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Original Research Article

FUNCTIONAL OUTCOME PREDICTION USING FUNC SCORE IN PRIMARY INTRACEREBRAL HEMORRHAGE PATIENTS ADMITTED TO MEDICAL WARDS IN A TERTIARY CARE HOSPITAL

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Abstract

Background: Intra-cerebral haemorrhage (ICH) is the most dangerous and distressing stroke subtype and is challenging to treat, resulting in significant impairment in survivors. The study aimed to assess the utility of FUNC SCORE in evaluating patients with primary intra-cerebral haemorrhage and prognosticating functional outcomes. **Materials and Methods:** This single-centre longitudinal follow-up study was conducted at the Institute of Internal Medicine, Rajiv Gandhi Government General Hospital in Chennai, for 6 Months from May 2021 to October 2021 on 100 patients admitted with spontaneous intracerebral haemorrhage as confirmed by computed tomography of the brain on a medical ward. A patient's history includes age, sex, and physical and neurological symptoms. Assessments include vital signs, Glasgow coma score, CBC, RFT, LFT, coagulation profile, and non-contrast head CT scan was done in all patients. **Result:** Out of 100 patients, 50% of patients had limb weakness, 44% of patients had limb weakness along with loss of consciousness, 4% of patients had only loss of consciousness, and the remaining 2% had Seizure along with limb weakness. According to the Glasgow coma scale score, 71% of patients had less than or equal to 8, and 29% had greater than or equal to 9. Depending on the ICH location, 2% of patients located with infratentorial, 35% in the lobar region and 63% of patients had deep ICH. The functional score with the Glasgow outcome scale at 90 days found that the death rate has a mean value of 6.24 and the mean value of good recovery is 10.38 if the p-value is < 0.0001. **Conclusion:** Using the FUNC score, the functional outcome of the patients presenting with primary intracerebral haemorrhage could be reliably predicted.

INTRODUCTION

Intracranial haemorrhage is caused by bleeding within and around the brain, which can lead to a mass effect on nearby neural structures, toxic effects of extravasated blood, or raised intracranial pressure. Most intracerebral haemorrhages are caused by hypertension, trauma, and cerebral amyloid angiopathy. These haemorrhages are typically large, spontaneous, and devastating.[1] It is considered to be the second most prevalent cause of stroke is non-traumatic intracerebral haemorrhage (ICH), which accounts for 7.5-30% of all strokes.[2,3] It is classified as a spontaneous haemorrhage within the brain parenchyma due to a ruptured blood vessel within the brain, as confirmed by neuroimaging or autopsy.[4]
ICH is considered fatal in most cases, and patients' treatment is frequently withdrawn early in the hospital course, at home, resulting in a situation that can deprive patients of a fair chance for those whose prognosis may not be as bad as initially thought.[5]

Offering proper care to such patients aids in their survival and leads to a positive independent outcome for those who survive the illness. The major classification of intracerebral haemorrhage is primary and secondary Intracerebral haemorrhage. The former is a common but potentially fatal spontaneous brain haemorrhage. Chronic hypertension and degenerative alterations in the cerebral arteries are the main causes.[6] The latter can result from a vascular malformation, hemorrhagic conversion of an ischemic stroke, coagulopathy, or an intracranial tumour, among other things. Significant trauma, tumours, aneurysms, vascular malformations, coagulopathies, or the hemorrhagic transformation of cerebral infarction are all linked to secondary ICHs. Intracerebral haemorrhage patient symptoms frequently worsen in the first 24 to 48 hours following onset. Continued bleeding surrounding the lesion, oedema around the lesion, and the impact of the lesion on blood flow and metabolism all contribute to this deterioration. Within 48 to 72

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hours, several patients who had stabilized over the first 24 to 48 hours showed progressively decreasing awareness and worsened focal abnormalities. Antiplatelet therapies have been associated with an increased risk of ICH. The ICH score system is scientifically proven to predict mortality and clinical outcomes. Rapid coagulopathy reversal can be performed in patients receiving VKAs by infusing prothrombin complex concentrates, which can be delivered fast, followed by fresh-frozen plasma and vitamin K.[7]

The Glasgow Coma Scale (GCS) is a widely used and approved prognostic score for both traumatic and non-traumatic altered consciousness levels.[8] In acute stroke, assessing the level of consciousness is critical for therapeutic care and as a prognostic indicator. The accuracy of the GCS as a measure of consciousness level may be harmed due to localized motor, speech, or language abnormalities caused by stroke. The FUNC score is a reliable clinical assessment tool for identifying individuals with ICH who will achieve functional independence, which can help with clinical decision-making and patient selection for clinical trials. It is calculated using the GCS score, the ICH volume, the ICH location, the patient's age, and the presence of pre-ICH cognitive impairment.[9] The scale ran from 0 to 11, with 11 indicating a high probability of functional independence. Patients with a score of 4 were unlikely to achieve functional independence after 90 days. This study aimed to evaluate the clinical profile of patients admitted to RGGGH with Spontaneous Intracerebral Hemorrhage and the utility of the FUNC SCORE in predicting functional independence.

MATERIALS AND METHODS

This single-centred longitudinal follow-up study was conducted at the Institute of Internal Medicine, Rajiv Gandhi Government General Hospital in Chennai for 6 Months from May 2021 to October 2021 on 100 patients admitted with spontaneous intracerebral haemorrhage as confirmed by computed tomography of the brain on a medical ward. All the patients were explained the study design at the time of enrollment, and detailed consent regarding their willingness to participate was obtained. Ethical committee approval was obtained before the study started.

Inclusion Criteria

Age >12 years, male and female sex, admitted with spontaneous ICH, and patients who consent to participate in the study were included.

Exclusion Criteria

Age <12 years, patients with traumatic ICH, Hemorrhagic infarct, AVM and Aneurysmal ICH, primary IVH, excess anticoagulation [INR >3], blood dyscrasia, and who undergone surgical intervention were excluded.

On admission, a detailed history, physical and neurological examination, vitals, assessment of Glasgow coma score, CBC, Renal Function Tests, Liver function tests, coagulation profile, and non-contrast head CT scan were done in all patients. FUNC scoring was performed in the ER once CT brain reports were obtained and also looked for functional independence (Glasgow Outcome Scale & > OR = 4) at 90 days in the OPD review visit.

Statistical Analysis: Data are presented as percentages and the number of cases. Continuous variables were compared using the independent sample t-test and One-way ANOVA. Categorical data were analyzed with Pearson chi-square tests. Significance was defined by P values less than 0.05 using a two-tailed test. Data analysis was performed using IBM-SPSS version 21.0 (IBM-SPSS Science Inc., Chicago, IL).

RESULTS

Out of 100 patients, 75% of patients were males, 25% of patients were females. Twenty-one patients were aged below 40 years, 21 patients had aged between 41-50 years, 29 patients had aged between 51-60 years, 14 patients had age between 61-70 years, five patients had age between 70-79 years and ten patients had age greater than 80 years [Table 2].

27% of patients arrived at the hospital between 0-6 hours, 7% between 6-12 hours, 39% between 12-24 hours, 26% between 24-48 hours, and 1% arrived after two days.

Based on the clinical symptoms, 50% of patients had limb weakness, 4% had a loss of consciousness, 44% had both losses of consciousness and limb weakness, and 2% had a seizure and limb weakness. Twelve patients had noticed symptoms while awakening, 48 patients during rest, two at sleep and 38 at work. Thirty-four patients had NIHS scores between 11-15, 59 patients had between 16-22, and 7 patients had greater than 22. [Table 2].

Based on the Glasgow Coma Scale score, 71% of patients had a less than or equal to 8, and 29% had a score of greater than or equal to 9 [Figure 1].
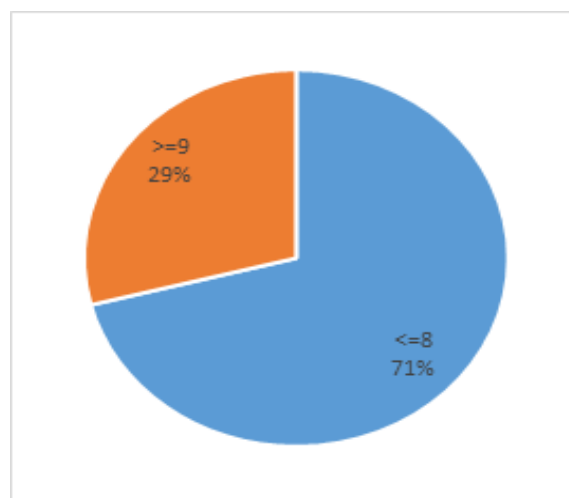

Figure 1: Distribution of GCS

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Based on the risk factors, 42% had hypertension, 3% had hypertension, diabetes and alcoholic habits, 1% had hypertension and old CVA, and 54% had hypertension and a habit of drinking alcohol. Based on the distribution of ICH location, 63% of patients had deep ICH, 35% had present with lobar ICH, and 2% had infratentorial ICH. Eighty-six patients had no precognitive impairment, and 14 patients had precognitive impairment. Sixty-three patients had no IVH-SAH Complications, and 37 patients had IVH-SAH complications. 58 patients ICH volume less than 30ml, 22 patients between 30-60ml, 20 patients had greater than 60ml.

The results of the Glasgow outcome scale score at 90 days showed that 54% of patients had died, 4% had a persistent vegetative state, 5% had a severe disability, 29% had a moderate disability, and 8% had a good recovery [Table 3].

The Correlation between age group and Glasgow outcome scale at 90 days showed that 100% of patients were observed in age groups of 70 to 79 years, where all five patients have died, followed by 71.4% between 61 to 70 years, 65.5% were 51 to 60 years, 28.6% were showed a maximum good recovery was observed in the age group of fewer than 40 years, and years 14.3%, were between the age group of 61 to 70 years. The gender group with GOS at 90 days found that 72% of female patients showed more deaths than 10.7% of males with good recovery [Table 4].

Symptoms with the Glasgow outcome scale at 90 days found that eight patients (16%) had good recovery with symptoms of only limb weakness. However, 38 patients (86.4%) died with symptoms of loss of consciousness and limb weakness [Table 5].

The GCS score with the Glasgow outcome scale at 90 days showed that 73.2% of patients had died in the Glasgow coma scale of less than 8, and 27.6% had shown good recovery with a score of more than 9. The NIHS score with the Glasgow outcome scale at 90 days showed that 47 patients had died with NIHS scores between 16-22, and 8 patients had good recovery with NIHS scores between 11-15 [Table 6]. The complication with the Glasgow outcome scale at 90 days found that 31 patients had died with nil good recovery in patients with IVH-SAH complications. No good recovery occurred in patients with ICH volume between 30-60ml and greater than 60ml. Twenty-two patients died with an ICH volume of less than 30ml.

The functional score with the Glasgow outcome scale at 90 days found that the mean values for death rate were 6.24, the persistent vegetative state was 6.50, the severe disability rate was 8, and the moderate disability rate was 9.31. The good recovery rate was found to be 10.38 [Figure 2].
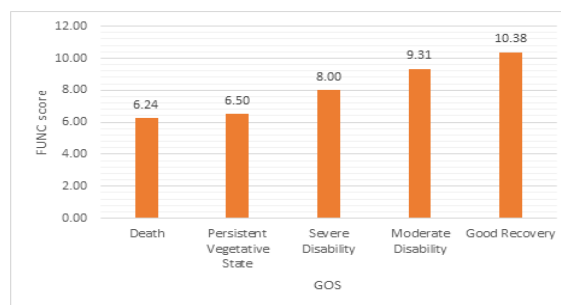
Figure 2: Distribution of GOS with FUNC score

Table 1: Determinants of FUNC score

Component		FUNC score points
ICH volume (cm^3)	<30	4
	30-60	2
	>60	0
Age (years)	<70	2
	70-79	1
	≥80	0
ICH location	Labor	2
	Deep	1
	Infratentorial	0
GCS score	≥9	2
	≤8	0
Pre-ICH cognitive impairment	No	1
	Yes	0
Total FUNC score		0-11

Table 2: Demographic data of the study

		Frequency	Percentage
Gender	Male	75	75
	Female	25	25
Age Group	< 40	21	21
	41- 50	21	21
	51- 60	29	29
	61- 70	14	14
	71- 79	5	5
	>80	10	10
Time of arrival	0-6	27	27
	6-12	7	7
	12-24	39	39

	24-48	26	26
	> 2 days	1	1
Symptoms	Limb weakness	50	50
	LOC	4	4
	LOC, limb weakness	44	44
	Seizure, limb Weakness	2	2
NIHSS	Nov-15	34	34
	16-22	59	59
	>22	7	7

Table 3: Glasgow outcome scale score at 90 days

		Frequency	Percentage
GOS at 90 Days	Death	54	54
	Persistent Vegetative State	4	4
	Severe Disability	5	5
	Moderate Disability	29	29
	Good Recovery	8	8

Table 4: Correlation between age group and gender between Glasgow outcome scale

Age Group	% Of Glasgow Outcome Scale At 90 Days					Total (%)	P-value
	Death	Persistent vegetative state	Severe disability	Moderate disability	Good recovery		
< 40	23.8	9.5	19	19	28.6	100	< 0.0001
41-50	23.8	9.5	4.8	61.9	0		
51-60	65.5	0	0	34.5	0		
61-70	71.4	0	0	14.3	14.3		
70-79	100	0	0	0	0		
>= 80	100	0	0	0	0		
Total	54	4	5	29	8		
GENDER							
Female	72	0	8	20	0		0.11
Male	48	5.3	4	32	10.7		

Table 5: Cross-tabulation of GOS with symptoms

Symptoms	% of Glasgow Outcome Scale at 90 days					Total (%) and P-value
	Death	Persistent vegetative state	Severe disability	Moderate disability	Good recovery	
Limb weakness	24	0	2	58	16	100, if the P-value is < 0.0001
LOC	100	0	0	0	100	
LOC, Limb weakness	86.4	4.5	9.1	0	0	
Seizure, Limb weakness	0	100	0	0	0	
Total	54	4	5	29	8	

Table 6: Cross-tabulation of GOS with GCS and NIHS

GOS SCORE	% Of Glasgow Outcome Scale At 90 Days					Total (%) and P-value
	Death	Persistent vegetative state	Severe disability	Moderate disability	Good recovery	
< 8	73.2	5.6	7.0	14.1	0	100, if the P-value is <0.0001
> 9	6.9	0	0	65.5	27.6	
Total	54	4	5	29	8	
NIHS SCORE						
11-15	0	0	0	76.5%	23.5%	
16-22	79.7	6.8	8.5	5.1	0	
>22	100	0	0	0	0	
Total	54	4	5	29	8	

DISCUSSION

Intracerebral haemorrhage (ICH) is the most dangerous and distressing stroke subtype. This study was conducted in the Institute of Internal Medicine, RGGGH, among 100 patients. The outcome in patients with primary intracranial bleeding could be predicted using a measure like the FUNC score, and the Glasgow outcome scale assessed their functional outcome at 90 days of FUNC score. In our study, the maximum number of patients observed with death was 54 (54%), followed by moderate disability in 29 (29%) and severe disability in 5 (5%) patients. Only 8 (8%) patients recovered well in the current study. Intracerebral haemorrhage (ICRH) is rare before age 40 and increases with age increase. In our study, of all 100 patients, only 21% were below 45 years, suggesting that advancing age increases the risk of ICH, and most were found to be male, 75 (75%), and only 25 (25%) reported female. The male-to-female ratio was 3:1. The observation of the Glasgow outcome scale at 90 days concerning both genders was recorded; it was observed that female patients showed more deaths, 18 (72%) in comparison to

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males, whereas males reported 8 (10.7%) patients with good recovery. A similar association was reported in a study by Sacco et al.[10]

Based on the time of arrival, (39%) were found with 12 to 24 hours of arrival time, followed by 24 to 48 hours 26 (26%), and only one patient was reported with an arrival time of more than two days. In our present study, when the Glasgow outcome scale was evaluated against the time of arrival, it was found maximum death was observed with higher arrival times, i.e., more than two days with 100% death and 24 to 48 hours with 84.6 % death without any patients with good recovery- A similar association had been reported in a study by Aysenne et al.[11]

In our study, the symptoms of all patients were recorded. The Glasgow outcome scale at 90 days was correlated with symptoms experienced by all patients. A high death of 4 (100%) was reported with LOC alone symptoms, the most persistent vegetative state was observed with seizure and limb weakness symptoms 2 (100%), and severe disability was reported maximum with LOC and limb weakness 4 (9.1%). Moderate disability 29 (58%) and good recovery 8 (16%) were observed maximum with limb weakness symptoms.

In our study, When the GCS score was evaluated against the Glasgow outcome scale at 90 days, it was observed that a GCS score of less than showed more deaths, 52 (73.2%) with nil good recovery, whereas a GCS score of more than 9 reported with only 2 (6.9%) death and 8 (27.6%) patients with good recovery- A similar study report had done by Kodliwadmath et al.[12]

In our study, the NIHSS score could effectively correlate with the Glasgow outcome scale at 90 days for functional outcome prediction of ICH patients. It showed that with an increase in NIHSS score, there is an increase in death reported with a decrease in good recovery. Rost et al. reported that when the ICH locations were correlated with the Glasgow outcome scale at 90 days in the present study, it was found that infratentorial location was observed with the highest death 2 (100%) followed by lobar location and only the deep ICH location observed a good recovery 8 (12.7%).[13] Finally, the Glasgow outcome scale at 90 days was compared with the mean FUNC score for all patients. There was a strong correlation between the two. As the FUNC score increased, there was a strong tendency towards better outcomes.

CONCLUSION

This study concluded that the FUNC score could be a reliable tool in predicting the outcome of patients presenting with primary intracerebral haemorrhage. Using this scale makes it possible to avoid discontinuing treatment for patients expected to have a positive result, which may decrease mortality and aid in early mobilization. Although many indicators have a role in determining the fate of patients with ICH, the patient's GCS and the volume of ICH remain the two most crucial. Age, length of presentation, pre-ICH cognitive impairment, and ICH location are other characteristics helpful in predicting the prognosis. Early detection of hypertension, good antihypertensive drug administration, and good blood pressure management may avert such a disaster and limit re-bleeding episodes in individuals with ICH.

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