

Original Research Article

Analysis of Conventional Risk Factors in Stroke in Young Population (A Tertiary Care Hospital Based Study)Namrata Khandelwal^{1*}, Biman Kanti Ray², Deep Das²¹Assistant Professor Neurology, Super specialty Hospital, NSCB Medical College, Jabalpur, Madhya Pradesh, India²Professor, Neuromedicine, Bangur Institute of Neurosciences, IPGMER Kolkata, West Bengal, India³Consultant Neurologist, Woodland Multispecialty Hospital, Kolkata, West Bengal, India

Received: 07-06-2021 / Revised: 19-07-2021 / Accepted: 24-08-2021

Abstract

Background: The published literature, in INDIA, addressing risk factors and aetiology of stroke in young, is limited at best. **Objectives:** To assess the aetiology and conventional risk factors for stroke in young population attending a tertiary care hospital and compare risk factors in various age groups and ischemic and haemorrhagic subgroups. **Material & Methods:** Patients aged 15-49 years attending stroke clinic at tertiary care hospital, were evaluated from January 2012 - June 2013. Diagnosis was based on clinical and imaging features. Detailed risk factor evaluation was done by history, examination, biochemistry, parenchymal imaging to determine stroke subtype. **Result:** 98 patients of stroke (37 were females and 61 were males) were assessed. Mean age for ischaemic stroke was 32.8 years and for haemorrhagic stroke was 31.4 years. Out of 98 patients of stroke studied, smoking was the most common risk factor (37.75%) followed by systemic hypertension (36.73%) and dyslipidaemia (30.6%). Alcohol abuse and smoking were more common in males as compared to females and the difference was statistically significant. Incidence of diabetes was 13.64% in ischemic subgroup and 9.38% in haemorrhagic subgroup. Univariate regression analysis of all risk factors revealed that smoking, family history of stroke, diabetes, hypertension, and dyslipidaemia are the potential risk factors among older age groups. Multivariate regression analysis of all risk factors also observed and found that the adjusted odds of family history, hypertension, and dyslipidaemia were statistically significant and concludes that these are more potent risk factors in older age groups.

Keywords: Stroke, Neuroimaging, CNS.

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Introduction

The impact of stroke on the individual family and society is strongest when it affects a young individual. Previous hospital-based data from India indicated a high proportion of young stroke (first-ever stroke onset <40 years of age), ranging between 15% and 30%. However, this number was biased because of preferential admission policy. In a recent well-designed population-based study, 8.8% of stroke subjects were young, which is similar to that seen in Western countries. The age group for stroke in young has been variable between different studies but perhaps should be restricted to 15-49 years as this age group tends to have a unique set of causes and risk factors. Risk factors for stroke may be divided into modifiable and non-modifiable. Non-modifiable risk factors for stroke include age, sex, ethnicity, low birth weight and heredity. Hypertension, smoking, cardiovascular disease, diabetes, asymptomatic carotid stenosis, atrial fibrillation, dyslipidemia, unhealthy diet, obesity, physical inactivity and postmenopausal hormone therapy are established modifiable risk factors for stroke. The focus of our study is to analyse the role of conventional risk factors for stroke in young patients. This study will provide better understanding in diagnosis and effective management of stroke in young patients [1,2,3,4].

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E-mail: khandelwalnamrata@yahoo.com**Aim and Objectives**

- To evaluate the Patients, stroke in age group 15-49 years by analysing the history, clinical, laboratory investigations and neuroimaging, in patients attending a tertiary care centre in eastern India.
- Analysis of conventional risk factors among various subgroups.

Materials and Methods

A Non-Randomized descriptive (cross-sectional) study of 98 consecutive patients of stroke who were admitted to the Department of Neurology in SSKMH, or were referred to the stroke clinic, fulfilling the WHO definition of stroke during study period of January 2012 to February 2013 was undertaken. Patients who were included in study group had the following characteristics:

Subject Inclusion Criteria

Subjects aged 15-49 years attending our tertiary neurology centre, fulfilling WHO definition of stroke with imaging evidence (CT and MRI) suggestive of stroke.

Subject Exclusion Criteria

- Head injury patients
- Intracranial Space Occupying Lesions (tumor/SDH/EDH)
- Any CNS infection
- Known Patient of demyelinating disease
- Any Patient with static encephalopathy or significant metabolic derangement.

Method of Study

All consecutive stroke patients aged 15-49 years attending Stroke Clinic and Neurology OPD, neurology wards of BIN, SSKM hospital, were evaluated for age, gender, risk factors, family history, type of neurodeficit and neurological examination. An informed

written consent was taken, and blood samples were drawn in fasting condition for evaluation of biochemical parameters like lipid profile and blood sugar level. Other relevant blood investigations like hemogram, blood urea, serum creatinine, blood sugar (F and PP), liver function tests, and Homocysteine levels were done. Further, radiological assessment including ECG, 2D echocardiography, carotid and/ or vertebral Doppler and neuroimaging was done

Data analysis method

All Patient report forms were checked for completeness and inappropriate or illogical responses. The forms were entered using Microsoft 2007 Excel worksheet. The databases were validated, and all inconsistencies and differences were resolved. Before analysis all categorical variables were coded in numerical categories and discrete age distribution was re-coded into two distinct categories i.e. 15-39 and 40-49 years. Statistical analysis was performed using SAS 9.3.1 for Windows (SAS Institute Inc., Cary, NC, USA). Categorical data was presented as frequency counts (percent) and compared using the Chi-square or Fisher's exact statistic as appropriate. Odds Ratio and 95% Confidence Intervals were also presented for 2 x 2 contingency tables. Continuous data was presented as means(± standard deviation) and compared using the t-test. Univariate logistic regression model was applied to test the difference of various risk factors between ischemic and hemorrhagic stroke, age groups, sexes and multivariate

model was also tested and adjusted by all potential risk factors status variables.

Observations

98 consecutive patients of stroke, fulfilling the inclusion criteria and exclusion criteria admitted in neuromedicine ward or attending stroke clinic in BIN, SSKM hospital during a study period of 20 months (from Jan 2012 to February 2013) were included in study. All patients underwent complete laboratory biochemical and radiological evaluation to evaluate various risk factors for stroke as explained in materials and methods section. In the present study a total of 66 (67.3%) patients out of total 98 were found to have ischemic stroke, and 32(32.7%) had hemorrhagic stroke. The ratio of ischemic to hemorrhagic stroke in our study was 2.1:1. The risk factors were analysed, etiologies were determined, imaging characteristics were noted and are presented in the tables below.

Demographics:The age distribution of the Patients is depicted in figure 1. The youngest patient in our study was 16 years old in ischemic subgroup and 17-year-old in hemorrhagic subgroup at the time of presentation. The mean age of ischemic and hemorrhagic stroke subjects were 34.26 years and 32.81 years respectively. In ischemic subgroup, 27 patients (40.9%) fell in 40 to 49 years age subgroup. In hemorrhagic subset, largest age wise cohort was 30 to 39 years (46.8%).

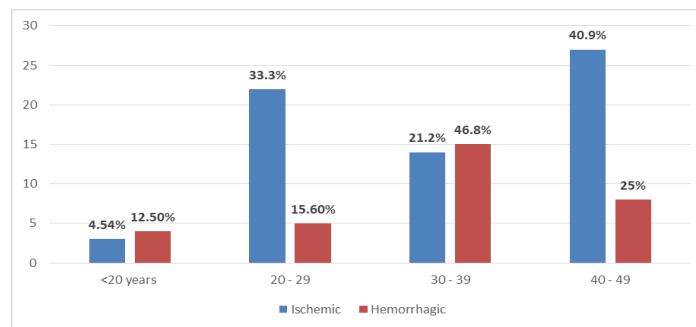


Fig 1: Shows the Age distribution of the Patients

Out of total 98 patients studied 37 were females and 61 were males. In ischemic subgroup, 40 patients (60.6%) were males and 26(39.4%)were females. In the hemorrhagic stroke subgroup, of a

total of 32 patients, 21(65.6%) were males while 11(34.4%) were females.

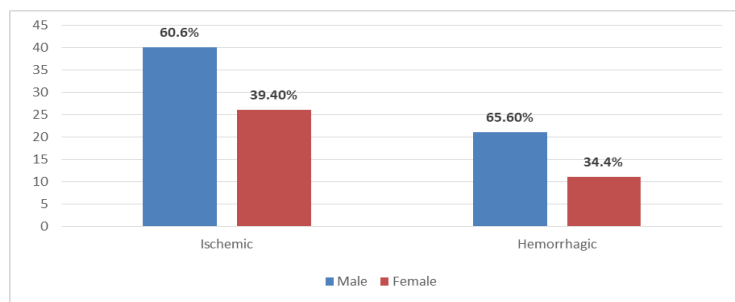


Fig 2: Shows the Sex wise distribution of patients

Table 1: Shows the Age and sex wise distribution of patients of ischemic and haemorrhagic stroke

Age group	Male		Female		Total	
	Ischemic (%)	Hemorrhagic (%)	Ischemic (%)	Hemorrhagic (%)	Ischemic (%)	Hemorrhagic (%)
15-39	22 (56.41)	17 (43.59)	17 (70.83)	7 (29.17)	39 (61.90)	24(38.10)
40-49	18(81.82)	4(18.18)	9(69.23)	4(30.77)	27(77.14)	8(22.86)
total	40(65.57)	21(34.43)	26(70.27)	11(29.73)	66(67.35)	32(32.65)

The above table 1 shows the distribution of ischemic and hemorrhagic subgroups in two age groups: 15-39 years and greater than 40 years. In ischemic subgroup, out of total 66 patients: 22 males and 17 females (total 39) belonged to 15 to 39 years age group

while 18 males and 9 females (total 27) belonged to the age group greater than 40 years. The mean age for ischemic stroke in females was 33.27 years and for males was 34.90 years.

In hemorrhagic subset, of a total 32 patients, 17 males and 7 females (total 24) belonged to the 15-39 years age group while 4 males and females each (total 8) belonged to the age group greater than 40

years. The mean age for hemorrhagic stroke in females was 37.09 years and for males was 30.57 years.

Table 2: Shows the conventional risk factors across all Patients (n=98)

Risk factor	Frequency	Female	Male	Odds Ratio (95% CI)
Hypertension	36(36.73%)	13/37(35.14)	23/61(37.70)	1.1(0.5-2.6) (P>0.05)
Smoking	37(37.75%)	0/37(0.00)	37/61(60.66)	Chi Sq 35.7; P<0.0001
Dyslipidemia	30(30.6%)	9/36(25.00)	21/60(35.00)	1.62(0.64-4.06) p>0.05
Alcoholism	20(20.4%)	1/37(2.70)	19/61(31.15)	16.3(2.1-127.7) (P=0.0008)
TIA/previous stroke	29(29.59%)	10/37(27.03)	18/61(29.51)	1.1(0.5-2.8) (P>0.05)
Family history	21(21.4%)	6/37(16.22)	15/61(24.59)	1.7(0.6-4.8) (P>0.05)
Diabetes mellitus	14 (14.28%)	5/37(13.51)	7/61(11.48)	0.8(0.2-2.8) (P>0.05)

Out of 98 patients of stroke studied, smoking was the most common risk factor (37.75%) followed by systemic hypertension (36.73%) and dyslipidemia (30.6%). Previous history of stroke was present in 29.9% Patients and family history was positive in 21.4% Patients. On

calculation of odds ratio, there was significant difference between male and female patients for risk factors like smoking (chi square value=35.7, p<0.0001) and alcoholism (odds ratio 16.6, p value <0.0001) which were more prevalent among males.

Table 3: Shows the Risk factor analysis for ischemic versus hemorrhagic stroke

Risk factor	Ischemic (%)	Hemorrhagic (%)	Odds Ratio (95% CI)	p-value
Hypertension	26/66 (39.39)	10/32 (31.25)	0.70 (0.29-1.71)	>0.05
Smoking	27/66 (40.91)	10/32 (31.25)	0.66 (0.27-1.61)	>0.05
Dyslipidemia	21/66 (31.8)	7/32 (21.80)	0.44 (0.19-1.05)	>0.05
Alcoholism	14/66 (21.21)	6/32 (18.75)	0.86 (0.30-2.49)	>0.05
TIA/previous stroke	25/66 (37.88)	3/32 (9.38)	0.17 (0.05-0.62)	0.0036
Family history	19/66 (28.79)	2/32 (6.25)	0.16 (0.04-0.76)	0.0112
Diabetes mellitus	9/66 (13.64)	3/32 (9.38)	0.66 (0.16-2.61)	>0.05

A detailed history and biochemical evaluation were done to ascertain risk factors for stroke in the two subsets. Out of a total of 66 patients of ischemic stroke evaluated, smoking was the most common risk factor (40.9%), followed by systemic hypertension (39.39%) and previous history of stroke / TIA (37.8 %). Dyslipidemia was found in 32.81% patients of ischemic stroke. Other less common conventional risk factors were family history of stroke in 29.79 % Patients and heavy alcohol use in 21.21 % Patients.

In hemorrhagic subset, hypertension and smoking were the most common risk factors (each 31.25%). Dyslipidemia was seen in 21.8%

Patients. Heavy alcohol use was seen in 18.75% Patients of hemorrhagic stroke.

Incidence of diabetes was 13.64% in ischemic subgroup and 9.38% in hemorrhagic subgroup.

After comparison and calculation of odds ratio, no statistically significant difference (p>0.05) was found between risk factors like smoking, systemic hypertension, dyslipidemia, diabetes and alcoholism in the ischemic and hemorrhagic subgroup; however, there was a statistically significant difference in occurrence of previous stroke /TIA(p<0.005) and family history (P<0.05).

Table 4: Shows the age group- wise distribution of conventional risk factors for ischemic stroke

Risk factor	15-39 years	40-49years d/n (%)	Odds Ratio (95% CI)	Female d/n (%)	Male d/n (%)	Odds Ratio (95% CI)
Smoking	12/39 (30.77)	15/27 (55.56)	2.8(1.0-7.8) (P=0.0457)	0/26 (0.00)	27/40 (37.50)	Chi ² =29.3; P<0.0001
Hypertension	8/39 (20.51)	18/27 (66.67)	7.8(2.5-23.6) (P=0.0002)	11/26 (42.31)	15/40 (37.50)	0.8(0.3-2.2) (P>0.05)
Dyslipidemia	4/37 (10.81)	17/27 (62.96)	14.03(3.83-51.40); p<0.0001	7/25 (28.0)	14/39 (35.90)	1.44 (0.48-4.29)
Alcoholism	8/39 (20.51)	6/27 (22.22)	1.1(0.3-3.7) (P>0.05)	1/26 (3.85)	13/40 (32.50)	12.04 (1.5-98.8) (P=0.0058)
TIA/ Previous Stroke	14/39 (35.90)	11/27 (40.74)	1.23(0.4-3.4) (P>0.05)	10/26 (38.46)	15/40 (37.50)	1.0(0.3-2.7) (P>0.05)
Family History	5/39 (12.82)	14/27 (51.85)	7.3(2.2-24.4) (P=0.0006)	6/26 (23.08)	13/40 (32.50)	1.6(0.5-5.0) (P>0.05)
Diabetes Mellitus	3/39 (7.69)	6/27 (22.22)	3.4(0.8-15.2) (P>0.05)	3/26 (11.54)	6/40 (15.00)	1.4(0.3-6.0) (P>0.05)

Smoking was the most common risk factor in ischemic subgroup with 27(40.9%) patients out of 66 who were smokers. There was statistical significance (p<0.05) across age groups with higher number of smokers (55.5%) in the 40-49 years age group.

In ischemic stroke subset out of 66 patients studied, a total of 26(39.4%) patients were hypertensive, of which a significant number (46%) of patients were in age group of 40-49 years (P<0.0001). Dyslipidemia was seen in 21 patients, and there was statistically significant difference noted across age groups.

Family history of stroke was noted in 19 patients (28.8%) and there was statistical significance noted across the two age cohorts with higher number belonging to the 40–49-year age group.

Previous history of stroke/TIA was noted in 25 patients (37.8%); however, no statistical significance ($P>0.05$) was noted in the two age groups.

Alcohol was a risk factor in 25% of patients. However, there was no statistical significance noted across the two age cohorts.

Table 5: Shows the Risk factor comparison in hemorrhagic subgroup

Risk factor	15-39 years	40-49years d/n (%)	Odds Ratio (95% CI)	Female d/n (%)	Male d/n (%)	Odds Ratio (95% CI)
Smoking	7/24 (29.2)	3/8 (37.5)	1.5(0.3-7.8) ($P>0.05$)	0/11 (0.00)	10/21 (47.62)	Chi ² =7.4; $P=0.007$
Hypertension	6/24 (25.0)	4/8 (50.0)	3.0(0.6-15.9) ($P>0.05$)	2/11 (18.18)	8/21 (38.1)	2.8(0.5-16.2) ($P>0.05$)
Dyslipidemia	4/24 (16.7)	3/8 (37.5)	13.0(0.5-17.9) ($P>0.05$)	2/11 (18.18)	5/21 (23.81)	1.4(0.2-8.8) ($P>0.05$)
Alcoholism	5/24 (20.83)	1/8 (12.5)	0.5(0.05-5.5) ($P>0.05$)	0/11 (0.00)	6/21 (28.57)	Chi ² =3.7; $P=0.0529$
TIA/Previous Stroke	1/24 (4.17)	2/8 (25.0)	7.7(0.6-99.5) ($P>0.05$)	0/11 (0.00)	3/21 (14.29)	Chi ² =1.7; $P>0.05$
Family History	0/24 (0.00)	2/8 (25.0)	Chi ² =6.2; $P=0.0128$	0/11 (0.00)	2/21 (9.52)	Chi ² =1.1; $P>0.05$
Diabetes Mellitus	1/24 (4.17)	2/8 (25.0)	7.7(0.6-99.5) ($P>0.05$)	2/11 (18.18)	1/21 (4.76)	0.2(0.02-2.8) ($P>0.05$)

In the hemorrhagic subgroup, smoking and hypertension (31.3% each) were the most common risk factors. Of the risk factors studied, there was no statistically significant difference in occurrence of risk factors such as smoking, systemic hypertension, diabetes, and history of previous stroke in the two age group subsets. However, there was statistical significance noted after chi square test of family history of stroke between the two subgroups which was more common in older age group cohort.

Risk Factors

Epidemiologic studies have established myriad stroke risk factors. Some of them are modifiable and some are not. A detailed history and biochemical evaluation were done to ascertain risk factors for stroke in the two subsets. Overall, out of 98 patients, analysis for risk factors revealed that smoking was the most common risk factor (37.75%) followed by systemic hypertension (36.73%) and dyslipidemia (30.6%). Alcohol abuse and smoking were more common in males as compared to females and the difference was statistically significant. We found unexpectedly high frequencies of modifiable and well-defined risk factors in our patients.

On comparison of risk factors between ischemic and hemorrhagic stroke Patients, out of the total 66 patients of ischemic stroke evaluated, smoking was the most common risk factor (40.9%), followed by systemic hypertension (39.39%) and previous history of stroke / TIA (37.8 %). Dyslipidemia was found in 32.81% patients of ischemic stroke. Other less common conventional risk factors were family history of stroke in 29.79 % Patients and heavy alcohol use in 21.21 % Patients. In hemorrhagic subset, hypertension and smoking were most common risk factors (each 31.25%). Dyslipidemia was seen in 21.8% Patients. Heavy alcohol use was seen in 18.75% Patients of hemorrhagic stroke.

Incidence of diabetes was 13.6% in ischemic subgroup and 9.4% in hemorrhagic subgroup. After comparison and calculation of odds ratio, no statistically significant difference ($p>0.05$) was found between risk factors like smoking, systemic hypertension, dyslipidemia, diabetes and alcoholism in the ischemic and hemorrhagic subgroup; however, there was a statistically significant difference in occurrence of previous stroke /TIA ($P<0.005$) and family history ($P<0.05$).

Further Univariate analysis was performed between ischemic and hemorrhagic subsets. Analysis revealed that family history, previous stroke history and low HDL are the potential risk factors among ischemic groups. However, due to small number in hemorrhagic subgroup, no risk factors could be identified, limiting further multivariate analysis and comparison between the two groups.

Comparison across age group cohorts

Smoking was the most common risk factor in the ischemic subgroup with 27(40.9%) patients out of 66 who were smokers. There was a

statistical significance ($P<0.05$) across age groups with higher number of smokers (55.5%) in the 40-49 years age group.

In the ischemic stroke subset, out of 66 patients studied, a total of 26(39.4%) patients were hypertensive, of which a significant number (46%) of patients were in the age group of 40-49 years ($P<0.0001$). Dyslipidemia was seen in 21 patients and there was a statistically significant difference noted across age groups. Family history of stroke was noted in 19 patients (28.8%) and there was a statistical significance noted across the two age cohorts with higher number belonging to the 40–49-year age group. Previous history of stroke/TIA was noted in 25 patients (37.8%); however, no statistical significance ($P>0.05$) was noted in the two age groups. Alcohol was a risk factor in 25% of patients. However, there was no statistical significance noted across the two age cohorts.

In the hemorrhagic subgroup, smoking and hypertension (31.3% each) were the most common risk factors. Of the risk factors studied, there was no statistically significant difference in occurrence of risk factors such as smoking, systemic hypertension, diabetes, and history of previous stroke in the two age group subsets. However, there was statistical significance noted after applying the chi square test in the family history of stroke between the two subgroups which was more common in older age group cohort.

Univariate regression analysis of all risk factors (and with population divided in two age groups: 15-39 and 40-49 years) revealed that smoking, family history of stroke, diabetes, hypertension, high total cholesterol, low HDL, high LDL and high TG (the last four comprising dyslipidemia), are the potential risk factors among older age groups. Further, multivariate regression analysis model of these significant risk factors observed during Univariate analysis revealed that the adjusted odds of family history, hypertension, and dyslipidemia were found statistically significant which leads us to conclude that family history, hypertension and dyslipidemia in older age groups are more potent risk factors in higher age groups. This model explains 33% of association ($R^2 = 0.33$).

Univariate and multivariate logistic regression analysis of gender with following independent exposure factors revealed alcohol as a potential risk factor in males on Univariate analysis.

In other risk factors, Oral Contraceptive Pill (OCP) usage was the most common risk factor noted. Other risk factors included migraine. 4 patients had rheumatic heart disease (RHD) with atrial fibrillation as the risk factor for stroke. Illicit drug use (cannabis smoking) was noted in a total of 3 patients. 1 patient had history of anabolic steroid use and dissection of extra cranial vessel. Minor trauma was a precipitating factor for 3 strokes, all of which were arterial dissections. Hypercoagulability was noted in 3 patients: 1 had anti phospholipid antibody (APLA) syndrome, 1 had protein C deficiency while the remaining had Factor V Leiden mutation, all of whom suffered from venous sinus thrombosis. Homocysteine estimation was done in a total of 15 patients of ischemic stroke and 5 patients of

hemorrhagic stroke, out of which 4 patients had increased Homocysteine levels (3 ischemic, 1 hemorrhagic) [5]. Smoking has been identified as an independent risk factor for stroke in large number of studies over the years. The relative risk for stroke

ascribed to cigarette smoking is 1.5. Relative risk varies among stroke subtypes with ischemic stroke having a relative risk of 1.9. Smokers younger than 55 years of age have a relative risk of 2.9, which is considerably higher than smokers older than 55 years [6].

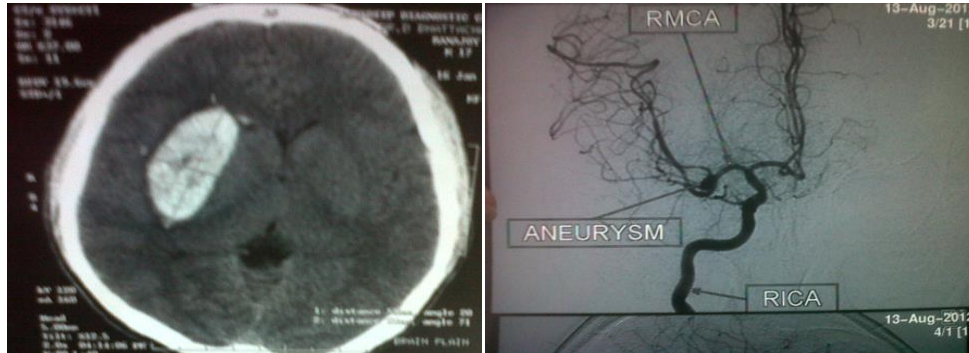


Fig. 3: Shows the Aetiology of haemorrhagic stroke & **Fig. 4:** NCCT (Non-contrast Computed Tomography) Shows the hypertensive intracranial bleed

Hypertension is the most powerful risk factor for ischemic stroke and ICH. There is a continuous association between both systolic and diastolic blood pressures (BPs) and the risk of ischemic stroke. The mortality of heart disease and stroke double with each increment of 20 mm Hg systolic blood pressure. This risk is increased because hypertension accelerates the development of atherosclerosis, ultimately leading to an increased number of atherothrombotic events. Elevated serum cholesterol and stroke is not a well-established risk factor for stroke. Previous studies were confounded by the inverse association of total cholesterol and cerebral hemorrhage, but more recent trials are specific to ischemic stroke. The Asia Pacific Cohort Studies Collaboration suggests a 25% increased risk for ischemic stroke with each 1-mmol/L (38.7-mg/dL) increase in total cholesterol. Studies have shown an increased risk for stroke with “irregular” drinking, including heavy and binge drinking. Acute consumption of an intoxicating amount of alcohol is suggested to be an independent risk for stroke with a relative risk of 1.82 [7,8,9,10].

In a Patient control study of young stroke patients (age group 15-45 years) with age- and sex-matched hospital and community controls, prevalence of various risk factors was studied. Two hundred fourteen South Indian patients with first acute ischemic stroke and 99 hospital and 96 community controls were included. There was higher prevalence of smoking (odds ratio [OR] 7.77), systolic blood pressure (OR 1.88) and fasting blood glucose (OR 4.55) in patients. High density lipoprotein (HDL) was low and total cholesterol/HDL ratio was high in Patients when compared with both hospital and community controls. A unit increase in the ratio of total cholesterol to HDL was associated with doubling of stroke risk. In another study from Mangalore, Karnataka in age group of 15-45 years involving 109 patient’s hypertension was the most common risk factor followed by smoking and diabetes. In a study of stroke in the young from Taiwan, the most common risk factors observed were hyperlipidemia (53.1%), smoking (49.8%), hypertension (45.8%) and a family history of stroke (29.3%).

Thus, our study had high percentage of patients with conventional risk factors which were similar to the findings observed in the above-mentioned studies.

In the Helsinki Young Stroke Registry which included 1008 first ever patients of ischemic stroke in the age group of 15-49 years, hypertension, smoking and dyslipidemia with high total cholesterol emerged as important risk factors. The prevalence of hypertension increased with increasing age and was seen in 28.3% of patients in

the 15-44-year age group, whereas it was prevalent in 51.7% of patients in the 45-49-year age group. Similarly, 38.4% of patients in 15-44-year age group and 54.5% in 45-49-year age group had increased level of cholesterol. Low HDL was present in 15.3 and 23.9% of the patients, respectively. Increased LDL was also present in 38.4% patients in 15-44-year age group and in 54.5% patients in 45-49-year age group. Smoking as a risk factor was observed in around 47% patients in both the age groups. It appears that the risk factor profile becomes similar to the older population with increasing age. Our study showed similar trends: i.e., traditional risk factors (smoking, hypertension, dyslipidemia, prior stroke history) increase with age in ischemic stroke.

In a retrospective study of 200 patients of ICH, (mean age 27 years; range 15 to 40 years) in Mexico, the most frequent risk factors were tobacco use(20%),hypercholesterolemia(35%),hypertension, (13%), and alcohol use (10%). The Hemorrhagic Stroke Project (HSP) [20] had 217 out of 1714 patients with primary ICH. The independent risk factors found were hypertension, diabetes, menopause, current cigarette smoking, alcoholic drinks >or=2/day, caffeinated drinks >or =5/day, and caffeine in drugs. In our study, out of a total 32 patients of hemorrhagic stroke, systemic hypertension and smoking were most common risk factors observed followed by heavy alcohol use. This was in accordance with previous studies mentioned above. However, a small sample size of the hemorrhagic subset was a limitation for further analysis.

Conclusion

Ischemic stroke is a relatively rare event among young individuals but its incidence begins to rapidly rise during early midlife. Modifiable risk factors are common in young ischemic stroke patients and progressively increase in magnitude as ageing occurs. In the Patient of young adults, there is a long lifespan expected ahead. Also, a disease like stroke has severe socio-economic consequences. Owing to these two reasons, detecting these factors is particularly important, because in most patients, they can be modified by lifestyle changes, strictly controlled medication, or invasive interventions as and when indicated. The high rate of risk factors such as hypertension, smoking and dyslipidemia indicate the need for population screening and education programs, targeted to the young population. A rigorous search for all potential risk factors is obviously crucial for adequate secondary prevention. Primary prevention strategies should perhaps be mainly targeted to the age group of 35 to 40 in order to prevent the striking increase of stroke occurrence among those aged 5 or 10 years more.

Table 6:Univariate and multivariate logistic regression analysis of ischemic and hemorrhagic (ischemic coded as 0 and hemorrhagic coded as 1) with following independent exposure factors

Factors		Univariate		Multivariate	
		Exp Beta or Odds Ratio (Age)	R ²	Adjusted Exp Beta or Odds Ratio (Age)	R ² (0.40)
Smoking	No	1			
	Yes	0.7(0.3-1.6)	0.007		
Alcohol	No	1			
	Yes	0.9(0.3-2.5)	0.0007		
Family History	No	1		1	
	Yes	0.2(0.04-0.8)*	0.0617	0.5(0.1-2.6)	0.22
Pre-Stroke	No	1		1	
	Yes	0.2(0.05-0.6)**	0.0789	0.5(0.1-2.1)	
Diabetes	No	1			
	Yes	0.7(0.2-2.6)	0.0031		
High BP	No	1			
	Yes	0.7(0.3-1.7)	0.005		
High Cholesterol	No	1			
	Yes	0.7(0.2-2.11)	0.0036		
Low HDL	No	1		1	
	Yes	0.2(0.1-0.9)*	0.0394	0.2(0.04-1.3)	
High LDL	No	1			
	Yes	1.02(0.3-3.3)	0		
High TG	No	1			
	Yes	1.3(0.5-3.4)	0.0024		
Dyslipidemia	No	1			
	Yes	0.8(0.3-2.0)	0.0018		

Analysis revealed that family history, previous stroke history and low HDL are the potential risk factors among ischemic groups. However, due to a small number in hemorrhagic subgroup, no risk factors could

be identified, limiting further multivariate analysis and comparison between the two groups.

Table 7:Univariate and multivariate logistic regression analysis of age group (15-39 coded as 0 and 40-49 coded as 1) with following independent exposure factors

Factors		Univariate		Multivariate	
		Exp Beta or Odds Ratio (Age)	R ²	Adjusted Exp Beta or Odds Ratio (Age)	R ² (0.40)
Smoking	No	1 (Reference)		1 (Reference)	
	Yes	2.4(1.0-5.8)*	0.03	0.5(0.1-1.9))	
Alcohol	No	1 (Reference)			
	Yes	1.0(0.3-2.7)	0.00		
Family History	No	1 (Reference)		1 (Reference)	
	Yes	9.8(3.2-30.2)***	0.15	7.3(1.6-2.3)**	
Previous Stroke	No	1 (Reference)			
	Yes	1.9(0.8-4.6)	0.01		
Diabetes	No	1 (Reference)		1 (Reference)	
	Yes	3.2(1.3-7.8)**	0.05	5.7(1.3-25.1)**	
Hypertension	No	1 (Reference)		1 (Reference)	
	Yes	5.9(2.4-14.7)***	0.12	2.9(0.8-10.6)	
High Cholesterol	No	1 (Reference)		1 (Reference)	
	Yes	5.6(2.2-14.2)***	0.11	0.9(0.1-13.2)	
Low HDL	No	1 (Reference)		1 (Reference)	
	Yes	9.8(3.6-26.2)***	0.19	8.4(1.5-47.2)**	
High LDL	No	1 (Reference)		1 (Reference)	
	Yes	5.5(2.1-14.2)***	0.10	2.2(0.2-33.7)	
High TG	No	1 (Reference)		1 (Reference)	
	Yes	5.1(2.1-12.4)***	0.11	1.1(0.2-5.8)	

Analysis revealed that smoking, family history, diabetes, hypertension, high cholesterol, low HDL, high LDL, high TG (dyslipidemia) are the potential risk factors in older age groups. Further, multivariate regression analysis model of these significant risk factors observed during Univariate analysis revealed that the adjusted odds of family history, and low HDL was found statistically significant which concludes that family history, and low HDL in older age groups are more potential risk factors. This model explains 40% of association n (R² = 0.40). In other risk factors, OCP usage was the most common risk factor noted. Other risk factors included

migraine, though all were migraine (6) patients without aura. 4 patients had rheumatic heart disease (RHD) with atrial fibrillation as the risk factor for stroke. Illicit drug use (cannabis) was noted in a total of 3 patients, 1 patient had history of anabolic steroid use and dissection of extra cranial vessel. Minor trauma was a precipitating factor for 3 strokes, all of which were arterial dissections. Hypercoagulability was noted in 3 patients: 1 had anti phospholipid antibody (APLA) syndrome, 1 had Protein C deficiency while the last had Factor V Leiden mutation, all of whom suffered from venous sinus thrombosis. Owing to cost constraints, hypercoagulability

profile was performed only in 3 patients of stroke of undetermined etiology, all of whom turned out to be negative for the parameters tested. Homocysteine estimation was done in a total of 15 patients of ischemic stroke and 5 patients of hemorrhagic stroke, out of which 4 patients had increased Homocysteine levels (3 ischemic, 1 hemorrhagic).

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Conflict of Interest: Nil

Source of support: Nil