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An Observational Descriptive Study On the Risk Factors and Their Impact On Clinical Course and Outcome of Ischemic Stroke Patients in A Tertiary Care Hospital

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Abstract: **Background:** As we all know that Stroke is becoming an important cause of disability and premature death in low-income and middle-income countries like India, affecting largely the poorer sections of the society driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors which impoverish their families further. Therefore, our study was planned to evaluate the risk factors and their prognostic value in patients of ischemic stroke in our setup? **Research Question:** What are the risk factors and their prognostic value in the patients of ischemic stroke? The setting of the study was at department of General Medicine, Government General Hospital, Government Medical College, Machilipatnam, Andhra Pradesh. A one-year observational study was conducted during the period from October 2022 to September 2023 on about 100 Ischemic Stroke cases admitted during the above period in the department of General Medicineby studying their socio-demographic profiles, associated risk factors, assessment of the degree of severity in association with risk factors, clinical course and outcome, etc. **Results:** Among the total study subjects 61% were male and 39% were female and it was observed that the distribution of the disease was more as age advances and it was also noticed that the severity of the disease was more among males when compared to females. Among all the study subjects 55% had hypertension followed by 45% had diabetes mellitus, 34% had history of smoking, 26% had history of regular alcohol intake, 23% had dyslipidemia, 13% had heart disease, 6% had hypercoagulable states,10% had history of TIA, 6% had history of migraine, 3% had history of OC pills usage and 2% had family history of stroke. Hypertension, Diabetes and smoking were the common risk factors present in the majority of the study subjects. Regarding the outcome of the disease the disability and mortality was more among the study subjects who had hypertension and diabetes when compared to non-hypertensive and non-diabetic study subjects significantly(P<0.001).

Keywords: Ischemic stroke, TIA (transient ischemic attack), Hypertension, Diabetes, Dyslipidemia etc

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INTRODUCTION

Stroke is the leading cause of disability worldwide and the second leading cause of death. The Global Stroke Factsheet released in 2022 reveals that lifetime risk of developing a stroke has increased by 50% over the last 17 years and now 1 in 4 people is estimated to have a stroke in their lifetime[1]. In 2016, there were 13.7 million new incident strokes globally; ≈87% of these was ischemic stroke[2]. A stroke, or cerebrovascular accident, is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause [3]. The most striking feature is that the bulk of the global stroke burden (86% of deaths due to stroke and 89% of DALYs) occur in lower and lower-middle-income countries. This disproportionate burden experienced by lower and lower-middle income countries has posed an unprecedented problem to families with less resources[4]. Stroke is becoming an important cause of disability and premature death in low-income and middle-income countries like India, driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors[3]. The poor are increasingly affected by stroke, because of both the changing population exposures to risk factors and, not being able to afford the high cost for stroke care. Most of the stroke survivors continue to live with disabilities, and the costs of on-going rehabilitation and long term-care are largely undertaken by family members, which impoverish their families[5]. One of the main clinical risk factors for stroke is a high blood pressure. Other risk factors include tobacco use, physical inactivity, unhealthy diet, use of alcohol, atrial fibrillation, raised blood lipid levels, obesity, genetic disposition, stress, and depression. Stroke survivors may live with impacts which include physical disability, communication difficulties, loss of work, income, and social networks. Fast access to treatment saves lives and improves recovery[1].

It is a life changing event that affects not only the person who may be disabled, but their family and caregivers. India with more than 1 billion inhabitants is undergoing remarkable economic and demographic changes in recent years, resulting in a transition from poverty related infections and nutritional deficiency diseases towards lifestyle related cardiovascular and

cerebro-vascular diseases[6]. In spite of a rapid economic boom, a large segment of the Indian population still lives in poverty and increase in burden of stroke in coming years is highly anticipated [5].

The prevalence of stroke in India varies in different regions of country and the estimated prevalence rates increases from 0.3/1000 in <45 years' age group to 12-20/1000 in the 75-84 years' age group. Approximately 12% of all strokes occur in a population < 40 years of age [6]. It is generally acknowledged that stroke is a multi- factorial condition. A number of risk factors have been shown to be associated with stroke namely age, sex, hypertension, serum cholesterol, alcohol intake, smoking, diabetes mellitus, obesity, physical inactivity, family history of transient ischemic attack and dietary factors[7]. However, their relative contribution in the outcome of stroke varies from study to study and from population to population[6].And aggressive risk-factor management and lifestyle advice are essential for all patients[8].

In view of rapid increase in burden of stroke in coming years and limited availability of stroke care in India, it would be better to study stroke prevention strategies, because preventive methods will reduce the incidence of stroke[9]. In view of the increasing incidence, high health care costs and the potential for prevention of stroke this current study was conducted to identify the important risk factors associated to the severity and outcome of ischemic stroke[9].

MATERIAL & METHODOLOGY:

The setting of the study was at department of General Medicine, Government General Hospital, Government Medical College, Machilipatnam, Andhra Pradesh. A one-year observational study was conducted during the period from October 2022 to September 2023. According to the hospital censes the prevalence of Ischemic Stroke cases admitting in General Medicine department was found to be 50% and the sample size was calculated by using the formula $N=4PQ/L^2$ where P=50%, Q=100-P that is 50% and L=20%allowable error in 'P' that is 10 therefore N=100. All the cases of clinically diagnosed and as per thethe standard case definitions admitted in the ward during the above period up to reach the required sample size was included in the study after duly following the inclusion and exclusion criteria as indicated below**.**

Inclusion criteria:

1. Symptoms and Signs suggestive of acute loss of focal or global cerebral function
2. Evidence of Ischemia on CT scan of brain.

Exclusion criteria:

1. Patients with focal Epilepsy and structural brain lesions (tumors)
2. Patients with evidence of haemorrhage on CT scan of brain.
3. Stroke secondary to infection and connective tissue disorders
4. Patients who did not give written informed consent.

Objectives:

1. To know the socio-demographic profiles of the study subjects
2. To study the risk factors and their prognostic value among the Ischemic Stroke patients.

After receiving the Ethical committee clearance from the institution the study was began and the required data was collected by using a pretested proforma pertaining to their socio-demographic profiles, associated risk factors and assessing the degree of severity and prognostic value in association with risk factors and all the cases (study subjects) of the study were managed and followed until discharge. **NIHSS score** was used to classify the severity of stroke. A score of 0–5 indicates mild stroke, 6–15 denotes moderate stroke and score of more than 15 is suggestive of severe stroke. In this study **Barthel index** was used to assess prognosis at the time of discharge. Barthel index score of 76–100 points denote good function, 51–75 points denote moderate disability and score under 50 denotes severe disability and "0" score represents totally dependent bedridden state. The risk factor profile of each patient was evaluated during the stay.

Finally, the collected data was analyzed by using appropriate statistical tools like percentages, proportions, measures of central tendency, measures of dispersion, standard error of mean and tests of significance etc. with the help of computer software. The study results were compared and discussed in the light of published material of various similar studies belongs to different authors and there by conclusions and recommendations was framed.

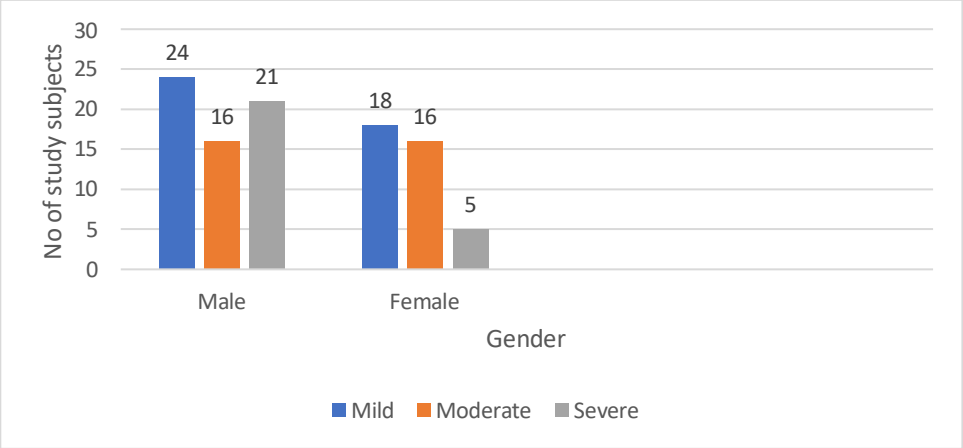
OBSERVATIONS AND RESULTS

Table 1: Age, sex and severity wise distribution of study subjects

S.No	Age	Total	Male(61)& Severity of Stroke	Female(39)& Severity of Stroke

	(in years)		Mild	Moderate	Severe	Total	Mild	Moderate	Severe	Total
1.	21-30	3	1	0	1	2	1	0	0	1
2.	31-40	8	3	1	2	6	1	1	0	2
3.	41-50	8	3	1	2	6	1	1	0	2
4.	51-60	25	5	4	5	14	4	4	1	9
5.	61-70	28	5	5	4	14	6	6	2	14
6.	>70	28	7	5	7	19	5	4	2	11
Total		100	24	16	21	61	18	16	5	39

Mean = 61.4± 13.7, P



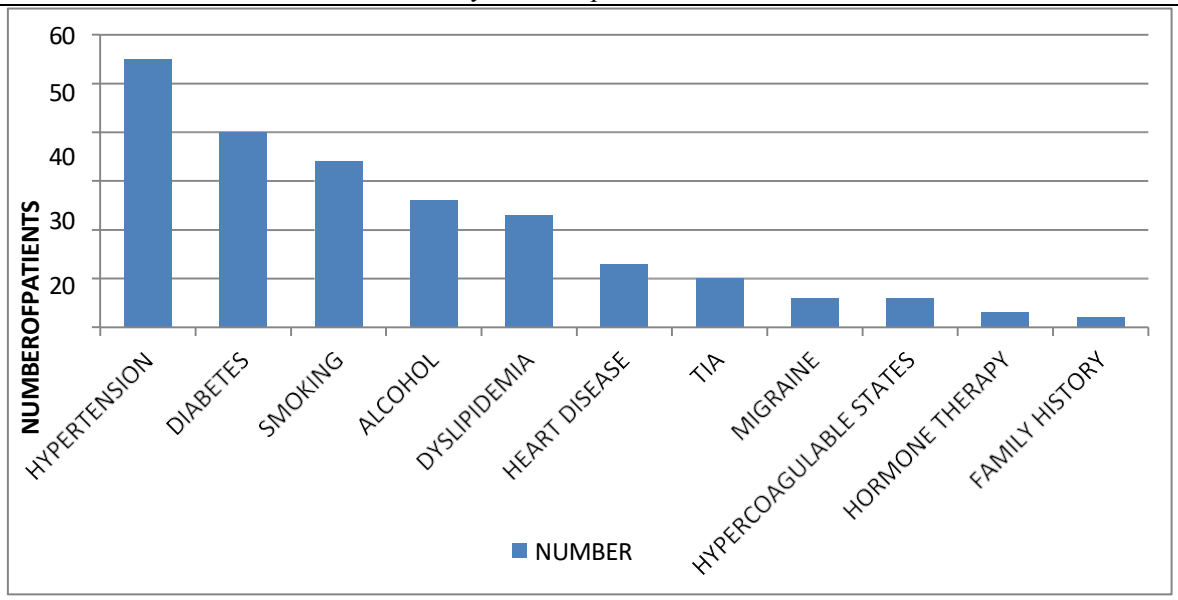
< 0.01

- Among the total study subjects 61% were male and 39% were female
- It was observed that Incidence of the disease was more as age advances
- And also it was noticed that the severity was more among males when compared to females significantly

Table2: Evaluation of Risk Factors among the study subjects

Risk factors	Number of Patients	Percentage
Hypertension	55	55%
Diabetes Mellitus	40	40%
Smoking	34	34%
Alcohol intake	26	26%
Dyslipidemia	23	23%
Heart disease	13	13%
TIA	10	10%
Migraine	6	6%
Hypercoagulable States	6	6%
Hormone therapy	3	3%
Family history	2	2%

Figure-2: Evaluation of Risk Factors among the study subjects.



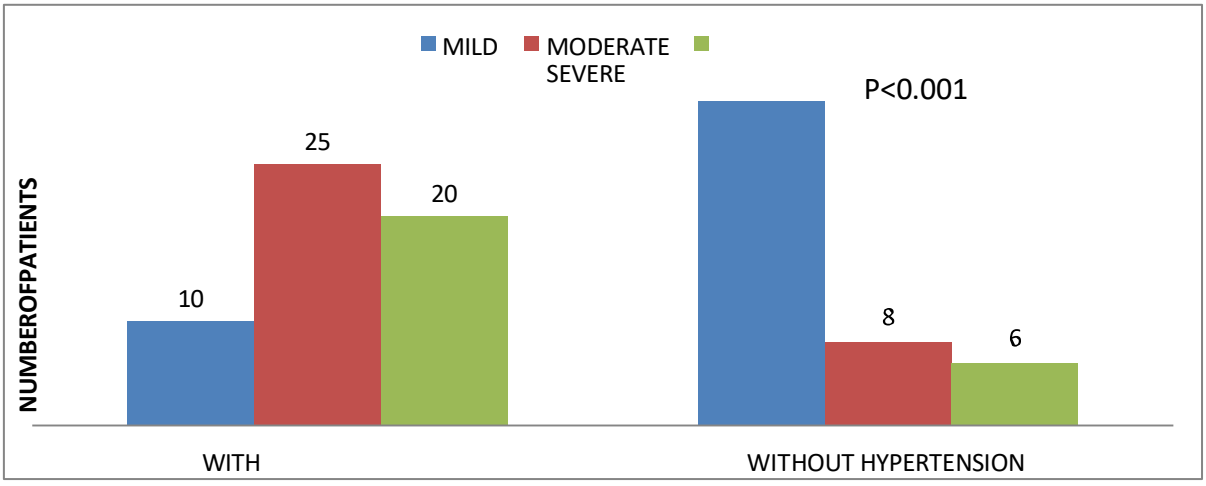
- Among all the study subjects 55% had hypertension followed by 45% had diabetes mellitus, 34%had history of smoking, 26% had history of alcohol intake, 23% had dyslipidemia, 13% had heart disease, 6% had hypercoagulable states, 10% had history of TIA, 6% had history ofmigraine,3% had history of OC pills usage and 2%hadfamilyhistoryofstroke.
- Hypertension, Diabetes, smoking and dyslipidemia were the common risk factors present in the majority of the study subjects.

Table3: Distribution of Severity of Stroke among Hypertension Vs Non Hypertension Study Subjects

	Total		Mild Stroke		Moderate Stroke		Severe Stroke	
	NO.	%	NO.	NO%	NO.	NO%	NO.	%
Patients with Hypertension	55	55%	10	18.2%	25	45.4%	20	36.4%
Patients without Hypertension	45	45%	31	68.8%	8	17.8%	6	13.45%

P<0.001

Figure3: Hypertension and Severity of Stroke



- It was observed that severity of the disease was more among the study subjects who had hypertension when compared to non-hypertensive study subjects

Table4: Outcome in Ischemic Stroke Patients with Hypertension.

Study Subjects	Good function		Moderate function		Severe disability		Bedridden		Death	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
With hypertension	9	16.3%	20	36.4%	11	20%	3	5.4%	12	21.9%
Without hypertension	31	68.8%	8	17.8%	2	4.4%	3	6.6%	1	2.2%

P <0.001

- Regarding the outcome of the disease the disability and mortality was more among the study subjects who had hypertension when compared to non-hypertensive study subjects significantly

Figure 4: Outcome in Ischemic Stroke Patients with Hypertension

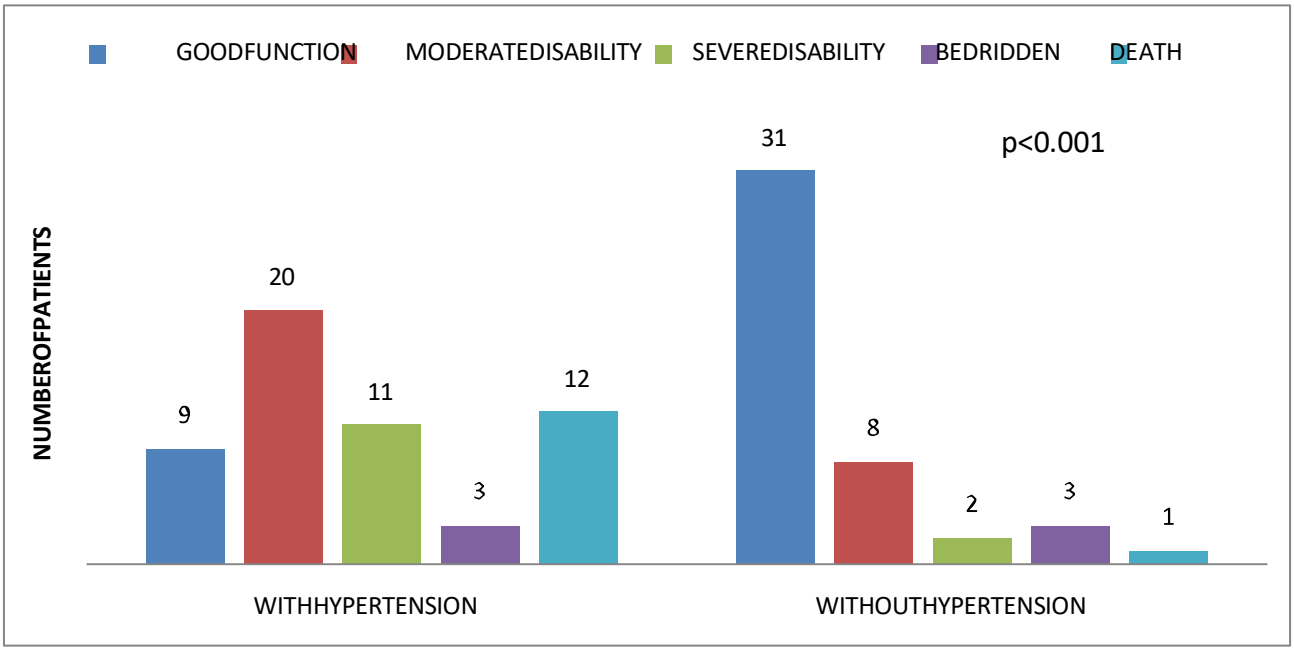
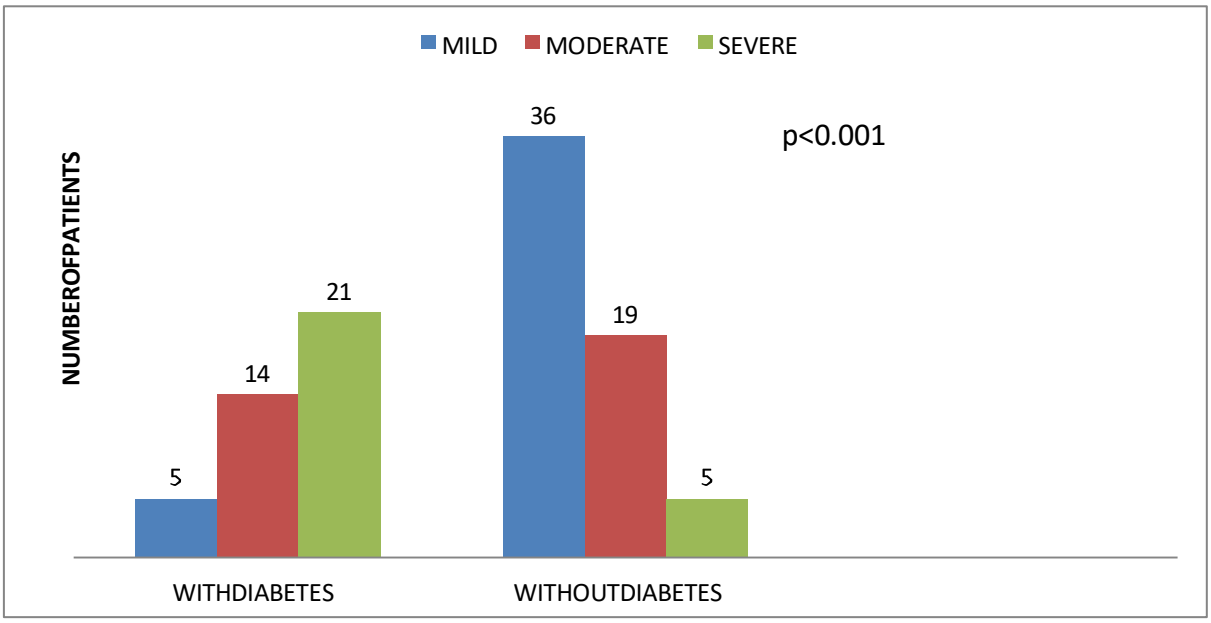


Table5: Severity of Stroke in relation with Diabetes

Study Subjects	Number of Patients		Mild Stroke		Moderate Stroke		Severe Stroke	
	NO.	%	NO.	%	NO.	%	NO.	%
With Diabetes	40	40%	5	12.5%	14	35%	21	52.5%
Without Diabetes	60	60%	36	60%	19	31.6%	5	83.4%

P<0.01

Figure5: Severe of Stroke in relation with Diabetes



- Among the total study subjects about 40% were Diabetic and 60% were non Diabetic**.**
- The severity of the disease was more among Diabetic study subjects when compared to non-Diabetic study subject

DISCUSSION

In the present study out of 100 study subjects 61% were male and 39% were female which was correlated with the findings of the other studies like Fukuoka Stroke Registry[10] (61.5% and 38.5%), P.N. Sylaja et al[11] (67.2% and 32.8%), Push pendranath et al[12] (67.6% and 32.4%) and Noushin Fahimfar et al[13]etc. And it was understood that in our study the distribution of Ischemic stroke was more among males as it was observed in other above studies also.

The mean age of the study subjects in the present study was 61.4± 13.7 years which was comparable to study done by Biswas et al[14] (Indians) 64 ± 10 years versus (Americans) 71 ± 13 years. And the Studies done by PNSylaja et al[11] showed that the mean age of presentation of stroke was 58.3 ± 4.7(64), Push pendranath *et al*[12](66) it was 57.1±1.7 years and various other studies also showed similar age of presentation of stroke. In the present study older age (>60 years) was significantly associated with higher morbidity and mortality (p=0.0006) and Patients with age >60 years at the time of presentation had severe stroke (p<0.0078). Regression analysis in this study showed that age is an independent risk factor predicting severity (p=0.0003) and outcome of stroke (p=0.0002). Similar other studies like P N Sylajaet al[11], Weiminwei et al[15], SeneDiouf et al[16] and González et al[17] has proved that old age strongly associated with poor prognosis.

Related to risk factors among all the study subjects 55% had hypertension followed by 45% had diabetes mellitus, 34% had history of smoking, 26% had history of regular alcohol intake, 23% had dyslipidemia, 13% had heart disease, 6% had hypercoagulable states, 10% had history of TIA, 6% had history of migraine, 3% had history of OC pills usage and 2% had family history of stroke and Hypertension, Diabetes and smoking were the common risk factors present in the majority of the study subjects and these findings were very much close to the findings of the studies of P.N. Sylaja et al[11], Push pendranath et al[12], Noushin Fahim far et al[13] , PM Dalal et al[18] and Jin Liang et al[19] and In the present study it was also observed that patients with hypertension, diabetes had severe stroke and poor functional outcome as morbidity and mortality was significantly higher when compared to non-hypertensive and non-diabetic study subjects. And regression analysis also proved that hypertension, diabetes and smoking were independently associated with the occurrence of the disease. Study by Weiminwei et al[15] showed that history of hypertension was associated with increased risk of death within 90 days after stroke. High blood pressure is common in acute stroke and is independently associated with poorprognosis[20]. A study by Noushin Fahimfar et al[13] showed that diabetes mellitus was independently associated with increased risk of stroke events in general population.

In a study by P.N. Sylajaetal[11] diabetes mellitus predicted poor three months' outcome.

Study by Nayak ARetal[21]showed that diabetes increases the risk of dependent /expired outcome in acute ischemic stroke patients. Study by Ju-Hun Lee et al[22] showed that smoking was independently associated with severe stroke. In the present study it was found that smoking was associated with more morbidity and mortality (P=0.01). In a study by Ju-Hun Lee et al[22] it was shown that smoking was not associated with a good functional outcome. And a study by Ovbiageleetal[23] showed

that current or recent smokers experience poorer functional outcomes than nonsmokers three months after acute ischemic stroke. In this study it was also noticed that regular alcohol intake and dyslipidemia also associated with major risk of the disease as it was also reported by the above other studies.

LIMITATIONS

The study was a hospital based and conducted in a small group of patients. There were confounding factors in the present study and there was no long term follow-up.

CONCLUSIONS AND RECOMMENDATIONS

- As the distribution of the disease was more among the male and older age group population, it is very important to target our intervention and preventive strategies among these groups to control the incidence and prevalence of the Ischemic stroke.
- And also findings in the present study suggest that hypertension, diabetes, smoking, alcoholism and dyslipidemiawere the major risk factors associated with the disease, we need to focus towards elimination and control of these factors because these are preventable risk factors which independently associated with severity and functional outcome of stroke.And it is also recommended that early detection of hypertension and diabetes by means of mass screening programmes and regular treatment and follow-up, smoking cessation and alcohol abstinence awareness& DE addiction programmes by involving local community leaders, NGOs and peripheral healthcare workers etc. will impact a lot on decrease of burden of the disease in community .

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