

Comparison of SIRIRAJ Stroke Score with Computerized Tomography in Ascertaining Type among 50 cases of Cerebrovascular Stroke Patients**Jayantilal Lalji Sathavara¹, Mohini Datraniya², Dileep Gamit³**¹Assistant Professor, Department of General Medicine, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat²Assistant Professor, Department of General Medicine, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat³MBBS, MD Medicine, Maa and Family Multi-Specialty Hospital, Songadh

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Conflict of interest: Nil

Abstract:**Background:** Timely diagnosis is especially important in ischemic stroke, because early thrombolytic therapy and anti-platelet drugs not only improve the functional outcome but also reduce mortality and recurrent strokes. Vast majority of patients do not have access to brain imaging. Therefore, the clinical criteria for distinguishing between ischemic and hemorrhagic stroke has been emphasized.**Objectives:** Present study is done with following objectives. To determine the accuracy of the Siriraj stroke score in differentiating the ischemic from the hemorrhagic strokes and to find the sensitivity, specificity and positive and the negative predictive values of this scoring system in stroke patients.**Material and Methods:** Present Cross-sectional study included 50 cases of stroke of adult patients. The study includes patient's age, sex, duration of symptoms before presentation, and whether the patient is a known diabetic or hypertensive. In addition, the first record blood pressure from onset of the stroke, consciousness level, presence of atheroma marker, and the presence of headache or vomiting within 2 hours of onset were documented. The presence or absence of clinical variables in the Siriraj stroke score was matched against the stroke types as confirmed by CT scan. Sensitivity, specificity, positive predictive value and negative predictive value were calculated using standard methods.**Results:** Clinical parameters such as diastolic blood pressure (>90 mmHg) were in 27 (54%) patients, systolic blood pressure (>140 mm hg) were in 40 (80%) patients. From the risk factor wise of distribution, Stroke Patients were highly associated with hypertension 27(54%), others were related to Diabetes Mellitus. Comparison of CT scan and Siriraj score it was found that Score<-1 was present in (60%) patients where ischemic stroke (52%) and hemorrhagic stroke (8%); -1to+1 was in (18%) patients where ischemic stroke (10%) and hemorrhagic stroke (8%) in each; and > +1 was in (22%) patients where ischemic stroke (6%) and hemorrhagic stroke (16%). The Sensitivity – 76.47%; Specificity – 75.00% was found in Ischemic stroke while Hemorrhagic stroke have Sensitivity -50.00%; Specificity-91.18%.**Conclusion:** Based on clinical variables with using Siriraj Stroke Score, a high degree of accuracy in detecting both types of strokes where CT scan is not available immediately. However, there is a low sensitivity in diagnosing hemorrhagic strokes and higher sensitivity in diagnosing ischemic strokes.**Keywords:** Hemorrhagic stroke, Ischemic stroke, Sensitivity, Siriraj Stroke ScoreThis is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Developing countries like India are having a huge burden of both communicable and non-communicable diseases. Among non-communicable diseases stroke grabs a lion's share, in causing both mortality and morbidity among general population especially elderly.[1] Cerebrovascular accident (CVA) or stroke is defined as an acute onset of focal neurological deficit resulting from cerebrovascular disease. It is the third most

common cause of death among adults and one of the leading causes of long term disability and has vast social, financial and personal implications. Decisions regarding management of stroke require accurate diagnosis of stroke types. [2,3] Timely diagnosis is especially important in ischemic stroke, because early thrombolytic therapy and anti-platelet drugs not only improve the functional outcome but also reduce mortality and recurrent

strokes. An appropriately timed computerized tomography (CT) scan brain helps to differentiate an infarction from a hemorrhage.[4] However a vast majority of patients do not have access to brain imaging. Therefore, the clinical criteria for distinguishing between ischemic and hemorrhagic stroke has been emphasized. Different scoring systems are used to differentiate clinically between hemorrhagic and ischemic stroke, famous and commonly used are sirriraj stroke score (SSS) and allen score. [5,6]

Some studies conducted in India reported that sirriraj score is better to differentiating between stroke types in Indian population [7-10]. Siriraj score despite its limitations and lesser reliability compared to CT scan still has a place in practice of medicine. This is especially pertinent for developing countries where newer diagnostic facilities may not be available except for major cities. In rural setting, there may be none. Hence clinical tool to diagnose and differentiate between ischemic and hemorrhagic stroke still retains its utility. We conducted this study to see the accuracy of Sirriraj Stroke Score in our population. The result of this study may be useful in non-specialist institutions in providing empirical therapy and would therefore reduce the morbidity caused by delay in treatment due to non-availability of diagnostic imaging facilities especially in the rural areas of India. Present study is done with following objectives.

1. To determine the accuracy of the Sirriraj stroke score in differentiating the ischemic from the hemorrhagic strokes.
2. To find the sensitivity, specificity and positive and the negative predictive values of this scoring system in stroke patients.

Material and Methods

Cross sectional study was conducted among patients from General Medicine department in tertiary center during the period of January 2016 to August 2017. Study included 50 cases of stroke of adult patients.

Inclusion Criteria

1. Patients whose deficit lasted for more than 24 hours.
2. CT scan showed cerebral infarction or intracerebral hemorrhage.
3. Patients age > 18 years.

Exclusion Criteria

1. Age < 18 years.

2. Duration of stroke >14 days because of the possibility of missing an ICH.
3. Causes of focal neurological deficit other than stroke (tuberculosis, tumour or trauma).
4. Patients on anti-coagulation therapy.
5. Patients in whom CT scan could not be done.
6. Patients admitted 72 hours after the onset of neurological deficit.
7. Patients with sub-arachnoid hemorrhage.
8. Repeat or recurrent stroke.

The study includes patient's age, sex, duration of symptoms before presentation, and whether the patient is a known diabetic or hypertensive. In addition, the first record blood pressure from onset of the stroke, consciousness level, presence of atheroma marker, and the presence of headache or vomiting within 2 hours of onset were documented. The clinical diagnosis of stroke type was recorded by a consultant physician and the reports of CT scan by a consultant radiologist.

The SSS was calculated using the formula: $(2.5 \times \text{level of consciousness}) + (2 \times \text{headache}) + (2 \times [\text{vomiting}] + [0.1 \times \text{diastolic blood pressure}] - 12 - [3 \times \text{atheroma marker}])$. A score of -1 was taken to suggest infarction, a score of +1 was taken to suggest hemorrhage, while a score of -1 to +1 was considered indeterminate. The SSS calculation is as shown in Table 1.

Angina pectoris, diabetes mellitus and intermittent claudication were taken as atheroma markers. A previous history of diabetes or a fasting plasma glucose of 126 mg/dL or more, and a random blood glucose of 200 mg/dL or higher was classified as diabetes mellitus. Patients presenting with systolic blood pressure 140 mmHg and above or diastolic blood pressure 90 mmHg and above or who had normal blood pressure but were pharmacologically being treated for hypertension were categorized as hypertensive.

Statistical Analysis

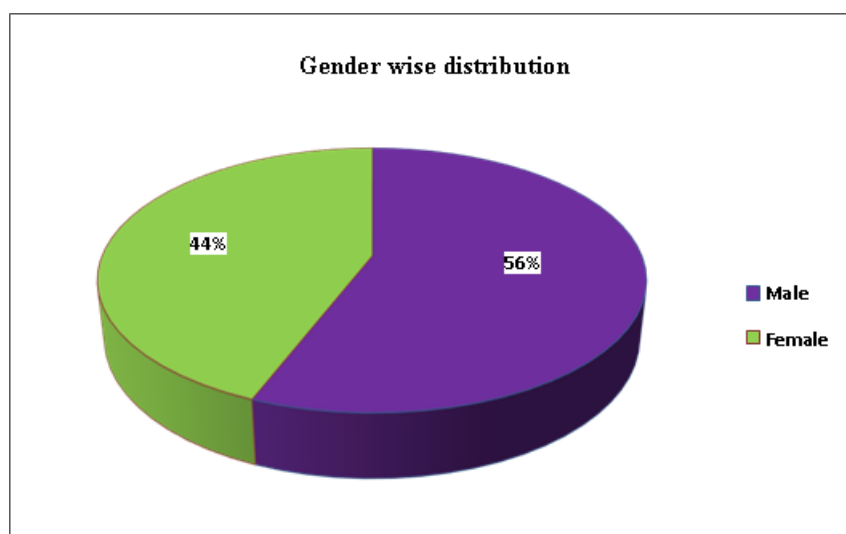
Data were analyzed using statistical package for IBM (SPSS) version 22.0. Chi square test was used to determine statistical significance. P value < 0.05 was accepted as statistically significant. The presence or absence of clinical variables in the Siriraj stroke score was matched against the stroke types as confirmed by CT scan. Sensitivity, specificity, positive predictive value and negative predictive value were calculated using standard methods.

Results and Discussion

Table 1: Age wise distribution

Age in Years	No of patients	Percentage (%)
30-39	01	02%
40-49	05	10%
50-59	18	36%
60-69	23	46%
70-79	03	06%
Total	50	100%

From the table and graph shows that highest no. of patients (46%) was in 60-69 age group and lowest (2%) in 30-39 age groups. The youngest patient was 33 years and oldest was 73 yrs. In a study done by A Somasundaran et al [11], highest incidence was present in 61-70 age groups. Age is one of the risk factors responsible for stroke development.

**Figure 1:****Graph 1**

Graph 1 show that the 28 (56%) patients were Male. Remaining 22 (44%) were Female. In a study done by S. Rajan et al [12], similar results were observed (65% vs. 35%). The male: female ratio was 3:1 in study by H. Singh et al.[13]

Clinical parameters such as diastolic blood pressure (>90 mmHg) were in 27 (54%) patients, systolic blood pressure (>140 mm hg) were in 40 (80%) patients. In the study done by H singh et al[13], systolic blood pressure (>140 mm hg) were present in

65% cases, while diastolic blood pressure (>100 mm hg) were present in 60% of cases. Blood pressure was found to be elevated more in hemorrhagic stroke being more in diastolic blood pressure when compared to ischemic stroke. Headache was seen in 30% of patients. In the study done by H.singh et al [13], headache was seen in 25% of patients. Headache though a common complaint was found more in cases of hemorrhagic infarct and ischemic cases exhibited less of it, thus headaches more likely to be associated with hemorrhage.

Table 2: Risk Factor wise Distribution

	No of patients	Percentage (%)
Hypertension	27	54%
DM	24	48%
IHD	11	22%
PVD	09	18%
Smoking	22	44%
Alcohol	22	44%
AF	11	22%

From the risk factor wise of distribution, Stroke Patients were highly associated with hypertension 27(54%), others were related to Diabetes Mellitus. In the study of A Somasundaran et al, Hypertension was the common-

est risk factor seen in 68% patients followed by Diabetes Mellitus 45%. In the study done by H singh et al [13], Hypertension was present in 36.7% cases, while IHD and DM were present in 5% of cases.

Table 3: SIRIRAJ Score Wise Distribution

Siriraj Score	No of patients	Percentage (%)
<-1	30	60%
-1to+1	09	18%
>+1	11	22%
Total	50	100%

The different study such as S. Rajan et al, H Singh et al, and A Somasundaranetal² found support to our study by siriraj stroke score that where<-1(51.6%;53%; 74.6%) and> +1(30%;40%;16.8%)and remaining others-1to+1(18.3%;6.67%; 8.6%) respectively. In the present study, CT scan of brain was diagnosed that is chemic stroke was found in 34 (68%) patients and hemorrhagic stroke in 16(32%) patients.

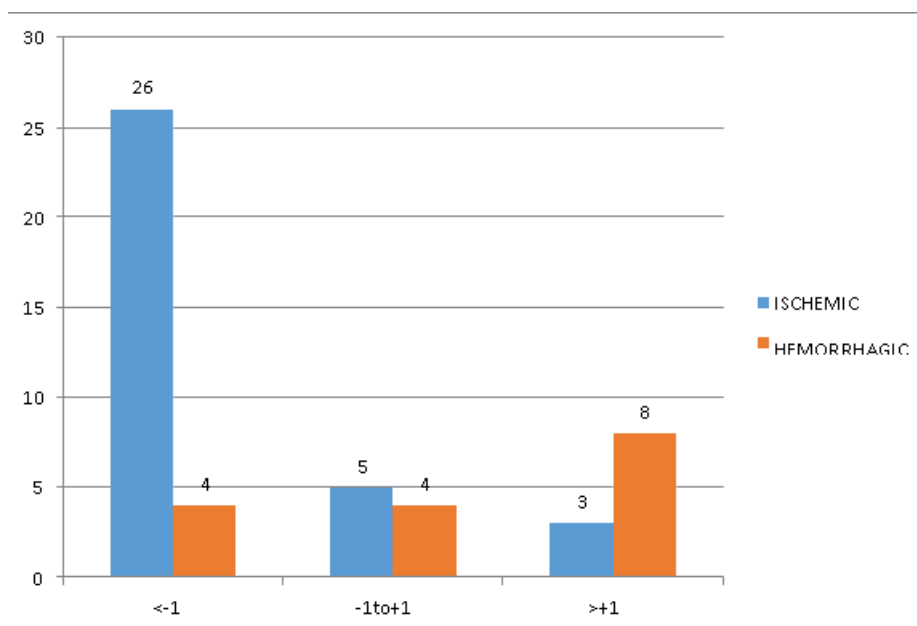


Figure 2:

Graph 2

In the present study, Comparison of CT scan and siriraj score it was found that Score <-1 was present in 30 (60%) patients where CT scan was showing ischemic stroke in 26 (52%) and hemorrhagic stroke in 4 (8%) patients; -1 to +1 was in 9 (18%) patients where CT scan was showing ischemic stroke in 5 (10%) and hemorrhagic stroke in 4 (8%) patients ; and > +1 was in 11 (22%) patients where

CT scan was showing ischemic stroke in 3 (6%) and hemorrhagic stroke in 8 (16%) patients.

The different study such as S. Rajan et al [12], H. Singh et al [13], and A Somasundaran et al [11] found support to our study that where ischemic stroke (51.6%; 53%; 74.6%) and hemorrhagic stroke (30%; 40%; 16.8%) and remaining others undiagnosed (18.3%; 6.67%;8.6%) respectively.

Table 4: Sensitivity and Specificity of Ischemic and Hemorrhagic Stroke by Siriraj Stroke Score

Variable	Sensitivity	Specificity	PPV	NPV
Ischemic Stroke	76.47%	75.00%	86.67%	60.00%
Hemorrhagic Stroke	50.00%	91.18%	72.73%	79.49%

In the present study, the ischemic stroke has Sensitivity-76.47%; Specificity –75.00%; Positive predict value -86.67%; Negative predict value-60.00%. While Hemorrhagic stroke have Sensitivity- 50.00%; Specificity–91.18%; Positive predict value-72.73%; Negative predict value-79.49%. In the study done by, H. singh et al [13], the ischemic

stroke had sensitivity- 93.75%; specificity-76.6%; and positive predict value-81.2%. while hemorrhagic stroke had sensitivity- 83.3%; specificity-92.5%; and positive predict value-86.9%. Hung LY et al [14] in their study have reported that the diagnostic sensitivities for intracranial hemorrhage and infarction were 85% and 90% respectively, with an

overall predictive accuracy of 88.5%. Pongvarin et al [15] have shown that the sensitivity of Siriraj stroke score for cerebral hemorrhage and cerebral infarction were 89% and 93% respectively, with an overall predictive accuracy of 90%. Akpunonu et al reported sensitivity was 36% for hemorrhagic stroke and 90% for ischemic ones. Study in South Indians by Pavan MR et al showed that the sensitivity for detecting infarction was 87.93% and specificity was 77% whereas for hemorrhage was 77% and 88% respectively.

Conclusion

Based on clinical variables with using Siriraj Stroke Score, a high degree of accuracy in detecting both types of strokes where CT scan is not available immediately. However, there is a low sensitivity in diagnosing hemorrhagic strokes and higher sensitivity in diagnosing ischemic strokes. The low sensitivity of the scoring system in diagnosing hemorrhagic stroke might turn potentially disastrous, as it can mislead the clinician to initiate the patient on anti-thrombotic agents which could worsen the bleed.

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