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Original Research Article

PREDICTIVE VALUE OF THE INTRACEREBRAL HEMORRHAGE (ICH) SCORE FOR MORTALITY IN HEMORRHAGIC STROKE PATIENTS

QuratUlAin[1], Sanam Chachar[2], Afreen Zubair[3], Shahnaz[4], Muhammad Asif[5], Deepa Kumari[6]

[1]*Consultant Neurologist, Tabba Heart Institute Karachi, Pakistan.*
[2]*Senior Registrar, Department of Neurology, Al-Tibri Medical College, Karachi, Pakistan*
[3]*Consultant Neurologist, Saifee Trust Hospital, Karachi, Pakistan*
[4]*Associate Professor, Department of Neurology, Jinnah Sindh Medical University, Karachi, Pakistan.*
[5]*Assistant Professor, Department of Neurology, Khairpur Medical College, Khairpur, Pakistan.*
[6]*Consultant Neurologist, Karachi Adventist Hospital, Karachi, Pakistan*

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Corresponding Author:
Dr. QuratUlAin,
Consultant Neurologist, Tabba Heart Institute Karachi, Pakistan.
Email: quratulainpanhwar@ymail.com

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ABSTRACT

Background: Hemorrhagic stroke is linked with a high risk of death and chronic disability. Around 10% to 15% of strokes come from intracerebral hemorrhage (ICH), which has an even greater risk of dying compared to ischemic stroke. The ICH Score is a scoring system used in hospitals to estimate the 30-day risk of death in patients with intracerebral hemorrhage. The objective is to evaluate the predictive value of the ICH Score for 30-day mortality in patients with hemorrhagic stroke. This study was conducted at Tabba Heart Institute Karachi from May 2025 to May 2026.

Materials and Methods: Ninety-five patients with confirmed intracerebral hemorrhage were enrolled using consecutive sampling. Data were collected using a structured proforma according to predefined inclusion and exclusion criteria. The ICH Score was calculated for each patient based on clinical and radiological findings. Patients were followed for 30 days after admission, and mortality was recorded. Data were analyzed using SPSS version 20.

Results: Among the 95 patients, 60 (63.2%) were male and 35 (36.8%) were female, with a mean age of 40.0 years. Thirty-four patients (35.8%) had an ICH Score of ≥3. Of these, 27 (79.4%) died within 30 days. Among patients with an ICH Score of ≥3, mortality was observed in 17 (77.3%) males and 10 (83.3%) females. Overall 30-day mortality was 27/95 (28.4%).

Conclusion: A high ICH Score was associated with a markedly increased risk of 30-day mortality. In this study, 79.4% of patients with an ICH Score of ≥3 died within 30 days. The findings suggest that the ICH Score may be a useful bedside tool for identifying patients at high risk of mortality following intracerebral hemorrhage.

Keywords: Intracerebral Hemorrhage; ICH Score; Glasgow Coma Scale; Stroke Mortality; 30-Day Mortality.

INTRODUCTION

Stroke is a major neurological disorder caused by an interruption of cerebral blood flow, resulting in focal neurological dysfunction. It is broadly classified into ischemic and hemorrhagic stroke. Hemorrhagic stroke includes bleeding within the brain parenchyma, such as intracerebral hemorrhage (ICH), as well as bleeding into the surrounding intracranial spaces, including subarachnoid, subdural, and extradural haemorrhage.[1]

Stroke continues to be one of the most common causes of death and chronic disability across the globe. Every year, about 15 million people suffer from stroke, of whom almost one-third die and another one-third have to live with irreversible disability.[1,2] The incidence and distribution of stroke subtypes vary according to geographic region and population characteristics. Asian populations have been reported to have a relatively higher proportion of intracerebral hemorrhage and deep

cerebral hematomas compared with Western populations.[3,4]

Intracerebral hemorrhage accounts for approximately 10%–15% of all strokes but is associated with substantially higher mortality than ischemic stroke.[5] Despite advances in the management of ischemic stroke and subarachnoid hemorrhage, effective treatment options for spontaneous ICH remain limited.[6] Surgical evacuation may be appropriate in selected patients, but its role and effectiveness vary according to hematoma location, size, clinical condition, and other patient-related factors. Consequently, early identification of patients at high risk of mortality is essential for clinical decision-making, prognostic assessment, and appropriate allocation of healthcare resources.[7]

Several clinical and radiological factors have been associated with poor outcomes following ICH. These include a low Glasgow Coma Scale (GCS) score, larger hematoma volume, intraventricular hemorrhage, infratentorial hematoma location, advanced age, and hematoma expansion after hospital admission. Reported mortality following ICH is approximately 40%–45%, although outcomes vary considerably according to the severity and characteristics of the haemorrhage.[8–13]

Several prognostic scoring systems have been developed to estimate mortality and functional outcome following intracerebral hemorrhage. Out of all the different tools available, ICH Score is the easiest and most popular tool used at the bedside. It comprises five easy to obtain clinical and radiological factors: GCS score on admission, age ≥80 years, ICH volume ≥30 mL, presence of intraventricular hemorrhage and infratentorial origin of haemorrhage.[5] The score can be calculated rapidly using information available at the time of initial assessment and has been investigated as a predictor of 30-day mortality.

Accurate early prognostication in patients with ICH is important because it may assist clinicians in identifying patients at increased risk of death and in guiding monitoring and treatment decisions. Therefore, this study was conducted to evaluate the predictive value of the ICH Score for 30-day mortality among patients presenting with intracerebral hemorrhage.

MATERIALS AND METHODS

Every adult admitted with a clinical picture of stroke who was suspected of harboring intracerebral haemorrhage was assessed for eligibility. Written consent was obtained from each patient, or in cases when a patient was incapable of consenting, from their designated guardian. The data was collected through the use of a structured form prepared before the recruitment process.

Eligible patients were adults suffering from the intracerebral haemorrhage. Eligible patients were adults presenting with acute focal neurological deficits lasting more than 24 hours, irrespective of consciousness level (ranging from fully alert [GCS 15] to comatose), with parenchymal hemorrhage confirmed on initial non-contrast brain CT scan (ICD-10 I61.x).

Patients were ineligible if they were younger than 14 years of age. We excluded secondary causes of intracerebral hemorrhage, including trauma, hemorrhagic conversion of arterial ischemic stroke, ruptured cerebral aneurysm or arteriovenous malformation, intracranial tumor, and hemorrhagic venous infarction secondary to cerebral venous sinus thrombosis (CVST) confirmed on CT venography (CTV) or MR venography (MRV). Meningoencephalitis cases were also excluded after clinical and radiological review.

Ninety-five patients were enrolled using a consecutive sampling approach. SPSS version 20 was used for statistical processing. Descriptive statistics were generated for continuous variables: age, random blood sugar, ICH score, mean arterial pressure, and systolic blood pressure. Counts and proportions were computed for categorical data including sex, GCS band, hematoma volume class, presence of intraventricular extension, infratentorial location, age group, and 30-day mortality. Subgroup analysis was stratified by age and sex.

Additional baseline data collected for each patient included presenting blood pressure, pulse pressure, mean arterial pressure, and GCS score. Hematoma volume was measured on the initial CT scan using the ABC/2 formula. Under this formula, the first dimension is the widest span of the largest bleed slice, the second is the perpendicular width on that same slice, and the third is the total number of involved axial slices multiplied by slice thickness. The ICH score was also noted based on whether intraventricular extension was present or absent. Follow-up continued for 30 days post-admission, with death during this period constituting the primary study endpoint.

RESULTS

A total of 95 patients were included in the study. The mean age was 40.0 ± 7.2 years. The demographic and clinical characteristics of the patients are presented in [Tables1–5].

Table 1: Age distribution of patients (n=95)

Parameter	Value
Mean age (years)	40.0
Standard deviation	7.2
Minimum age (years)	26
Maximum age (years)	*52*

Sixty patients (63.2%) were male, while 35 (36.8%) were female. Overall, 89 patients (93.7%) were younger than 80 years, while 6 (6.3%) were aged 80 years or older.

The mean random blood sugar (RBS) was 152.4 ± 58.6 mg/dL, with values ranging from 88 to 310 mg/dL. The mean mean arterial pressure (MAP) was 131.2 ± 25.8 mmHg, ranging from 90 to 168 mmHg. The mean systolic blood pressure (SBP) was 168.5 ± 23.4 mmHg, with values ranging from 138 to 215 mmHg.

Table 2: Random blood sugar (n=95)

Parameter	Value
Mean (mg/dL)	152.4
Standard deviation	58.6
Minimum (mg/dL)	88
Maximum (mg/dL)	310

The mean ICH Score among the 34 patients with an ICH Score ≥3 was 4.3 ± 0.81, with scores ranging from 3 to 5.

Table 3: ICH Score among patients with ICH Score ≥3 (n=34)

Parameter	Value
Mean	4.3
Standard deviation	0.81
Minimum	3
Maximum	5

Table 4: Mean arterial pressure (n=95)

Parameter	Value
Mean (mmHg)	131.2
Standard deviation	25.8
Minimum (mmHg)	90
Maximum (mmHg)	168

Table 5: Systolic blood pressure (n=95)

Parameter	Value
Mean (mmHg)	168.5
Standard deviation	23.4
Minimum (mmHg)	138
Maximum (mmHg)	215

The Glasgow Coma Scale (GCS) score was between 3 and 4 in 76 patients (80.0%), while 19 patients (20.0%) had GCS scores between 5 and 12.

Hematoma volume was ≥30 cm^3 in 49 patients (51.6%). Intraventricular hemorrhage was present in 61 patients (64.2%), while an infratentorial hemorrhage was documented in 11 patients (11.6%). An ICH Score of ≥3 was observed in 34 patients (35.8%), whereas 61 patients (64.2%) had an ICH Score <3.

Among the 34 patients with an ICH Score ≥3, 27 (79.4%) died within 30 days, while 7 (20.6%) survived.

Age-specific mortality among patients with an ICH Score ≥3 is presented in Table 6. Among the 18 patients younger than 80 years, 12 (66.7%) died and 6 (33.3%) survived. Among the 16 patients aged 80 years or older, 15 (93.8%) died and 1 (6.3%) survived.

Table 6: Age distribution and 30-day mortality among patients with ICH Score ≥3 (n=34)

Age group	Mortality: Yes	Mortality: No	Total
<80 years	12 (66.7%)	6 (33.3%)	18 (100%)
≥80 years	15 (93.8%)	1 (6.3%)	16 (100%)
Total	27 (79.4%)	7 (20.6%)	34 (100%)

Sex-specific mortality among patients with an ICH Score ≥3 is presented in Table 7. Of the 22 male patients in this subgroup, 17 (77.3%) died and 5 (22.7%) survived. Among the 12 female patients, 10 (83.3%) died and 2 (16.7%) survived.

Table 7: Sex distribution and 30-day mortality among patients with ICH Score ≥3 (n=34)

Sex	Mortality: Yes	Mortality: No	Total
Male	17 (77.3%)	5 (22.7%)	22 (100%)
Female	10 (83.3%)	2 (16.7%)	12 (100%)
Total	27 (79.4%)	7 (20.6%)	34 (100%)

DISCUSSION

Intracerebral haemorrhage (ICH) accounts for approximately 10%–15% of incident strokes but contributes disproportionately to stroke-related mortality. Reported 30-day case-fatality rates range from approximately 35% to 52%, with a substantial proportion of deaths occurring during the first 48 hours after onset.[14–16]

The mean age of participants in this research was determined to be 40.0 years. This is slightly less than the two similar studies whose means were reported to be 42.3 years and 41.8 years, respectively.[17,18] The differences in mean age might occur due to differences in the features of the groups studied, the referral system and the admission criteria in the hospitals.

A male predominance was observed in our study, with males comprising 63.2% of the cohort compared with 36.8% females. In contrast, other studies have reported more balanced sex distributions, with females accounting for 51.4% and 43.9% of their respective study populations.[17,18] The higher proportion of male patients in our study may reflect differences in the prevalence of vascular risk factors and demographic characteristics of the study population.

The mean random blood sugar and systolic blood pressure in our study were 152.4 mg/dL and 168.5 mmHg, respectively. These findings were comparable to those reported by another study, which documented a mean blood glucose level of 144.1 mg/dL and a mean systolic blood pressure of 173.8 mmHg.[17] The similarity in these clinical parameters suggests that hypertension and metabolic abnormalities were common features among patients with ICH in both study populations.

Among patients with an ICH Score of ≥3, the 30-day mortality rate in our study was 79.4%. This was considerably higher than the 37.8% mortality reported in a previous study.[17] The difference may be related to variations in patient characteristics, disease severity, sample size, and referral patterns. As the present study was conducted in a tertiary-care setting, it is possible that a greater proportion of patients had severe disease at presentation.

Previous studies have demonstrated a strong association between increasing ICH Score and mortality, with higher scores corresponding to progressively poorer outcomes.[18,19] The original derivation study of the ICH Score reported increasing 30-day mortality with increasing score, with mortality rates of approximately 13%, 26%, 72%, and 97% for scores of 1 through 4, respectively, while no patient with a score of 5 survived.[5] The high mortality observed among patients with an ICH Score ≥3 in our study is consistent with the established relationship between higher ICH Scores and poor outcome.

The ICH Score has several practical advantages. It is based on readily available clinical and radiological parameters and can be calculated rapidly at the time of initial assessment. The score incorporates the Glasgow Coma Scale, age, hematoma volume, intraventricular hemorrhage, and infratentorial location. Its simplicity makes it particularly useful in emergency and resource-limited settings, where rapid prognostic assessment may be required.

The present study has some limitations. The sample size was relatively small, and the study was conducted at a single centre, which may limit the generalizability of the findings. In addition, the analysis primarily assessed mortality among patients with an ICH Score ≥3. Conventional methods to assess predictive performance including sensitivity, specificity, positive predictive value, negative predictive value, and area under the receiver operating characteristic curve were not mentioned. In this regard, future studies with larger sample size and quantitative assessment of diagnostic characteristics need to be conducted.

CONCLUSION

Thirty-day mortality in the study population was 28.4%. Among patients with an ICH Score of ≥3, 79.4% died within 30 days. Higher ICH Scores were therefore associated with a substantially increased risk of mortality. According to our observations, the ICH Score possesses the qualities of a straightforward yet potentially effective tool for bedside risk assessment in patients suffering from intracerebral hemorrhage. Calculating the score as part of standard practice at the time of admission can help medical professionals establish forecasts, monitor patients, and liaise with their families regarding patients. Larger prospective studies are recommended to further evaluate its predictive accuracy and generalizability.

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