EVALUATION OF MODIFIABLE RISK FACTORS IN ISCHEMIC STROKE AND HEMORRHAGIC STROKE OBSERVATIONAL COHORT STUDY

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ABSTRACT: Stroke is a heterogenous, multifactorial disease regulated by modifiable and non-modifiable risk factors. A stroke is defined as the abrupt onset of a focal neurological deficit lasting more than 24hrs it is also called cerebrovascular accident or apoplexy. Modifiable risk factors like hypertension, diabetes mellitus, alcohol consumption, smoking, cardiac problems, migraine, and dyslipidemia. Evaluation of these ischemic and hemorrhagic stroke risk factors may contribute to more effective prevention. A retrospective observational cohort study of six months duration was conducted at secondary care hospital with 100 cases in the neurology department from Dec 2021 to June 2022, regarding patient demographic, past history, type of stroke, and its treatment was collected and analyzed using Microsoft excel 2010 of all reviewed cases the most modifiable risk factors were hypertension(86%), diabetes mellitus(64%), alcohol consumption(27%), smoking(23%), migraine(19%), dyslipidemia (11%). The majority of patients were in the age group of 36 to 55 yrs(n=49). In our study, we found that males(68%) and females(32%) thus males are more prone to stroke. We concluded that ischemic and hemorrhagic strokes are at an equal incidence rate of 50% each. The major modifiable risk factors are hypertension and diabetes mellitus which can be prevented by regular follow-up and medications as prescribed.

KEYWORDS: Stroke, Ischemic, Hemorrhagic, Risk factors, Hypertension.

INTRODUCTION

A stroke, also known as a cerebrovascular accident (CVA), is a medical condition that occurs when blood flow to the brain is disrupted, leading to a lack of oxygen and nutrients in the affected area. This disruption can happen either due to a blockage in a blood vessel (ischemic stroke) or due to the rupture of a blood vessel, causing bleeding into the brain (hemorrhagic stroke) (1).

EPIDEMIOLOGY :

Stroke is a significant global health concern, and its epidemiology varies across different populations and regions.

Incidence and Prevalence:

The Global Burden of Disease Study estimated that in 2019, there were approximately 13.7 million new cases of stroke worldwide (2).

The age-adjusted incidence rate of stroke varies globally, ranging from around 50 to over 200 cases per 100,000 population (3).

Stroke prevalence increases with age, and the burden is higher in older populations (Feigin et al., 2014).

Regional Variations:

High-income countries generally have a lower incidence and mortality rate of stroke compared to low- and middle-income countries (3)

ETIOLOGY :

The etiology of stroke refers to the underlying causes or factors that contribute to the occurrence of a stroke.

Ischemic Stroke:

Atherosclerosis: The buildup of fatty deposits (plaques) in the arteries can lead to the narrowing or blockage of blood vessels supplying the brain (4)

Cardioembolism: Blood clots originating from the heart (often due to atrial fibrillation or other cardiac conditions) can travel to the brain and cause a blockage (5).

Small Vessel Disease: Damage to the small blood vessels in the brain due to chronic hypertension, diabetes, or other risk factors can result in lacunar infarcts (6)

Hemorrhagic Stroke:

Hypertensive Intracerebral Hemorrhage: Chronic hypertension can weaken blood vessel walls, leading to rupture and bleeding within the brain (7).

Cerebral Amyloid Angiopathy: The deposition of amyloid protein in blood vessels can increase the risk of hemorrhage, especially in the elderly (8).

Other Etiological Factors:

Other less common causes of stroke include arterial dissections, vasculitis, blood disorders (e.g., sickle cell disease), and rare genetic disorders (e.g., Fabry disease, cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy - CADASIL) (9,10).

MODIFIABLE RISK FACTORS :

Stroke is a complex medical condition influenced by various risk factors. While some of these factors are non-modifiable (such as age, gender, and family history), several risk factors can be modified or managed to reduce the risk of stroke.

Hypertension (High Blood Pressure): Hypertension is a major risk factor for stroke. Maintaining blood pressure within a healthy range through lifestyle modifications and medication can significantly reduce the risk of stroke. (11)
Smoking: Cigarette smoking increases the risk of stroke by damaging blood vessels and promoting the formation of blood clots. Quitting smoking reduces the risk of stroke over time. (12)
Physical Inactivity: Lack of regular physical activity is associated with an increased risk of stroke. Engaging in regular exercise or physical activity helps maintain cardiovascular health and reduces the risk of stroke. (13)
Unhealthy Diet: A diet high in saturated fats, trans fats, cholesterol, and sodium, and low in fruits, vegetables, whole grains, and healthy fats is associated with an increased risk of stroke. Adopting a balanced and heart-healthy diet can help reduce the risk. (14)
Obesity: Excess body weight, particularly abdominal obesity, is associated with an increased risk of stroke. Maintaining a healthy weight through a combination of a balanced diet and regular physical activity can help reduce the risk. (15)

AIMS AND OBJECTIVES

Aim:- The study aims to evaluate the modifiable risk factor in stroke (ischemic and hemorrhagic stroke) and evaluate the risk factor that causes more impact on stroke patients leading to mortality rate by using the Glasgow coma scale and the national institute of health stroke scale and finding adherence to hypertensive medications. To improve the quality of life.
Objectives:-
Temporary or permanent loss (paralysis) is a common finding in stroke patients
To evaluate the modifiable risk factors in both ischemic and hemorrhagic stroke
To analyze the modifiable risk factors and less modifiable risk factors involved in stroke disease
To check if there are any other unknown or other causes or risk factors involved in stroke disease
To take preventive steps from complicating the problem by quitting smoke, and alcohol, doing physical activity, eating a healthy diet, and maintaining the good weight
To evaluate any cardio-related problems involved and any other comorbidities like aneurysms and AVM To improve the quality of life

MATERIALS AND METHODS

Study site and study population :
This study was carried out at Uday Hospital, Guntur, Andhra Pradesh. The study included adult patients (both male and female) from the age group 20 to 80 years who are primary or secondary to any stroke (ischemic or hemorrhagic).
Study design :
This project approach employed a retrospective observational cohort study design to achieve the study objectives. Study period and sample size: The study size included in the study is about 100 stroke patients. The study is being conducted for 6 months.

Inclusion criteria :
Patients are included in this study if they were age group 20 to 80 years; conscious or unconscious state. Gender included both males and females.
Modifiable risk factors
- Hypertensive
- Cardio-related problems
- Hyperlipidaemia
- Obesity
- Migraine/Headache
- Diabetes mellitus
- Smoking
- Alcohol consumption
- Any other comorbidities other than these

Exclusion criteria
- Pregnancy patients and children
- Genetic disorders
- RTA cases

Study method :
- Study is conducted at UDAY HOSPITAL, GUNTUR.
- The patients included in the study are ischemic and hemorrhagic stroke patients with primary and secondary attacks. The laboratory parameters for patients required for a study like CT scan, MRI scan, Blood pressure, and Blood glucose.
- Patients with modifiable risk factors are assessed using the proforma.

The tools used in this study are as follows:
- PATIENT PROFORMA
- GLASGOW COMA SCALE
- NATIONAL INSTITUTE OF HEALTH STROKE SCALE

STUDY PROCEDURE
PROFORMA: PROFORMA contains the patient demographics and data about comorbidities and modifiable risk factors like hypertension, diabetes mellitus, cardiac problems(ischemic heart disease, aortic myxoma), alcohol, smoking, dyslipidemia, and laboratory data to confirm the ischemic or hemorrhagic stroke with CT scan and MRI scan.

GLASGOW COMA SCALE: The Glasgow Coma Scale (GCS) objectively describes the extent of impaired consciousness in all types of acute medical and trauma patients. The scale assesses patients according to three aspects of responsiveness: eye-opening, motor, and verbal responses. Reporting each of these separately provides a clear, communicable picture of a patient. The findings in each component of the scale can aggregate into a total Glasgow Coma Score which gives a less detailed description but can provide a useful summary of the overall severity. The Glasgow Coma Scale and its total score have since been incorporated into numerous clinical guidelines and scoring systems for victims of trauma or critical illness

NATIONAL INSTITUTE OF HEALTH STROKE SCALE: The National Institutes of Health (NIH) stroke scale is a standardized neurologic examination developed to quantitate the patient's deficits in clinical trials for new stroke therapies. It is used upon admission to determine patient eligibility for thrombolytic therapy, throughout the acute hospital stay, and at 3 months to assess neurologic recovery. The NIH stroke scale scores correlate with initial infarct volume, cerebral perfusion, and functional outcome.

RESULTS

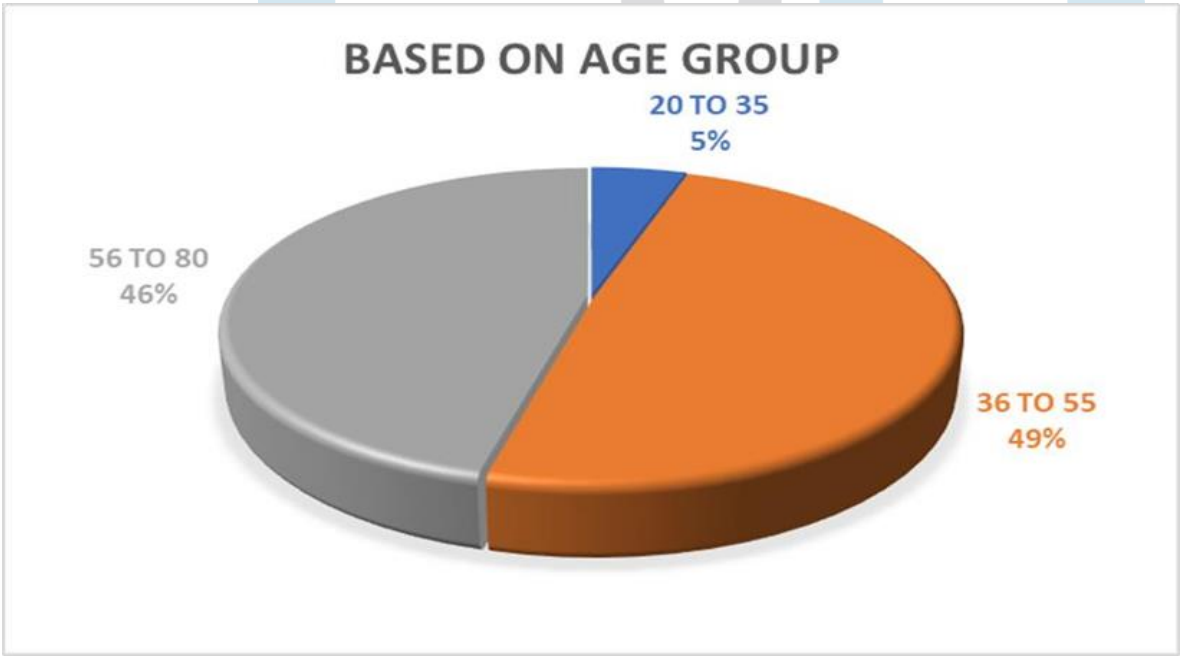
A total of 100 patients were included in the study during the period from DECEMBER to JUNE 2022. In these majority (n=68) 68% of people were male and (n=32) 32% were female patients. the Theority of patients were in the age group of 36 to 55 years (n=49).

AGE GROUP	FREQUENCY	PERCENTAGE	CUMULATIVE FREQUENCY	CUMULATIVE PERCENTAGE
20-35	5	5%	5	5%
36-55	49	49%	54	54%
56-80	46	46%	100	100%

STROKE PATIENTS DISTRIBUTION

AGE GROUP	TOTAL NUMBER OF PATIENTS
20-35	5
36-55	49
56-80	46

AGE GROUP DISTRIBUTION IN STROKE PATIENTS

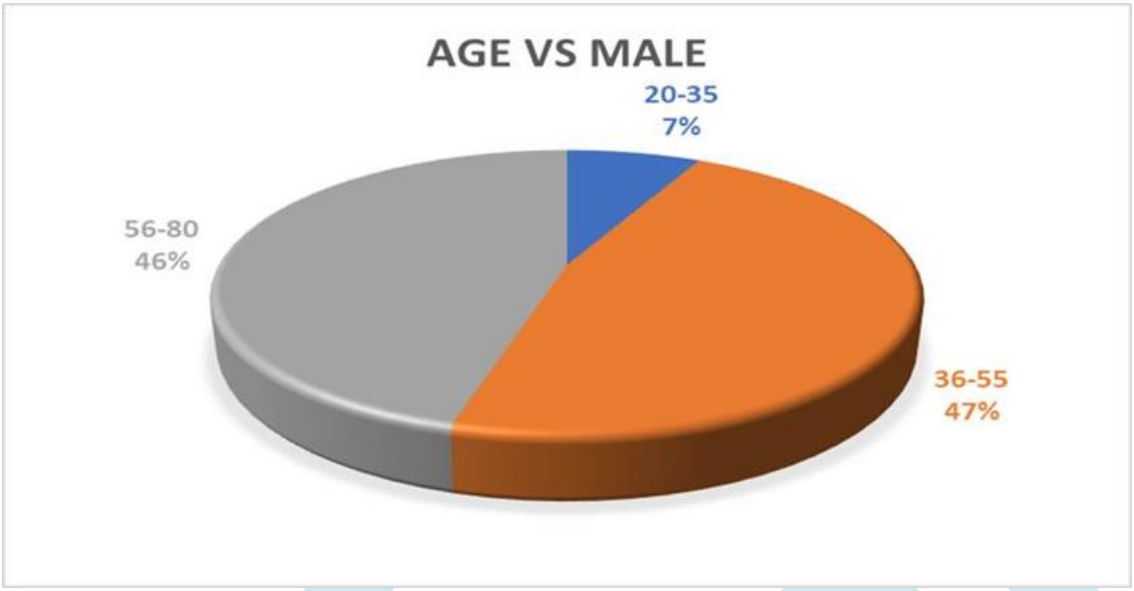


AGE GROUP DISTRIBUTION IN STROKE PATIENTS

This pie chart indicates different age groups by stroke.36-55 age group people are more attacked by stroke.

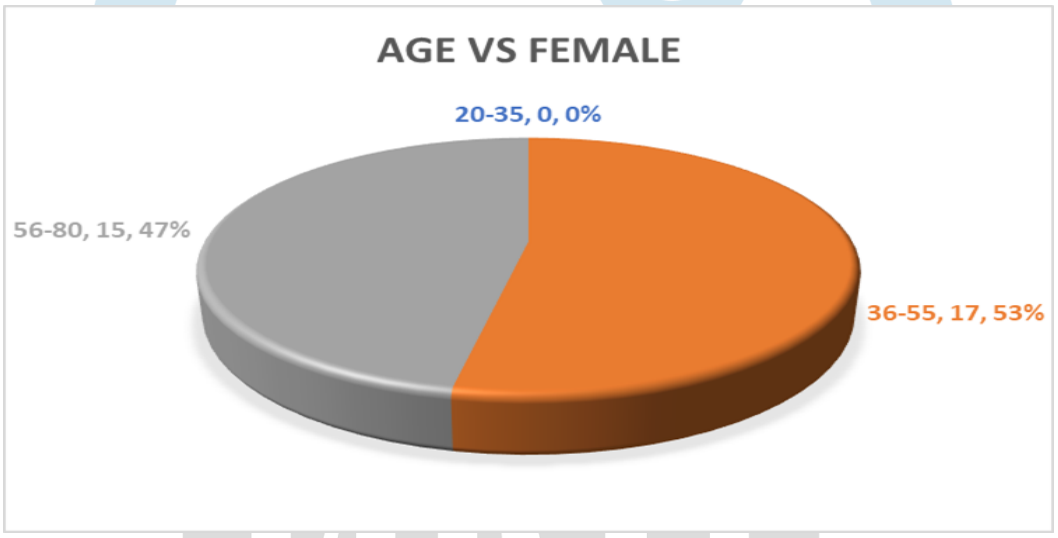
AGE GROUP	TOTAL NUMBER OF PEOPLE	MALES	FEMALE
20-35	5	5	0
36-55	49	32	17
56-80	46	31	15

AGE VS MALE AND FEMALE GENDER DISTRIBUTION



AGE VS MALE GENDER DISTRIBUTION

This pie chart indicates age vs gender distribution. Males are more prone to stroke than females. In the male's age group (36-55)



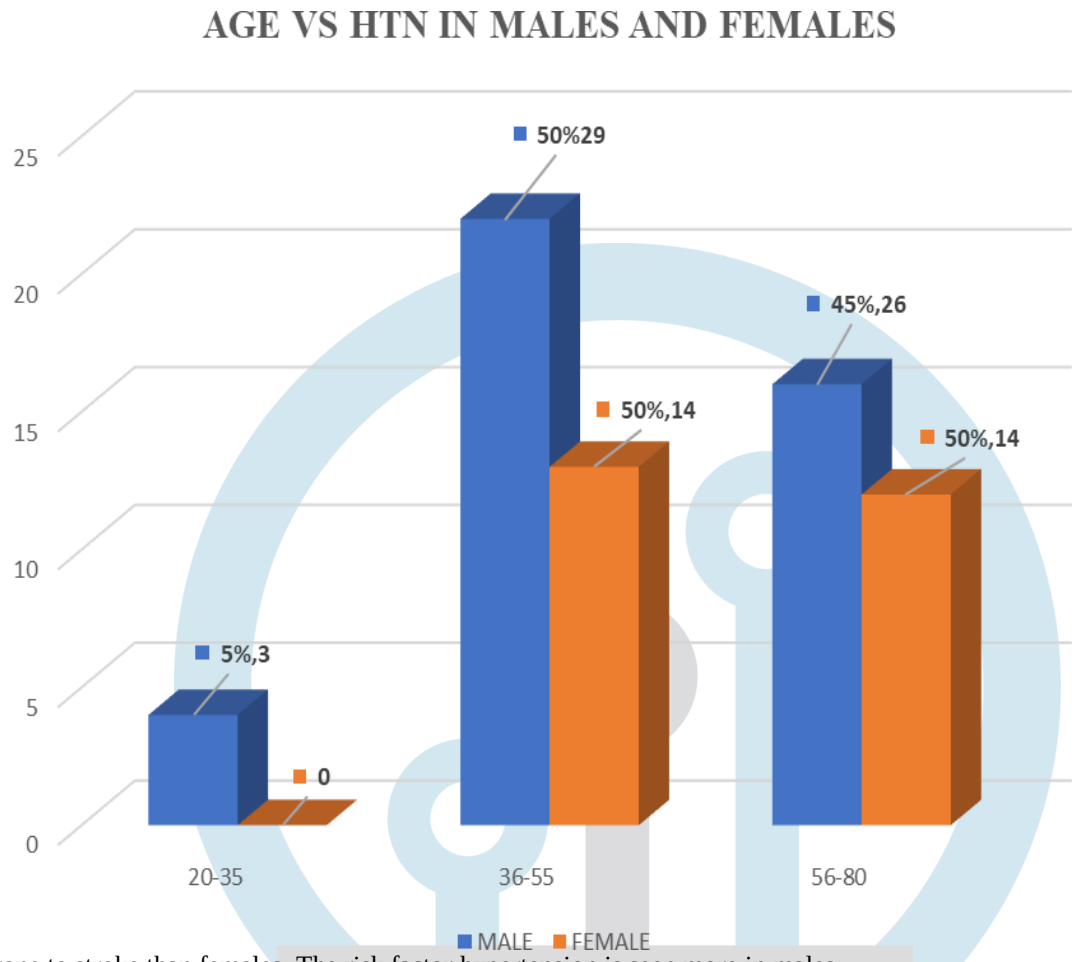
47% are prone to stroke and in the female's age group (36-55) 53% of stroke cases are seen.

AGE GROUP	MALES WITH HTN	FEMALES WITH HTN
20-35	3	0
36-55	29	14
56-80	26	14

AGE GROUP VS HYPERTENSION DISTRIBUTION

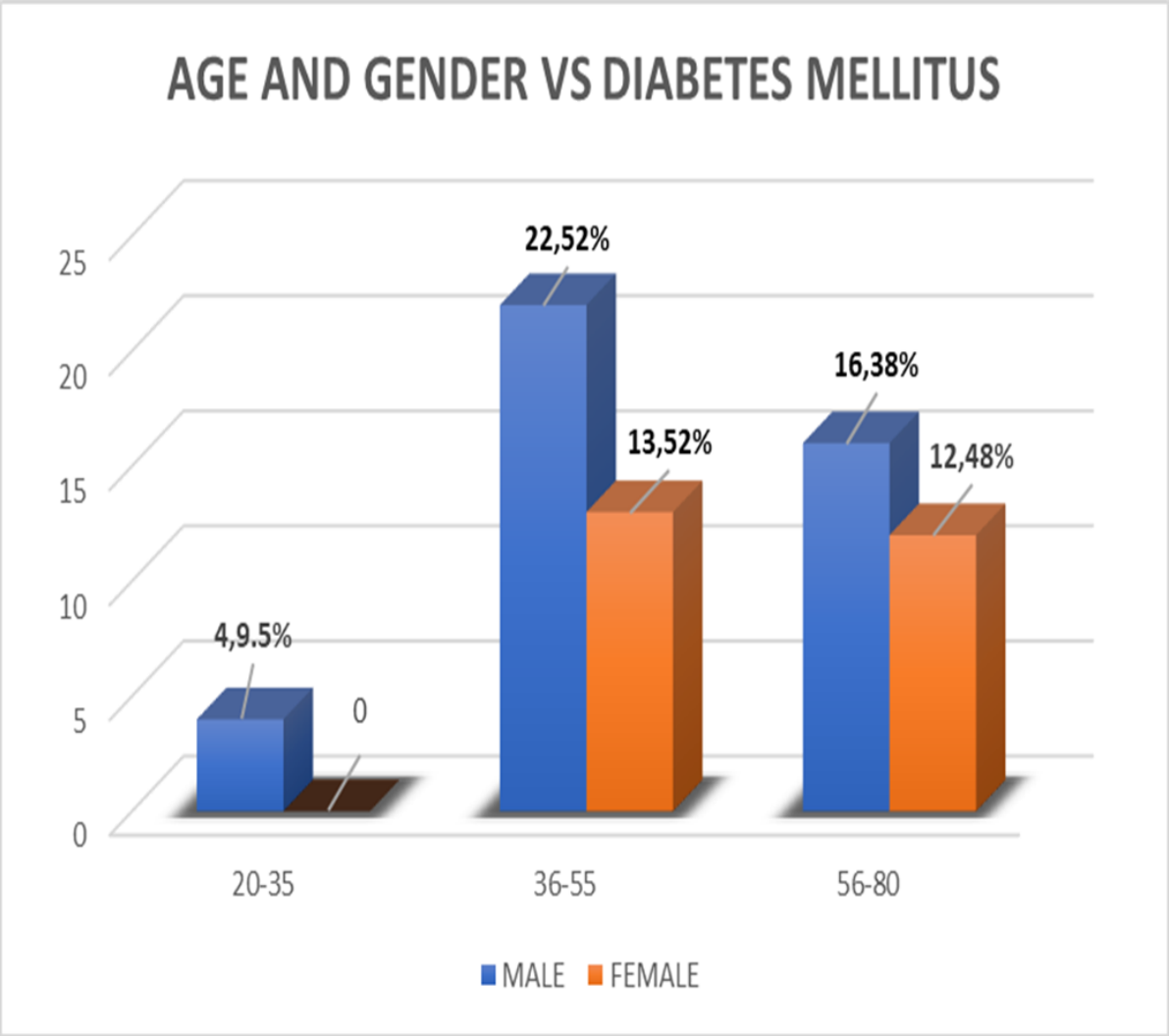
AGE VS HTN IN MALES AND FEMALES

In this histogram, the age group with hypertension comparison in both males and females was done. Males with hypertension are more prone to stroke than females. The risk factor hypertension is seen more in males.



AGE GROUP	DM IN MALES	DM IN FEMALES
20-35	4	0
36-55	22	13
56-80	13	12

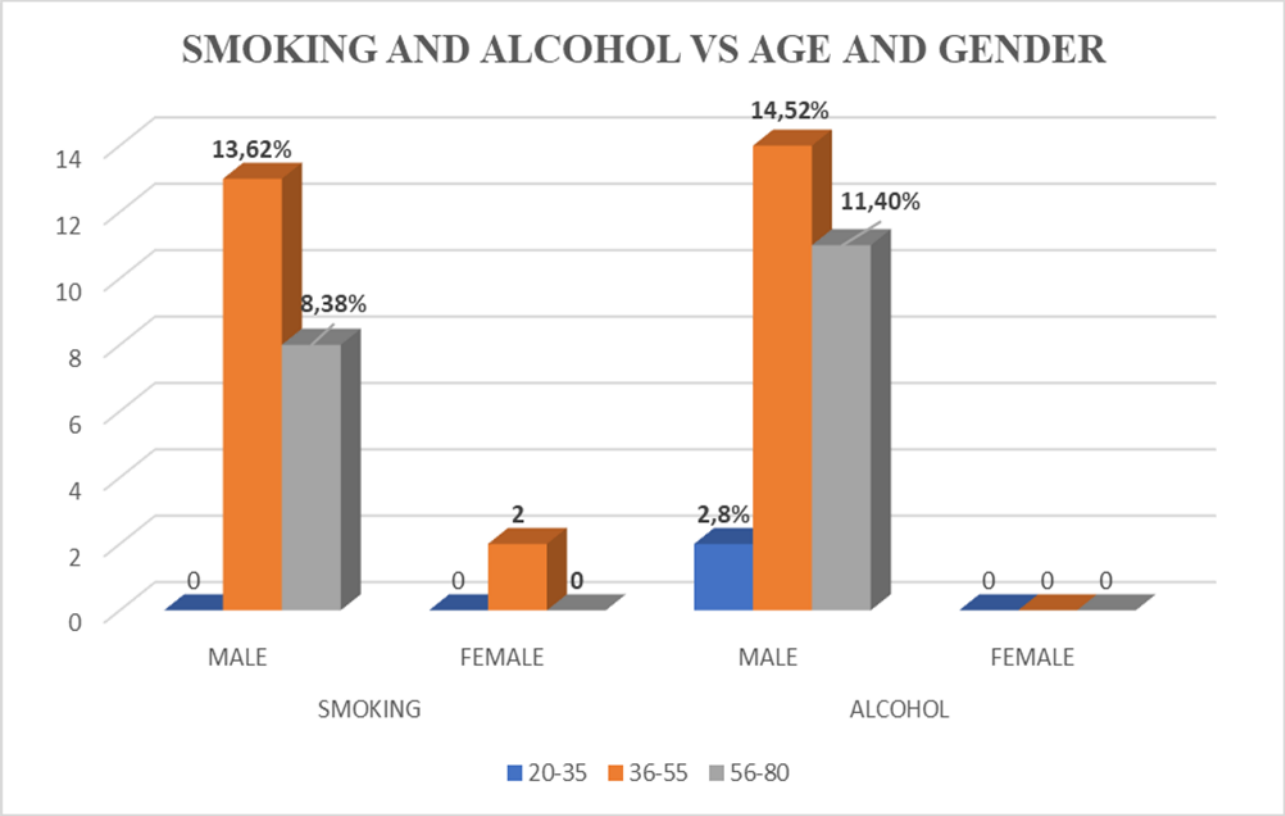
AGE VS DIABETES MELLITUS DISTRIBUTION
AGE AND GENDER VS DIABETES MELLITUS



This histogram indicates the age group with diabetes mellitus comparison in both males and females. The males, the age group of 36-55 are more prone to stroke are 52% and females are also in the name age group with a 52% of DM rate.

	AGE GROUP	20-35	36-55	56-80
SMOKING	MALES	0	13	8
	FEMALES	0	2	0
ALCOHOL	MALES	2	14	11
	FEMALES	0	0	0

SMOKING AND ALCOHOL VS AGE AND GENDER

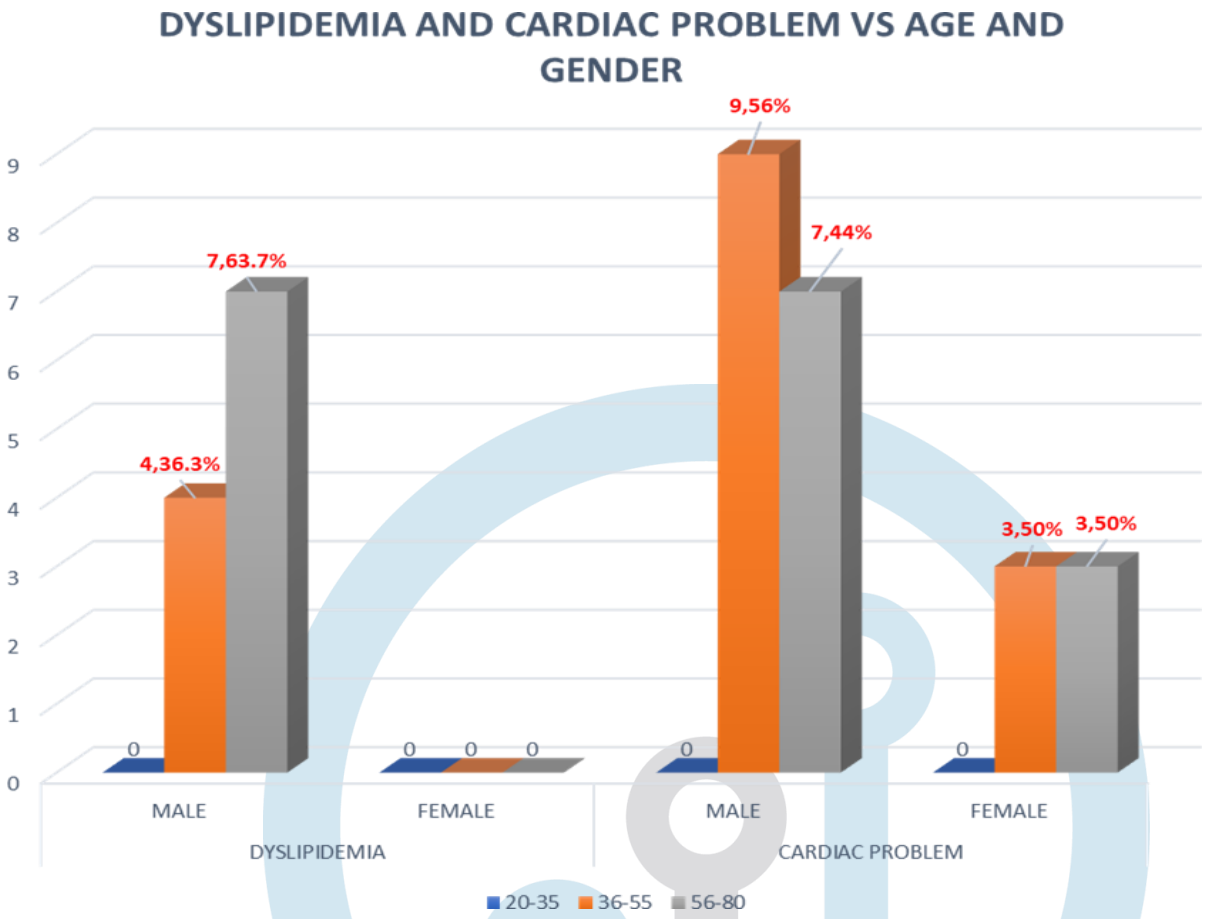


SMOKING AND ALCOHOL VS AGE AND GENDER

In these histogram comparisons of alcohol and smoking patients with gender female vs male were compared which is one of the modifiable risk factors. These males are more prone to stroke and the consumption rate of alcohol and smoking is more in the males age group 36 to 55 with 62% of smoking and 52% of alcohol rate.

	AGE GROUP	20-35	36-55	56-80
DYSLIPIDEMIA	MALE	0	4	7
	FEMALE	0	0	0
CARDIAC PROBLEM	MALE	0	9	7
	FEMALE	0	3	3

AGE VS DYSLIPIDEMIA AND CARDIAC PROBLEMS DISTRIBUTION

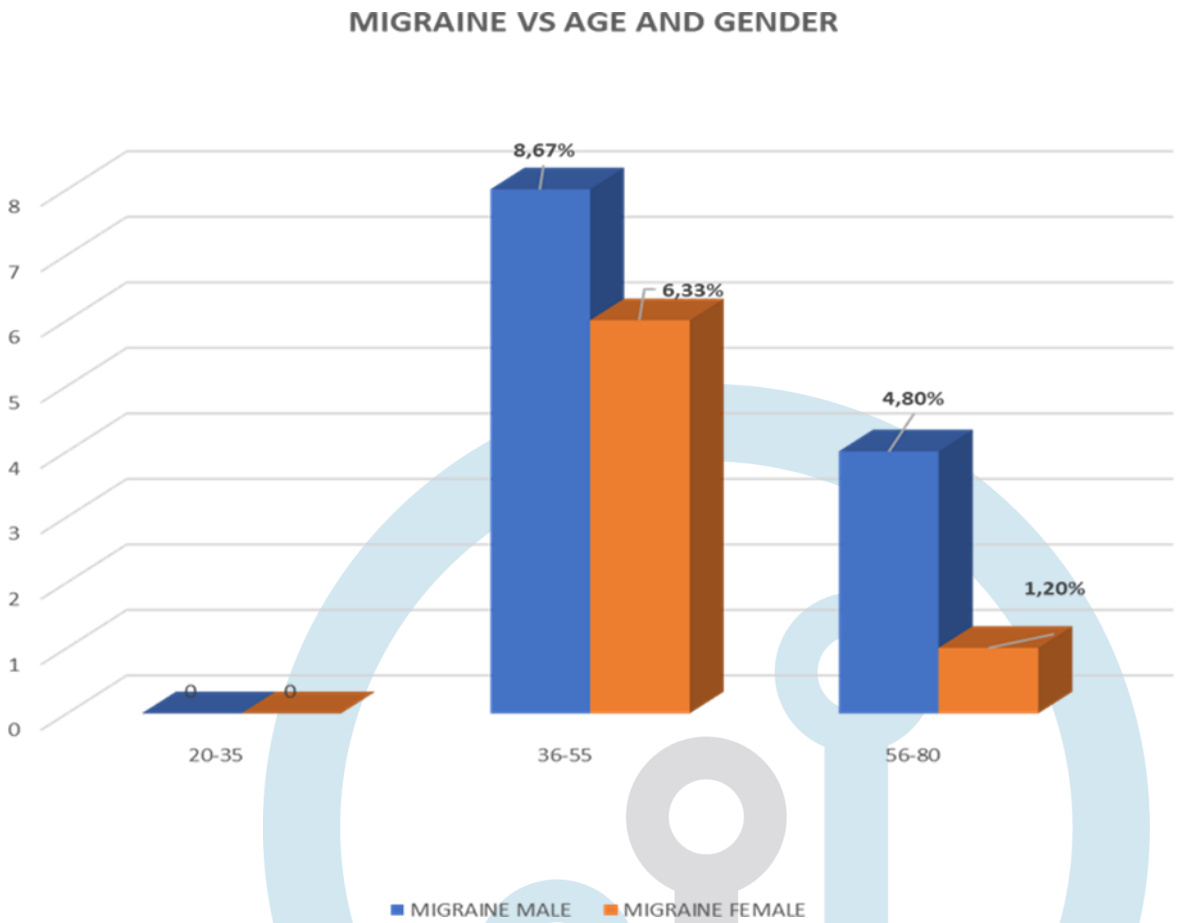


DYSLIPIDEMIA AND CARDIAC PROBLEM VS AGE AND GENDER DISTRIBUTION

This histogram represents a comparison of dyslipidemia and cardiac problems in males and females in the respective age group (36 – 55) the patients with cardiac problems are moreprone to stroke than dyslipidemia patients. In males, the age group 56-80 having dyslipidemia are more prone to stroke. In males, the age group 36-55 having cardiac problems are prone to stroke.

AGE GROUP	MALES WITH MIGRAINE	FEMALES WITH MIGRAINE
20-35	0	0
36-55	8	6
56-80	4	1

AGE VS MIGRAINE DISTRIBUTION

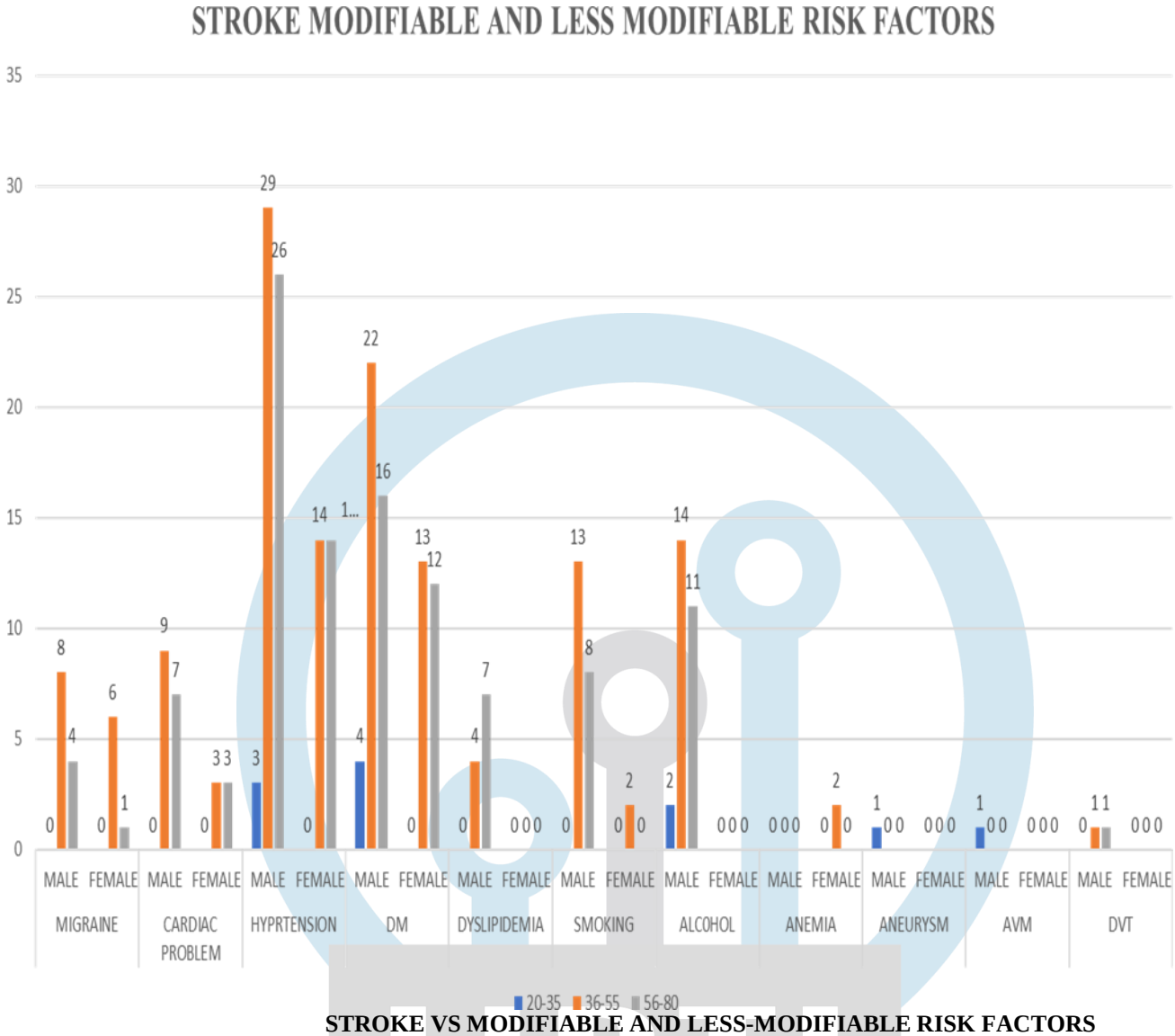


AGE VS MIGRAINE DISTRIBUTION

This histogram indicates the comparison of age groups with migraine in both males and females. In this male age group, 36 – 55 (67%)with migraine are more prone to stroke. Females in the age group 36-55(33%) with migraine are more prone to stroke.

TYPE OF RISK FACTOR	GENDER	20-35	36-55	56-80
HYPERTENSION	MALE	3	29	26
	FEMALE	0	14	14
DIABETES MELLITUS	MALE	4	22	16
	FEMALE	0	13	12
DYSLIPIDEMIA	MALE	0	4	7
	FEMALE	0	0	0
SMOKING	MALE	0	13	8
	FEMALE	0	2	0
ALCOHOL	MALE	2	14	11
	FEMALE	0	0	0
CARDIAC PROBLEM	MALE	0	9	7
	FEMALE	0	3	3
ANEMIA	MALE	0	0	0
	FEMALE	0	2	0
ANEURYSM	MALE	1	0	0
	FEMALE	0	0	0
AVM	MALE	1	0	0
	FEMALE	0	0	0
DVT	MALE	1	1	0
	FEMALE	0	0	0
MIGRAINE	MALE	0	8	4
	FEMALE	0	6	1

AGE VS GENDER: OVERALL RISK FACTORS



STROKE VS MODIFIABLE AND LESS-MODIFIABLE RISK FACTORS

In this overall assessment of modifiable risk factors in ischemic and hemorrhagic stroke. Among overall risk factors, in our study, we found that hypertension and diabetes mellitus is the major risk factor for stroke. Smoking, alcohol consumption, and cardiac problems are moderate risk factors for stroke. Migraine and dyslipidemia are the least risk factors for stroke.

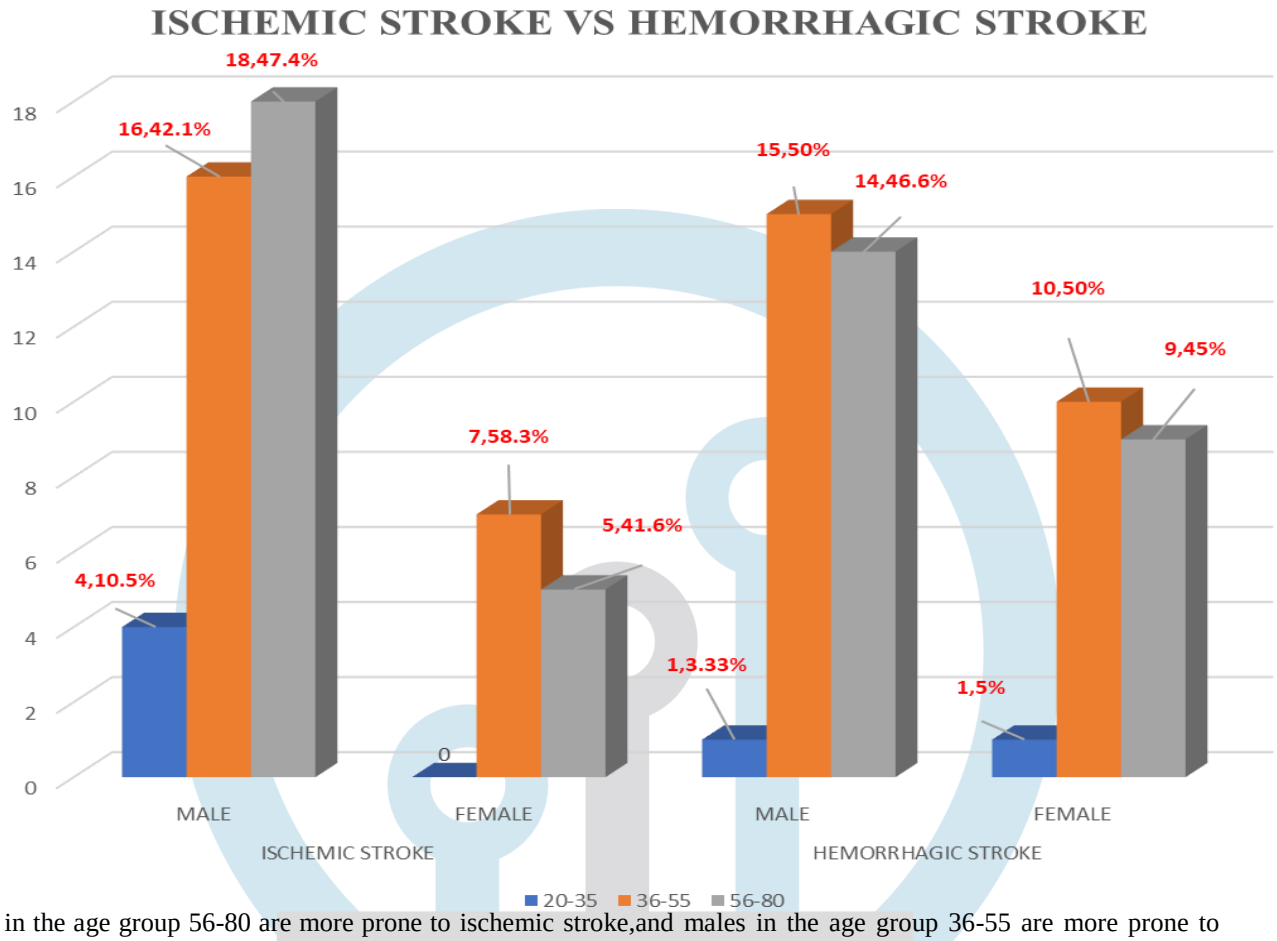
HYPERTENSION(86%) > DIABETES MELLITUS (64%) > ALCOHOL CONSUMPTION (27%) > SMOKING (23%) > CARDIAC PROBLEMS (22%) > MIGRAINE (19%) >DYSLIPIDEMIA (11%).

TYPE OF STROKE	GENDER	20-35	36-55	56-80
ISCHEMIC STROKE	MALE	4	16	18
	FEMALE	0	7	5
HEMORRHAGIC STROKE	MALE	1	15	14
	FEMALE	1	10	9

AGE VS TYPE OF STROKE IN GENDER DISTRIBUTION

ISCHEMIC STROKE VS HEMORRHAGIC STROKE

This histogram represents a comparison of Ischemic and Hemorrhagic strokes in both males and females. In our study,

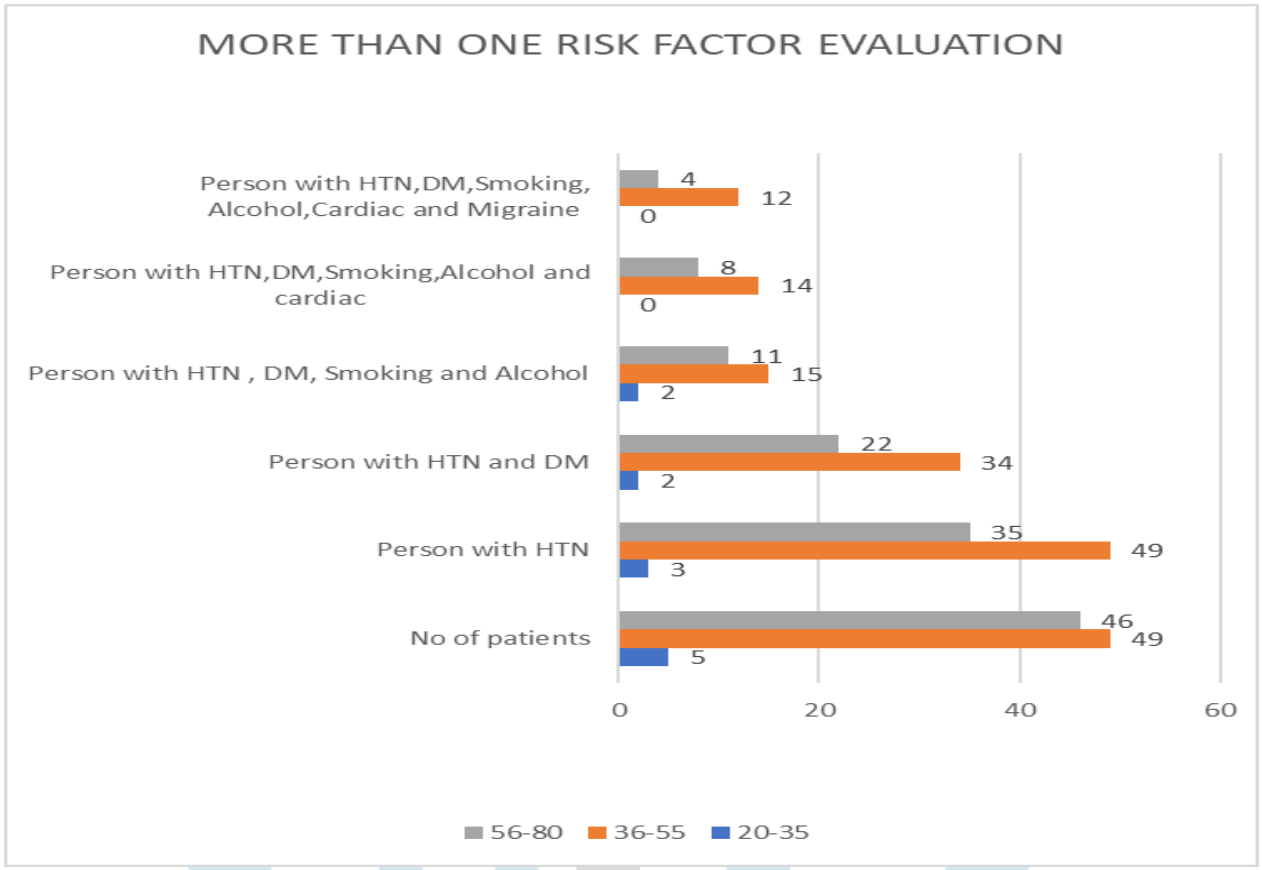


males in the age group 56-80 are more prone to ischemic stroke,and males in the age group 36-55 are more prone to hemorrhagic stroke. Females in the age group 36-55 are more prone to both ischemic and hemorrhagic stroke.

AGE GROUP	NO OF PATIENTS	PEOPLE WITH HTN	PEOPLE WITH HTN AND DM	PEOPLE WITH HTN, DM SMOKING, AND ALCOHOL	PEOPLE WITH HTN, DM SMOKING, ALCOHOL AND CARDIAC PROBLEMS	PEOPLE WITH HTN, DM SMOKING ALCOHOL CARDIAC PROBLEMS AND MIGRAINE
20-35	5	3	2	2	0	0
36-55	49	49	34	15	14	12
56-80	46	35	22	11	8	4

AGE GROUP VS EVALUATION OF MODIFIABLE RISK FACTORS

AGE GROUP VS EVALUATION OF MORE THAN ONE RISK FACTOR



This histogram represents the assessment of comorbidities in stroke patients. In our study, we found that the age group 36-55 (stroke patients) had more comorbidity conditions whencompared to other age groups mentioned in our study.

DISCUSSION:

In our study out of the estimated sample size of n=100, males are n=68 (68%) and females are n=32(32%). We observed that the majority of patients that are affected by stroke are between the age group 36-55 in both males and females.

In this study, 100 patients were included and categorized into three different age groups 20-35, 36 - 55, and 56-80. In the age group 20 – 35 (n=5) 5% are affected, followed by the age group 36- 55 (n=49) 49% are affected and in the age group 56- 80 (n=46) 46% are observed in the stroke patients included in the study.

A total of n=100 patients were recruited and categorized into different age groups of male and femaleparticipants. In the age group 20-35 the males are n=5 (7%) and females are n=0 (0%) affected, thenfollowed by the age group 36 – 55 the males are n=32 (47%) and females are n=17 (53%) are affected and the age group 56-80 the males are n=31 (46%) and females are n=15 (47%) are affected. In these,we observed males are more prone to stroke than females.

This study mainly focuses on the evaluation of risk factors that trigger stroke in both males and females. Age groups are differentiated and the first risk factor that is considered a major risk is a hypertension in both gender participants in the male age group 20 – 35 n=3 (5%), females are n=0 (0%) are suffering from hypertension then followed by age group 36 – 55 males are n=29 (50%), females are n=14 (50%) and the age group 56 – 80 males are n=26 (45%) and females are n = 14 (50%) are suffering. Majorly the target age group is 36-55.

The second risk factor that majorly triggers stroke is Diabetes mellitus. In the age group 20 – 35 malesare n= 4 (9.5%), and females are n = 0 (0%) then followed by the age group 36-55 males are n=22 (55%) and females are n=16 (52%), and the age group 56 – 80 males are n=16 (38.5%) and females are n=12(48%).

In this overall assessment of modifiable risk factors in ischemic and hemorrhagic stroke. Among overall risk factors, in our study, we found that hypertension and diabetes mellitus is the major risk factor for stroke. Smoking, alcohol consumption, and cardiac problems are moderate risk factors forstroke. Migraine and dyslipidemia are the least risk factors for stroke. This is following the study of "**ginners fekadu et**." Which included 116 patients in which the most common risk factor identified was hypertension.**HYPERTENSION(86%) > DIABETES MELLITUS (64%) > ALCOHOL CONSUMPTION (27%) > SMOKING (23%) > CARDIAC PROBLEMS (22%) > MIGRAINE (19%)>DYSLIPIDEMIA (11%).**

In our study, we found that the males with Diabetes mellitus, age group of 36-55 years are more prone to stroke(n=22) and females are also in the same age group 36-55years(n=13). This is by the study **NyoNyoTun et al**. stated that Diabetes mellitus poses about four times higher risk for stroke. Cardiac metabolic risk factors including obesity, hypertension, and dyslipidemia often coexist in patients with diabetes mellitus that add to stroke risk.

Now- a -days smoking and alcohol consumption are leading causes of a variety of co-morbidities conditions which are also one of the main causes of stroke which causes severe withdrawal symptomsand abuse. In our study smoking and alcohol are considered modifiable risk factors that cause strokein male participants of age group 20 – 35 n=0 in smoking and n=2 (8%) in alcohol consumption followed by age group 36-55 males are n=13 (62%) in smoking and n=14 (50%) in alcohol consumption are affected and age group 56-80 n=8 (32%) are smoking and n= 11 (40%) are alcoholconsumption participants.

Cardiac problems (cardioembolic stroke, aortic stenosis, coronary artery disease, atrial fibrillation) are the 1st leading cause of death all over the world that causing the complication of stroke which is the second leading cause, and dyslipidemia or hyperlipidemia or obesity which is leading cause for various problems such as stroke (heart and brain) and hyperventilation disorders. In our study, we take cardiac and dyslipidemia patients in which categorized into males and females of different age groups in which 36 – 55 n=4 (36.3%) in males, age group 56 – 80 n=7 (63.7%) in dyslipidemia, and age group 36 – 55 n=9 (56%) males, n=3 (50%) females, and age group 56-80 n=7 (44%) males and n=3 (50%) females causing the cardiac problems.

Mainly the stroke is classified into two types ischemic and hemorrhagic stroke they are different factors that are contributing to the stroke which are classified into modifiable, less modifiable, and non-modifiable risk factors. In our study, we considered both types of stroke and compared which type of stroke is causing mortality and permanent or temporary damage to participants can be evaluated. Age group 20 – 35 (n=4) 10.5% males , n=0 (0%) females , age group 36 – 55 n= 16 (42.1%) males , n=7 (58.3%) females , age group 56- 80 n=18 (47.7%) males , n=5(41.6%) females– ischemic stroke and the hemorrhagic stroke age group 20 – 35 n=1 (3.33%) males, n=1 (5%) females age group 36-55 n=15(50%) males, n=10(50%) females and age group 56 – 80, n=14(46.6%) males,n=9 (45%) females are affected by stroke.

The assessment of comorbidities in stroke patients is done in our study where more participants are suffering from more than one risk factor that is leading to stroke. In our study, we found that the agegroup 36-55 (stroke patients) had more comorbidity conditions when compared to other age groups mentioned in our study.

In our study, we found that more stroke cases are due to improper medication adherence mainly due to antihypertensive medications. Hypertension is the most common reason that is occurring after certain age between 34- 40 and lifestyle modification and proper medication adherence to drugs canprevent it from leading to more complications. Thus, prevention plays a crucial role in counteractingmorbidity and mortality related to ischemic stroke. it has been estimated that 50% of stroke cases arepreventable through the control of modifiable risk factors and lifestyle changes.

Antihypertensive treatment is recommended for both prevention of recurrent stroke and vascular events. The awareness of modifiable risk factors of ischemic stroke and hemorrhagic stroke is very important in its prevention. The majority of strokes are also caused due to cardiac problems due to aortic stenosis (AORTIC VALUE REPLACEMENT SURGERY) observed in our study and participants are taking anti-coagulants acenocoumarol induced high risk of ischemic and hemorrhagicstroke **Thorsten tenor et al:** study the intracerebral hemorrhage associated with oral anticoagulants-Spontaneous intracerebral hemorrhage (SICH) is the deadliest form of stroke, with a mortality rate between 30% and 55%, increasing to as high as 67% in patients receiving oral anticoagulant therapy(OAT). The incidence of OAT-related-ICH (OAT-ICH) is expected to increase in the coming years as a result of an anticipated rise in the incidence of atrial fibrillation attributable to an aging population.

Stress is also one of the major causes that lead to stroke but it is non-modifiable and age, gender, andfamily history. Mainly in our study, we observed that the occurrence of both ischemic stroke and hemorrhagic stroke among the age group 36-55 and 56-80 are at equal rates of stroke.

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