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RESEARCH PAPER

Spontaneous intracerebral haemorrhage: an observational study on its risk factors, assessment of intracerebral haemorrhage score and its relation to outcome in a tertiary care hospital

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ABSTRACT

***Background and aims:** ICH, a subtype of stroke, is a devastating condition and is usually caused by the rupture of small penetrating arteries secondary to hypertensive changes or other vascular abnormalities. This paper aims to evaluate the risk factors associated with spontaneous ICH and assessment of ICH score as a prognostic score for determining short-term outcomes. **Methods:** This institution-based observational study was conducted on 140 patients attending the emergency and outpatient departments of Medicine and Neurology at Gauhati Medical College and Hospital. All patients had undergone NCCT brain, Complete hemogram, Coagulation profile, Renal function test, Fasting lipid profile, Thyroid profile, Glycosylated Haemoglobin, FBS, and PPBS. ECG and MRI brain, including MRA and MRV, were also done, if necessary. **Results:** The study showed that 72.85% of the patients had hypertension,13.57% had diabetes mellitus,10% had chronic kidney disease, and 5% patients had a history of usage of anticoagulants/ antiplatelets. The ICH score calculated showed that patients with an ICH score of 0-1 had a favourable outcome, as reflected by their low mortality percentage. In contrast, 80 % of patients with an ICH score of 4 and 100 % of patients with an ICH score of 5 died, which showed that the percentage of mortality increased with increasing ICH score. There was no patient with an ICH score of 6. **Conclusion:** Systemic hypertension was the most common risk factor among patients with spontaneous intracerebral haemorrhage, followed by diabetes mellitus, chronic kidney disease and use of anticoagulants or antiplatelets, and ICH score seemed to predict patients with spontaneous intracerebral bleeding effectively. A low ICH score was compatible with a good outcome, whereas a high one predicted more mortality*

***Keywords:** Systemic hypertension; diabetes mellitus; chronic kidney disease; anti-coagulants; antiplatelets*

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INTRODUCTION

A stroke, or cerebrovascular accident, is defined as an abrupt onset of a neurological deficit that is attributable to a focal vascular cause.[1] Intracerebral haemorrhage (ICH), a subtype of stroke, is a devastating condition whereby a hematoma is formed within the brain parenchyma with or without blood extension into the ventricles. Non-traumatic ICH comprises 10-15%

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of all strokes and is associated with high morbidity and mortality.[2]

Non-traumatic intracerebral haemorrhage can be divided into primary and secondary, where primary bleeds account for 85% of all ICH and are related to chronic hypertension or degenerative changes in cerebral arteries.[3] Secondary haemorrhage is associated with bleeding diathesis (iatrogenic, congenital, acquired), vascular malformations, neoplasms, hemorrhagic conversion of an ischaemic stroke, drug abuse and cerebral amyloid angiopathy.[4]

A primary ICH diagnosis is often one of exclusion where no other pathological or structural cause is found and is supported by a history of chronic hypertension, increased age and location of the clot. The putamen and adjacent internal capsule, basal ganglia, thalamus, cerebellum and pons are the most frequently affected areas by these hematomas, which account for almost 60% of main bleeds.[2]

Studies have identified certain risk factors in the population suffering from ICHs, hypothesizing both modifiable and non-modifiable risk factors. The latter include non-white ethnicity, older age, familial apolipoprotein syndromes, cerebral amyloid angiopathy and being male.[5] Uncontrolled or untreated hypertension is a modifiable risk factor that increases the risk of ICH by two in the ageing population. Other adjustable risk factors include diabetes mellitus, cigarette smoking, excessive alcohol consumption, decreased low-density lipoprotein cholesterol, low triglycerides, chronic kidney disease, use of anticoagulants and antiplatelets and abuse of sympathomimetic drugs such as heroin, cocaine, amphetamine and ephedrine.[3]

To make treatment decisions and be able to determine a prognosis, it is essential to know which factors predict outcome. Several prediction models have been developed to date; the most widely used is the ICH score.[6] The intracerebral haemorrhage (ICH) score is a commonly used prognostic model for 30-day mortality in ICH, based on five independent predictors (ICH volume, location, Glasgow Coma Scale, age and intraventricular extension). The ICH score (0–6) was calculated as described by Hemphill et al.[6] One point was given for age >80 years, one point for infratentorial origin, one point for ICH volume >30 ml, one point for intraventricular extension of ICH, one point for a GCS of 5–12, and two points for a GCS of 3–4.

Awareness of the disease, knowledge of the spectrum of risk factors and calculation of ICH score as a prognostic marker will help reduce morbidity and mortality associated with the disease. Though many studies have been reported from India and abroad, there is a shortage of such studies in this region. So, this study has been undertaken to evaluate the risk factors and assess the ICH score as a prognostic marker in patients with spontaneous intracerebral haemorrhage in a tertiary care hospital.

MATERIALS AND METHODS

This institution-based observational study was conducted from Jul 1 2020 to Jun 31 2021. It included patients of spontaneous intracerebral haemorrhage presenting in the emergency and outpatient departments of Medicine and Neurology at Gauhati Medical College and Hospital (GMCH), Assam.

Inclusion Criteria: Patients over 18 years old presenting with spontaneous ICH were included in the study.

Exclusion Criteria:

- Traumatic ICH
- Subarachnoid hemorrhage and subdural hemorrhage
- Haemorrhage secondary to brain tumours, to the hemorrhagic transformation of cerebral infarct, or aneurysmal or vascular malformation rupture
- Known history of hemorrhagic disorders
- Patients with ages below 18 years of age and those not willing to give consent

All patients who fulfilled the inclusion criteria of the study underwent a thorough clinical and neurological examination and had undergone tests like complete hemogram, coagulation profile, renal function

tests, liver function tests, fasting lipid profile, thyroid profile, serum electrolytes, glycosylated haemoglobin, fasting blood sugar, post-prandial blood sugar, ECG, NCCT brain and MRI brain including MRA and MRV, if necessary. Prognostic factors were studied, and the outcome was assessed as short-term mortality during a hospital stay within a week. In every patient, the intracerebral haemorrhage score was calculated as devised by Hemphil et al.,[6] and its utility as a predictive tool was evaluated.

Table 1 The ICH Score

CLINICAL OR IMAGING FACTOR	POINT SCORE
Age	
<80 years ≥80 years	0 1
Hematoma Volume	
<30 cc ≥30 cc	0 1
Intraventricular Hemorrhage Present	
No Yes	0 1
Infratentorial Origin of Hemorrhage	
No Yes	0 1
Glasgow Coma Scale Score	
13-15 5-12 3-4	0 1 2
Total Score	0-6 Sum of each category above

RESULTS

One hundred forty patients with spontaneous intracerebral haemorrhage were included, presenting to Gauhati Medical College and Hospital (GMCH) during the study period and fulfilling the inclusion criteria.

In this study, the maximum number of patients who presented with spontaneous ICH were in the age group 51-60 years (33.57%). The mean age of presentation was 56.45 years, as shown in **Table 2**.

Table 2 Age Distribution

Age (in years)	No of Patients (n=140)	Percentage (%)
18-30	5	3.57%
31-40	22	15.71%
41-50	22	15.71%
51-60	47	33.57%
61-70	28	20%
71-80	8	5.71%
>80	8	5.71%

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The majority, 56.66% of the patients were male, with a male-to-female ratio of 1.25:1. As seen in **Table 3**, out of the 140 patients, the most common risk factor was hypertension found in 102 (72.85%) patients, followed by diabetes in 19 patients, which accounted for 13.57%. CKD and usage of antiplatelet/anticoagulant drugs were found in 10% and 5% of patients, respectively.

Table 3 Risk Factor

Risk Factor	No of Patients (n=140)	Percentage (%)
HTN	102	72.85%
DM	19	13.57%
CKD	14	10%
Antiplatelet/ Anticoagulant	7	5%

The ICH score (0-6) was calculated based on five independent predictors (ICH volume, location, Glasgow Coma Scale, age, and intraventricular extension). Most patients had an ICH score of 3, which constituted 36 patients (25.71%), followed by an ICH score of 1 seen in 34 patients (24.28%). ICH score of 5 was seen in 4 patients (2.8%). Thirty patients had a score of 2 (21.42%), ten patients (7.1%) had an ICH score of 4 and 26 patients had a score of 0, which accounted for 18.57%. As shown in **Table 4,** all the patients with an ICH score of 0 survived, whereas the percentage of mortality increased with increasing ICH score, and there was 100 % mortality with an ICH score of 5.

Table 4 ICH score and outcome

ICH score	No of Patients (n=140)	Survived	Died	Percentage (%) of death
0	26	26	0	0
1	34	28	6	17.64%
2	30	20	10	33.33%
3	36	13	23	63.88%
4	10	2	8	80%
5	4	0	4	100%

DISCUSSION

In this study, the maximum number of patients who presented with spontaneous ICH were in the age group 51-60 years (33.57%). The mean age of presentation was 56.45 years, ranging from 18 to 90 years. This is like the study by Rincon et al.,[7] where most cases occurred in the 6th decade. Mapoure et al.,[8] found that out of 261 patients with spontaneous ICH, 55-65 years was the most frequent age group with 50.65%, like the present study.

Out of the 140 patients, the most common risk factor was hypertension found in 102 (72.85%) patients, followed by diabetes in 19 patients, which accounted for 13.57%. CKD and usage of antiplatelet/ anticoagulant drugs were found in 10% and 5% of patients, respectively. This study is like a retrospective cohort study consisting of 220 patients by Volbers et al.,[9] which reported hypertension as the most common risk factor followed by diabetes mellitus and renal insufficiency. These findings are also concordant with the study done by Wang et al.,[10] who also concluded that hypertension was the most common risk factor associated with spontaneous ICH (73%), followed by diabetes mellitus (20%). Increased incidence of HTN as a risk factor in ICH was also reported in another

study.[11] Various authors have reported systemic HTN as the most common risk factor, like our findings.

Diabetes mellitus was the second most common risk factor (13.57%) associated with spontaneous ICH in our study. This finding matches observations with other researchers,[11-14] where it was concluded that high admission blood glucose results from serious ICH.

Chronic kidney disease increased the risk for ICH in a population-based study, and the association remained significant even after adjusting for covariates.[15] CKD may be a marker of cerebrovascular small vessel disease, the primary mechanism of hypertensive ICH.[16] Platelet dysfunction in patients with chronic kidney disease might also account for the increased risk of ICH. Beuscher et al., in 2020, identified 12.2% of cases had CKD on hospital admission, like our study.[17] Anticoagulation-related ICH is nowadays increasing because of the increased use of oral anticoagulation in the elderly population.[18] Antiplatelet therapy can also increase the risk of ICH. Several case-control studies did not show an increased ICH risk with antiplatelet use.[19,20] Still, meta-analyses showed that antiplatelet therapy was associated with a small but significant increase in the ICH risk.[21,22] In this study, the use of antiplatelets/ anticoagulants was found in 5% of ICH patients. This finding is consistent with the study done by Woo et al.,[23] where 12% of all patients with ICH were on blood thinners at the time of their bleeding. Another study by Suo et al., revealed that the percentage of ICH due to antiplatelet and anticoagulant use was 9.2% and 10%, respectively.[24]

ICH score calculated based on five independent predictors showed that patients with an ICH score of 0-1 had a favourable outcome, as reflected by their low mortality percentage. In contrast, 80 % of patients with an ICH score of 4 and 100 % of patients with an ICH score of 5 died, which showed that the percentage of mortality increased with increasing ICH score. There was no patient with an ICH score of 6.

Studies stated a positive association between the 30-day mortality and ICH score; with a higher ICH score, the 30-day mortality was also higher, no matter the hematoma size.[6,10,13,25] The results in our study are like the study done by Bhatia R et al.,[13] where he found that the in-hospital mortality was relatively high with increasing ICH score (6.25% at score 0 to 81% at score 4). Hemphil III et al.,[6] found that no patient with an ICH score of 0 died, whereas all patients with an ICH score of 5 died. Mortality rates for patients with ICH scores of 1,2,3 and 4 were 13%,26%,72% and 97%, respectively, concordant with the present study.

CONCLUSION

The present study found that systemic hypertension was the most common risk factor, followed by diabetes mellitus, chronic kidney disease and the use of anticoagulants or antiplatelets among patients with spontaneous intracerebral haemorrhage and ICH score seemed to predict patients with spontaneous intracerebral bleed effectively. A low ICH score was compatible with a good outcome, whereas a high one predicted more mortality.

Conflicts of Interest: None declared

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Contribution of Authors: We declare that this work was done by the authors named in this article, and the authors will bear all liabilities about claims relating to the content of this article.

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