**Original Research Article**

# To assess the reliability of ICH score for predicting the mortality rate in acute intracerebral hemorrhage patients, in a rural based hospital, Jhalawar

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## Abstract

**Background:** A simple clinical scale of intracerebral hemorrhage, comprising the Glasgow Coma Scale score, age, Infratentorial origin, ICH volume, and Intraventricular hemorrhage, was recently shown to predict 30-day mortality. We studied how well the original ICH Score would predict morbidity and mortality.

**Materials and methods:** We did a retrospective study, in which records of all the patients with acute intracerebral hemorrhage were reviewed. Components of the ICH Score were recorded along with other clinical characteristics. Outcome was analyzed using modified ranking scale.

**Results:** The mean age was 69 ± 15 years with 45.4% males and 54.6% females. Common risk factors were smoking, diabetes mellitus and hypertension. Supratentorial lesions were 93.25% and Infratentorial lesions were 6.74 %. The overall 30 day mortality rate for ICH was 29.03%. Important predictors of mortality were, GCS score on admission (P<0.0001), hematoma volume >30ml (P <0.0001), Intraventricular extension (P <0.0001), and ICH score (P <0.0001).

**Conclusion:** The study shows ICH score is very useful in prognostication. The overall mortality rate with ICH is similar to the previously published studies.

## Key words

Intracerebral hemorrhage, ICH score, Mortality, Infratentorial, Supratentorial, Intraventricular, GCS.

## Abbreviations

ICH – Intracerebral haemorrhage, GCS – Glasgow coma scale, SAH – Subarachnoid haemorrhage, NIHSS – National Institute of Health Stroke Scale, CT Scan – Computed tomography scan, CAVA - Computer Assisted Volumetric analysis, IVH - Intraventricular Hemorrhage, CVA - Cerebrovascular Accident

## Introduction

Intracerebral hemorrhage is one of the leading causes of disability which is preventable [1]. Intracerebral hemorrhage (ICH) constitutes 10% to 15% of all strokes and has a higher risk of morbidity and mortality than cerebral infarction or subarachnoid hemorrhage (SAH) [2]. Approximately one third of the patients die within one month. Incidence rates are particularly high in Asians and blacks. Although 40% of patients with acute intracerebral hemorrhage die [3], others have good to complete recovery, if they survive the initial hemorrhage.

The base line severity score should be performed as a part of initial evaluation of patients with Intracerebral hemorrhage [4]. To assess and predict mortality in non-traumatic ICH, numerous questions being raised but one of the simple and applied method is use of ICH score. The National Institute of Health Stroke Scale (NIHSS score) is commonly used for ischemic infarct. Its utility for ICH is diminished because of depressed level of consciousness on initial presentation [4-6]. The ICH score is considered as the simplest and reliable method to predict 30 day mortality. Parameters of ICH score are: GCS score, age, hematoma size, origin of intracerebral hemorrhage and ventricular involvement.

Level of consciousness and hematoma volume at admission are the most consistent outcome predictors, and grading scores combining these variables with other independent outcome predictors show the best predictive values [7]. These grading scores have been validated previously using measures of discrimination and calibration [7-9], but it remains unclear whether these scores are useful in clinical practice [3].

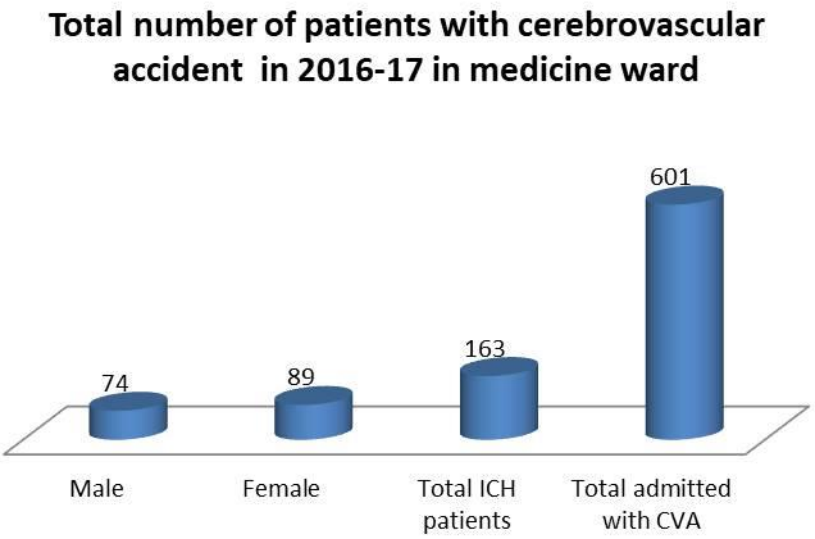
In this study we correlated the ICH score with 30 Day mortality in Jhalawar population. We also validated each variable of ICH score as an independent predictor of outcome.

## Materials and methods

The study had been done in Jhalawar Medical College and Hospital. We used the hospital information system to retrieve discharge summary of all the patients, aged 12 years and above, who were discharged with diagnosis of intracerebral hemorrhage from January 2016 to January 2017.Total number of patients admitted with cerebrovascular accident in medicine department indoors were 601 in one year. In which 207 were of intracerebral hemorrhage, Depending on availability of records 163 patients with 89 females 74 males were taken for study (**Graph- 1**). We did a retrospective study, in which all the records of patients under the diagnosis of acute intracerebral hemorrhage were initially reviewed. 7 patients were excluded from the study after reviewing the records as they could not undergo non contrast CT scan during hospital stay. The Infratentorial hemorrhage patients with high volume who required immediate surgical intervention were referred to higher center. As their in hospital data was incomplete, they could not be included in our study.

44 patients were excluded from the study based on the following exclusion criteria: concomitant subarachnoid hemorrhage (n=5), head injury (n=26), brain tumor (n=4), past history of ischemic infarct (n=9). Finally we selected 163 patients with acute ICH in our study. We obtained their clinical data and laboratory data (age, gender, and history of hypertension, history of diabetes mellitus, blood pressure, GCS score, random blood sugar, and platelet count.)

**Graph – 1:** Total patients with cerebrovascular accident admitted in medicine ward in 2016-17.




To assess the 30 day mortality, the survival status of all the patients was checked from the medical records on admission and in outpatient follow up.

Imaging data collection: we collected the data (hemorrhage volume, site, and intraventricular hemorrhage) of all the patients from the previous records of CT scan. Non contrast CT scan of all the patients was acquired using multirow spiral CT scanners. Imaging parameters included 150KV, 35MA; slice thickness of 1.5 to 5 mm, slice gap of 1mm, field of view 250 mm. We calculated hemorrhage size by CAVA method.

**Statistical analysis**

Statistical analysis of data was done by help of SPSS 20.0 software (trial version). Chi Square test and unpaired T test was used in data analysis, and p value <0.05 was considered as significant.

Chi square was used to find association between two qualitative variables and Unpaired T test was used to find difference between two groups mean where the group was differ to each other.

## Results

We recruited total 163 patients for our study, out of which 89 were females (54.6%) and 74 were males (45.4%). The overall 30 day mortality was 25.15% (n=41) (**Table - 1**). Mean age at ICH was 69 ± 15 years (range 34 to 91 years), the mean GCS score on admission was 10±4 (range, 3 to 15). When compared age and sex with ICH score p values is significant 0.031 and 0.051 respectively (**Table - 1**).

The patients had risk factors such as diabetes (n=25), hypertension (n=86), smoking (n=24). The risk factors were significantly associated with the mortality rate at 30 days, with p value = <0.0001 (**Table - 1**).

The GCS score of all the patients was calculated and patients with moderate score of GCS had mortality of 27.6% and patients with severe GCS score, mortality rate was 100%, p value= 0.0001 (**Table - 2**).

55 patients had ICH volume >30ml, with a 30 day mortality rate of 58.2%, p value= 0.0001 (**Table - 2**).

Patients with Intraventricular hemorrhage (n=59), had 30 day mortality rate 59.3%, p value=0.0001. None of patient with IVH was associated with hydrocephalus (**Table - 3**).

Patients with Infratentorial hemorrhage (n=11) showed no significant 30 day mortality (0%). It was observed that the patients had high GCS

score and ICH volume was low in these patients (p value 0.046) (**Table - 4**). The Infratentorial hemorrhage patients with high volume who required immediate surgical intervention were referred to higher center. As their in hospital data was incomplete, they could not be included in our study.

**Table – 1:** Distribution of patients according to age, sex and risk factors.

| Parameter | Survive | | Death | | Total | Chi square | P value |
|---|---|---|---|---|---|---|---|
| | Total no | % | Total no | % | | | |
| **Age** | | | | | | | |
| **<80 yr** | 118 | 76.6% | 36 | 23.4% | 154 | 4.677 | 0.031 |
| **>80 yr** | 4 | 44.4% | 5 | 55.6% | 9 | | |
| **Total** | 122 | 74.85% | 41 | 25.15% | 163 | | |
| **Sex** | | | | | | | |
| **Female** | 72 | 80.9% | 17 | 19.1% | 89 | 3.814 | 0.051 |
| **Male** | 50 | 67.6% | 24 | 32.4% | 74 | | |
| **Total** | 122 | 74.85% | 41 | 25.15% | 163 | | |
| **Risk factors** | | | | | | | |
| **DM** | 19 | 76% | 6 | 24% | 25 | 40.185 | <0.0001 |
| **DM, SMO** | 1 | 100% | 0 | 0% | 1 | | |
| **HTN** | 70 | 81.4% | 16 | 18.6% | 86 | | |
| **HTN, DM** | 4 | 30.8% | 9 | 69.2% | 13 | | |
| **HTN, DM, Smoking** | 0 | 0% | 1 | 100% | 1 | | |
| **HTN, Smoking** | 4 | 30.8% | 9 | 69.2% | 13 | | |
| **Smoking** | 24 | 100% | 0 | 0% | 24 | | |
| **Total** | 122 | 74.85% | 41 | 25.15% | 163 | | |

DM- Diabetes Mellitus, HTN- Hypertension

**Table – 2:** Classification according to GCS and ICH volume.

| Parameter | Survival | | Death | | Total | Chi square | P value |
|---|---|---|---|---|---|---|---|
| | Total no | % | Total no | % | | | |
| **GCS (Glasgow coma scale)** | | | | | | | |
| Minimum | 38 | 100% | 0 | 0% | 38 | 39.916 | <0.0001 |
| Moderate | 84 | 72.4% | 32 | 27.6% | 116 | | |
| Severe | 0 | 0% | 9 | 100% | 9 | | |
| **Total** | **122** | **74.85** | **41** | **25.15** | **163** | | |
| **ICH (Intra cerebral hemorrhage) Volume** | | | | | | | |
| <30 ml | 99 | 91.7 | 9 | 8.3 | 108 | 48.099 | <0.0001 |
| >30 ml | 23 | 41.8 | 32 | 58.2 | 55 | | |
| **Total** | **122** | **74.85** | **41** | **25.15** | **163** | | |

The mortality rate among Supratentorial bleed was 41 out of 152 (27%). All these 41 patients had low GCS score and high ICH volume or Intraventricular hemorrhage. The GCS score and ICH volume were independent predictors of poor outcome in Supratentorial bleed (**Table - 2**).

Most common Supratentorial bleed was found in lobar hemorrhage (n=57).Basal ganglion and thalamus shows hemorrhage in 30 and 34 patients respectively. Overall higher mortality seen in basal ganglion hemorrhage (**Table - 4**).

## Discussion

The 30 day mortality of patients with spontaneous intracerebral hemorrhage has been reported as ranging from 25 to 52% in previous studies [10-12]. In our study the findings are

consistent with the previous studies (p value <0.0001).

Consistent with previously published studies gender and age are non-significant outcome predictors [10, 13-15].

The result for the location of hematoma as an independent factor to predict 30 day mortality varies from study to study. In many studies, the most favorable outcome was recorded in patients with subcortical hematomas, and the worst in the brainstem hematomas. Arboix, et al. [11] stated that the highest mortality rate was in patients with multiple hematomas, which is consistent to our study. Few studies [14, 16] mentioned the lowest mortality rate related to cerebellar hematomas, and the highest with hematomas located in pons. In our study the lowest mortality rate was observed with infratentorial hemorrhage (0%), this may be because the infratentorial hemorrhage patients which were included in our study had low ICH volume and high GCS score.

**Table – 3:** Classification according to Intraventricular Hemorrhage, Infratentorial Origin Hemorrhage and Site of Supratentorial bleed.

| **Parameter** | **Survival** | | **Death** | | **Total** | **Chi square** | **P value** |
|---|---|---|---|---|---|---|---|
| | **Total no** | **%** | **Total no** | **%** | | | |
| **Intra Ventricular Hemorrhage(IVH)** | | | | | | | |
| Absent | 98 | 94.2 | 6 | 5.8 | 104 | 57.345 | <0.0001 |
| Present | 24 | 40.7 | 35 | 59.3 | 59 | | |
| **Total** | **122** | **74.85** | **41** | **25.15** | **163** | | |
| **Infratentorial Origin Hemorrhage** | | | | | | | |
| Absent | 111 | 73% | 41 | 27% | 152 | **3.964** | **0.046** |
| Present | 11 | 100% | 0 | 0% | 11 | | |
| **Total** | **122** | **74.85%** | **41** | **25.15%** | **163** | | |
| **Site of Supratentorial bleed** | | | | | | | |
| BG | 27 | 90% | 3 | 10% | 30 | 78.549 | <0.0001 |
| BG, CR | 3 | 50% | 3 | 50% | 6 | | |
| BG, LO | 0 | 0% | 4 | 100% | 4 | | |
| BG, TH | 0 | 0% | 13 | 100% | 13 | | |
| LO | 50 | 87.7% | 7 | 12.35 | 57 | | |
| LO, BG, CR | 4 | 100% | 0 | 0% | 4 | | |
| TH | 27 | 79.4% | 7 | 20.6% | 34 | | |
| TH, CR | 0 | 0% | 4 | 100% | 4 | | |
| **Total** | **111** | **73.03%** | **41** | **26.97%** | **152** | | |

BG-basal ganglion, CR-corona radiate, LO-lobar hemorrhage, TH-thalamus

**Table - 4:** Distribution of death according to ICH score.

| **ICH Score (Mortality)** | **N** | **Mean** | **St. Dev.** | **t value** | **p value** |
|---|---|---|---|---|---|
| Survive | 122 | 1.3115 | 1.03718 | 12.821 | <0.0001 |
| Death | 41 | 3.6829 | 0.98588 | | |

The volume of hematoma was an independent factor influencing mortality in patients with ICH [16]. Studies of Godoy, et al. [10] and Togha and Bakhtavar [13] showed that unfavorable outcome (mortality) was higher in the groups with greater hematoma volume, which is similar to the results of our study.

The cut off value for ICH volume predicting a poor outcome was identified as 40 ml by Flemming, et al. [17], 30 ml by Hemphill, et al. [3], 60 ml by Nilsson, et al. [12]. Therefore, the cut off values differ in the previous published studies. This may be because the outcome scales used in each study were different, and the follow

up time of the patients was different in these studies. In our study ICH volume more than 30 ml showed significant 30 day mortality of 58.2% (p value <0.0001).

Ali Mahta, et al., stated that a modified ICH score, intraventricular extension without hydrocephalus does not increase mortality [18], but in our study intraventricular hemorrhage without hydrocephalus showed significant increase in 30 day mortality (p value<0.0001).

## Conclusion

The study concludes that the ICH score is very useful to predict 30 day mortality. Age, sex and risk factors such as diabetes, hypertension, smoking are strongly associated with 30 days mortality when compared with ICH score. Mortality in infratentorial hemorrhage is low but it needs further confirmation as most of the cases with infratentorial hemorrhage referred to higher center.

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