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Study on "Interpretation and analysis of factors associated with ischemic cerebrovascular accident"

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ABSTRACT

Background: Stroke or Cerebro Vascular Accident can also be defined as abrupt onset of neurologic deficit that is attributable to a focal vascular cause. Cerebrovascular accident can be divided into ischemic and hemorrhagic. Ischemic stroke occurs when the blood supply to a part of the brain is suddenly interrupted by vascular occlusion. Hemorrhagic stroke on the other hand results from the rupture of a weakened cerebral blood vessel.There are various risk factors associated with stroke, both non modifiable and modifiable.

Identification of risk factors in patients can provide us clues to the cause of the stroke and help in the treatment and secondary prevention plan. Non modifiable risk factors such as: age, gender, race, hereditary.

Modifiable risk factors include but not limited to hypertension, smoking, hyperlipidemia, heart diseases, diabetes, alcohol consumption, drug abuse etc.

Aim of the study:

Analysis of factors associated with acute cerebrovascular accident

Materials and methods:

The study is carried out in patients admitted in the Department of General Medicine, Gauhati Medical College & Hospital, Assam. The period of study is from 1st June 2019 to 31st May 2020. Ethical clearance was obtained from the Institutional Ethical Committee, Gauhati Medical College & Hospital, Assam. The present study consists of 149 patients, both males and females, who had been diagnosed with acute ischemic stroke.

Results:

In the present study, 149 patients who have met the selection criteria were enrolled into the study during a period of one year from 1st June 2019 to 31st May 2020. They were analysed with regards to their risk factors and outcome.

Among 149 patients, 83 (55.7%) were male and 66 (44.3%) were females.

Among 149 patients, 39 (26.17%) patients were over 70 years, 52 (34.89%) patients were in the age group of 60-69 years, 39 (26.17%) patients were in the age group of 50-59 years, 12 (8%) patients were in the age group of 40-49 years, 4 (2.6%) patients were in the age group of 30-39 years and 3 (2%) patients were in the age group of 20-29 years.

Among 149 patients, 90 (60.4%) patients had hypertension, 49 (33%) patients had Diabetes Mellitus, 46 (30.8%) patients had Dyslipidemia, 40 (26%) patients were smokers, 23 (15.4%) patients were alcoholic, 18 (12%) patients had past history of stroke, 14 (9.3%) patients had coronary artery disease, 23(15.4%) patients had atrial fibrillation, 13 (8.7%) patients had family history of stroke, 104 (69.79%) had more than one risk factors.

Conclusion:

The prevalence of stroke was more among the elderly population with peak after 60 years. Males were affected more than females.

The most common modifiable risk factors were hypertension, diabetes mellitus, dyslipidemia.Commonest non modifiable risk factors were age, sex and family history of stroke. Hypertension was the most common risk factor and mortality and morbidity associated with ischemic stroke. Proper reforms to be made to identify undiagnosed hypertension and initiate early treatment and also compliance to be checked.It was seen that 12% cases had past history of stroke. So patients with previous history of stroke should be followed regularly and all other risk factors to be modified.Presence of multiple risk factors was related to poor prognosis.

I. INTRODUCTION

The World Health Organization (WHO) definition of stroke is: "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin." (Aho et al., 1980)

Stroke or Cerebro Vascular Accident can also be defined as abrupt onset of neurologic deficit that is attributable to a focal vascular cause. (Smith et al., 2018)

Stroke is the second leading cause of death

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worldwide with 6.2 million dying from stroke in 2015, an increase of 830,000 since the year 2000. While stroke has grown in incidence worldwide, it is declining among the affluent and rising among those with less access to medical care. In the United states, the incidence of stroke has declined steadily since at least 1958, and stroke is currently the fifth leading cause of death with 133,000 dying in 2014. Despite this progress, however stroke remains the most common disabling disease in the United states and in many forms preventable. (Smith et al., 2018)

The prevalence of stroke ranges from 84–262/100,000 in the rural setting and from 334–424/100,000 in the urban areas in India. The incidence is about 119–145/100,000 based on recent population-based studies. (Pandian and Sudhan, 2013)

According to the World Health Organization (WHO), 15 million people suffer stroke worldwide each year. Of these, 5 million die, and another 5 million are left permanently disabled. (Mackay and Mensah, 2004)

An acute stroke is a stroke that occurs or develops suddenly and without warning. Depending on the site of stroke, the major presenting symptoms of an acute stroke include numbness or weakness of one side of the body, difficulty in speaking or trouble in understanding, difficulty with vision, falling or difficulty in walking, a sudden, severe headache involving a stiff neck, facial pain, pain between the eyes or vomiting, loss of balance or co-ordination, and confusion.

Cerebrovascular accident can be divided into ischemic and hemorrhagic.

Ischemic stroke occurs when the blood supply to a part of the brain is suddenly interrupted by vascular occlusion.

A transient ischaemic attack (TIA) is an acute loss of focal brain or monocular function with symptoms lasting less than 24 hrs and which is thought to the due to inadequate cerebral or ocular blood supply as a result of arterial thrombosis, embolism or low flow, associated with arterial, cardiac or haematological disease. (Warlow, 2001)

The Trial of Org10172 (TOAST) is the most commonly used classification that identifies five subtypes in acute ischemic stroke: 1) large artery atherosclerosis 2) cardio-embolism 3) small vessel occlusion 4) stroke of other determined etiology 5) stroke of undetermined etiology. (Adams Jr et al., 1993)

Cerebral infarction is most commonly caused by thrombo-embolic disease secondary to atherosclerosis in the major extra cranial arteries (carotid and aortic arch). Infarctions are due to embolism from the heart and major arteries or thrombosis caused by intrinsic disease of small perforating vessels (lenticulostriate arteries) precipitated by atherosclerosis, producing so called lacunar infarctions.

Ischemic stroke causes a varied clinicial manifesation based on the duration, cause of the stroke, the part of the brain affected and the involved artery.

Hemorrhagic stroke on the other hand results from the rupture of a weakened cerebral blood vessel. Hemorrhagic strokes are further subdivided into - Intracerebral haemorrhage (ICH) and Subarachnoid haemorrhage (SAH). Intracerebral hemorrhage (ICH) is defined as a hemorrhage or bleeding into the brain parenchyma, usually arising in the region of small arteries that supply the basal ganglia, thalamus, brainstem and cerebellum. Subarachnoid hemorrhage (SAH) on the other hand, is defined as a hemorrhage or bleeding into the subarachnoid space, with or without intraparenchymal hemorrhage. SAH can further be subdivided into - Aneurysmal SAH (mainly due to the rupture of aneurysms at the bifurcations of large arteries at the inferior surface of the brain); and Non-aneurysmal SAH (commonly due to trauma).

There are various risk factors associated with stroke, both non modifiable and modifiable.

Identification of risk factors in patients can provide us clues to the cause of the stroke and help in the treatment and secondary prevention plan.

Non modifiable risk factors such as: age, gender, race, hereditary.

Modifiable risk factors include but not limited to hypertension, smoking, hyperlipidemia, heart diseases, diabetes, alcohol consumption, drug abuse etc.

There have been a vast advancement in the treatment of stroke and in reducing deaths from stroke. The advent of intravenous tissue-type plasminogen activator as a specific treatment for selected patients with acute ischemic stroke in therapeutic window and the promise of other intervention therapies, still the best approach to decrease stroke burden is effective prevention. (Adams Jr et al., 2007)

The primary aim of this study is to evaluate the risk factors in patients with ischemic stroke and to determine their short term outcome. As Stroke is primarily seen in patients with long-lasting exposure to risk factors related to lifestyle, modification of such risk factors have a great affect in decreasing the incidence of stroke and even mortality rates. Primary prevention is particularly important because 77% of strokes are first events. The risk of a first stroke can be lowered by 80% in people who practice a healthy lifestyle compared with those who do not. (Chiuve et al., 2008)

AIMS AND OBJECTIVES OF THE STUDY

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- To evaluate factors associated with patients of ischemic stroke.
- To find out the short term outcome of ischemic stroke during hospital stay in relation to therisk factors.

MATERIALS AND METHODS

STUDY DESIGN: Hospital based observational study
SAMPLE SIZE: 149
Calculated using the formula: (Daniel and Cross, 2018)
Z^2{p*(1-p)}/d^2
Where,
Z = Z value (eg. 1.96 for 95% confidence interval)
P = prevalence of acute ischemic stroke in India, 0.42 (Pandian and Sudhan, 2013)
d = precision, here taken as 0.25

LOCATION OF STUDY: Gauhati Medical College and hospital, Guwahati (Assam).
SOURCE OF DATA: Patients admitted in the Department of General Medicine, Gauhati Medical College & Hospital, Assam.
PERIOD OF STUDY: The period of study is from 1st June 2019 to 31st May 2020.
ETHICAL CLEARANCE: Ethical clearance was obtained from the Institutional Ethical Committee, Gauhati Medical College & Hospital, Assam.
SELECTION OF CASES: Patients, both males and females, who had been diagnosed with acute ischemic stroke were taken up for the study. Patients were randomly selected according to the case definitions subject to the inclusion and exclusion criteria as given below.

INCLUSION CRITERIA:

- Patients with clinical evidence of acute loss of focal or global cerebral function.
- Evidence of ischemia in Brain CT scan.
- Age >12 years.

EXCLUSION CRITERIA:

- Age less than 12 years.
- Patients with evidence of haemorrhage in Brain CT scan.
- Patient with history of head injury
- Patients with evidence of structural brain lesion.
- Patients not giving consent for detailed clinical examination.

II. METHODOLOGY:

Patients who fulfilled the selection criteria were enrolled into the study and were subjected to a detailed history and clinical examination. The patients and their attendants were fully informed about the study and their informed consent was taken prior to their participation in the study. In patients having speech disturbances, history was obtained for the attendees. All the patients were clinically examined and investigated routinely as per the protocol of the Department of Medicine for stroke patients.
The data of each patient was collected in the specific proforma which included:

- Patient's name, age , sex, demographic details ,presenting complaints, risk factors, past history, drug history, family history, socioeconomic history.
- General examination
- Vital signs
- System examination
- Morbidity and Mortality reassessment on admission and day 7 using Modified Rankin Scale(MRS).

Outcome Variables: The two main primary outcomes of the study were Mortality and Functional Outcome.
Mortality in the study indicated death occurring during the stay in the hospital or within 7 days whichever was earlier.
Functional Outcome on the other hand was assessed using mRS criteria.
To assess the functional outcome of the patients, MRS scoring is done at baseline on admission and on 7th day and are correlated accordingly. This scale runs from 0-6, from perfect health without symptoms to death.

The outcome during the hospital stay was divided as follows:

- Complete recovery: MRS score 0 on 7th day.
- Partial recovery: MRS score decreased from baseline.
- No recovery : MRS score same or increased from baseline.
- Death at any point of time from admission.

MODIFIED RANKIN SCALE (mRS):

- 0 = No symptoms at all.
- 1 = No significant disability despite symptoms; able to carry out all usual
- duties and activities.
- 2 = Slight disability; unable to carry out previous activities, but able to
- look after own affairs without assistance.
- 3 = Moderate disability; requiring some help, but able to walk without assistance.
- 4 = Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance
- 5 = Severe disability; bedridden, incontinent and requiring constant nursing care and attention

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- 6 = Dead

The following investigations were carried out:

1. Radiological studies :
- Brain CT scan- Plain.
- MRI Brain.(Optional)
- Chest X Ray.
- Carotid ultrasound.

2. Echocardiography.
3. Hematological studies:
- Complete Haemogram.
- Routine investigations : RBS, RFT, LFT, Fasting lipid profile, TSH, Serum electrolytes, FBS, PPBS, HbA1c.

4. Urine analysis.
5. Electrocardiogram.

The risk factors of each patient was evaluated during the stay. In the study

- Hypertension: Patients with a systolic BP ≥ 140 mm Hg or diastolic BP ≥ 90 mm Hg or both or those previously diagnosed irrespective of their treatment status were considered to be hypertensives. (Chobanian et al., 2003b)
- Dyslipidemia: National Cholesterol Education Programme (NCEP) guidelines were used for definition of dyslipidemia as follows:

1. HDL cholesterol ≤ 40mg/dl in males or ≤ 50 mg/dl in females.
2. Triglycerides ≥ 150 mg/dl.
3. Total Cholesterol ≥ 200 mg/dl.
4. LDL cholesterol ≥ 130 mg/dl.

- Diabetes Mellitus: Patients were either previously diagnosed or newly diagnosed on the basis of American Diabetic Association Criteria, 2012 as follows:

1. HbA1C ≥ 6.5%. OR
2. Fasting Plasma Glucose (FPG) ≥126 mg/dl (7.0mmol/l) (Fasting was defined as no caloric intake for at least 8 hrs). OR
3. 2-h plasma glucose ≥200mg/dl (11.1mmol/l) during an Oral Glucose Tolerance Test (OGTT) (The test was performed as described by the World Health Organization,using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water). OR
4. In a patient with classic symptoms of hyperglycaemia or hyperglycaemic crisis, a random plasma glucose ≥ 200 mg/dl (11.1 mmol/l).

- Patients were considered suffering coronary artery disease if diagnosed by ECG or Echocardiography.

- Smoking, tobacco chewing and alcohol intake were based on the clinical history of past and present consumption of these substances.

- A family history of stroke was entertained if the first degree relatives of the patients suffered from stroke.

III. RESULTS:

In the present study, 149 patients who have met the selection criteria were enrolled into the study during a period of one year from 1st June 2019 to 31st May 2020. They were analysed with regards to their risk factors and outcome.

SEX:

Among 149 patients, 83 (55.7%) were male and 66 (44.3%) were females.

Male : Female ratio was found to be 1.25:1

Total patients	149	
Male	83	55.7%
Female	66	44.3%

Table 4: Showing sex distribution of patients

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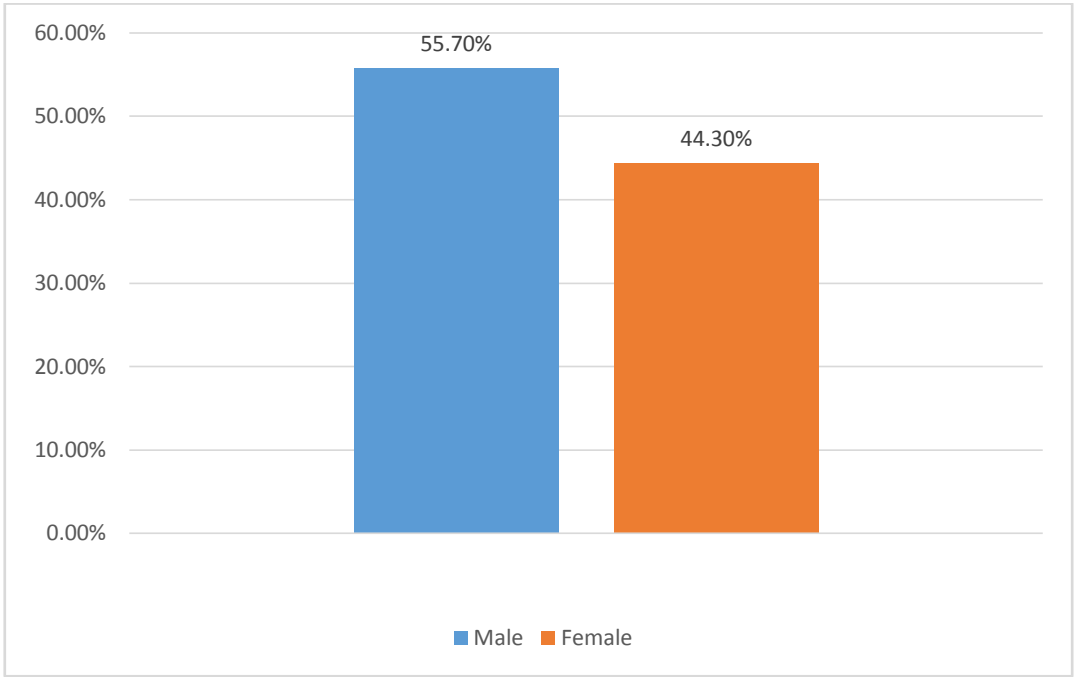

Figure 1: Showing sex distribution of patients

Among 83 male patients, 12 (14.45%) patients expired, 10 (12%) patients had complete recovery, 33 (39.75%) patients had partial recovery and 28 (33.7%) patients had no recovery at all.

Among 66 female patients, 11 (16.66%) patients expired, 6 (9.09%) patients had complete recovery, 23 (34.8%) patients had partial recovery and 26 (39.9%) patients had no recovery at all.

	Death	Complete recovery	Partial recovery	No recovery
Male (83)	12 (14.45%)	10 (12%)	33 (39.75%)	28 (33.7)
Female (66)	11 (16.66%)	6(9.09%)	23 (34.8%)	26 (39.9%)

Table 1: Showing outcome with relation to sex

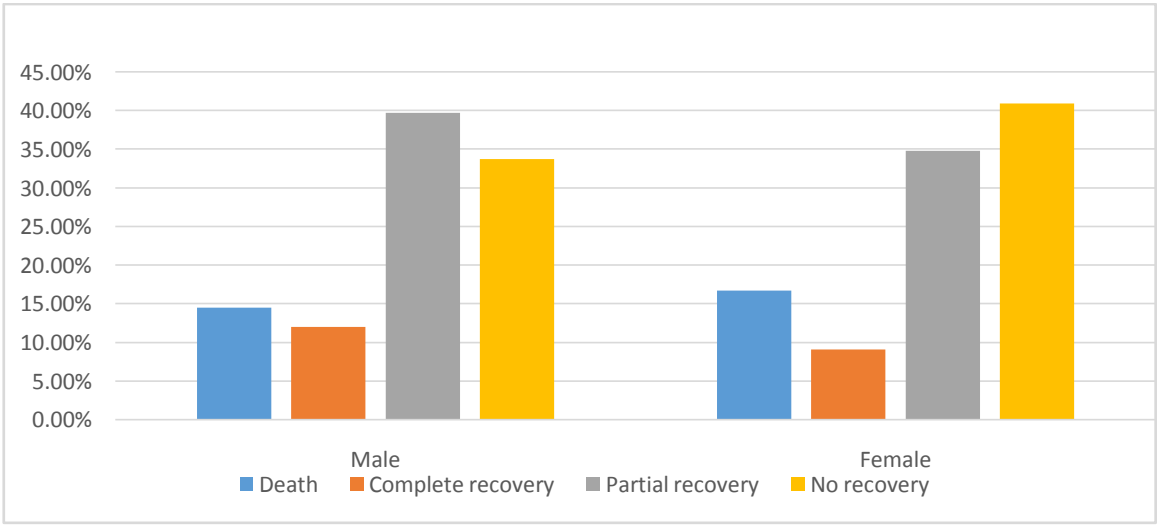

Figure 2: Showing outcome with relation to sex

AGE: Among 149 patients, 39 (26.17%) patients were

over 70 years, 52 (34.89%) patients were in the age group of 60-69 years, 39 (26.17%) patients were in the age group of 50-59 years, 12 (8%) patients were in the age group of 40-49 years, 4 (2.6%) patients were in the age group of 30-39 years and 3 (2%) patients were in the age group of 20-29 years.

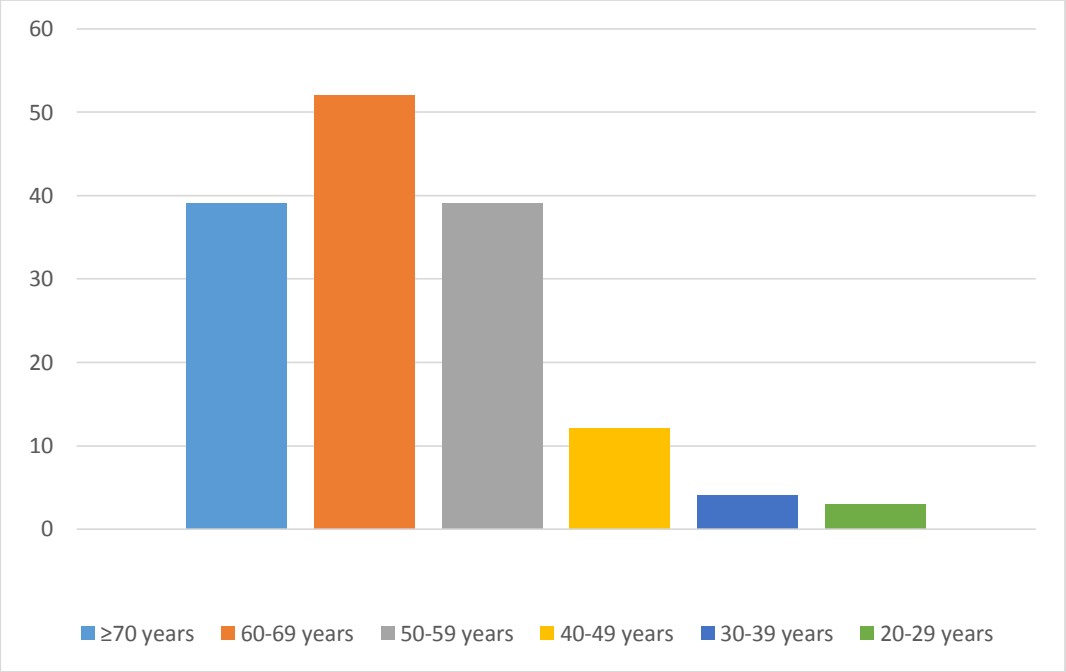

Figure 3: Showing age distribution

Age group	Total	Death	Complete recovery	Partial recovery	No recovery
≥70	39 (26.17%)	9 (23%)		8 (20.5%)	22(56.4%)
60-69	52 (34.89%)	8 (15.38%)	9 (17.3%)	16 (30.7%)	19 (36.5%)
50-59	39 (26.17%)	5 (12.8%)	4 (10.25%)	25 (64%)	5 (12.8%)
40-49	12 (8%)	1 (8.3%)	2 (16.6%)	4 (33.3%)	5 (41.06%)
30-39	4 (2.6%)	0	1(25%)	2 (50%)	1 (25%)
20-29	3 (2%)	0	0	1 (33.3%)	2 (66.6%)

Table 2: Showing age distribution and outcome

In the age group of over 70 years, 9 (23%) patients expired, 8 (20.5%) patients had partial recovery and 22 (56.4%) patients had no recovery. There was no complete recovery in this group

In the age group of 60-69 years, 8 (15.38%) patients expired, 9 (17.3%) patients had complete recovery, 16 (30.7%) patients had partial recovery and 19 (36.5%) patients had no recovery at all.

In the age group of 50-59 years, 5 (12.8%) patients expired, 4 (10.5%) patients had complete recovery, 25

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(64%) patients had partial recovery and 5 (12.8%) patients had no recovery at all.
In the age group of 40-49 years, 1 (8.3%) patient expired, 2 (16.6%) patients had complete recovery, 4 (33.3%) patients had partial recovery and 5 (41.06%) patients had no recovery at all.
In the age group of 30-39 years, no patient expired, 1(25%) patients had complete recovery, 2 (50%) patients had partial recovery and 1 (25%) patients had no recovery at all.
In the age group of 20-29 years, no patient expired, no patient had complete recovery, 1 (33.3%) patients had partial recovery and 2 (66.6%) patients had no recovery at all.

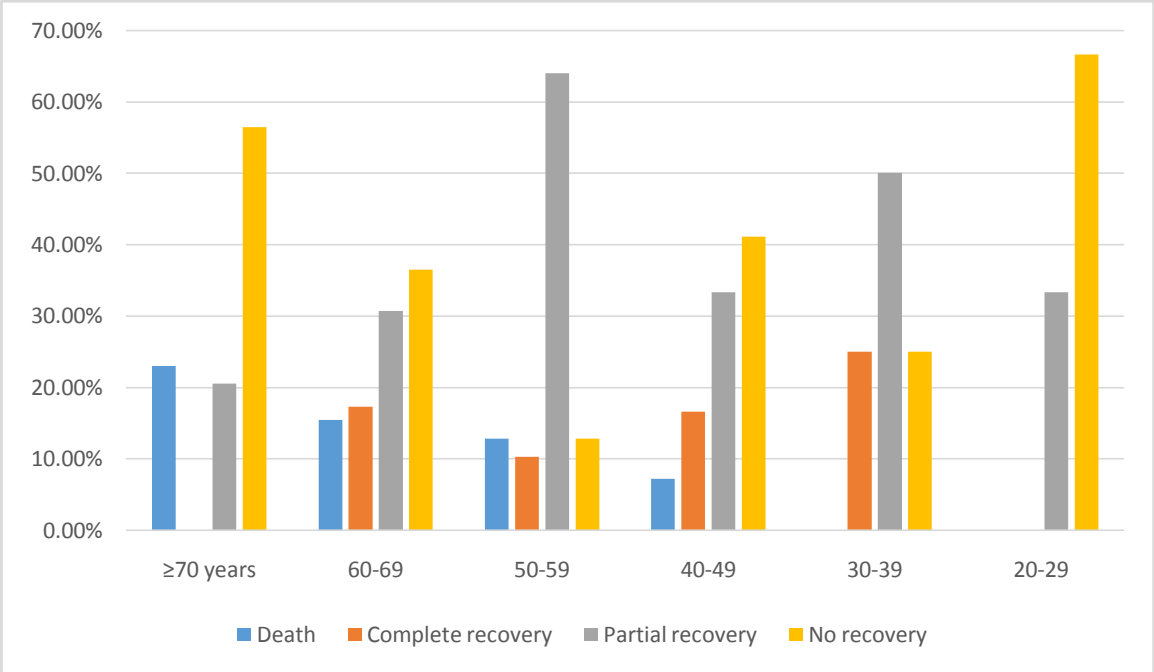

Figure 4: Bar diagram showing age distribution and oucome

Other risk factors:

Among 149 patients, 90 (60.4%) patients had hypertension, 49 (33%) patients had Diabetes Mellitus, 46 (30.8%) patients had Dyslipidemia, 40 (26%) patients were smokers, 23 (15.4%) patients were alcoholic, 18 (12%) patients had past history of stroke, 14 (9.3%) patients had coronary artery disease, 23(15.4%) patients had atrial fibrillation, 13 (8.7%) patients had family history of stroke, 104 (69.79%) had more than one risk factors.

Risk factors	No of patients	Percentage
Hypertension	90	60.4%
Diabetes Mellitus	49	33%
Dyslipidemia	46	30.8%
Smoking	40	26%
Alcohol	23	15.4%

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Coronary artery disease	14	9.3%
Atrial Fibrillation	23	15.4%
Past history of stroke	18	12%
Family history of stroke	13	8.7%
Multiple risk factors	104	69.79%

Table 3: Showing presence of risk factors

HYPERTENSION:

Among 149 patients, 90 (60.4%) had hypertension. Out of these 18 (20%) patients expired, 5 (5.5%) patients had complete recovery, 26 (28.8%) patients had partial recovery and 41 (45.5%) patients had no recovery at all.

Out of 59 non hypertensive patient in the study mortality was 5 (8.4%)

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%
Hypertension	90	18	20%	5	5.5%	26	28.8%	41	45.5%
Non hypertensives	59	5	8.4%	11	18.64%	30	50.8%	13	22.03%

Table 4: Showing outcome in relation to hypertension

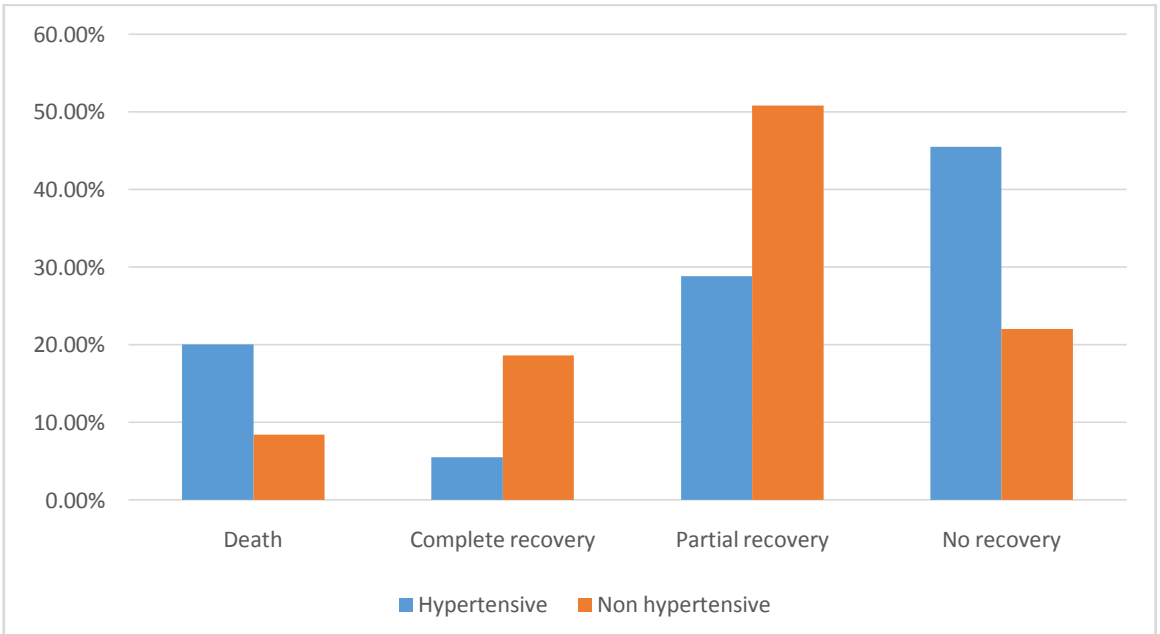

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Figure 5: Showing outcome in relation to hypertension

DIABETES MELLITUS:
Out of 149 patients, 49 (33%) had diabetes. Out of them 14 (28.5%) patients expired, 14 (28.5%) had partial recovery and 21 (42.8%) patients had no recovery at all.
Out of 100 non diabetic patient, 9 (9%) expired

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%
Diabetes mellitus	49	14	28.5%	-	-	14	28.5%	21	42.8%
Non diabetics	100	9	9%	16	16%	42	42%	33	33%

Table 5: Showing outcome in relation to diabetes

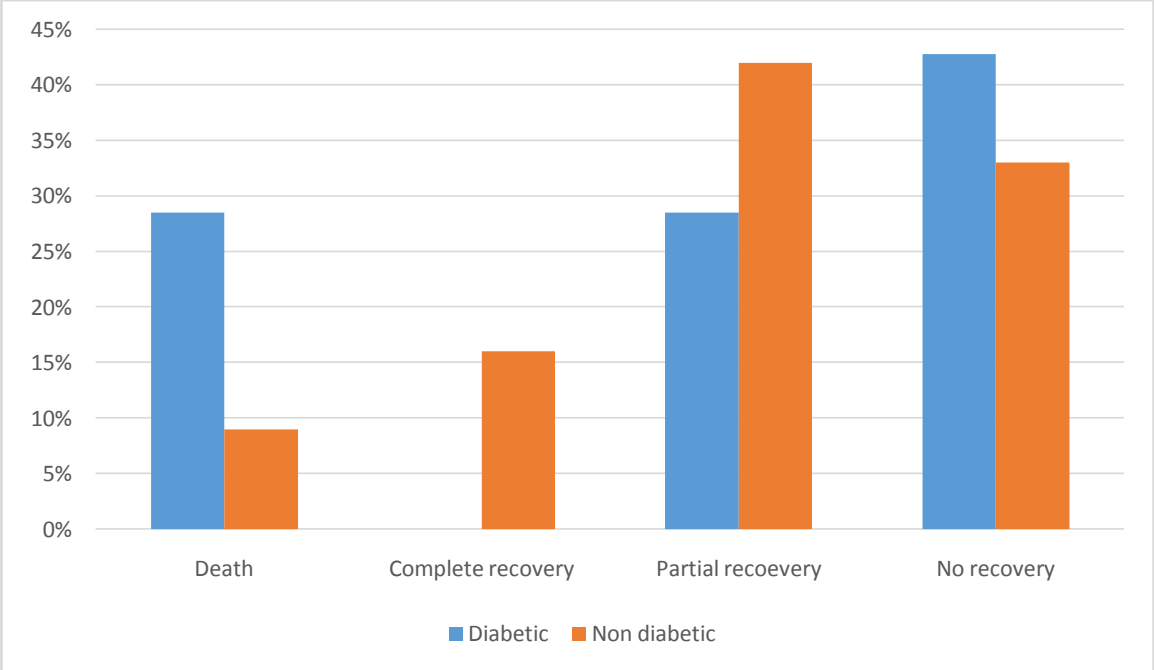

Figure 6: Showing outcome in relation to diabetes

DYSLIPIDEMIA :
Out of 149 patients,46 (30.8%) had dyslipidemia. Out of them 10 (21.7%) patients expired,14 (30.4%) had partial recovery and 22 (47.8%) patients had no recovery at all.
Out of 103 patients who did not had dyslipidemia, 13 (12.6%) expired

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%

Dyslipidemia	46	10	21.7%	-	-	14	30.4%	22	47.8%
Patient without dyslipidemia	103	13	12.6%	16	15.5%	42	40.7%	32	31%

Table 6: Showing outcome in relation to dyslipidemia.

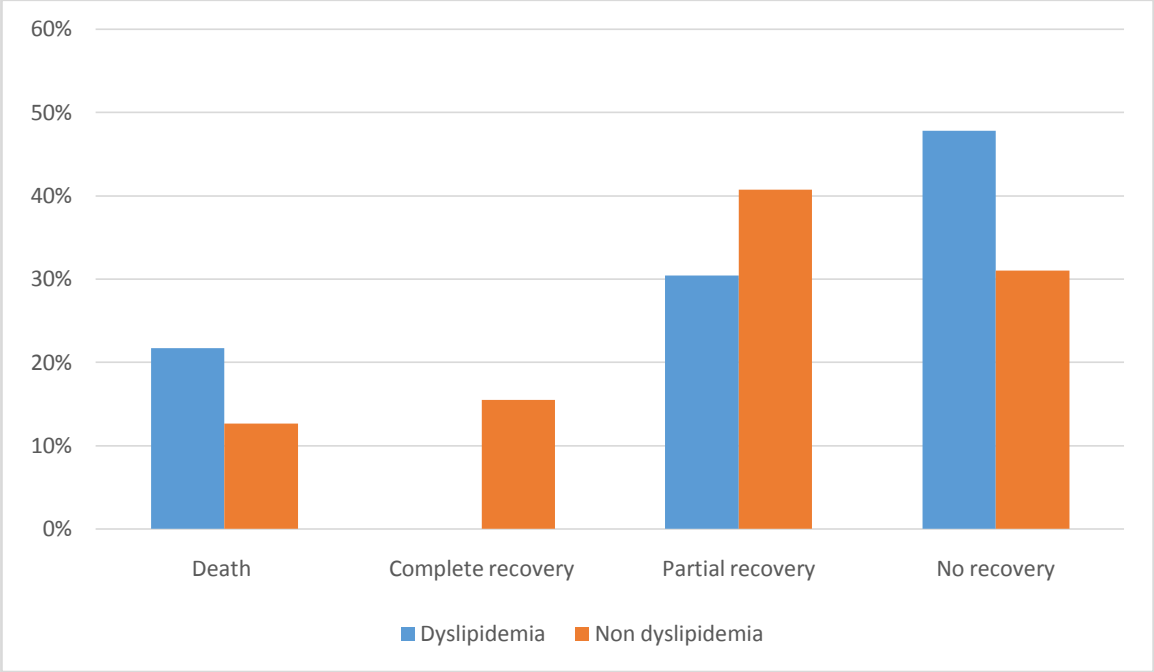

Figure 7: Showing outcome in relation to dyslipidemia

SMOKING:
Out of 149 patients, 40 (26%) were smokers. Out of them 7 (17.5%) patients expired, 3 (7.5%) had complete recovery, 12 (30%) had partial recovery and 18 (45%) patients had no recovery at all.
Out of 109 non smokers, death occurred in 16 (14.67%)

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%
Smoking	40	7	17.5%	3	7.5%	12	30%	18	45%
Non smoker	109	16	14.67%	13	11.92%	44	40.36%	36	33%

Table 7: Showing outcome in relation to smoking

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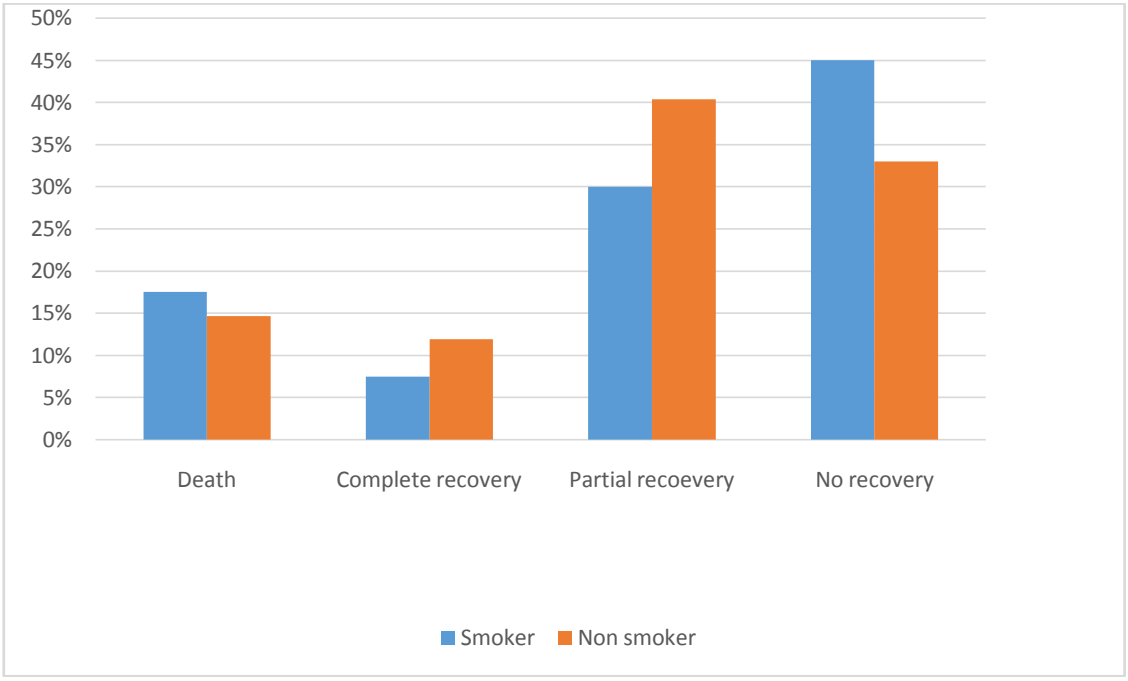

Figure 8: Showing outcome in relation to smoking

ALCOHOL:
Out of 149 patients, 23 (15.4%) were alcoholic. Out of them 6 (26%) patients expired, 2 (8.6%) had complete recovery, 6 (26%) had partial recovery and 9 (39.1%) patients had no recovery at all.
Out of 126 patients who were non alcoholic mortality was 17 (13.44%)

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%
Alcohol	23	6	26%	2	8.6%	6	26%	9	39.1%
Non alcoholics	126	17	13.44%	14	11.11%	50	39.6%	45	35.7%

Table 8: Showing outcome in relation to consumption of alcohol

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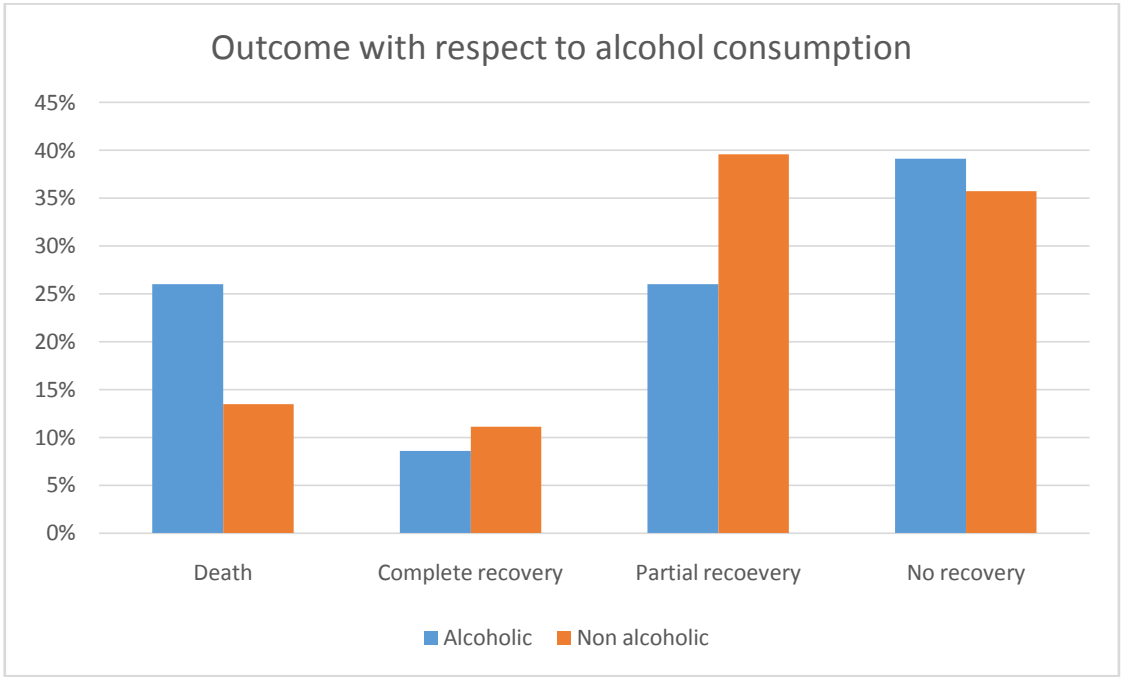

Figure 9: Showing outcome in relation to consumption of alcohol

CORONARY ARTERY DISEASE:

Out of 149 patients, 14 (9.3%) patients had coronary artery disease. Out of them 4 (28.5%) patients expired, 2 (14.28%) had complete recovery, 4 (28.5%) had partial recovery and 4 (28.5%) patients had no recovery at all.

Out of 135 patients who did not have coronary artery disease death occurred in 19 (14.07%)

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%
CAD	14	4	28.5%	2	14.28%	4	28.5%	4	28.5%
Patients without CAD	135	19	14.07%	14	10.37%	52	38.5%	50	37.03%

Table 9: Showing outcome in relation to presence or absence of coronary artery disease

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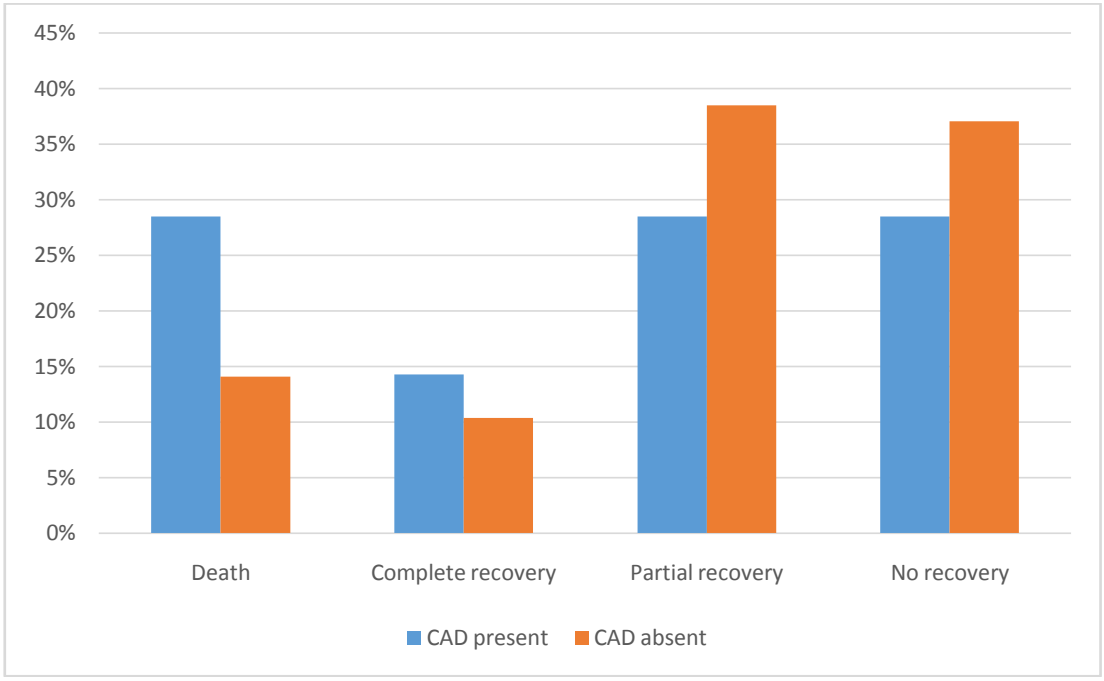

Figure 10: Showing outcome in relation to presence or absence of coronary artery disease

ATRIAL FIBRILLATION:

Out of 149 patients, 23 (15.4%) patients had atrial fibrillation. Out of them 5 (21.7%) patients expired, no one had complete recovery, 6 (26%) had partial recovery and 12 (52.17%) patients had no recovery at all.

Out of 126 patients who did not have coronary artery disease death occurred in 18 (14.28%)

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%
Atrial fibrillation	23	5	21.7%	0	0%	6	26%	12	52.17%
Patients without Atrial fibrillation	126	18	14.28%	16	12.7%	50	39.68%	42	33.3%

Table 10: Showing outcome in relation to atrial fibrillation

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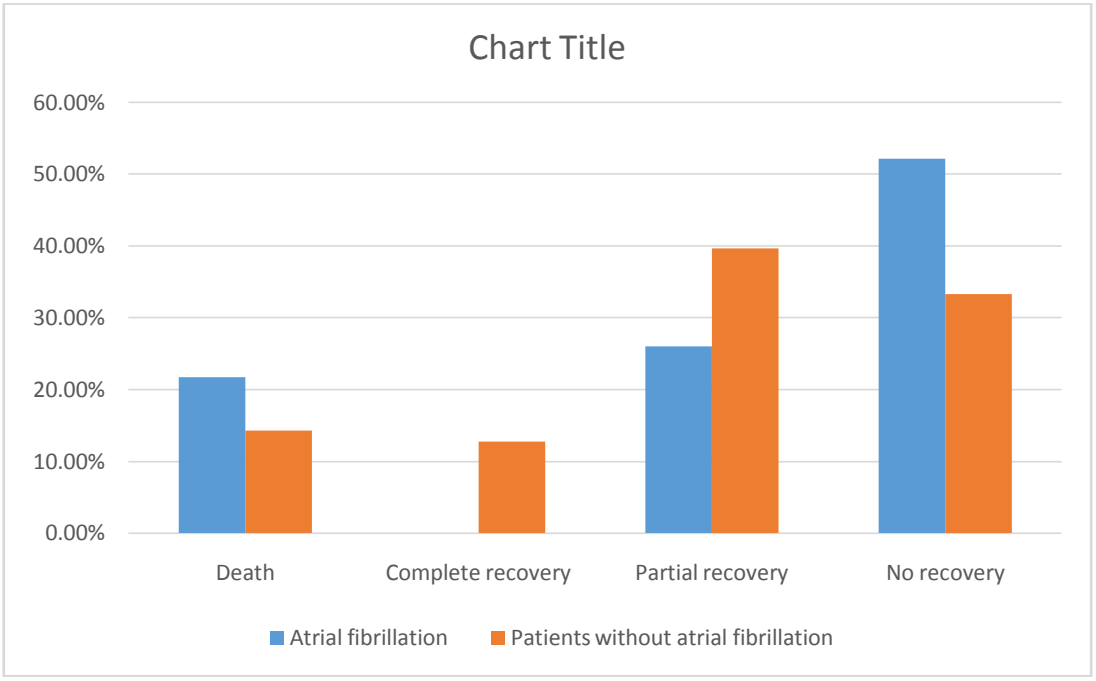

Figure 11: Showing outcome in relation to atrial fibrillation

FAMILY HISTORY OF STROKE :

Out of 149 patients, 13 (8.7%) had family history of stroke. Out of them 7 (53.8%) patients expired, no one had complete recovery, 2 (15.38%) had partial recovery and 4 (30.7%) patients had no recovery at all.

Out of 136 patients who did not have family history of stroke or myocardial infarction death occurred in 16 (11.76%)

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%
Family h/o stroke	13	7	53.8%		0%	2	15.38%	4	30.7%
Patients without family history of stroke	136	16	11.76%	16	11.76%	54	39.7%	50	36.7%

Table 11: Showing outcome in relation to presence of family history of stroke

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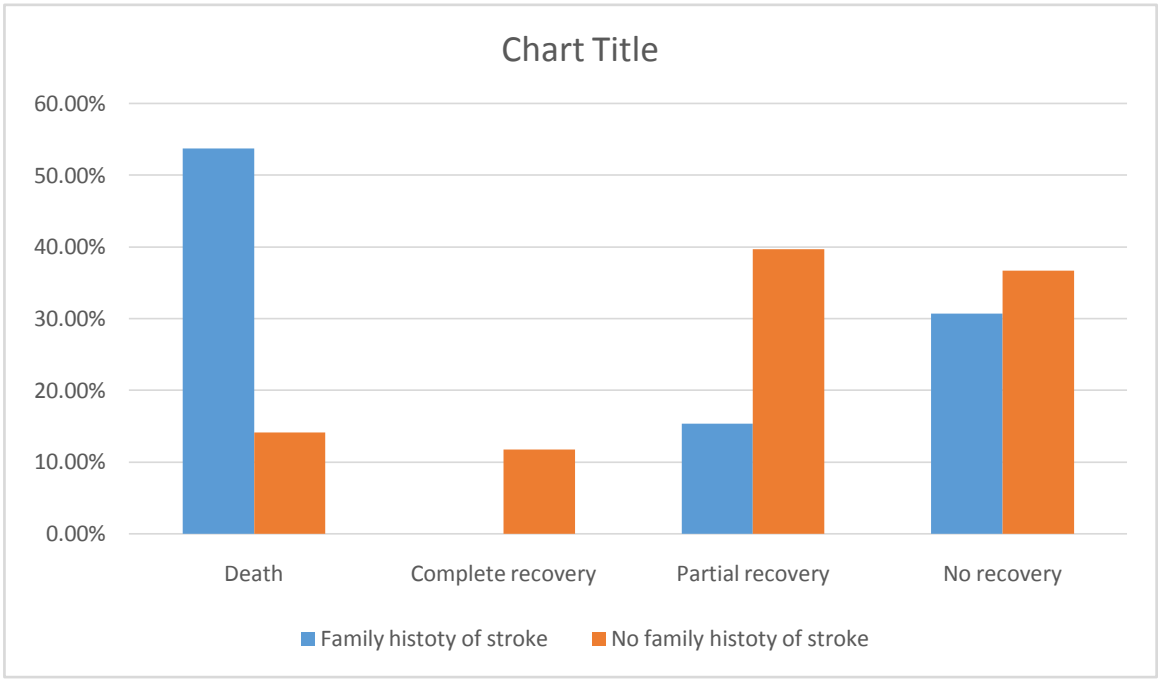

Figure 12: Showing outcome in relation to presence of family history of stroke

PAST HISTORY OF STROKE:

Out of 149 patients, 18 (12%) patients had past history of stroke. Out of them 6 (33.3%) patients expired, no patient had complete recovery, 5 (27.77%) had partial recovery and 7 (38.8%) patients had no recovery at all.

Out of 131 patients who did not have prior history of stroke death occurred in 17 (12.9%)

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%
Past history of stroke	18	6	33.3%	-	-	5	27.7%	7	38.8
Patients without prior past history of stroke	131	17	12.9%	16	12.2%	51	38.9%	47	35.8%

Table 12: Showing outcome in relation to presence of past history of stroke

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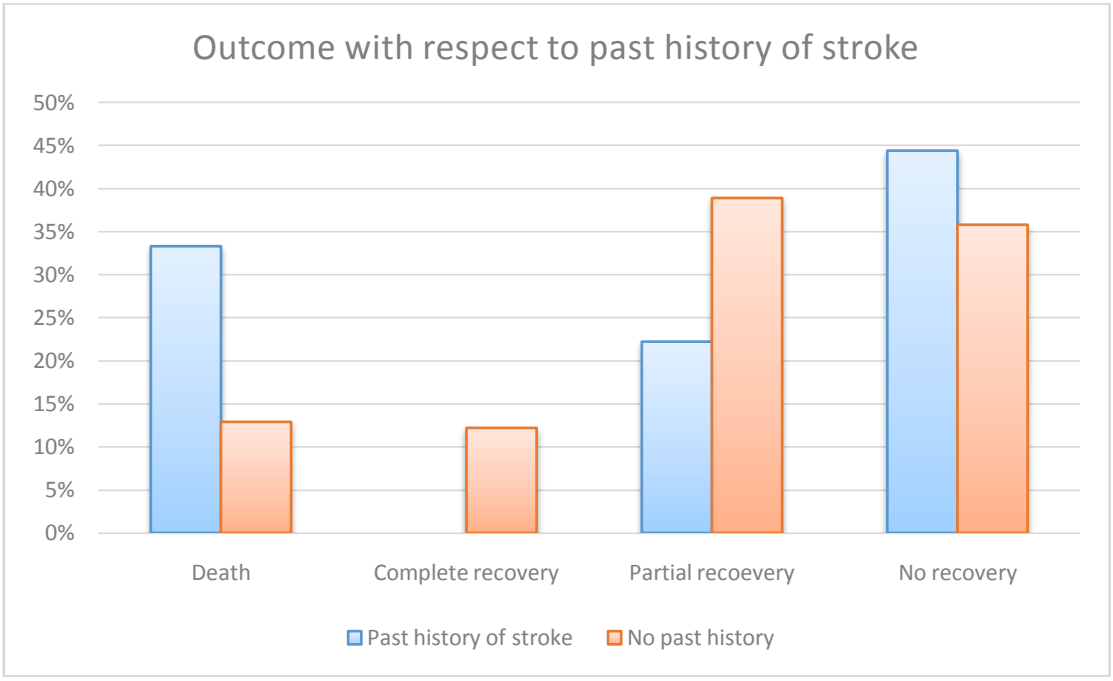

Figure 13: Showing outcome in relation to presence of past history of stroke

MULTIPLE RISK FACTORS:

Among 149 patients, 104 patients (69.79%) patients had multiple risk factors like age more than 60 years, hypertension, diabetes, dyslipidemia, smoking, alcohol intake, history of prior stroke, family history of stroke, coronary artery disease, atrial fibrillation etc.

Out of this, 19 patients (18.8%) expired, 45 (43.26%) patients had no recovery, 35 (33.6%) patients had partial recovery and 5 patients (4.8%) had complete recovery.

	Total	Expired		Complete recovery		Partial recovery		No recovery	
	No.	No.	%	No.	%	No.	%	No.	%
Multiple risk factors	104	19	18.8%	5	4.8%	35	33.6%	45	43.26%
Patients with ≤1 risk factor	45	4	8.8%	11	24.4%	21	46.6%	9	20%

Table 13: Showing outcome in relation to presence of multiple risk factors

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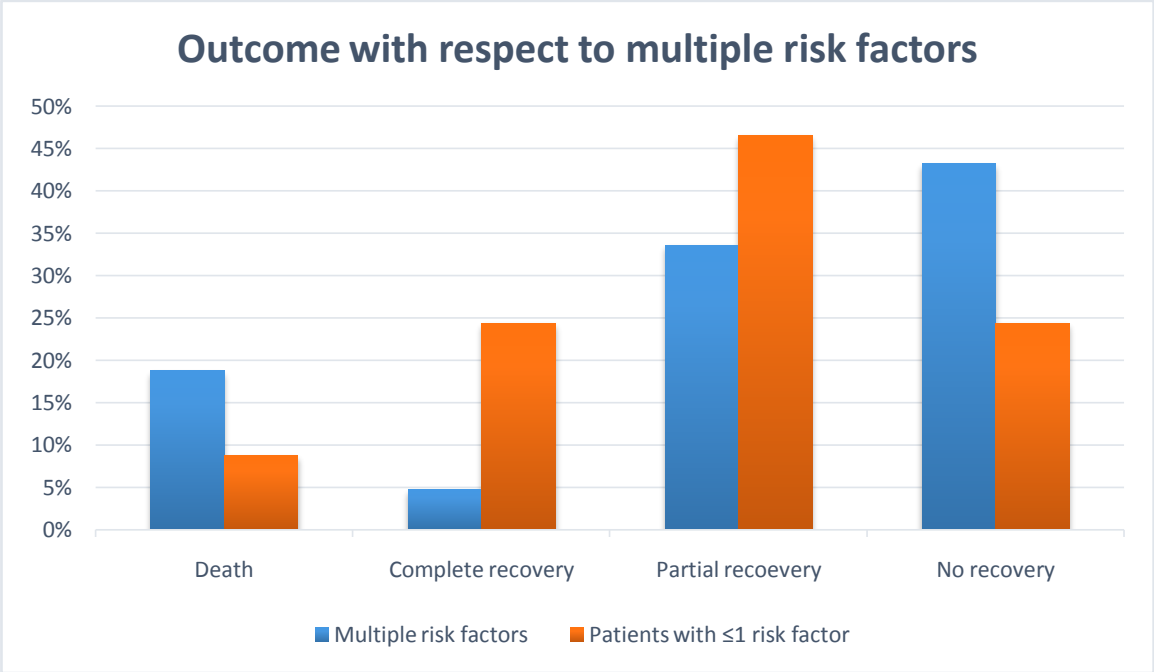

Figure 14: Showing outcome in relation to presence of multiple risk factors

COMPARISION OF RISK FACTORS IN RELATON TO MORTALITY:

Risk factors	Survivors (n=23)	Non-survivors (n=126)
Hypertension	18 (78.2%)	72 (57.14%)
Diabetes mellitus	14 (60.8%)	35 (27.7%)
Dyslipidemia	10 (43.4%)	36 (28.57)
Smoker	7 (30.4%)	33 (26.19%)
Alcohol intake history	6 (26%)	17 (13.4%)
Coronary artery disease	4 (17.3%)	10 (7.9%)
Atrial fibrillation	5 (21.7%)	18 (14.28%)

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Family history of stroke	7 (30.4%)	6 (4.7%)
Past history of stroke	6 (26%)	12 (9.5%)
Multiple risk factors	19 (82.6%)	85 (67.46%)

Table 14: Patient's risk factors in survivors and non survivors.

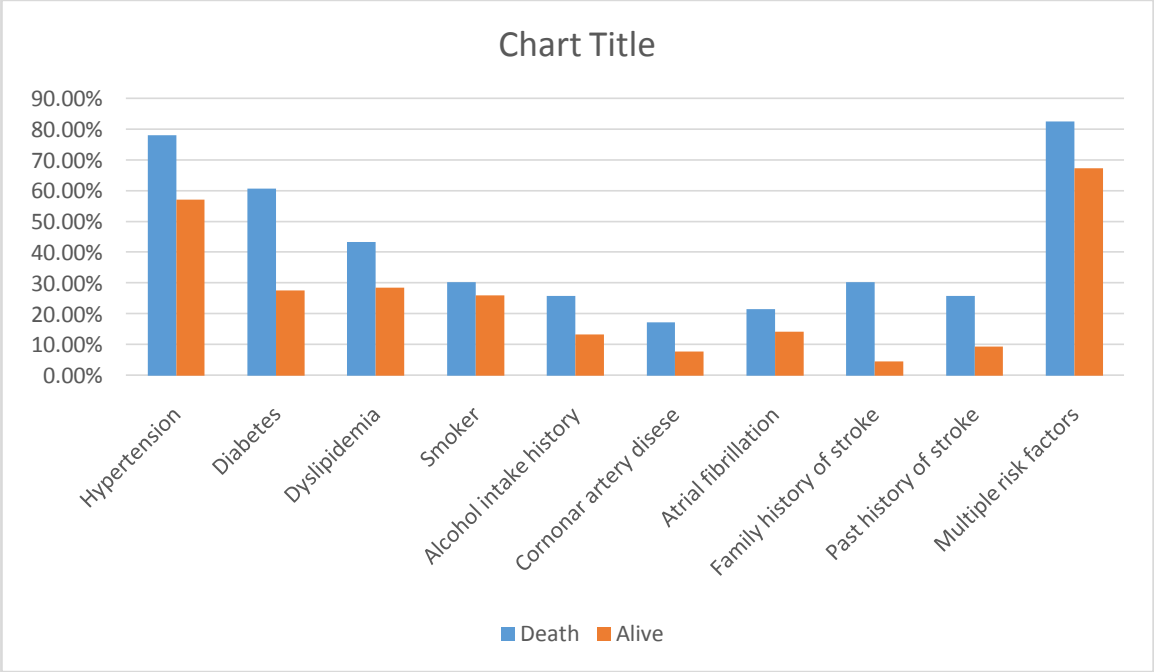

Figure 15: Patient's risk factors in dead and alive population

IV. DISCUSSION:

Stroke carries a major burden of mortality and morbidity in the society. Several studies documented that systemic hypertension, diabetes mellitus, hyperlipidemia, ischemic heart disease, alcohol intake, smoking are contributing factors for stroke. The prevalence of risk factors varies in different population. Inspite of numerous previous studies, risk factors much remains unknown and several inconsistencies continue to exist.

There is no definitive treatment of stroke which can guarantee a person full recovery and as such many people are left with permanent disability and so the aim is to prevent the risk factors that are associated with it.

Many of the risk factors have been consistently identified as predictor of stroke outcome whereas others are less consistent.

In our study, 149 patients were studied who were admitted in our institution from a period of 1st June, 2019 to 31st May 2020 and evaluated their risk factors and also the outcome in relation to the risk factors both modifiable and non modifiable such as age, sex, hypertension, diabetes, dyslipidemia, smoking, alcohol intake, past history of stroke, family history of stroke, coronary artery disease, atrial fibrillation etc. It was found to be more or less consistent with earlier studies.

SEX:

In the present study it was found that the ratio of ischemic stroke in male and female was 1.25:1

Among 149 patients, 83 (55.7%) were male and 66 (44.3%) were females which is comparable to the following studies. It was seen to be higher in males in Indian population which may be due to the fact that alcohol consumption and smoking was more in males as compared to females.

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Study	Ratio
(Dalal et al., 2008)	1.1:1
(Baidya, 2015)	1.29:1
(Zhang et al., 2011)	1.5:1
(Vaidya and Majmudar, 2015)	1.6:1
(Tan et al., 2014)	1.8:1
Present study	1.25:1

Table 15: Comparing sex ratio with previous studies

AGE:

Mean age of patient in our study was found to be 61 years, that was consistent with (Vaidya and Majmudar, 2015): 60.2 yrs and (Yao et al., 2012): 68 yrs .

It was seen that among 149 patients, 39 (26.17%) patients were over 70 years, 52 (34.9%) patients were in the age group of 60-69 years i.e majority of the cases 91 (61%) was above 60 years of age which is more or less consistent with previous study of (Shah et al., 2017) where cases over 60 years was 71%.

In the age group of over 70 years, 9 (23%) patients expired and in the age group of 60-69 years, 8 (15.38%) patients expired. Hence, it is seen that17 (38.38%) patients above 60 years which implies that advancing age is a risk factor for ischemic stroke and has a poor outcome.

HYPERTENSION:

In the present study 90 (60.4%) had hypertension. This can be compared with the following studies, a slight variability was seen among the studies probably due to variability in demography. Hypertension was found to be the most common risk factor in ischemic stroke. It may be concluded that strict control of blood pressure will definitely reduce the incidence of stroke.

Study	Result
(Tan et al., 2014)	47.2%
(Nayak et al., 2016)	70%
(Zhang et al., 2011)	75%
(Baidya, 2015)	68%
Present study	60.4%

Table 16: Comparing presence of hypertension with previous studies

DIABETES:

In our present study, 49 (33%) had diabetes. It was seen to be more in Indian population may be because of associated obesity and other co morbidities due to physical inactivity resulting from environment, lifestyle changes due to industrialization.

Study	Result
(Tan et al., 2014)	24.3%
(Baidya, 2015)	37%
(Zhang et al., 2011)	31%
Present study	33%

Table 17: Comparing presence of diabetes with previous studies

SMOKING:
In the study 40 (26%) were smokers. This was found to be consistent with (Zhang et al., 2011)

Study	Result
(Tan et al., 2014)	38.9%
(Zhang et al., 2011)	23.3%
Present study	26%

Table 18:Comparing smoking history with previous studies

ALCOHOL:
In this study, 23 (15.4%) were alcoholic which is found to be more or less consistent with earlier studies as discussed below. A major limitation in the study was that amount of alcohol consumed could not be specified.

Study	Result
(Zhang et al., 2011)	15.9%
(Vaidya and Majmudar, 2015)	6.5%
(Tan et al., 2014)	15.1%
(Nayak et al., 2016)	11%
Present study	15.4%

Table 19: Comparing alcohol consumption history with previous studies

DYSLIPIDEMIA:
In the present study 46 (30.8%) had dyslipidemia.

Study	Result
(Tan et al., 2014)	42.6
(Basri et al., 2003)	31.3%
Present study	30.8%

Table 20: Comparing presence of dyslipidemia with previous studies

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FAMILY HISTORY OF STROKE

13 (8.72%) had family history of stroke. It was more or less consistent with previous studies.

(Zhang et al., 2011)	9.8%
(Tan et al., 2014)	5.5%
Present study	8.72%

Table 21: Comparing presence of family history of stroke with previous studies

CORONARY ARTERY DISEASE

Among 149 patients,14 (9.3%) patients had coronary artery disease. It was slightly less compared to following studies. With high prevalence of diabetes, hypertension , dyslipidemia, alcohol and smoking history, the presence of CAD should have been more compared to previous studies but it was seen to be less which may be due to the fact that only admitted patients were taken into our study and patients that expired beforehand were not included.

Study	
(Zhang et al., 2011)	16.67%
(Roquer et al., 2007)	13.1%
Present study	9.3%

Table 22: Comparing presence of coronary artery disease with previous studies

ATRIAL FIBRILATION

Among 149 patients, 23 (15.4%) had atrial fibrillation. It was comparable to the study of (Saposnik et al., 2013) (17.2%)

In this study, a major limitation was that patients were not segregated among those who were in anticoagulation prophylaxis or not.

(Saposnik et al., 2013)	17.2%
(Morgenstern et al., 2013)	14.9%
Present study	15.4%

Table 23: Comparing presence of atrial fibrillation with previous studies

PAST HISTORY OF STROKE

Among 149 patients 18 (12%) patients had past history of stroke. It was found to be highly variable due to different rates of follow up and risk factor modification among patients with past history of stroke.

Study	
(Basri et al., 2003)	15.3%
(Nayak et al., 2016)	6%
Present study	12%

Table 24: Comparing presence of past history of stroke with previous studies

MULTIPLE RISK FACTORS

Out of 149 patients, 104 patients (70%) patients had multiple risk factors. It was comparable with study of (Ong et al., 2016) where multiple risk factors was found to be 78 %

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Study	
(Ong et al., 2016)	78%
Present study	70.46%

Table 25: Comparing presence of multiple risk factor with previous studies

IN HOSPITAL MORBIDITY :

It is seen from the study that mortality and morbidity was consistently very high among all the risk factors. This is due to the fact that we analysed patients till hospital stay. Morbidity will decrease in further followup in relation to individual risk factors as there would be complete recovery in some patients and some others will expire.

A contrasting feature was that morbidity in patients with multiple risk factors was low compared to individual morbidity of atrial fibrillation and dyslipidemia, the reason being increased mortality in patients with multiple risk factors.

Risk factors	Partial recovery	No recovery	Total morbidity
Age (>70 years)	20.5%	56.4%	76.9%
Male	39.75%	33.7%	73.5%
Female	34.8%	39.9%	74.7
Hypertension	28.8%	45.5%	74.3%
Diabetes Mellitus	25.5%	42.8%	71.3 %
Dyslipidemia	30.4%	47.8%	78.2%
Smoking	30%	45%	75%
Alcohol	26%	39%	65%
CAD	28.2%	28.2%	57%
Atrial Fibrillation	26%	57.17%	83%
Past history of stroke	27.7%	38.8%	66.5%
Family history of stroke	15.38%	30.7%	46%
Multiple risk factors	43.26%	33.6%	76.9%

Table 26: Showing morbidity in relation to risk factors

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IN HOSPITAL MORTALITY:

Risk factors	Non-survivors (N=23)	(Kortazar- Zubizarreta et al., 2019)	(Ong et al., 2016)	(Nedeltchev et al., 2010)
Hypertension	18 (78.2%)	70.21%	82.5%	80%
Diabetes mellitus	14 (60.8%)		46.3%	
Dyslipidemia	10 (43.4%)		41.3%	54%
Smoker	7 (30.4%)	25.5%		23%
Alcohol intake history	6 (26%)			
Coronary artery disease	4 (17.3%)	14.89%		
Family history of stroke	7 (30.4%)			38%
Past history of stroke	6 (26%)	34%	31.3%	
Multiple risk factors	19(82.6%)			
Atrial fibrillation	5 (21.7%)	22.3% (Saposnik et al., 2013)		

Table 27: Comparing mortality in relation to risk factors with previous studies

V. SUMMARY:

The following salient features have been noted during the study-

- Out of 149 patients, 23 expired.
- Male : Female ratio was found to be 1.25:1
- Mortality was more or less similar in both groups with 14.45% and 16.66% in male and female respectively.
- Majority of the cases (61%) were above 60 years of age and high mortality was seen in this group.
- It was seen that patients with low GCS score and high MRS score at presentation had bad prognosis and also higher GCS score at presentation reflecting favourable outcome on day 7 assessed by Modified Rankin scale.
- Among all risk factors, 60.4% patients were hypertensive, 33% patients had Diabetes Mellitus, 30.8% patients had Dyslipidemia, 12% patients had past history of stroke, 9.3% patients had coronary artery disease, 15.4% patients had atrial fibrillation, 8.7% patients had family history of stroke, 69.79% had more than one risk factors.
- 26% cases were smokers and 15.2% had history of consumption of alcohol.
- Among patients that expired, 78.2 % were hypertensives, 60.8% had diabetics, 43.4% had dyslipidemia, 30.4% were smokers, 26% had history of alcohol intake, 17.3% had coronary artery disease, 21.7% had atrial fibrillation, 30.4% had family history of stroke, 26% had past history of stroke, 82.6% had multiple risk factors.
- Out of 23 cases that expired, 19 (82.6%) had more than one risk factors.

VI. CONCLUSION:

- The prevalence of stroke was more among the elderly population with peak after 60 years.
- Males were affected more than females.
- The most common modifiable risk factors were hypertension, diabetes mellitus, dyslipidemia.
- Commonest non modifiable risk factors were age, sex and family history of stroke.
- In the present study, factors predicting poor outcome were: hypertension, diabetes mellitus, dyslipidemia, coronary artery disease, low GCS score, and high MRS score at presentation.
- Hypertension was the most common risk factor and mortality and morbidity associated with ischemic stroke. Proper reforms to be made to identify undiagnosed hypertension and initiate early treatment and also compliance to be checked.
- It was seen that 12% cases had past history of stroke. So patients with previous history of stroke should be followed regularly and all other risk factors to be modified.
- Presence of multiple risk factors was related to poor prognosis.
- Atrial fibrillation was present as a risk factor in 15.4% and was associated with high mortality and morbidity, hence patients with atrial fibrillation should be identified early and anti coagulation prophylaxis should be initiated as per guidelines.

ABBREVIATIONS

ACA	Anterior Cerebral Artery.
AF	Atrial fibrillation
AMI	Acute myocardial infarction
AMP	Adenosine Monophosphate
ATP	Adenosine triphosphate
BP	Blood Pressure.
BBB	Blood Brain Barrier
CBF	Cerebral blood flow
CCA	Common Carotid Artery.
CSF	Cerebrospinal Fluid.
CT	Computed Tomography.
CVA	Cerebrovascular Accident.
CXR	Chest X- ray
DALY	Disability Adjusted Life Year.
DM	Diabetes Mellitus.
DVT	Deep Venous Thrombosis
ECG	Electrocardiogram.
FBS	Fasting Blood Sugar.
GCS	Glasgow Coma Scale.
Hb	Hemoglobin.
HbA_1C	Glycosylated Hemoglobin.
HDL	High Density Lipoprotein.
HIV	Human Immunodeficiency Virus
HTN	Hypertension.
ICA	Internal Carotid Artery.
ICH	IntracerebralHemorrhage.
ICP	Intracranial Pressure.
INR	International Normalised Ratio.
LDL	Low Density Lipoprotein.
LFT	Liver Function Test
MCA	Middle Cerebral Artery.
MRA	Magnetic Resonance Arteriogram.
MRI	Magnetic Resonance Imaging.
MRS	Modified Rankin Scale
MRV	Magnetic Resonance Venography.
NMR	Nuclear Magnetic Resonance
PET	Positron Emission Tomography
PCA	Posterior Cerebral Artery.
PICA	Posterior Inferior Cerebellar Artery.
PPBS	Post Prandial Blood Sugar.
PT	Prothrombin Time.
RBS	Random Blood Sugar.
RFT	Renal Function Test
rtPA	recombinant tissue Plasminogen Activator
SAH	Sub Arachnoid Hemorrhage.
SBP	Systolic Blood Pressure.
SCA	Superior Cerebellar Artery
TIA	Transient Ischemic Attack
TSH	Thyroid Stimulating Hormone
VLDL	Very Low Density Lipoprotein.
WHO	World Health Organization

BIBLIOGRAPHY

[1]. Adams Jr, H.P., Bendixen, B.H., Kappelle, L.J., Biller, J., Love, B.B., Gordon, D.L. and Marsh 3rd, E.E., 1993. 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, 24(1), pp.35-41.

[2]. Adams Jr, H.P., Del Zoppo, G., Alberts, M.J., Bhatt, D.L., Brass, L., Furlan, A., Grubb, R.L., Higashida, R.T., Jauch, E.C., Kidwell, C. and Lyden, P.D., 2007. 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. Stroke, 38(5), pp.1655-1711.Aggarwal, A. et al. (2010) 'Cerebral ischemic stroke: sequels of cascade', International Journal of Pharma and Bio Sciences, 1(3), pp. 1–24.

[3]. Aho, K., Harmsen, P., Hatano, S., Marquardsen, J., Smirnov, V.E. and Strasser, T., 1980. Cerebrovascular disease in the community: results of a WHO collaborative study. Bulletin of the World Health Organization, 58(1), p.113.

[4]. Baidya, O. P. (2015) 'Acute ischemic stroke in young adults-a hospital based study in North

[5]. Chiuve, S.E., Rexrode, K.M., Spiegelman, D., Logroscino, G., Manson, J.E. and Rimm, E.B., 2008. Primary prevention of stroke by healthy lifestyle. Circulation, 118(9), p.947.

[6]. Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Green, L.A., Izzo Jr, J.L., Jones, D.W., Materson, B.J., Oparil, S., Wright Jr, J.T. and Roccella, E.J., 2003. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. hypertension, 42(6), pp.1206-1252.

[7]. Dalal, P.M., Malik, S., Bhattacharjee, M., Trivedi, N.D., Vairale, J., Bhat, P., Deshmukh, S., Khandelwal, K. and Mathur, V.D., 2008. Population-based stroke survey in Mumbai, India: incidence and 28-day case fatality. Neuroepidemiology, 31(4), pp.254-261.

[8]. Daniel, W. W. and Cross, C. L. (2018) Biostatistics: a foundation for analysis in the health sciences. Wiley.

[9]. Kortazar- Zubizarreta, I., Pinedo- Brochado, A.,

Azkune- Calle, I., Aguirre- Larracoechea, U., Gomez- Beldarrain, M. and Garcia- Monco, J.C., 2019. Predictors of in- hospital mortality after ischemic stroke: A prospective, single- center study. Health science reports, 2(4), p.e110.

[10]. Mackay, J. and Mensah, G. A. (2004) The atlas of heart disease and stroke. World Health Organization.

[11]. Morgenstern, L.B., Smith, M.A., Sanchez, B.N., Brown, D.L., Zahuranec, D.B., Garcia, N., Kerber, K.A., Skolarus, L.E., Meurer, W.J., Burke, J.F. and Adelman, E.E., 2013. Persistent ischemic stroke disparities despite declining incidence in Mexican Americans. Annals of neurology, 74(6), pp.778-785.

[12]. Nayak, A.R., Badar, S.R., Lande, N., Kawle, A.P., Kabra, D.P., Chandak, N.H., Raje, D.V., Singh, L.R., Daginawala, H.F. and Kashyap, R.S., 2016. Prediction of outcome in diabetic acute ischemic stroke patients: a hospital-based pilot study report. Annals of neurosciences, 23(4), pp.199-208.

[13]. Nedeltchev, K., Renz, N., Karameshev, A., Haefeli, T., Brekenfeld, C., Meier, N., Remonda, L., Schroth, G., Arnold, M. and Mattle, H., 2010. Predictors of early mortality after acute ischaemic stroke. Swiss medical weekly, 140(17-18), pp.254-259.

[14]. Ong, C.T., Sung, S.F., Wong, Y.S., Wu, C.S., Hsu, Y.C., Su, Y.H., Li, C.H. and Hung, L.C., 2016. Risk factors for in-hospital mortality among ischemic stroke patients in southern Taiwan. International Journal of Gerontology, 10(2), pp.86-90.

[15]. Pandian, J. D. and Sudhan, P. (2013) 'Stroke epidemiology and stroke care services in India', Journal of stroke, 15(3), p. 128.

[16]. Roquer, J., Ois, A., Rodríguez-Campello, A., Gomis, M., Munteis, E., Jiménez-Conde, J., Cuadrado-Godia, E. and Martinez-Rodriguez, J.E., 2007. Atherosclerotic burden and early mortality in acute ischemic stroke. Archives of neurology, 64(5), pp.699-704.

[17]. Saposnik, G., Gladstone, D., Raptis, R., Zhou, L. and Hart, R.G., 2013. Atrial fibrillation in ischemic stroke: predicting response to thrombolysis and clinical outcomes. Stroke, 44(1), pp.99-104.

[18]. Smith, W.S., Johnston, S.C., Hemphill, J.C., (2018) 'Cerebrovascular Diseases', Harrison's principles of Internal Medicine, 20th edition: McGraw Hill Education, pp 3068-3091.

[19]. Vaidya, C. V. and Majmudar, D. K. (2015) 'A clinical study of ischemic stroke from capital of Gujarat, India', Sahel Medical Journal, 18(4), p. 177.

[20]. Warlow, C. (2001) 'Stroke, transient ischaemic attacks and intracranial venous thrombosis', Brain's Diseases of the Nervous System, pp. 775–896.

[21]. Yao, X.Y., Lin, Y., Geng, J.L., Sun, Y.M., Chen, Y., Shi, G.W., Xu, Q. and Li, Y.S., 2012. Age-and gender-specific prevalence of risk factors in patients with first-ever ischemic stroke in China. Stroke Research and Treatment, 2012.

[22]. Zhang, J., Wang, Y., Wang, G.N., Sun, H., Sun, T., Shi, J.Q., Xiao, H. and Zhang, J.S., 2011. Clinical factors in patients with ischemic versus hemorrhagic stroke in East China. World journal of emergency medicine, 2(1), p.18.