Association of Early Nutritional Status with the Clinical Severity in Patients with Acute Stroke

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Abstract

Background: Prevalence of malnutrition in stroke patients in Indonesia is not known for certain because the assessment of nutritional status has not been conducted optimally in all stroke patient5s due to the existing limitations. Early nutritional status assessment is helpful in planning the provision of nutrition for acute stroke patients. Commonly used nutritional status assessment methods are anthropometry (LOLA and TST) and biochemistry (serum albumin levels).

Objective: To analyze the association of early nutritional status with clinical severity in acute stroke patients.

Methods: The study design was a prospective cohort with consecutive sampling according to inclusion and exclusion criteria of 102 subjects. Initial nutritional status was measured in Upper Arm Circumference (LOLA), Triceps Skinfold Thickness (TST), and serum albumin level. The clinical severity was measured by calculating the NIHSS (National Institutes of Health Stroke Scale) at admission to hospital and the 7th day of stroke. Data was analyzed using chi square ($p < 0.05$).

Results: Most subjects were males (52.00%) with mean age of clinical severity was 54.48 ± 9.634 years old. There was no significant association between initial nutritional status ($p = 0.227$) and serum albumin level (0.552) with clinical severity. The measurements of LOLA ($p = 0.049$) and TST ($p = 0.481$) were statistically significant ($p = 0.049$) but not clinically.

Conclusion: There was no association between early nutritional status that was measured with LOLA, TST and serum albumin levels with clinical severity measured with NIHSS scale in acute stroke patients.

Keywords: *early nutritional status, LOLA, TST, Albumin, acute stroke, NIHSS*

Introduction

The incidence of stroke is 12.1 per 1000 population [1] and stroke is considered as the highest cause of death in Indonesia [2]. The high number of deaths due to stroke in Indonesia is influenced by many factors, one of which is the nutritional status of the patients. Malnutrition is often undetectable and an unresolved problem in stroke patients due to the low awareness and lack of education of hospital staff; thus, only a few malnourished patients receive adequate nutritional therapy [3].

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The incidence of malnutrition in stroke in Indonesia is not known for certain because the assessment of nutritional status has not been a routine thing conducted in the management of stroke patients. The incidence of malnutrition in acute stroke patients ranged from 8:00 to 20.00% during the first day of treatment and increased to 35.00-50.00% in the first week of treatment with a prevalence of malnutrition in acute stroke as a whole was 6.00-62.00% [4] [5]. The difference in prevalence of malnutrition in stroke patients is quite wide because of the variety of nutritional status assessment methods used, the measurement time and the type of stroke [6].

Methods of frequent assessment of nutritional status are anthropometric and biochemical parameters. Examinations of upper arm muscle antropometry

(LOLA) and triceps skinfold thickness (TST) are quite appropriate for bed rest patients and can roughly estimate lipid storage and muscle mass [7]. TST values will decrease significantly in acute stroke patients on day one and 7 days after treatment [8]. Serum albumin levels are frequently used biochemical nutritional assessments. Albumin is mentioned to have a strong value in diagnosing malnutrition in stroke [9]. Serum albumin concentration will decrease during the first day and one week after treatment in acute stroke patients [8].

Stroke causes a negative energy balance and increases nutritional needs, but few stroke patients can fulfill the increased need [10]. Malnutrition is one of the poor clinical outcome indicators [3 5] months post stroke and low albumin levels on the first day of treatment to be an independent predictor of poor clinical outcomes. Malnutrition can lead to high mortality in the long term [11 12]. Early nutritional status assessments can greatly assist nutrition planning for patients, [6] and given the high prevalence of malnutrition in patients with acute stroke and the magnitude of the impact, the reserachers intended to examine the association of initial nutritional status assessed with TST, LOLA and serum albumin levels with clinical severity assessed with NIHSS in acute stroke patients[13].

Method and Materials

The subjects of the study were acute stroke patients treated in Dr. Soetomo General Hospital Surabaya from April to August 2017. The inclusion criteria were acute stroke, either infarct stroke or bleeding stroke diagnosed clinically with Computed Tomography scans (CT-scan) head without contrast, age >18 years old, and first onset stroke <48 hours. Exclusion criteria included patients with malignant tumors, symptoms and signs of sepsis when admitted to the hospital, suffering from acute and chronic kidney failure, and impaired hepatic function.

The study design was a prospective cohort. The sample collection was conducted by consecutive sampling admission technique. The major subjects of the study were determined by the sample formula for unpaired categorical analytic research, two-way hypothesis with type I error of 5.00% and type II error of 20.00%. The subjects of the study were divided into two groups, namely the acute stroke subject group with malnutrition and the stroke subject group with good nutrition. At the end of the research, we obtained a large sample of 102 subjects. Prior to the identification of the subject first, the researchers conducted a test of ethics (324/Panke.KKE/V/2017) in dr. Soetomo General Hospital Surabaya, Indonesia.

Anamnesis was performed to collect demographic data (age and gender) as well as clinical data (type of stroke, blood pressure, random sugar levels, and smoking status). The subjects were examined for initial nutritional status measured by TST, LOLA and serum albumin levels. A good nutritional status was shown if all TST, LOLA and serum albumin levels were normal and poor nutritional status if at least one of the measurements of TST, LOLA and serum albumin levels was below normal. TST was measured with caliper skinfold. Normal TST value of male patients was 12.5 mm and female patients was 16.5 mm [14]. LOLA was measured by a tape measure of the formula LOLA = [0.1 LLA (mm) - (0.314xTST (mm)] .The normal value of LOLA in males was 23 cm and female was 20 cm [15]. Levels of serum albumin were examined from the blood of the subjects within <48 hours of stroke treatment. Normal albumin level was 3.5 g/dL [9]. The clinical severity was measured by using NIHSS scale. Measurement of clinical severity with NIHSS scale was performed on the first day of admission and 7th day of onset. The data was analyzed using chi square statistic test with SPSS version. 20.0 (SPSS, Inc., Chicago, IL).

Results

Basic Data Characteristics of Research Subjects

The majority of research subjects were male patients (52.00%). In the group with clinical severity, the research subjects with male gender (69.80%) were greater than female subjects (57.10%) (table 1). The mean age of the study subjects in the group with a fixed clinical severity was 54.48 ± 9.634 years and the mean age of the study subjects in the group with improved clinical severity was 59.05 ± 11.935 years (table 2). The mean gender difference ($p = 0.84$) and age ($p = 0.331$) in both groups was not statistically significant.

Clinical Data of Research Subjects

The clinical severity in the group of subjects with bleeding stroke (64.70%) was greater than stroke infarction (63.20%). Subject groups with normotension (70.00%) were greater than hypertension (63.00%) at a constant clinical severity. The clinical severity in the subjects group with hyperglycemia (64.03%) was greater than normoglycemia (63.30%). Group of non-

smoking subjects (63.80%) was greater than smoking (63.60%) in the degree of permanent clinical severity. There was no significant difference between stroke (p = 0.884), hypertension (p = 0.744), hyperglycemia (p = 0.922) and smoking (p = 0.990) with clinical severity (table 1).

Association of Early Nutritional Status with the Clinical Severity

The degree of clinical severity subjects with malnutrition status (68.30%) was greater than in subjects with good nutritional status (56.40%) and it was not statistically significant (p = 0.227). In LOLA measurements, the clinical severity in the group of subjects with malnutrition status (73.50%) was greater than good nutritional status (54.70%).

In TST measurement, the clinical severity in the group of subjects with good nutritional status (65.40%) was greater than malnutrition status (57.10%). In measurement of serum albumin level, the clinical severity in the subjects group with malnutrition status (100%) was greater than good nutrition status (62.6%). The measurement of the fixed clinical severity towards nutritional status with LOLA (p = 0.049) and TST (p = 0.481) had statistically significant differences compared with serum albumin levels (p = 0.552). However, the measurements of LOLA (RR = 1.343, 95% I999-1997) and TST (RR = 1.597; 95% IK 1.371-1.859) were also not clinically significant (table 3).

Discussion

The majority of research subjects were males although the percentage was not much different from female subjects. Males have a higher risk of having a stroke than females, especially in the <65 years age group [16]. In this study, the mean age of study subjects in the group with fixed clinical severity was 54.48 ± 9.634 years and mean age in the group of subjects in the improved clinical severity group was 59.05 ± 11.935. This result was not much different from epidemiological data from 28 hospitals in Indonesia which stated that the mean age of stroke patients was 58.8 ± 13.3 years [17].

Confounding variables such as hypertension, stroke type, hyperglycemia and smoking do not show statistically significant proportions [18]. Thus, these confounding factors can be neglected although in other studies stated that confounding variables have an influence with the severity of clinical stroke [19]. There was no significant association between initial nutritional status and clinical severity. Inappropriateness with the research hypothesis may be due to the observation period for assessing clinical severity is only the first 5-7 days of acute onset of stroke. Research in China showed a poor clinical outcome (MRS scale) at 3 months post stroke [20]. Extended observation may increase the number of clinical significance but can increase the number of drop outs for patients who undergo outpatient care.

Second, this study measured only two anthropometric parameters and one biochemical parameter as a parameter of nutritional status of acute stroke patients. The more examination of nutritional status, the value of the measurement of nutritional status is stronger, because until now there has not been one method used as a gold standard in the assessment of nutritional status [21 22]. Third, nutritional status is presumed to be only a minor risk factor in affecting the degree of clinical severity in stroke patients. Poor clinical outcomes in stroke patients are caused by age at the onset of stroke, severity at the time of stroke, disability suffered before stroke, comorbid factors and complications arising from infection [23].

At LOLA and TST examinations, there was a statistically significant difference in proportion but not clinically significant. The results of the analysis on both anthropometric parameters can be caused by the cut off used. This study used a cut off of LOLA and Dutch TST (Caucasian race) [14]. In Indonesia, research on cutoffs for LOLA and TST examinations on populations is still limited. Assessments of dietary intake, mobility or activity performed before illness or other factors are required to be taken that may affect the outcome of the nutritional status parameters used [8 20].

Most subjects had good nutritional status from the point of biochemical parameters. This can be seen from the low subjects with hypoalbuminemia. Hypoalbuminemia is a predictor of poor clinical outcomes as measured by MRS scales three months after stroke onset [24]. Hypoalbuminemia in acute ischemic stroke is associated with mortality in the first 7 days [12].

Although there are studies that examine the relationship between nutritional status and hospitalization and geriatrics, there has been no research in Indonesia that specializes in nutritional status with clinical severity in acute stroke patients [25]. This study is the first study to find the relationship between initial nutritional status

with clinical severity in acute stroke patients. In addition, this study used a prospective cohort design study which is the best observational research design to find out the cause of a case.

Conclusion

The majority of subjects were male patients with the average age of more than 50 years old. The majority of subjects had a type of infarct stroke, high blood pressure, normoglycemia, and no smoking. Initial nutritional status as measured by TST, LOLA and serum albumin levels did not correlate with clinical severity measured using NIHSS scales in acute stroke patients. Factors that influenced can be a short observation time, cut off value used, the limited tool during the examination of nutritional status, and nutritional status is a minor factor that affects the clinical severity in acute stroke patients. Further research is required by measuring the degree of clinical severity over a longer period of time, increasing the parameters of nutritional status used and assessing changes in nutritional status before and after stroke treatment in relation to clinical severity of acute stroke.

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Ethical Clearance: This study was approved by Ethical Commission of Health Research Faculty of Medicine University of Airlangga (324/Panke. KKE/V/2017) in dr. Soetomo General Hospital Surabaya, Indonesia.

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