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A STUDY OF CLINICAL PROFILE, RISK FACTORS AND DRUG UTILIZATION PATTERN IN CEREBROVASCULAR STROKE

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ABSTRACT

Background: Stroke continues to be one of the leading causes of mortality and morbidity worldwide. Each year, stroke occurs in 30.9 million individuals worldwide and is responsible for ~4 million deaths. Stroke is a disease of multifactorial aetiology that may develop as an end state in patients with serious vascular conditions—most notably, uncontrolled arterial hypertension. Apart from death, the greatest burden of stroke is serious long-term physical and mental disability. Stroke has deleterious effects on quality of life. Chronic arterial hypertension is the most significant modifiable risk factor for stroke. Other risk factors include diabetes mellitus, dyslipidaemia, smoking, alcohol consumption, atrial fibrillation. Treatment of elevated blood pressure during acute stroke must balance the theoretical risk of worsening the stroke due to reduced cerebral perfusion against the benefits of lowering blood pressure (reduced risk of haemorrhage, cerebral oedema, and other end-organ damage). Study of risk factors and drug-prescribing pattern can give insight into the trends in using the drugs in cerebrovascular stroke in treating their co-morbid conditions. The knowledge of drug utilization pattern can lead us towards the rational drug use and help to take measures to improve prescribing habits. Risk factors modification remains as the principal aspect of care for stroke prevention. Understanding of risk factors has advanced and several options are now available to treat modifiable risk factors. However, effective treatment remains a challenging task in clinical practice. **Objectives: Primary:** To study the clinical profile and prevalence of cerebrovascular stroke. **Secondary:** To evaluate the risk factors and drug utilization pattern in cerebrovascular stroke**. Study Design:** A Cross Sectional study was carried out in the General Medicine Department, MIMS Teaching Hospital, Mandya, Karnataka, using a well-designed patient proforma. **Results:** In this study, among 70 cases of cerebrovascular stroke analysed, the incidence of stroke was more common in male n=50 (60.6%) and n=20 (39.4%) were females. In this study 2 types of stroke was identified, 59 Ischemic stroke and 11 haemorrhagic stroke patients. Most of the patients diagnosed with stroke are in age group of 61-70 (38.57%). The most common co-morbid conditions were hypertension 34 (48.57%), diabetes mellitus 8 (11.42%) and a combination of hypertension, diabetes, dyslipidaemia 12 (17.14%) patients. The prescription pattern of various drugs were found to be as – antiplatelet drugs 59 (84.28%), anti-hyperlipidemic drugs 70 (100%), anti-diabetics 38(54.28%) antibiotics 57 (81.42%), anti-anginal drugs 25 (35.71%), antihypertensives 70 (100%), anticoagulants 12 (17.14%), diuretics 45 (64.28%) and bronchodilators 25 (35.71%). The average number of drugs per prescription was found to be 7.55. The most commonly prescribed drug classes in cerebrovascular stroke were anti-hyperlipidemic drugs, anti-hypertensives, antiplatelet drugs. **Conclusion:** The incidence of stroke was more common in male compared to female. Diabetes Mellitus, Hypertension, Hyperlipidaemia, Smoking and alcohol consumption are the risk factors for developing cerebrovascular stroke. Effective treatment in stroke remains a challenging task in clinical practice. Identifying and modifying key risk factors is crucial to reducing the morbidity and mortality of stroke. Computed tomography remains an appropriate imaging technique in the early assessment of most stroke patients.

KEYWORDS: Cerebrovascular stroke, Arterial Hypertension, Atrial Fibrillation, Dyslipidaemia, Drug Utilization pattern, Computed Tomography.

INTRODUCTION

Stroke, also known as cerebrovascular accident (CVA) occurs when poor blood flow to the brain results in cell death. There are two main types of stroke: ischemic, due to lack of blood flow caused by blockage (thrombosis, arterial embolism), or a haemorrhagic, due to bleeding. As a result the affected part of the brain cannot functioning properly, which might result in an inability to move one or more limbs, inability to understand or

formulate speech, or an inability to see one side of the visual field.[1,2]

A stroke or cerebrovascular accident is defined as the rapid loss of brain function due to disturbance in the blood vessels supplying to the brain.[1] In 2013 approximately 6.9 million people had an ischemic stroke and 3.4 million people had a haemorrhagic stroke.[3] In 2013, stroke was the second most frequent cause of death after coronary artery disease, accounting for 6.4 million deaths (12% of the total). About 3.3 million deaths resulted from ischemic stroke while 3.2 million deaths resulted from hemorrhagic stroke. Overall, two thirds of strokes occurred in those over 65 year's old.[4]

Among all the neurologic diseases of adult life, the cerebrovascular diseases clearly rank first in frequency and importance. It is one of the leading causes of morbidity and mortality. They compose about 50% of all neurological hospital admission. WHO defined Stroke as 'Rapidly developed clinical signs of focal disturbance of cerebral function, lasting morethan 24 hours or leading to death, with no apparent cause other than vascular region. The cerebrovascular diseases occur predominantly in the middle and late years of life and the incidence of stroke increases with age. Thus, the disability affects many people in their '' golden years.''. A stroke is the acute neurologic injury occurring as a result of one of these pathologic processes and is manifested either as brain infarction or haemorrhage.[5, 6]

Although the prevalence of stroke appears to be comparatively less in India, but it is increasing proportionally with increase in life expectancy. Proportion of young stroke is significantly more in India. Various risk factors are associated with stroke, especially atherosclerotic risk factors. This study was undertaken to know the various types of strokes and the associated risk factors and their frequencies. Various diagnostic modalities have been applied to the radiologic evaluation of cerebral infarction. With the introduction of Cranial Computed Tomography, a non-invasive technique has been made available to not only precisely demarcate the area of encephalomalecia, but also to accurately and safely follow the natural course of cerebral infarction. The diagnostic value of Computed Tomography in patients with occlusive disease of the cerebral vessels is undisputed. In a great number of the patients, the demonstration of the infarct as well as its precise location and extent are possible. CT enables us also to diagnose the kind of infarct and to differentiate between infarct and hematoma.[6]

RISK FACTORS FOR STROKE

The most important modifiable risk factors for stroke are high blood pressure and atrial fibrillation.[7] Other modifiable risk factors include high blood cholesterol levels, diabetes mellitus, cigarette smoking (active and passive), drinking lots of alcohol and drug use, lack of physical activity, obesity and unhealthy diet.[8] Alcohol use could predispose to ischemic stroke, and intracerebral and subarachnoid hemorrhage via multiple mechanisms (for example via hypertension, atrial fibrillation, rebound thrombocytosis and platelet aggregation and clotting disturbances).[9] High levels of physical activity reduce the risk of stroke by about 26%.[10]

Hypertension

High blood pressure accounts for 35-50% of stroke risk. Blood pressure reduction of 10 mmHg systolic or 5 mmHg diastolic reduces the risk of stroke by ~40%. Lowering blood pressure has been conclusively shown to prevent both ischemic and haemorrhagic strokes.[11] It is equally important in secondary prevention. Even patients older than 80 years and those with isolated systolic hypertension benefit from antihypertensive therapy.[12] Prospective epidemiologic study has identified hypertension as the major risk factor for stroke with incidence of stroke rising in direct relation to the level of blood pressure.[13] Hypertension, defined as elevation in blood pressure above 140 mm Hg systolic or 90 mm Hg diastolic, afflicts 25% of the general population and is the premier risk factor for serious diseases affecting the brain, heart, and kidneys.[14] The brain is a major target of the deleterious effects of hypertension and is responsible for a large portion of the related mortality and morbidity. Hypertension is the number one risk factor for stroke and is a leading cause of cognitive decline and dementia.[15]

There is a linear relationship between blood pressure and stroke mortality and in patients with treated hypertension, a 1 mm Hg increase in systolic blood pressure increases stroke deaths by 2%. Hypertension Alters the Structure of Cerebral Blood Vessels Atherosclerosis and Lipohyalinosis. Hypertension promotes formation of atherosclerotic plaques in cerebral arteries and arterioles, which may lead to arterial occlusions and ischemic injury. In addition, hypertension induces fibrinoid necrosis (lipohyalinosis) of penetrating arteries and arterioles supplying the white matter, resulting in small white matter infarcts (lacunes) or brain haemorrhage (Figure 3).[16]

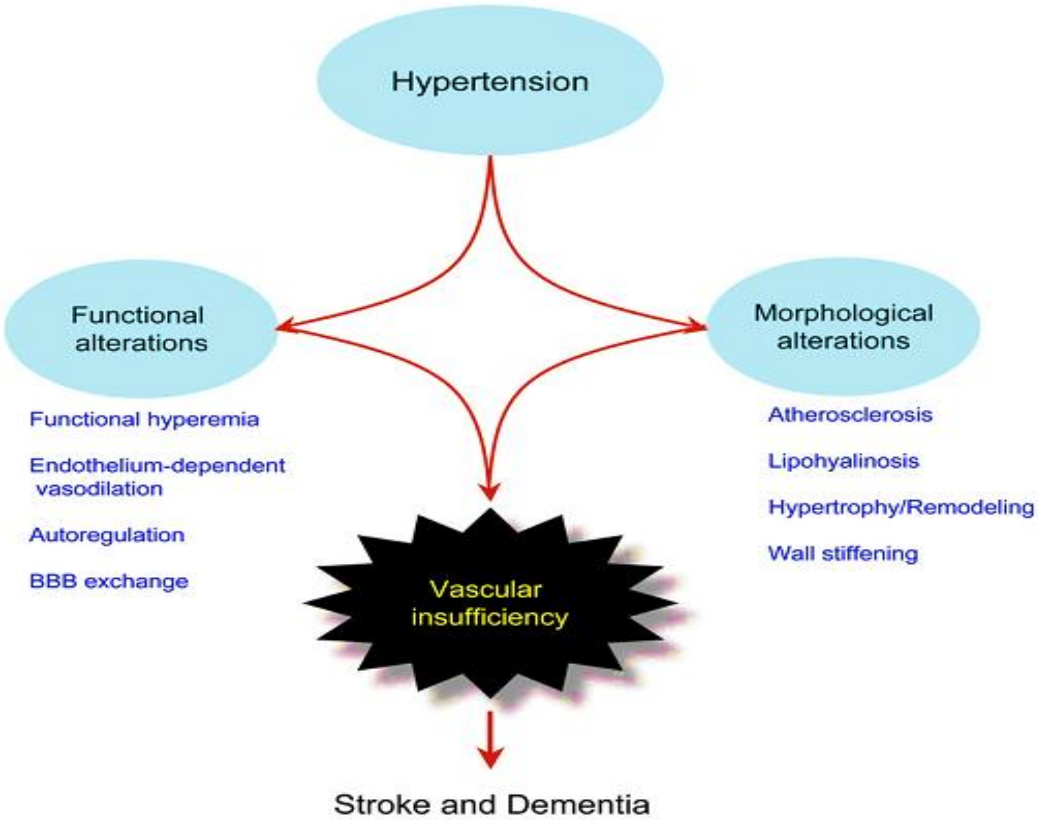

Fig 1: Effects of Hypertension on the Cerebral Blood Vessels.

Hypertension is a common early finding in patients who have experienced an acute ischemic stroke. It occurs both in patients who were normotensive and in those who were receiving antihypertensive therapy before the stroke. In many cases the hypertension that follows an ischemic stroke is transient, often lasting 24–48 hours. The blood pressure rise is due to 1 or more of the following mechanisms: impaired neurogenic cardiovascular control, autonomic dysregulation, baroreflex failure, increased sympathetic drive, reflex response to cerebral ischemia and mental stress.[17] Patients with lacunar infarcts — subcortical lesions more common in hypertensive and diabetic patients — tend to have milder neurologic deficits and higher baseline blood pressures but a better clinical outcome than patients with either atherothrombotic or cardio embolic stroke of the anterior or posterior circulation.[18]

Patients with lacunar infarcts more often die of cardiac complications, whereas those with atherothrombotic or cardio embolic stroke die of complications more directly related to the neurologic damage and immobilization. The better outcomes observed among patients with lacunar infarcts can likely be attributed to differences in lesion size, since such infarcts tend to result in smaller lesions and less damage than atherothrombotic and cardio embolic strokes. When deciding whether to give antihypertensive drugs to reduce the blood pressure after stroke, we should distinguish the early phase (the first 24–48 hours) from the late phase because of the rapid changes of cerebral blood flow auto regulation that occur after stroke.[19]

In the healthy brain, cerebral blood flow is kept at 50 mL/100 g per minute through a mechanism known as the auto regulation of cerebral perfusion. This occurs despite wide fluctuations in the perfusion pressure in the range of 70– 120 mm Hg. Any increase in pressure automatically results in vasoconstriction and any decrease in vasodilation. These responses lower the risk of cerebral hyper- and hypo perfusion respectively. After an acute ischemic stroke, the auto regulation of cerebral perfusion is lost in the tissues surrounding the ischemic core, the so-called penumbra. This peri-infarct zone is a moderately ischemic area affected by varying degrees of injury. The area may be salvaged if blood flow is rapidly restored within hours after the initial injury because, although electrical function has been lost, the ionic pumps have not yet failed. Flow in the range of 10–20 mL/100 g per minute is the border between irreversible and reversible damage. Because of the loss of auto regulation in the penumbra, the extent of cerebral perfusion depends on the perfusion pressure and a fall in blood pressure during this critical time may reduce cerebral perfusion, extend the ischemic area, induce irreversible damage and worsen the disabling consequences of the initial stroke. Therefore, during the first 24–48 hours a high blood pressure may be desirable to reduce the cerebral damage, until the auto regulation is restored and any further neurologic improvement unlikely. In contrast, in the later phase a smooth rate of

blood pressure reduction is recommended, in order to reduce the risk of cerebral oedema, haemorrhagic transformation, stroke recurrence and cardiovascular complications.

Given these uncertainties, the American Stroke Association and the European Stroke Initiative recommend that only patients with blood pressure values repeatedly above 220/120 mm Hg should be given either labetalol or sodium nitroprusside, intravenously, unless there are other indications for antihypertensive therapy (congestive heart failure, myocardial infarction, aortic dissection). The blood pressure target during the acute phase of an ischemic stroke should not be a normal blood pressure but, rather, 180/105 mm Hg in previously hypertensive patients and 160–180/90–100 mm Hg in previously normotensive patients.[19]

In patients who were not receiving antihypertensive treatment before the ischemic stroke and who have a baseline systolic pressure of 180–220 mm Hg and a diastolic pressure below 120 mm Hg, antihypertensive therapy should be deferred for the first 48 hours after the stroke, unless thrombolytic therapy is indicated. In patients who were already receiving oral antihypertensive therapy before the stroke and who have a baseline blood pressure within the above-mentioned range, antihypertensive therapy should be given to avoid rebound hypertension, with the aim of maintaining a systolic pressure of 180–220 mm Hg and a diastolic pressure below 120 mm Hg. If the systolic pressure is higher than 220 mm Hg and the diastolic pressure higher than 120 mm Hg, intravenous antihypertensive drugs are recommended to keep the blood pressure at about 180/100– 105 mm Hg. It is important to select rapidly reversible agents in case neurologic signs and symptoms worsen with the blood pressure reduction.[20]

Patients, families, emergency physicians and paramedics alike should be instructed to abstain from administering antihypertensive agents if stroke symptoms are present, until the diagnosis of stroke has been established and the existence of severe hypertension requiring treatment confirmed. In the acute phase of stroke they must resist the temptation to “catch up” on failed prevention by starting or potentiating antihypertensive therapy too early, since by this action they may unwittingly interfere with cerebral perfusion of the injured brain.[21]

Dyslipidaemia

High cholesterol levels have been inconsistently associated with (ischemic) stroke. Statins have been shown to reduce the risk of stroke by about 15%.Since earlier meta-analyses of other lipid-lowering drugs did not show a decreased risk, statins might exert their effect through mechanisms other than their lipid-lowering effects. High cholesterol increases the risk of blocked arteries. If an artery leading to the brain becomes blocked, strokes can result.[22]

Diabetes mellitus

Diabetes mellitus increases the risk of stroke by 2 to 3 times. While intensive blood sugar control has been shown to reduce small blood vessel complications such as kidney damage and damage to the retina of the eye it has not been shown to reduce large blood vessel complications such as stroke.[23]

Carotid or other artery disease

The carotid arteries in your neck supply most of the blood to your brain. A carotid artery damaged by a fatty build-up of plaque inside the artery wall may become blocked by a blood clot. This causes a stroke.

Excessive alcohol intake: Drinking an average of more than one drink per day for women or more than two drinks a day for men can raise blood pressure. Binge drinking can lead to stroke.

Smoking

Smoking is an independent stroke risk factor, increasing the risk of stroke by about 50%. The risk increases proportionally with the number of cigarettes smoked per day and passive smoking also increases the risk of ischemic stroke. Smoking cessation is an effective measure to reduce stroke risk. Tobacco use damages blood vessels. This can lead to blockages within those blood vessels, causing a stroke. Don’t smoke and avoid second-hand smoke.[24]

Cerebrovascular accident (CVA) is mainly due to atherosclerosis (plaque) of the inner lining of the blood vessels that supply blood to the brain. CVA begins when hard cholesterol substances (plaques) are deposited within a artery. The plaques narrow the internal diameter of the arteries which may cause a tiny clot to form, which can obstruct the flow of blood to the brain. This reduces the supply of oxygen and nutrients to the brain. This may eventually result in a portion of brain being suddenly deprived of its blood leading to stroke. The treatment for CVA involves the use of various categories of drugs namely antiplatelet drugs, anticoagulants, Statins, Anti-Hypertensives. Effective screening, evaluation, and management strategies for CVA are well established in high-income countries, but these strategies have not been fully implemented in India.[25]

The quality of medical care requires prescribing to be judicious, appropriate, safe, effective and economic. ‘Good’ prescribing is a complex balance between various conflicting factors. The aim is to achieve clinical benefit with minimum risk at cost-effective price while respecting the patient’s choice.[26] The study of prescribing pattern is a component of medical audit that does monitoring and evaluation of the prescribers as well as recommends necessary modifications to achieve rational and cost-effective medical care.[27]

Irrational prescribing of drugs is of common occurrence in clinical practice[28], important reasons being lack of

knowledge about drugs, unethical drug promotions and irrational prescribing habits of clinicians. Inappropriate prescribing habits lead to ineffective and unsafe treatment, prolongation of illness, distress and unnecessary economic burden to the patient.[29] Studies of prescribing patterns and drug utilization are useful to identify the problems and provide feedback to prescribers so as to create awareness about rational use of drugs.[30]

Drug utilization pattern study is a powerful exploratory tool to evaluate present trends of drug use and appropriateness of prescriptions. It is a descriptive and analytical method of collection, quantification, understanding and evaluation of the prescribing pattern, as well as dispensing and consumption for the advancement of existing therapy and enhancement of patient safety. Nowadays inappropriate drug use is a common hurdle which receives the support of numerous worldwide research studies to determine the safe and effective drug utilization.[31]

Drug utilization research helps in the management of drug-specific problems and the evaluation of the appropriateness of drug therapy. Identification and assessment of the prescribing pattern are one of the very first steps towards improving both medication quality and patient safety. Medication quality and patient, safety requires a rational prescription of medication and avoidance of inappropriate/ irrational prescribing patterns. Rational prescription of drugs means an efficient and safe drug according to clinical needs for an adequate period and at the minimum available cost. Prescribing unnecessarily branded drugs, the cost issue, inadequate drugs supply and lack of patient counselling regarding dosing schedules and possible side effects are the major causes of irrational use of drugs, which may lead to failure of therapy and undesirable side effects. Triad of right diagnosis, accurate prescription and excellent patient counselling leads to the effective and safe use of the drug.[32]

Therefore, this study attempts to analyse the risk factors, current drug utilization patterns in the treatment of cerebrovascular accident and quality of life of patients in order to ensure appropriate drug use to reduce the morbidity and mortality of the disease and reduce the unnecessary economic burden on the patient. The findings of this study are expected to provide relevant and useful feedback to physicians. Findings from this study provide a benchmark at local and national level.

MATERIALS AND METHODOLOGY

The Ethical clearance for the study was obtained from the Institutional Ethics committee, Mandya Institute of Medical Sciences and Teaching Hospital, Mandya, Karnataka, India.

STUDY DESIGN: A Cross Sectional study was carried out in various units such as Intensive Critical Care Unit (ICCU), Respiratory Intensive Care Unit (RICU), Medical Intensive Care Unit (MICU), Medical wards (Male and Female) of the department of general medicine, Mandya Institute of Medical Sciences and Teaching hospital, Mandya, Karnataka, India. The essential data for the Cross Sectional study was collected from patient case files using a well-designed patient data collection form.

STUDY SITE: The study was carried out in Department of General Medicine at Mandya Institute of Medical Sciences and Teaching hospital, Mandya, Karnataka, India. It is one of Karnataka's leading healthcare institutions offering multi-super specialty tertiary care of high standards. MIMS hospital situated in Mandya has earned the reputation for being one of the best tertiary care multi-super specialty hospitals in Karnataka. It is a 650-bedded hospital providing tertiary level multi-super specialty care services. It provides specialized services in General Medicine, Gastroenterology, Minimal Access Surgery, ENT, Ophthalmology, Psychiatry, Paediatrics, Orthopaedics, OBG (Obstetrics and gynaecology), Dermatology and Community Medicine.

STUDY CRITERIA

The patients admitted in department of general medicine having the clinical diagnosis of cerebrovascular stroke were subjected to routine and specific investigations including CT/MRI scan depending upon the availability of funds for carrying out the procedure were enrolled in to the study after taking their consent and by considering following inclusion and exclusion criteria.

INCLUSION CRITERIA

- All adult patients having the clinical and radiologic confirmed diagnosis of stroke were included in the study.
- Individuals giving consent for study.
  Diagnosis in all patients was confirmed by brain imaging study by CT Brain, performed by medically and professional radiologist.

EXCLUSION CRITERIA

- Individuals who are not willing to be a part of the study.
- All pregnant women and lactating mothers.
- All out patients in OPDs.
- Patients having stroke due to trauma.
- Seriously and mentally ill patients.
- Patients in whom CT scan of brain could not be obtained.

SOURCE OF DATA

The data was collected from the patients who met the inclusion criteria. To study the prevalence, prescribing patterns and quality of life of cerebrovascular accident patients, relevant details of every in-patient with cerebrovascular accident were collected in suitably designed proforma. On admission, the following the following investigations were carried out.

A complete hemogram, Routine urine, Routine stool, Random blood sugar, Liver function test, Renal function test, Lipid profile, ECG, X-ray PA view, Fundoscopy, Brain imaging and blood pressure were documented in proforma. The relevant data on drug prescription of each patient was collected from the in-patient record. The demographic data (age, sex), the diagnosis by the treating physician/neurologist was obtained from the in-patient case records of each patient. Also, associated co-morbid conditions, risk factors identified for developing cerebrovascular accident were noted from the medical records. The drug data - drugs, dosage form, dose, route of administration, frequency were noted. Any other relevant data required which could not be obtained from case records were obtained by interviewing the patients, their caretakers or health care providers.

STUDY PROCEDURE

To study the prevalence, drug prescribing patterns and quality of life in cerebrovascular accident, all patients included in the study were considered for analysis. The trade names of drugs were deciphered and classified into pharmacological groups that included aspirin, clopidogrel-antiplatelet agents, Statins, short and long-acting nitrates, anticoagulants such as enoxaparin sodium, diuretics, antibiotics, multivitamins, diabetic medications, and other medications. Utilization of different classes of drugs as well as individual drugs was analysed and presented as percentage. The average number of drugs per prescription and the percentage of drugs prescribed by generic name were determined. The percentage encounters with an antibiotic prescribed were also determined.

STATISTICAL ANALYSIS

Collected information was analysed using Microsoft Office (MS-Word and Excel) 2010. Descriptive data analysis has been performed in the form of percentage of demographic variables and drug therapy and related issues were shown as various tables and graphs for better understanding of data. For the analysis of the results, simple percentage calculations were used to arrive at a conclusion of our study.

RESULTS

A total number of 70 case sheets of cerebrovascular accident patients admitted to MIMS teaching hospital were analysed. It consists of male n=50 (71.4%) and n=20 (28.6%) were females (Figure No.1). The patients were divided into 8 groups based on their age and the age group being kept at an interval of 10 years (Figure No.2, Table No.1). The incidence of CAD was more common in male compared to female.

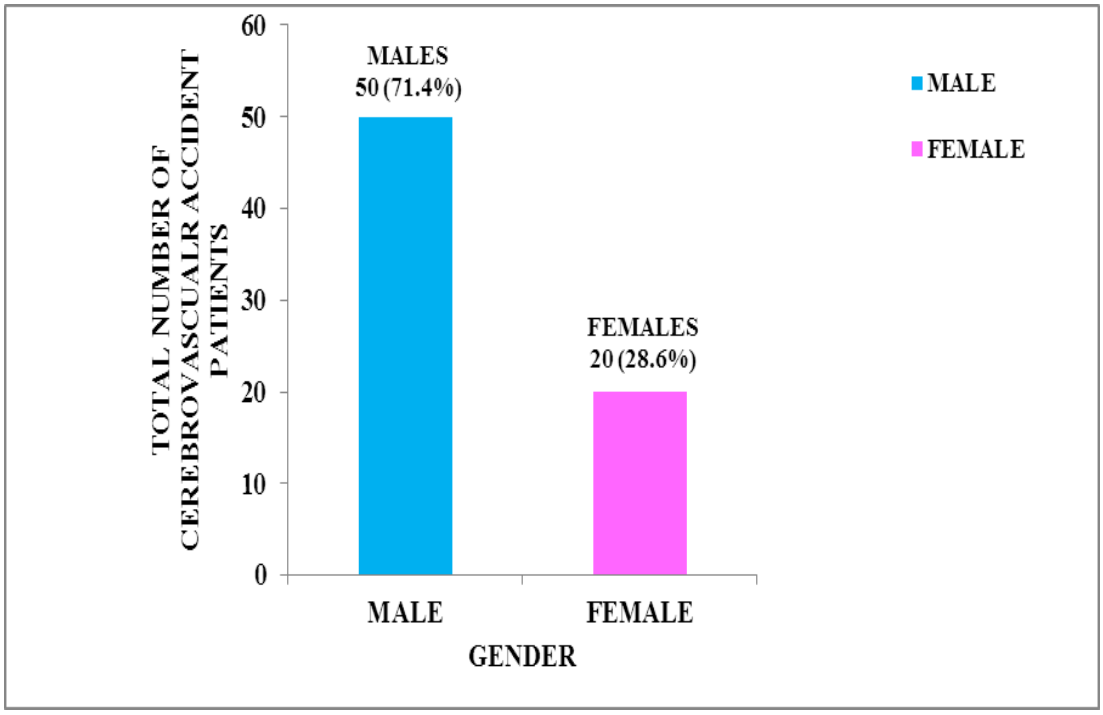

Fig.2: Sex Wise Distribution of Cerebrovascular Accident Patients.

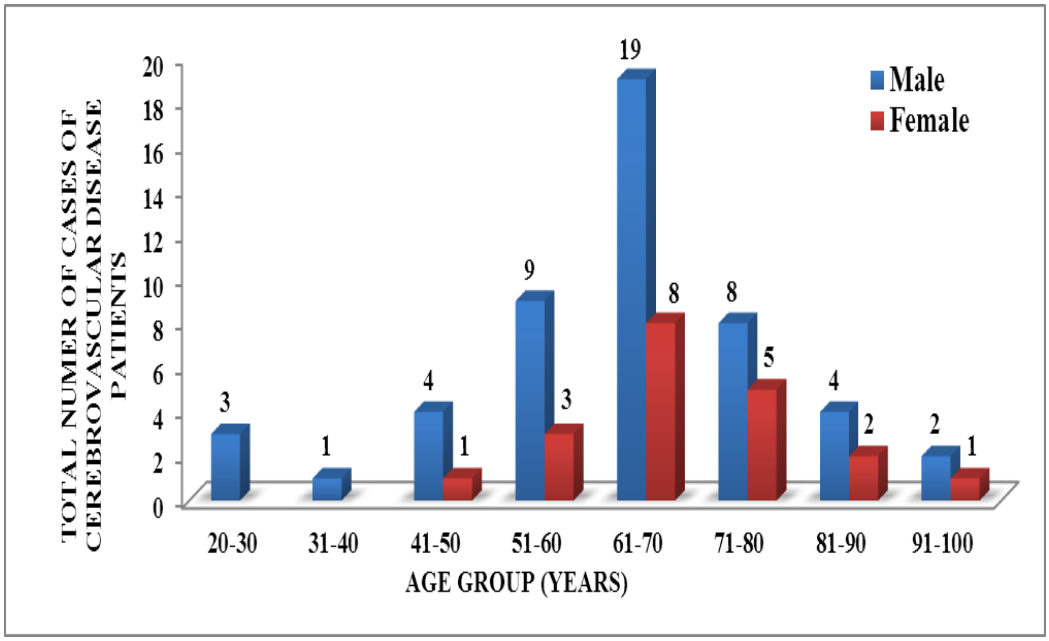

Fig.3: Age and Gender wise Distribution of Cerebrovascular Accident patients.

In this study two different types of cerebrovascular accident were identified which includes 59 patients had ischemic stroke and 11 patients had haemorrhagic stroke. (Figure No.3, Table No: 2).

Table 1: Age and Gender wise Distribution of Cerebrovascular Accident.

AGE GROUP (YEARS)	STROKE	
	MALE	FEMALE
21-30	3	0
31-40	1	0
41-50	4	1
51-60	9	3
61-70	19	8
71-80	8	5
81-90	4	2
91-100	2	1
TOTAL	**50**	**20**

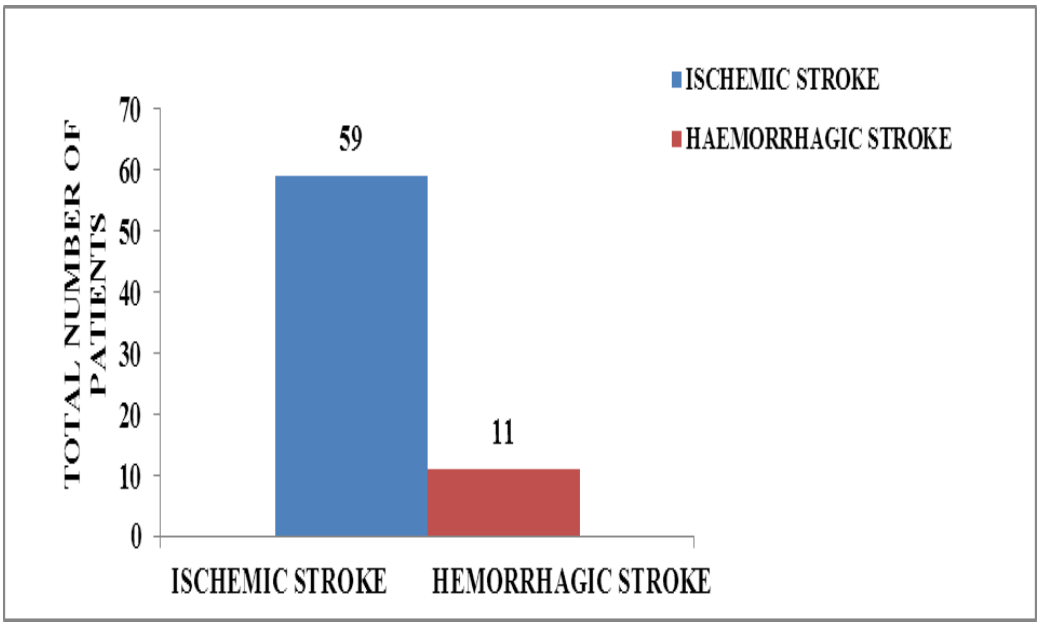

Fig.4: Classification of Stroke.

Table 2: Age and Gender wise Distribution of Types Stroke.

AGE GROUP (YEARS)	ISCHEMIC STROKE		HAEMORRHAGIC STROKE	
	MALE	FEMALE	MALE	FEMALE
21-30	3	0	0	0
31-40	0	0	1	0
41-50	3	1	1	0
51-60	7	2	2	1
61-70	16	7	3	1
71-80	8	4	0	1
81-90	3	2	1	0
91-100	2	1	0	0
TOTAL	**42**	**17**	**8**	**3**

The Ischemic stroke includes 3 (4.28%) males within 21-30 years of age, 3 (4.28%) males and 1 (1.42%) female within 41-50 years of age, 7 (10%) males and 2 (2.85%) females within 51-60 years of age, 16 (22.8%) males and 7 (10%) females within 61-70 years of age, 8 (11.42%) males and 4 (5.71%) females within 71-80 years of age, 3 (4.28%) males and 2 (2.85%) females within 81-90 years of age, 2 (2.85%) males and 1 (1.42%) female within 91-100 years of age (Figure No:5).

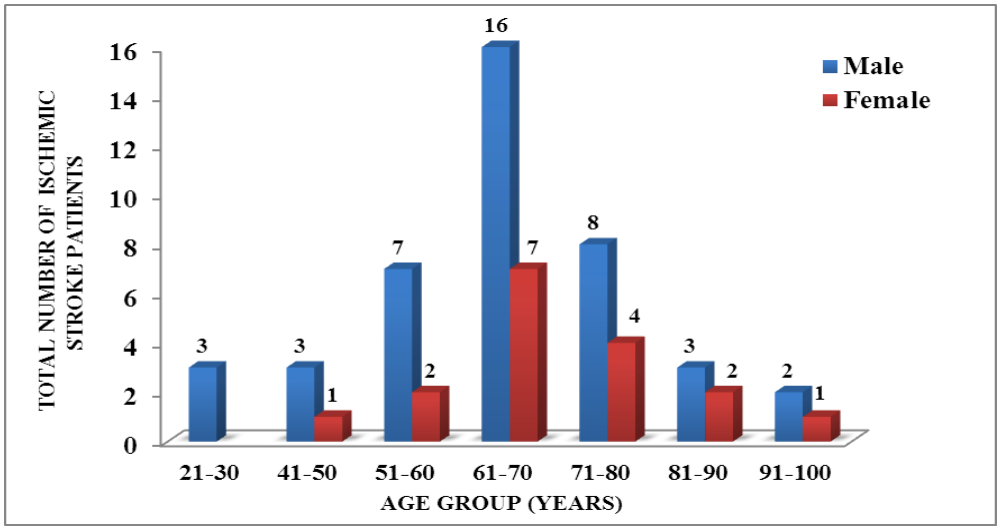

Fig.5: Age and Sex Wise Distribution of Ischemic Stroke Patients.

Haemorrhagic stroke includes 1 (1.42%) male within 31-40 years of age, 1 (1.42%) male within 41-50 years of age, 2 (2.85%) males and 1 (1.42%) female within 51-60 years of age, 3 (4.28%) males and 1 (1.42%) female within 61-70 years of age, 1 (1.42%) female within 71-80 years of age, 1 (1.42%) male within 81-90 years of age (Figure No:6).

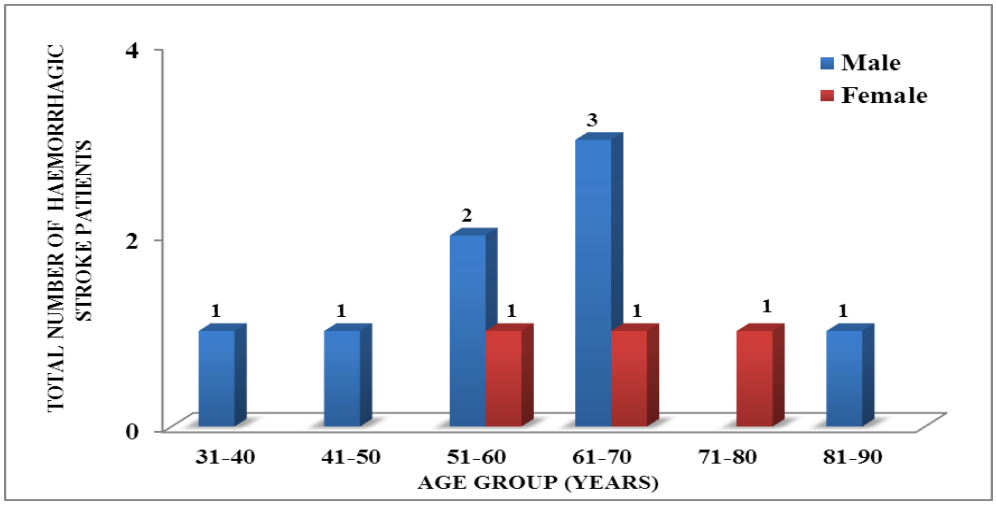

Fig.6: Age and Gender Wise Distribution of Haemorrhagic Stroke Patients.

Various co-morbid conditions like hypertension, diabetes mellitus, dyslipidaemia, smoking and alcoholism were seen among patients and many of these were found to be risk factors of stroke (Table 3, Table 4, Figure 6). Hypertension and diabetes were the two most common co-morbid conditions found in most of the patients which increase the stroke. Treatment of cerebrovascular disease involves various categories of drugs namely antiplatelet drugs, anti-hyperlipidemic agents, in addition drugs such as anticoagulants, fibrinolytics, anti-anginal drugs, antihypertensives, bronchodilators, antibiotics were also used to treat co-morbidities and also as adjunct therapy. The usages of these drugs were recorded and analysed.

Table 3: Details of the Patients based on Co-morbid Conditions

Co-morbid Condition/ Risk Factors	No. of Patients (n=99)	Percentage
Hypertension	34	48.57%
Diabetes Mellitus	8	11.42%
Hypertension+Diabetes Mellius	23	32.85%
Hypertension+Dyslipidemia	4	5.71%
Hypertension+Diabetes+ Dyslipidemia	8	11.42%
Hypertension+Diabetes+Others (Dyslipidemia+Hypothyroidism+ COPD+CKD)	3	4.28%
TOTAL	70	

CKD = Chronic Kidney disease, COPD = Chronic obstructive Pulmonary Disorder.

Table 4: Details of the Patients based on Risk factors

Risk Factors	No. of Patients (n=99)	Percentage
Smoking	50	71.42%
Alcoholic	49	70.00%
Smoker+Alcoholic	47	67.41%

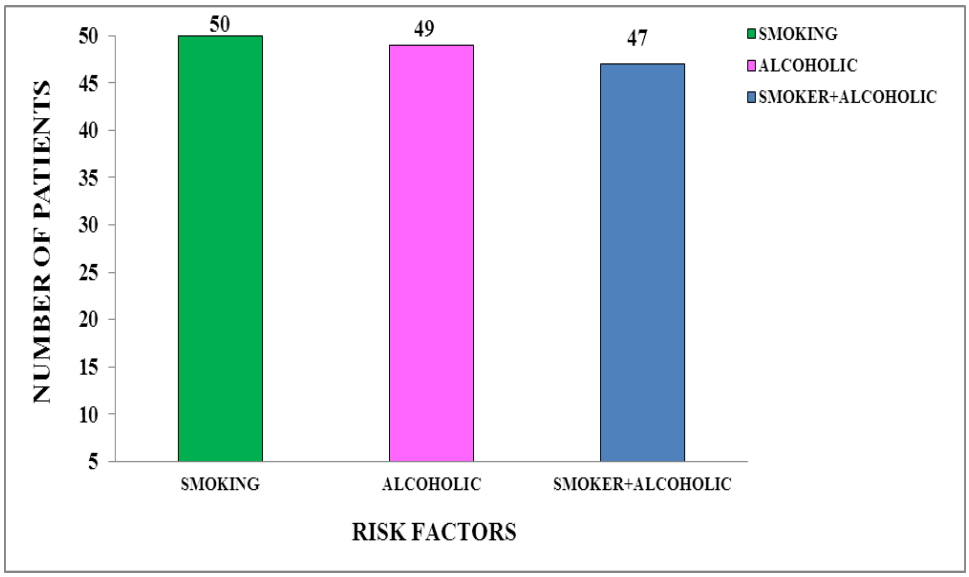

Fig.7: Details of the Patients based on Risk factors.

Table 5: Different Categories of Drugs Prescribed to the Patients.

Drug Categories	No. of Patients (n=70)	Percentage
Antiplatelets	59	84.28%
Nitrates	25	35.71%
Antihyperlipidemic	70	100%
Antidiabetics	38	54.28%
Antihypertensives	70	100%
Anticoagulants	12	17.14%
Diuretics	45	64.28%
Bronchodilators	25	35.71%
Antibiotics	57	81.42%

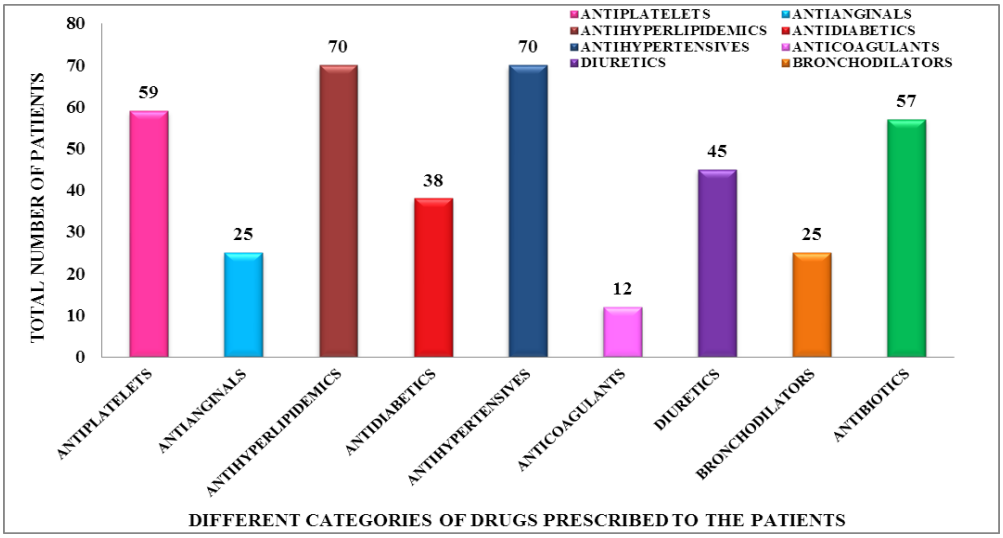

Fig.8: Different Categories of Drugs Prescribed to the Patients.

Different combinations of anti-thrombotic drugs, which include the antiplatelet drugs (aspirin, clopidogrel), anticoagulants (heparin, enoxaparin sodium), were prescribed. The percentage and no. of patients received anti-thrombotic drugs is shown in (Table 6).

Table 6: Combination of Anti-thrombotic Drugs Prescribed to the Patients.

Drug Categories	No. of Patients	Percentage
Antiplatelets	59	84.28%
Antiplatelets +Anticoagulants	12	17.14%
Antiplatelets+Anticoagulants+Fibrinolytics	2	2.85%

The anti-platelet drugs aspirin and clopidogrel were used to reduce the cerebrovascular mortality. Among 70 prescriptions analyzed anti-platelet drugs were prescribed in 59 (84.28%) patients. Details of anti-platelet drugs prescribed are shown in (Table 7, Figure 9). Out of these (n=59), a fixed dose combination (75 mg) of aspirin and clopidogrel was found to be used in 6 (31.31%) and aspirin (150 mg) and clopidogrel (75 mg) singly were used in 28 (54.54%) of the patients. Aspirin alone was used in very few patients 20 (14.14%) and in least no. of patients 5 (4.04%) clopidogrel alone was used. All these drugs were prescribed in oral dosage form.

Table 7: Details of Anti-platelet Drugs Prescribed to the Patients.

Drug Categories	No. of Patients	Percentage
Fixed dose combination of Aspirin+Clopidogrel	6	8.57%
Clopidogrel	5	7.14%
Aspirin	20	28.57%
Aspirin + Clopidogrel	28	40.00%

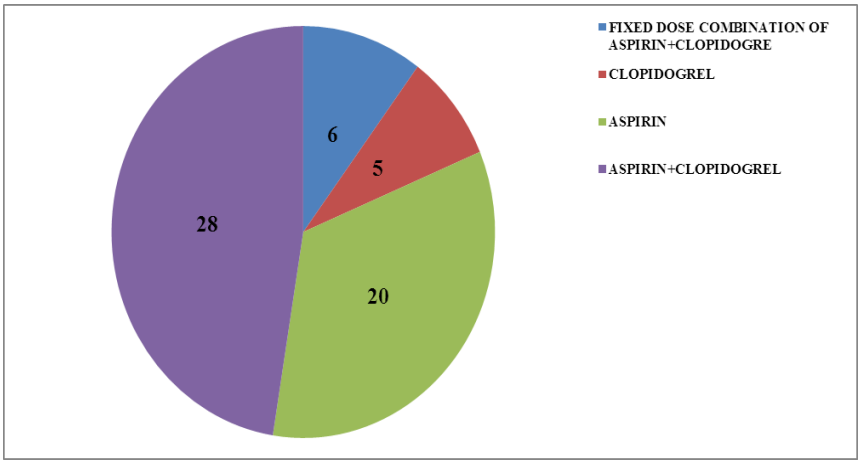

Fig.9: Total number of patients received anti-platelet drugs.

Anticoagulant drugs prescribed include heparin and low molecular weight heparins- enoxaparin sodium. Details of anticoagulants prescribed are shown in (Table 8). These were prescribed in the form of injections through SC route of administration.

Table 8: Details of Anticoagulant Drugs Prescribed to the Patients.

Drug Category	No. of Patients	Percentage
Enoxaparin sodium	12	17.14%

Details of prescribed antianginals (Table 9), anti-hyperlipidemics (Table 10), antihypertensives (Table 11, Fig.10), bronchodilators (Table 12, Fig.11), and miscellaneous drugs (Table 13, Fig.12) are shown below.

Table 9: Details of Anti-anginal Drugs Prescribed to the Patients.

Drug Category	No. of Patients	Percentage
Nitrates	25	35.71%

Table 10: Details of Anti-hyperlipidemic Drugs Prescribed to the Patients.

Drug Category	No. of Patients	Percentage
Atorvastatin	70	100%

Table 11: Details of Anti-hypertensive Drugs Prescribed to the Patients.

Drug Categories	No. of Patients (n=70)	Percentage
Beta-Blockers		**37.14%**
Atenolol	11	15.71%
Metoprolol	15	21.42%
Diuretics		
Furosemide	40	**57.12%**
CCB		**5.17%**
Amlodipine	4	5.71%

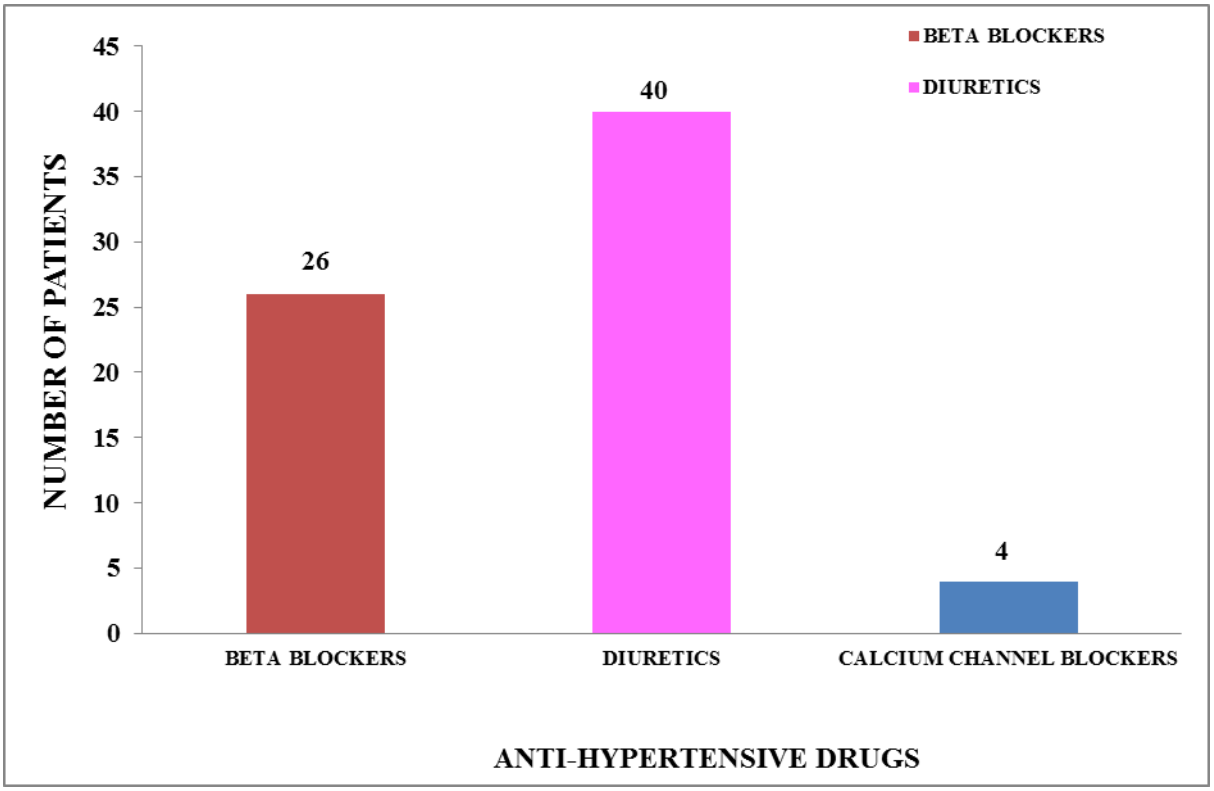

Fig.10: Total number of patients received anti-hypertensive drugs.

Table 12: Details of Bronchodilators Prescribed to the Patients.

Drug Categories	No. of Patients (n=25)	Percentage
Theophylline + Etophylline	14	20.00%
Salbutamol + Ipratropium bromide	25	35.71%
Salbutamol + Ipratropium bromide+ Budesonide	25	35.71%

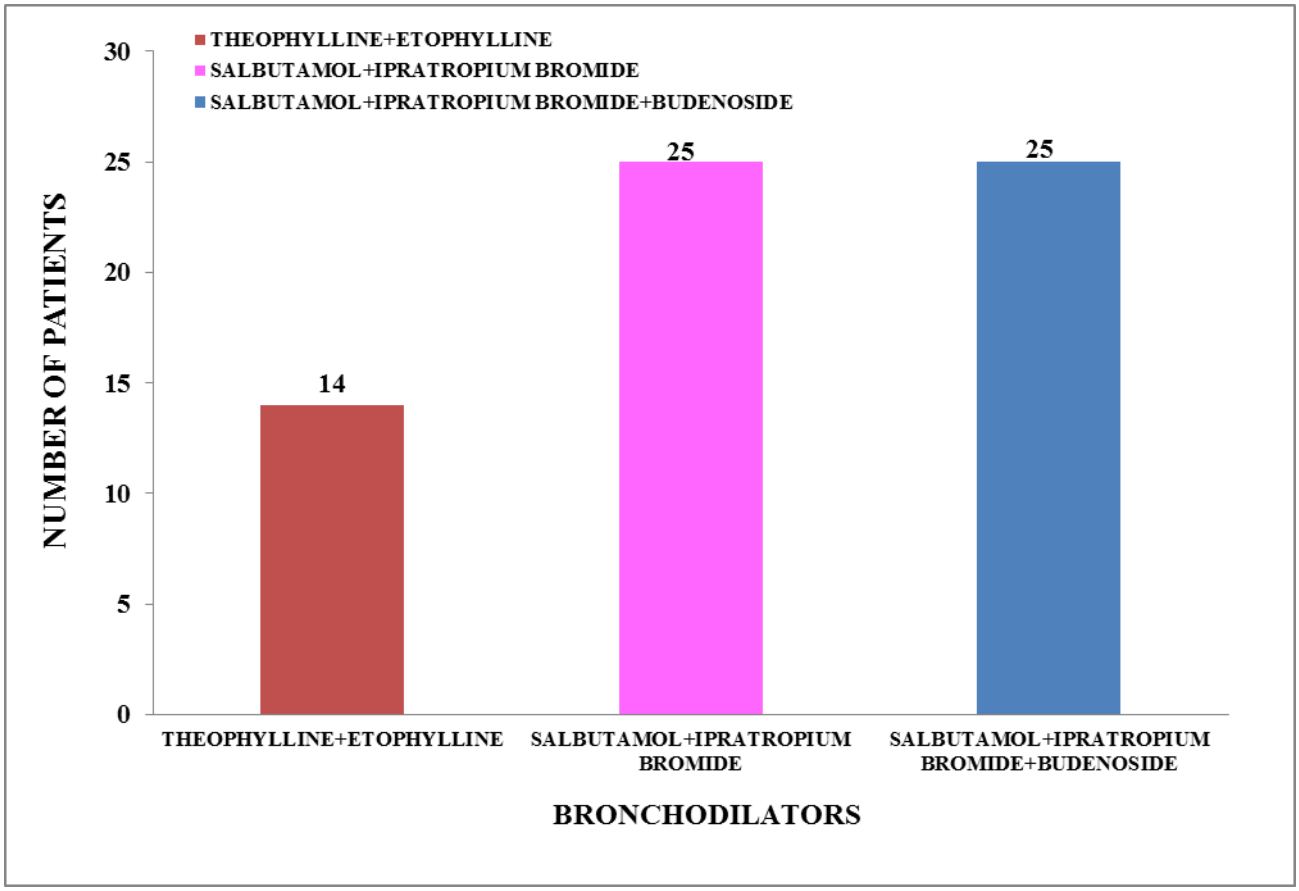

Fig.11: Total number of patients received Bronchodilators.

Table 13: Miscellaneous Drugs Prescribed.

Drug Categories	No. of Patients (n=99)	Percentage
Pantoprazole	70	78.78%
Lactulose	21	17.17%
Paracetamol	29	29.29%

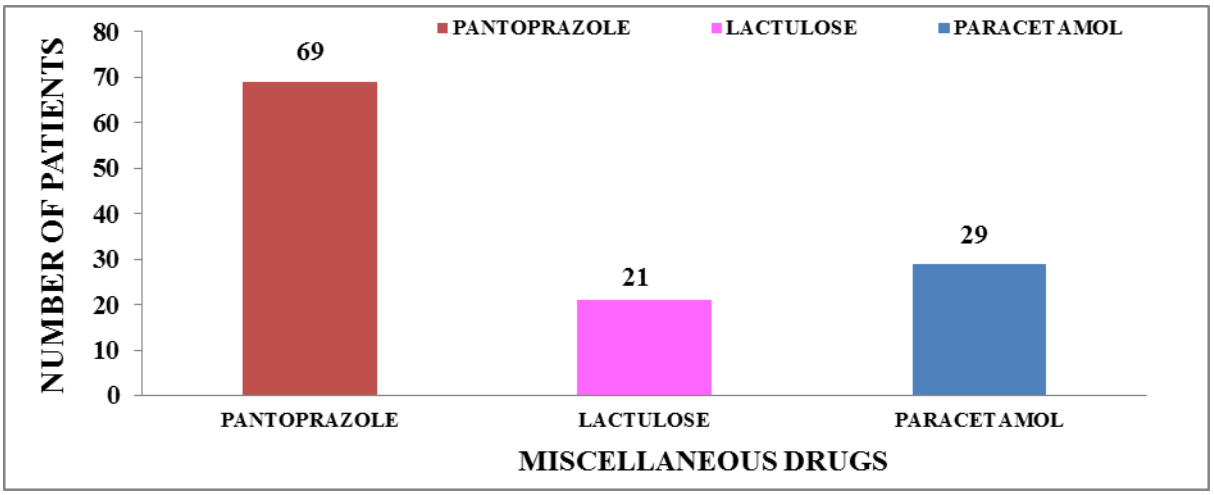

Fig.12: Total number of patients received miscellaneous drugs.

Out of 70 patients, 40 (47.47%) patients had diabetes mellitus. Most of the patients were prescribed with human actrapid insulin and Human Mixtard Insulin during hospital stay of treatment. The doses of insulin were given based on the blood glucose levels. Very few patients were prescribed with oral hypoglycaemic agents. The total number of drugs prescribed among 70 in-patients (prescriptions) with the diagnosis of

cerebrovascular stroke included in the study was 529. The average number of drugs per patient (prescription) was determined and found to be 7.55 (Table 14). The number of drugs prescribed by generic name was only 213 (40.26%). Aspirin, Atorvastatin, Amlodipine, Paracetamol, Pantoprazole, Furosemide, and ceftriaxone were the drugs prescribed by generic name.

Table 14: Details of prescriptions.

Details of prescriptions	Number
Total no. of patients prescriptions analysed	70
Total number of drugs prescribed	529
Average number of drugs per prescription	7.55
Number of drugs prescribed by generic name out of total number of drugs prescribed	213

ANALYSIS OF CLINICAL SYMPTOMS

Out of 70 patients, 61 patients had speech defects, 7 patients speech were not elicitable due to disturbed consciousness or coma and 2 patients had normal speech. Out of 61 patients with speech defects, 39 had dysarthria, 17 had motor aphasia and 3 had global aphasia. Thus, we can see that speech involvement in patients with cerebrovascular stroke most commonly takes the form of dysarthria, whereas sensory aphasia is rarely seen. This conclusion also closely correlates with the study done by Aiyar et al[33] who found that speech disturbance in cerebrovascular disease is dysarthria, the most common followed by motor aphasia followed by global aphasia.

Out of the total of 70 CT scan performed 59 (84.28%) shoed infarcts which consists of 51 (72.85%) old infarcts and 8 (11.42%) shown new infarct. 11 (15.71) cases has shown intracerebral bleed. In 84.28% of the cases clinical diagnosis matched with the CT finding regarding the type of lesions. This is comparable with the study done by Walk et al[34] who showed CT has diagnostic sensitivity of 78% in the detection of cerebral infarction.

DISCUSSION

In the present study, the incidence of cerebrovascular stroke was more common in male (71.4%) compared to female (28.6%). The age range was from 20 years to 95 years with mean age of 57 years which is closely related to study by Naik M, Rauniyar R.K., Sharma U.K. et al[35] who found mean age of 58.27 years. In this study the youngest patient was 25 years and oldest was 95 years old. The incidence of stroke is maximum in the age group of 61-70 years, which comprises 38.57% of total patients. It also correlates with the findings of Aiyar et al[33] which comprised 34% of total patients in 61-70 age group. Among 59 cerebral infarction cases, 42 (60%) were males and 17 (24.28%) were females.This is nearly comparable with the study done by Sotaniemi K.A. t al[36] who found 66.2% infarcts and infarcts i.e. thromboembolic vascular accidents are more common than haemorrhagic vascular accidents.

Among the total of 70 patients, 50 (71.42%) were smokers, comprising all the males. This brings us the conclusion that smoking is an undisputable risk factor for patients having a thrombotic stroke more common in males. Out of 70 patients, 48.57% had hypertension, among them 8 (11.42%) had a haemorrhage while 59 (84.28%) has infarct. Thus we can come to conclusion that hypertension was more significant risk factor in stroke. Hypertension was observed as a risk factor in a greater proportion of males as compared to females.

In this study of 70 patients, 13 (18.57%) had a hyperlipidemia which was judged by Serum cholesterol value of >200 mg/dl which correlates with the study by Khan et al[37] who found hyperlipidemia in 19.4%. Thus, it brings that conclusion that hyperlipidemia is a risk factor in case of patient with an infarct closely followd by patient with haemorrhagic stroke. Hyperlipidemia was observed as a risk factor in a greater proportion of males as compared to females.

Total of 23 (32.85%) had diabetes mellitus and 15 had an infarct and 3 had haemorrhage. Amomg them 18 patients were male and 5 patients were females. This observation stressing the role of diabetes mellitus as a risk factor for an infarct particularly in males and associated with high mortality and morbidity. Out of 70 patients, among 59 patients with an infarct, 49 (70%) were alcoholics. Thus we can conclude that alcoholism is most significant risk factor fortor for stroke in males.

The above all conclusions closely correlates with the study done by Pinhero et al[38] who found smoking, hypertension, alcohol, diabetes mellitus and hyperlipidemia having a descending order of significance as a risk factor for cerebrovascular stroke. In the present study, the average no. of drugs per patient is 7.34 which were higher compared to previous study. The percentage of drugs prescribed by generic name is 24.20%. The present and previous studies have shown much variation in the average number of drugs per prescription and the percentage of drugs used by generic name. Better health care services will have a positive impact on health care system. Determining whether a patient actually requires drug therapy is probably the most intricate problem to identify because the outcomes of the patient's drug therapy depends upon the patient's social history as well pathophysiology and pharmacotherapeutics, which is altered due to disease conditions.

Among all admitted patients in ICCU, RICU, MICU and medical wards (male and female) for stroke, patients

were suffering mostly from co-morbid conditions and commonly found co-morbid condition was hypertension, diabetes mellitus, dyslipidaemia and a combination hypertension, diabetes mellitus, dyslipidaemia which supports the study that these are more prone to high risk of stroke and its complications.

CONCLUSION

The cerebrovascular strokes were more common in males than females, in present study, male (71.4%) and females (28.6%). The most commonly affected age group was 61-70 years which compised 38.57% of total patients and the mean age was 57 years.

Among the risk factors for cerebrovascular stroke, hypertension, smoking, alcoholism, Diabetes mellitus were detected as most common risk factors. Of all the risk factors hypertension is more significant risk factor in case of haemorrhagic stroke. Hyperlipidaemia plays an important role as risk factor in thrombotic subgroup than haemorrhagic stroke. Speech defects were seen in majority of the patients among them dysarthria being the commonest followed by motor aphasia. The overall clinical diagnosis correlation with CT brain was with an accuracy of 84.27%. Hypertension accelerates the atherogenic process and is the major correctable risk factor in the development of stroke.

Treatment of hypertension has been shown to reduce the incidence of both primary and recurrent stroke. Elderly patients and patients with mild hypertension appear to benefit from antihypertensive therapy. The management of hypertension in the setting of an acute stroke is a vexing clinical problem. Recent data suggest that lowering BP in acute ICH is probably safe; however, it remains to be seen if this decreases hematoma expansion or improves outcome. Blood pressure management in acute ischemic stroke remains problematic and questions such as when to start antihypertensives and by how much to reduce BP are yet to be resolved. Although lowering BP is effective for recurrent stroke prevention, the degree of BP reduction may be more important than the class of the agent used.[39]

From the study it is concluded that co-morbidities and risk factors were the main cause for cerebrovascular diseases and their complications. By controlling the co-morbid conditions there is a substantial decline in the cerebrovascular diseases and their complications. The prescription pattern of various drugs were found to be as–antiplatelet drugs 59 (84.28%), anti-hyperlipidemic drugs 70 (100%), anti-diabetics 38(54.28%) antibiotics 57 (81.42%), anti-anginal drugs 25 (35.71%), antihypertensives 70 (100%), anticoagulants 12 (17.14%), diuretics 45 (64.28%) and bronchodilators 25 (35.71%) respectively. The average number of drugs per prescription was found to be 7.55. The most commonly prescribed drug classes in cerebrovascular stroke were anti-hyperlipidemic drugs, anti-hypertensives, antiplatelet drugs. Extensive polypharmacy (7.55 drugs per prescription) was noticed in the prescriptions. The prescribing pattern can be improved by reducing the number of drugs per prescription. Very few drugs were prescribed by generic name. The economic burden of the patients can be reduced by prescribing generic drugs.

The study of prescribing pattern is a component of medical audit that does monitoring and evaluation of the prescribers as well as recommends necessary modifications to achieve rational and cost-effective medical care. The results of this study on drug prescribing pattern can provide a framework for continuous prescription audit in a hospital in-patient setting. This will help prescribers improve patient management by rationalizing prescribing practices. Moreover, time to time studies is required to assess drug utilization pattern for improving disease management strategy and quality of life of patients. In order to achieve optimal therapeutic outcomes unnecessary multifaceted prescription must be avoided. In addition from regular workshops or seminars for the health care professionals and dissemination of treatment guidelines could facilitate rational use of the drug.

CONFLICT OF INTEREST

All the authors declare that there is no potential conflict of interest in the study.

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