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Study of Prognostic Factors in Intracerebral Haemorrhage

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I. Introduction

Stroke is the second leading cause of death worldwide.Intracerebral haemorrhage (ICH)accounts for ~10% of all strokes, and about 35–45% of patients die within first month. Incidence rates are particularly high in Asians and blacks. Hypertension, coagulopathy, sympathomimetic drugs (cocaine, amphetamine) and cerebral amyloid angiopathy cause the majority of these haemorrhages. Advanced age and heavy alcohol consumption increase the risk and cocaine and amphetamine use is one of the most important causes in the young.Intracerebral haemorrhage is often discovered on noncontrast CT imaging of the brain during the acute evaluation of stroke. Because CT is more widely available and logistically easier, CT imaging is the preferred method of acute stroke evaluation.[1]
The aim of this work is to study the risk factors, causes, sites and early prognosis of ICH and determining the clinical and radiographic features.

AIMS AND OBJECTIVES
1. To study the various risk and prognostic factors in the patients with intracerebral haemorrhage.

MATERIAL AND METHODS
The present study was conducted at Government Medical College and Hospital, Aurangabad during the period of December 2013 to November 2015
Study design:
This is a two year cross sectional study on patients of intracerebral haemorrhage confirmed by NCCT brain.
Source of data:
Patients admitted in medicine ward of tertiary care hospital who satisfy the inclusion criteria were enrolled in the study.
Sample size:100
Inclusion criteria:
Patients presenting with clinical diagnosis of intracerebral haemorrhage, confirmed by radiological investigation and giving consent were included in the study.
Exclusion criteria:
1. All trauma patients.
2. Patients with primary or secondary brain tumours.
3. Cortical vein thrombosis.

Method and collection of data:
Data collection:
Descriptive data of participants like name, age, sex, personal history including addictions, occupation were obtained by interviewing the patients or relatives. Patient's proper history and examination details were recorded on predesigned and pretested proforma.
Investigations:
- Hb, TLC, DLC, Platelets
- Blood urea level and creatinine
- Serum cholesterol
- Random BSL
- ECG
- Fundus examination
- NCCT brain

On NCCT brain, site of bleed was classified as thalamic, basal ganglia (caudate nucleus, putamen, nucleus accubens, globus pallidus, substantia nigra), cerebellum, gangliocapsular hematoma, brain stem (medulla oblongata, midbrain, pons), intraparenchymal bleed with intraventricular extension or intraventricular bleed, lobar (frontal, parietal, temporal and occipital lobe).

Volume of hematoma is calculated by formula[2]
- ABC/2
- A is the largest haemorrhage diameter on the selected slice (in centimetres [cm]).
- B is the largest diameter perpendicular to A on the same slice.
- C is the approximate number of 1 cm slices in which the haemorrhage is seen.

The Glasgow coma scale as described for head injury wasused.[3]For each patient, we analyzed the following risk factors: smoking history (the consumption of ≥ 5 cigarettes / bidi at least 2 days per week over a period of 12months), alcohol use (the ingestion of 100 g/d or more every day for at least 20 days per month during the last 2 months or acute alcoholic intoxication during the 24 hours prior to the attack).[4]Hypertension was recorded if the pre-hemorrhage blood pressure (BP) was documented to be > 140 mm Hg systolic or >90 mm Hg diastolic, if the patient was described as previously hypertensive in the physician notes, or if taking anti-hypertensive medications.[5] History

of diabetes mellitus was determined by previous treatment or from records of a distinctly abnormal fasting blood sugar level and/ or glucose tolerance test. History of coronary heart disease was considered positive if any of the following conditions were found: angina pectoris, coronary insufficiency, myocardial infarction, congestive heart failure or cardiac arrhythmia. (As per Pilot Stroke Data Bank.[6])
Patients were followed till the time of discharge from the ward.

Statistical analysis
Results of demographic and biochemical characteristics were expressed as range, mean and median.
Statistical software
The Statistical software SPSS 20 was used for analysis of the data, Microsoft word and Excel were used to generate graphs and tables.p value of <0.05 was considered as significant.

OBSERVATIONS AND RESULTS

Table 1: Gender wise distribution of cases

Gender	No. of cases	Percentage
Male	71	71 %
Female	29	29 %
Total	100	100 %

In the present study, out of 100 cases, 71 were males and 29 were females. Male female ratio was 2.44:1.

Table 2: Age wise distribution of cases

Age (In years)	No. of cases (Male)	No. of cases (Female)	Total	Percentage
11-20	0	1	1	1 %
21-30	3	0	3	3 %
31-40	8	2	10	10 %
41-50	15	3	18	18 %
51-60	15	8	23	23 %
61-70	25	12	37	37 %
71-80	4	2	6	6 %
81-90	1	1	2	2 %
Total	**71**	**29**	**100**	**100 %**

In the present study a high incidence of ICH was noted in 5th to 7th decade of life. Majority of males 40 out of 71 cases were between the age group of 51-70 years (40 %). Females also had high incidence of ICH in 5th to 7th decade of life. (20 out of 29 females)

Table 3: Risk factors associated with clinical cases of ICH

Risk Factor	Male	Female	No. of cases
Hypertension	56	20	76
Smoking	48	0	48
Alcohol	30	0	30
Diabetes	15	5	20
Past history of CVA	9	3	12
Family history of CVA	9	1	10
Ischemic heart disease	6	3	9

Hypertension in 76 cases, history of smoking in 48 cases, history of alcoholism in 30 cases and diabetes mellitus in 20 cases were observed in this study. Out of 100 cases, 6 males and 3 females had history of heart disease.

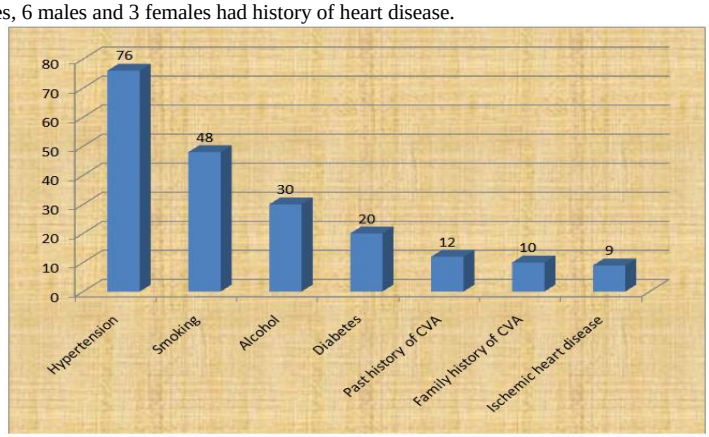

Fig. 1: Risk factors wise distribution of cases

Table 4: Clinical presentation of ICH

Clinical parameters	No. Of cases	Percentage
Hemiplegia / hemiparesis	96	96%
Coma	72	72%
Aphasia	72	72%
Headache	61	61%
Vomiting	49	49%
Convulsions	17	17%
Dysarthria	9	9%
Neck Stiffness	9	9%
Quadriplegia / quadriparesis	4	4%

It was observed that hemiplegia / hemiparesis was the most common presentation (96%): 58 patients had left hemiplegia / hemiparesis and 38 patients had right hemiplegia / hemiparesis. Coma was seen in 72 patients. Aphasia was seen in 72 patients. Headache was observed in 61 patients. Vomiting was noticed in 49 patients. Convulsions were seen in 17 patients. Dysarthria in 9 patients.

Fundus examination of cases

Fundus was normal in 50% of patients and not visualised due to cataract in 15%. Grade I hypertensive retinopathy was seen in 8 patients (8%), grade II hypertensive retinopathy found in 13 patients (13%). grade III hypertensive retinopathy in 5 patients (5%) and grade IV hypertensive retinopathy in 5 patients (5%). 2 patients had papilloedema and 2 patients had diabetic retinopathy.

ECG findings

ECG revealed left ventricular hypertrophy in 44% of cases, IHD in 9% of cases, sinus bradycardia in 13 % of cases, and sinus tachycardia in 1% case. ECG was normal in 33% of cases.

Table 5: GCS score and mortality

GCS score	Death (% of deaths)	Survived (% of survived)	No. of cases	Chi-Square	P value
Below 6	34 (100%)	0	34	1.896	0.168
6-10	8 (27.59 %)	21 (72.41 %)	29	1.694	0.193
Above 10	1 (2.7 %)	36 (97.3 %)	37	18.528	0.000
Total	**43 (43 %)**	**57 (57 %)**	**100**		

Out of 100 patients, 37 % had GCS above 10 and having 2.7% mortality. 34 % had GCS below 6 and having 100% mortality. The remaining cases i.e. 29 % had GCS between 6-10 and 27.59% mortality. The table showed significant correlation between cases having GCS above 10 and mortality as p=0.000 (p<0.05).

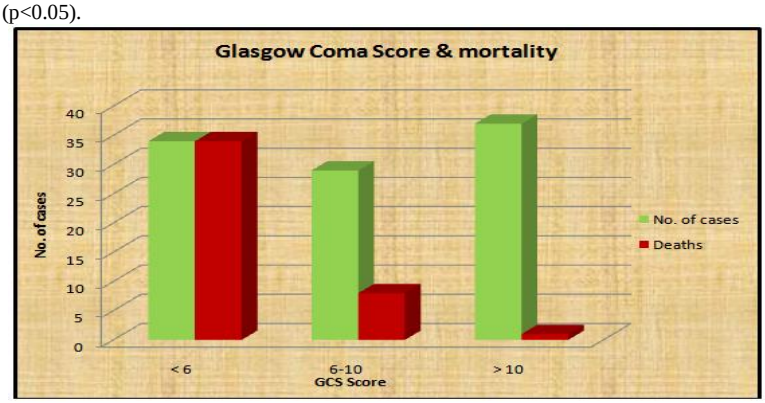

Fig. 2: GCS score and mortality

Table 6: Site of bleed and mortality

Sr. No.	Site of bleed	No. of cases	Mortality	Chi square	p value
1	Thalamus	10	1 (10%)	2.4942	0.114
2	Basal ganglia	3	1 (33.33%)	0.170	0.680
3	Cerebellum	5	1 (20%)	1.329	0.248
4	Ganglio-capsular hematoma	22	1 (4.5%)	**18.65**	**0.000**
5	Brain stem	2	2 (100%)	2.494	0.114
6	Intraparenchymal bleed with intraventricular extension / intraventricular bleed	46	31 (67.39%)	**17.256**	**0.000**
7	Lobar	12	6 (50%)	0.137	0.710
	TOTAL	**100**	**43 (43%)**		

Out of 10 patients of thalamic haemorrhage, 1 patient died. Out of 3 patients ofbasal ganglia haemorrhage, 1 patient died. Out of 5 patients of cerebellar haemorrhage, 1 patient died. Out of 22 patients ofcapsulo-ganglionic haematoma, 1 patient died. 31 patients died of intraparenchymal haemorrhage with intraventricular extension and 6 patients died of lobar haemorrhage.

Table 7: Intraventricular hemorrhage/ intravantricular extension and mortality

Intraventricular Hemorrhage/ Intravantricular Extension	Deaths(% of deaths)	Survived(% of survived)	No.of Cases	Chi square	p value
Present	31 (67.39%)	15 (32.61%)	46	8.237	0.004
Absent	12 (22.22%)	42 (77.78%)	54		

Intraventricular extension of bleed or intraventricular bleed had 67.39 % mortality compared to 22.22 % in cases of bleed without intraventricular extension. It was statistically significant (p value = 0.004)

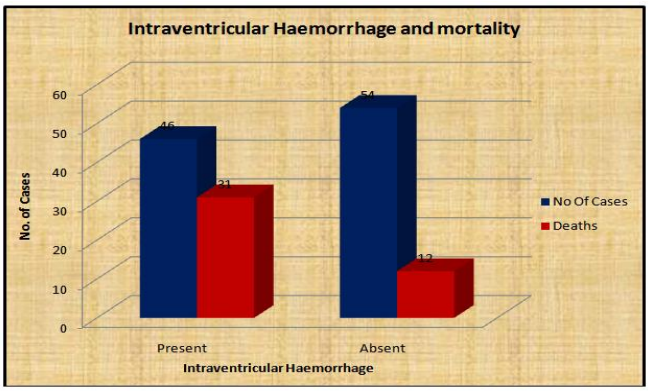

Fig. 3: Intraventricular haemorrhage and mortality

Table 8: Volume of hematoma and outcome of ICH

Volume of hematoma in ml	Died (% of died)	Survived (% of survived)	No. of cases	Chi Square	P value
Small (less than 20)	2 (8.33%)	22 (91.66%)	24	16.306	0.000
Moderate (20-40)	6 (24%)	19 (76 %)	25	5.385	0.020
Massive (more than 40)	35 (68.63%)	14 (31%)	51	30.208	0.000

Out of 24 patients with haematomas of small size (<20 ml), 22 patients improved and 2 died. Out of 25 cases of moderate haematomas (20-40 ml) 19 patients improved and 6 died. Out of 51 cases of massive haematomas (>40ml), 35 patients died and 14 improved. It was statistically significant (p value < 0.05).

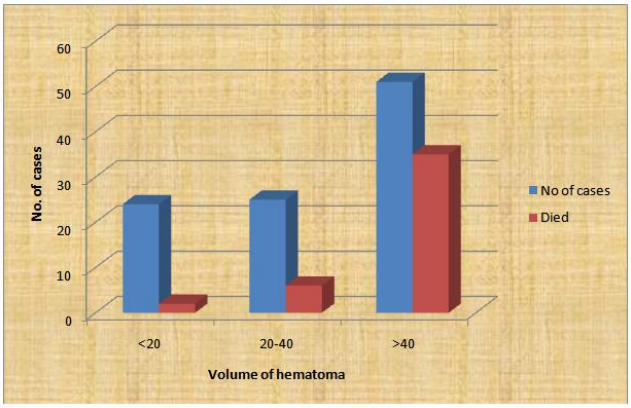

Fig. 4: Volume of hematoma and mortality

Table 9: Midline shift of structures on NCCT brain and outcome of ICH

Midline shift	Deaths (% of deaths)	Survived (% of survived)	No. of cases	Chi Square	P value
Present	36 (55.38%)	29 (44.61%)	65	**11.621**	**0.001**
Absent	7 (20%)	28 (80%)	35		

NCCTbrain was suggestive of midline shift of structures in 65 cases out of which 36 (55.38%) died and 29 (44.61%) improved. 35 cases did not have midline shift of structures out of which 7 (20%) were died and 28 (80%) improved. It was statistically significant (p value = 0.001).

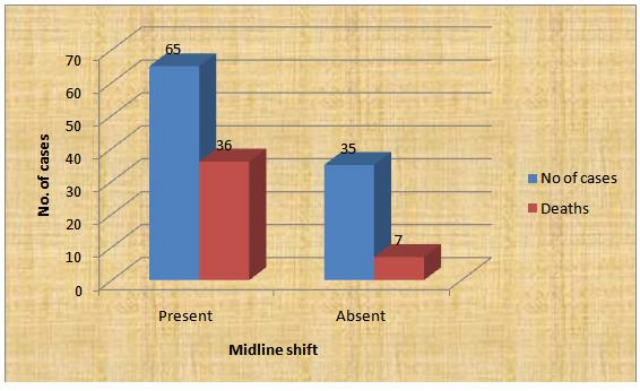

Fig. 5: Midline shift of structure on NCCT brain and mortality

II. Discussion

Age distribution:

In the present study, ICH was noticed in 78 % patients in age group 41-70 years which correlates with **Ganesh Namani et al**[7] study and **Thacker et al**[8]study. The mean age of patients in present study was 56.9+/- 17.18 years which correlates with **Ganesh Namani et al**[7] study. Age related processes like atherosclerosis, hypertension and diabetes mellitus might have contributed to the high incidence of ICH in this age group.

Sex distribution:

In present the study, males were affected in 71 % of cases and females in 29% of cases which correlates with other studies like **Ganesh Namani et al** [7]study in which 66.6% of males and 33.3% of females were affected by ICH. Study by **Narayan SK et al** [9]had 63.3% males and 36.6% females.Another study conducted by **Yun-zhen Hu et al** [10]had 67.3% males and 32.7% females.

Associated risk factors:

Hypertension was found to be the most important risk factor for ICH. In this study, hypertension was detected in 76 % of cases which correlated well with other studies like **Ganesh Namani et al** [7]study (72 %),**Smajlovic et al** [11]study (84 %). **Abbott et al.**[12] showed an increased risk of intracranial haemorrhage in cigarette smoking Hawaiian men of Japanese ancestry. **Donahue et al** [13] and **Juvela et al** [14] documented an increased risk of ICH in relation to alcohol ingestion, an effect that operated independently from other risk factors. In the present study the risk factors like smoking (48 %) and alcoholism (30%) were also responsible for the occurrence of ICH in males in addition to hypertension as the male community was more prone to indulge in smoking and alcohol consumption compared to females. Excessive intake of alcohol might result in increased VLDL and LDL content resulting in accelerated atherosclerosis. Diabetes mellitus was reported in 6% of cases by **Ganesh Namani et al**[7], 14% in **Smajlovic et al**[11] study and 8 % in **Maya P. Danovska et al** [15] Study. In the present study, 20% of patients were having diabetes mellitus. This difference might be due to high prevalence of diabetes mellitus in this region.

Clinical features:

Coma in 72 %, aphasia in 72 %, headache in 61 %, vomiting in 49 % and convulsions in 17 % were the important presenting features in the present study which enabled a clinical diagnosis of ICH to be made in cases of stroke. Compared to the other study **Olufemi Adeleye et al** [16] coma was seen in 57.2 %, headache in 60.3 %, vomiting in 50.8%, convulsions in 22.2 %. The onset of stroke was also taken into consideration. The diagnosis of ICH was considered with sudden onset illness. In all 100 cases, the onset was sudden. Hemiplegia / hemiparesis (96 %) was the most common presentation in the present study compared to other study like **Ganesh Namani et al** [7](88 %). Left hemiplegia / hemiparesis (58 cases) was more common in this study than right hemiplegia / hemiparesis (38 cases). Thus coma, aphasia and headache contributed as the most common presenting symptom and hemiplegia / hemiparesis the most common neurological sign in this study.

Hypertensive retinopathy:

Fundus examination revealed hypertensive changes in 31 % of cases in the present study which correlates well with other studies like **Nileshkumar M et al** [17] (32 %) and **Shital Rathod et al.**[18] (36 %).

Table 17: ECG finding of left ventricular hypertrophy in clinical series

ECGfinding showed LVH in 44% of cases in the present study which correlates with 52% in **Nileshkumar M et al**[17]study.

MORTALITY IN DEFERENT CLINICAL SERIES

Site of bleeding:

Table 10: Comparison of site of bleed and mortality with other study

Site of bleed	Shital Rathod et al.[18](2015)	Present study (2015)
Thalamus	27%	10%
Basal ganglia	35%	33.33%
Cerebellum	37%	20%
Gangliocapsular hematoma	-	4.5%
Brain stem	83%	100%
IVE/ Intraventricular bleed	66%	67.39%
Lobar	39%	50%

Mortality in the present study was 43 %. Mortality was higher in brain stem (100%), intraventricular bleed or intraventrecular extension of bleed (67.39%), followed by lobar (50%), and basal ganglia (33.33 %) which correlates well with other study by **Shital Rathod et al.**[18],in which mortality in brain stem was (83%), intraventricular bleed / intraventricular extension (66%), lobar (39%) and basal ganglia (35 %).

Volume of hematoma:

Table 11: Comparison of volume of hematoma and mortality with other study

Volume of hematoma in ml	Ganesh Namani et al[7] (2014)	Present study (2015)
Less than 20	27. 2 %	8.3 %
20-40	50 %	24 %
More than 40	86.9 %	68.62 %

Very large volumes greater than 40 cc invariably associated with high mortality. In the present study, mortality was 68.62 % in cases with volume greater than 40 cc, which is comparable to **Ganesh Namani et al**[7] study (86.9 %). The relation between volume of hematoma and mortality was statistically significant.

It was observed patients having ICH and midline shift on CT brain had high mortality (55.38%) as compared to patients without midline shift (20%), the difference is statistically significant (p = 0.001).

GCS score on admission and mortality:

Table 12: Comparison of GCS score and mortality with other study

GCS score	Ganesh Namani et al[7](2014)	Present study (2015)
Below 6	100 %	100 %
6-10	59.1 %	27.59 %
Above 10	23.8 %	2.7 %

In the present study, patients with GCS score on admission less than 6 had mortality of 100 %. **Ganesh Namani et al**[7] also got 100 % mortality when GCS score was less than 6. In present study patients with GCS score above 10 had mortality of 2.7%, it was statistically significant (p value = 0.000). Thus state of consciousness at admission is an important determinant of short term prognosis.

III. Summary

The summary at the end of our study is as follows:

- Among 100 patients, 71 were males and 29 were females.
- Age range: 20-85 years and the mean age 56.9 years.
- The highest incidence was seen in the fifth to seventh decades of life.
- Sudden onset severe headache, vomiting, convulsions, loss of consciousness, loss of power, aphasia were common presentations.
- Hemiplegia / hemiparesis was the most common presentation.
- Hypertension was the most important contributing risk factor for ICH (76 %).
- Volume of haematoma ranged from 9 cc to 70 cc.
- 51 % had volume of hematoma more than 40 cc.
- Significantly high mortality was seen when volume was more than 40 cc (68.62%).
- Level of sensorium at the onset was the most important predictor of finaloutcome. Mortality with Glasgow Coma Scale <6 was 100 %, whereas the mortality with Glasgow coma scale >10 was 2.7 %
- Intraventricular Extension (IVE): Significantly high mortality was seen in patients with IVE (67.39 %).
- Significantly high mortality was observed in patients with midline shift of structures (55.38%).

IV. Conclusion

This study showed that ICH has a male preponderance, mostly occurring after 40 years of age. Motor deficit, coma, aphasia, vomiting, and headache are the predominant presenting symptoms.

- Hypertension is the most common risk factor.
- The most important prognostic factors arevolume of haematoma, intraventricular extension (IVE), midline shift of structures and Glasgow coma scale (GCS)less than 6 at onset.

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