Clinical Profile and Outcomes in Patients with Acute Intracerebral Haemorrhage Presenting to the Emergency Department at a Tertiary Care Teaching Hospital, South India

Subramanyam Penubaku¹, Madhusudhan Mukkara², Kanchi Mitra Bhargav³, Ramesh Chandra V.V.⁴, Sadasiva Raju S.⁵, Pavan Kumar G.⁶, Lakshmi A.Y.⁷

^{1, 5, 6} Department of Emergency Medicine, Sri Venkateshwara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India. ² Department of Anaesthesiology and Critical Care Medicine, Sri Venkateshwara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India. ³ Department of Medicine, Sri Venkateshwara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India. ⁴ Department of Neurosurgery, Sri Venkateshwara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India. ⁷ Department of Radiodiagnosis, Sri Venkateshwara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India.

ABSTRACT

BACKGROUND

World Health Organisation (WHO) defined stroke as rapidly developing clinical signs of focal disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin. Prognostic factors for predicting functional outcome and mortality play a major role in determining the treatment outcome. We intended to study the clinical characteristics and outcome of patients with intracerebral bleeding coming to emergency room.

METHODS

Patients more than 18 years of age who were diagnosed to have intracerebral haemorrhage (ICH) on CT brain plain scan were included in the study. Age < 18 years, patients not willing to participate in the study were excluded from the study. Type of clinical presentation, imaging findings, ICH score, and Glasgow coma scale (GCS) score, were calculated for each patient at the time of admission. The condition of the patient, whether death / discharge (alive) was documented in all study population at the time of discharge.

RESULTS

Hypertension was the most common risk factor present in 68 % of study population. Most of the patients were between 41 - 70 years of age with a male preponderance. High ICH score, low GCS score at the time of admission, presence of intraventricular haemorrhage, and midline shift (P - value 0.000) were significantly associated with poor clinical outcome. Mortality was high in patients with infratentorial bleed and volume > 40 c.c.

CONCLUSION

Males in their sixth decade were the most affected in our study on ICH. Cerebellar and brainstem haemorrhages had higher mortality, though putamen is the commonest site of haemorrhage, low Glasgow Coma Scores and high ICH scores were associated with increased mortality.

KEY WORDS

Stroke, Haemorrhage, Intracerebral, Prognosis, Bleed

Corresponding Author:
Subramanyam Penubaku,
Assistant Professor,
Department of Emergency Medicine,
Sri Venkateshwara Institute of
Medical Sciences, Tirupati,
Andhra Pradesh, India.
E-mail: subbu4727@gmail.com

DOI: 10.14260/jemds/2021/329

How to Cite This Article:
Penubaku S, Mukkara M, Bhargav KM, et al.
Clinical profile and outcomes in patients
with acute intracerebral haemorrhage
presenting to the emergency department at
a tertiary care teaching hospital, South
India. J Evolution Med Dent Sci
2021;10(21):1575-1582, DOI:
10.14260/jemds/2021/329

Submission 03-01-2021,
Peer Review 10-03-2021,
Acceptance 16-03-2021,
Published 24-05-2021.

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BACKGROUND

WHO defined stroke as rapidly developing clinical signs of focal disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin.¹ The cerebrovascular diseases occur predominantly in the middle and late years of life and the incidence of stroke increases with age. Thus the disability affects many people in their golden years. Among all neurological diseases of adult life, the cerebrovascular disease clearly ranks first in frequency and importance. The mortality and morbidity with stroke is still high.¹

There are 15 million people worldwide who suffer from stroke each year.² According to the World Health Organization, for elderly individuals (age more than 60) it is the second most common cause of mortality and for individuals below 60 it is the fifth most common cause of death.²

Approximately 15 % of all strokes are due to intracranial haemorrhage. About two thirds of intracranial bleeding are predominantly subarachnoid haemorrhages, whereas about a third are intracerebral haemorrhages.³ Intracerebral haemorrhage is most frequently caused by the rupture of arteries that are within the brain substance e.g. hypertensive haemorrhage, vascular malformations but do not extend to the cerebrospinal fluid spaces. Intracranial haemorrhage is caused by bleeding directly into or around the brain, it produces neurologic symptoms by producing a mass effect on neural structures, from the toxic effects of blood itself or by increasing intracranial pressure. Classic presentation of intracerebral haemorrhage (ICH) is sudden onset of a focal neurological deficit that progresses over minutes to hours associated with vomiting and nausea, headache, altered sensorium and blood pressure increase.³ ICH is one of the major community health problem causing

ICH is an important public health problem leading to high rates of death and disability in adults. Although the number of hospital admissions for ICH has increased worldwide in the past 10 years, mortality has not fallen. Results of clinical trials and observational studies suggest that coordinated primary and specialty care is associated with lower mortality than is typical community practice.⁴ Spontaneous intracerebral haemorrhage (ICH) accounts for 10 % to 15 % of all strokes.⁵ ICH appears to be more common in eastern countries, accounting up to 30 % of strokes⁶ with an overall mortality of 40 % to 50 %.⁷

Importantly, in oral anticoagulants (OAC) associated ICH the bleeding evolves slowly, for 24 hours or more, perhaps in half of patients. This is in contrast to spontaneous ICH in patients who are not anticoagulated, in whom the duration of bleeding is usually brief (approximately 10 % show progressive enlargement in the first 24 hours). OAC - associated ICHs often continue to enlarge after the diagnosis is made by neuroimaging studies.⁸ The increased incidence of ICH has not been matched with any considerable improvement in treatment.⁹

Despite advances in the treatment of cerebral infarction and subarachnoid haemorrhage, there remains no treatment of proven benefit in improving outcome after ICH.¹⁰

With this background we intended to study the clinical characteristics and outcome of patients with intracerebral bleeding coming to emergency room.

METHODS

A prospective observational study was conducted among all the patients consecutively admitted with diagnosis of intracerebral haemorrhage on CT brain plain scan, in the emergency room of a tertiary care teaching hospital at Sri Venkateswara Institute of Medical Sciences (SVIMS), Andhra Pradesh, India from February 2017 to June 2018. The study was conducted after obtaining approval from Institutional Thesis Protocol Approval Committee and Institutional Ethics Committee (with IEC No : 592). Written informed consent obtained before the study from each patient / responsible attender if the patient was not able to give his or her consent (appendix 1).

Patients more than 18 years of age who were diagnosed to have intracerebral haemorrhage on CT brain plain scan were included. Patients with age < 18 years, having trauma, Patients or patient attendants who were not willing to participate in the study were excluded. A detailed clinical history which consists of demographic data, presenting complaints, history of present illness, personal history, drug history were obtained. Mean arterial pressure was calculated. All the participants were subjected to a detailed physical examination, consisting of general physical examination, detailed neurological examination, GCS score and examination of other systems.

All patients underwent initial CT brain on a 128 slice multi detector – row CT system (somatom definition 128, Siemens). Image acquisition parameter consisted of 0.6 mm collimation, 120 kv, 160 mAs eff pitch off 1.2, and a reconstructed section thickness of 6 mm. ICH volume calculated with the use of the ABC / 2 method, in which A was the greatest diameter on the largest haemorrhage slice, B was the diameter perpendicular to A and C and was the approximate number of axial slices with haemorrhage multiplied by the slice thickness.¹¹ The presence or absence of IVH noted on initial head CT scan. Patients with head trauma investigated with CT brain plain with bony cuts. In patients in whom aneurysm and AV malformations were suspected, CT cerebral angiogram was done. ICH score documented in all patients with acute hemorrhagic stroke.¹² (Table 1)

Component	Score at Presentation	ICH Score Points
GCS score at presentation	13 - 15	0
	5 - 12	1
	3 - 4	2
ICH volume (cm ³)	≥ 30	1
	< 30	0
IVH	Yes	1
	No	0
Origin of ICH	Infratentorial	1
	Supratentorial	0
Age	≥ 80	1
	< 80	0

Table 1. Calculation of ICH Score

GCS - Glasgow coma scale; ICH - Intracerebral haemorrhage; IVH - intraventricular haemorrhage

GCS Score

Glasgow Coma Scale (GCS) score determined at the time of admission in all study population. The GCS is a 3 to 15 - point scale used to assess a patient's level of consciousness and level of neurological functioning.¹

In all the study population, after thorough clinical and physical examination, relevant laboratory investigations were sent depending on clinical presentation and underlying comorbid illness. After initial stabilization, all the study patients were transferred out to respective wards or ICUs depending upon their severity of illness. All Patients were treated either medically or surgically depending on their clinical features or imaging findings as per the standard institute protocol. All patients were followed until their discharge. The condition of patient, whether death / discharge (alive) was documented in all study population at the time of discharge. All the study parameters were documented in the predesigned proforma and was analysed statistically. Patients who left against medical advice were considered as worst outcome that is death.

Score	Best Motor Response	Best Verbal Response	Eye Opening
1	None	None	None
2	Decorticate posturing	Mutters unintelligibly	Opens to pain
3	Decerebrate posturing	Inappropriate speech	Opens to command
4	Withdraws to pain	Confused	Opens spontaneously
5	Localizing response to pain	Alert and oriented	NA
6	Obeys commands	NA	NA
Total	1 - 6	1 - 5	1 - 4
Table 2. Calculation of GCS Score			
NA=not applicable.			

Statistical Analysis

All data was recorded on a predesigned proforma and managed using Microsoft Excel worksheet (Microsoft Corp, Redmond, WA). All the entries were double checked for any possible error. Descriptive statistics reported as mean $\pm$ standard deviation, median. Categorical variables were reported as percentages. chi - square test was used to analyse group differences for categorical data. The statistical software

IBM SPSS statistics version 22.0 (IBM Corp Somers NY, USA) was used for statistical analysis.

RESULTS

In the prospective observational study a total number of 487 patients were screened with features suggestive of cerebrovascular accidents and were subjective to CT scan brain plain. A total number of 116 patients were found to have intracerebral haemorrhage out of which 16 cases were excluded as they did not meet inclusion criteria (Figure 1). A total of 100 patients were studied and the data was analysed.

Age and Sex Distribution of ICH

Mean age of the study population was 58.37 ± 12.26 . Most of the patients (79 %) were between 41 – 70 years of age. 8 % (N = 8) were < 40 yrs. There were only 2 patients in 18 - 30 years age group and 1 patient in > 80 years age group. It appears that ICH was more common in elderly individuals as 92 % of the patients were in > 40 years age group. There was a male preponderance in the incidence of intracerebral haemorrhage. In present study 65 patients were males and 35 patients were females and male to female ratio was 1.85:1

Hypertension was the most common risk factor seen in 68 (68 %) of patients. Smoking was the second most common risk factor seen in 58 (58 %) of patients. Alcoholism and Diabetes mellitus were the other associated risk factors in 46 (46 %) and 14 (14 %) patients respectively.

Aetiology of Intracerebral Haemorrhage

Hypertension was the most common cause of ICH among the study population, seen in 68 (68 %) of patients, followed by hypertension and diabetes in (9 %) of patients. In 4(4 %) of

the patients, use of anticoagulant contributed to ICH. AV Malformation was seen in 4 (4 %). Two patients of lobar haemorrhage were diagnosed as having an underlying intracranial space occupying lesion.

The most common feature noticed was hemiparesis which was seen in 83 % (N = 83) of the patients. All the patients with putamen and thalamic haemorrhage invariably had hemiparesis. Hemiparesis was followed by Loss of

consciousness (LOC) which was seen in 27 % (N = 27) of patients. Patients with lobar haemorrhage had lesser incidence of LOC (18 %) compared to others. Headache was seen in 8 % (N = 8) of patients of which 40 % were seen in patients with cerebellar haemorrhage. Headache was not seen in thalamic haemorrhage.

Vomiting was seen in 18 % (N=18) patients of which 22 % of brainstem and 80 % of lobar haemorrhage had vomiting. Only 1 (9.1 %) of lobar haemorrhage had vomiting. Seizures were seen in 18 % of lobar haemorrhage. Sensory disturbances were seen in cerebellar (60 %), brainstem (44 %), putamen (30 %), lobar (27 %), and thalamic (23.8 %) haemorrhages much commonly in cerebellar (60 %).

Among putamenal (N = 54) haemorrhages 98 % (N = 53) had hemiparesis, 11 % (N = 6) had loss of consciousness, 3.7 % (N = 2) had headache.

In patients with lobar (N = 11) haemorrhage 55 % (N = 6) had hemiparesis, 18 % (N = 2) had Seizures, loss of consciousness and headache and 9.1 % had vomiting (N = 1), 27 (N = 3) had sensory disturbances.

In patients with thalamic (N = 21) haemorrhages 90.5 % (N = 19) had hemiparesis, 26.8 % (N = 6) had LOC and 23.8 % (N = 5) had vomiting and sensory disturbances. Most patients with brainstem haemorrhage and cerebellar haemorrhage had vomiting and LOC.

LOC-loss of consciousness; ICT- intracranial tension

Site of Haemorrhage

In a total of 100 patients with ICH, 54 (54 %) were in putamen, 21 (21 %) in thalamic, 11 (11 %) in lobar, 9 (9 %) were in brainstem, 5 (5 %) were cerebellar haemorrhages. 65 (65 %) were males and 35 (35 %) were females (Table 7 and Figure 8)

Outcome in Patients with Intracerebral Haemorrhage

GCS Score at Presentation

Mortality was 100 % in patients with GCS Score < 6 at the time of admission. In those with GCS Score between 6 and 10, mortality was 24.5 %, while in patients with GCS Score > 11, the mortality was only 15 % (Table 8 and Figure 7).

Volume of Haematoma

Mortality reached 100 % in patients whose hematoma volume exceeded 60 cc. 86.9 % of the patients with hematomas above 40 cc were dead. Mortality was considerably less with volumes less than 40 cc in 40.7 % (Table 9 and Figure 8).

Factors Influencing Outcome

86.9 % of the patients with bleed volume above 40 mL were dead. Mortality reached 100 % in patients whose hematoma volume exceeded 60 mL (Table 10 and Figure 9). Most common site of bleed was putamen in 54 patients. Among patients having midline shift 16 (66.6 %) expired and 8 (33.3 %) were discharged. The mortality in patients with intraventricular extension was 64.2 % and 13.8 % in patients without intraventricular extension. Mortality rate was 55.5 % in patients with MAP > 130 mm of Hg and 21.9 % in patients with MAP ≤ 130 mm of Hg. The mortality rates observed with ICH score was 0 % with score 0, 8.6 % with score 1, 37.5 % with score 2, 86.6 % with score 3, 100% with score 4 and 5. Among surgically treated patients 06 (42.8 %) died and 08 (57.1 %) discharged in haemodynamically stable condition. Lastly, among medically treated patients 22 (25.5 %) expired and remaining 74.5 % were discharged in a stable haemodynamic condition.

DISCUSSION

The mean age of intracerebral haemorrhage in the present study was 58.37 years. Mohammad Wasay et al. showed a mean age of 55 years in their study.¹⁴ Safatli da et al. reported a mean age of 67 years in their study.¹⁵ Sai Sampath et al. in their study of predictors of mortality of intracerebral haemorrhage among the sea coast population of South India reported a mean age of 56.8 years.¹⁶

In the present study, 92 % of patients with intracerebral haemorrhage were aged above 40 years. Most of the patients in this study were in the age group of 40 - 70 years. Ganesh Namani et al.¹⁷ reported 74 % of the patients were > 40 years of age. One of the component of ICH score is age > 80 years and in the present study, only one patient aged more than 80 years.¹⁷

The present study showed no significance of age in determining the outcome of patients with intracerebral haemorrhage. Sai Sampath N et al.¹⁶ revealed that age is not significant risk factor. Rita Szepesi et al.¹⁸ had a borderline predictive value of 0.054 consistent with previous observations that role of age in outcome after intracerebral haemorrhage is controversial. Earlier studies reported that age was significantly and independently associated with fatal outcome for patients aged ≥ 80 years, whereas others did not find this association.

In the present study, there was a male preponderance in the incidence of intracerebral haemorrhage. 65 patients were males and 35 patients were females. The male: female ratio was 1.85:1. The in hospital mortality in males and females was 37.1 % and 23.07 % respectively.

In the study by Sai Sampath et al.¹⁶ patient gender is not found to be a significant risk factor, where males were 66 % and females were 34 %. Ranjit Sanu Watson et al.¹⁹ reported a male: female ratio of 1.43:1. There were 59 men and 41 females in the study. Patient sex was not found to be a significant prognostic marker. Togha M et al.²⁰ reported that gender is not a significant predictor of prognosis. Safatli Da et al.¹⁵ showed gender was not a significant outcome predictor. The present study showed that gender was not a prognostic indicator for mortality in patients with intracerebral haemorrhage consistent with other previously published studies.

In a review of risk factors in our study population, hypertension was the commonest factor (68 %). It was followed by cigarette smoking (58 %). Smajlovic D et al.²¹ have found that the leading risk factor for ICH was Hypertension, heart disease followed by smoking. Articles citing smoking as a risk factor of ICH were few, in our study we have found that 58 % of our patients were smokers. Alcohol consumption was seen in 46 % of patients and diabetes in 14 %.

Smajlovic D et al.²¹ have found that 14 % of their cases with ICH had Diabetes, in our study we had 14 % of patients with diabetes and only 5 % of them having only diabetes, the rest 9 % were also having concomitant hypertension.

Study conducted by Sunil K. Narayan et al.²² showed that systemic hypertension was the single most frequent associated risk factor. The incidence of hypertension in the present study was 77 %. The next identifiable cause was AV malformations and tumour which were present in 4 % of the patients. In a study conducted by Tejas N modi et al.²³ hypertension was the single most risk factor.

Robert G. Hart et al.²⁴ had found that anticoagulation to conventional intensities increases the risk of intracranial haemorrhage 7 - to 10 - fold, to an absolute rate of nearly 1 % per year. Most (70 %) anticoagulant - related intracranial haemorrhages were intracerebral hematomas (approximately 60 % are fatal). In our study there were 2 patients who were on oral anticoagulants (warfarin).

The commonest clinical sign in present study was paresis seen in 83 % of the cases. Hemiplegia was seen in more than 90 % of putamen, thalamic and lobar hematomas while pontine hematoma presented with quadriplegia. The second commonest clinical finding was LOC seen in 27 % of the cases, it was followed by vomiting and dysarthria. In a study conducted by sampath et al.¹⁶ most common clinical feature was weakness (80.3 %) compared to present study (83 %).

Yacoub G. Bahou²⁵ had found that 80 % of their patients with ICH had hemiparesis / plegia during their presentation, it was followed by LOC, headache and Vomiting. In the present study the site of bleed was putamen in 54 patients, thalamus in 21 patients, lobar in 11 patients, brain - stem in 9 cases and cerebellum in 5 patients. Mortality was highest in patients with cerebellar (100 %) and brain stem (77.77 %). In thalamic bleed, the mortality was 33.3 %, in putamen it was 12.9 % and the mortality in lobar haemorrhage (22.2 %). Smajlovic D et al.²³ reported a mortality rate of 42 % in patients with intracerebral haemorrhage with highest mortality in brainstem hematoma patients (83 %). Yun - Zhen Hu et al.²⁶ also found that the highest mortality was observed in patients with ICH of the brainstem (100.0 %), followed by patients with ICHs in multiple sites (50.0 %). Most of the patients with bleed in the putamen and lobar improved (62.6 % and 62.5 %, respectively).

Sai Sampath N et al.¹⁶ showed that maximum number of cases were in the region of putamen followed by thalamus, lobar or cortical, cerebellum and brain - stem. The putamen was the most common site of haemorrhage in both alive and dead patients. Ranjit Sanu Watson et al.²⁰ reported maximum mortality in pontine haemorrhage (85.7 %), least for basal ganglia haemorrhage (37.3 %). Ganesh Namani et al.¹⁸ reported maximum mortality in cerebellar and brainstem hematomas followed by lobar, putamen and thalamic bleeds. Thalamic and lobar haemorrhage patients had higher survival rates. In the present study, the mortality rate in patients with initial Glasgow Coma Score ≤ 10 was 77.5 % and > 10 was 6.6 % ($P < 0.001$). The present study reported a significant association between GCS scores at the time of admission and mortality in patients with intracerebral haemorrhage.

Togha M et al.²⁰ reported a mortality of 100 % in patients with GCS score 3 - 4 and 7.2 % in patients with GCS score of 14 - 15 at the time of admission. In the same study, Togha M et al.²⁰ reported that patients with GCS score ≤ 8 when compared to those with GCS score > 8 had a significant mortality rate ($p < 0.001$). Sai Sampath N et al.¹⁶ reported low GCS score ≤ 9 as an independent predictor of mortality in patients with intracerebral haemorrhage. Ranjit Sanu Watson et al.¹⁹ reported mortality rate of 92 % in patients with GCS score < 6 . Sunil K Narayan et al.²² showed that lower baseline GCS score as an important predictor of death or severe disability. Ganesh Namani et al.¹⁷ reported 100 % mortality in patients with GCS score < 6 at the time of admission. In the present study, intraventricular extension was seen in 28 patients out of 100 patients. The mortality in patients with and without intraventricular extension was 64.2 % and 13.8 % ($P < 0.001$).

Havelli et al.²⁷ found that patients with intraventricular haemorrhage were twice likely to have a poor outcome when compared with patients without intraventricular haemorrhage ($P = 0.001$). Similarly a study on stroke patients in Japan also found that intraventricular haemorrhage, haemorrhage size and ICH severity on admission were related to mortality.²⁸ Daverat et al.²⁸ showed that intraventricular spread of the haemorrhage (OR = 5.3) was one of the independent predictor mortality.

Ganesh namani et al.¹⁷ reported that 75.8 % of the patients with intraventricular extension died. Chiranjib Nag et al.²⁹ also reported that intraventricular extension of bleed is an independent poor prognostic factor ($P < 0.0001$). In the present study, patients with MAP > 130 mm of Hg had a mortality of 55.5 % whereas those with MAP ≤ 130 mm of Hg had a mortality of 21.9 %. Mean systolic blood pressure in discharged patients was 157.7 ± 31.05 and diastolic blood pressure was 90.7 ± 15.3 . The mean systolic blood pressure in death patients was 174 ± 34.48 and diastolic blood pressure was 103.2 ± 23.42 .

Sami tetri et al.³⁰ reported that admission mean arterial pressure (MAP) can predict the survival of the patient. Fogelholm R et al.³¹ reported increased MAP on day one increased the mortality rate. In the present study patients having midline shift > 5 mm has 66.6 % mortality while patients not having midline shift had 15.7 % mortality. Increased midline shift is associated with increased mortality.

kyu - hong Kim³² study showed that < 5 mm and > 5 mm midline shift patients had 10.9 % and 34.4 % mortality respectively. In a study conducted by Rohit Bhatia et al.³³ mortality was 40 % when there was a midline shift of more than 6 mm. In the present study, neurosurgical intervention did not improve mortality or outcome. Although surgery in ICH has always been a controversial issue, outcomes after surgery are dependent on host of factors of which age, GCS, onset to surgery times, baseline hematoma volume, IVH and depth of hematoma are important predictors.³⁴ A systematic review estimated that only between 12 and 39 % of patients achieve independent function.³⁴ In a recently published study on post-surgically treated ICH patients, poor outcome on GOS at 6 months was observed in 86 % patients. They identified midline shift of > 5 mm as the strongest predictor of outcome.³⁵ In the present study, 28 patients expired out of 100 patients correlating well with literature.^{36,30,37}

CONCLUSIONS

Males in their sixth decade were the most affected by ICH in our study. Cerebellar and brainstem haemorrhages had higher mortality, though putamen is the commonest site of haemorrhage. Low Glasgow Coma Scores and high ICH scores were associated with increased mortality.

Limitations

- Our study is a single centre study, our study results cannot be extrapolated to the general population.
- Sample size is less in this study
- In the present study we have observed the patients until their discharge alive or death. We have not followed the

discharged patients with their functional outcome (morbidity).

Data sharing statement provided by the authors is available with the full text of this article at jemds.com.

Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jemds.com.

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