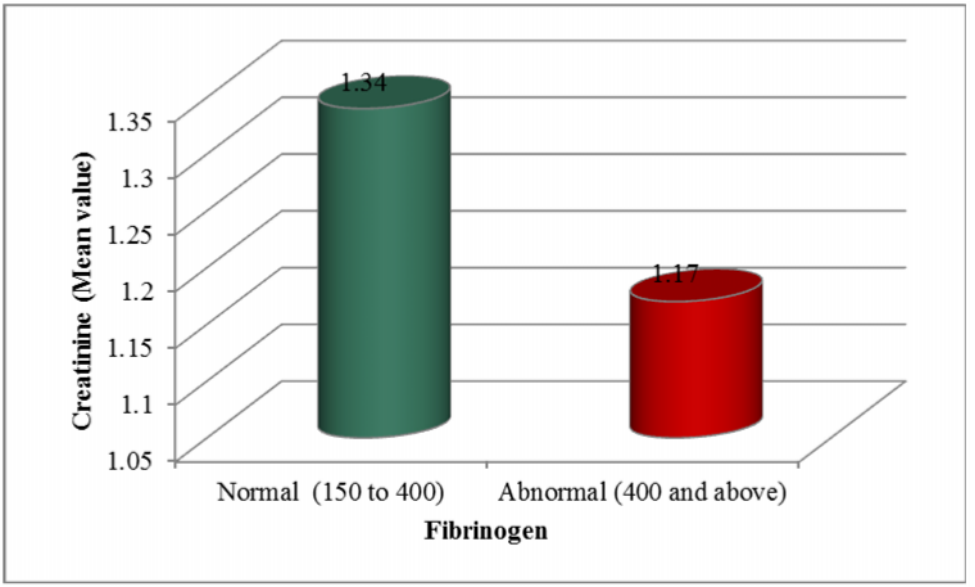

Figure 23: Bar chart of comparison of mean creatinine between fibrinogen levels (N=100)

Table 20: Comparison of NIHSS with fibrinogen levels (N=100)

NIHSS	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
Mild <5	15	7	22
Percentage	30%	13.7%	22%
Moderate 6-15	33	32	65
Percentage	67.3%	62.7%	65%
Severe 16-25	1	6	7
Percentage	2%	11.8%	7%
Very severe >25	0	6	6
Percentage	0%	11.8%	6%
Total	49	51	100
Chi square	12.461		
P value	0.006		

This table shows there is significant relationship between NIHSS and Fibrinogen levels.

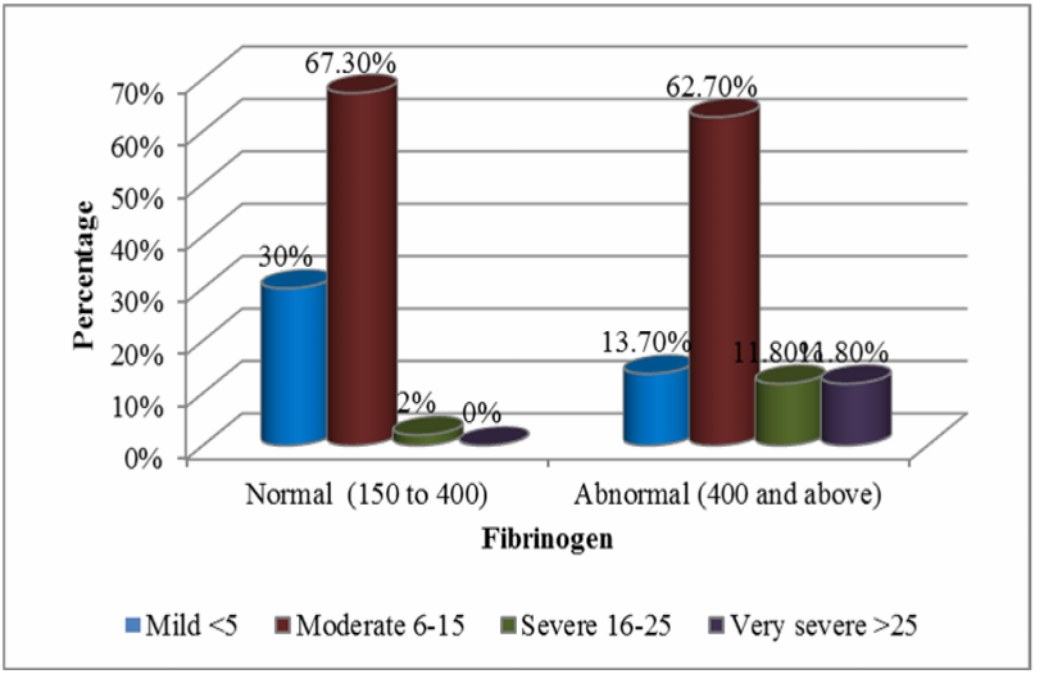

Figure 24: Cluster bar chart of comparison of NIHSS with fibrinogen levels (N=100)

Table 21: Comparison of total cholesterol with fibrinogen levels (N=100)

Total cholesterol	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
<200	35	17	52
Percentage	71.4%	33.3%	52%
200-240	6	5	11
Percentage	12.2%	9.8%	11%
>240	8	29	37
Percentage	16.3%	56.9%	37%
Total	49	51	100
Chi square	5.057		
P value	0.025		

This table shows that there is significant relationship between fibrinogen and Total cholesterol

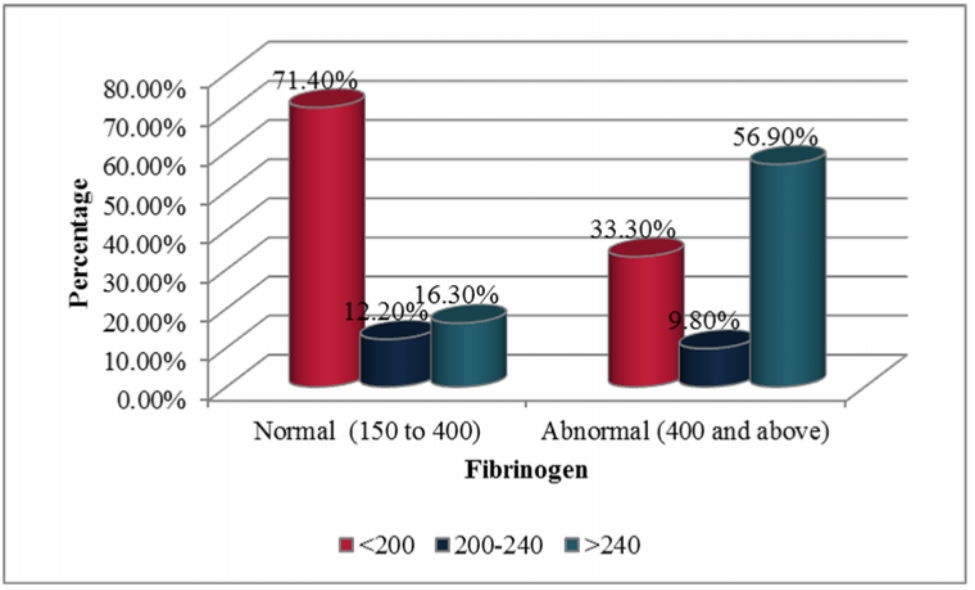

Figure 25: Cluster bar chart of comparison of total cholesterol with fibrinogen levels (N=100)

Table 22: Comparison of TGL with fibrinogen levels (N=100)

TGL	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
<150	40	25	65
Percentage	81.6%	49%	65%
150 to 199	9	24	33
Percentage	18.4%	47.1%	33%
>200	0	2	2
Percentage	0%	3.9%	2%
Total	49	51	100
Chi square	12.245		
P value	0.002		

This table shows that there is significant relationship between Triglycerides and fibrinogen levels.

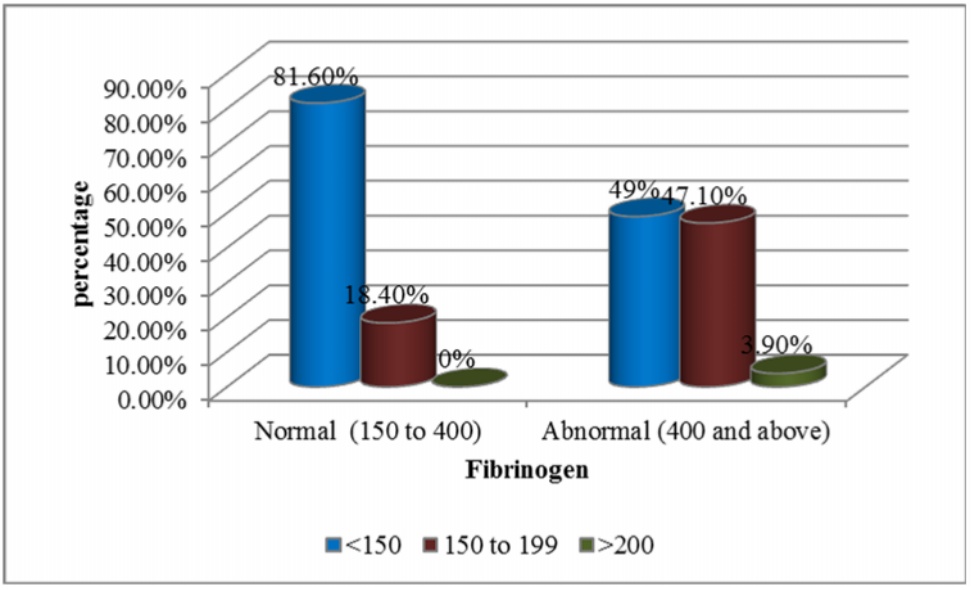

Figure 26:Cluster bar chart of comparison of TGL with fibrinogen levels (N=100)

Table 23: Comparison of LDL with fibrinogen levels (N=100)

LDL	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
<100	13	3	16
Percentage	26.5%	5.9%	16%
100 to 130	26	8	34
Percentage	53.1%	15.7%	34%
131 to 160	9	22	31
Percentage	18.4%	43.1%	31%
>160	1	18	19
Percentage	2%	35.3%	19%
Total	49	51	100
Chi square	36.416		
P value	< 0.001		

This table shows that there is significant relation between LDL and fibrinogen levels

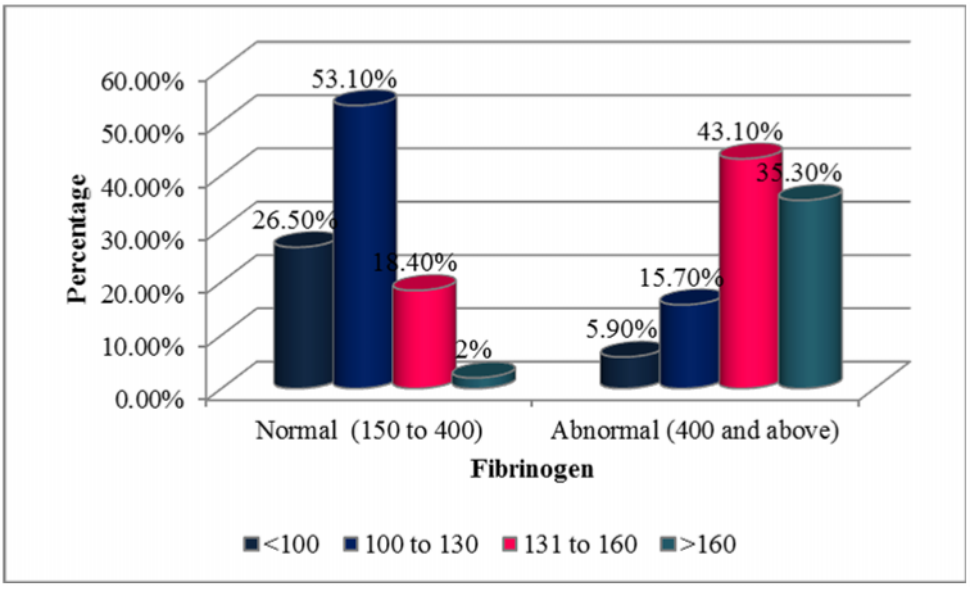

Figure 27: Cluster bar chart of comparison of LDL with fibrinogen levels (N=100)

Table 24: Comparison of HDL with fibrinogen levels (N=100)

HDL	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
<40	9	22	31
Percentage	18.4%	43.1%	31%
≥40	40	29	69
Percentage	81.6%	56.9%	69%
Total	49	51	100
Chi square	7.168		
P value	0.007		

This table shows that there is significant relation between HDL and fibrinogen levels

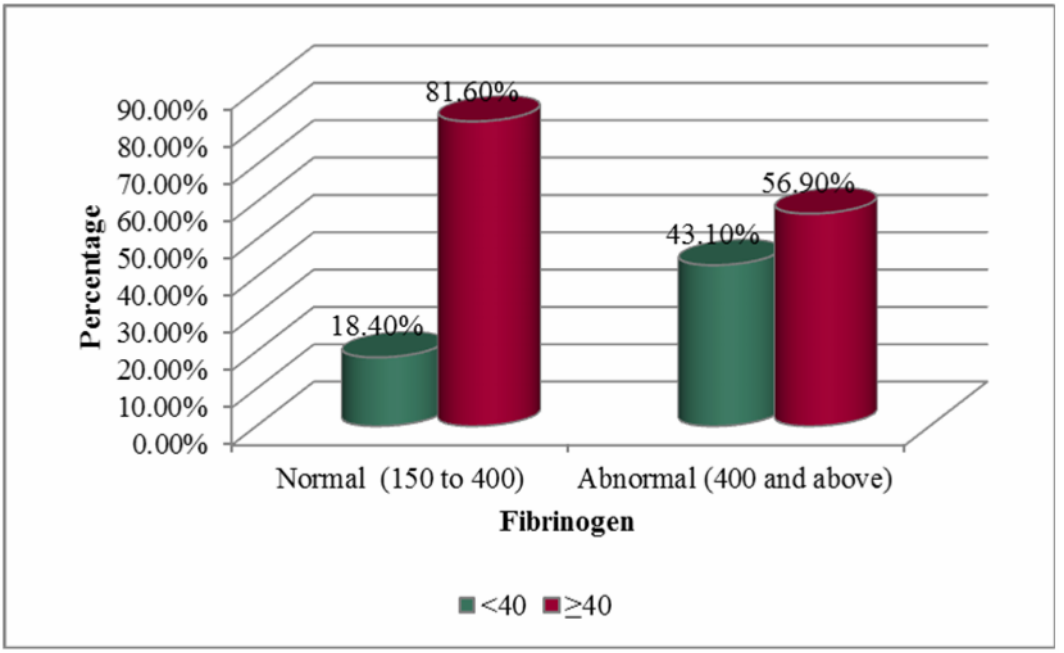

Figure 28: Cluster bar chart of comparison of HDL with fibrinogen levels (N=100)

Table 25: Comparison of outcome with fibrinogen levels (N=100)

Outcome	Fibrinogen		Total
	Normal (150 to 400)	Abnormal (400 and above)	
Discharge	49	46	95
Percentage	100%	90.2%	95%
Expired	0	5	5
Percentage	0%	9.8%	5%
Total	49	51	100
Chi square	5.057		
P value	0.025		

This table shows that there is significant relationship between outcome and fibrinogen levels.

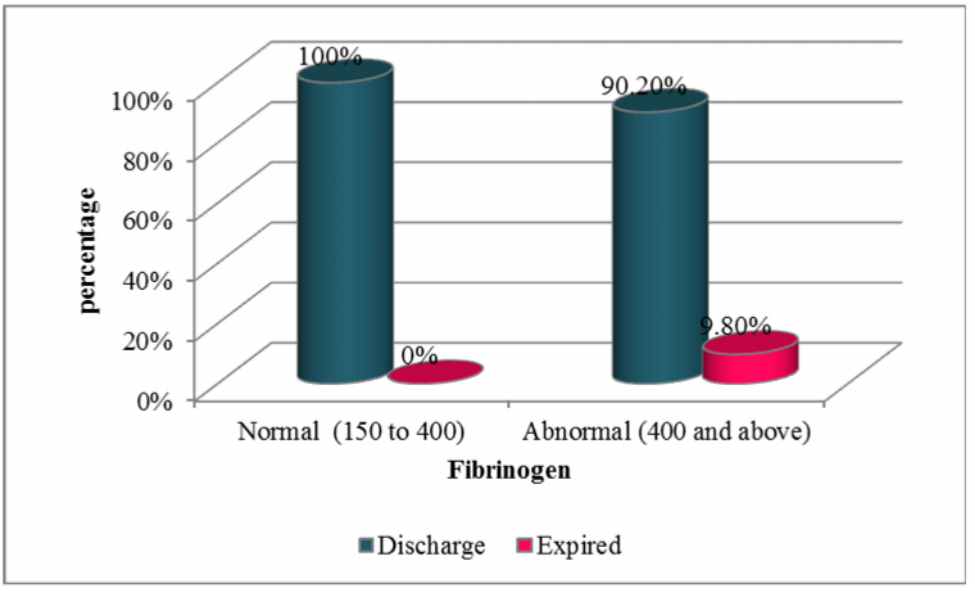

Figure 29: Cluster bar chart of comparison of outcome with fibrinogen levels (N=100)

Table 26: Comparison of Total cholesterol with NIHSS (N=100)

Total cholesterol	NIHSS				Total
	Mild <5	Moderate 6-15	Severe 16-25	Very severe >25	
<200	13	33	4	2	52
Percentage	59.1%	50.8%	57.1%	33.3%	52%
200-240	5	5	1	0	11
Percentage	22.7%	7.7%	14.3%	0%	11%
>240	4	27	2	4	37
Percentage	18.2%	41.5%	28.6%	66.7%	37%
Total	22	65	7	6	100
Chi square	8.824				
P value	0.184				

This table shows that there is no significant relationship between Total cholesterol and NIHSS

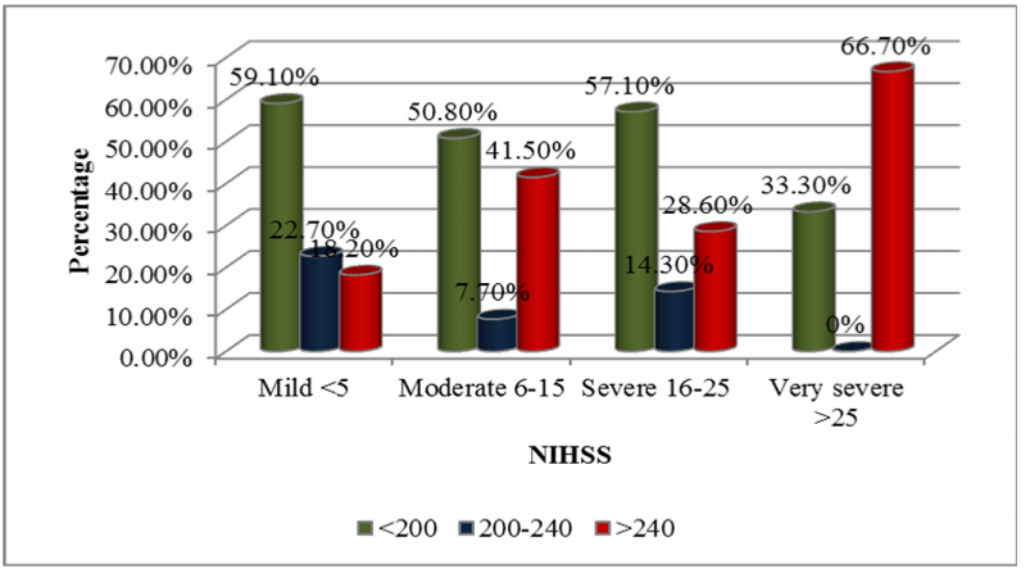

Figure 30: Cluster bar chart of comparison of Total cholesterol with NIHSS (N=100)

Table 27: Comparison of TGL with NIHSS (N=100)

TGL	NIHSS				Total
	Mild <5	Moderate 6-15	Severe 16-25	Very severe >25	
<150	14	45	4	2	65
Percentage	63.6%	69.2%	57.1%	33.3%	65%
150-199	8	18	3	4	33
Percentage	36.4%	27.7%	42.9%	66.7%	33%
>200	0	2	0	0	2
Percentage	0%	3.1%	0%	0%	2%
Total	22	65	7	6	100
Chi square	5.152				
P value	0.525				

This table shows that there is no significant relationship between TGL and NIHSS

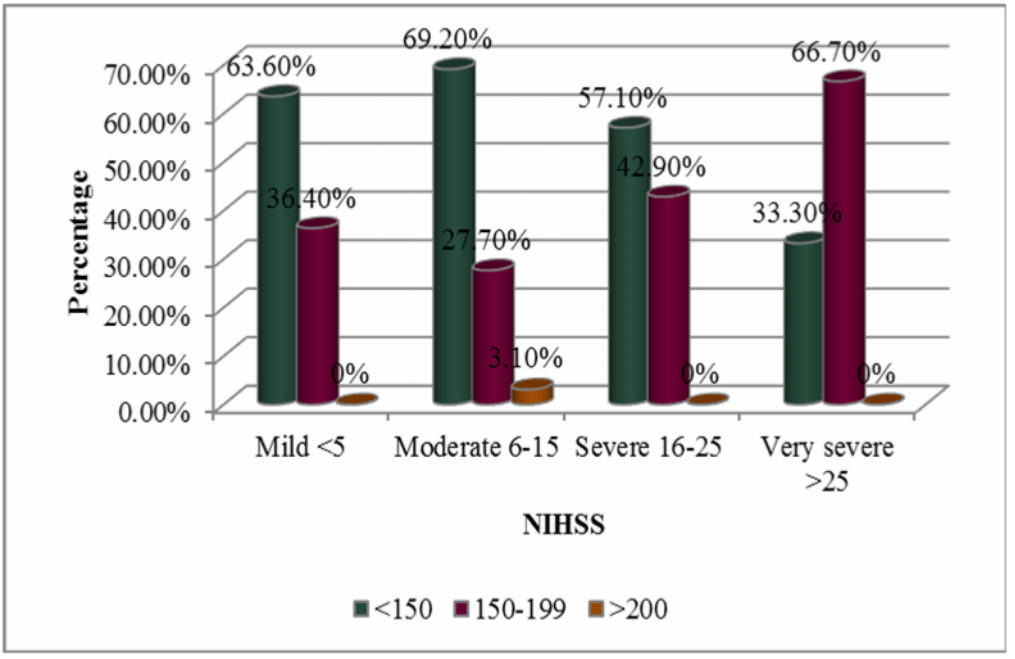

Figure 31: Cluster bar chart of comparison of TGL with NIHSS (N=100)

Table 28: Comparison of LDL with NIHSS (N=100)

LDL	NIHSS				Total
	Mild <5	Moderate 6-15	Severe 16-25	Very severe >25	
<100	4	10	2	0	16
Percentage	18.2%	15.4%	28.6%	0%	16%
100 to130	9	25	0	0	34
Percentage	40.9%	38.5%	0%	0%	34%
130 to 160	6	22	2	1	31
Percentage	27.3%	33.8%	28.6%	16.7%	31%
>160	3	6	3	5	19
Percentage	13.6%	12.3%	42.9%	83.3%	19%
Total	22	65	7	6	100
Chi square	24.553				
P value	0.004				

This table shows that there is significant relationship between LDL and NIHSS

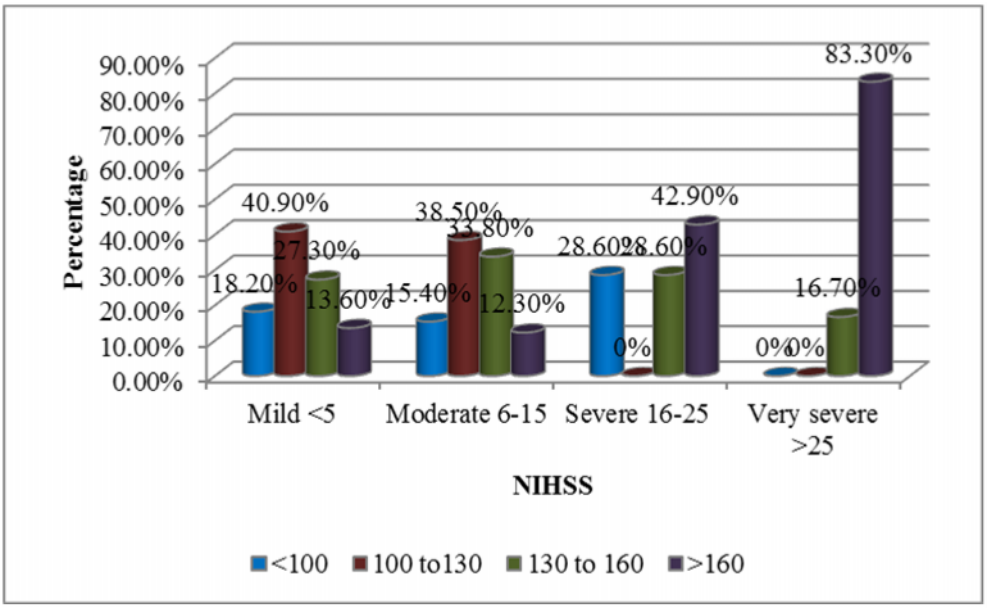

FIGURE 32: Cluster bar chart of comparison of LDL with NIHSS (N=100)

TABLE 29 Comparison of HDL with NIHSS (N=100)

HDL	NIHSS				Total
	Mild <5	Moderate 6-15	Severe 16-25	Very severe >25	
<40	3	24	1	3	31
Percentage	13.6%	36.9%	14.3%	50%	31%
≥40	19	41	6	3	69
Percentage	86.4%	63.1%	85.7%	50%	69%
Total	22	65	7	6	100
Chi square	6.094				
P value	0.107				

This table shows shows that there is no significant relationship between HDL and NIHSS

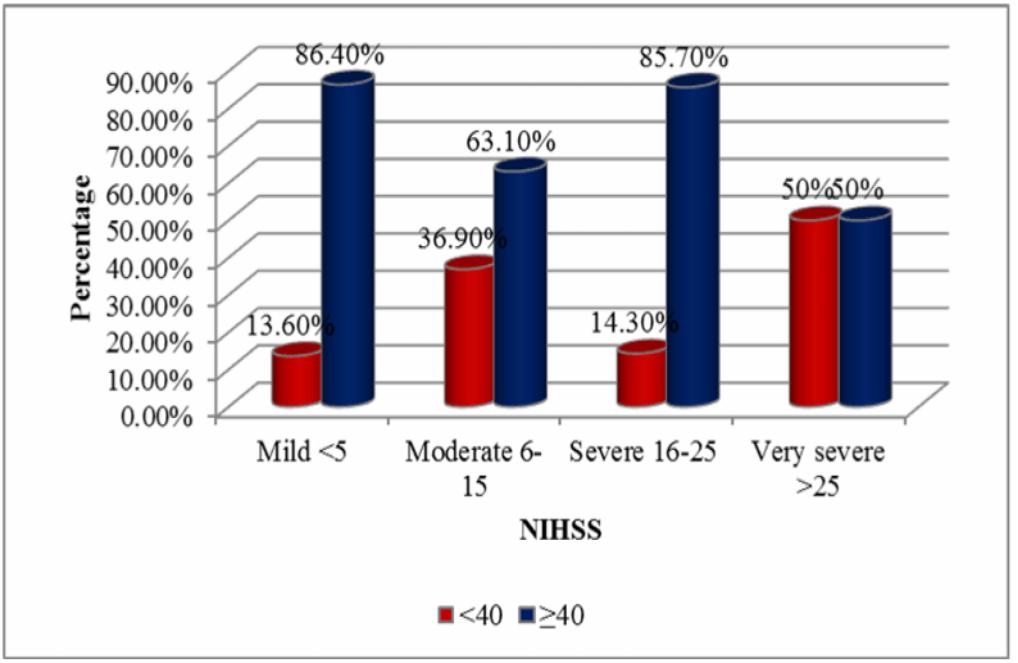

FIGURE 33 Cluster bar chart of comparison of HDL with NIHSS (N=100)

DISCUSSION

In this study, a total of 100 people who had undergone CT/MRI Brain and diagnosed as acute ischemic stroke were included after fulfilling the selection criteria. Of the 100 population, 58% were males and 42% are females. Out of the 100, 46% were hypertensives and diabetics were 31%. Among the males, 39% are smokers and 20% were alcoholics. Out of the 100 population, 51% had higher fibrinogen levels more than 400 mg/dl.

AGE AND FIBRINOGEN

On comparing age with fibrinogen levels, there is increase in level of fibrinogen as the age advances. This is evidenced by increased fibrinogen level of more than 400mg/dl observed in only 11 people in age group less than 60 as other 14 people in age group less than 60 had normal fibrinogen level. Where as in age group more than 60 years, 40 people had fibrinogen level of more than 400mg/dl and the remaining 35 had normal fibrinogen levels. This relationship of increasing fibrinogen level with age is found to have statistical significance with p value < 0.001.

GENDER AND FIBRINOGEN

On comparing gender with fibrinogen level, 28 males and 21 females had normal fibrinogen levels whereas abnormal fibrinogen level more than 400 mg/dl is seen in 30 males and 21 females. 58.8% males and 41.2% females had abnormal fibrinogen levels but there is no statistically significant relationship existing between gender and fibrinogen level ($p = 0.865$).

HYPERTENSION AND FIBRINOGEN

Out of the 46 hypertensives, 12 of them had normal fibrinogen level and 34 of them had abnormal fibrinogen level more than 400 mg/dl. Among the non-hypertensives, 37 of them had normal fibrinogen level and 17 of them had abnormal fibrinogen level. 66.7% of hypertensives and 33.3% of non-hypertensives had increased fibrinogen levels. There is a significant relationship between presence of hypertension and serum fibrinogen levels statistically.

DIABETES MELLITUS AND FIBRINOGEN

Out of 31 diabetes mellitus, 23 had higher fibrinogen level and 8 had normal fibrinogen level. In 69 patients who did not have diabetes, only 28 had abnormal fibrinogen level and the rest 41 had normal fibrinogen levels. 45.1% of diabetics and 54.9% of non-diabetics had higher fibrinogen levels. There is statistically significant relationship between diabetes and higher levels of fibrinogen ($p= 0.002$).

SMOKING AND FIBRINOGEN

24 out of 39 smokers had higher fibrinogen level and the rest fifteen had normal fibrinogen level. 34 out of 61 non-smokers had normal levels of fibrinogen and the remaining 27 had higher levels of fibrinogen. 47.1% of smokers and 52.9% of non-smokers had abnormal fibrinogen levels. There is no significant relationship between smoking and fibrinogen levels ($p = 0.092$).

ALCOHOL AND FIBRINOGEN

Out of 100 study population, 80 were non-alcoholics and 20 were alcoholics. Among the 20 alcoholics 15 had higher fibrinogen levels and 5 had normal fibrinogen levels. Among 80 non-alcoholics, those having normal and abnormal fibrinogen levels were 44 and 36 respectively. The percentage of people having abnormal fibrinogen levels were 29.4% among alcoholics and 70.6% among non-alcoholics. The association between alcoholics and increased levels of fibrinogen is statistically significant ($p = 0.016$).

MEAN SYSTOLIC BP AND FIBRINOGEN

The mean systolic BP among those having normal fibrinogen levels was 132.86 mmHg and for those having abnormal fibrinogen level was 149.22 mmHg. This reveals that the level of fibrinogen rises with rise in mean systolic BP with significant statistical association ($p =0.001$).

MEAN DIASTOLIC BP AND FIBRINOGEN

Mean diastolic BP among those who had normal fibrinogen level was 83.88 and for those having abnormal fibrinogen level was 90.39. There is a significant statistical relationship between diastolic blood pressure and fibrinogen ($p=0.033$).

FASTING BLOOD SUGAR AND FIBRINOGEN

The mean fasting blood sugar among those who had normal fibrinogen level was 143.90 mg/dl and those having abnormal fibrinogen level was 165.24 mg/dl. There is no statistically significant association observed between fasting blood sugar and fibrinogen levels ($p = 0.083$).

UREA AND FIBRINOGEN

The mean urea among those who have normal fibrinogen level was 33.45 and those who have abnormal fibrinogen level was 28.57. There is no statistical relationship between urea and fibrinogen levels (p = 0.338).

CREATININE AND FIBRINOGEN

The mean creatinine among those who have normal fibrinogen level was 1.34 and those who have abnormal fibrinogen level was 1.17.There is no statistical significance between creatinine and fibrinogen.

NIHSS AND FIBRINOGEN

Out of 51 cases with abnormal fibrinogen level,7 of them belong to mild NIHSS group, 32 of them in moderate NIHSS group, 6 of them in severe NIHSS group,6 of them in very severe NIHSS group respectively.13.7% cases of abnormal fibrinogen levels had mild NIHSS Score, 62.7% cases of abnormal fibrinogen had moderate NIHSS Score, 11.8% of abnormal fibrinogen had severe NIHSS Score,11.8% of abnormal fibrinogen had very severe NIHSS Score .There is significant relationship between fibrinogen and NIHSS Score. (p=0.006)

TOTAL CHOLESTROL AND FIBRINOGEN

Out of 51 cases with abnormal fibrinogen, 17 cases had cholesterol less than 200mg/dl, 5 cases had cholesterol between 200-240 mg/dl, 29 cases had cholesterol more than 240mg/dl. Among cases with abnormal fibrinogen, 33.7% of cases had cholesterol less than 200mg/dl, 9.8% of cases had cholesterol between 200-

240mg/dl, 56.9% of cases had cholesterol more than 240mg/dl. There is significant statistical relationship between fibrinogen and total cholesterol. (p=0.025).

TRIGLYCERIDES AND FIBRINOGEN

Out of 51 cases with abnormal fibrinogen, 25 cases had TGL less than 150mg/dl, 24cases had TGL between 150-199mg/dl, 2 cases had TGL more than 200mg/dl. Among cases with abnormal fibrinogen, 49% of cases had TGL less than 150mg/dl, 47.1% of cases had TGL between 150-199mg/dl, 3.9% of cases had TGLl more than 200mg/dl. There is significant statistical relationship between fibrinogen and total cholesterol. (p=0.002).

LDL AND FIBRINOGEN

Among the 51 cases with abnormal fibrinogen, 3 cases had LDL less than 100mg/dl, 8 cases had LDL between 100-130 mg/dl, 22 cases had LDL between 131-160mg/dl, 18 cases had LDL more than 160mg / dl. Among patients with abnormal fibrinogen, 5.9% of cases had LDL less than 200mg/dl, 15.7% of cases had LDL between 100-130mg/dl, 43.1% of cases had LDL between 131-160mg /dl, 35.3% of cases had LDL more than 160mg/dl. There is significant statistical relationship between fibrinogen and LDL. (p=0.001).

HDL AND FIBRINOGEN

Out of 51 cases with abnormal fibrinogen, 22 cases had HDL less than 40mg/dl, 29 cases had HDL more than 40mg/dl. Among cases with abnormal fibrinogen, 43.1% of cases had HDL less than 40mg/dl, 56.9% of cases had HDL

than 40mg/dl. There is significant statistical relationship between Fibrinogen and HDL. (p=0.007).

OUTCOME AND FIBRINOGEN

Out of 51 cases with abnormal fibrinogen, 5 of them expired and remaining 46 got discharged. Among cases with abnormal fibrinogen, 90.2% cases got discharged and 9.8% cases died.

TOTAL CHOLESTEROL AND NIHSS

52 patients had cholesterol less than 200mg/dl.Out of 52, 13 belong to mild NIHSS group, 33 belong to moderate NIHSS group, 4 belong to severe NIHSS group, 2 belong to very severe NIHSS group. 11 patients had cholesterol between 200-240mg/dl. Out of 11,5 belong to mild NIHSS group, 5 belong to moderate NIHSS group,1 belong to severe NIHSS group, none belong to very severe NIHSS group. 37 patients had cholesterol more than 240mg/dl. Out of 37,4 belong to mild NIHSS group,27 belong to moderate NIHSS group,2 belong to Severe NIHSS group, 4 belong to very severe NIHSS group. However there is no statistical significance between Total cholesterol and NIHSS. (P=0.184). A study done by Benfante et al(stroke 1994) revealed high levels of serum cholesterol is associated with both thromboembolic stroke and coronary artery disease in Hawaiian Japanese Men. A similar finding was found out in a study by Di Mascio et al also.

TRIGLYCERIDES AND NIHSS

65 patients had TGL less than 150mg/dl. Out of 65, 14 belong to mild NIHSS group, 45 belong to moderate NIHSS group, 4 belong to severe NIHSS group, 2 belong to very severe NIHSS group. 33 patients had TGL between 150-199mg/dl. Out of 33, 8 belong to mild NIHSS group, 18 belong to moderate NIHSS group, 3 belong to severe NIHSS group, 4 belong to very severe NIHSS group. 2 patients had TGL more than 200mg/dl. Out of 2, 2 belong to moderate NIHSS group and none belong to other NIHSS group. There is no statistical significance between TGL and NIHSS. (P=0.525). Hachinski et al concluded that there is a positive correlation between TGL in patients with ischemic stroke and TIA. In a study done by Tilvis R.S.et al, it was found that, serum triglyceride levels are increased in patients with ischemic stroke.

LDL AND NIHSS

16 patients had LDL less than 100mg/dl. Out of 16,4 belong to mild NIHSS group, 10 belong to moderate NIHSS group, 2 belong to Severe NIHSS group and none belong to Very severe NIHSS group. 34 patients had LDL between 100-130mg/dl. Out of 34, 9 belong to mild NIHSS group, 25 belong to moderate NIHSS group and none belong to severe and very severe NIHSS group. 31 patients had LDL between 130-160mg/dl. Out of 31, 6 belong to mild NIHSS group, 22 belong to moderate NIHSS group, 2 belong to Severe NIHSS group, 1 belong to very severe NIHSS group. 19 patients had LDL more than 160mg/dl. Out of 19, 3 belong to mild NIHSS group, 6 belong to moderate NIHSS group, 3 belong to Severe NIHSS group, 5 belong to very severe NIHSS group. There is statistical

significance between HDL and NIHSS.(P=0.004) Kurth T et al in 2007 and Hachinski et al have showed that there is a direct relationship between increased levels of LDL and incidence of stroke.

HDL AND NIHSS

31 patients had HDL less than 40mg/dl. Out of 31, 3 belong to mild NIHSS group, 24 belong to moderate NIHSS group, 1 belong to severe NIHSS group, 3 belong to very severe NIHSS group. 69 patients had HDL more than 40mg/dl. Out of 69, 19 belong to mild NIHSS group, 41 belong to moderate NIHSS group, 6 belong to severe NIHSS group, 3 belong to very severe NIHSS group. However there is no statistical significance between HDL and NIHSS.(P=0.107).). In 2001, Study conducted in Northern Manhattan, showed increase in HDL cholesterol level was linked with decreased risk of CVA. According to Simons et al, HDL cholesterol is found to have protective effect on ischemic stroke.

CONCLUSION

The following conclusions were derived from this study.

1) Plasma fibrinogen acts as a prognostic marker to predict functional outcome of stroke. This is evidenced by higher plasma fibrinogen values correlated with severity of stroke and outcome.

2) Plasma fibrinogen is an important risk factor for stroke, independent of age, diabetes mellitus, hypertension, smoking, alcoholism, dyslipidemia.

3) In this study, fibrinogen also has statistically significant association with other risk factors such as hypertension, diabetes mellitus, alcoholism, dyslipidemia.

4) This study also shows that there is significant association with LDL and severity of stroke. So LDL cholesterol is more significant while doing lipid profile in ischemic stroke.

5) So fibrinogen can be recommended as a screening tool while screening for Non Communicable diseases.

BIBLIOGRAPHY

1. WHO | The world health report 2002 - Reducing Risks, Promoting Healthy Life [Internet]. WHO. [cited 2017 Sep 6]. Available from: http://www.who.int/whr/2002/en/
2. Pandian JD, Sudhan P. Stroke Epidemiology and Stroke Care Services in India. J Stroke. 2013 Sep;15(3):128–34
3. S Kamath and Lip GYH.Fibrinogen and cardiovascular disorders. QJM 2003;96:711-729
4. Dimino G,Manoni M.Measuring plasma fibrinogen to predict stroke and myocardial infarction. Arteriosclerosis.1990; 10: 1-7.
5. Conditions (UK) NCC for C. Introduction [Internet]. Royal College of Physicians (UK); 2008 [cited 2017 Sep 6]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK53302/
6. Bod_cerebrovasculardiseasestroke.pdf [Internet]. [cited 2017 Sep 9]. Available from: http://www.who.int/healthinfo/statistics/bod_cerebrovasculardiseasestroke.pdf.
7. Adams HP, Bendixen BH, Kappelle LJ, Biller J, Love BB, Gordon DL, et al. Classification of subtype of acute ischemic stroke. Definitions for use in a multicenter clinical trial. TOAST. Trial of Org 10172 in Acute Stroke Treatment. Stroke. 1993 Jan 1;24(1):35–41. 4.
8. Markus HS. Cerebral perfusion and stroke. J NeurolNeurosurg Psychiatry 2004; 75:353

9. Dirnagl U, Iadecola C, Moskowitz MA. Pathobiology of ischaemic stroke: an integrated view. Trends Neurosci. 1999 Sep;22(9):391–7.

10. Doyle KP, Simon RP, Stenzel-Poore MP. Neuropharmacology – Special Issue on Cerebral Ischemia Mechanisms of Ischemic Brain Damage – Review Article. Neuropharmacology. 2008 Sep;55(3):310–8.

11. Nakayama H, Jørgensen HS, Raaschou HO, Olsen TS. The influence of age on stroke outcome. The Copenhagen Stroke Study. Stroke. 1994 Apr;25(4):808–13.

12. Li J, Jiang S, Zhang Y, Tang G, Wang Y, Mao G, et al. H-type hypertension and risk of stroke in chinese adults: A prospective, nested case–control study. J Transl Intern Med. 2015;3(4):171-8.

13. Jorgensen H, Nakayama H, Raaschou HO, Olsen TS. Stroke in patients with diabetes. The Copenhagen Stroke Study. Stroke. 1994 Oct;25(10):1977–84.

14. Wolf PA, D'Agostino RB, Kannel WB, Bonita R, Belanger AJ. Cigarette Smoking as a Risk Factor for Stroke: The Framingham Study. JAMA. 1988 Feb 19;259(7):1025–9.

15. Wolf PA, Abbott RD, Kannel WB. Atrial fibrillation as an independent risk factor for stroke: the Framingham Study. Stroke. 1991 Aug 1;22(8):983–8.

16. Saxena Y, Saxena V, Mittal M, Srivastava M, Raghuvanshi S. Age-Wise Association of Carotid Intima Media Thickness in Ischemic Stroke. Ann Neurosci. 2017

17. Carotid-Artery Intima and Media Thickness as a Risk Factor for Myocardial Infarction and Stroke in Older Adults — NEJM [Internet]. [cited 2017 Sep

10]. Available from: http://www.nejm.org/doi/full/10.1056/NEJM199901073400103#t=article

18. Coull AJ, Lovett JK, Rothwell PM, Oxford Vascular Study. Population based study of early risk of stroke after transient ischaemic attack or minor stroke: implications for public education and organisation of services. BMJ. 2004 Feb 7;328(7435):326. May;24(1):5–11.

19. Adams HP, Zoppo G del, Alberts MJ, Bhatt DL, Brass L, Furlan A, et al. Guidelines for the Early Management of Adults With Ischemic Stroke: A Guideline From the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council, and the Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups: The American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists. Circulation. 2007 May 22;115(20):e478–534.

20. Neuroimaging of Ischemic Stroke With CT and MRI [Internet]. Medscape. [cited 2017 Sep 11]. Available from: http://www.medscape.com/viewarticle/587073

21. Jauch EC, Saver JL, Adams HP, Bruno A, Connors JJ (Buddy), Demaerschalk BM, et al. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke. 2013 Mar 1;44(3):870–947.

22. Martinez J. In: Hoffman R,Benz EJ, Shattil SJ, Furie B, Cohen HJ,Silberstein LE, editors. Hematology, Basic principles and practice. 2nd Edn.Newyork : Churchill Livingstone. P. 1703- 1713.

23. Rosenson RS, Beth A, Staffelino D, Tangney CC. Clinical Chemistry 1998; 44: 688-89.

24. Beutler E, Patrick M, Copan A. In: Fuster V, Alexander RW, O'Rourke RA, Williams GA, Editors. Textbook of hematology. 5th Edn. California : Mcgraw Hill publications. P. 87-88.

25. Ernst E. Regional variation in plasma fibrinogen levels. Ann of internal medicine 1991; 115(4) : 329-330.

26. Meade TW, Chakrabarthi R, Haines AP, North WR, Stirling Y. Characteristics affecting fibrinolytic activity and plasma fibrinogen concentration. BMJ 1979; 1: 153-56.

27. Edzard E, Karl RL. Fibrinogen as a cardiovascular risk factor. Ann of internal medicine. 1993; 118 : 956-63

28. Wilhelmsen L, Svardsudd K, Bengsten KK, Larsson B, Welin L, Tibblin G. Fibrinogen as a risk factor for stoke and myocardial infarction.N Engl. JMed 1984; 311:501-505.

29. ConnellyJB, Cooper JA, Meade TW. Sternuous exercise, plasma fibrinogen and factor VII activity. Br. Heart J 1992; 67: 351-354.

30. Vanninen E, Laetinen J, Uusitupa M. Physical activity and fibrinogen concentration in newly diagnosed NIDDM. Diabetes care.1994; 17 (9): 1031-8.

31. Lee AJ, Lowe GD, Woodwand M, Pedoe TH. Fibrinogen in relation to personal history of prevalent hypertension, diabetes, stroke, intermittent claudication, coronary heart disease and family history. The Scottish Heart Health Study. Br Heart J. 1993; 69: 338-342.

32. Dalal PM. Stroke in young and elderly: Risk factors and Strartegies for stroke prevention. J Assoc Physicians india. 1997; 45: 125-131.

33. Mistry P, Chawla KP, Rai HP, Jaiswal P. Plasma fibrinogen levels in stroke. J Postgrad Med 1990; 36:1-4

34. Diminno G, Mancini M. Measuring plasma fibrinogen to predict stroke and myocardial infarction. Arteriosclerosis 1990; 10:1-7.

35. Smith WS, Johnston SC, Easton JD. Cerebrovascular diseases. In: Kasper DL, Fauci AS, Longo DL, Braunwald E, Hauser SL, Jameson LJ, editors. Harrison's Principles of Internal Medicine. Vol 2.16th Edn. New York: McGraw Hill;2005.p.2372-2393

36. Atkins ER, Brodie FG, Rafelt SE, et al. Dynamic cerebral autoregulation is compromised acutely following mild ischaemic stroke but not transient ischaemic attack. Cerebrovasc Dis 2010; 29:228.

37. Aries MJ, Elting JW, De Keyser J, et al. Cerebral autoregulation in stroke: a review of transcranial Doppler studies. Stroke 2010; 41:2697.

38. Deb P, Sharma S, Hassan KM. Pathophysiologic mechanisms of acute ischemic stroke: An overview with emphasis on therapeutic significance beyond thrombolysis. Pathophysiology 2010; 17:197.

39. Bogousslavsky J, Regli F, Van Melle G. Risk factors and concomitants of internal carotid artery occlusion or stenosis. A controlled study of 159 cases. Arch Neurol 1985; 42:864

40. Candelise L, Bianchi F, Galligoni F, et al. Italian multicenter study on reversible cerebral ischemic attacks: III--Influence of age and risk factors on cerebrovascular atherosclerosis. Stroke 1984; 15:379.

41. Wilson PW, Hoeg JM, D'Agostino RB, et al. Cumulative effects of high cholesterol levels, high blood pressure, and cigarette smoking on carotid stenosis. N Engl J Med 1997; 337:516

42. Li C, Engström G, Hedblad B, et al. Risk factors for stroke in subjects with normal blood pressure: a prospective cohort study. Stroke 2005; 36:234.

43. Wolf PA, D'Agostino RB, Kannel WB, et al. Cigarette smoking as a risk factor for stroke. The Framingham Study. JAMA 1988; 259:1025.

44. Wannamethee SG, Shaper AG, Whincup PH, Walker M. Smoking cessation and the risk of stroke in middle-aged men. JAMA 1995; 274:155.

45. Arvanitakis Z, Schneider JA, Wilson RS, et al. Diabetes is related to n subjects with normal blood pressure: a prospective cohort study. Stroke 2005; 36:234.

46. Emerging Risk Factors Collaboration, Sarwar N, Gao P, et al. Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. Lancet 2010; 375:2215.

47. Luitse MJ, Biessels GJ, Rutten GE, Kappelle LJ. Diabetes, hyperglycaemia, and acute ischaemic stroke. Lancet Neurol 2012; 11:261.

48. Sabeti S, Exner M, Mlekusch W, et al. Prognostic impact of fibrinogen in carotid atherosclerosis: nonspecific indicator of inflammation or independent predictor of disease progression? Stroke 2005; 36:1400.

49. Lip GYH. Fibrinogen and cardiovascular disorders.QJM 1995; 88: 153-6.

50. Marta Swarowska, Aleksandra JanowskaThe Sustained Increase of Plasma Fibrinogen During Stroke.1142-1147

51. Sreenivasulu C, Bai LS, Kumar KN. Study of serum lipid profile in stroke patients, medical science. Indian J Applied Res. 2016;6(2):385-6.

52. Qizilbash N, Duffy SW, War low C, Mann J. Lipids are risk factors for ischemic stroke: overview and review. Cerebrovascular Disease. 1992;3(2):127-36.

53. Togha M, Gheini MR, Ahmadi B, Khashaiar P, Razeghi S. Razeghi S. Lipid profile in cerebrovascular accidents. Iran J Neurol. 2011; 10(1-2):1-4.

54. Lindenstrom E, Boysen G, Nyboe J. Influence of total cholesterol, high-density lipoprotein cholesterol, and triglyceride on risk of cerebrovascular disease. BMJ1994; 309 (1):11-15

55. Harrisons principles of medicine 20th edition

56. Bruno A, Biller J Adams H P Jr et al acute blood glucose level and outcome from ischemic stroke .Neurology1999 ;52;280-284.

57. Thomas S Bowman et al.cholesterol and risk of ischemic stroke. stroke 2003;34(12)2930-2934.

58. Sacco R L,Wolf P A et al .Risk factors and stroke prevention. Neurology 1999;53(suppl 4);515-524

59. Tall G S et al .Relation between blood lipids lipoproteins and cerebrovascular atherosclerosis .stroke 1988;19;423-430. 55.

60. Salonen J T et al .Relation of blood pressure ,serum lipids and smoking to risk of cerebral stroke.stroke 1982;13;327-333. 47.

61. Misirli H Somay G et al.Relation of lipids and lipoproteins(a) to ischemic stroke J clin neurol 2002;9(2);127-132.

62. Immanuel s,Giantini A et al.The role of lipid profile as a risk factor for ischemic stroke in Jakarta.Acta Med Indones 2006;38(1);11-1645

63. Koren Morag N et al LDLC and HDLC and risk of ischemic stroke Arch intern med 2002;162;993-999

64. Tanne D Koren N et al.HDLc and risk of stroke mortality.stroke 1997;28(1); 83-87

65. Kleinman Y et al.serum lipids in acute ischemic stroke .stroke1997;28;1467

66. Kannel W B et al .cholesterol in the prediction of atherosclerotic disease.Ann intern med 1979;90;85-9131.

67. Iso H,Jacobs DT,Wentworth D,Neaton JD,Cohen J.D, & for the MRFIT Research group.1989 serum cholesterol levels and six –year mortality from stroke in 350977 men screened for multiple risk factor trial N Engl J Med 320;904-910.

68. Taylor W C &Landau WM1990.Atheroscerosis and stroke. Ann Neurol 28;108

69. Joseph L N ,Babikian V L ,Allen N C ,Winter M R,. Risk factors modification in stroke prevention.stroke 1999;30(1);16-20

70. Lalouge P Galanti L et al.Lipids in ischemic stroke subtypes. Actaneurol Belg 2004;104(1);13-19

PROFORMA

NAME: AGE: SEX:

ADDRESS: IP NO: OCCUPATION:

HISTORY:

WEAKNESS OF LIMBS

LOSS OF CONSCIOUSNESS

SEIZURES

PAST HISTORY:

SYSTEMIC HYPERTENSION

DIABETES MELLITUS

CORONARY ARTERY DISEASE

SMOKING

LIPID LOWERING DRUGS

GENERAL PHYSICAL EXAMINATION:

PALLOR: YES/ NO CYANOSIS: YES/ NO

CLUBBING: YES /NO PEDAL EDEMA: YES/ NO

VITALS:

PULSE: BP:

CENTRAL NERVOUS SYSTEM:

HIGHER MENTAL FUNCTION:

CRANIAL NERVE EXAMINATION:

MOTOR SYSTEM:

SENSORY SYSTEM:

CEREBELLUM:

NHISS SCORE:

EXAMINATION OF OTHER SYSTEM:

INVESTIGATIONS:

CBC:

RBC-

HB-

WBC-

PLT-

RBS-

UREA-

CREATININE-

FASTING LIPID PROFILE-

ESR-

SERUM ELECTROLYTES-

SERUM FIBRINOGEN-

ECG

CT BRAIN/MRI BRAIN:

NIHSS SCALE

1a. Level of Consciousness:

0 = Alert; keenly responsive.

1 = Not alert, but arousable by minor stimulation to obey, answer, or respond.

2 = Not alert, requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped).

3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, areflexic.

Score:

1b. LOC Questions:

0 = Answers both questions correctly.

1 = Answers one question correctly.

2 = Answers neither question correctly.

Score:

1c. LOC Commands:

0 = Performs both tasks correctly

1 = Performs one task correctly

2 = Performs neither task correctly

Score:

2. Best Gaze:

0 = Normal

1 = Partial gaze palsy. This score is given when gaze is abnormal in one or both eyes, but where forced deviation or total gaze paresis are not present.

2 = Forced deviation, or total gaze paresis not overcome by the oculocephalic maneouver.

Score:

3. Visual:

0 = No visual loss

1 = Partial hemianopia

2 = Complete hemianopia

3 = Bilateral hemianopia (blind including cortical blindness)

Score:

4. Facial Palsy:

0 = Normal symmetrical movement

1 = Minor paralysis (flattened nasolabial fold, asymmetry on smiling)

2 = Partial paralysis (total or near total paralysis of lower face)

3 = Complete paralysis of one or both sides (absence of facial movement in the upper and lower face)

Score:

5 & 6. Motor Arm and Leg:

0 = No drift, limb holds 90 (or 45) degrees for full 10 seconds.

1 = Drift, Limb holds 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support.

2 = Some effort against gravity, limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity.

3 = No effort against gravity, limb falls.

4 = No movement

9 = Amputation, joint fusion

Score: 5a.Left Arm 5b. Right Arm

0 = No drift, leg holds 30 degrees position for full 5 seconds.

1 = Drift, leg falls by the end of the 5-second period but does not hit bed.

2 = Some effort against gravity; leg falls to bed by 5 seconds, but has some effort against gravity.

3 = No effort against gravity, leg falls to bed immediately.

4 = No movement

9 = Amputation, joint fusion ,

Score: 6a. Left Leg 6b. Right Leg

7. Limb Ataxia:

0 = Absent

1 = Present in one limb

2 = Present in two limbs If present, is ataxia in

Right arm 1 = Yes 2 = No

Left arm 1 = Yes 2 = No

Right leg 1 = Yes 2 = No

Left leg 1 = Yes 2 = No

9 = amputation or joint fusion,

Score:

8. Sensory:

0 = Normal; no sensory loss.

1 = Mild to moderate sensory loss; patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick but patient is aware he/she is being touched.

2 = Severe to total sensory loss; patient is not aware of being touched in the face, arm, and leg.

Score:

9. Best Language:

0 = No aphasia, normal

1 = Mild to moderate aphasia; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension, however, makes conversation about provided material difficult or impossible. For example, in conversation about provided materials, examiner can identify picture or naming card from patient's response.

2 = Severe aphasia; all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden of communication. Examiner cannot identify materials provided from patient response.

3 = Mute, global aphasia; no usable speech or auditory comprehension.

Score:

10. Dysarthria:

0 = Normal

1 = Mild to moderate; patient slurs at least some words and, at worst, can be understood with some difficulty.

2 = Severe; patient's speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute/anarthric.

9 = Intubated or other physical barrier,

Score:

11. Extinction and Inattention (formerly Neglect):

0 = No abnormality.

1 = Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities.

2 = Profound hemi-inattention or hemi-inattention to more than one modality. Does not recognize own hand or orients to only one side of space.

Score:

TOTAL SCORE(0 to 42): AT ADMISSION:

- >25 Very severe neurological impairment
- 5-24 Severe impairment
- 5-14 Moderately severe impairment
- <5 Mild impairment

MASTER CHART

S.NO	AGE	SEX	HTN	DM	S	A	SBP	DBP	FBS	U	C	TC	TGL	LDL	HDL	F	NIHSS	OUTCOME
1	60	F	YES	YES	NO	NO	170	100	153	30	1	256	182	155	36	425	4	D
2	40	M	YES	NO	YES	YES	150	90	112	41	1.2	289	165	135	32	454	5	D
3	86	M	YES	YES	YES	NO	150	80	228	19	1	234	185	169	39	424	8	D
4	75	F	NO	NO	NO	NO	110	70	82	28	0.9	156	112	165	44	401	4	D
5	50	M	NO	NO	YES	YES	110	70	99	16	0.9	179	125	167	54	499	9	D
6	60	F	YES	YES	NO	NO	150	80	143	64	1.1	276	162	178	46	430	25	D
7	75	F	YES	NO	NO	NO	170	90	121	22	0.7	244	171	152	51	440	26	D
8	60	F	YES	YES	NO	NO	160	100	380	24	1.1	221	181	136	28	224	4	D
9	75	F	YES	YES	NO	NO	140	80	129	27	1	278	187	145	35	404	12	D
10	70	F	YES	NO	NO	NO	160	100	114	32	0.7	231	165	122	29	249	11	D
11	85	F	NO	NO	NO	NO	130	80	96	15	0.9	191	135	152	52	457	16	D
12	70	M	NO	NO	YES	NO	120	70	95	17	1.1	249	187	162	38	445	15	D
13	80	F	YES	YES	NO	NO	180	110	165	31	0.7	233	196	121	57	565	5	D
14	73	F	YES	NO	NO	NO	160	100	149	20	1.3	163	145	172	55	458	26	D
15	70	M	NO	NO	YES	YES	120	60	129	55	1.1	152	121	165	42	436	6	D
16	96	M	NO	YES	YES	YES	120	80	362	45	0.8	184	136	170	49	505	7	D
17	50	F	YES	YES	NO	NO	130	70	148	30	0.9	265	158	165	41	478	13	D
18	80	F	YES	NO	NO	NO	160	90	121	30	1.4	219	171	155	46	405	17	D
19	63	M	YES	YES	YES	NO	150	110	262	18	1.1	345	201	144	33	478	8	D
20	65	F	YES	NO	NO	NO	220	120	98	16	1.1	241	127	162	48	502	4	D
21	66	F	NO	NO	NO	NO	110	70	110	18	1.2	196	116	159	43	484	4	D
22	85	F	NO	NO	NO	NO	120	90	95	20	1.3	187	119	98	54	195	7	D
23	85	F	YES	NO	NO	NO	160	90	110	25	0.9	165	139	96	51	185	9	D
24	60	F	YES	YES	NO	NO	170	100	345	22	1.6	259	196	136	39	456	12	D
25	85	F	YES	NO	NO	NO	180	110	145	19	1	225	165	112	47	185	4	D
26	75	F	YES	YES	NO	NO	160	90	292	20	1.1	302	185	147	37	425	15	D

27	56	F	YES	YES	NO	NO	180	110	245	24	1.4	298	187	89	35	429	12	D
28	62	F	NO	NO	NO	NO	120	90	114	21	0.9	191	141	115	49	265	10	D
29	75	F	NO	NO	NO	NO	130	80	110	26	0.8	267	163	121	53	264	4	D
30	55	F	NO	NO	NO	NO	140	90	154	32	1	159	140	141	40	404	9	D
31	67	F	YES	YES	YES	YES	180	110	398	34	1.2	245	192	117	52	496	12	D
32	45	F	NO	NO	NO	NO	120	80	135	26	1.3	185	125	128	56	245	6	D
33	70	F	NO	NO	NO	NO	110	70	112	18	1.2	193	134	145	46	486	13	D
34	85	F	NO	NO	NO	NO	130	70	89	95	1.8	188	139	115	57	283	6	D
35	67	F	NO	NO	NO	NO	140	80	97	29	1.3	289	174	162	39	489	16	D
36	50	F	NO	NO	NO	NO	110	70	109	35	1.4	169	187	122	59	288	13	D
37	60	F	NO	NO	NO	NO	170	110	94	31	1.2	145	192	109	52	185	5	D
38	65	F	YES	NO	NO	NO	130	80	113	98	1.9	221	161	119	53	269	4	D
39	65	F	NO	NO	NO	NO	100	70	88	17	1	174	129	101	43	275	6	D
40	60	F	NO	NO	NO	NO	130	80	106	25	1.3	189	128	97	44	242	8	D
41	50	F	NO	NO	NO	NO	110	70	123	16	0.9	162	106	98	47	181	11	D
42	80	F	NO	NO	NO	NO	130	90	106	26	0.8	187	109	109	49	225	10	D
43	53	F	NO	NO	NO	NO	120	80	134	22	1.2	192	117	112	59	202	9	D
44	70	F	NO	NO	NO	NO	190	110	112	28	1.3	181	124	123	58	223	6	D
45	45	F	YES	YES	NO	NO	170	110	245	34	1.1	231	198	128	57	437	13	D
46	58	F	YES	NO	NO	NO	160	100	167	25	1.1	221	139	115	55	233	4	D
47	90	M	NO	NO	NO	NO	110	90	183	19	1	159	131	121	45	202	3	D
48	76	M	NO	NO	NO	NO	140	100	198	90	1.8	174	131	141	43	208	5	D
49	85	M	YES	YES	YES	YES	200	100	269	112	3.4	265	177	159	31	467	13	D
50	51	M	NO	NO	NO	NO	140	90	184	87	1.4	196	122	89	42	176	5	D
51	60	M	NO	NO	NO	NO	110	70	198	45	1.2	171	132	438	41	405	4	D
52	63	M	NO	NO	YES	YES	130	90	145	29	1.1	178	113	168	48	455	9	D
53	65	M	NO	NO	YES	NO	110	70	156	16	1.3	162	114	95	41	221	4	D
54	50	M	NO	YES	YES	NO	130	80	112	17	1.1	156	120	91	32	226	6	D
55	64	M	YES	NO	NO	YES	150	110	165	15	9	298	130	151	35	269	7	D
56	70	M	NO	NO	YES	YES	120	90	154	19	1	165	146	87	56	205	10	D

57	60	M	YES	YES	YES	NO	170	110	147	20	1.2	311	148	143	36	425	13	D
58	85	M	NO	NO	YES	YES	110	70	161	16	1.5	183	129	156	46	471	14	D
59	69	M	NO	NO	NO	NO	130	70	178	18	1.2	172	139	112	47	205	6	D
60	86	M	NO	NO	YES	NO	120	80	150	21	0.9	167	147	135	49	166	9	D
61	73	M	YES	NO	NO	NO	170	90	124	23	1.1	287	188	131	39	296	8	D
62	58	M	NO	NO	NO	NO	120	90	114	20	1.2	163	108	169	53	488	17	D
63	70	M	YES	YES	YES	YES	160	110	136	25	1.1	265	118	147	55	415	14	D
64	58	M	NO	NO	NO	NO	120	80	165	22	1	192	128	88	51	285	4	D
65	63	M	YES	YES	YES	YES	180	100	261	17	1.3	291	191	146	34	416	11	D
66	65	M	YES	NO	YES	YES	170	90	132	19	1.2	341	205	138	28	456	6	D
67	70	M	YES	NO	NO	YES	140	100	98	23	1	145	119	122	59	402	9	D
68	73	M	NO	NO	NO	NO	130	70	126	18	1.2	185	129	165	54	356	12	D
69	80	M	YES	NO	YES	NO	120	80	132	19	1.1	249	180	175	37	585	26	E
70	65	M	NO	NO	YES	NO	110	60	197	25	1.3	145	149	95	41	424	10	D
71	70	M	NO	NO	YES	NO	130	70	181	26	1.3	198	109	139	40	156	11	D
72	80	M	YES	YES	YES	NO	160	110	175	36	1.1	285	190	166	33	524	30	E
73	50	M	YES	NO	YES	NO	150	100	142	39	1.1	253	115	116	32	406	6	D
74	90	M	YES	NO	NO	NO	150	110	138	21	1.4	274	127	136	34	469	12	D
75	70	M	YES	NO	YES	NO	190	110	125	20	1.2	296	133	124	49	454	10	D
76	70	M	YES	YES	NO	NO	160	100	165	19	1.1	306	143	129	38	536	15	D
77	78	M	NO	NO	YES	NO	140	90	176	44	1.2	190	134	113	45	297	10	D
78	58	M	NO	YES	NO	NO	110	80	174	29	1.1	170	144	134	56	210	7	D
79	55	M	NO	NO	YES	NO	120	90	155	25	1	180	104	79	57	214	6	D
80	70	M	NO	NO	YES	NO	110	70	90	22	1.2	160	105	136	53	227	5	D
81	40	M	YES	YES	YES	YES	180	100	168	25	1.1	301	175	157	37	469	7	D
82	75	M	YES	NO	NO	NO	160	90	123	34	1	287	166	134	51	429	9	D
83	60	M	NO	NO	YES	NO	120	70	125	25	1.2	165	110	113	52	295	8	D
84	25	M	NO	YES	YES	YES	110	70	185	21	1.5	186	131	122	59	226	7	D
85	69	M	NO	NO	YES	YES	120	70	112	33	1.2	159	137	161	55	512	29	E
86	70	M	YES	YES	YES	NO	160	110	110	210	1.1	271	147	132	32	215	6	D

87	80	M	NO	NO	NO	NO	140	70	169	19	1.2	256	117	95	35	256	8	D
88	80	M	YES	YES	YES	YES	180	110	187	20	1.1	277	183	168	39	492	32	E
89	70	M	NO	NO	NO	NO	110	70	154	26	1.1	192	125	116	57	254	15	D
90	46	M	YES	YES	YES	YES	190	100	179	25	1.2	289	168	126	56	235	14	D
91	38	M	YES	YES	YES	NO	160	90	175	22	1.1	305	194	131	36	485	12	D
92	56	M	NO	YES	YES	NO	110	60	184	25	1.2	167	140	126	47	275	5	D
93	70	M	YES	YES	NO	NO	150	80	102	41	1	228	125	129	50	505	6	D
94	74	M	YES	NO	YES	NO	140	70	156	30	1.2	298	126	121	30	192	10	D
95	58	M	NO	YES	NO	NO	110	80	152	28	1.2	224	116	125	54	232	9	D
96	70	M	NO	NO	YES	YES	120	70	125	21	1.1	196	139	121	48	249	5	D
97	70	F	NO	NO	NO	NO	130	70	145	26	1.3	192	142	86	44	235	4	D
98	65	M	YES	NO	NO	NO	150	110	132	29	1.1	293	122	125	37	195	12	D
99	60	F	NO	NO	NO	NO	110	70	120	32	1.3	186	133	93	50	176	16	D
100	55	F	NO	NO	NO	NO	130	90	135	22	1.1	188	116	96	41	521	18	E

KEY TO MASTER CHART

HTN	-	SYSTEMIC HYPERTENSION
DM	-	DIABETES MELLITUS
S	-	SMOKING
A	-	ALCOHOLISM
SBP	-	SYSTOLIC BLOOD PRESSURE
DBP	-	DIASTOLIC BLOOD PRESSURE
U	-	SERUM UREA
C	-	SERUM CREATININE
TC	-	TOTAL CHOLESTEROL
TGL	-	TRIGLYCERIDES
LDL	-	LOW DENSITY LIPOPROTEIN
HDL	-	HIGH DENSITY LIPOPROTEIN
F	-	FIBRINOGEN
NIHSS	-	NATIONAL INSTITUTE OF HEALTH STROKE SCALE
E	-	EXPIRED
D	-	DISCHARGE

PATIENT CONSENT FORM

STUDY DETAIL: **COMPARATIVE STUDY OF PLASMA FIBRINOGEN LEVELS AND LIPID IN PATIENTS WITH ISCHEMIC STROKE IN GVMCH**

STUDY CENTRE :

PATIENT'S NAME :

PATIENT'S AGE :

IDENTIFICATION NUMBER:

I confirm that I have understood the purpose and procedure of the above study. I have the opportunity to ask questions and all my questions and doubts have been answered to my complete satisfaction.I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected.I understand that the investigator of the clinical study, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However I understand that my identity would not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study.

I hereby consent to participate in this study.

I hereby give permission to undergo complete clinical examination and diagnostic tests including haematological, biochemical, radiological tests.

Signature/thumb impression:

Patient’s name and address:

Place:

Date:

Signature of the investigator:

Name of the investigator:

Place:

Date:

PATIENT CONSENT FORM

ஒப்புதல் படிவம்

முழுப்பெயர் :

தந்தை / தாயார் பெயர் :

பிறந்த தேதி / வயது :

1. நான் மேலே குறிப்பிட்டுள்ள ஆராய்ச்சி குறித்த விவரங்களை உரியமுறையில் படித்துப்புரிந்து கொண்டேன் என்றும், எனக்கு கேள்விகளைக் கேட்கும் வாய்ப்பு அளிக்கப்பட்டது என்றும் உறுதி செய்கிறேன்.

2. நான் இந்த ஆராய்ச்சியில் பங்குபெறுவது தன்னிச்சையானது என்றும், நான் எப்பொழுது வேண்டுமானாலும், காரணம் ஏதும் தெரிவிக்காமல் இந்த ஆராய்ச்சியிலிருந்து விலக முற்பட எனக்கு அதிகாரம் உண்டு என்றும், அப்படி செய்வதனால் என் சட்ட ரீதியான மற்றும் சிகிச்சை சம்பந்தப்பட்ட உரிமைகள் பாதிக்கப்படமாட்டாது என்றும் நான் அறிகிறேன்.

3. இந்த ஆராய்ச்சியின் புரவலர் மற்றும் அவர்கள் சார்பாக பணிபுரிபவர்கள் நெறிமுறைகள் குழு மற்றும் கட்டுப்பாட்டு குழுவினர் ஆகியோர், இந்த ஆராய்ச்சியின் போதும், பின்னர் இதன் சம்பந்தமாக வேறு ஆராய்ச்சி செய்யும்போதும், என் சம்பந்தப்பட்ட சிகிச்சை விவரங்களை மேலும் எனது அனுமதி இன்றி காண அனுமதி அளிக்கிறேன். மூன்றாம் நபர்களுக்கு இந்த ஆராய்ச்சியை பற்றி விளக்கும் போதும், இந்த ஆராய்ச்சியின் முடிவுகளை பிரசுரிக்கும் போதும் எனது அடையாளம் வெளியிடப்படமாட்டாது என்றும் நான் அறிகிறேன்.

4. இந்த ஆராய்ச்சியின் மூலம் அறியப்படும் விஷயங்கள் மற்றும் முடிவுகள் அறிவியல் சார்ந்த காரணங்களுக்கோ வெளியிடப் படுவதை நான் எப்போதும் தடுக்கமாட்டேன் என்று உறுதி அளிக்கிறேன்.

5. நான் இந்த ஆராய்ச்சியில் பங்கு பெற சம்மதம் தெரிவிக்கிறேன்.

ஆராய்ச்சியில் பங்கு பெறுபவர் / சட்டப்பூர்வ பிரதிநிதியின் கையெழுத்து /

ஆள்காட்டி விரல் பதிப்பு

பெயர் / உறவுமுறை

ஆராய்ச்சியாளர் சாட்சி கையெழுத்து,

தேதி