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Validation of Siriraj Score among Stroke Patients in a Tertiary Care Hospital in North India

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Abstract: ***Background: Stroke is a leading cause of Cardiovascular mortality in India and the world over. Two types of strokes are more common, Ischemic and Haemorrhagic. The prompt diagnosis and differentiation between the two is of paramount importance for treatment. However CT scan, as conventionally used, is not available in many peripheral parts of India. Siriraj score provide an effective bedside tool for this differentiation. However it has not yet been validated in India. Method: 200 patients admitted in the hospital satisfying the WHO definition of stroke were evaluated and Siriraj score evaluated for them. They were subjected to CT scan and the results compared. Results: Siriraj score had a sensitivity of approximately 93% and 65% for Haaemorhhagic and Ischemic Strokes respectively, while specificities were 91% and 71% respectively. Conclusion: The Siriraj score has a good utility in Indian population in differentiating between Haemorrhagic and Ischemic strokes bed side, without needing a CT scan in peripheral locations.***

Keywords: Siriraj, Stroke, CT, Haemorrhagic, Ischemic

1. Introduction

Stroke is a very common problem in India and across the world. As per WHO estimates, stroke burden in the world over is very large. In 2013, stroke was the second most common cause of deaths (11.8% of all deaths [95% UI, 10.9–13.0%]) worldwide, after ischemic heart disease (14.8% of all deaths [95% UI, 13.4–15.8]), and the third most common cause of disability (4.5% of DALYs from all cause [95% UI, 4.1–5.2]) after ischemic heart disease (6.1% [95% UI, 5.5–6.8]). [1]

The WHO has defined stroke as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular etiology"[2]

Stroke can be Ischemic, Haemorrhagic or SAH [2]. Moreover, data suggests In Caucasian populations approximately 80% of all strokes are ischemic, 10%-15% intracerebral hemorrhage (ICH), 5 % subarachnoid hemorrhage (SAH), and the rest is due to other causes of stroke . Studies from Asian countries indicate that the proportion of ICH is higher than in Caucasians with approximately 20 % to 30% being hemorrhagic 9-12 13 [3]

Ideally a CT Scan is needed to differentiate between Ischemic Stroke and Haemorrhagic stroke, because management of these two entities is different. However, a CT scan may not be available in certain setups. In these situations, making a diagnosis bedside is very important. Siriraj Score was developed for this purpose. [4]. It can differentiate between Hamorrhagic and Infarct stroke [4].

Accordingly, patients are assigned a score based on levels of consciousness, presence or absence of headache and vomiting, stigmata of atheroma etc. A score of >1 is suggestive of Haemorrhagic stroke, a score of <-1 suggestive of Ischemic stroke and between 1 and -1 equivocal.

However the validity of this score in Indian set up is not known. With this aim, we decided to validate this score among Indian patients attending a tertiary care hospital in North India.

2. Literature Survey

Global burden of stroke is very high in the Indian scenario. It is one of the leading causes of death and disability in India [1]. While prospective studies concerning the validation of Siriraj score in India is rare, a few studies have been done outside India. Controversy shrouds the applicability of Siriraj score in different population groups. A study conducted in Nigeria found Sirriaj score not sufficiently sensitive and specific to merit use. The authors went on to say that CT scan should remain the Investigation of choice an should remain affordable.[5]

A similar study done in Pakistan found the specificities was 85% for Ischemic and 90% for Haemorrhagic stroke while the sensitivity was 71% for Ischemic stroke and 73% for haemorrhagic stroke.[6]. The authors believed the score had high enough sensitivity and specificity to be used in clinical practice.

The original Siriraj score validated in Siriraj hospital, Thailand and found sensitivities to the range of 83.2% for hemorrhagic stroke and 93.2% for Ischemic stroke [4]

To date, to the best of our knowledge, no such validation has been done in North India. While Siriraj score could serve as a effective bed side tool for diagnosis, its validation needs to be done in India.

Problem Definition (Aims and objectives)

To validate the Siriraj score among stroke patients attending a tertiary care hospital in North India.

3. Materials and Methods

Study Type: Observational and descriptive study.
Study Design: Cross Sectional.
Place of study: A tertiary care hospital in North India (Uttarakhand)
Study Duration: 2 months
Study population: Patients admitted to "Medicine" ward of the hospital with the disgnosis of "Acute Stroke Syndrome" as per WHO definition (Vide "Definitions")

Sampling
All the patients who satisfied the Inclusion and Exclusion criteria were considered.

1. Inclusion criteria:
a) Patients admitted to Medicine ward and satisfying WHO Acute Stroke Syndrome criteria.

2. Exclusion criteria
a) Patients or their relatives who declined to give consent were left out.
b) Patients who were later detected to have intracerebral pathology other than Cerbrovascular accident (Ischemic or Haemorrhagic) as evident on further imaging studies were left out.
c) Insufficient/ Incomplete information: Cases whose past history of diabetes were not documented were left out.
d) Those cases which on subsequent Computerized Tomography (CT) scan indicated Subarachnoid Haemorrhage were excluded

3. Sample size: 200 patients who satisfied the criteria of inclusion during the study period.

Study Tools:
a) A predesigned and pretested written questionnaire containing information about past history.
b) Patients medical history files, including prescriptions, past treatment records etc
c) A mercury Sphygmomanometer to record Blood Pressure.

Technique:
a) Topic selection and literature review.
b) Ethical Committee approval was sought.
c) Consent form was given to each patient who satisfied Inclusion criteria
d) In case where patient could not give information, the nearest relative was asked about patient's medical history
e) The patients past medical history as recorded verbally was cross examined from supporting documents, such as past prescription files.

Siriraj Score Calculation
The Siriraj Score was calculated as:
(2.5 x level of consciousness)+
(2 x vomiting)+
(2 x headache)
+(0*1 x diastolic blood pressure)
-(3x atheroma markers)-12.

Where
A. Level of conciousness was assigned a score as:
Alert: 0
Drowsy/ Stupore: 1
Semicomatose: 2
Comatose: 3

B. Vomiting after onset of symptoms was assigned a score as :
No: 0
Yes: 1

C: Headache within 2 hours of onset of symptoms as
No: 0
Yes: 1

D: history of Atheroma markers ;
These included:
1. A history of documented Diabetes Mellitus
2. History of Intermittent Claudication
3. History of Angina.
If any ONE or more was present The score was assigned 1
If NO factors present: A score was assigned as 0.

E: Diastolic Blood Pressure(DBP)
Phase V of the Korotkoff Sound was taken as DBP.
Scoring: 0.1 X DBP (in mm Hg)

The final score was calculated as: (2.5 X Level of Consciousness) + (2 X Vomiting) + (2 X Headache) + (0.1 X Diastolic Blood Pressure in mm Hg) – (3 X Atheroma markers) – 12.

vii) A Non Contrast Computerized Tomographic scan (CT scan) of the cranium was done within 24 hours of admission.

viii) The results of the CT scan were now compared to that of Siriraj Score to see any correlation.

Quality Control:
a) Blood Pressure was measured by a pre-validated mercury sphygmomanometer, following standard procedure.
b) Cases where incomplete information could be obtained were left out of study.
c) Only those cases who satisfied the WHO definition of stroke were included in the study.
d) A qualified radiologist who was blinded about the Patient Characteristics (including their Siriraj scores) evaluated the CT scans of the patients to reach radiological diagnosis.

Study Variables
1) Diastolic Blood Pressure
2) History of Headache within 2 hours of symptom
3) History of Vomiting in the last 24 hours of symptoms onset
4) History of Angina/ Intermittent Claudication/ Diabetes Mellitus
5) Level of Consciousness

Statistical Analysis
Results were analyzed using Microsoft Excel XP and EPI info 7 Software and various statistical methods and represented by charts, diagrams and tables.

The results were analyzed using software EpiInfo 7.

6. Definitions used:
Stroke means a patient who satisfies the following definition: The World Health Organization (WHO) definition of stroke is: "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin"[2]

7. Interpretation of Siriraj score
>1 indicates: Haemorrhagic stroke
<-1 indicates : Ischemic Stroke
between 1 and -1 indicates: Equivocal score

4. Results

Table 1: Baseline Characteristics of Patients (N = 200)

Characteristic	Number of patients (% of patients)
Age	
<50	5 (2.5%)
50 – 60	75 (37.5%)
60 – 70	82 (41%)
70 – 80	26 (13%)
>80	12 (6%)
Sex	
Male	167 (83.5%)
Female	33 (16.5%)
Diabetes Status	
No Diabetes	136 (68%)
Known Diabetic	64 (32%)
DBP >100 mm on admission	
Yes	146 (73%)
No	54 (27%)
History of Vomiting after symptoms	
Yes	122 (61%)
No	78 (39%)
History of Headache within 2 hours of symptoms	
Yes	137 (67.5%)
No	63 (32.5%)

In our study, the age ranged from 42 years to 88 years, with a median age of 64 years. The male preponderance was marked, with >80% of our study population being males. Majority of the patients, 61% had witnessed atleast 1 episode of vomiting since symptom onset. A whopping 68% of the population had received a diagnosis of diabetes at some point in their history in our study. 67.5% of the patients said they had witnessed headache after symptoms onset.

Table 2: Distribution of patients according to Siriraj Score(N = 200)

Siriraj Score	Number of Patients
More than 1	137
Between -1 and 1 (Both Inclusive)	29
Less than -1	34
Total	200

As is evident from Table 2 ,Majority of the patients were scored more than 1 on Siriraj scoring.

The score ranged from 10 to -6. The median score was 3. The mode frequency score was 3.

Table 3: Distribution of patients according to diagnosis on CT scan (N = 200)

Type of Stroke	*Number of Patients*
Haemorrhagic	144
Ischemic	56
Total	200

Majority of the patients were of haemorrhagic stroke.

Table 4: Correlation between Siriraj score and CT scan finding: (N = 171) *

Type of Stroke		
Siriraj Score	*Haemorrhagic*	*Ischemic*
Score>1	124	13
Score <-1	10	24
Total	134	37

*: Those patients with equivocal score (that is, -1 to +1, both inclusive)who were 29 in number (N = 29) were left out from this table.

Sensitivity and Specificity Issues:

Sensitivity to detect Haemorrhagic stroke: (124/134) x 100 = 92.537%
The sensitivity of the siriraj score to detect Haemorrhagic stroke was commendable, at 92.53%

Sensitivity for Ischemic Stroke : (24/37) x 100 = 64.864%. This sensitivity, while not as great as that for Haemorrhagic stroke, is still commendable.

Specificities
Specificity for Haemorrhagic stroke: (124/137) x 100 = 90.511%
Specificity for Ischemic Stroke: (24/34) x 100 = 70.588%
Predictive values

The Positive Predictive value for a score >1 to predict a haemorrhage was:
(124/137) X 100 = 90.511%

The Positive Predictive Value for a score <-1 to predict Ischemic stroke was:
(24/34) X 100 = 70.588%

Such a value is commendable in Indian health care setting where CT may not be immediately available.

5. Discussions

Stroke is a medical emergency. Unfortunately many victims with stroke will face significant delays in reaching a hospital or lack of treatment there owing to lack of imaging facilities in the peripheral parts of the country. The treatment of these two types of strokes is radically different and as such, definitive treatment cannot be commenced unless one has an idea of the type of stroke involved. A simple clinical tool, such as the Siriraj score can be used to know the type of stroke.

This study done in Northern India has found a Sensitivity for hemorrhagic stroke at 92.537%, whereas that for ischemic stroke at 64.864%. This is in close agreement with study done in Pakistan where authors found a sensitivity of 71% for Ischemic stroke and 73% for haemorrhagic stroke.[6]

The specificities for the said study in Pakistan was 85% for Ischemic and 90% for Haemorrhagic stroke [5]. Our study found figures of 70% and 90% respectively for Ischemic and Haemorrhgic stroke. Hence our study is in close agreement with the Pakistani study.

In the study conducted in Siriraj Hospital, where this score was devised, the authors found thee diagnostic sensitivities of the score for cerebral haemorrhage and cerebral infarction were 89.3% and 93.2% respectively, with an overall predictive accuracy of 90.3% [4]. This again was in close agreement to our study.

Siriraj stroke score is NOT meant to be a substitute for CT scan in centres where it is affordable. It is to be used only in centres where significant delay might occur in procuring the services of Diagnostic Imaging services.

6. Conclusion

With a sensitivity of 92% for Hamorrhagic stroke and 65% for Ischemic stroke, Siriraj Stroke Score can be used effectively as a simple tool for diagnosis and treatment of acute stroke syndromes. While not a substitute for CT, it can be used in peripheral places, particularly in developing countries that may lack imaging facility and significant waste of time may occur as a result of travelling from far flung places. In such a scenario, Siriraj Stroke score can be used. However, more research is needed to ensure whether the same holds true for all subpopulations throughout the country.

7. Conflict of Interest

The author states NO Conflict of Interest to declare.

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Author Profile

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