COMPARATIVE STUDY OF NEUROLOGICAL (NATIONAL INSTITUTES OF HEALTH STROKE SCALE AND GLASGOW COMA SCALE) AND FUNCTIONAL (MODIFIED RANKIN SCALE) (MODIFIED BARTHEL INDEX) OUTCOME IN PATIENT'S OF ISCHEMIC VERSUS HAEMORRHAGIC STROKE IN FIRST 30 DAYS

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ABSTRACT

BACKGROUND

Stroke is one of the leading causes of mortality and morbidity worldwide. Stroke is a life-changing event that affects not only the person who may be disabled, but their family and caregivers also.

MATERIALS AND METHODS

Inclusion Criteria: Patients diagnosed to have various form of strokes and who are willing to participate in the study.
Exclusion Criteria: Pregnant women, patients with life threatening co morbid conditions and who are not willing to participate in the study.

RESULTS

Among these ischemic stroke (71%) (no. =213) patients 69.33% had arterial (no. =208) and 1.66% had venous infarcts (no. =5). Among arterial ischemic strokes commonest arterial territories involvement is middle cerebral artery 56%, anterior cerebral artery 9.33% and posterior circulation is 4%. Hemorrhagic Stroke: Most common locations of bleed in our study are capsuloganglionic 12.33% (n=37) followed by lobar 7.33% (n=22) and thalamus 6.33% (n=19). Other least common sites are Cerebellar 1.33% (n= 4), pons 1% (n=3) and others 0.66% (n=2).

CONCLUSION

Hypertension is commonest Risk factor about 57.33% in our study, followed by other risk factors like smoking 28.33% and diabetes 25.66%. Moreover, no single measure fully describes or predicts all dimensions of stroke recovery and disability. Despite that NIHSS(score21-42) and GCS (GCS <8) can be used as a predictive value for assessment initial stroke severity and prognostic tool within the first 30 days in acute stroke being a simple scale, especially in countries with poor resources like India.

KEYWORDS

National Institutes Health Stroke Scale, Glasgow coma scale, Modified Rankin Scale, Barthel Index.

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BACKGROUND

Globally stroke is one of the leading causes of mortality and morbidity.[1] Approximately 20 million people are suffering from stroke each year and of these 5 million are disabled by stroke (Dalal et al 2007).[2] The lifetime risk of stroke is estimated to be in 1 in 5 for middle-aged Women and 1 in 6 for men according to Framingham Study. A stroke is sometimes called a brain attack or a cerebrovascular accident (CVA). Stroke is a life-changing event that affects not only the person who may be disabled, but also their family and caregivers. Strokes affect men more often than women. Effective screening, evaluation, and management strategies for stroke are well established in high-income countries (Bath and Lees 2000)[3] but these strategies have not been fully implemented in India (Pandian 2007).[4] In India reliable morbidity and mortality data for stroke are limited due to various reasons like incomplete death certification, incorrect death classification, and uncertainty

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of aetiology in cases of sudden death or multiple co-morbidities (Sethi et al 2007).[5] The World Health Organization's International Classification of Functioning, Disability and Health (WHO-ICF) gives a conceptual framework that can aid classification of the scales and help decide on the appropriate measure for a particular purpose. It also describes levels of pathology (in this case, the stroke lesion), impairments (the direct loss of function), activity limitation (formerly called disability), and societal participation (formerly called handicap) (WHO-ICF).[6]

No single stroke scale can describe or predict all dimensions of recovery and disability. So several scales have been combined in stroke trials to derive a global statistic to better define the effect of acute interventions. In practice, the National Institutes of Health Stroke scale (NIHSS) and Glasgow coma scale (GCS) are useful for assessing early prognosis and for subsequent assessments, whereas Modified Rankin Scale (MRS) provide summary measures of outcome and Barthel Index (BI) is useful for planning rehabilitative strategies.[7]

Stroke scales are aids to improve diagnostic accuracy, determine the suitability of specific treatments, and monitor change in neurologic status and measure outcome.[8,9] Predicting outcome in stroke patients based on stroke scales scores is difficult due to the variability in aetiology, presentation and underlying pathophysiology score as well as high quality stroke services is not widely available in India.

The aim and objective of this study is to investigate how these scales were used and interpreted in acute stroke.

MATERIALS AND METHODS

It is prospective study conducted in the department of General Medicine, GITAM Institute of Medical Sciences and research, Visakhapatnam. Duration of the study was from January 2017 to June 2018.

Selection of Cases

The total sample size was 300 consecutive patients diagnosed to have and treated for various forms of strokes at the neurology and medicine out-patient's departments, acute neurological care unit (ANCU), medical intensive care unit (MICU) and medicine and neurology wards. The study was carried out in two stages.

First Stage of the Study

We defined acute stroke, according to WHO stroke definition.[9] in the first stage, 300 consecutive patients with strokes who had given consent to participate in the study and applied Stroke assessment scales initially for acute assessment by NIHSS and GCS, functional assessment by MRS, and BI within 24 hours of admission.

Second Stage of the Study

We again reassess Stroke scales after 30 days of admission for acute assessment by NIHSS and GCS, functional assessment by MRS, and BI for these 300 patients.

Inclusion Criteria

Patients diagnosed to have various form of strokes and who are willing to participate in the study.

Exclusion Criteria

Pregnant women, patients with life threatening co morbid conditions and who are not willing to participate in the study.

Data Analysis

Data entry was done by using MS excel, Data analysis was done by using SPSS version 22. Data was presented in the form of frequencies and percentages using tables and graphs.

RESULTS

Age

The mean age of stroke was 50-60 years and total no of stroke in young were about 16.33% (n=49) and 1.33% (n=4) patients were below 20 years old. Rest of patients 83.66% aged more than 40 years old.

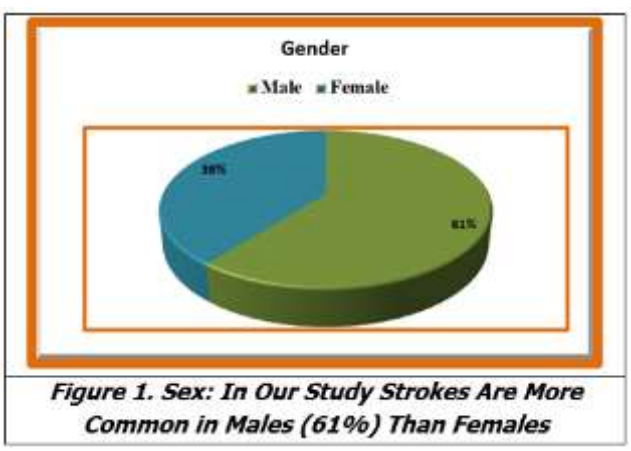

Figure 1. Sex: In Our Study Strokes Are More Common in Males (61%) Than Females

Types of Stroke

Ischemic strokes (71%) are more common than haemorrhagic strokes (29%).

Ischemic Stroke

Among this ischemic stroke (71%) (no. =213) patients 69.33% had arterial (no=208) and 1.66% had venous infarcts (no. =5). Among arterial ischemic strokes commonest arterial territories involvement is middle cerebral artery 56%, anterior cerebral artery 9.33% and posterior circulation is 4%

Haemorrhagic Stroke

Most common locations of bleed in our study are capsuloganglionic 12.33% (n=37) followed by lobar 7.33% (n=22) and thalamus 6.33% (n=19). Other least common sites are Cerebellar 1.33% (n= 4), pons 1% (n=3) and others 0.66% (n=2).

Various Symptoms and Signs of Stroke

Among these 81% complain of hemiplegia (no=243) (right side 45.33% and left side 35.66%), 43.33% had fascial palsy (no=130) (right side 23% and left side 20.33%). Other symptoms like 27.33% had headache, 18% had vomiting

0.9% had loss of consciousness, 6.33% had seizures, 5% had cerebellar signs (Table 1).

Symptoms and Signs	Frequency	Percentage
1. Hemiplegia	**243**	**81**
Right	136	45.33
Left	107	35.66
2. Facial Nerve Palsy	**130**	**43.33**
Right	69	23
Left	61	20.33
3. Raised Intracranial Pressure Symptoms		
Headache	82	27.33
Vomiting	54	18
Seizures	19	6.33
Loss of Consciousness	27	9
4. Cerebellar Signs	**19**	**6.33**

Table 1. Various Symptoms and Signs of Stroke

NIHSS in Ischemic Strokes

This study also demonstrates that with categorization of NIHSS into 5 groups. No Stroke (score 0) observed in 1.87% (n=4) patients on Day 1 and 19.71% (n=42) patients on Day 30 that means shown improvement 17.84% from other Severity type strokes. Minor Stroke (score 1-4) seen 13.14% (n=28) patients on Day 1 and 39.43% (n=84) patients on Day 30 that means shown improvement 26.29% from other Severity type strokes. Moderate Stroke (score 5-15) seen 48.82% (n= 104) patients on Day 1 and 25.35% (n=54) patients on Day 30. Moderate – severe Stroke (score 15-20) seen 16.43% (n=35) patients on Day 1 and 0.93% (n= 2) patients on Day 30. Severe Stroke (score 21-42) seen 19.71% (n=42) patients on Day 1 and 0.93% (n= 2) patients on Day 30.

NIHSS in Haemorrhagic Strokes

No Stroke (score 0) observed in 3.44% (n=3) patients on Day 1 and 14.94% (n=13) patients on Day 30 that means shown improvement 11.55% from other Severity type strokes. Minor Stroke (score 1-4) seen 6.89% (n=6)

Patients on Day 1and 27.58% (n=24) patients on Day 30 that means shown improvement 20.69% from other Severity type strokes. Moderate Stroke (score 5-15) seen 28.73% (n= 25) patients on Day 1 and 18.39% (n=16) patients on Day 30. Moderate – severe Stroke (score 15-20) seen6.89% (n= 6) patients on Day 1 and 2.29% (n=2) patients on Day 30. Severe Stroke (score 21-42) seen 54.02% (n=47) patients on Day 1 and none of patients have severe type stroke on Day 30.

Glasgow Coma Scale (GCS) in Ischemic Strokes

GCS is normal (15) in 58.69% (n=125) patients on Day 1 and 76.99% (n=164) patients on Day 30 that means shown improvement 18.30% from other Severity type strokes on Day 30. Mild Severity type stroke (13-14) seen in 12.67% (n= 27) patients on Day 1 and 5.63% (N=12) patients on Day 30. Moderate Severity type stroke (8-12) seen in 18.77% (n=40) patients on Day 1 and 3.73% (N= 8) patients on Day 30. On Day 1 severe type stroke (≤7) seen in 9.85% (n=21) patients and on Day 30 none of patients have severe type stroke (≤7).

Glasgow Coma Scale (GCS) in Haemorrhagic Strokes

On Day 1 GCS score was normal in 33.33 (n=29) patients and On Day 30 Glasgow coma score (GCS) is normal (15) in 56.32% (n=49) patients that means shown improvement 22.99% from other Severity type strokes. Mild Severity type stroke (13-14) seen in 10.34% (n=9) patients on Day 1 and 5.74% (n=5) patients on Day 30. Moderate Severity type stroke (8-12) seen in 32.18% (n=28) patients on Day 1 and 0.46% (n=1) patients on Day 30. On Day 1 severe type stroke (≤7) seen in 24.13% (n=21) patients and none of patients have severe type stroke (≤7).

Modified Rankin Scale (MRS) Grading in Ischemic Strokes

On Day 1 favourable outcome on the MRS was defined score ≤2 observed 16.90% (n=36) patients and unfavourable outcome on the MRS was defined score ≥3 observed 83.09% (n=177) patients. On Day 30 favourable outcome on the MRS was defined score ≤2 observed 46% (n= 98) patients and unfavourable outcome on the MRS was defined score ≥3 observed 40.37% (n= 86) patients.

Modified Rankin Scale Grading in Haemorrhagic Strokes

On Day 1 favourable outcome on the MRS was defined score ≤2 observed 16.09% (n=14) patients and unfavourable outcome on the MRS was defined score ≥3 observed 83.90% (n=73 () patients. On Day 30 favourable outcome on the MRS was defined score ≤2 observed 44.82% (n=39) patients and unfavourable outcome on the MRS was defined score ≥3 observed 18.39% (n= 16) patients.

Modified Barthel Index in Ischemic Strokes

MBI a variety of sum scores between 50 and 100 were used as cut-off scores to define favourable outcome. Under this we subcategorized Minimal Dependency Level (Score 91-99) observed 4.69% (n=10)patients on Day 1 and 24.41% (n=52)patients on Day 30 that means shown improvement 19.72% from other grades of severe dependency Level and Mild Dependency Level (Score 75-90) 5.63% (n=12) patients on Day 1 and 21.59% (n= 46)patients on Day 30 that means shown improvement 15.96% from other grades of severe dependency Level and Moderate Dependency Level (Score 50-74) 11.73% (n=25)patients on Day 1 and 30.98% (n=66) patients on Day 30 that means shown improvement 19.25% from other grades of severe dependency Level. Unfavourable outcome on the MBI was defined score <50. Under this we subcategorized Severe Dependency Level (Score 25-49) observed 18.77% (n=40) patients on Day 1 and 5.63% (n=12) patients on Day 30 that means shown decrement 13.14% from of severe grade dependency Level and total Dependency Level (Score 0-24) observed 59.15% (n=126) patients on Day 1 and 3.75% (n=8) patients on Day 30 that means shown decrement 55.4% from of total dependency Level on Day 1 shown in table no 2.

Score	Dependency Level	Grading	No. of Patients (%) Day 1	No. of Patients (%) Day 30
0-24	Total	1	126 (59.15)	8 (3.75)
25-49	Severe	2	40 (18.77)	12 (5.63)
50-74	Moderate	3	25 (11.73)	66 (30.98)
75-90	Mild	4	12 (5.63)	46 (21.59)
91-99	Minimal	5	10 (4.69)	52 (24.41)

Table 2. ***Comparison Outcome Assessment with Modified Barthel Index Between Day 1 and Day 30 in Ischemic Strokes***

Modified Barthel Index in Haemorrhagic Strokes

MBI a variety of sum scores between 50 and 100 were used as cut-off scores to define favourable outcome. Under this we subcategorized Minimal Dependency Level (Score 91-99) observed 4.59% (n=4)patients on Day 1 and 21.83% (n=19) patients on Day 30 that means shown improvement 17.24% from other grades of severe dependency Level and Mild Dependency Level (Score 75-90) 2.29% (n=2) patients on Day 1 and 20.68% (n=18) patients on Day 30 that means shown improvement 18.39% from other grades of severe dependency Level and. Moderate Dependency Level (Score50-74) 10.34% (n=9) patients on Day 1 and 16.09% (n= 14)patients on Day 30 that means shown improvement 5.75% from other grades of severe dependency Level. Unfavourable outcome on the MBI was defined score <50. Under this we subcategorized Severe Dependency Level (Score 25-49) observed 6.89% (n=6) patients on Day 1 and 4.59% (n= 4) patients on Day 30 that means shown decrement 2.3% from of severe grade dependency Level and total Dependency Level (Score 0-24) observed 75.86% (n=66) patients on Day 1 and none of patients have total Dependency Level (Score 0-24) on Day 30 that means shown decrement 75.86% from of total dependency Level on Day 1 shown in table no 3.

Score	Dependency Level	Grading	No. of Patients (%) Day 1	No. of Patients (%) Day 30
0-24	Total	1	66 (75.86)	0 (0)
25-49	Severe	2	6 (6.89)	4 (4.59)
50-74	Moderate	3	9 (10.34)	14 (16.09)
75-90	Mild	4	2 (2.29)	18 (20.68)
91-99	Minimal	5	4 (4.59)	19 (21.83)

Table 3. Comparison Outcome Assessment with Modified Barthel Index Between Day 1 and Day 30 in Haemorrhagic Strokes

Total no of Deaths in our study 61 (20.33%) patients. Among these, Deaths in haemorrhagic strokes 36.78% (n=32) more common than Ischemic strokes 13.61% (n=29) (23). Among Ischemic strokes, most of deaths observed in middle cerebral artery 9.85% (n=21) territory followed by anterior cerebral artery 2.81% (n= 6), posterior circulation 0.93% (n=2) and no deaths seen in venous infarcts 0 (0). Among haemorrhagic strokes most of deaths observed in Capsuloganglionic 11 (12.64) followed by Lobar 11 (12.64), Thalamus 7 (8.04), Pons 3 (3.44), and no v deaths observed in Cerebellar 0 (0) and others 0%. In surgically treated (n=5) patients, 3.44% (n=3) patients were died, Lobar-1.14% (n=1), Thalamus 1.14% (n=1), and Capsuloganglionic 1.14% (n=1) patients.

DISCUSSION

The mean onset of stroke for men in India ranges from 63-65 for men and 57-68 for women.[10,11,12] Total no of stroke in young were 16.33% (n=49) and 4 patients were below 20 years old and rest of patients 83.66% aged more than 40 years old. Comparison of stroke in young with other studies. Generally, Strokes affect men more often than women[5] and in our study also men more affected (ratio of male to female 182: 118 (60.66: 39.33). This may be due to differences in risk factors such as smoking and drinking which are more prevalent among men in India compared with women (39%).

Commonest Presenting symptom of patients with stroke hemiplegia 81% (no=243) (right side 45.33% and left side 35.66%), next common Presenting symptom facial palsy 43.33% (no=130) (right side 23% and left side 20.33%). Other symptoms like 27.33% had headache, 18% had vomiting, 9% had loss of consciousness, 6.33% had seizures, 5% had cerebellar signs**.**

About 50- 85 percent of strokes are ischemic strokes and 15-50 percent of strokes are Haemorrhagic strokes.[13] In our study majority of patients 71% had ischemic (no=213) and 29% had Haemorrhagic Stroke (no=87). These results similar with western study where cerebral infarction was 85%, intra cerebral haemorrhage 10% and subarachnoid haemorrhage 5% of cases, (40) Among these ischemic types arterial stroke 69.33% (no=208) are more common than venous infarcts 1.66% (no=5). Among arterial strokes non-embolic 66% (no=198) are more common than embolic strokes 3.33% (no=10).

NIHSS can be used to predict mortality and functional outcome in patients presenting with acute stroke.[7,14,15] NIHSS In ischemic strokes, this study also demonstrates that

with categorization of NIHSS into 5 groups. No Stroke (score 0) observed in 1.87% (n=4) patients on Day 1 and 19.71% (n=42) patients on Day 30 that means shown improvement 17.84% from other Severity type strokes. Severe Stroke (score 21-42) seen 19.71% (n=42) patients on Day 1 and 0.93% (n= 2) patients on Day 30. There was a strong graded relation between increasing NIHSS score and higher 30-day mortality.[7,14] In haemorrhagic strokes: No Stroke (score 0) observed in 3.44% (n=3) patients on Day 1 and 14.94% (n=13) patients on Day 30 that means shown improvement 11.55% from other Severity type strokes. Severe Stroke (score 21-42) seen 5 4.02% (n=47) patients on Day 1 and none of patients have severe type stroke on Day 30. Cheung CM at al showed The NIHSS can predict 30-day mortality with a sensitivity of 81% [corrected] and a specificity of 90%.[7,15]

GCS In ischemic strokes is normal (15) in 58.69% (n=125) patients on Day 1 and 76.99% (n=164) patients on Day 30 that means shown improvement 18.30% from other Severity type strokes on Day 30. On Day 1 severe type stroke (≤7) seen in 9.85% (n=21) patients and on Day 30 none of patients have severe type stroke (≤7). In haemorrhagic strokes: On Day 1 GCS score was normal in 33.33 (n=29) patients and On Day 30 Glasgow coma score (GCS) is normal (15) in 56.32% (n=49) patients that means shown improvement 22.99% from other Severity type strokes. On Day 1 severe type stroke (≤7) seen in 24.13% (n=21) patients and none of patients have severe type stroke (≤7). Ong TZ et al study showed Poor GCS on admission, deterioration of GCS, and haemorrhagic stroke are found to be independent predictors of one-month mortality.[16] Weir C J et al, study showed GCS better predicted the outcome of early mortality than the outcome of 3-month recovery. They have demonstrated a strong relationship between the verbal and eye GCS score and outcome of acute stroke population.[7,17]

Pre-stroke MRS is a moderately valid measure of pre-stroke disability and a robust predictor of post stroke prognosis.[7,18,19] Greet Salter at al showed Poor outcome could be defined if any of the following end points are reached: death, institutionalization due to stroke, MRS >3, 20. But in our study in ischemic strokes: favourable outcome on the MRS was defined score ≤2 observed 16.90% (n=36) patients On Day 1 and 46% (n= 98) patients On Day 30. Unfavourable outcome on the MRS was defined score ≥3 observed 83.09% (n=177) patients On Day 1 and 40.37% (n= 86) patients On Day 30. In haemorrhagic strokes: favourable outcome on the MRS was defined score ≤2 observed 16.09% (n=14) patients On Day 1 and 44.82% (n=39) patients On Day 30 and unfavourable outcome on the MRS was defined score ≥3 observed 83.90% (n=73) patients On Day 1 and 18.39% (n= 16) patients On Day 30.

According Granger CV et al and Greet Salter et al Poor outcome in MBI could be defined if any of the following end points are reached: death, institutionalization due to stroke, BI <60.[7,19,20] But in our study MBI a variety of sum scores between 50 and 100 were used as cut-off scores to define favourable outcome and Unfavourable outcome on the MBI was defined score <50. In ischemic strokes Under this we subcategorized Minimal Dependency Level (Score 91-99) observed 4.69% (n=10)patients on Day 1 and 24.41% (n=52) patients on Day 30 that means shown improvement 19.72% from other grades of severe dependency Level and total Dependency Level (Score 0-24) observed 59.15% (n=126) patients on Day 1 and 3.75% (n=8) patients on Day 30 that means shown decrement 55.4% from of total dependency Level on Day 1. In haemorrhagic strokes Minimal Dependency Level (Score 91-99) observed 4.59% (n=4) patients on Day 1 and 21.83% (n=19) patients on Day 30 that means shown improvement 17.24% from other grades of severe dependency Level and total Dependency Level (Score 0-24) observed 75.86% (n=66) patients on Day 1 and none of patients have total Dependency Level (Score 0-24) on Day 30 that means shown decrement 75.86% from of total dependency Level on Day 1.[7,20]

Among these, Deaths in haemorrhagic strokes 36.78% (n=32) more common than Ischemic strokes 13.61% (n=29). In Dawodu and Olaniya et al study 30-day mortality in haemorrhagic strokes was 59.2% (29)[21] and in Fonarow et al study it is 13.6% in Ischemic strokes.[14] Among haemorrhagic strokes most of deaths observed in Capsuloganglionic 11 (12.64) followed by Lobar 11 (12.64), Thalamus 7 (8.04), Pons 3 (3.44), and no deaths observed in Cerebellar 0 (0) and others 0%. Among Ischemic strokes, most of deaths observed in middle cerebral artery 9.85% (n=21) territory followed by anterior cerebral artery 2.81% (n= 6), posterior circulation 0.93% (n=2) and no deaths seen in venous infarcts 0 (0). In surgically treated (n=5) patients, 3.44% (n=3) patients were died, Lobar-1.14% (n=1), Thalamus 1.14% (n=1), and Capsuloganglionic 1.14% (n=1) patients.

CONCLUSION

To improve stroke outcome, it is important to identify factors that predict outcome as a first step to apply interventions and any method to predict outcome is more important in developing countries like India. Majority of patients were more than 40 years old and commonest presenting symptom in patients with stroke is hemiplegia. Ischemic strokes are more common than haemorrhagic strokes and arterial strokes are more common than venous infarcts. Hypertension is commonest risk factor.

Despite that NIHSS (score 21-42) and GCS (GCS ≤8) can be used as a tool of predictive value for assessment of initial stroke severity, and prognostic tool within the first 30 days in acute stroke as it is a simple scale, especially in countries with poor resources like India. The MRS and BI are reliable measures that provide a more objective assessment of functional recovery after stroke and also useful in assessment of prognosis. Deaths are more common in haemorrhagic strokes. Lastly, efforts are urgently needed to educate the public about stroke symptoms, diagnosis, and treatment to optimize health care decisions and behaviours in order to help curb the growing stroke problem in India.

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