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RESEARCH ARTICLE

A RETROSPECTIVE STUDY OF RISK FACTORS, CLINICAL AND RADIOLOGICAL PROFILE OF STROKE PATIENTS IN SOUTHERN KASHMIR, INDIA

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Abstract

Background and Purpose:Stroke is a devastating and major disabling disease affecting 15 million people worldwide per year and causing 6 million deaths annually (the third leading cause of death after cardiovascular and cancer disease). One in six people worldwide suffers from a stroke in their lifetime.This study aims to find the clinical profile, risk factors, and radiological profile of stroke patients in Southern Kashmir of India. Which will be beneficial for taking various preventive measures and planning treatment protocols for stroke patients in the future.

Methods: This is a retrospective observational study carried out in south Kashmirfrom August 2016 to February 2020. Stroke was diagnosed clinically and confirmed by Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) and Lumbar Puncture (wherever needed).

Results: There were 1632 stroke patients (males 64.82% and females 35.18%) in the age group of 24-85 years. A large number of stroke patients (30.39%)were in the age group of 51 to 65 years. The most common presentation of these stroke patients was hemiplegia (64.58%),dysarthria (55.84%), and altered sensorium(30.14%). The dominant risk factors observed were hypertension (69.54%), smoking (65.93%), and dyslipidemia (23.48%). The most common type of stroke was hemorrhagic stroke (67.27%) whereas ischemic stroke and subarachnoid hemorrhage were observed in 28.55% and4.16% of patients respectively. The most common site of hemorrhage in hemorrhagic strokewas at basal ganglion (44.34%) whereas the parietotemporal areawas the most common affected area in ischemic stroke(40.18%).

Conclusions: Hemorrhagic strokes are more common in Kashmir because of peculiar social, environmental, and unique food habits causing hypertension and dyslipidemia.In addition, environmental pollution especially during winters also contributes to this type of stroke.The younger generation is becoming increasingly vulnerable to strokes because of extreme stress conditions due to turmoil and unemployment.Furthermore, a sedentary lifestyle, increased use of junk foods, and lack of exercise in winter also add to the risk for stroke. Hemorrhagic and ischemic strokes were more common in

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maleswhereassubarachnoid hemorrhages are more common in females. Hospital mortality is higher in males in all three types of strokes. Higher hospital mortality in all strokes was associated withmultiple risk factors and an ICH score of 4 or 5.

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Introduction:-

Stroke is a clinical syndrome characterized by the abrupt onset of a neurological deficit that is attributable to focal vascular cause and lasting for more than 24 hours. It results from vascular ischemia or vascular hemorrhage[1,2]. Stroke is a devastating and major disabling disease throughout the world. It causes increased morbidity and mortality both in developed and developing countries. It is the third leading cause of death in the world. The annual incidence of new stroke is 2/1000 population and the overall prevalence of stroke is 794/100000 population [3,4]. 20 million people suffer from stroke per year and 6 million people die of stroke annually. Strokes are 1.5 times more common in males than females, more common in developing than in developed countries[5], and more common in people with low socio-economic status[2,6]. The risk of stroke doubles in each successive decade after 55 years of age [7]. Blacks have a high incidence and mortality[8]. Similarly, family history of stroke (maternal or paternal) is associated with increased stroke risk [9].

Hypertension, diabetes mellitus (DM), smoking, dyslipidemia, cardiovascular diseases, valvular heart disease, and previous strokes are the most important risk factors for stroke[8,9]. Strokes are more common in urban than in rural populations (334-424/100000 vs 84-262/10000). Globally ischemic strokes are more common than hemorrhagic strokes and these can be hemodynamic or thromboembolic depending upon the mechanism of ischemia (atherosclerotic, lacunar, cardioembolic, or indeterminate). Hemorrhagic strokes are more common in Asian countries (due to the high prevalence of hypertension) than in western countries [2].

In India, ischemic strokes are more common than hemorrhagic strokes[10]. In Kashmir (Northern region of India) because of peculiar food habits, prevailing turmoil, cold climatic conditions, and stressful living conditions, the incidence of strokes has increased in the population especially in the young generation. In Kashmir hemorrhagic strokes have been reported to be more common than ischemic strokes (79% versus 21%) [11].

Though stroke is a clinical diagnosis but advent of various imaging techniques like Computed Tomography (CT), Magnetic Resonance Imaging (MRI), CT Angiography, carotid doppler and CT Perfusion Imaging have aided in not only making anaccurate diagnosis of stroke but also in understanding pathogenesis, location of stroke besides predicting prognosis of strokes and in selecting the appropriate therapy for different strokes.[12,13].

The present study aims to study the clinical presentation, association of various risk factors and pattern of brain involvement besides imaging profile of different stroke patients of Southern Kashmir which has a total population of 6.9 million and southern districts of Kashmir (Anantnag, Kulgam, Shopian, and Pulwama) comprise 48% of the area and 33% of the population of Kashmir with the majority of the population being Muslims (https://censusindia.gov.in/).Kashmir Valley lies in the northernmost region of India between latitudes 33^{o}20'-34^{o}40' N and longitudes 73^{o}40'-75^{o}40' E characterized by temperate climate [14,15].(Figure 1)

This study was conducted to help the health planners to devise various preventive measures and formulate treatment protocols for different stroke patients to reduce the incidence and mortality from this disease.

Methods:-

This retrospective observational study was carried out at Mirza Mohammad Afzal Beigh Memorial Hospital, now affiliated with newly created Government Medical College, Anantnag in patients admitted in Casualty and Medicine wards from August 2016 to February 2020. Data related to age, sex, clinical features, diagnosis and risk factors like hypertension, diabeties mellitus, dyslipidemia and radiological investigations was obtained from medical records section of hospital. Details about the outcome and hospital mortality were also obtained from the records of the hospital. This study did not include post discharge mortality cases of stroke. All the patients above 24 years with CT/MRI confirmed diagnosis of stroke were included in this study. However, the patients below 24 years orhavinga

history of stroke due to head injury orwhose CT/MRI and lumbar puncture did not reveal stroke or thosehaving coagulation disorders with stroke and venous infarcts were excluded from this study.

Results:-

In our study there were 1632 patients, males 1058(64.82%) and females 574(35.18%) who were in the age group of 24-85 years with a male to female ratio of1.84:1. The maximum number of stroke patients were in the age group of 51-70 years (57.04%) whereas 308 (18.87%) of patients had a stroke in the younger age (<40 years).

As shown in Table 1, the most common clinical presentation of stroke was hemiplegia (64.58%) followed by speech disturbance (55.84%) and altered sensorium (30.14%). 475 patients (29.10%) had incontinence (urinary and or fecal), whereas 18.50 % of patients hada history of generalized tonic-clonicseizures (GTCS). Many patients had more than two clinical features at presentation.

The various risk factors observed in these patients are shown in Table 2. The most common risk factors were hypertension (69.54%), smoking (65.93%), dyslipidemia (23.48%) anddiabetes mellitus (18.62%).198 patients (12.13%) had associated cardiovascular disease and 88 patients (5.39%) had valvular heart disease. History of previous stroke and/or Transient Ischemic Attack (TIA) was present in 185 patients (11.33%).

As shown in Figure 2, the most common stroke was hemorrhagicstroke which waspresent in 1056 patients (64.70%) followed by ischemic stroke 492 patients (30.14%) and subarachnoid hemorrhage 84 patients (5.14%). Haemorhagic and ischemic strokes were common in males whereas subarachnoid haemorhage was more common in females.

The most common site of hemorrhage was basal ganglion (44.34%), followed by thalamus (21.18%), internal capsule (8.43%), and pons (8.14%) as shown in Figure 3. Intraventricular extension of cerebral bleed was observed on CT in 14.56% of patients.

Similarly, the most common site of infarct was parietotemporal cortex (40.81%), internal capsule (20.43%), thalamus (16.36%),and basal ganglion (10.20%) as shown in Figure 4. Thus, middle cerebral artery territory is the most commonlyaffected areain strokes.Subarachnoid hemorrhage was observed in 84 patients,38 males (45.23%) and 46 females(54.77%).

The hospital mortality of 15.83% of patients was observed in ICH (9.22% males and 6.61% females), 20.80% in SAH (11.54% males and 9.26% females), and 9.55% in ischemic strokes(5.27% males and 4.28% females).Thus, males having more risk of death than females. Two- third (72.84%) of death cases had a stroke during sleep and 76.72% of these presented with stage 3 coma. Hemorrhagic stroke patients who died had an ICH score of 4 or 5.

Discussion:-

Stroke is a major global health problem that leads to devastating and disabling deformities. It ranks first among all the central nervous diseases in frequency and severity. 20 million people suffer from strokes each year and out of these 6 million people do not survive[16]. Stroke constitutes nearly 1.5% of all hospital admissions, 4.5% of all medical cases, and 20% of neurological cases [17]. Stroke is a clinical syndrome comprising a constellation of various neurological findings that are sudden in onset and persist for more than 24 hours. This syndrome results from vascular disturbance (thrombotic/embolic occlusion or spontaneous rupture of an intracranial vessel/aneurysm) which leads to cerebral infarction, intracerebral hemorrhage, or subarachnoid hemorrhage [2,11]. The clinical features as well as clinical outcomes vary depending upon the site of brain damage and severity of the damage caused and include hemiplegia, disorders of speech (dysarthria, sensory aphasia, motor aphasia, global aphasiaetc), convulsions and disturbance of learning, concentration, and memory. Some patients may present with visual disturbance, urinary or fecal incontinence, swallowing difficulties, and emotional disorders [18].

Stroke is usually a disease of 50's and the risk of stroke doubles in each successive decade after 35 years of age [7]. Males are affected more commonly than females. Ischemic strokes are more common than hemorrhagic strokes (85-90% vs 10-15%) in western countries whereas hemorrhagic strokes are more common in Asia [2,4].

Our study found the majority of stroke patients in the age group of 51-70 years (57.04%). These results are similar to the study carried out by Shafiet al. who found the majority of stroke patients in the age group of 40-80 years[11].

Similar findings have been reported by Aring et al. [19]who reported 92% of strokepatients between 50-80 years. In our study the most common clinical presentation was sudden onset of hemiplegia observed in 64.58% cases, whereas severe headache (especially patients with SAH and ICH) was noticed in 34.92% cases. Hatano [20] also reported a similar clinical presentation of hemiplegia in 70% of stroke patients. Jebasinghet.al.[21]has also reported hemiplegia in 54.2% of stroke patients.

Speech disturbance was observed in 55.84% of our patients. Similar observations have been reported by Rathore et. al.[22] and Shijematsu et.al. [23] who found speech disturbances in half of their stroke patients. Speech disturbance was observed in only 3.34% of SAH patients which can be explained by the reason that the hemorrhage occurs in the subarachnoid space outside the cerebral cortex and has less direct effect on speech centres.

The young stroke (age<40 years) constituted 18.87% (308 patients) in this study. Similar findings have been reported by Sallam et.al. [24]who observed 19% of young strokes in their study. Chitrambalam et.al. [25] also reported 20% of young strokes in their study in Chennai whereas the previous study conducted from Kashmir by Razdan et. al.[26] has reported 10.9% of strokes amongst the patients aged 15-39 years about 3 decades back. This increasing percentage of young strokes in our study is attributable to prolonged turmoil[27], unemployment[28], sedentary lifestyle[29], unfavorable behavior/drug abuse[30]and stressful life conditions[31] besides the use of junk foods[32], increasing incidence of young obesity[33], and dyslipidemia amongst the young generation[34]. The other reason could be large size of our study population as compared to the previous studies.

We observed a male to female ratio of 1.84:1 among the stroke patients. The haemorhagic and ishchemic strokes were common in males than females in our study.Meirhaegheet.al. [35] have also reported similar findings in their study. Jebasingh et.al. [21] reported a male to female ratio of 1.5:1 for South Tamil Nadu (India) whereas Shafiet. al. [11] found a ratio of 1.4:1 for Kashmir. The reason for this disparity could be attributed tothe large number of patients in our study (1632 vs 100) than Shafi et. al. [11].

The most common risk factor associated with stroke was hypertension (69.54%) followed by smoking (65.93%), dyslipidemia (23.48%), and diabetes mellitus (18.62%). Shafiet.al.[13] has also reported hypertension in 73% of stroke patients of Kashmir. Similarly Sallam et.al.[24]found hypertension in 67% of the stroke patients. Mustanojaet. al. [36] has also observed a strong association between hypertension and ischemic strokes inyoungsters.The second most common risk factor for stroke in our study was smoking (65.93%) especiallyin ischemic strokes (84.97%). A strong association between smoking and the incidence of stroke has also been reported by Shinton and Beevers[37] in a meta-analysis of 32 separate studies and Khuda et.al. [38].

Dyslipidemia was found in 23.48% of stroke patients especially in ischemic stroke patients (40.98%) in this study. A similar observation has been reported by Bougousslayskyet.al.[30]. Jebasinghet.al.[20] has also found dyslipidemia in 25.70% of stroke patients. The association of diabetes mellitus with stroke was 18.62%. Similar findings have been reported by Dalal[16] and Khoury et al. [39].

Two-third of the stroke patients had more than two risk factors. Similar findings have been reported by Shafi et al.[11]. History of transient ischemic attack (TIA) and/or history of previous stroke was observed in 11.33% of patients. Results similar to our study have been reported in many otherstudies [24,40].

The most common type of stroke in our study was hemorrhagic stroke (64.70%) followed byischemic stroke (30.14%) and SAH (5.14%). This is contrarary to the most global researches which show ischemic strokes to be more common[41], except in Japan and China (where intracerebral hemorrhage prevalence is reported to be 39.4% and 38.7% respectively[42]).The percentage of hemorrhagic stroke is increasing in Asian countries [2] which is attributed to the high prevalence of hypertension in south Asian countries [3]. The reasons for the higher incidence of ICH in this study are multifactorial as attributed to the strokes among youngsters mentioned above.Additionally, cold winter conditions with increased environmental pollution may increase the incidence of hemorrhagic strokes by causing peripheral vasoconstriction and thereby increasing the magnitude of hypertension which could be the reason for increased incidence of haemorhagic stroke in winter months.[43]The other reason can be the patients having experienced ischemic stroke with minor neurodeficit being managed at peripheries or home and may not be reporting to the referral hospital whereas the ICH patients with extensive neurodeficit and altered sensorium are referred to tertiary referral centre. Similar observations have been reported by Shafi et al. [11] and Razdan et al. [26].

The subarachnoid hemorrhage (SAH) was observed in 5.14% of cases. These were mostly young patients whose major risk factor was smoking (79.41%) and hypertension (61.76%). Arneet.al[34]has alsoreported same findings of SAH in their study. The most common site of hemorrhage on CT/MRI in our study was the basal ganglion region of the brain (44.34%), followed by the thalamus (21.18%), internal capsule (8.43%), and pons (8.14%). Similar observations have been reported by Patne et al. [10], Sreen et al. [44],and Wiggins [45].

The most common site of ischemic stroke in our study was parietotemporal area (40.81%) followed by internal capsule (20.43%) and thalamus (16.36%) that is in the distribution of the middle cerebral artery. Our findings have been substantiated by Patni et al.[10] who found a major site of cerebral infarction in the region of the parietal lobe (30.08%).78.9% of cerebral infarction in the middle cerebral artery territory was also reported by Sreen et al.[44], Sylaja et al.[46].

The hospital mortality among the stroke patients of this study was 20.80% in SAH ,15.83% in intracerebral hemorrhage and 9.55% in ischemic stroke.The major prognostic factors were advanced age, comorbid diseases, convulsions, more than two risk factors, and high ICH score. Similar observations have been reported by Anim et. al.[47], Braksick et. al.[48], Donnan et. al.[49], andLekoubou et. al[50].

Conclusion:-

Although the incidence of stroke is decreasing in developed countries, the developing countries especially southeast Asian countries including India are in the midst of the stroke epidemic. There are large regional variations of stroke incidence in our country. The incidence of stroke is maximum in the age group of 51-70 years (57.04%), however, there is a significant increase in the incidence of young strokes(18.87%).Haemorhagic and ischemic strokes are more common in males than in females.Though ischemic strokes are most common in the rest of India but hemorrhagic strokes are more common in our Kashmir because of the peculiar cold environmental conditions, social and food habits (especially the use of high salt diets and beverages). The silent killer hypertension is the major risk factor for all the types of strokes followed by smoking, dyslipidemia, and diabetes mellites. Hypertensive cardiovascular disease was the leading risk factor for ischemic strokes. Hemiplegia is the most common clinical presentation followed by speech disturbances and altered sensorium.The most common site of cerebral hemorrhage was the basal ganglion region, followed by the thalamus and pons whereas the most common site of ischemic stroke was the temporoparietal lobe followed by the internal capsule and thalamus thereby involvement of middle cerebral artery is major cause of strokes. The mortality rate in hospitals was highest for SAH and ICH.

The government of India has started the National Program for prevention and control of cancer, diabetes, cardiovascular disease, and stroke (NPCDCS) focusing mainly on early diagnosis of cases, management, infrastructure development, public awareness, and capacity building at national, state, divisional and district level for all the non-communicable diseases including stroke. Focusing on addressing the various modifiable risk factors of stroke through this program can help in reducing the incidence and prevalence besides mortality and morbidity of stroke in our country.

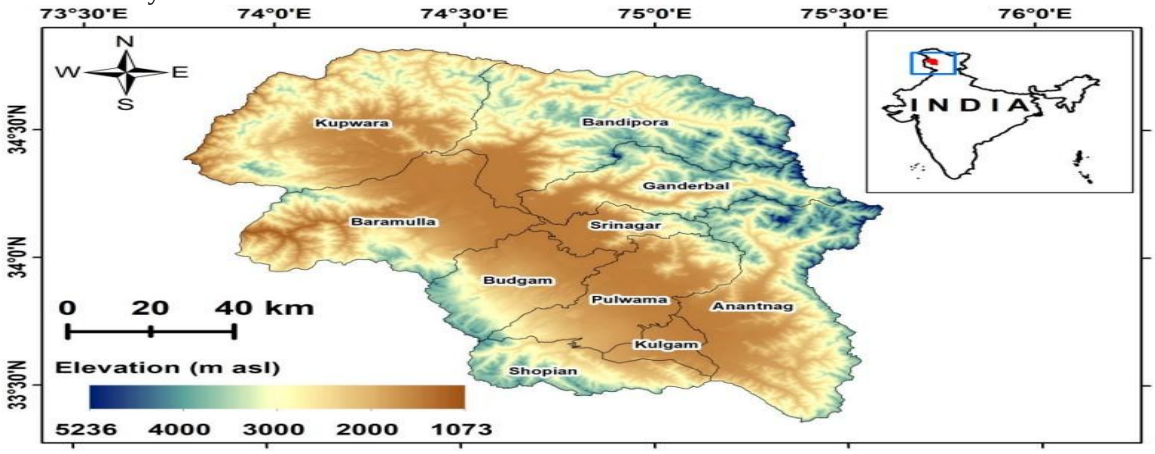


Fig. 1. Location of the Kashmir Valley (Inset map: India political boundary with red dot in the North indicating Kashmir Valley). The 4 districts (Anantnag, Kulgam, Pulwama, Shopian) lie towards the Southern most part of valley. Background data: Shuttle Radar Topography Mission (SRTM) Digital Elevation Model of Kashmir Valley

Figure 2:- Pattern of different strokes in males and females.

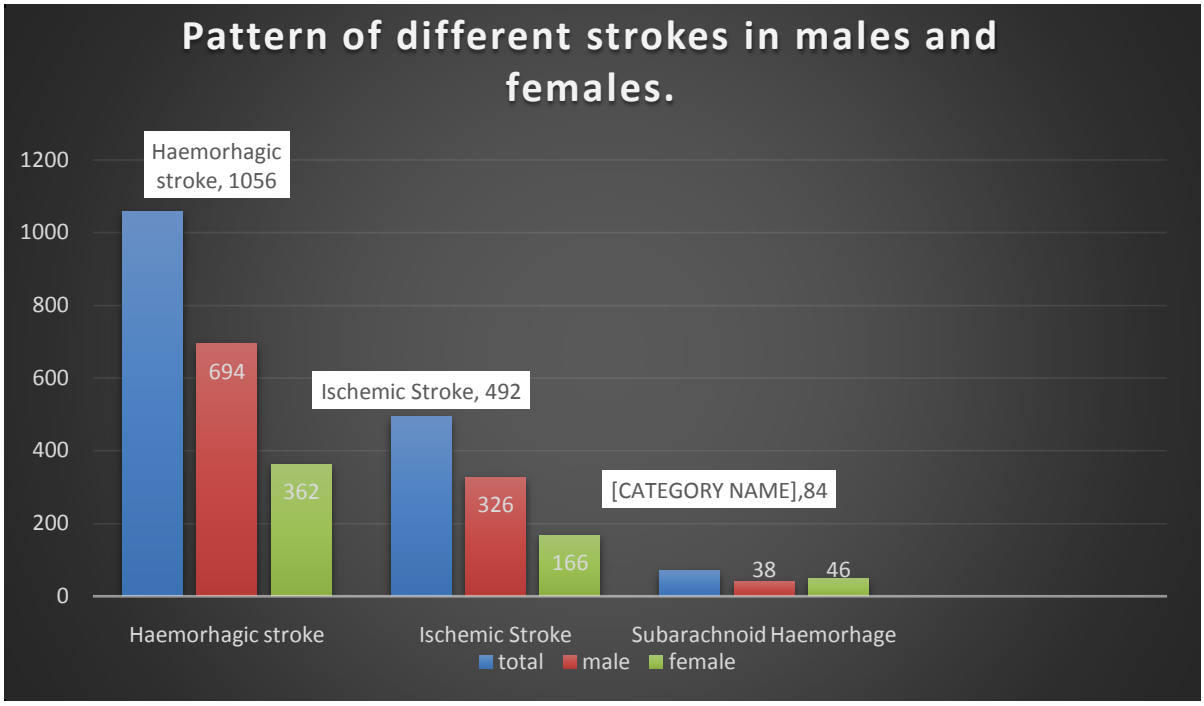


Figure 3:- Anatomical Location Of Intracerebral Haemorhages On CT (n=1098).

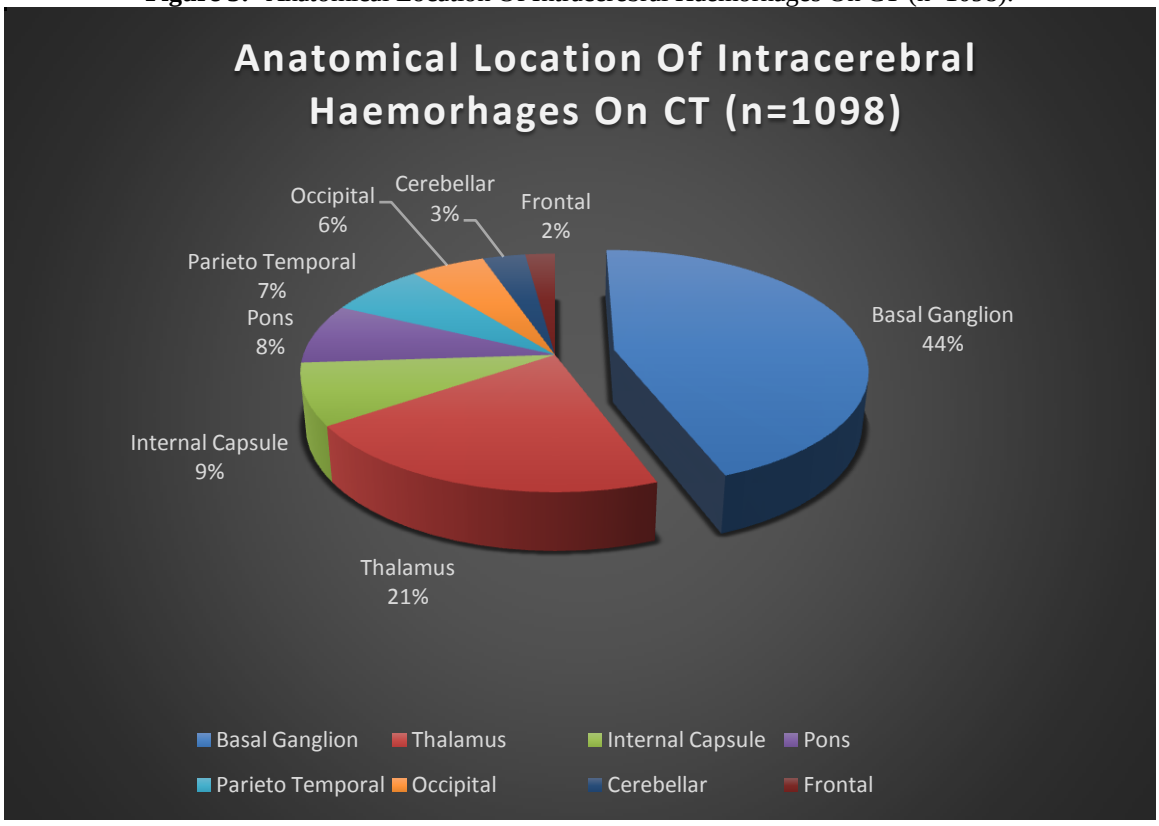


Figure 4:- Anatomical DistrubutionofIscheamic Stroke on CT (n=466).

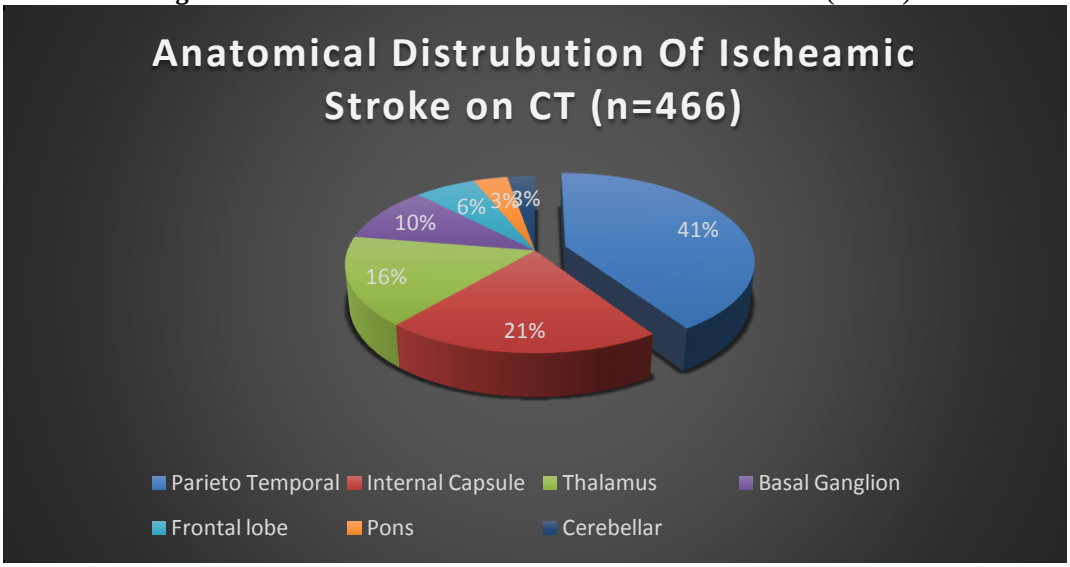


Table 1:- Clinical Features of Stroke Patients (n=1632).

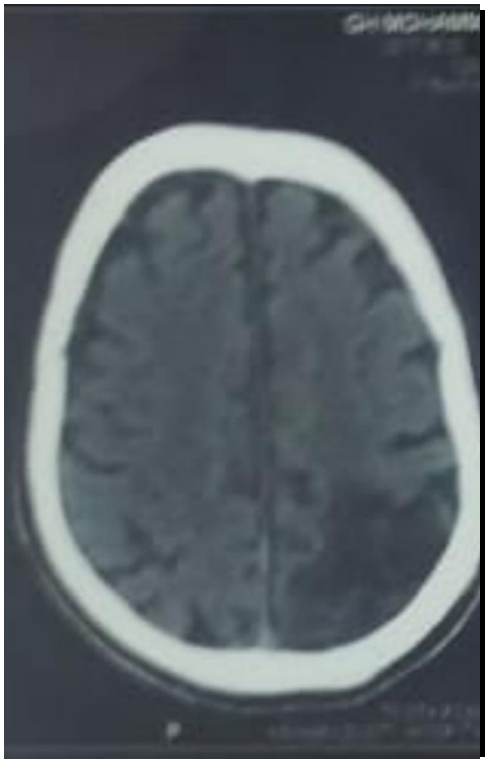
Clinical Presentation	**Number**	**Percentage**
Hemiplagia	1054	64.58
Speech Disturbances	911	55.84
Headache	570	34.92
Altered Sensorium	492	30.14
Incontinence	475	29.10
Convulsions	302	18.50
TIA	253	15.52
Previous stroke	176	10.82
Monoplagia	102	6.25
Giddiness	25	1.53

Many patients had more than one clinical feature.

Table 2:- Association of risk factors with different types of stroke patients.

S. No	Risk factors	Total patients(n=1632)	Haemorrhagic stroke(n=1098) No %age	Ishaemic Stroke(n=466) No %age	Subarachnoid Hemorrhage (n=68) No %age
1	Hypertension	1135 (69.54%)	817 74.70	276 59.22	42 61.76
2	Smoking	1076 (65.93%)	626 57.01	396 84.97	54 79.41
3	Dyslipidemia	383 (23.48%)	181 16.48	193 40.98	12 17.64
4	CAD	198 (12.13%)	131 11.93	63 13.51	04 05.88
5	Diabeties Mellitus	304 (18.62%)	148 13.47	148 31.75	08 11.76
6	Valvular heart disease	88 (05.39%)	32 02.91	53 11.37	03 04.41
7	Previous stroke/TIA	185 (11.33%)	88 08.01	92 19.74	05 07.35

CAD – Coronary Artery Disease, TIA- Transient Ischeamic Attack.
Many patients had more than one risk factors.



Ischaemic Stroke

Subarachnoid Haemorrhage

Haemorrhagic Stroke

ICH with intraventricular extension

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