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VALIDATION STUDY OF THE SIRIRAJ STROKE SCORE IN NORTH-EAST NIGERIA

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ABSTRACT

Background: The management and prognosis of stroke depends on the correct assessment of its pathological sub-type. It is therefore pertinent to have a simple and quick means of evaluating patients with stroke. The Siriraj stroke score (SSS) was developed in Thailand based on clinical parameters and have a good predictive value. This study aims at validating the Siriraj stroke score, as the predictive value of any diagnostic score depends on the prevalence of the disease in the community.

Methodology: Patients who had stroke less than fourteen days before admission were enrolled into the study. Clinical variables for calculating the Siriraj stroke score were documented all patients subsequently had computerized tomography scan performed. A total of fifty patients were studied from University of Maiduguri Teaching Hospital and the State Specialist Hospital Maiduguri

Results: Twenty-seven patients had infarction while twenty-three patients had hemorrhagic strokes respectively, based on the CT scan findings. The Siriraj stroke score correctly diagnosed fourteen as infarction and twenty as having hemorrhagic strokes, sixteen subjects were unclassified. The SSS correctly diagnosed thirteen cases as infarctive and seventeen as hemorrhagic strokes as confirmed by CT scan. The sensitivity and the predictive value of the SSS were 76.2% and 93% for infarction and 94.4% and 85% for hemorrhagic stroke respectively with overall accuracy of 84.6%. The clinical variables such as headache, vomiting and atheroma markers did not show discriminant value independently in differentiating CI and CH. However, level of Consciousness (coma) and diastolic blood pressure of greater than 110mmHg are discriminant variables in differentiating CI and CH.

Conclusion: Siriraj stroke score is recommended to be used in this community especially where CT scan is not available or affordable and the physician wishes to start thrombolytic or/and anticoagulation therapy.

Key words: Stroke, Siriraj stroke score (SSS), North-east Nigeria *(Accepted 10 May 2007)*

INTRODUCTION

Stroke is a rapidly developing clinical sign of focal or global disturbance of cerebral function, with symptoms lasting twenty- four hours or longer or leading to death with no apparent cause other than of vascular origin[1]. In Nigeria, Osuntokun et al[2] found a community prevalence ratio for stroke at 58/100,000, which was rather low, with annual mortality rate of 70 /100,000. In a study conducted at University of Maiduguri Teaching Hospital (UMTH), hospital based incidence was 0.23%[3].

The ability to precisely distinguish the pathological types of stroke, hemorrhagic from ischemia, which is of prognostic and therapeutic importance, depends on computerized tomogram (CT) and magnetic resonance imaging (MRI)[4]. However, some clinical scales can achieve high predictive value such as the Siriraj stroke score (SSS)[8] and Guy's hospital score[6 7], (Allen score). Thought the Allen score has a reasonably good accuracy it can only be administered after 24hour, thus SSS is easily administered and more applicable to bedside assessment.

The Siriraj stroke score was developed and has been in used use since 1986 throughout Thailand has a predictive accuracy in acute stroke of 90.3% [6]. The predictive value of any diagnostic score depends on the prevalence of the disease in the community being considered hence the Siriraj stroke score may not be applicable with the same predictive value trans culturally. Therefore, there is a need for validation of the Siriraj stroke score in Northeastern Nigeria.

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Design

This was a cross-sectional study; aimed at validating the Siriraj stroke score card in the black population in Northeastern Nigeria.

The study was carried out at the University of Maiduguri Teaching Hospital (UMTH) and State Specialist Hospital (SSH) in Maiduguri metropolitan council of Borno state.

Maiduguri town is the capital of Borno state in the Northeastern part of Nigeria, which lies between latitudes 11.5-13.5E in the Sudan Savannah. It has a population of approximately 2.5millon (National population census 1991).

Exclusion criteria

1) Patients below the age of 16 years.
2) Stroke patients with second or recurring stroke.
3) Stroke patients with duration of 14 days or more.
4) Patients with other causes of focal neurological deficit other than stroke such as space-occupying lesion.

SUBJECTS AND PROTOCOLS

On admission, complete Medical history was obtained and neurological examination conducted, with particular emphasis on onset of headache and vomiting and the level of consciousness. The presence of headache and vomiting two hours preceding and after the ictus was scored 1 each and where absent was scored 0. The level of consciousness immediately after the ictus were scored as follows: Alert patients were scored 0, drowsy and stupor scored 1 and those in coma scored 2.

History of hypertension, diabetes mellitus, angina and intermittent claudication were sought and documented. Alcohol ingestion and cigarette smoking, quantities of such substances consumed and duration of use were noted.

The presence of neck stiffness, Kernig's sign and carotid bruit were noted. Weight was measured immediately on admission in kilograms using conventional weighing machine for those that are alert. Height was measured in meters and the Body Mass Index (B M I) calculated using the formula Weight in Kg / height $(m)^2$. Blood sample was taken for random and or fasting sugar and for creatinine, urea, uric acid, potassium, sodium, chloride and bicarbonate. Serum lipids: Cholesterol, low-density lipoprotein (LDL), triglyceride, high-density lipoprotein (HDL) and the packed cell volume (PCV) measured.

Computerized tomographic scan (plain and enhanced) was done using Siemens Somatom ART model 50-1066N 60 BAS between 4hours and 14 days of ictus.

Data Analysis

The data was manually sorted out, coded and entered to a personnel computer for analysis using EPI INFO version 6.04. Sensitivity, specificity, predictive value and efficiency of the test were calculated according to methods proposed by Galen and Gambino[8].

RESULTS

There were fifty study subjects aged between twenty-four and seventy-seven years. The mean age was 52.5yrs. Thirty-five (70%) were males, and fifteen (30%) females with a ratio of 2.3:1. The peak age of stroke for males and females were 46-55 and 56-65 years respectively.

Twenty-seven and twenty-three patients were categorized by computerized tomography scan as ischemic or hemorrhagic stroke respectively.

Headache was a prominent symptom and was present in 31 patients (62%), sixteen of whom had infarction, while fifteen had hemorrhagic stroke. Vomiting occurred in fifteen patients (30%), six had infarction and nine hemorrhagic strokes respectively.

Neck-stiffness was elicited in eight patients, six patients had hemorrhage and two had infarction. Kernig's sign was present in three patients, all the three had hemorrhagic stroke.

Eighteen patients in total presented with one or more makers of atheroma. Ten of these patients are diabetic, twelve patients had history of Angina and seven patients admitted to have had intermittent claudication.

Ten patients presented in coma, nine of these patients were diagnosed to have hemorrhagic stroke. Majority of patients who had ischaemic stroke were alert or drowsy at presentation. Systolic blood pressure between 140-190mmHg was recorded in thirty-six patients while values greater than 190mmHg were recorded in patients with hemorrhagic stroke. Diastolic blood pressure greater than 110mmHg were recorded in fourteen patients. Of those with blood pressure greater than 110mmHg, eleven had hemorrhage and three had infarction.

The Siriraj score was able to correctly diagnosed 13 (16) and 17cases as infarctive or hemorrhagic strokes respectively. Sixteen cases were unclassified while three cases were misdiagnosed as ischaemic and one as hemorrhagic.

The sensitivity was 81.3% and 94.4% for infarctive and hemorrhagic strokes respectively, with accuracy of 88.2%. (Tables 1)

Table 1: **Comparison of Siriraj stroke score with results of computed tomography**

Siriraj Stroke Score	Patients with infarction by CT-Scan	Patients with hemorrhage by CT-Scan
Below -1 (CI)	16	1
-1, +1	6	5
Above +1 (CH)	5	17
Total	27	23

Sensitivity for Ischemic stroke score below 1: 16/21=76.2%
Sensitivity for Hemorrhagic stroke score above +1: 17/18 =94.4%
Accuracy: 33/39 =84.6%

Table 2: **Frequency distribution of Siriraj score values with CT diagnosis of CI and CH.**

Siriraj Stroke Score	Ischemic Stroke	Hemorrhagic Stroke	Total
-4.5	0	1	1
-3.5	1	0	1
-3	4	0	4
-2	6	0	6
-1.5	2	0	2
-1	3	0	3
-0.5	1	2	3
0	1	2	3
0.5	4	1	5
1	2	0	2
1.5	0	2	2
2	0	5	5
2.5	1	3	4
3.5	0	1	1
4.5	1	2	3
5	0	1	1
5.5	0	1	1
7	1	0	1
8	0	1	1
11	0	1	1
	27	23	50

Table 3: **Frequency, Sensitivity, Specificity And Accuracy of Scores In Patients With CT Diagnosis o f Cerebral Ischemia**

SSS	Frequency	Sensitivity(%)	Specifficity(%)
-3.5	1	3.7	100
-3	4	18.5	96.3
-2	6	40.7	81.5
-1.5	2	48.1	59.3
-1	3	59.2	51.9
-0.5	1	62.9	40.7
0	1	66.7	37.0
0.5	4	81.5	33.3
1	2	88.2	18.5
2.5	1	92.5	11.1
4.5	1	96.3	7.0
7	1	100	3.7

Table 4: **Frequency, Sensitivity, Specificity And Accuracy of Scores In Patients With CT Diagnosis o f Cerebral Hemorrhage**

SSS	Frequency	Sensitivity(%)	Specificity(%)
11	1	4.3	100
8	1	8.7	95.6
5.5	1	13.	91.3
5	1	17.4	86.9
4.5	2	26.1	82.6
3.5	1	30.4	73.9
2.5	3	43.5	69.6
2	5	65.2	56.5
1.5	2	73.9	34.8
0.5	1	78.3	26.1
0	2	86.9	21.7
-0.5	2	95.7	13.0
-4.5	1	100	4.3

DISCUSSION

Stroke is a major cause of morbidity and mortality, the management and prognosis depends on the pathological type. The aim of this study is to develop a simple, cheap and reliable diagnostic method for distinguishing the pathological type of acute stroke.

The clinical variables such as headache and vomiting were not effective in differentiating between the pathological types of stroke. Headache was a prominent symptom and occurred in 62% of the patients. Vomiting was less prominent and was reported by 30% of patients (p values = 0.93 & 0.39respectively). Neck stiffness and Kernig's sign was demonstrated in 2 patients who had infarction and in 9 with hemorrhagic stroke (p value < 0.03). Neck stiffness may have occurred due to raised intracranial pressure. The occurrence of neck stiffness in CI could probably due to cervical spondylosis or aseptic meningitis. This finding is significant in distinguishing the pathological types of stroke. Of the atheroma markers, one or more were present in (18) 36% of patients.

None of the atheroma markers discriminate between hemorrhage and ischemia as was similarly reported by Ogun et al[9] in western Nigeria. History of diabetes mellitus was obtained from twelve patients 8(16%) had ischaemic and 4(8%) had hemorrhagic stroke respectively (p value = 0.49 Yates corrected). This finding is statistically not significant.

Angina and Intermittent claudications were not common findings in the study subjects. The low incidence may be attributable to patient inability to describe or differentiate the symptoms of angina and intermittent claudications with other chest or leg conditions that may mimic the symptoms.

Elevated systolic and diastolic pressure occurred in 81% and 92% respectively. This corroborates the

earlier finding of 79% in stroke patients admitted into UMTH between 1982 and 1987 and the worldwide pattern of being the most significant risk factor for stroke,[3 10 11 12 13 14 15]. The study demonstrated that diastolic blood pressure greater than 110mmHg was significantly ($p < 0.03$) more common in hemorrhagic stroke. This was similarly observed for systolic pressure of 190mmHg and above ($p < 0.05$). Coma had a very high discriminatory value for hemorrhagic stroke ($p<0.001$) as nine out of 10 patients admitted in coma had hemorrhage on CT. A pool data combining drowsiness and stupor/coma show significant discriminatory value $p= 0.0185$. Thus the significant discriminatory variables for Siriraj Stroke card were level of consciousness and diastolic blood pressure as corroborated by Ogun et al[9]. In addition to these however elevated systolic blood pressure greater 190mmHg and signs of meningeal irritation are significant discriminant in this study population. These findings may be more relevant if inco-oporated into the SSS and scored for this community.

Forty-six percent of the patients enrolled in this study had hemorrhagic stroke similar to the high incidence of hemorrhagic stroke reported in Thailand where CH accounts for 40-50% of stroke[16]. Recent findings also support the increasing proportion of hemorrhagic stroke in our population[17].

This study found sensitivity of Siriraj stroke score (SSS) of 76.2% and 94.4% for ischaemic and hemorrhagic stroke respectively with accuracy of 88.2%. This is similar to that reported in Thailand, sensitivity of 93.2% and 89.3% for ischaemic and hemorrhagic strokes respectively and accuracy of 90.3%. However, there was a reversal of the sensitivity pattern of ischaemic and hemorrhagic strokes in our patients compared to Thai subjects. These findings differ from that of Ogun et al9 who had sensitivity of 50% and 58% for ischaemic and haemorrhagic strokes respectively and accuracy of 54.2%.

The results did not support the view of Celami et al that SSS is probably better in detecting infarction than hemorrhage that reported sensitivity of 93% for ischemia and 61% for hemorrhage[18].

Our diagnostic gray zone of the SSS which is between 1 and +1 had (11)subjects (22%) this shows variation with that of Poungvarin et al 5 who reported 20% in the Siriraj validation study in Thailand. The higher percentage in this study might be due to the small number of subjects involved unlike the validation study that was multi centered and had 162 patients. There was marked variation with that of Ogun et al9 8.3%.

CONCLUSION

This study has demonstrated conclusively that the SSS with the cut off point of <-1 and +1 and above for supratentorial infarctive and hemorrhagic strokes respectively could safely be applied in our environment. Therefore Siriraj stroke score based on this validation study is recommended for use. It is those with value of 1 to +1(gray zone) that will need computerized tomograpy scan (CT Scan) to evaluate the pathological type of stroke. This will reduce the cost of stroke management and improve the outcome of stroke patients.

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