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Nutritional Status of Patients with Non-Communicable Diseases after Discharged from Hospital

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Abstract: The prevalence of non-communicable disease (NCD) is increasing dramatically in the recent years. Malnutrition in discharged patients with NCD was associated with increased risk of hospital readmission and mortality. The aim of this study was to analyze the nutritional status of patients with NCD after discharged from hospital and also to evaluate the relationship between age, readmission, frequency of treatment and the nutritional status. This was a cross-sectional study of 83 subjects with inclusion criteria: patients with NCD with a history of hospital discharged for 6 months, adults >18 years old and be able to participate in the research. The nutritional status of the subject is determined based on body mass index (BMI), percent mid-upper arm circumference (% MUAC), albumin, hemoglobin, hand grip strength (HGS) and total lymphocytes count (TLC). Dietary intake was also measured in this study. The prevalence of malnutrition based on parameters BMI, % MUAC, albumin, hemoglobin, hand grip strength and TLC were 19.2, 43.4, 4.8, 36.1, 30.4, and 39.7, respectively. The average energy and protein intake were 1784 kcal and 59.2 g. There is a significant correlation between age and nutritional status based on BMI, % MUAC and HGS. There was a relationship between frequency of treatment with energy and protein intake. In this study we showed that the prevalence of malnutrition in 6 months discharged patients with NCD was relatively high and this malnutrition was associated with age and frequency of treatment.

Key words: Nutritional status, malnutrition, non-communicable disease, discharged patient

INTRODUCTION

Background: The prevalence of non-communicable disease (NCD) is increasing dramatically in the recent years and this is responsible for 36% of total deaths worldwide. Based on data from health research in 2007 and 2013, the prevalence of non-communicable diseases in Indonesia has risen from 1.1 to 2.1 (diabetes mellitus), 7.6 to 9.5 (hypertension), and 0.83 to 1.21% stroke (Kemenkes, 2013). A report published by Lancet in 2010 states that in 2008 there were 57 million mortality worldwide. Of these, 36 million people (63%) died of NCD and 80% occurred in low-middle income countries. The cause of death are cardiovascular disease (48%), cancer (21%), diseases of the respiratory tract (11.6%) and diabetes mellitus (3.6%) (Alwan *et al*., 2010).

Death caused by NCD in Indonesia also showed an increase. Based on hospital report in 2009 and 2010, NCD was the leading cause of death in hospitals. Therefore, the National Program for Prevention and Control of Communicable Diseases in 2010-2014 put cardio-vascular disease as a priority that must be taken care of immediately, followed by cancer disease control (Kemenkes, 2010). The primary types of cardiovascular disease in Indonesia, are hypertension, heart failure and stroke. Stroke and heart failure are included in the top 10 leading causes of hospitalization in Indonesia with a prevalence of 4.6 and 2.7%, respectively. One factor that allegedly increases the risk of death in various diseases is malnutrition status issue.

Malnutrition along with many other factors, is associated with increased risk of death among patients with NCD. It has been previously reported that the prevalence of malnutrition patients in hospital were between 20-60%. Malnutrition in discharged patients with NCD was associated with increased risk of hospital readmission and mortality. The prevalence of malnutrition patients upon hospital admission is high enough, reportedly ranged from 20-60% (Waitzberg *et al*., 2001; Correia and Waitzberg, 2003). A study of 495 patients with the disease and nerve in Dr. Sardjito Hospital showed 44 and 51.5% patients are at risk of malnutrition measured by nutritional screening tool SGA and SNST (Susetyowati *et al*., 2014).

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Malnutrition in hospitals occurs as a result of food intake doesn't meet the nutritional requirements due to decreased nutrient intake, increased nutritional needs due to illness or disorder nutrient utilization (Schenker, 2003; Alberda *et al*., 2006). Causes of malnutrition by Saunders *et al*. (2010) are (1) inadequate nutrients intake, decreased appetite, pain/nausea related to food, swallowing disorders, depression and unconsciousness; (2) nutrients malabsorption, pathological conditions of the stomach, intestines, pancreas and liver; (3) changes in metabolic that altered nutrients need and liver dysfunction; (4) loss of excessive nutrients: caused by vomiting, tube feeding problems, diarrhea, dehydration due to surgery, fistulas and stoma. Several studies related to the consequences of malnutrition in hospitalized patients and its correlations with the increasing length of stay, cost, complications and mortality has been documented. Meta-analysis of 27 Randomized Control Trial (RCT) studies with 1710 patients and 30 RCTs research with 3250 patients showed a significant association between malnutrition with complications, infections and mortality (Stratton *et al*., 2003). A decrease in nutritional status of hospitalized patients regardless of patient's nutritional status at the time of hospital admission associated with higher costs and longer hospital stay (Marco *et al*., 2011). Patients with malnutrition has longer hospital stay and tend to be re-admitted to hospital 15 days after hospital discharge (Lim *et al*., 2012). The aim of this study was to analyze the nutritional status of patients with NCD after discharged from hospital and also to evaluate the correlation of age, readmission, treatment frequency and the nutritional status.

MATERIALS AND METHODS

This was a cross-sectional study of 83 subjects with inclusion criteria: 6 months post hospital discharged patients with NCD, adults >18 years old, and able to participate in this study. This study received ethical clearance from Ethics Committee Faculty of Medicine, Gadjah Mada University. Written informed consents were obtained from all participants. Subject's nutritional status was determined based on body mass index (BMI), percent mid-upper arm circumference (% MUAC), albumin, hemoglobin, hand grip strength and total lymphocytes count (TLC). Dietary intake was obtained from SQ-FFQ questionnaire and later compared to individual Harris-Benedict equation to see the percent of compliance. According to The Indonesian Health Department (Kemenkes, 2013), declared adequate intake when = 80% and inadequate when <80%. The correlation was later analyzed using Chi Square test. Anthropometric data collected were weight, height and mid upper arm circumferences (MUAC). Patients were weighed wearing light clothes, using a mechanical scale to the nearest 0.1 kg and height was measured with a fixed tape to the nearest 0.1 cm. Weight and height were used to calculate BMI and later classified as underweight (BMI<18.5 kg/m^2), normal (BMI 18.5-24.9 kg/m^2), or overweight (BMI>25 kg/m^2) (Kemenkes, 2013). Nutritional status was categorized as well-nourished if %MUAC >90% and malnutrition if %MUAC <90% (Zeman and Ney, 1988). HGS was measured using mechanical handgrip dynamometer. High strength was defined as above 20 kg in male and 10 kg in female (Wang *et al*., 2005). Biochemical indicator used to assess nutritional status were albumin, hemoglobin and TLC. According to Gibson (2005) TLC > 2000 mm^3 indicating well-nourished status. Serum albumin levels were measured using bromcresol green. Hypoalbuminemia was defined as under 3.5 g/dl (Gibson, 2005). Hemoglobin levels were measured using Cyanmethemoglobin. Normal levels of hemoglobin was defined as more than 12 g/dl.

RESULTS

Characteristics of the subjects are all listed in Table 1. The majority of the subjects were female (62.7%), age <60 years (62.7%). The overall readmission was 24.1% within 6 months post hospital discharge.. The frequency of most subjects who came for retreatment to health care was less than 3 times post hospital discharged. Based on the type of diseases, the highest number was diabetes mellitus (28.9%), followed by CHF (25.3%), cancer/tumor (19.3%) and hypertension (12.1%). Subjects' level of education were no school, primary school, secondary school and only a small fraction (4.8%) with advanced education.

According to Soeters (Soeters *et al*., 2008) assessment of nutritional status can be performed using four measurements : (a) measurement of nutrients balance; (b) measurement of body composition; (c) measurement of inflammatory activity, and (d) for measurement functions. In this study, measurement of nutrients balance obtained from energy and protein intake Measurement of body composition including anthropometric measurements, weight, height, body mass index, and upper arm circumference. Measurement of inflammatory activity was based on indicators of albumin and hemoglobin. Measurement functions seen from TLC and hand grip strength. Table 2 showed the prevalence of malnutrition based on parameters BMI, % MUAC, albumin, hemoglobin, hand grip strength and TLC were 19.2, 32.5, 4.8, 36.1, 30.4 and 39.7% respectively. The average of energy and protein intake were 1784 kcal and 59.2 g. After analyzed using Chi Square test, there was a significant association between age and BMI, % MUAC also HGS (Table 3).

Table 4 showed association between treatment frequency with energy and protein intake. Adequate energy and protein intake were most likely found in

Table 1: Characteristic of the subjects

Criteria	N	%
Sex		
Male	31	37.3
Female	52	62.7
Age		
Adult	52	62.7
Elderly	31	37.3
Frequency of treatment		
≤3 times	51	61.4
>3 times	32	38.6
Readmission		
Yes	20	24.1
No	63	75.9
Disease		
Hypertension	10	12.1
Diabetes mellitus	24	28.9
Tumor/cancer	16	19.3
CHF	21	25.3
Others	12	14.4
Education		
No school	18	21.7
Primary school	44	53.0
Secondary school	17	20.5
Advanced school	4	4.8

CHF: Congestive Heart Failure, Others: Stroke, Chronic Kidney Disease

Table 2: Nutritional status of the subjects

Criteria	N	%
BMI		
Overweight	35	44.9
Well-nourished	28	35.9
Underweight	15	19.2
% MUAC		
Well-nourished	47	56.6
Malnourished	36	43.4
Albumin		
Well-nourished	79	95.2
Malnourished	4	4.8
Hemoglobin		
Well-nourished	53	63.9
Malnourished	30	36.1
HGS		
Well-nourished	55	69.6
Malnourished	24	30.4
TLC		
Well-nourished	50	60.2
Malnourished	33	39.8

patient with lower re-treatment frequency (72.7 and 75.0%) than in patients with higher re-treatment frequency (27.3 and 25.0%). Table 5 showed that there was no correlation between readmission and nutritional status in NCD patients after discharged from hospital.

DISCUSSION

Malnutrition was most likely found in NCD patients. That was associated with greater mortality, delayed functional recovery and higher rates of nursing home usage. A study result stated that 219 hospitalized patients (59.3%) were well nourished, while 90 (24.4%) were moderately malnourished and 60 (16.3%) were severely malnourished (Covinsky *et al*., 1999). Age was a factor that affects this screening, hence elderly patients were at greater risk for malnutrition (Kondrup *et al*., 2003). This study showed a significant correlation between age and nutritional status based on BMI, % MUAC and HGS (Table 3). Nutritional status based on BMI and % MUAC in elderly patients were lower (67.9 and 45.2%) than in adult patients (88.0 and 80.8%). BMI and % MUAC were used to measure human body composition. MUAC changes were widely used to monitor progress during nutritional therapy and positively associated with body weight. MUAC changes were easily detected in a short period of time and required simple equipment only (Gibson, 2005). A low percentage of MUAC could be used to diagnose chronic protein energy malnutrition (Lim *et al*., 2012). Chronic protein energy malnutrition (PEM) was common in elderly patient because they could not maintain their dietary intake. It was necessary to pay special attention to nutritional status especially nutritional status of elderly patient to prevent readmission. There was a significant difference in nutritional status based on HGS between adult (78.8%) and elderly patients (51.9%). A study by Alfitri proved a significant positive correlation between HGS and MUAC in hemodialysis patients. Analysis of correlation between age and other nutritional status showed no significant correlation. Nutritional intake was one of the factors that directly affects nutritional status. Another factors that directly affects nutritional status another factors that directly affect nutritional status were nutrient intake and disease conditions, it means that patient's food and type of disease would directly influence change in body weight (Norman *et al*., 2008). This study also showed a significant correlation between treatment frequency with energy and protein intake. Adequate energy and protein intake were more common in patients with lower re-treatment frequency (62.7 and 64.7) than in patients with higher re-treatment frequency (37.5 and 34.4%). Adequate intake in NCD patient was necessary and strongly recommended for better quality of life. However in other study, patients with severe malnutrition issue must pay attention with their consistency and form of nutrition to increase patient's adequate intake (Evans *et al*., 2014). This study showed no correlation between readmission and nutritional status in NCD patients after discharged from hospital. This result was contrary with several studies in which stated that post discharged patients with malnutrition had a higher risk of readmission 15 days after hospital discharged (Lim *et al*.,2012). This study proved that there was no significant correlation between sex, age, treatment frequency and readmission with albumin, with p-value >0.05. A recent study stated that evidently albumin was not the most ideal marker of nutritional status. This was because albumin was affected by hydration status, infection and inflammation, which

Table 3: Association age with nutritional status

	Age					
	Elderly (≥60)		Adult (<60)			
Nutritional status	N	%	N	%	p-value (CI 95%)	OR
Energy intake						
Inadequate	15	48.4	24	46.2	0.512	1.09
Adequate	16	51.6	28	53.8	(-11.35-317.37)	
Total	31	100	52	100		
Protein intake						
Inadequate	18	58.1	21	40.4	0.091	2.04
Adequate	13	41.9	31	59.6	(4.24-29.05)	
Total	31	100	52	100		
BMI						
Malnourished	9	32.1	6	12.0	0.033*	3.47
Well-nourished	19	67.9	44	88.0	(1.56-6.52)	
Total	28	100	50	100		
% MUAC						
Malnourished	20	64.5	16	30.8	0.001*	4.09
Well-nourished	11	35.5	36	69.2	(1.29-5.28)	
Total	31	100	52	100		
Albumin						
Malnourished	3	9.7	1	1.9	0.144	5.46
Well-nourished	28	90.3	51	98.1	(-0.06-0.34)	
Total	31	100	52	100		
Hemoglobin						
Malnourished	9	29.0	21	40.4	0.211	0.60
Well-nourished	22	71.0	31	59.6	(-1.24-0.42)	
Total	31	100	52	100		
HGS						
Malnourished	13	48.1	11	21.2	0.014*	3.46
Well-nourished	14	51.9	41	78.8	(-0.78-6.98)	
Total	27	100	52	100		
TLC						
Malnourished	15	48.4	18	34.6	0.157	1.77
Well-nourished	16	51.6	34	65.4	(-147.86-548.54)	
Total	31	100	52	100		

(a) 95% CI

Table 4: Association frequency of treatment with nutritional status

	Frequency of treatment						
	>3		≤3				
Nutritional status	N	%	N	%	Total (%)	p-value (CI 95%)	OR
Energy intake							
Inadequate	20	51.3	19	48.7	100	0.022*	2.81
Adequate	12	27.3	32	72.7	100	(-237.40-496.96)	
Protein intake							
Inadequate	21	53.8	18	46.2	100	0.007*	3.50
Adequate	11	25.0	33	75.0	100	(0.71-28.07)	
BMI							
Malnourished	7	46.7	8	53.3	100	0.372	1.42
Well-nourished	24	38.1	39	61.9	100	(-0.78-4.34)	
% MUAC							
Malnourished	17	47.2	19	53.8	100	0.117	1.91
Well-nourished	15	31.9	32	68.1	100	(-0.37-3.77)	
Albumin							
Malnourished	1	25.0	3	75.0	100	0.499	0.52
Well-nourished	31	39.2	48	60.8	100	(-0.02-0.38)	
Hemoglobin							
Malnourished	10	33.3	20	66.7	100	0.31	0.70
Well-nourished	22	41.5	31	58.5	100	(-0.95-0.72)	
HGS							
Malnourished	9	37.5	15	62.5	100	0.58	0.97
Well-nourished	21	38.2	34	61.8	100	(-0.27-5.41)	
TLC							
Malnourished	14	42.4	19	57.6	100	0.359	1.31
Well-nourished	18	36.0	32	64.0	100	(-114.38-575.81)	

Table 5: Association readmission with nutritional status

	Readmission						
	Yes		No				
Nutritional status	N	%	N	%	Total (%)	p-value (CI 95%)	OR
Energy intake							
Inadequate	9	23.1	30	76.9	100	0.522	0.90
Adequate	11	25.0	33	75.0	100	(-50.91-1015.01)	
Protein intake							
Inadequate	10	25.6	29	74.4	100	0.478	1.17
Adequate	10	22.7	34	77.3	100	(-5.38-26.26)	
BMI							
Malnourished	3	25.0	12	75.0	100	0.526	0.80
Well-nourished	15	23.8	48	76.2	100	(-3.05-2.97)	
% MUAC							
Malnourished	10	27.8	26	72.2	100	0.333	1.42
Well-nourished	10	21.3	37	78.7	100	(-2.79-2.00)	
Albumin							
Malnourished	2	50.0	2	50.0	100	0.244	3.39
Well-nourished	18	22.8	61	77.2	100	(-0.50-0.13)	
Hemoglobin							
Malnourished	7	23.3	23	76.7	100	0.562	0.94
Well-nourished	13	24.5	40	75.5	100	(-1.37-0.52)	
HGS							
Malnourished	4	16.7	20	83.3	100	0.292	0.59
Well-nourished	14	25.5	41	74.5	100	(-1.97-9.83)	
TLC							
Malnourished	9	27.3	24	72.7	100	0.384	1.33
Well-nourished	11	22.0	39	78.0	100	(-432.49-316.40)	

stimulates cytokine-mediated acute phase response which in turn will increase the capillary leakage of albumin (Herselman *et al*., 2010).

Haemoglobin levels in heart failure patients started to be highlighted as some of the impacts. Patients with low levels of hemoglobin could have an impact on morbidity and mortality that these conditions would increase the cost of care as a result of treatment of anemic conditions. Several studies showed that heart failure was likely found in elderly and occurred in approximately 10% of men and 8% of women over the age of 60 and the prevalence increases with age (Braunwalt, 2013). Other studies mentioned that patients with heart disease, stroke, cancer and liver usually had a history of recurrent hospitalizations. Inpatient in hospital is a very strong predictor of death in patients with heart failure and stroke (Setoguchi *et al*., 2007). A study involving 14.374 patients with heart disease, showed that the more often a patient is hospitalized, life expectancy will continue to decline. Patients would last up to 2.4 years after their first hospitalization and chances to survive keep decreasing 6 months after fourth hospitalization (Setoguchi *et al*., 2007).

Conclusion: The prevalence of malnutrition based on parameters BMI, % MUAC, albumin, hemoglobin, hand grip strength and TLC respectively were 19.2, 43.4, 4.8, 36.1, 30.4 and 39.7%, respectively. The average energy and protein intake were 1784 kcal and 59.2 g, respectively. There is a significant correlation between age and nutritional status based on BMI, % MUAC and HGS. There is a relationship between frequency of treatment with energy and protein intake. Prevalence of malnutrition in discharged patients with NCD was relatively high and this malnutrition was associated with repeated hospitalization.

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