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Study of co-relation of Incidence of various risk factors with type of stroke in young patients at tertiary rural health care centre

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ABSTRACT

Background: Stroke was the second most common cause of death worldwide in 2014, resulting in 5.7 million deaths. Though it principally occurring in the elderly, the young are not spared. This hospital based cross sectional study was conducted in tertiary rural health care teaching hospital of Ambajogai to Study co-relation of Incidence of various risk factors with type of stroke in young patients and the impact of these risk factors on young stroke.

Method: This Study was done at the Department of General Medicine in Government tertiary rural health Care Hospital of Ambajogai. This hospital based cross sectional study included 50 cases (young stroke patients). This study was accomplished from October 2012 to December 2014 in rural tertiary health care hospital of Ambajogai.

A proper detailed history, clinical examination and requisite investigations were used to collect data from all the cases which were recorded in the form of tables and graphs. The risk factors studied were Hypertension, Smoking, diabetes,sedentary lifestyle, use of alcohol, cardiac problems, B.M.I, diet, stress and family history of stroke. Anthropometric (weight, height, body mass index) measurements were done on all patients. The results were analyzed to assess the aetiology, risk factors, and the pattern of clinical and radiological profile.

Results: Sex ratio in our study was 1.3:1 (male: female) with mean age in the study population of 31.92±8.59 years. Some risk factors were more associated with ischemic stroke and some were associated with hemorrhagic stroke. In present study we had compared risk factors with type of stroke in young patients with other similar studies. Hypertension (32%), Atherosclerosis (32%), cardiac problems (18%), diabetes mellitus (28.2%), smoking (36%) were significant risk factors. CT scan (brain) showed 60% of patients had infarction. Cortical venous thrombosis was seen in 18% of patients and intra cerebral haemorrhage was seen in 22%.

Conclusion: Hypertension, Smoking, alcohol, diabetes, family history, homocysteinemia, coronary artery disease, sedentary lifestyle and cardiac problems have strong co-relation with Stroke in young population. For early diagnosis encourage younger generation for timely health checkup to detect these risk factors which will help to decrease morbidity and mortality in young population of rural areas.

Keywords: Stroke, Hypertension, family history, alcohol, Smoking, Diabetes, Sedentary lifestyle, Young patients.

Introduction

Stroke is one of the most important causes of high morbidity and mortality all over the world. Stroke was defined by World Health Organization (WHO) as rapidly developing clinical signs of focal, at times, global disturbance of cerebral function lasting for more than 24 hours or leading to death with no apparent cause other than vascular origin[1].The diseases of cerebral blood vessels and the related infarcts and hemorrhages, though principally occur in the elderly, the young are not spared [2].Stroke has been known by

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various names through the ages as apoplexy, cerebrovascular accidents and brain attack[3]. Stroke like presentation may be seen in other conditions like brain tumours that bleed, acute subdural hematomas but the term stroke should be restricted to cerebrovascular disease. Although the common presentation of stroke is hemiplegia, other presentations are also seen. Transient global amnesia due to ischemic process in left posterior cerebral artery territory, fluent or receptive aphasia with minimal or no motor deficit as in dominant hemisphere parietal lobe lesions, dysphonia and dysphasia without medullary paralysis as seen in medullary infarct are also observed [4].Community based surveys from the West and Japan indicate average annual incidence of stroke as 111-180/100,000 general population and 9-28/100,000 in young people's below the age of 45 years. Various epidemiological studies have reported the relatively high prevalence of stroke in younger age group amongst Indians. The incidence of stroke in young population (<45 yrs) in various hospitals catering rural areas has been reported to be 15-30% of all stroke [5]. In adults younger than 45 years old, incidence ranges from 3.4 to 11.3/100,000 people per year in primarily white populations, while the incidence in young black adults is as high as 22.8/100,000 people per year[6,7,8]. Data from major Indian hospitals show 24 to 35% of stroke in young of all neurological admissions [2].Although various studies on stroke in young included subjects from second to fourth decade; in general, stroke in young includes subjects falling under the age group of 15-45 years. The aetiology may vary with different age groups, but most of the risk factors are common to all age groups. Still, certain factors are confined to the young [9].Major risk factors for cerebral infarction in young adults, surprisingly, have rarely been studied systematically. Reasons for this probably include difficulties in making precise diagnosis in the pre-CT era, selecting appropriate controls, and having sufficient sample size [10, 11]. Stroke in the young is particularly tragic because of the potential to create a long-term burden for the victims, their families, and the community [12,13,14]. However, effective stroke prevention in the young cannot be attempted until the risk factors are clearly documented. So considering its impact on younger generation, needs more studies for identification and modification of risk factors to prevent social and economic loss of community. There is a paucity of reliable information on the possible risk factors for stroke in the developing countries [11].A better understanding of the relative importance of the risk factors could lead to better secondary prevention and thus limit the future stroke burden in the increasingly young population. Thus, in this hospital-based cross sectional study we aimed to establish the association and to determine the known and emerging risk factors of stroke and to assess the contribution of these risk factors to the causation of stroke.

Methods

Study design

The study design for our project was a hospital based cross sectional study.

Definition of cross sectional study

Cross sectional study is a type of observational study that involves the analysis of data collected from a population, or a representative subset, at one specific point in time that is, cross-sectional data.

This study design was selected because it is rapid, inexpensive and easy to carry out.

Study setting

We selected Patients diagnosed to have stroke in young admitted in rural Tertiary Health Care Centre in the department of medicine.

Study duration

The duration of our study was from October 2012 to December 2014.

Sample size

The sample size was restricted to 50 cases.

Inclusion Criteria

1. Patients with abrupt onset of focal or global neurological deficit attributable to vascular cause and persist for more than 24 hours or new brain infarction suggestive of ischemic stroke regardless of whether symptoms persist.
2. Age15-45 years.

Exclusion Criteria

1. Head injury.
2. Intracranial tumours (primary and metastatic).

Ethics:

The sample of 50 cases was considered to be sufficient for this study, which adhered to the principles of the Declaration of Helsinki, and was approved by independent ethical committees of our college. We obtained written informed consent in all cases to participate in the study.

Data collection procedure

All patients who fulfilled the inclusion and exclusion criteria were included in this study. The consent was taken from the patients or attendants who were

included in the study, for performing the necessary investigations or procedures. A proforma was prepared which included detailed history, clinical examination and requisite investigations available in our hospital. History includes all symptoms pertaining to stroke in detail with emphasis on all the risk factors attributable to the stroke in young. A detailed clinical examination was done and neurological deficits were identified. Relevant investigations like hemoglobin, total white cell count, erythrocyte sedimentation rate, routine urine analysis, blood glucose, blood urea, serum creatinine, serum lipid profile, blood VDRL, Chest X-ray, CT scan head, electrocardiography were done for all patients, Bleeding time, Clotting time, test for HIV, lumbar puncture for CSF analysis and echocardiogram, Color Doppler were done in the required patients. The results were analyzed to assess the etiology, risk factors, and the pattern of clinical and radiological profile.

Various clinical examinations were done as;

Clinical examination for checking blood pressure

Hypertension

The American guidelines state that blood pressure below 120/80 mm of Hg is normal, 120 to 139/80 to 89 mm of Hg is pre hypertension, and readings above prehypertension level are abnormal. Isolated systolic hypertension is defined as an elevated B.P of >140 mm Hg with a normal (<80 mm of Hg) diastolic pressure. The European and British guidelines have classified a B.P of less than 120/80 mm of Hg as optimal. 120 to 129/80 to 84 mm is normal. 130 to 139/85 to 89 mm of Hg is high normal, and anything above that is classified as hypertension and is divided into three stages [13].

Stage -1: Systolic 140 to 159 mm Hg and/or diastolic 90 to 99 mm of Hg.

Stage -2: Systolic 160 to 179 mm Hg and/or diastolic 100 to 109 mm Hg.

Stage -3: Systolic 180 mm Hg or higher and/or diastolic 110 mm of Hg or higher.

Blood sugar level

Blood samples for measuring regular blood sugar and HBA1c were taken from cases (within 72 hrs of admission) these tests are used for assessment of blood-glucose level. Random blood sugar (RBS) and HBA1c will be used for the assessment of blood sugar level.

HBA1c

The hemoglobin hbA1C test is used to monitor long term glucose (sugar) control in people with diabetes, while daily blood sugar testing gives a picture of the day to day fluctuations. The hemoglobin hbA1C test offers an overview of how well glucose has been controlled over the past two to three months, because the glucose irreversibly binds to hemoglobin for the life of RBC (about 120 days) Doctors can use the test to determine the person's average blood sugar levels over that time.

Fasting blood sugar (FBS)

FBS measure blood sugar after you have not eaten for at least 8 hrs. It is often the first test done to check for pre-diabetes and diabetes.

Random blood sugar (RBS)

RBS measures blood glucose regardless of when someone last eats. Several random measurements are taken throughout the day. The random test is useful because glucose level in healthy people does not vary widely throughout the day. Blood glucose that varies widely may mean a population problem. This test is also called a casual blood glucose test.

Diabetic ranges based HBA1C:

- Normal range- 4.5 to 7.0%
- Good control -6.4 to 7.7%
- Fair control -7.8 to 8.5%
- Poor control above -8.5%

Smoking status

It is defined as never, former and current smoker. We defined current smoker as an individual who smoked any tobacco in the past 12 months and included those who had quit within the past year. Former smoker is defined as who had quit more than a year earlier.

Diet assessment

For assessment of diet questions were asked from cases and controls regarding meat, vegetables and fruit intake in the last week.

Physical activity

Questions were asked regarding exercise tolerance and extent of usual physical activity. The individual was classified as physically active if they were regularly involved in moderate exercise (brisk walking, cycling or gardening etc.) or strenuous exercise (jogging, football etc.).

Psychosocial stress

For psychosocial stress, we used a combine measure of general stress at home, workplaces and financial status.

Analysis

We aimed to determine and address the common potential risk factors and their relative risk for stroke. This cross sectional Study was done at Government tertiary rural health Care Hospital SRTRGMC Ambajogai and involved 50 cases (young stroke patients).A proper questionnaire was used to collect data from all the cases and which was recorded in the

form of tables and graphs. Chi square test, Fisher Exact test and 90% Confidence Interval had been used to find the significant association of clinical factors with the ventilation support requirement.

1. **Chi-Square Test**

$\frac{\sum (Oi - Ei)^2}{Ei}$, Where Oi is observed frequency and Ei is Expected frequency

2. **Fisher Exact Test**

	Class1	Class2	Total
Sample 1	A	B	a+b
Sample2	C	D	c+d
Total	a+c	b+d	n

Fisher Exact Test statistic= $\sum p \frac{(a+b)!(c+d)!(a+c)!(b+d)!}{n!} \frac{1}{\sum a!b!c!d!}$

3. **90% Confidence Interval**

P ± 1.65* SE (P), Where SE (P) is the Standard error of proportion = P*Q/Vn

4. **Significant figures**

+ Suggestive significance 0.05<P<0.10
*Moderately significant 0.01 <P < 0.05
**Strongly significant P<0.01
Statistical software: The Statistical software namely SPSS 15.0, Stata.

Results

Following are findings regarding different variables in our study.

Exercise

Among 50 cases, 32% were exercising and 68% were not exercising.

Smoking

Among 50 cases there were 36% smokers and 64% were non-smokers.

Alcohol

Among 50 cases, 30% patient had history of alcohol consumption.

Diet

Among 50 cases 46% were using balanced healthy diet and 54% were using unhealthy diet.

Diabetes

Among 50 cases 24% were diabetic and 76% were non-diabetic.

Hypertension

Among 50 cases 32% were hypertensive and 68% were non-hypertensive.

Stress

Among 50 cases, 68% were not stressed and 32% were stressed.

Body mass index

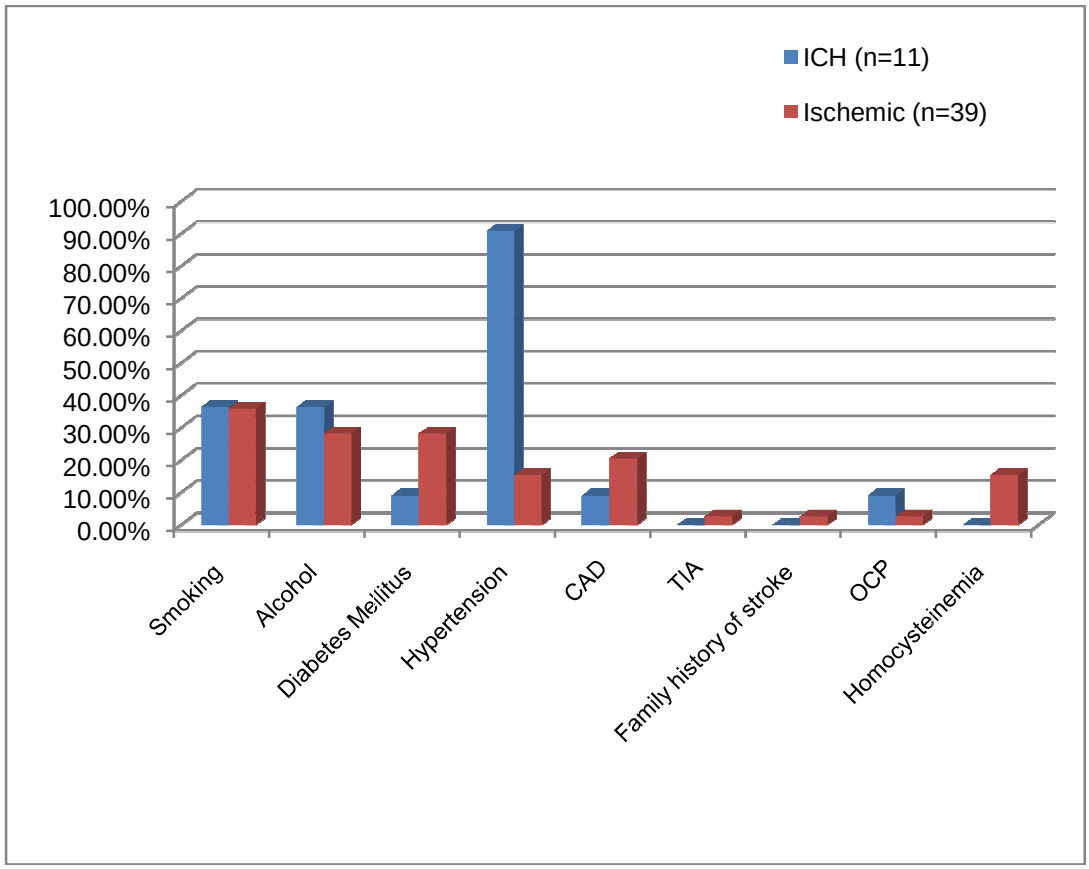
Among 50 cases 30% have a normal BMI, 28% were overweight and 42% were obese.

Family history of stroke

Among 50 cases 2% were having a family history of stroke and 98% were having no family history of stroke.

Cardiac problem

Among 50 cases 36% had diagnosed cardiovascular disease and 64% were having no known cardiac problem.



Graph 1: Risk factors associated with type of young stroke

Discussion

As our study comprised of rural population; it will be useful for the diagnosis, management and prognosis of stroke in young patients in similar areas. Sex ratio in our study was 1.3:1 (male: female). Zunni *et.al*[17] demonstrated a similar ratio of 1.2:1 in Africa. Mehndiratta MM *et.al*[2] showed a ratio of 1:08 in north India. The mean age of all the patients in our study was 31.92 years, the mean ages of males and females were 33.65 and 29.67 years. A study in north India by Mehndiratta MM *et.al* [2] showed a similar mean age of 31.97 years and mean age of males and females were 30.66 years and 33.28 years respectively. Our study had a markedly higher mean age group among men at 33.65 years whereas among women it was much lower at 29.67 years probably because there was more number of females in the present study who presented with CVT (cortical venous thrombosis) in early age.

Table 1: Comparison of risk factors for young stroke with other studies

Risk factors	Present study	Dalai *et al*	Nagaraj a*et al*	Grindal *et al*	Bogoussla vskyJ *et al*	Zunni *et al*	Alverez *et al*
Smoking	36%	40 %	15%	-	36.6%	-	56.7%
Alcohol	30%	40 %	15%	-	-	-	37.8%
BMI	12%	-	-	-	-	-	-
DM	24%	20 %	11%	5.2%	-	14.8%	10.9%
HTN	32%	40 %	22.6%	17.2%	7.3%	22.2%	23.3%
CAD	18%	-	-	26%	-	-	3.9
TIA	2%	-	-	-	-	-	-
FH/S	2%			-	17.1%	-	-
OCP	4%	-	-	17.9%	16.5%	-	21.2%
HC	12%	-	-	-	-	-	-
High fat diet	8%	-	-	-	-	-	-
Sedentary lifestyle	9%	-	-	-	-	-	-
Lack of exercise	17%	-	-	-	-	-	-
Stress	68%	-	-	-	-	-	-

In our study 36% were smokers who had stroke. Similarly in Dalai *et al*[18]study 40% were smokers, Bogousslavsky *et al*[19] study 36.6% were smokers. In present study 30% patient had history of alcohol consumption similarly Alverez *et al*[20] found history of alcohol consumption in 37.8% and Dalai *et al*[18] in 40%.In our study 24% patient had Diabetes Mellitus. Similarly Dalai et.al study 20% patients had Diabetes Mellitus. From Zunni *et al* study 14.8% patients were suffered from Diabetes Mellitus. Nagaraja *et al* study 11% patients had history of Diabetes Mellitus. In the present study 16 patients (32%) had hypertension. Dalai *et al* study 46.7% patients had hypertension. From Alverez *et al* study 23%,Nagaraja *et.al*[33] 22.6% patients had hypertension. In this study 18% of all stroke patients had CAD. Similarly Grindal *et.al*[32] found CAD in 26% patients and Alverez *et al* found CAD in 3.9% patients. In our study TIA observed in 2% patients. In the study by Mehndiratta MM et al incidence of TIA was 3%.In our study 4% patients of stroke had OCP's as risk factor. Whereas Grindal *et al* study, 17.9% patients were taking OC Pills. This difference possibly because of less use of OCP's as contraception in the rural population. In present study 12% patients had increased Homocysteine as risk factor. Study by Mehndiratta MM *et al* incidence of homocysteinemia was 0.9%.Higher levels of Homocysteine in our study may because of, Homocysteine can elevate temporarily after stroke. For confirmation it requires repeat testing after 8 weeks but in present study it was not repeated as a result of lack of follow up.

Table 2: Comparison of risk factors with type of stroke

Risk factors	Present study		Mehndiratta *et.al*		Bevan *et.al*		Alverez *et.al*
	ICH	ISCH	ICH	ISCH	ICH	ISCH	ICH
Smoking	36.4	35.9%	4.72%	18.11%	-	20.83%	56.74%
Alcohol	36.4	28.2%	1.57%	2.36%	28.26%	16.7%	37.82%
DM	9.1%	28.2%	2.36%	3.96%	-	10.41%	1O.88%
HTN	90.9	15.4%	3.14%	16.53%	15.2%	31.25%	23.32%
CAD	9.1%	20.5%	0.78%	6.29%	-	14.58%	3.91%0
TIA	0%	2.6%	0%	5.87%	-	6.25%	-

FH/S	0%	2.6%	0%	2.36%	-	12.5%	31.59%
OCP	9.1%	2.6%	-	-	-	18.75%	21.17%
HC	4%	8%	-	-	-	-	-
High fat diet	2%	6%	-	-	-	-	-
Sedentary lifestyle	6%	3%	-	-	-	-	-
Lack of exercise	12%	5%	-	-	-	-	-
BMI> 30	7%	5%	-	-	-	-	-
Stress	48%	20%	-	-	-	-	-

In the present study smoking was present in 35.9% of ischemic strokes and 36.4% of hemorrhagic strokes where as it was 18.11% and 4.72% in ischemic and hemorrhagic strokes respectively in Mehndiratta *et al*[2].In the study by Alverez *et al*[20] it was present in 56.74% of ischemic strokes. In the present study history of alcohol consumption was present in 28.2% of ischemic strokes and 36.4% of hemorrhagic strokes where as it was 16.7% and 28.26% in ischemic and hemorrhagic strokes respectively in Beevan *et al*[3].Diabetes was present in 28.2% of ischemic and 9.1% of hemorrhagic strokes in present study whereas it was 3.96% and 2.36% in ischemic and hemorrhagic strokes respectively in Mehndiratta *et al*. This did not concur with the present study probably because the incidence of Diabetes Mellitus was less in Mehndiratta *et al*[2].In the present study hypertension was present in 15.4% of the ischemic and 90.9% of hemorrhagic strokes whereas it was 16.53% and 3.14% in ischemic and hemorrhagic strokes respectively in Mehndiratta *et al*[2].This did not concur with the present study probably because there were number of risk factors present in the same patients diluting the effect of single risk factor. In the present study CAD was present in 20.5% of the ischemic and 9.1% of the hemorrhagic strokes whereas it was 6.29% and 0.78% in the same in Mehndiratta *et al*[2].History of TIA was present in 2.6% of the ischemic stroke and none in the hemorrhagic stroke whereas Mehndiratta *et al*[2] showed an incidence of TIA in the same as 7.87% and none.2.6% of the ischemic and 9.1% of hemorrhagic strokes patients had history of consumption of OCP's whereas it was 18.75% and none in Bevan et al[3].Present study did not concur with the above study probably because the present study was done in rural setup. Our study showed a high occurrence of dyslipidemia in the form of elevated LDL and decreased HDL. Mehndiratta MM et al[2] showed abnormal cholesterol and triglycerides levels as a risk factor. Albucher JF *et al* [22] showed by multivariate analysis that HDL was the only one to be highly associated with stroke.

Table 3: Comparison of Various etiologies

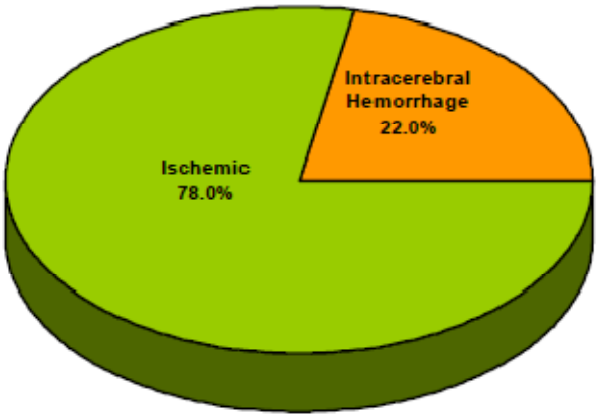
Sr.No.	Authors	Year	Common Aetiology
1	Srinivasan *et al* [31]	1984	Meningovascular syphilis,CVT
2	Adams RD *et al* [9]	1986	Cardioembolic, Atherosclerosis
3	Bogousslavsky *et al* [19]	1987	Cardioembolic, Atherosclerosis
4	Alverez *et al*[20]	1988	Atherosclerosis, Cardioembolic
5	Dalai *et al*[18]	1989	Atherosclerosis
6	Bevan H *et al*[21]	1990	Cardioembolic, Atherosclerosis
7	Nagaraja *et al* [33]	1997	APLA syndrome
8	KashinKunti *et al* [34]	2013	Atherosclerosis
9	Present Study	2014	Atherosclerosis

Atherosclerosis had emerged as the main etiological factor responsible for 52% of the patients in our study. Atherosclerosis was considered based on the criteria similar to Adams *et al* [9] when the patient had 2 or more risk factors for atherosclerosis in the absence of identifiable causes. Bevan *et al* [3] found

atherosclerosis in 31% cases. In a case study by Dr. KashinKunti *et al* [34] cause of ischemic stroke was atherosclerosis in 60% cases. Hypertension is the etiological factor in 20% of the patient's maximum 90.9% of them had cerebral hemorrhage, Dalai *et al* [18]found hypertension as cause in 40% of patients. CVT (cortical venous thrombosis) was seen in 9 patients (18%). Venkataraman *et al* [24] found 4.3% incidence of CVT in his study whereas Toubin[25] found CVT in 9% cases out of 182 autopsies. This difference in incidence can be explained on basis Bousser *et al*'s[26] trial from autopsy series who found true incidence much higher than that thought. In our study 12% patients had Tubercular meningitis similarly Grau AJ *et al* [27]found incidence of 19.2%.RHD leading to cardio embolic stroke comprised 10% of the cases. In a study by Mehndiratta MM *et al* [2] showed 30%. Bansal *et al* [28] showed an incidence of 16%. Present study had less number of cases of RHD in comparison to other Indian studies probably because of small study group. In the present study 2 patients (4%) were diagnosed to have SLE. In the study by Mehndiratta MM *et al* the incidence was 1.8%.Aetiology was undetermined in 4% of the cases. In a study by Mehndiratta MM *et al* the undetermined cases were 8%.Present study had fewer numbers of undetermined cases probably because of a smaller study group.

Table 4: Comparison of CT (brain) findings with other study

CT(brain) finding	Kumar HNH *et al*[29]	Present study
Ischemic stroke	56.00%	60%
Intracerebral hemorrhage	22.9%	22%
Cortical venous thrombosis	-	18%



Graph 2: Type of young stroke

Ischemic infarcts were noted in 30 (60%) patients. 25 (50%) patients had MCA infarct, 2 (4%) had lacunar infarcts, 2 (4%) had cerebellar infarcts and 1 (2%) patient had anterior cerebral artery infarct. Intracerebral hemorrhage was seen in11 (22%) patients. 3 (6%) patients had hemorrhage involving MCA territory, 4 (8%) patients had hemorrhage involving putamen, 2 (4%) patients had in globuspallidus, 1 (2%) in thalamus. Kumar HNH *et al*[29] Study shows Ischemic stroke 56%, intracerebral hemorrhage 22.9%. Rajesh SA et al[30] in their study had found ischemic infarction in CT in 76.2% and hemorrhage in 23.8% of the stroke in young. Cortical venous thrombosis was seen in 9 (18%) patients, who all were females. 8 (16%) females were post partum & 1 (2%) female had APLA syndrome. In a study by Venkataraman *et al* [23,24] who evaluated 69 patients less than 40 years with stroke, the incidence of CVT was 4.3%.Special hematological investigations like antithrombin III, protein C, protein S deficiencies and angiographic studies could not be done in the present study. Evaluations of various risk factors of stroke in young are important as they may play a major role in predisposing an individual to a disease which has terrible impact on the family and society. Stroke in young deserves an extensive evaluation that includes hematological, biochemical and angiographic studies. By these approaches a large number of potential causes

can be detected and the treatment of these patients can be tailored according to the outcome. Consistent with the findings of other studies, this study showed that Hypertension, Smoking, diabetes, sedentary lifestyle and cardiovascular diseases have strong correlations and association with Stroke and are the major risk factors of stroke while B.M.I, Diet, Stress and family history of stroke had no significant association with stroke.

Conclusion

In our hospital based cross sectional study in patients with stroke, hypertension, sedentary lifestyle, cardiac problems, diabetes, alcohol and cigarette smoking, were significant risk factors. This could be helpful in early identification of subjects at risk for stroke and formulating public health strategy, if proven by a larger population based studies.

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Abbreviations

BMI-body mass index
CAD-coronary artery disease
DM-diabetes mellitus
HTN-hypertension
OCP-oral contraceptive pills
CVT-cortical vein thrombosis
TIA-transient ischemic attack
FS/S-family history of stroke
HC-homocysteinemia
ICH-intracerebral hemorrhage
ISCH- ischemic stroke
APLA-antiphospholipid antibody syndrome
RHD-rheumatic heart disease
CT-computed tomography

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