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Letter to the Editor

Response to letter of "hemoglobin level as a predictor of clinical outcome in patients with ischemic stroke" by Tomoyuki Kawada

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To the Editor,

We are grateful to Tomoyuki Kawada for the interest in our article—"Hemoglobin level and three-month clinical outcomes among ischemic stroke patients with elevated systolic blood pressure" [1]. It makes sense to involve peer scientists in the extensive discussions on our findings. The aim of our study was to investigate the association between hemoglobin and prognosis of ischemic stroke among patients from the CATIS (China Antihypertensive Trial in Acute Ischemic Stroke).

Hemoglobin is a routine laboratory index in clinical practice, which is simple and easy to test at acute phase. Thus, much research has focused on the hemoglobin including functional study and clinical study. As we described in the paper, reports regarding relationship between hemoglobin levels and prognosis of ischemic stroke are inconsistent so far. A reason for the inconsistency may be due to the characteristic of hemoglobin. First, hemoglobin is the multiple indicators of both anemia (low hemoglobin) and vascular blood clotting (high hemoglobin) [2]. Low and high hemoglobin levels are both associated with the risk of cardiovascular disease due to different mechanisms [3–6]. Second, elevated blood pressure that is common in the acute phase of ischemic stroke is associated with high hemoglobin (we have discussed in the paper). Not only stroke patients with elevated blood pressure may have an elevated hemoglobin, but also the long-term elevation of hemoglobin has a harmful effect on the blood pressure and the entire vascular system. Therefore, in a certain sample size, choosing hypertensive patients (All ischemic stroke patients in CATIS are hypertensive or with elevated blood pressure) may enable us to investigate the association between elevated hemoglobin levels and prognosis of ischemic stroke with high statistical power. However, this study was not applicable to assess the association of low hemoglobin levels with poor outcomes after ischemic stroke because of a low rate of anemia among the participants. We have added the limitation that this study is not applicable to assess the association of low hemoglobin levels with poor outcomes after ischemic stroke.

In our study, modified Rankin Scale (mRS) score was used to evaluate the clinical outcomes at 3 months after stroke. Major disability was defined as a score of three to five on the mRS at 3 months, and death was defined as a score of six. Thus, many large clinical trials on the prognosis of ischemic stroke have combined major disability or death as the primary outcome [7–9]. A score of five on the mRS indicate severe disability (ie, bedridden, incontinent, or requiring constant nursing care and attention), and patients with a score of five are often close to death, but we classified these patients as major disabilities. Therefore, the major disability and death are a continuous process according to scores on the mRS. We believe that the combined outcome (major disability or death) may be more useful for clinical practice. Using composite outcome of major disability or death as our primary outcome was in line with the objective requirements of stroke prognosis studies and consistent with the clinical and epidemiological literatures.

The present study found a significant association of high hemoglobin with composite outcome of death or major disability, and the association seemed to be stronger for major disability than for death. These indicated that elevated hemoglobin might mainly affect functional recovery of ischemic stroke patients. In addition, the severity of CATIS participants was relatively low [NIHSS score: 4 (2–7)], so the largest number of poor outcomes in the present study were major disability. The relatively few number of death were observed during 3-month follow-up of relatively short time, which might limit our power to detect significant association between hemoglobin and death. Further long-term follow-up studies are required to examine their relationships.

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Disclosures

None.

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Daoxia Guo, Yonghong Zhang*
Department of Epidemiology, School of Public Health, Jiangsu Key Laboratory of Preventive and Translational Medicine for Geriatric Diseases, Medical College of Soochow University, Suzhou, Jiangsu, China
E-mail address: yhzhang@suda.edu.cn (Y. Zhang).

* Corresponding author at: Department of Epidemiology, School of Public Health, Jiangsu Key Laboratory of Preventive and Translational Medicine for Geriatric Diseases, Medical College of Soochow University, 199 Renai Road, Industrial Park District, Suzhou, Jiangsu Province 215123, China.