

## Distinguishing Non-Hemorrhagic From Hemorrhagic Stroke In Rural Nepal Setting Using The Besson Score

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**Abstract: Introduction:** The management and prognosis of patient with acute stroke varies depending mainly on stroke subtypes. Hence it is very crucial to make a timely differentiation between the stroke subtypes. Computed Tomography is largely unavailable in rural Nepal. This study identifies the diagnostic accuracy of Besson Score to distinguish stroke subtypes in Nepalese population. **Methods:** It was a prospective observational cross-sectional study conducted at United Mission Hospital Tansen. It included 71 patients presenting to UMHT with acute stroke. Besson Score was calculated and was compared with Computed Tomography (CT) of head. **Results:** A total of 71 patients were included in this study, out of them 27 patients had hemorrhagic stroke and 44 had non-hemorrhagic stroke. This study showed that sensitivity and specificity for Besson score for non-hemorrhagic stroke were 45.45% and 96.30% respectively. The positive likelihood ratio was 13.18 and the negative likelihood ratio was 0.57. Positive predictive value of the Besson score was 95.24% for non-hemorrhagic stroke. **Conclusions:** This scoring system is not accurate enough to replace CT scan as investigation of choice but can be used in resource poor settings in order to minimize referral and to manage the cases with non-hemorrhagic stroke at rural hospitals.

**Keywords:** stroke subtypes; clinical scoring system; UMHT; cardiovascular disease

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### I. Introduction

The World Health Organization (WHO) defines stroke as “rapidly developing signs of focal (or global) disturbance of cerebral function, leading to death or lasting longer than 24 hours, with no apparent cause other than vascular<sup>1</sup>. Worldwide, the second most common cause of mortality and the third most common cause of disability is stroke<sup>2</sup>. Based on disability-adjusted life years, stroke is one of the major causes of death and is among the top five diseases in Nepal<sup>3</sup>. The management and prognosis of patients with acute stroke syndrome vary depending mainly on stroke subtypes. Non-contrast computed tomography (CT) scan is the gold standard for distinguishing stroke sub-types<sup>4</sup>. But in a country like Nepal, where such facilities are out of reach of the majority population, a simple diagnostic clinical tool that could differentiate the stroke subtype, with fair amount of accuracy would be of great help for timely diagnosis of such cases. Besson et al. proposed a scoring system (Besson score or BS) that could be used to identify a fairly good proportion of ischemic stroke patients at the bedside, with good safety margin for appropriate therapy<sup>5</sup>. Besson score is easy to calculate at bedside and does not require laboratory investigations. BS was not previously validated in Nepal. This study has been undertaken with the aim of determining the diagnostic accuracy of Besson Score in Nepalese population to differentiate the major stroke subtype taking CT scan head as the gold standard.

### II. Material And Methods

A cross-sectional study was done and a descriptive research design was used. United Mission Hospital Tansen was selected as the study area for the research. The study time for the study was 2 years and sample collection time was from 9<sup>th</sup> October 2015 to 8<sup>th</sup> October 2016. Ethical clearance was obtained from the IRB of the Institute of Medicine. Permission was taken from the United Mission Hospital, Tansen. Informed written consent was taken from the patients enrolled in the study. All new stroke patients presenting to emergency department of UMHT were included. Patients with previous history of stroke and those who were already diagnosed outside this hospital with CT report were excluded from study. Patients presenting with stroke as defined by WHO<sup>1</sup> i.e. rapidly developing signs of focal (or global) disturbance of cerebral function, leading to death or lasting longer than 24 h, with no apparent cause other than vascular were evaluated by doctor on duty in ER with Besson Score and compared with CT scan. Besson score <1 was consider as cut off value for non-hemorrhagic stroke.

Besson Score calculated with formula  $BS = (2 \times \text{alcohol consumption}) + (1.5 \times \text{plantar response}) + (3 \times \text{headache}) + (3 \times \text{history of hypertension}) - (5 \times \text{history of transient neurological deficit}) - (2 \times \text{peripheral arterial disease}) - (1.5 \times \text{history of hyperlipidemia}) - (2.5 \times \text{atrial fibrillation on admission})$ . Alcohol consumption was scored as 0 if absent or unknown and 1 if the patient drank alcohol every day, whatever the amount. Peripheral arterial disease was scored as 0 if absent and 1 when the patient had a documented history of lower-limb claudication or if physical examination showed the loss of at least one arterial ankle pulse. Headache within 2 hours before onset, and/or headache after onset was scored as 0 if absent or unknown and as 1 if present. History of hyperlipidaemia was scored as 0 if absent and 1 if present. Atrial fibrillation was scored as 0 if absent and 1 if present. Plantar responses was scored as 0 if absent or flexion, 1 if extensor ipsilateral to the deficit, 2 if extensor, contralateral to the deficit, and 3 if they were both extensor. . Descriptive statistical method was used to analyse and interpret data by using SPSS v 20.

### III. Result

The mean age of the study population was  $66 \pm 11.44$  years (table-1).

**Table-1 Distribution of stroke patients according to age group.**

N= 71

Age group(in years)	Percent
40-49	7
50-59	21.1
60-69	25.4
70-79	32.4
80-89	12.7
>=90	1.4

The difference between non-hemorrhagic and hemorrhagic stroke with respect to age was statistically not significant (Table-2).

**Table-2 Independent sample t-test to show difference between non-hemorrhagic and hemorrhagic stroke with respect to age**

N=71

Category	Mean±SD	p-value
Non-hemorrhagic	67.09 ± 11.92	0.476
Hemorrhagic	65.37 ± 10.74	

Presence of Ischemic stroke is more common than the hemorrhagic stroke in women which is statistically significant (Table-3).

**Table-3 Chi-Square test to show association between sex and type of stroke**

N=71

Sex	CT Findings		P-value
	Ischemic CVA	Hemorrhagic CVA	
Male	19 (45.2%)	23 (54.8%)	<0.001
Female	25 (86.2%)	4 (13.8%)	

The association between smoking and stroke subtype was not significant (Table-4).

**Table-4 Chi-Square test to show association between smoking and type of stroke**

N=71

		CT findings		Total	P Value
		Ischemic CVA	Haemorrhagic CVA		
Smoking	Non smoker	23	16	39	0.64
	<10 Pack Year	3	1	4	
	>10 Pack Year	18	10	28	
Total		44	27	71	

The association between alcohol consumption and stroke was statistically not significant with p=0.058 (Table-5)

**Table-5 Chi-Square test to show association between alcohol consumption and type of stroke.**

N= 71

Alcohol consumption	CT scan		Total	P Value
	Hemorrhagic	Ischemic		
Yes	12	10	22	0.058
No	15	34	49	

**Table-7 Sensitivity, Specificity, Positive Likelihood Ratio and Negative Likelihood Ratio of Besson Score**

N=71

Sensitivity	$\frac{a}{a + b}$	45.45%
Specificity	$\frac{d}{c + d}$	96.55 %
Positive Likelihood Ratio	$\frac{\text{Sensitivity}}{100 - \text{Specificity}}$	13.18
Negative Likelihood Ratio	$\frac{100 - \text{Sensitivity}}{\text{Specificity}}$	0.56

**Table-8 Predictive values for Besson Score.**

N=71

Positive Predictive Value	$\frac{a}{a + c}$	95.24%
Negative Predictive Value	$\frac{d}{b + d}$	52.00 %

#### IV. Discussion

Besson Score was developed with propose to distinguish non-hemorrhagic stroke from hemorrhagic stroke with very high positive predictive value. Besson score is simple and can be calculated from data available to all physicians at bedside, since it does not need laboratory tests. Sensitivity of the Besson Score was 45.45%. Goswami et.al.<sup>6</sup> validated Besson Score<sup>5</sup>, Siriraj Stroke score<sup>7</sup>, Greek score<sup>8</sup> and Guy’s Hospital score<sup>9</sup>. They found that sensitivity of Besson score was 65%. Besson Score had a specificity of 96.30%. Specificity was 96% for Besson Score in a study done by Efstathiou et al. in Greece<sup>8</sup>.

In this study, ischemic stroke was present in 68% and 32% had hemorrhagic stroke, which is in accordance to the global incidence of hemorrhagic and ischemic stroke<sup>10</sup>. This study agrees with the results of the study carried out in Nepal by Naik, et al in which hemorrhagic stroke was present in 42% cases<sup>11</sup>.

In our study smoking was present in 32(45.07%) cases and 28(39%) gave history of smoking more than 10 pack year. The association between smoking and stroke subtype was statistically not significant in our study. Smoking emerged as commonest risk factor in the study reported by Naik et al<sup>11</sup>. It was present in 40.66% of cases in their study<sup>11</sup>.

BS was not previously validated in Nepal; it has high specificity in predicting non-hemorrhagic stroke. It was single centre study and study did not compare Besson Score with other scoring systems like Siriraj Stroke Stoke, which can be taken as limitations of this study.

## V. Conclusion

Besson Score as one of the clinical scoring system is easy to calculate at bedside, does not require laboratory investigations. This scoring system is not accurate enough to replace CT scan as investigation of choice but can be used in resource poor settings in order to minimize referral and to manage the cases with non-hemorrhagic stroke at rural hospitals.

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