



## Original Research

# Malnutrition Rate in Stroke Patients on Admission

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### Abstract

**Objectives:** Malnutrition is frequently observed in patients with acute stroke and its prevalence after stroke varies widely among published reports. Differences in the timing of assessment, stroke type, comorbid medical conditions, and stroke complications may have contributed to this large variability. This study is conducted to investigate the prevalence of malnutrition, and its associated risk factors in stroke patients admitted to our stroke clinic.

**Methods:** A prospective design was used to measure the nutritional status and nutritional risk of stroke patients during hospitalisation between June 2016 and February 2017. Nutritional status was measured at admission. Demographic data and information on clinical variables were collected, which included the patient's age, gender, type of stroke and other comorbid disorders. Blood samples, including concentrations of high-sensitivity C-reactive protein (CRP), serum albumin, serum creatinine, lipid profile and serum lymphocyte count, were measured by routine methods. Nutritional status was measured using the Mini Nutritional Assessment (MNA); for elderly stroke patients (age older than 65). For stroke patients younger than 65 age, Nutrition Screening 2002 (NRS 2002) was used.

**Results:** 318 patients with acute stroke were assessed for their nutritional status at admission. There were 145 (45%) female and 173 (55%) male patients. Their mean age was  $66.16 \pm 14.32$ . 66.1% of the patients elder than 65 years were malnourished. 12.2% of the patients younger than 65 years were found to be malnourished. We found no relationship between comorbidities and malnutrition, except hyperlipidemia. Nourished stroke patients older than 65 years had higher serum lipid levels than the malnourished patients. We also found no relationship between malnutrition biomarkers and being malnourished.

**Conclusion:** Malnutrition is frequently observed in patients with stroke. Early recognition of malnutrition is crucial, but the absence of valid markers hampers to find out the presence of malnutrition. Thus, further research is needed in targeting the modifiable nutrition risk factors and give attention to nutrition in stroke patients.

**Keywords:** Comorbidities; malnutrition; stroke.

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The term "malnutrition" represents an important preventable complication of acute stroke and is used to describe a large number of nutritional abnormalities. Malnutrition is frequently observed in patients with acute stroke and its prevalence after stroke varies widely among published reports.<sup>[1]</sup>

Knowing the prevalence of malnutrition of patients with acute stroke at admission and during hospital stay provides insight into the importance of preventive nutritional

interventions during hospitalization. Studies showed that, at admission to the hospital, 16%-49% of the patients with acute stroke were already malnourished.<sup>[2, 3]</sup> Differences in the timing of assessment, stroke type, comorbid medical conditions, and stroke complications might have contributed to this large variability.<sup>[4, 5]</sup>

The present study aims to investigate the prevalence of malnutrition, and its associated risk factors in stroke patients residing in our stroke clinic.

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## Methods

In this study, a prospective design was used to measure the nutritional status and nutritional risk of patients during hospitalisation. After obtaining ethical approval from the local research Ethics Committee, this study took place on the stroke unit of our hospital between June 2016 and February 2017.

## Participants

318 patients with the diagnosis of a stroke, defined by the World Health Organization (WHO) as a clinical syndrome consisting of "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin" were included in this study.<sup>[6]</sup>

## Data Collection

Patients' nutritional status was measured at admission (t1=day 2-5). Demographic data and information on clinical variables were collected. Demographic data included the patient's age, gender, type of stroke and other comorbid disorders. Blood samples were collected in the morning. Concentrations of high-sensitivity C-reactive protein (CRP), serum albumin, serum creatinine, lipid profile and serum lymphocyte count were measured by routine methods. Nutritional status was measured using the Mini Nutritional Assessment (MNA) for elderly stroke patients (age older than 65).<sup>[7]</sup>

The purpose of MNA is to detect the presence of undernutrition and the risk of undernutrition among the elderly in home-care programmes, nursing homes and hospitals. The MNA includes anthropometric measurements: body mass index (BMI), mid-arm circumference, calf circumference, weight loss, questions related to lifestyle, medication, and mobility, a dietary questionnaire and a subjective assessment (self-perception of health and nutrition) with a maximum score of 14 and scores of  $\geq 12$  indicating a satisfactory nutritional status. A screening score of  $\leq 11$  indicates possible malnutrition.<sup>[8]</sup>

For stroke patients younger than 65 age, Nutrition Screening 2002 (NRS 2002) was used.<sup>[9]</sup> The NRS consists of five items: (i) the age of the patient, (ii) the BMI, (iii) the appetite of the patient, (iv) accidental weight loss and (v) the consideration of the severity of acute illness of the patient. The severity of the malnutrition was classified as absent (0 points), mild (one point), moderate (two points) and severe (three points). Patients with a total score of three or above were considered to be at risk of malnutrition.<sup>[9]</sup>

## Results

318 patients with acute stroke were assessed for their nutritional status at admission. There were 145 (45%) female and 173 (55%) male patients. Their mean age was  $66.16 \pm 14.32$ . On admission, 52% of the stroke patients were found to be malnourished. 66.1% of the patients elder than 65 years were malnourished. 12.2% of the patients younger than 65 years were found to be malnourished. Among patients screened by NRS 2002, men gender found to be malnourished than women, and it was statistically important ( $p=0.03$ ).

The distribution of risk factors of stroke patients was summarised in Table 1. Stroke patients having the comorbidity of hyperlipidemia were not malnourished ( $p=0.03$ ). Our study showed no relation between malnutrition biomarkers and to be malnourished.

## Discussion

Malnutrition is common among patients who suffer from a stroke and affects the clinical course of stroke patients. Compared with nourished patients, malnourished patients need a longer length of hospital stay, have an increased rate of complications, such as infection, pressure ulcers, falls, and increased frequency of dysphagia and enteral feeding.<sup>[10]</sup> The prevalence of malnutrition after stroke varies widely among published reports. It is estimated that about one-fifth of acute stroke patients are malnourished on admission.<sup>[11]</sup> In our study, 52% of the stroke patients

**Table 1.** Distribution of risk factors in malnourished subjects

	Malnourished subjects (MNA)	p	Malnourished subjects (NRS 2002)	p
Hypertension	110/236	0.87	4/82	1.0
Diabetes	57/236	0.32	3/82	0.68
Coronary artery disease	28/236	0.48	2/82	0.65
Stroke	25/236	0.85	1/82	1.0
Hyperlipidemia	19/236	0.03	1/82	0.48
Dementia	7/236	0.27	0	
Cancer	6/236	0.42	0	

were malnourished. Differences in the timing of assessment, stroke type (ischemic versus hemorrhagic), comorbid medical conditions, and stroke complications may have contributed to this large variability.<sup>[4,5]</sup>

In this study, male patients younger than 65 years of age were more likely malnourished. Although women are more susceptible than men to undernourishment, this result may be because they suffer from stroke at an older age than men. In a study by Magnus et al.,<sup>[11]</sup> in the male participants, the effects of malnutrition on Health Quality of Life (HRQoL) were stronger than in men. Research on body composition has shown that during weight loss, men lose more lean mass than fat mass, whereas women lose more fat than lean mass. It is possible that a relatively higher reduction in lean body mass can partly explain the stronger impacts of malnutrition in men than in women.

On admission, the presence of chronic diseases is associated with an increased risk of malnutrition.<sup>[12]</sup> Diabetes mellitus and a history of stroke increased the risk for malnutrition on admission by 58 and 71%, respectively.<sup>[4,13]</sup> Comorbidities were not a significant risk factor for malnutrition in our study. This finding is in agreement with that of a Swedish study showing that the BMI of 231 patients with dementia did not differ, regardless of whether they had no/mild or severe morbidities.<sup>[14]</sup> Among the 12 risk factors of malnutrition analysed statistically in Chai et al.'s<sup>[13]</sup> study, eight risk factors were shown not to be significant risk factors. These were a previous history of alcohol consumption, comorbidities, polypharmacy, diabetes mellitus, impaired functional status of daily living, impaired mobility, tube-feeding, and edentulism. Thus, the hypothesis that the risk of malnutrition would not be increased by these eight factors was accepted. Establishing a patient's nutritional status is not always a straightforward task because there is no universally accepted definition of malnutrition or a gold standard for nutritional status assessment. Indicators of malnutrition include serum levels of albumin, prealbumin, and transferrin; total lymphocyte count; body weight and body mass index; triceps skinfold thickness and also midarm muscle circumference.<sup>[4]</sup>

Hepatic proteins, such as albumin, prealbumin, and transferrin, are commonly used as markers to evaluate nutrition status. They are influenced by many non-nutrition factors. Mediators of inflammation have the largest effect on serum protein levels. They are all negative acute-phase proteins and therefore decrease in the presence of inflammation regardless of premorbid nutrition status.<sup>[15]</sup> In our study, we found no correlation between these markers and being malnourished. However, well-nourished stroke patients older than 65 years had higher serum lipid levels, which

were statistically important. In recent years, researchers pay more attention to the low plasma total cholesterol (TC) concentration. International studies have shown that low plasma TC level is correlated with the patient's nutritional status. TC is more sensitive to assess nutritional deficiency than the low serum albumin level. There are two possible reasons. Firstly, the half-life of cholesterol is eight days, while that of albumin is 16-20 days. Secondly, the serum albumin level is affected by many factors, such as blood volume and renal function, while the influence of TC level is less than albumin.<sup>[16]</sup>

In this study, 166 of 318 stroke patients (52%) were found to be malnourished. Most of the malnourished patients were the elder patients. In the younger group, male predominancy was detected. We found out no relationship between comorbidities and malnutrition, except hyperlipidemia. Nourished stroke patients older than 65 years had higher serum lipid levels than malnourished patients. We also found no relationship between malnutrition biomarkers and being malnourished.

Malnutrition is frequently observed in acute stroke patients, and it contributes to adverse outcomes. Early recognition of malnutrition is crucial for stroke patients. However, the absence of valid markers hampers to find out the presence of malnutrition. Thus, work is needed in targeting the modifiable nutrition risk factors and give attention to nutrition in stroke patients.

#### Disclosures

**Ethics Committee Approval:** The study was approved by the Local Ethics Committee of Bakirkoy Mental and Neurological Diseases Training and Research Hospital with the number of 280.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

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