

**PATIENT DEMOGRAPHIC, RISK FACTORS AND SEASONAL VARIATION IN ONSET OF STROKE**M. K. M. Kathyayani<sup>1</sup>, D. Vijaya Babu<sup>2</sup>, S. Sreenivas<sup>3</sup><sup>1</sup>Assistant Professor, Department of General Medicine, Andhra Medical College, Andhra Pradesh.<sup>2</sup>Assistant Professor, Department of General Medicine, Andhra Medical College, Andhra Pradesh.<sup>3</sup>Professor, Department of General Medicine, Andhra Medical College, Andhra Pradesh.**ABSTRACT****BACKGROUND**

Existence of particular chronobiological pattern in onset of acute cerebrovascular diseases characterised by circannual rhythms has been detected. India is a subtropical country with clear seasonal variations in weather conditions. Stroke causes death and disability worldwide. Seasons may influence stroke occurrence. The mechanisms underlying these seasonal variations of stroke are not fully understood, but a possible reason may include seasonal variation of biological factors such as arterial blood pressure, serum lipid levels and other blood components. Better understanding and controlling of risk factors associated with onset of stroke will improve the disease prevention. The objective of the present study is to examine the role of possible precipitating or triggering factors. This study reviews records of patients with stroke attending the Department of Medicine, KGH, Visakhapatnam.

**MATERIALS AND METHODS**

Patients with diagnosis of stroke attending the Department of Medicine, KGH, Visakhapatnam, were selected. Computed tomographic types of stroke, both ischaemic and haemorrhagic and risk factors associated were considered with tropical seasonal variation.

**RESULTS**

A total of 150 stroke patients were included in the study of which 93 (62%) were males, 57 (38%) were females and 46% in 50-65 years age group, 4% in 20-35 years, 28% in 35-50 years, 22% in 65-80 years and above age groups. Of the total, 93.33% presented with 1<sup>st</sup> attack and only 6.66% presented with recurrent stroke. The prevalence of types of stroke was: ischaemic stroke 54.66%, haemorrhagic stroke 45.33%. The prevalence of risk factors associated with stroke was - male gender 62%, smoking 56.66%, hypertension 56%, age >50 years 46%, alcohol consumption 43%, hyperlipidaemia 16.66%, consumption of alcohol and smoking together 13.33%, valvular heart diseases 6.66%. A high seasonal prevalence was observed in winter season (50.66%).

**CONCLUSION**

This study revealed that male gender, smoking, uncontrolled systemic hypertension, elderly age, excessive alcohol consumption and hyperlipidaemia are major risk factors. Further, it showed high seasonal prevalence of stroke during winter season. With better understanding of demographic and risk factors, we can prevent the disease at an early stage and reduce the global burden of disease worldwide.

**KEYWORDS**

Ischaemic Stroke, Haemorrhagic Stroke, Seasonal Variation.

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**BACKGROUND**

Definition of Stroke: Stroke was defined according to WHO criteria as rapidly developing clinical symptoms or signs of focal or global loss of cerebral function with symptoms lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin<sup>2</sup>. Stroke in India is a major public health problem with higher mortality than in developed countries.

Higher burden of stroke is linked to higher rates of risk factors like male gender, older age, excessive alcohol consumption, type II diabetes mellitus, hyperlipidaemia (low HDL, high LDL cholesterol and triglycerides).<sup>1</sup> Systematic evaluation of risk factors and their prevention both primary and secondary is an effective global strategy to reduce the risk of premature stroke. The relationship of seasonal variation and incidence of stroke is under study.

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**MATERIALS AND METHODS**

Visakhapatnam is a city in coastal Andhra Pradesh with a population of 20 lakhs. King George Hospital (KGH) is a tertiary care hospital located in Visakhapatnam, which is attended by people from nearby coastal districts of Andhra Pradesh. We carried out our study on 150 stroke patients who attended Department of Medicine, King George Hospital, Visakhapatnam, in a period of one year.



Patients with a clinical diagnosis of stroke and computed tomographic confirmation of ischaemic and haemorrhagic stroke were included and patients who suffered from transient ischaemic attacks with symptom resolution within 24 hours of onset with no detectable lesions on computed tomographic scan were excluded. We also excluded secondary intracerebral haemorrhage including arteriovenous malformation and venous strokes. The laboratory investigations included computed tomographic scan, magnetic resonance imaging, blood tests (random blood sugar, blood urea, serum creatinine, serum cholesterol, serum electrolytes, etc.), 12-lead electrocardiogram, chest radiography, carotid Doppler, echocardiography and other additional required tests. All patients underwent complete physical and neurological examination. Diagnosis was based on clinical features and on results from imaging and laboratory tests.

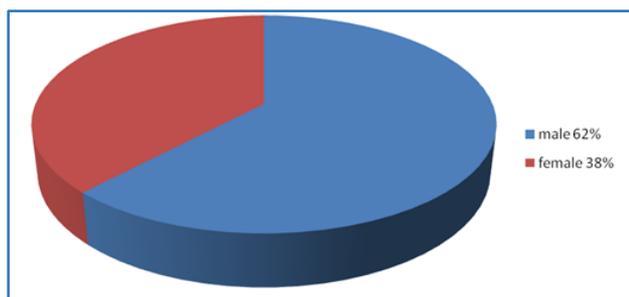
The prevalence of risk factors including seasonal variation was studied in all patients. Date of onset of stroke was recorded. Months are categorised into seasons in accordance with Indian Meteorological Department guidelines as winter between December to March with temperature variation 10-15 degrees centigrade to 20-25 degrees centigrade; summer between April to June with temperature variation 32-40 degrees centigrade; rainy season (monsoon) between July to September; autumn between October to November.

**RESULTS**

A total of 150 stroke patients were included in the study of which 93 (62%) were males, 57 (38%) females as in Table 1 and Figure 1.

Sex	Number of Cases (n)	Percentage of Cases
Male	93	62%
Female	57	38%

**Table 1. Total Number of Cases (n=150)**

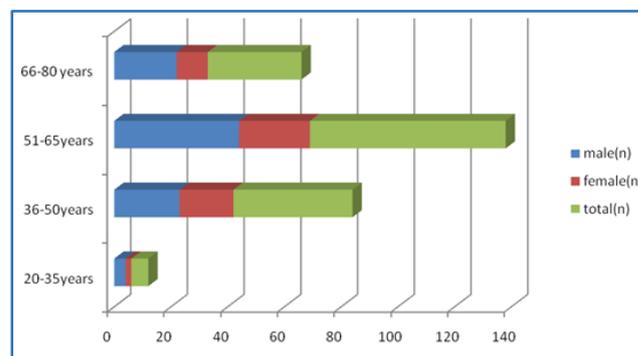


**Figure 1. Total Number of Cases (n=150)**

Most of the patients (46%) are in 50-65 years age group, 4% in 20-35 years, 28% in 35-50 years, 22% in 65-80 and above as in Table 2 and Figure 2.

Age Group	Male (M) Number, (%)	Female (F) Number, (%)	Total (M and F) Number, (%)
20-35 Years	4, (2.66%)	2, (1.3%)	6, (4%)
36-50 Years	23, (15.33%)	19, (12.66%)	42, (28%)
51-65 Years	44, (29.33%)	25, (16.66%)	69, (46%)
66-80 Years and above	22, (14.66%)	11, (7.33%)	33, (22%)

**Table 2. Incidence of Stroke According to Age Groups**

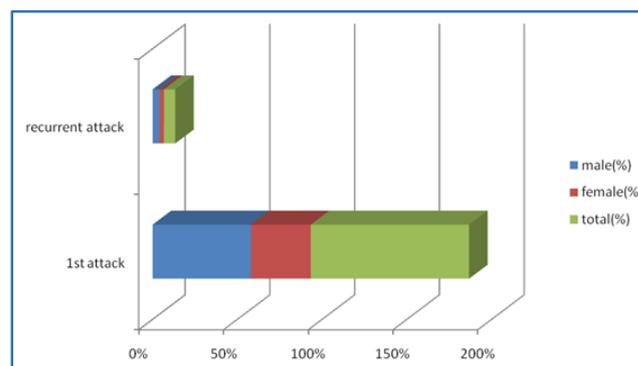


**Figure 2. Stroke Incidence According to Age Groups**

Out of 150 patients, 93.33% presented with 1<sup>st</sup> attack only 6.66% were with recurrent stroke as in Table 3 and Figure 3.

1 <sup>st</sup> Attack/ Recurrent attack	Male (M) Number, (%)	Female (F) Number, (%)	Total (M and F) Number, (%)
1 <sup>st</sup> attack	87, (58%)	53, (35.33%)	140, (93.33%)
Recurrent attack	6, (4%)	4, (2.66%)	10, (6.66%)

**Table 3. Incidence of 1<sup>st</sup>/Recurrent Stroke**

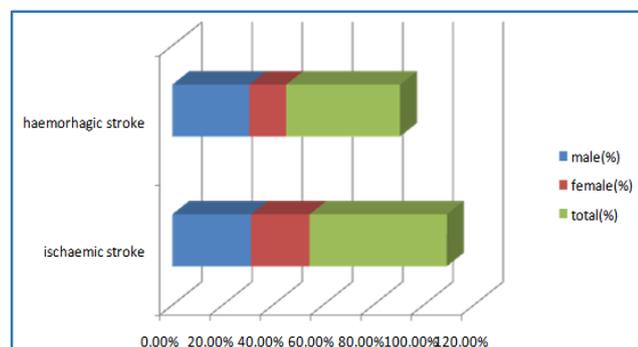


**Figure 3. Incidence of 1<sup>st</sup>/Recurrent Stroke**

The prevalence of types of stroke was: ischaemic stroke 54.66%, haemorrhagic stroke 45.33% as in Table 4 and Figure 4.

Type of Stroke	Male (M) Number, (%)	Female (F) Number, (%)	Total (M and F) Number, (%)
Ischaemic	47 (31.33%)	35 (23.33%)	82 (54.66%)
Haemorrhagic	46 (30.66%)	22 (14.66%)	68 (45.33%)

**Table 4. Prevalence of Type of Stroke**

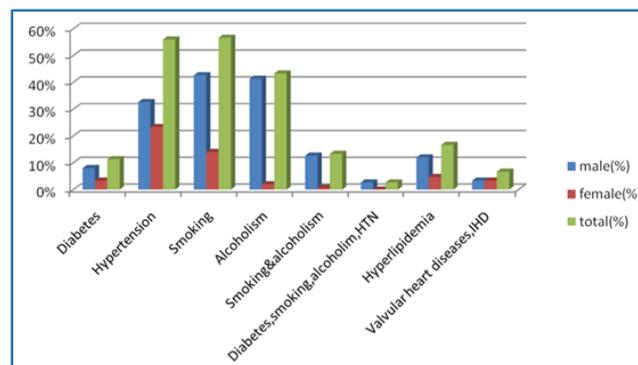


**Figure 4. Prevalence of Type of Stroke**

The prevalence of risk factors associated with stroke was male gender 62%, smoking 56.66%, hypertension 56%, age >50 years 46%, alcohol consumption 43%, hyperlipidaemia 16.66%, consumption of alcohol and smoking together 13.33%, diabetes 11.33%, valvular heart diseases 6.66% as in Table 5 and Figure 5.

Risk Factor	Male (M) Number, (%)	Female (F) Number, (%)	Total (M and F) Number, (%)
Diabetes (D)	12 (8%)	5 (3.33%)	17 (11.33%)
Hypertension (H)	49 (32.66%)	35 (23.33%)	84 (56%)
Smoking (S)	64 (42.66%)	21 (14%)	85 (56.66%)
Alcoholism (A)	62 (41.33%)	3 (2%)	65 (43.33%)
S and A Together	19 (12.66%)	1 (0.66%)	20 (13.33%)
D, H, S, A Together	4 (2.66%)	0 (0%)	4 (2.66%)
Hyperlipidaemia	18 (12%)	7 (4.66%)	25 (16.66%)
Valvular Diseases and IHD	5 (3.33%)	5 (3.33%)	10 (6.66%)

**Table 5. Prevalence of Risk Factors**

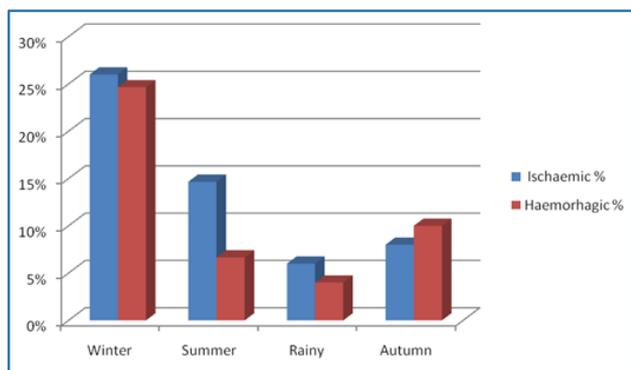


**Figure 5. Prevalence of Risk Factors**

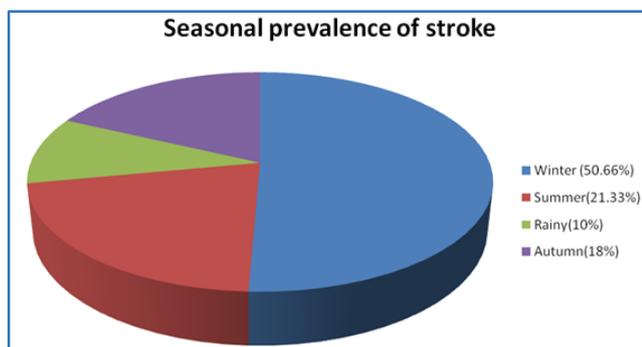
A seasonal high prevalence was observed in winter season (50.66%) as in Table 6 and Figure 6 and 7.

Season of the Year	Male (M) Number, %	Female (F) Number, %	Total (M and F) Number, %	Ischaemic Stroke Number, %	Haemorrhagic Stroke Number, %
Winter	48 (32%)	28 (18.66%)	76 (50.66%)	39 (26%)	37 (24.66%)
Summer	18 (12%)	14 (9.33%)	32 (21.33%)	22 (14.66%)	10 (6.66%)
Rainy	11 (7.33%)	4 (2.66%)	15 (10%)	9 (6%)	6 (4%)
Autumn	16 (10.66%)	11 (7.33%)	27 (18%)	12 (8%)	15 (10%)

**Table 6. Seasonal Prevalence of Stroke**



**Figure 6. Seasonal Prevalence of Ischaemic and Haemorrhagic Stroke**



**Figure 7. Seasonal Prevalence of Stroke**

## DISCUSSION

In our study, male preponderance (male 62%, female 38%) was observed as with other studies by Raj K et al<sup>2</sup> showing male preponderance (male 71%, female 29%).<sup>3</sup> Similar was observed in a study by Miah et al.<sup>4</sup> The prevalence of stroke in our study is more in patients aged between 50-65 years (46%). This is also observed in the study by Miah et al<sup>4</sup> showing 60.7% stroke cases with patients aged more than 60 years. A study: stroke in South Asian countries by Mohammad Wassay et al<sup>5</sup> also states that age is an important risk factor. The mean age of stroke occurrence in India is 63 years.

In our study, the prevalence of stroke type was ischaemic stroke 54.66%, haemorrhagic stroke 45.33%, this is also in line with study by Miah et al<sup>4</sup> showing prevalence of ischaemic stroke 54.1%, haemorrhagic stroke 49.9%. Study by Mohammad Wassay et al<sup>5</sup> states that the proportion of ischaemic stroke and haemorrhagic stroke in India as 68-80% and 20-32%, respectively. Interstroke study by O'Donnell et al<sup>6</sup> showing prevalence of ischaemic stroke and haemorrhagic stroke as 78% and 22%, respectively. Above two studies are varying in percentages as compared to our study, but overall including our study, the prevalence of ischaemic stroke is more as compared to haemorrhagic stroke.

The major risk factors in our study were found to be smoking (56.66%), hypertension (56%), age >50 years (46%), alcohol consumption (43%), hyperlipidaemia (16.66%), consumption of alcohol and smoking together (13.33%) and diabetes (11.33%).

High prevalence of risk factors hypertension, diabetes, hyperlipidaemia and smoking observed in study by

Mohammad Wassay et al.<sup>5</sup> Study by O'Donnell et al<sup>6</sup> showed that five risk factors that accounted for >80% of the risk included hypertension, smoking, abdominal obesity, diet and physical activity. Study by Raj K et al<sup>3</sup> showed prevalence of risk factors hypertension (61.4%), diabetes (26.4%), smoking (17.84%), alcoholism (9%), hyperlipidaemia (7.7%) and rheumatic heart diseases (7.37%). Study by Miah et al<sup>4</sup> showed hypertension as an important risk factor and others being smoking, diabetes, alcoholism, ischaemic heart diseases and hyperlipidaemia. Two risk factors strongly related to stroke in study Hege, Ihle, Hassen, et al<sup>7</sup> are smoking, hyperlipidaemia. Study by Femi et al<sup>8</sup> showed hypertension, smoking as risk factors. In all the above studies, hypertension, smoking accounted as major risk factors as with our study showing that hypertension, smoking are more prevalent risk factors.

In our study, high prevalence of stroke is seen in winter season (50.66%). Study by Raj K et al<sup>3</sup> showed that there was no significant difference found by dividing the groups into two 6 months periods, but there was an increasing trend in number of patients with stroke during November to February months. In our study also, we got more number of cases between November to February (November (23), December (26), January (23), February (23) patients, respectively). Study by Arsalan et al<sup>9</sup> shows that overall stroke was highest in winter. Study by Diaz et al<sup>10</sup> also shows winter spring predominance. Study by Palm F et al<sup>11</sup> shows ischaemic stroke predominance in winter, haemorrhagic stroke predominance in spring. Study by Ricci et al<sup>12</sup> shows that infarctions are frequent in winter. All the above studies are in line with our study. Study by Auda Fares et al<sup>13</sup> states that seasonal variations do occur in the incidence of nontraumatic intracerebral haemorrhage, which is extensively evaluated in studies conducted in various parts of the world. The underlying causes are not completely understood, but hypertension, exposure to low temperature are predisposing factors. The seasonal variation in blood pressure do occur being higher in winter. Elevated blood pressure during the winter may play a role as a trigger for intracerebral haemorrhage. The seasonal variation in hypertension maybe due to outdoor temperature, physical activity, seasonal variation in vitamin D levels and in serum cholesterol level, noradrenalin, catecholamine and vasopressin.

Study by Miah et al<sup>4</sup> showed that frequency of ischaemic stroke was greater in summer (62.4%) than in winter (37.8%) and the frequency of haemorrhagic stroke was greater in winter (62.2%) than in summer (37.6%). A study in a hospital in North India by Pradeep Kumar et al<sup>14</sup> states that ischaemic stroke is more prevalent in spring (March to May) followed by winter (December to February) and haemorrhagic stroke is more common in winter. Study by Shigemastu et al<sup>15</sup> shows that cerebral haemorrhage was higher in winter and infarction in summer. All the three studies are in contrast to our study regarding ischaemic stroke, but haemorrhagic stroke was greater in winter as in our study.

Study by Auda Fares<sup>13</sup> states that many studies conducted in different countries throughout the world report an association between season and stroke incidence. About 48.4% studies reported a higher frequency in the colder months (autumn-winter seasons) and 39% studies reported higher frequency in warmer months (spring-summer) and 12% of these studies reported no evidence supporting seasonal variation in stroke rates. Our study showing high prevalence of stroke in winter season is in line with study by Auda Fares<sup>13</sup> showing higher frequency of stroke cases reported in colder months.

### Limitations

This study is limited in that it is done from a single centre and hospital based one in contrast to many stroke studies, which are community based ones. Stroke subtypes (e.g., large artery disease, small artery disease, cardiogenic infarction) could not be assessed. Seasonal variation of blood pressure was not observed in our study. This did not allow us to assess biological factors as a potential cause of seasonal variation in stroke incidence. Despite limitations, it provides valuable information on aetiopathogenesis including seasonal influences on stroke.

### CONCLUSION

This study revealed that male gender, smoking, uncontrolled systemic hypertension, elderly age, excessive alcohol consumption and hyperlipidaemia are major risk factors. Further, it showed high seasonal prevalence of stroke during winter season. With better understanding of demographic and risk factors, we can prevent the disease at an early stage and reduce the global burden of disease worldwide.

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