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Mohammad Wasay  
*Aga Khan University*

Bhojo A Khealani  
*Aga Khan University*

Saad Shafqat  
*Aga Khan University*

Ayesha Kamal  
*Aga Khan University*

Nadir Ali Syed  
*Aga Khan University*

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# Hypotension at presentation is an indicator of poor prognosis in acute intracerebral haemorrhage

Mohammad Wasay, Bhojo A Khealani, Saad Shafqat, Ayesha Kamal, Nadir Ali Syed  
Department of Neurology and Community Health Sciences, The Aga Khan University, Karachi.

## Abstract

**Objective:** To identify frequency of hypotension in a large cohort of patients with intracerebral haemorrhage and its prognostic significance.

**Methods:** We retrospectively reviewed medical records of 920 patients with spontaneous intracerebral haemorrhage (ICH). Patients were divided in three groups based on Diastolic blood pressure (DBP); hypotensive group (DBP <70 mmHg), normotensive group (DBP; 71-90 mmHg) and hypertensive group (DBP>90 mmHg).

**Results:** Of the total patients with ICH, 7% (64) presented with hypotension, 13% (120) were normotensive and 80% (736) were hypertensive. In the hypotensive group, 37% (24) patients died as compared to 25%(30) in normotensive group and 25% (182) in hypertensive group (p=0.03). Hypotension at presentation, thalamic and lobar haemorrhages were predictors of poor outcome. Patients with diastolic BP of less than 70 were significantly more likely to die than with DBP 71-90 (OR= 1.9, 95% CI; 1.1-2.9, p= 0.03). This relationship was still significant after adjusting for age, sex, history of presentation, coma at presentation and location of haemorrhage (OR=1.45, 95% CI; 1.0-2.2, p= 0.045).

**Conclusion:** Our findings suggest that hypotension at presentation is a predictor of poor outcome in patients with ICH. Patients with diastolic blood pressure less than 70 are more likely to have a fatal outcome as compared to those with normal blood pressure (JPMA 58:359;2008).

## Introduction

Most patients with intracerebral haemorrhage (ICH) present with high blood pressure.<sup>1</sup> Multiple guidelines and consensus statements are available on management of high blood pressure in patients with stroke.<sup>2</sup> Extremely high blood pressure is a known indicator of poor prognosis in ICH.<sup>3,4</sup> Literature is scarce regarding prognostic value of hypotension in patients with ICH. One study suggested that a rapid decline of mean arterial pressure within first 24 hours was independently associated with increased mortality.<sup>5</sup> A recently published article suggested that hypotension in Emergency Room is a predictor of survival after acute ischaemic stroke.<sup>6</sup> Hypotension at presentation in ICH may be small in magnitude but its identification and proper management may affect the outcome.

## Patients and Methods

We retrospectively reviewed medical records of 920 consecutive patients with spontaneous intracerebral haemorrhage during a period from 1995-2005. Blood pressure was measured by Emergency Room nurses using automated Blood Pressure apparatus with a standard cuff. The time interval between bleed and BP measurement was variable. Seventy percent patients presented within 6 hours of bleed, 22% within 7-24 hours and 8% in 24-48 hours. Neurological examination was performed by a Neurology Resident in ER. Glasgow Coma Scale (GCS)<sup>7</sup> was used for

documentation of mental status. Outcome was assessed at discharge as dead or alive. Patients were divided in three groups based on Diastolic blood pressure (DBP); hypotensive group (DBP <70 mmHg), normotensive group (DBP; 71-90 mmHg) and hypertensive group (DBP>90 mmHg). This division and cut off values are arbitrary and was not based on any previously published study.

We performed nonparametric analysis (chi square tests) for significance among three groups.(Table 1) Association between death and categories of diastolic blood pressure was analyzed by Logistic regression analysis. Adjusted analysis was done after adjusting for age, sex, history of presentation, coma at presentation and location of haemorrhage.

## Results

There was no significant difference in age (p-value=0.19), sex (p=0.127) and history of diabetes mellitus (p=0.118) among three groups. History of hypertension was present in 60% of hypotensive group as compared to 75-88% of normo or hypertensive group (p=0.051). Three groups were similar in location of haemorrhages except Thalamic or Lobar haemorrhage, which was more prevalent in hypotensive group. Coma on presentation (p=0.039), thalamic haemorrhage (p=0.010), lobar haemorrhage (p=0.009) and death of the patient (p=0.034) were significant predictors for different levels of blood pressure.

**Table 1. Distribution of predictors by different levels of blood pressure.**

| Predictors              | Hypotensive | Normotensive | Hypertensive | P value |
|-------------------------|-------------|--------------|--------------|---------|
|                         | n (%)       | n (%)        | n (%)        |         |
| Number of patients      | 64          | 120          | 736          |         |
| Percent                 | 7%          | 13%          | 80%          |         |
| Mean Age + SD           | 58 12       | 56 +10       | 57 12        | 0.190   |
| Sex:                    |             |              |              | 0.127   |
| Men                     | 41(64%)     | 83(69%)      | 442(60%)     | 0.051   |
| Women                   | 23(36%)     | 37(31%)      | 294(40%)     | 0.118   |
| History of hypertension | 38(60%)     | 90(75%)      | 651(88%)     | 0.039   |
| Diabetes                | 13(20%)     | 30(25%)      | 177(24%)     | 0.107   |
| Comatose                | 22(35%)     | 37(31%)      | 226(31%)     | 0.010   |
| Basal ganglia bleed     | 38(59%)     | 84(70%)      | 494(67%)     | 0.009   |
| Thalamic bleed          | 28(43%)     | 24(20%)      | 169(23%)     | 0.155   |
| Lobar hemorrhage        | 18(29%)     | 12(10%)      | 90(12%)      | 0.100   |
| Brain stem bleed        | 4(7%)       | 8(7%)        | 43(6%)       | 0.092   |
| Cerebellar hemorrhage   | 3(5%)       | 6(5%)        | 37(5%)       | 0.034   |
| Intraventricular blood  | 6(10%)      | 17(14%)      | 101(14%)     |         |
| Death                   | 24(37%)     | 30(25%)      | 182(25%)     |         |

**Table 2. Association between diastolic blood pressure and mortality**

| Diastolic BP(mmHg) | Number of patients | Mortality at discharge | Odds ratios    |         | Adjusted Odds ratios* |         |
|--------------------|--------------------|------------------------|----------------|---------|-----------------------|---------|
|                    |                    |                        | 95% CI         | P value | 95% CI                | P value |
| Less than 70       | 64                 | 37%                    | 1.9 ( 1.1-2.9) | 0.03    | 1.45 (1.0-2.2)        | 0.045   |
| 71-90              | 120                | 25%                    | Reference      |         | Reference             |         |
| More than 91       | 736                | 25%                    | 1.1 (1.0-1.4)  | 0.09    | 1.1 (0.9-1.3)         | 0.10    |

\* After adjusting for age, sex, history of hypertension, coma at presentation and location of hemorrhage

The association between different levels of blood pressure with coma on presentation ( $p=0.049$ ), thalamic haemorrhage ( $p=0.015$ ), lobar haemorrhage ( $p=0.013$ ) and death of the patient ( $p=0.03$ ) were found to be significant (Table 1).

The relationship between patients adjusted risk of death and diastolic blood pressure categories is shown in Table 2. Patients with diastolic BP of less than 70 were significantly more likely to die than with DBP 71-90 (OR= 1.9, 95% CI; 1.1-2.9,  $p= 0.03$ ). This relationship was still significant after adjusting for age, sex, history of presentation, coma at presentation and location of haemorrhage (OR =1.45, 95% CI; 1.0-2.2,  $p= 0.045$ ). The relationship between patients with DBP more than 90 and DBP 71-90 was not significant (OR =1.1, 95% CI; 1.0-1.4,  $p= 0.09$ ).

## Discussion

Our findings suggest that hypotension (Diastolic BP less than 70 mm Hg) is a predictor of poor outcome in patients with ICH. Patients with this blood pressure are

more likely to die as compared to normal blood pressure. The poor outcome related to hypotension in the setting of ICH is most likely related to poor cerebral perfusion pressure leading to extension of neuronal injury.<sup>8,9</sup> It is suggested that early hypotension in patients with acute ischaemic stroke is associated with two fold increase in mortality. Excessive blood pressure reduction in first 24 hours of acute ischaemic stroke is associated with poor functional outcome.<sup>9</sup> An association between hypotension and mortality in patients with ICH has not been previously reported. Interestingly our study did not show any difference between normotensive group (DBP 71-90) and hypertensive group (DBP more than 90). These findings are in contrast to previously published reports related to ischaemic stroke as well as ICH.<sup>3,4,8</sup> A possible explanation for this effect could be a low cut off for our hypertension group as 80% patients in our study had a DBP more than 90 (Range 91-184 mmHg). A normal or low diastolic blood pressure (< 90 mmHg) is uncommon in the setting of acute ICH. Most of these patients were known hypertensives. Only 7% patients were hypotensive at the time of

presentation. There could be several reasons for hypotension in the setting of ICH including a direct relation to ICH or a systemic cause like Myocardial infarction or sepsis. Our study was not designed to identify the exact cause of hypotension in our patients. Lack of serial blood pressure measurements is another limitation which is mandatory to identify persistence of hypotension and its likely correlation with mortality. We do not know how aggressively these patients were treated and was outcome any different in patients whose blood pressures were corrected. This may not be important as results of induced hypertension in ischaemic stroke has not been encouraging in the past but these trials have enrolled patients irrespective of initial blood pressure.<sup>11</sup>

Outcome was assessed at discharge using only one variable; dead or alive. This is a limitation of our study. Long term functional outcome was not available due to lack of follow up data. Interestingly, we identified a positive correlation between thalamic or lobar haemorrhage and hypotension. Autonomic dysfunction and cerebral haemodynamic abnormalities in relation to thalamic haemorrhage have been previously reported.<sup>12</sup> Cortical areas of the brain specially insular cortex and fronto parietal cortex may be associated with autonomic dysfunction.<sup>13</sup> These findings may explain high frequency of hypotension among patients with thalamic or lobar haemorrhage.

These findings are important as they represent a departure from standard thinking that only high blood pressure is bad and BP should be aggressively lowered in acute ICH. Our study suggests that hypotension in setting of acute ICH could be equally bad and should be avoided. Further prospective, well- designed studies may help to extend our findings.

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