



## CORRELATION OF CLINICAL DIAGNOSIS AND CT FINDINGS IN PATIENTS OF ACUTE STROKE

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**ABSTRACT** Cerebrovascular diseases include ischemic stroke and hemorrhagic stroke. They are leading cause of adult disability in the United States and Europe becoming more frequent with increasing age. The morbidity and mortality from cerebrovascular diseases has been diminishing in recent years largely due to better recognition and treatment of the underlying arterial and cardiac diseases including hypertension. Hypertension is found to be major risk factor for stroke. With the advent of CT Scan, MRI coupled with carotid vascular Doppler, and angiography, evaluation of patient with stroke has been revolutionized. **Aims And Objectives:** To evaluate the risk factors in cerebrovascular accidents, and to correlate the clinical diagnosis and CT scan findings in patients with acute stroke. **Patients And Methods:** 100 cases of stroke admitted into medical wards in tertiary care hospital during 1 year period were studied. **Summary:** The incidence of stroke was 1.15% among hospital admissions. The incidence of stroke was more in males (70%). Hypertension is the most common risk factor. Infarctions (76) are more common than hemorrhage (24). Mortality was seen in 14.47% of infarction cases and 66% of patients with hemorrhage. **Conclusion:** In spite of good clinico radiological correlation of strokes with CT scan, CT scan Brain should be taken in all stroke cases as it decides the management of stroke.

**KEYWORDS :** Cerebrovascular diseases, ischemic stroke, hemorrhagic stroke, CTscan

**INTRODUCTION**

Cerebrovascular diseases include some of the most common and devastating disorders: ischemic stroke and hemorrhagic stroke.<sup>1</sup> The incidence of stroke increases exponentially from 30 yrs of age and etiology varies by age.<sup>2</sup> Advanced age is one of the most significant stroke risk factor. 95% of strokes occur in people aged 45 yrs and above, and two-thirds of strokes occur in those over the age of 65.<sup>3,4</sup> Ischemia and infarction constitute 85 to 90 percent of the total group in western countries, while 10 to 15 percent are intra cranial hemorrhages.<sup>5</sup> Incidence of infarctions is more than hemorrhages. Men are likely to have 25% more strokes than women,<sup>4</sup> yet 60% of deaths from stroke occur in women.<sup>6</sup> Since women live longer, they are older on average when they have their strokes and thus more often killed (NIMH 2002).<sup>4</sup>

The morbidity and mortality from cerebrovascular diseases has been diminishing in recent years largely due to better recognition and treatment of the underlying arterial and cardiac diseases including hypertension. Hypertension is found to be major risk factor for stroke.

The last decade has witnessed exciting advances in the field of stroke both in terms of investigations and therapeutic options. The provisional diagnosis varies depending largely upon the clinical skill of the examiner.

With the advent of computerized Tomography Scan (CT Scan), Magnetic Resonance imaging (MRI) coupled with carotid vascular Doppler, and angiography, evaluation of patient with stroke has been revolutionized. Data compiled by the American Heart Association (AHA) show that the proportion of all strokes due to ischemia, intracerebral hemorrhage and subarachnoid hemorrhage is 87, 10, and 3 percent respectively.<sup>7</sup>

**AIMS AND OBJECTIVES:**

To evaluate the risk factors in cerebrovascular accidents. To correlate the clinical diagnosis and CT scan findings in patients with acute stroke.

**PATIENTS AND METHODS**

**Type Of Study:** Prospective Observational Study

**Study Period:** January 2019 to January 2020

**Study Setting:** Tertiary Care Hospital, Andhra Pradesh.

**Sample Size:** One hundred cases of stroke admitted into medical wards.

**Study Method:** These cases were studied and subjected to CT scan immediately after examination. The diagnosis of stroke was made according to WHO definition of stroke<sup>15</sup>

A proforma for detailed history, physical examination, risk factors and investigations were prepared. The presenting complaints, the mode of onset with particular reference to the existence of any prodromal symptoms, history of similar attack previously, hypertension, and diabetes mellitus were noted. A complete physical examination was done to evaluate the degree of neurological deficit, the presence of any respiratory and cardiovascular disease or any other associated diseases. Various risk factors like hypertension, diabetes, smoking, alcoholism, TIA, stroke, ischemic heart disease, and any drug intake were taken into consideration.

Investigations including routine examination of blood for hemoglobin, WBC counts, ESR, blood sugar, blood urea, serum creatinine, lipid profile, routine examination of urine were done. Fundus examination, ECG, chest X-ray and CT scan brain were done in all cases. CT scan was done immediately after hospitalization. 2D echocardiography was done in all cases who had associated cardiac diseases.

**OBSERVATIONS AND RESULTS:****Prevalence Of Stroke:**

Total no. of hospital admissions: 21,600

Total no. of medical admissions: 5400

Total no. of stroke cases in 18 months: 250

Prevalence of stroke in our hospital is: 1.15%

Prevalence of stroke amongst all medical admissions: 4.62%

The male to female ratio in the present study was 70:30(7:3).

**Table 1 Age Related Incidence**

Age group in years	No of cases (n=100)	Males (n=70)	Females (n=30)
21-30	8	5	3
31-40	6	5	1
41-50	22	15	7
51-60	30	20	10
61-70	22	15	7
71-80	8	7	1
>80	4	3	1
		70	30

**Table 2 Duration From Onset Of Weakness To Arrival At Hospital**

DURATION	ISCHEMIC STROKE		ICH		SAH	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
<12 hrs	28	10	11	7	2	0
12-24 hrs	20	10	1	1	0	0
>24 hrs	8	2	0	0	0	0
TOTAL	56	22	12	8	2	0

**Table 3 Incidence Of Risk Factors**

Risk factors	Total number of cases (n=100)	Infarction (n=78)	Hemorrhage (n=22)
Hypertension	82	62 (75.61%)	20 (24.39%)
Diabetes	40	33 (82.50%)	07 (17.50%)
Smoking	56	38 (67.86%)	18 (32.14%)
Alcoholism	30	21 (70%)	9 (30%)
Past h/o TIA	12	10 (83.33%)	2 (16.67%)
Past h/o stroke	10	8 (80%)	2 (20%)
H/o IHD	20	14 (70%)	6 (30%)
H/o Valvular disease	6	6 (100%)	0
H/o OCPs	4	4 (100%)	0
Dyslipidemias	24	19 (79.16%)	5 (20.84%)
Multiple risk factors	77	56 (72.73%)	21 (27.27%)
No risk factor	6	5 (83.33%)	1 (16.66%)

**Table 4 Clinical Presentation**

Clinical feature	N=100	Infarction(78)	hemorrhage(22)
Headache	40	24/78 (30.76%)	16/22 (72.72%)
Vomiting	34	22 (28.20%)	12 (54.52%)
Convulsions	15	10 (12.82%)	5 (22.72%)
Gaze palsies	45	33 (42.30%)	12 (54.55%)
Bladder disturbance	55	43 (55.12%)	12 (54.55%)
Unconscious	32	20 (25.64%)	12 (54.54%)
Conscious	68	60 (76.92%)	8 (36.36%)
Aphasia	30	28 (35.89%)	2 (9.09%)
Rt.hemiplegia (Pure motor)	48	42 (53.84%)	6 (27.27%)
Lt.hemiplegia (pure motor)	32	26 (33.33%)	6 (27.27%)
Quadriplegia (pure motor)	8	5 (6.41%)	3 (13.63%)
Sensory + motor	12	10 (12.82%)	2 (9.09%)
7 <sup>th</sup> nerve inv. (supranuclear)	27	25 (32.05%)	2 (9.09%)
Hemianopia	10	8 (10.25%)	2 (9.09%)
Pupil changes	1	0	1 (100%)

**Table 5 Fundus Examination**

FINDING	INFARCTION	HEMORRAGE
Hypertensive Retinopathy	45	12
Diabetic Retinopathy	25	5
Normal	8	5

**Table 6 Pathological Types Of Stroke- Clinical**

Sex	No. of cases (n=100)	Infarction %	Hemorrhage %
Male	70	56 80%	14 20%
Female	30	22 73.3%	8 26.6%

The various arterial territories involved were as follows(clinically): Anterior cerebral Artery 7.69%, Middle Cerebral Artery 76.92%, Posterior Cerebral Artery 15.34%.

**Table 7 Clinical Diagnosis Of Stroke**

Ischemic Stroke N=78		Hemorrhagic Stroke N=22		
Thrombosis	Embolism	Primary ICH	Brainstem hemorrhage	SAH
72 92.30%	6 7.69%	19 86.36%	1 4.54%	2 9.09%

**Table 8 Clinical Diagnosis And CT Scan Findings**

Clinical Diagnosis	CT scan findings		
	Normal study	Infarction	Hemorrhage
Infarction (78)	8	66	4
Hemorrhage (20)	-	2	18
SAH (2)	-	-	2

**Table 9 Correlation Of Clinical Diagnosis And CT Findings**

Clinical diagnosis (n=100)	CT scan findings (n=100)	Correlation %
Infarction(78)	Infarction(76)	84.62 %
Hemorrhage(22)	Hemorrhage(24)	90.90 %

Thus in infarction cases the clinical diagnosis correlated with 84.62% of CT scan findings and in hemorrhages, the correlation of clinical diagnosis was with 90.90% of CT scan findings. Considering the normal CT scan study in infarction patients, it could be because of early CT scan from the period of onset of symptoms, very small size of

the infarct or might be due to posterior circulatory strokes which could be better diagnosed by MRI than by CT scan. Hence normal CT scan study patients were included in infarction cases. Thus among 100 stroke cases cerebral infarction constituted 76% and Hemorrhage in 24%. **CT scan in cerebral infarction:** The various arterial territories involved in cerebral infarction according to CT scan were tabulated as below.

**Table 10 CT Scan -Arterial Territory Involved**

Artery territory	Number(n=66)	Percentage
ACA	5	7.57%
MCA	52	78.78%
PCA	7	10.60%
Multiple infarcts	2	3.03%

**Table 11 CT Scan In Cerebral Hemorrhage**

SITE	No of cases (n=22)	Percentage
Basal ganglia	10	45.45%
Lobes	7	31.81%
- frontal	3	13.63%
- parietal	2	9.09%
- temporal	0	0
- occipital	2	9.09%
Thalamus	3	13.63%
Cerebellum	2	9.09%

**Table 12 Complications**

STROKE TYPE	Pneumonia	UTI	Bed sores	DVT
Infarction	6	5	8	2
Hemorrhage	2	1	1	0
Total	8	6	9	2

**Table 13 Mortality In Stroke**

Cause of death	Infarction	Hemorrhage
Septicemia	2	2
Pulm. Embolism	1	3
ARDS	2	1
Massive stroke/SAH	6	10
TOTAL	11	16

**DISCUSSION**

The incidence in both males and females is consistent with the Indian study (P.M Dalal 1998).<sup>8</sup> The incidence in less than 40 years age group is only 14%, almost equal to other studies. Incidence is highest in 6<sup>th</sup> decade of life compared to other studies. But low in 7<sup>th</sup> decade as compared to others. In most of these studies the incidence of infarctions was more when compared to Hemorrhages and is correlated with present study. In this study incidence of Hemorrhages is less compared to Harrison, Roy & Mishra studies<sup>9</sup> but more than with other studies.

**Table 14 Incidence Of Headache -Comparison**

Study	Incidence of headache		Incidence of vomiting	
	Infarction	Hemorrhage	Infarction	Hemorrhage
Airing Merit	40	23	26	22
Harrison <sup>9</sup>	43	56	45	76
Maj Hp Singh	30.82	54.5	18.9	63.6
Mohr J.P <sup>10</sup>	17	36	17	44
Present study	30.76%	72.72%	28.20%	54.55%

Hypertension was noted in 82% of cases, **Harrison M.T.G<sup>9</sup>** in 55 and in **Mohr J.P<sup>10</sup>** 62. The frequency of past history of TIA's is much less ranging from 10% (Kannel and Wolff)<sup>11</sup> to 30% (Herman et al). It is in near correlation with Oxford Shire Community Project's incidence of 14%. Nearly 77% of patients had multiple risk factors(73% infarction and 27% hemorrhage) and correlated well with Oxford Shire Community Project.<sup>12</sup>

The correlation between clinical diagnosis and CT scan findings in the present study is 90.90% when compared to 88% and 75.5% by Von Arbin<sup>13</sup> and Mona Britton studies respectively. Infarction and Hemorrhage has to be confirmed for starting specific therapy. Hence, inspite of good clinicoradiological correlation CT scan has to be done immediately for all cases of stroke as it decides the management of stroke.

It is necessary to make correct identification of the exact pathologic process causing stroke. This can enable us to benefit from new developments in the management of acute stroke.<sup>14</sup>

**SUMMARY AND CONCLUSIONS:**

The incidence of stroke is 1.15% among hospital admissions and 4.62% amongst the admissions to medical wards. The incidence of stroke is more in males (70%) than in females (30%) with peak age incidence in 6<sup>th</sup> decade. Multiple risk factors are present in 77% of patients. Hypertension is the most common risk factor present in 82% of patients among which 75% had infarction and 25% had hemorrhages. Right hemi paresis is the most common presentation (48%). Signs of raised intra cranial tension are common for hemorrhage when compared to infarction. Infarctions (76) are more common than hemorrhage (24). In cerebral infarction, middle cerebral artery territory is most commonly involved (79%) and multiple infarcts are seen in 3%. In cerebral hemorrhage, the most common site involved is basal ganglia (45.45%). Subarachnoid hemorrhage is present in 2 cases. Complications such as septicemia, DVT, Pneumonia and bed sores were seen. Mortality was seen in 14.47% of infarction cases and 66% of patients with hemorrhage. Mortality is more common with hemorrhages than infarctions. In 84.62 % of cerebral infarction cases and 90.90 % of hemorrhages, clinical diagnosis correlated with CT scan findings. In 8 patients with normal CT Scan findings, 7 had CT scan within 12 hours and 1 patient had CT scan within 24 hrs of stroke onset. In these patients CT scan could have been repeated after 24 hrs or MRI would have been done but due to financial constraints it was not done.

In spite of good clinico radiological correlation of strokes with CT scan, CT scan Brain should be taken in all stroke cases as it decides the management of stroke.

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