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Original Research Article

AN OBSERVATIONAL STUDY ON PROGNOSTIC PREDICTORS IN PATIENTS WITH NON- TRAUMATIC INTRAPARENCHYMAL CEREBRAL HAEMORRHAGE IN PATIENTS ADMITTED TO A TERTIARY CARE HOSPITAL.

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Abstract:

Introduction: Intra parenchymal haemorrhage (IPH) which is a form of stroke syndrome results from the rupture of an intracerebral vessel leading to the development of a hematoma in the substance of the brain. Various factors have been identified as predicting outcome including age, gender, race, initial MAP, temperature, volume of bleed, site of bleed, intraventricular extension, mass effect and initial level of consciousness. Hence this study was done to evaluate various prognostic factors in predicting 30-day outcome (assessed by NIHSS score) of patients with non- traumatic intraparenchymal haemorrhage.

Methodology: An observational analytical study was done in 100 adult patients with acute stroke admitted in the medical ward of tertiary care hospital during October 2020 to January 2022. Institutional ethical committee clearance and patient's written informed consent was taken. Data was collected using a semi-structured questionnaire which includes age, gender, temperature in °F at admission, mean arterial pressure (MAP), Glasgow coma score (GCS) at admission to assess the severity of the bleed. CT brain was done on the day of admission and the following data were collected volume of Bleed, location of Bleed, presence / absence of Intraventricular haemorrhage.

Data entered in MS excel. Statistical analysis was done using SPSS 20 chisquare statistic and student T test was used with P<0.05 considered as statistically significant.
Results: Most common age group affected with IPH was 51-60 years (34%), followed by 61-70 years (23%). Majority were males (72%) with male:female ratio being 2.57:1. Prognostic predictors of 30-day mortality in non-traumatic IPH patients in this study are Volume >60ml, GCS <8, presence of IVH and MAP >145mm of Hg.
Conclusions: Age, gender, temperature do not have a significant role in detecting the 30-day mortality rate in patients with IPH. Volume of Bleed, GCS at admission, presence of IVH and mean arterial pressure have a significant role in detecting the 30-day mortality in IPH patients. Location of bleed at sites other than Brainstem did not have a difference in mortality in this study.

Keywords: Intraparenchymal haemorrhage, predictors, prognosis, 30 day mortality, tertiary care.

Introduction:

A stroke or cerebrovascular accident is defined as the abrupt onset of a neurologic deficit, that is attributable to a focal vascular cause. 80% of stroke is ischemic and remaining 20% is due to haemorrhage. Intracranial haemorrhage includes Intraparenchymal haemorrhage (IPH), Intraventricular haemorrhage and Subarachnoid haemorrhage.
Intra parenchymal haemorrhage which is a form of stroke syndrome results from the rupture of an intracerebral vessel leading to the development of hematoma in the substance of the brain [1,2,3]. Incidence rates are particularly high in Asians and blacks [4]. It constitutes 10% to 15% of all strokes and has a higher risk of morbidity and mortality then cerebral infarction and subarachnoid haemorrhage [5]. The 30day mortality ranges between 30% to 40% in hospital-based studies [6,7].
Many controversies surround the management of patients with IPH, which includes management of hypertension, treatment of raised ICP and appropriate use of surgical techniques. Since there is no sufficiently efficacious therapy for haemorrhage induced cerebral injury, prevention is the mainstay of treatment particularly hypertension [8].
A significant reason for the decreasing trend of mortality in the intra-parenchymal haemorrhage patients, in the industrialized countries have also been due to. the identification of the factors which might adversely affect the outcome, stratifying patients and instituting prompt acute stroke care. However, IPH continues to be a major health problem especially in those who lack hypertension treatment and who are genetically predisposed.
Various factors have been identified as predicting outcome including age, gender, race, initial MAP, temperature, volume of bleed, site of bleed, intraventricular extension, mass effect and initial level of consciousness. Although mortality is strongly dependent on hematoma size and to a lesser extent on location, the overall mortality rate varies between 25% and 60% [9].
This study was done to evaluate various prognostic factors in predicting 30-day outcome (as assessed by NIHSS score) of patients with non- traumatic intraparenchymal haemorrhage.

Methodology

An observational analytical study was done in 100 patients with acute stroke admitted in the medical ward of tertiary care hospital during October 2020 to January 2022. Patients were investigated for hemorrhagic stroke by obtaining a CT brain. Purposive sampling method was used. Institutional ethical committee clearance and patient's written informed consent was taken.

Inclusion Criteria

Adult patients with non- traumatic intraparenchymal hemorrhage admitted to medical wards were included.

Exclusion Criteria

Patients with history of trauma, with sub arachnoid hemorrhage alone, with intraventricular hemorrhage alone, with previous history of IPH and those who did not give consent were excluded.
Data was collected using a semi-structured questionnaire which includes age, gender, temperature in °F at admission, mean arterial pressure (MAP), Glasgow coma score (GCS) at admission to assess the severity of the bleed. CT brain was done on the day of admission and the following data were collected volume of Bleed, location of Bleed, presence / absence of Intraventricular hemorrhage.
Volume of bleed was calculated using the formula as given in study by LEE VH [10].i.e
Formula for ellipsoid = ABC / 2. A, B, C are the dimensions.
CT slices taken in our hospital were calibrated from 10 mm / 1 cm thickness. The slice with largest hemorrhage was found out and the largest diameter measured and is taken as 'A'. The diameter perpendicular to 'A' is taken as 'B' and 'C' is calculated by multiplying the number of hemorrhagic slices (n) and thickness of slice (1 cm). n was calculated by adding: 1 for hemorrhage area of a slice >75% of the largest hemorrhage area 0.5 for hemorrhage area of a slice 25 – 75% of the largest hemorrhage area. Hemorrhage area of a slice <25% is not included.
For example: n= slice (1) + slice (2) + slice (3)
= 1+0.5+0

n = 1.5
C = n x slice thickness
C = 2.5 x 1
C = 2.5 cm

By this method, volume of hemorrhage was calculated for all patients included in the study. Also the outcome at 30 days was noted. Patients were treated appropriately. The mortality or the morbidity status was noted at the end of 30 days as outcome using the NIHSS score.
Data analysis: Data entered in to MS excel 2013. Data represented as mean (SD) and proportions and bar diagrams. Statistical analysis was done using Chi-square test (fischer exact test when expected cell count less than 5), student t test with $P<0.05$ considered as statistically significant.

Results:

Results: Age ranges from 31 – 90 years. Most common age group with IPH was 51-60 years (34%), followed by 61-70 years (23%) with mean age being 62.3 years. Majority were males (72%) with male: female ratio being 2.57:1. Hypertension was the most common comorbidity (32%) followed by diabetes mellitus (18%) and cardiovascular diseases (10%). Outcome at the end of 30 day noted were 51% dead and 49% alive. (table 1)

Table 1: Distribution by patients characteristics

PARAMETERS	Sub- group	Frequency	Percentage
Age in years	31- 40 years	7	7
	41– 50 years	17	17
	51– 60 years	34	34
	61 - 70 years	23	23
	71- 80 years	16	16
	81 – 90 years	3	3
Age (years) Mean±SD		62.3±23.8	
Sex	Male	72	72
	Female	28	28
comorbidities	Diabetes Mellitus	18	18
	Cardiovascular diseases	10	10
	Hypertension	34	32
30 day outcome	Alive	49	49
	Dead	51	51

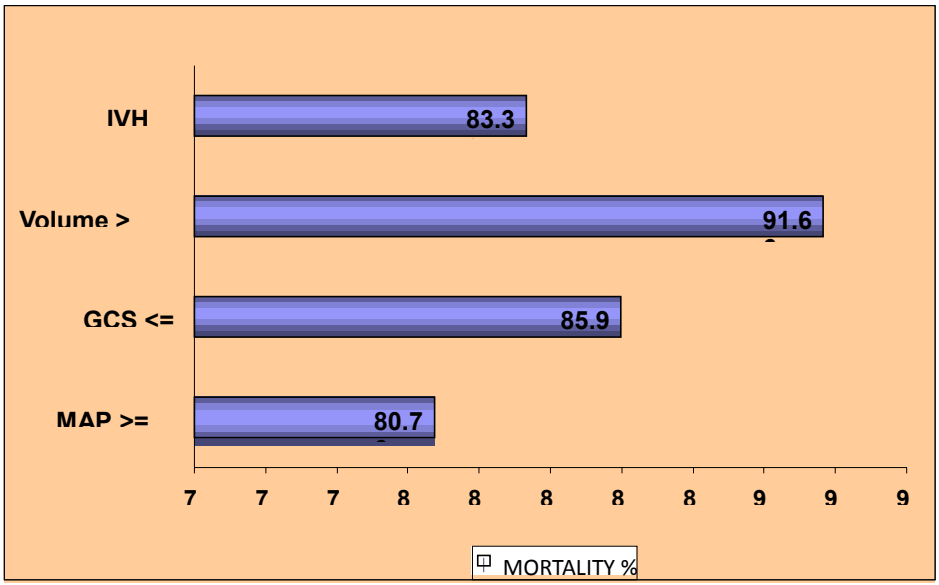
Though mean age was more in patients who died when compared to alive patients it was not significant statistically. Incidence of IPH is higher in males, but the mortality rate is higher in the females which was not significant statistically. Death was seen in more proportion of patients with temperature ≥103°F compared to patients with temperature <103degree F which was significant statistically. Incidence of IPH is high in patients who are not known hypertensives than in known hypertensives. Mortality is higher in non-hypertensive IPH which was not significant statistically. (table 2)

Table 2: variables assessed versus 30 day outcome

Variable	Sub category	30 Day outcome		Chi-square statistic/ t test - P value
		Alive (49)	Dead (51)	
Age (years) Mean±SD		52(24.5)	57 (34.2)	0.837/ 0.404
Sex	Male (72)	37 (51.4%)	35 (48.6%)	0.587/ >0.05
	Female (28)	12 (42.8%)	16 (57.2%)	
Temperature	Temperature >103°F (15)	5 (33.3%)	10(66.7%)	7.34/ 0.0067
	Temperature <103°F (85)	44(51.8%)	41 (49.2%)	
Hypertension	Yes (34)	20 (58.8%)	14 (39.2%)	1.989/ 0.158
	No (66)	29 (43.9%)	37 (56.1%)	
MAP	>145 mm Hg (26)	5 (19.2%)	21 (80.8%)	12.459/ 0.0004
	< 145 mmHg (74)	44(59.4%)	30(40.6%)	
GCS	<8 (57)	8(14%)	49(86%)	64.849/ <0.00001

	>8 (43)	41(95.3%)	2(4.7%)	
Volume of bleed	Volume <30 ml (51)	41(80.4%)	10(19.6%)	Fischer exact test- 41.45/ <0.00001
	Volume 30 - 60 ml (37)	7(18.9%)	30(81.1%)	
	Volume >60 ml (12)	1(8.3%)	11(91.7%)	
Location of bleed	Gangliocapsular (49)	26(53.1%)	23(46.9%)	3.716/ 0.29
	Lobar (24)	12(50%)	12(50%)	
	Thalamus (20)	10(50%)	10(50%)	
	Brainstem (7)	1(14.3%)	6(85.7%)	
IVH	Present (48)	8(16.7%)	40(83.3%)	38.6/ <0.00001
	Absent (52)	41(78.8%)	11(21.2%)	

The mortality rate in patients with MAP >145mm Hg is almost double that of patients with MAP<145mm Hg which was significant statistically. The mortality rate in patients with GCS >8 is less that of patients with GCS <8 which was significant statistically. Mortality significantly increases with increase in volume of bleed patients with volume of bleed >60 ml have 91.7% mortality followed by volume of bleed 30-60 ml(81.1%) and <30 ml(19.6%) and this difference was significant statistically. Basal ganglia was the most common site of bleed followed by the lobar, thalamus and brainstem. Mortality is significantly high with brainstem hemorrhage (85.7%). Presence of intraventricular hemorrhage carries a high risk of death which was significant statistically.



Thus the prognosis predictors of 30-day mortality in non-traumatic IPH patients in this study are Volume >60ml, GCS ≤8, presence of IVH and MAP >145mm of Hg. (figure 1)

Figure 1: Prognostic predictors of 30 day mortality in patients with IPH

Table 3: RELATION BETWEEN GCS AND NIHSS SCORE AT 30 DAYS

Type of patient	No. of patientsalive	Patientswith NIHSS <6	Patientswith NIHSS >6	Morbidity Rate (%)	P-Value
GCS ≤8	8	0	8	100	<0.01
GCS >8	41	35	6	15	
Total	49	35	14		

GCS is directly related to decreased NIHSS score. Higher the GCS, lower the NIHSS score.(table3)

Discussion:

Hundred patients were included in this study and 51 patients died at the end of 30 days. The 30-day mortality rate was 51% in this study.
Intraparenchymal hemorrhage was common in the 51- 60 yrs age group and death was also common in this age group. But age with a p value of 0.404 was insignificant as a prognostic factor in our study. In a study done by William chongruksut et al, age over 65 years and hypertension were an important predictor of 30-day mortality in a subgroup of intracerebral haemorrhage (ICH) patients [11]. In a study done by Karin radholmet al, INTERACT2 cohort, older people had more severe ICH and worse outcomes was not found significant similar to our study [12]. A study done by Debabratagoswami et al, found age to be a significant factor for poor outcome, though in our study higher age groups had higher mortality rates but age was not significant [8]. In a study done by Al mufti et al, old age is both a risk factor for ICH incidence and a predictor of worse outcome. ICH incidence increases with age [13]. But in our study increasing age does not carry any significance in predicting mortality which was similar to study by Forti P et al where age was unrelated to all other ICH characteristics [14].

In our study, IPH was common in males and it was found that a male has a 3 times risk of developing IPH. Though the mortality rate was high in females but p value is > 0.05 which implies gender was not significant enough to prognosticate 30-day mortality. A study done by Latha Ganti et al, found that female gender is an independent predictor of early mortality in ICH patients (p value 0.0127), even after adjustment for stroke severity, haemorrhage volume, IVE, serum glucose levels, and age [15].

In this study only 15 patients out of 100 patients had temperature above 103-degree F and out of them 100 patients died – 8 of them had brainstem Bleed with P value 0.006. In a study conducted by Asaf Honig et al, it was found that the risk of central fever is increased in patients with larger IPH and in those with IVH. Central fever negatively impacts outcome in patients with ICH. But the outcome cannot be attributed to fever as patients also had larger ICH and IVH which could be cause for the raised temperature and poor outcome [16].

In this study out of 100 patients, 32 patients were known hypertensive and the mortality rate was half in the patients compared to the non-hypertensive. This may be either due to the reason that they were undiagnosed hypertensive or due to the difference in the pathogenesis of an acute rise in BP and a chronic rise in BP. The p value for hypertension being 0.1, found to be insignificant in predicting mortality and further studies regarding the endothelial damage in these patients may clarify these queries. In a study done by William chongruksut et al, ages over 65 years and hypertensive were an important predictor of 30-day mortality in a subgroup of ICH patients [11]. In our study further evaluation is required to know exact pathology, especially in newly detected cases of hypertension.
Among the 51 dead patients 21 had a MAP of more than 145mm Hg in our study. MAP had a p value of 0.0004 and was found to be a highly significant predictor. A study done by Chu et al on SBP, DBP, MAP it was concluded that MAP can be used to predict short term mortality in ICH, as in our study [17]. A goal of MAP 110 mm hg is recommended in patients without elevated intracranial pressure. A

strict targeted control of MAP significantly reduces mortality and morbidity in ICH patients. Thus, MAP significantly affects mortality.

GCS has got a very strong association over the 30-day mortality. The p value for GCS < 0.00001 was found to be significant in our study. Furthermore, the degree of impairment of consciousness depends on the location, size and extension of bleed to deep structures. Study done by NN Suthar et, found that GCS at the time of admission in a case of ICH to be a significant predictor for mortality [18]. Patients with GCS of < 8 had poor outcome similar to our study. In a study done by Ajayhegde et al, on clinical profile and prognostic factors on ICH found that, low GCS was an important prognostic factor similar to our study [9].

In our study, 48 patients had IVH out of which 40 died and p value of IVH was found to be <0.00001, which was highly significant. Study done by Al mufti et al, concluded IVH had highly significant value in predicting mortality along with the other variables he compared, p value for IVH being 0.0001 in his study [13]. Study done by C. Stretz et al, concluded that IVH to be an important predictor of mortality similar to our study. But he also studied IVH with hydrocephalus which worsened the outcome even more [19]. In a study done by NN Suthar et al, on ICH score predicted IVH to be an important factor in prognosis [18].

The volume of bleed p value obtained in our study was <0.00001 which was highly significant. The volume of bleed of > 60 ml in 12, out of which 11 died, and those with 30-60ml thirty patients died in our study. Higher volume is associated with mortality. Studies of Godoy and Bakhtavar showed that unfavourable outcome (mortality) was higher in groups with greater hematoma volume, which is similar to our study [20,21]. Daveret et al and Lampl et al showed that hematoma volume influenced short term prognosis in patients with ICH and is similar to our study [22,23]. Hence hematoma volume measurement by abc/2 formula is an effective method to predict the mortality in patients with ICH within 30 days of presentation the greater the mortality.

The location of bleed p value obtained was 0.29 in our study which was not significant in predicting the mortality. Basal ganglia was the common site of Bleed. Nearly 50% cases were Basal ganglia Bleed. 25% Lobar Bleed, 20% Thalamic Bleed and 5% Brainstem bleed. In a study done by Ajay Hegde et al 2020, on Clinical Profile and Predictors of Outcome in Spontaneous Intracerebral Haemorrhage, location of bleed was significant in predicting prognosis, which was not similar to our study [9].

CONCLUSION:

Age, Gender, Temperature do not have a significant role in detecting the 30-day mortality rate in patients with IPH. Volume of Bleed, GCS at admission, presence of IVH and mean arterial pressure have a significant role in detecting the 30-day mortality in IPH patients. Location of bleed at sites other than brainstem did not have a difference in mortality in this study. Studies with larger number of patients with different locations of bleed may throw some light on this aspect. Early detection of hypertension and prompt management can prevent the occurrence of event.

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