Anemia on Admission Increases the Risk of Mortality at 6 Months and 1 Year in Hemorrhagic Stroke Patients in China

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Background: The relationship between anemia and intracerebral hemorrhage is not clear. We investigated the associations between anemia at the onset and mortality or dependency in patients with intracerebral hemorrhage (ICH) registered at the China National Stroke Registry (CNSR). *Methods:* The CNSR recruited consecutive patients with diagnoses of ICH in 2007-2008. Their vascular risk factors, clinical presentations, and outcomes were recorded. The mortality and dependency at 1, 3, and 6 months and at 1 year were compared between ICH patients with and without anemia. A favorable outcome was defined as a modified Rankin Scale (mRS) score of 2 or less and a poor outcome as an mRS score of 3 or more. Multivariable logistic regression was performed to analyze the association between anemia and the 2 outcomes after adjusting for age, gender, body mass index, history of smoking and heavy drinking, National Institutes of Health Stroke Scale score on admission, random glucose value on admission, and hematoma volume. *Results:* Anemia was identified in 484 (19%) ICH patients. Compared with ICH patients without anemia, patients with anemia had no difference in mortality rate at discharge and at 1 month. The rate of mortality at 3 months, 6 months, 1 year, and dependency at 1 year were significantly higher for those patients with anemia than those without ($P < .05$, $P < .001$, $P < .001$, and $P < .05$, respectively). After adjusting for potential confounders, anemia was an independent risk factor for death at 6 months and 1 year (adjusted odds ratio [OR] = 1.338, 95% confidence interval 1.01-1.78, and adjusted OR = 1.326, 95% confidence interval 1.00-1.75) in ICH patients. *Conclusions:* Anemia independently predicted mortality at 6 months and 1 year after the initial episode of intercerebral hemorrhage. **Key Words:** Intercerebral hemorrhage—anemia—dependency—mortality.

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Introduction

Intracerebral hemorrhage (ICH) accounts for 10%-15% of all stroke cases[1] and is associated with high rates of mortality and morbidity.[2] Only 12%-33% among ICH patients have an independent life after 6 and 12 months.[3,4] This is particularly true in China where it accounts for between 17.1% and 55.4% of all strokes,[5,6] which show an higher rate than Western countries.[7,8]

Anemia is considered a risk factor and common in patients with ICH. Anemia (definition of the World Health Organization is Hb $<$ 12 g/dL in woman and $<$13 g/dL in men) is common in elderly patients (age-standardized prevalence of $\approx$8.5%) and associated with increased risk of hospitalization and mortality.[9,10] Several studies have demonstrated that low hemoglobin levels were associated with poor outcome or death after ischemic stroke.[11-16] Approximately 19% of patients with acute ischemic stroke have anemia on admission.[12] However, the relationship between anemia and outcomes in ICH patients is inconclusive.[12,17,18] Our study systematically analyzed the effect of anemia on admission and its effect on mortality or functional dependency in Chinese patients with ICH at discharge, 3 months, 6 months, and 1 year.

Methods

China National Stroke Registry (CNSR) is a multicenter, prospective, cohort study aimed at studying vascular risk factors, clinical characteristics, diagnosis, treatment, and prevention for patients with acute stroke. All patients were followed for outcome at 1 year.

ICH is diagnosed by brain axial computerized tomography (CT) according to the World Health Organization criteria.[19] ICH patients were recruited by this registry who met the following criteria: (1) older than 18 years and (2) acute occurrence within 14 days after the onset of symptoms. Patients were excluded if ICH was caused by tumor, trauma, subarachnoid hemorrhage, primary intraventricular hemorrhage, no data of ICH hematoma volume, prestroke modified Rankin Scale (mRS) score greater than 2, participation in other research, or lost to follow-up. Our study has been approved by the ethic committee at Beijing Tiantan Hospital, Capital Medical University.

Baseline Data

Complete data sets include sex, age, blood pressure (in mm Hg), body mass index (BMI, calculated as measured

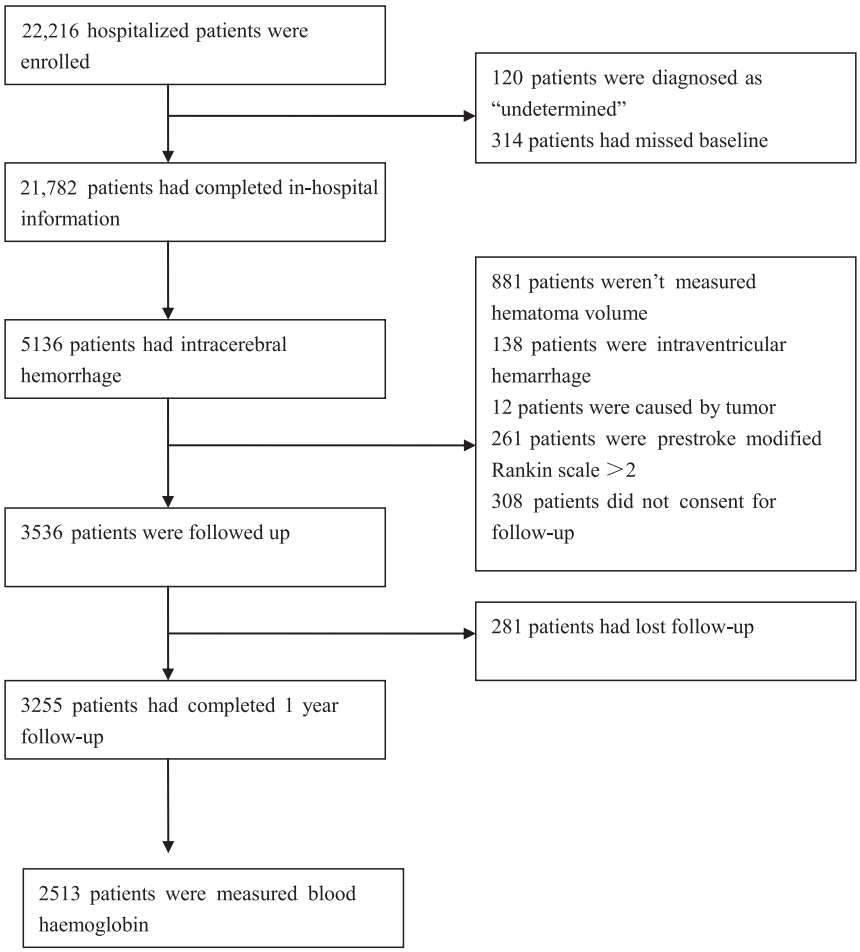

Figure 1. *Patients inclusion chart.*