



Editorial on the paper by Leung *et al.* “Associations between body-mass index and second-hand smoke exposure and stroke recurrence in Chinese patients in Xi’an, Shantou, and Chongqing: a multicentre cross-sectional survey”

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Comment on: Leung DY, Wong EM, Chan AW, *et al.* Associations between body-mass index and second-hand smoke exposure and stroke recurrence in Chinese patients in Xi’an, Shantou, and Chongqing: a multicentre cross-sectional survey. *Lancet* 2016;388 Suppl 1:S50.

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The global burden of stroke is significant with an annual incidence of more than 15 million first-ever strokes and nearly six million deaths every year. Considering demographic changes with ageing population, further increase of stroke rates is expected (1,2). Moreover, stroke also increasingly affects younger patients—recent data suggest that about 15% of all patients with stroke are younger than age of 65 years (3). The World Health Organization calls stroke therefore the incoming epidemic of the 21st century. Lifestyle modification is of particular interest for stroke prevention, as age-adjusted incidence of stroke has decreased by up to 42% in developed countries within the last 30 years, whereas an increase by more than 100% has been reported in developing countries (4). Recent studies suggest that up to 75% of global stroke burden is attributable to modifiable behavioural factors such as smoking, poor diet and low physical activity (5). The two latter factors are associated with obesity, which is also an established risk factor for the development of vascular diseases such as stroke. It has been shown that each unit increase of BMI was associated with a significant 6% increase in the adjusted relative risk of stroke (6), the association between BMI and risk of ischemic stroke was linear (7), similar in men and women and regardless of race (8). Tobacco smoking is another major independent risk factor for ischemic stroke (9). Recent data show that even second-hand smoking is known to raise the relative

stroke risk by about 30% (10).

In this study, Leung and colleagues assessed the relationship between body mass index (BMI), second-hand smoke (SHS) exposure and risk of stroke recurrence in 503 stroke patients. They included surveys between April 2012 and December 2013. A total of 202 patients (40%) suffered stroke recurrence. Logistic regression analysis showed a higher rate of recurrent stroke in patients with underweight (BMI <18.5 kg/m²) whereas patients with overweight (BMI ≥24 kg/m²) had similar risk for stroke recurrence compared to patients with normal weight. There was no association between SHS exposure at home or at work with recurrence of stroke. They concluded that optimal weight management should take essential part of secondary prevention and stroke rehabilitation.

This study indicates that physicians should also consider underweight and malnutrition as significant challenge in stroke patients. Severe underweight has been shown to be an independent significant risk factor for intracranial hemorrhages and cerebral microbleeds, even after adjustment for age, smoking, and pre-existing illness (11). Stroke patients with hypoalbuminemia at admission suggesting malnutrition had an increased risk of infective complications and poor functional outcome (12). Malnutrition has a high prevalence of 20–60% in patients on hospital admission, whereas underweight is a main indicator of malnutrition (13). Both underweight and

malnutrition correlate with higher risk for mortality (14,15). The high rate of 40% stroke recurrence in the current study by Leung *et al.* is unusual and remarkable. These numbers are controversial to recent studies describing stroke recurrence rates of 1.2–3.3% after one month and 9.2–14.1% after two years (16). This may be due to the fact that the underlying time period is not defined in the present study. Furthermore, we lack data on baseline characteristics of study population and the number of patients may be too low for a firm conclusion. Nevertheless, patients with underweight and/or malnutrition may be especially prone to adverse outcomes given the high catabolic stress in the acute phase of stroke. Frequency of malnutrition in these stroke patients and their outcome would be valuable to define to current burden and to plan nutritional intervention studies accordingly in this high risk-group.

On the other hand, most observational data indicate a survival benefit of obese patients after stroke which is called “obesity paradox”. However, a number of methodological concerns exists (17). No obesity paradox was observed in patients after intravenous thrombolysis (18,19). There is a need for well-designed and adequately-powered randomized controlled trials assessing the effects of weight reduction on stroke occurrence and recurrence in obese patients. Though conflicting results from observational studies reporting better stroke outcomes in obese patients or those with current smoking, optimal weight management and smoking cessation should still be strictly recommended to patients at stroke risk (20).

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appropriately investigated and resolved.

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