Section: General Medicine

Original Research Article

STUDY ON RISK STRATIFICATION AND PREDICTION OF 30-DAY MORTALITY RATE OF ICH PATIENTS USING ICH SCORE

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Abstract

Background: Cerebrovascular accidents, including intracerebral haemorrhage (ICH), are a major cause of morbidity and mortality worldwide. Despite the progress in the Indian economy, healthcare delivery remains limited. This study aimed to assess patients with intracerebral haemorrhage using the ICH score, substantiating the ease and rapidity of this assessment tool, employing it for risk stratification among patients, and evaluating outcomes regarding the 30-day mortality rate. **Material & Methods:** The study was conducted at Tirunelveli Medical College, Department of General Medicine, on 50 patients with intracerebral haemorrhage from June 2015 to May 2016. A short history of Epidemiological data, such as age, sex, area of residence, and important risk factors, such as hypertension and diabetes, with a history of stroke were noted. The total ICH score calculation used the Glasgow coma scale, categorised by CT location, intraventricular bleeding, haematoma volume, and age. **Results:** The predominant risk factors for cardiovascular morbidity were hypertension (43 patients) and diabetes (18 patients). There was a significant difference in GCS scores and ICH volumes between outcomes ($p<0.001$). There were no significant differences in IVH, site, or age between the outcomes ($p>0.05$). The ICH score correlated well with the outcome of death. The correlation of the ICH score with the location of the bleeding did not statistically correlate well with the ICH score. **Conclusion:** In conclusion, the ICH scoring system scale needs to be used for risk stratification of patients to assess treatment risks and benefits and to communicate effectively and precisely to provide families with information about disease and outcomes.

INTRODUCTION

Cerebrovascular accidents, commonly known as "Strokes", are one of the most common causes of morbidity and mortality in the world. It unassumingly constitutes one of the major challenges in terms of physical, mental, and economic aspects for the occupational and neurorehabilitation programmers of stroke patients. Stroke due to intracerebral haemorrhage (ICH) is a common cause only next to ischaemia due to embolism and thrombosis among the pathologies of stroke.[1,2] Non-traumatic intracerebral haemorrhage accounts for 10% to 15% of all strokes.[3] ICH appears to be more common in eastern countries of the world, accounting for up to 30% of strokes, with a mortality rate nearly reaching 40% to 50%.[4-6]

Although the Indian economy is progressing from a blue-collar economy to a white-collar, highly industrialised one, the pace of healthcare protocols, policies, and systems to the general public has largely been limited to private healthcare providers.[7] The burden on the public healthcare system in India is very demanding considering our sheer population, which is more of a middle- and low-income group. This holds not only in the treatment aspects of diseases but also in the assessment and outcome definition of major diseases, such as cerebrovascular accidents and, more importantly, intracerebral bleeding.

With the increased incidence of risk factors for non-traumatic intracerebral bleeds, such as hypertension, diabetes, stress, dyslipidaemia, and antiplatelet drug usage, it is imperative to study the risk assessment, course, and prognosis of these patients.[8] It helps

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explain the gravity of both morbidity and mortality to the patient's relatives. This could help them make major decisions for treatment and cost-effective solutions offered by healthcare providers. In cases of non-traumatic intracerebral bleeds, the mental trauma to the self and family is more acute and demanding than traumatic bleeds, where the cause is obvious. This prospective study, akin to a few in this part of the country, was conducted in Tirunelveli Medical College Hospital, one of the leading public healthcare centres in South Tamil Nadu, which focuses mainly on risk assessment, placing the patient in defined risk categories and predicting outcomes in terms of mortality using ICH score which is easy to apply and provides rapid assessment of predicted outcomes with emphasis on mortality risk.

Aim

This study aimed to assess patients with intracerebral haemorrhage using the ICH score, substantiating the ease and rapidity of this assessment tool, employing it for risk stratification among patients, and evaluating outcomes regarding the 30-day mortality rate.

MATERIALS AND METHODS

The study was conducted at Tirunelveli Medical College, Department of General Medicine, on 50 patients with intracerebral haemorrhage from June 2015 to May 2016. The study received approval from the institutional ethics committee before its initiation.

Inclusion Criteria

This study included patients with non-traumatic ICH.

Exclusion Criteria

Traumatic intracerebral haemorrhage may coexist with other conditions, such as a previous ischaemic infarct exhibiting haemorrhagic transformation or metastatic tumours, contributing to a complex clinical presentation.

A short history, epidemiological data such as age, sex, area of residence, and important risk factors such as hypertension and diabetes with a history of stroke, which could affect morbidity and mortality rates, were accounted for and noted. Then, the patient's general and systemic examinations were performed, and emphasis was laid on calculating the Glasgow coma scale with Eye, Motor and Verbal responses. The patients were followed up for a month if they were discharged by phone to determine their status at home.

Patients were evaluated with routine blood tests as done for other patients, such as complete haemogram, renal function tests, Electrocardiogram, Ultrasound abdomen, and Chest X-rays, to rule out patients with exclusion criteria. A CT scan was performed to determine the volume of the bleeding inside the brain, intraventricular extension, and location of the bleeding. A radiologist's help was obtained when the interpretation of the volume calculation was difficult.

The total ICH score calculation used the Glasgow coma scale, categorised by CT location, intraventricular bleeding, haematoma volume, and age. The scores range from 0 to 6, scoring 13-15, 5-12, and 3-4. The score was based on supratentorial, infratentorial, intraventricular bleeding, haematoma volume, and age.

RESULTS

This study included 50 patients (31 men (62%) and 19 women (38%)). The minimum age for males was 32 years, and for females, it was 40 years, with maximum ages reaching 82 for males and 85 for females. The mean age for males was 54.4, females was 60.89, and the standard deviation was higher for females at 13.16 compared to 12.11 for males. Additionally, 40% of the patients were from urban areas, whereas 60% were from rural areas. [Table 1]

Among the 50 patients, the most common presentations were acute-onset hemiplegia in 22, loss of consciousness in 25, and a few with seizures and chemosensory loss. The predominant risk factors for cardiovascular morbidity were hypertension and diabetes, with 43 and 18 patients, respectively. [Table 2]

Patients with a Glasgow Coma Scale (GCS) score of 0 had a death rate of 1 out of 25, those with a GCS score of 1 had 3 out of 8 deaths, and all 17 patients with a GCS score of 3 died. There was a significant difference in the GCS scores between the outcomes ($p<0.0001$). Among the 50 patients, 24 with intraventricular extension had 13 deaths, whereas 26 without intraventricular extension died. Patients with an intracerebral haemorrhage (ICH) volume <30 cc had six deaths out of 28, and those with > 30 cc had 15 deaths out of 22. There was a significant difference in ICH volume between the outcomes ($p=0.001$).

Mortality rates varied among different types of haemorrhages, with 11 out of 26 putaminal bleeds, 6 out of 9 pontine haemorrhages, 3 out of 8 lobar haemorrhages, and 1 out of 1 cerebellar bleed resulting in death. Among patients aged 80 years and above, three out of five died, while 18 out of 45 patients below 80 years succumbed to death due to ICH. There were no significant differences in IVH, site, or age between the outcomes ($p>0.05$). [Table 3]

Of the 50 patients, 29 were in the low-risk group, of which three died, 2 of the eight patients in the intermediate-risk group died, and 12 of the 13 patients in the high-risk category died. [Table 4]

The ICH score correlated well with the outcome of death. The correlation of the ICH score with the location of the bleeding did not statistically correlate well with the ICH score. Hence, the ICH score is a good prognostic scale for the risk assessment and prediction of death rates in ICH. [Table 5]

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Table 1: Demographic data of the study population

		Mean±std/Percentage
Age	Male	54.4±12.11
	Female	60.89±13.16
Sex	Male (31)	62
	Female (19)	38
Area	Urban	40
	Rural	60

Table 2: Presentation and main risk factors of the study population

		Absent	Present
Presentation	Hemiplegia	28	22
	Loss of consciousness	25	25
	Others (sensory loss, seizures)	47	3
Main risk factors	Diabetes	32	18
	Hypertension	7	43

Table 3: Comparison of GCS, IVH, ICH, site and age between outcome

		Alive	Expired	P value
GCS scale in ICH score	0	24	1	<0.0001
	1	5	3	
	2	0	17	
IVH	IVH absent	18	8	0.094
	IVH present	11	13	
ICH volume	<30	22	6	0.001
	30 & above	7	15	
Site	Putamen	15	11	0.291
	Pons	3	6	
	Lobe	5	3	
	Thalamus	3	0	
	Cerebellum	3	1	
Age	<80	27	18	0.39
	≥80	2	3	

Table 4: Risk and ICH score of the study population

		Alive	Death
Risk	Low risk	26	3
	Intermediate risk	2	6
	High risk	1	12
ICH score	0	10	0
	1	11	1
	2	5	2
	3	2	6
	4	1	8
	5	0	4

Table 5: Correlational test of the study population

ICH score	Correlation coefficient	P value
Outcome	0.669	<0.0001
Location	0.099	0.435

DISCUSSION

In this study, the initial age of presentation was 32 years in males and 40 years in females, while in the older age group, 82 years was the oldest among males and 85 years among females. The mean age group among males was 54 years, while that of females was approximately 61 years. In another study conducted by Namani et al. in India, the mean age was 51.[9] This shows that the prevalence of ICH is noticed in younger age groups, with the initial age affliction nearly in the fourth decade in this study. The sex preponderance for males continues to be present, as shown in other studies. The incidence of ICH was higher among patients from rural areas encompassing panchayat unions (around 60%), while 40% were from urban areas such as corporations and municipalities, showing the association of risk factors and compliance with those treatments of risk factors, even with many health programmers implemented by the government. Of the 50 patients, 25 had a loss of consciousness, and 22 had motor system involvement, such as hemiplegia or hemiparesis. In contrast, the remaining patients had hemisensory loss (mostly thalamic bleeds), and one patient presented with seizures. Most conscious patients with intraventricular extension complained of headaches.

The risk factors considered in this study were hypertension and diabetes mellitus, which continue to be the most prevalent factors in the general

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population. They continued to predominate, with 43 of 50 patients suffering from hypertension (86%), while 18 of 50 patients (36%) had diabetes. Of the 50 patients, 16 had both the diseases. Smajlovic et al., in their study, found that most ICH patients had hypertension, and 14% had diabetes.[10] Namani et al. study found 72% had hypertension association, 12% had diabetes, and 10% had both.[9]

In our study, 25 out of 50 patients presented with a Glasgow coma scale (GCS) of 13-15, scoring 1. Eight of them presented with a GCS of 5-12 with a score of 1, while 17 presented with a GCS of 3-4 with a score of 2. The mortality rate in the subgroup of patients with GCS scores on the ICH scaling system was 100%, with all 17 patients succumbing to death. In the subgroup with a score of 1, three of the eight patients died, with a mortality rate of 38%. Only one of the 25 patients with a score of 0 died. Hence, the GCS seems to be an important prognostic scale for assessing patients with ICH. In a study by Chamoun et al., the patients with a GCS score of 2 had nearly 100% mortality, while those with a score of 1 had nearly a mortality of 50%.[11] Namani et al. and Rockswold et al. also showed near centum mortality in patients with a GCS score of 2. The 'p' value of the association was 0.0001, showing that the values are statistically highly significant and proving the value of GCS being considered an independent and compelling predictor of prognosis and outcomes.[9,12]

In this study, intraventricular extension was present in 24 of the 50 patients, and 13 died. However, only eight of the 26 patients who had no intraventricular extension died, with a mortality rate of nearly 31%, showing that this extension of bleeding into the ventricles is associated with poor outcomes. Hemphill et al. showed that 55 of 84 patients with IVH had succumbed to death.13 In this study, there was no special preference for the location of hematomas to extend into the ventricles, and these findings correlate well with the findings of a study by Togha et al.[14] The ICH volume plays an important role in predicting adverse outcomes. This study showed that 15 of the 22 patients who had a haematoma volume of 30 ml and above succumbed to death (mortality risk of 68%). In comparison, only 6 of the 28 patients (mortality risk of 21%) with less than 30 ml of haematoma volume had poorer outcomes. The 'p' value is highly significant; hence, statistically, the importance of ICH volume is also proven. Namani et al. showed that the volume of hematomas of more than 20 ml had a death rate of 80 to 100%.[9]

The age as an individual scale was less predictable, with two out of five patients aged above 80 years and above dying, while 18 out of 45 patients died. Age is an independent predictor in studies by Hemphill et al., while it has been shown to have less predictive value in studies conducted by Juvela et al. and Qureshi et al.[13,15,16] The haematoma location was restricted to five sites in this study for statistical analysis. These were the putamen, pons, cerebral lobes, thalamus, and cerebellum. Of the 50 patients, putaminal haemorrhages were common in around 26 patients (52%), pontine haematoma in 9 patients (18%), followed by eight patients (16%) with lobar haemorrhages (mostly in parietal regions), 4 in cerebellar hemispheres (8%) and three patients (6%) in thalamic regions.

For poor outcomes, 11 out of 26 (42%) putaminal haemorrhage patients died, 6 out of 9 (67%) pontine haemorrhage patients died, 3 out of 8 (38%) patients died, and 1 out of 4 cerebellar haematomas (25%) died. None of the patients with thalamic bleeding died during this study. Namani et al. study also showed site predilection for basal ganglia and mortality rates were high in those patients with brainstem, especially pontine haemorrhages.9 Smajlovi et al. and Hu et al. also showed that mortality rates were high in the brainstem and cerebellar haemorrhages.[10,17]

The total ICH score had a better predictive nature than the individual scores, and the results of this study correlated well with those of other studies. Of the 50 patients, 10 had a score of 0, 12 had a score of 1, 7 had a score of 2, 8 had a score of 3, 9 had a score of 4, and 4 had a score of 5 or above. The mortality rates among ICH score patients were 0% with a score of 0, 8% with a score of 1, 29% with a score of 2, 75% with a score of 3, 89% with a score of 4, and 100% with a score of ≥ 5. Hemphill et al. Namani et al. also showed that mortality rates were predicted better with ICH score, similar to our study.[13,9] The initial assessment and CT evaluation time was mostly within an hour, reflecting the ease and rapid assessment of patients' outcomes in the intensive medical care department. Of the individual scales, the GCS score at the time of initial presentation and ICH volume of the haematoma had significant statistical correlations with the outcomes.

CONCLUSION

In conclusion, the ICH scoring system scale needs to be used for risk stratification of patients to assess treatment risks and benefits and to communicate effectively and precisely to provide families with information about disease and outcomes, even though it could lead to self–fulfilling prophecies at times. It could help standardise medical care and open horizons for developing newer treatment protocols for a disease without satisfying treatment, even in modern medicine.

Limitations

The study population of 50 was small, and aggressive surgical interventions were not considered, as previous studies have shown no mortality benefits.

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