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Association of Malnutrition with Quality of Life, Mortality and Readmission Post Hospitalization in Patients with Non-Communicable Disease

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Abstract: Non-communicable disease (NCD) can cause mortality, morbidity and hospital readmission. Hospitalization can affect a patient's nutritional status and impact a patient's quality of life. The aim of this study was to determine the relationship between a patient's discharged nutritional status with mortality, readmission and quality of life post hospitalization in patients with NCD. This study was an observational study with a retrospective cohort design. Subjects were selected by purposive sampling. Subjects were discharged patients with NCD aged 18 years or older, Mid upper arm circumference (MUAC) and subjective global assessment (SGA) were recorded. Discharged nutritional status 3 to 6 months from hospital was assessed using %MUAC and SGA. Quality of life was assessed using the SF-36 questionnaire. The results showed a significant relationship between a patient's discharged nutritional status assessed by SGA and 3 to 6 months post hospitalization mortality ($p = 0.047$; OR = 4.92), as well as patient's discharged nutritional status assessed by % MUAC and quality of life post hospitalization with non-communicable disease ($p = 0.003$; OR = 3.76). The malnourished subjects had an average quality of life sub-scale score lower than well-nourished, except for the mental health sub-scale (malnourished = 79.80±8.98; well-nourished = 78.78±10.63). There was no significant relationship between nutritional status and patient readmission ($p = 0.427$). It was concluded that a patient's discharged nutritional status was related to mortality and quality of life post hospitalization in patients with NCD. There was no correlation between nutritional status and patient readmission. However, patients with malnourished nutritional status have a higher tendency for readmission.

Key words: nutritional status, quality of life, readmission, mortality

INTRODUCTION

According to National Health Survey (Riskedas), non-communicable diseases (NCD) are chronic diseases that are non-transmissible among people. In Indonesia, the prevalence of NCD is increasing. The prevalence of diabetes mellitus increased from 1.1% on 2007 to 2.1% on 2013 and the prevalence of hypertension also increased from 7.2% on 2007 to 9.4% on 2013 (Depkes RI, 2013, 2007). Yogyakarta is one of the provinces that has more NCD cases than other provinces in Indonesia. Moreover, it has the highest prevalence of cancer, diabetes mellitus, heart failure, hyperthyroidism and renal lithiasis (Depkes RI, 2013).

NCD can cause a variety of negative effects for those suffering with the disease. One of them is mortality; NCD is the leading cause of global mortality. The mortality caused by NCD is predicted to rise by 15% globally between 2010 and 2020 (WHO, 2010). In addition, other negative effects of NCD include an increase in the morbidity rate. Morbidity that accompanies hospitalizations due to heart failure results in an increase in the number of in-patient hospital readmission, early retirement, income reduction and a lower ability to perform physical activity (Novita, 2005).

NCD also can lead to a person undergoing hospitalization. The increasing trend of hospitalization in Sri Lanka is due to diabetes, hypertension and ischemic heart disease. In 5 years, an increase in the incidence of hospitalization by 36, 40 and 29% due to diabetes mellitus, hypertension and ischemic heart failure, respectively, is projected (Premaratne *et al*., 2005). Hospitalization can affect the nutritional status of a person. A patient might experience malnutrition even when undergoing treatment at a hospital, due to various social, pathological and physiological factors. Hospital-based malnutrition also leads to longer lengths of hospitalization and poorer outcomes. In addition, many patients have a poorer nutritional status upon discharge than upon admission to the hospital. Discharge under malnutrition-associated conditions likely can lead to readmission (Schanker, 2003). Patients

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discharged from the hospital with chronic malnutrition also can result in rehospitalization. Patients discharged from the hospital with malnutrition have a higher risk of being rehospitalized within 15 days of discharge from the hospital (Lim *et al*., 2012). However, nutritional status upon discharge from the hospital is still rarely observed, so it is important to be aware of the nutritional status especially the nutritional status when patients are discharged from the hospital. It is important to prevent poor outcomes after a patient has been discharged from the hospital.

One of the ways to assess nutritional status is by using the mid-upper arm circumference (MUAC) measurement. MUAC measurement reflects the amount of muscle mass or subcutaneous fat. A low MUAC can be used to diagnose chronic protein energy malnutrition (Gibson, 2005). Nutritional status can also be assessed by subjective global assessment (SGA) determination. This is based exclusively on a carefully performed medical history and physical examination, that consists of weight change, changes in dietary intake, presence of gastrointestinal symptoms, functional capacity, energy level and metabolic demand of the patient's underlying disease state (Gibson, 2005).

MATERIALS AND METHODS

Study design and participants: The study was conducted as an observational study with retrospective cohort study design between September to November 2014. Patients from a previous report with the subject "Comparison Screening Methods as a Predictor of Discharge and Length of Stay in Sleman Hospital" with purposive sampling were studied. Patients over 18 years old with NCD and for whom MUAC data was available when discharged from the hospital were included in the study. Additionally, there was also information on their residential address or phone number at which they could be contacted. Patients who were resettled outside of Sleman district were excluded. All of the study procedures were approved by the Research Ethics Committee of Gadjah Mada University, Yogyakarta.

Data collection: The data collected from the previous study included: sex, age, type of diseases, mid upper arm circumference (MUAC) and subjective global assessment (SGA) score. Then, after 3 to 6 months post-hospitalization, the quality of life, readmission rate and mortality data were collected.

The nutritional status of the patients upon discharge from the hospital was determined using % MUAC and SGA. MUAC standard was determined according to 50% percentiles of the Harvard standard (Jelliffe, 1966). % MUAC was obtained by MUAC measurement divided by the MUAC standard multiplied by 100%. Nutritional status was categorized as well-nourished if % MUAC>85% and malnourished if % MUAC$\leq$85%. Nutritional status when the patient was discharged from the hospital also was assessed by SGA. Nutritional status was categorized as well-nourished if the SGA score was A and malnourished if the SGA score was either B or C (Bauer *et al*., 2002).

Quality of life data were collected by direct interview with short form 36 (SF-36) questionnaires (Ware and Sherbourne, 1992). The quality of life was categorized as good if the score was $\geq$ the mean score quality of life of the sample, while the quality of life was considered bad if the score was < the mean score quality of life of the sample (Ware and Sherbourne, 1992). Mortality data was collected after 3 to 6 months post-hospitalization by direct interviews with the patient's family. Meanwhile readmission data were collected after 3 to 6 months post-hospitalization by a questionnaire that explained the patient's readmission status.

Statistical analysis: Statistical analysis for categorical variables was performed by Chi-square test. Statistical analysis for numeric variables was performed by unpaired t-test. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 97 participants, 36 men and 61 women, were included in the study. The percentage of adults (62.9%) was higher than the percentage of elderly, defined as more than or equal to 60 years (37.1%). Using % MUAC, there were slightly more subjects that had a well-nourished status (50.5%) than those who were malnourished (49.5%). The prevalence of malnutrition, according to the SGA, was 48.5% categorized as malnourished and 51.5% categorized as well-nourished. The distribution of diseases the patients were suffering from were as follows: diabetes mellitus (29.9%), congestive heart failure (23.7%), cancer/tumor (18.6%), stroke and hypertension (9.3%), chronic kidney disease (6.2%) and chronic obstructive pulmonary disease (1.0%) (Table 1).

Nutritional status and mortality: Eight of ten patients who died were malnourished. The results showed a significant relationship between the patient's nutritional status assessed by SGA when discharged and mortality ($p = 0.047$). Patients with malnutrition upon discharge had 4.92 times greater mortality risk (Table 2). Patients who died had a MUAC mean (23.14±2.64) lower than the patients who survived (26.80±4.76). The results showed a significant relationship between the patient's mean MUAC and mortality ($p = 0.019$) (Table 3).

Using % MUAC, the prevalence of mortality in malnourished patients was higher than in well-nourished patients. Meanwhile the prevalence of survival in malnourished patients was lower.

Table 1: Subject characteristic

Variables	N (n = 97)	Percent (%)
Sex		
Men	36	37.1
Women	61	62.9
Age		
Adult (18-59 years)	61	62.9
Elderly (≥60 years)	36	37.1
Nutritional status assessed by % MUAC when discharge from hospital assessed		
Malnourished	48	49.5
Well-nourished	49	50.5
Nutritional status assessed by SGA when discharge from hospital assessed		
Malnourished	47	48.5
Well-nourished	50	51.5
Type of diseases		
Hypertension	9	9.3
Diabetes Mellitus	29	29.9
Stroke	11	11.3
Cancer/tumor	18	18.6
Congestive hearth failure	23	23.7
Chronic obstructive pulmonary disease	1	1.0
Chronic kidney disease	6	6.2

Table 2: Association between nutritional status and mortality

	----------Mortality----------				
Characteristic	Yes (%)	No(%)	Total (%)	OR	p-value (CI 95%)
Nutritional status assessed by SGA when discharge from hospital					
Malnourished	8 (17.0)	39 (83.0)	47 (100)	4.92	0.047* (0.88-24.532)
Well nourished	2 (4.0)	48 (96.0)	50 (100)		
Total	10 (10.3)	87 (89.7)	97 (100)		

*Correlation is significant at the p<0.05 (fisher)

Table 3: Result of unpaired t test

Mortality	n	MUAC Mean±Sb	Mean difference (95% CI)	p-value
Yes	10	23.14±264	3.66	0.019**
No	87	26.80±4,76	(6.71-0.62)	

**Correlation is significant at the p<0,05 (t- test)

Table 4: Association between nutritional status and readmission

	--------Readmission--------		Total (%)	OR	p-value (95% CI)
Characteristic	Yes (%)	No (%)			
Nutritional status assessed by %MUAC when discharge from hospital					
Malnourished	13 (31.7)	28 (68.3)	41 (100)	1.67	0.293 (0.639-4.370)
Well nourished	10 (21.7)	36 (78.3)	46 (100)		
Total	23 (26.4)	64 (73.6)	87 (100)		

Correlation is significant at the p<0.05 (chi square test)

Nutritional status and readmission: There were 23 individuals who had been readmitted after 3 to 6 months post- hospitalization. There was no significant association between nutritional status assessed by % MUAC and the readmission status of patients post-hospitalization (p = 0.293) (Table 4). This result was in contrast to most previous studies that have been reported. In those studies, it was found that undernourished patients were more likely to be rehospitalized.

Nutritional status and quality of life: Nutritional status assessed by % MUAC at discharge was compared to the quality of life using the chi-square test. The analysis showed that there was a significant relationship between a patient's nutritional status assessed by % MUAC upon discharge and quality of life post-hospitalization with non-communicable disease (p = 0.003). Patients with malnutrition upon discharge had a 3.76 times greater risk of having a poor quality of life (Table 5).

Quality of life sub-scales consisted of physical function (PF), role physical (RF), bodily pain (BP), vitality (VT), general health (GH), social function (SF), role emotional (RE) and mental health (MH). The nutritional status post-hospitalization was compared to the subscale quality of life by using the Mann-Whitney U test. The malnourished subjects had an average quality of life sub-scale score

Table 5: Association between nutritional status and quality of life

	--------- Quality of life ---------				
Characteristic	Bad (%)	Good (%)	Total (%)	OR	p-value (95% CI)
Nutritional status by % MUAC when discharge from hospital					
Malnourished	29 (70.7)	12 (29.3)	41 (100)	3.76	0.003*** (1.53-9.21)
Well nourished	18 (39.1)	28 (60.9)	46 (100)		
Total	47 (54.0)	40 (46.0)	87 (100)		

***Correlation is significant at the p<0.05 (*chi square test*)

Table 6: Association between nutritional status and quality of life

	---------- Nutritional status ----------		
Subscale quality of life	Malnourished Mean±SD	Well nourished Mean±SD	p-value
Physical function (PF)	62.20±29.07	71.20±27.12	0.138
Role Physical (RP)	27.44±42.13	40.76±46.06	0.178
Bodily pain (BP)	55.83±27.02	65.72±26.450	0.085
Vitality (VT)	37.80±11.83	40.33±9.03	0.233
General Health (GH)	58.54±12.81	59.77±14.72	0.412
Social Function(SF)	69.82±31.37	79.08±28.02	0.097
Role-Emotional (RE)	30.08±44.60	57.25±49.02	0.012*
Mental Health (MH)	79.80±8.98	78.78±10.63	0.616

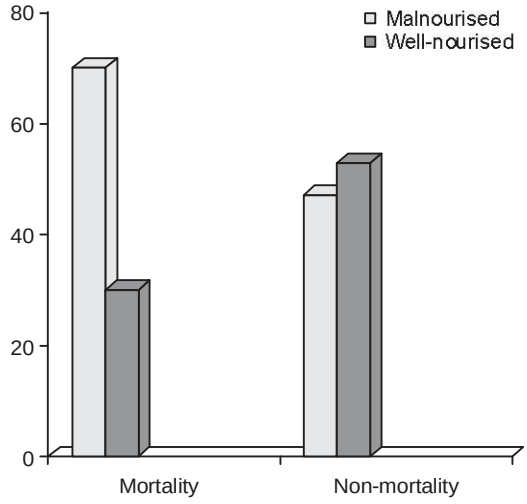

Fig. 1: Prevalence of mortality using % MUAC than in well-nourished patients

lower than well-nourished subjects, except the mental health sub-scale; the mental health subscale malnourished subjects had an average score (79.80±8.98) higher than with well-nourished (78.78±10.63). Mann-Whitney U test showed a significant relationship between role emotional (RE) in malnourished subjects and emotional role (RE) in well-nourished subjects. As for the other subscales, no other significant differences were identified (Table 6).

DISCUSSION

Malnutrition is both a cause and consequence of disease in children and adults (Brotherton *et al*., 2010). Research on the relationship between malnutrition and quality of life, mortality and readmission after hospitalization is rare because it examines factors after discharge from the hospital. Malnutrition causes damage at the cellular level, as well as at the physical and psychological levels (Barker *et al*., 2011). Patients with non-communicable diseases (NCD) need a rehabilitation phase to maintain optimum conditions and prevent recurrences that lead to poor quality of life post-hospitalization. The results in this study indicate that nutritional status has an influence on the quality of life and mortality of patients after hospitalization. Patients with malnutrition status upon discharge from the hospital had a 3.76 times higher risk of having a poorer quality of life than patients who were well-nourished. Additionally, patients with malnutrition upon discharge had a 4.92 times greater risk of mortality.

Nutritional status in this study was assessed by the indicator of mid-upper arm circumference (MUAC) and subjective global assessment (SGA). Previous reports indicate that MUAC is useful at predicting mortality (Middleton *et al*., 2001; Agarwal *et al*., 2012; Zapatero *et al*., 2013). MUAC measurement requires simple and easily available equipment and is easy to perform. Measurements of adult MUAC have long been known to reflect changes in adult body weight (Gibson, 2005). Furthermore, SGA is a useful tool for predicting mortality and readmission rates (Lim *et al*., 2012).

In this study, the malnourished patients had 4.92 times higher risk of mortality within 3 to 6 months after hospitalization. In addition, there are many studies which have examined the influence between malnutrition and mortality. The results from the present study correlate with the previous studies about the association between malnutrition and mortality cases. Similar to this study, malnourished patients had a 7 times higher risk of mortality in the first year after hospitalization compared to well-nourished patients. The prevalence of mortality in malnourished patients in the first year after being hospitalized in Sydney was 30% (Middleton *et al*., 2001).

Based on results obtained from Agarwal's *et al.* (2012) research, the mortality rate in patients with higher malnutrition was doubled (p = 0.023 and CI = 1.09 to 3.34). In this study, the sample size was 3.122 patients from 56 hospitals. Malnutrition indicators were measured using body mass index (BMI), while the screening was performed by using the malnutrition screening tool (MST) and subjective global assessment (SGA). Similar results were also obtained Zapatero *et al.* (2013); in 313.233 COPD patients with malnutrition status, there was a 77% higher risk of mortality compared to patients with normal weight (OR = 1.77; 95% CI = 1.65 to 1.89). In elderly inpatients older than 70 years with cardiovascular diseases, cognitive impairment and malnutrition (low body mass index and low plasma albumin) were significantly associated and both are predictors of all-cause mortality (Farid *et al.*, 2013). Guest *et al.* (2011) with a sample of 1,000 patients in the UK reported that malnutrition is an independent predictor of mortality with OR = 7.70. Malnutrition and weight loss significantly increase morbidity and mortality in patients with cancer cachexia (Sauer and Voss, 2012). A retrospective cohort study of 709 patients in 25 Brazilian hospitals, the mortality rate in malnourished patients was 12.4 vs., 4.7% in the well-nourished group (Correia and Waitzberg, 2003). Furthermore, malnourished patients that were assessed by SGA had longer stays in the hospital, higher possibility of readmission within 15 days and had higher mortality up to three years post-discharge (Lim *et al.*, 2012).

There was no significant association between nutritional status assessed by % MUAC and the readmission status of patients after hospitalization (p = 0.293). In this study, morbidity is defined as frequency of the patient being rehospitalized. This study had a different result from previously reported studies. Other reports showed that undernourishment in patients was related to patient rehospitalization. The study conducted by Lim *et al.* (2012) showed that malnutrition assessed by subjective global assessment (SGA) is associated with rehospitalization within 30 days and 6 months after hospitalization, although a different study reported the contrary. In the one study conducted by Agarwal *et al.* (2012), malnutrition was reported to not be a risk factor for rehospitalization. However, this result may be due to the small study sample size (n<800). Zapatero *et al.* (2013) indicated that COPD patients are at a 29% higher risk of malnutrition-induced readmission within 30 days compared to patients with normal weight (OR = 1.29; 95% CI = 1.21 to 1.37). The readmission rate was significantly lower in patients with nutritional support compared to patients who received standard hospital care (17/64 vs., 28/61; p = 0.027) (Susetyowati *et al.*, 2014).

Malnutrition can cause negative effects on the patient's health and quality of life in general. Patients will experience a decrease in immunity, resulting in apathy, depression, reduced muscle strength and greater fatigue. Patients with malnutrition will also experience a longer period of treatment in hospital (Guest *et al.*, 2011). There is a significant correlation (p-value 0.003) between nutritional status when discharged from the hospital and quality of life with OR is 3.76. Nutritional status is one of the components that affected hospital cost, length of stay and the quality of life. Malnourished individuals are likely to be disabled and disabled individuals are at a greater risk for nutritional problems because of their greater dependence on others. If the malnourishment is extreme, it can result in diminished muscle mass and vigor, functional impairment and decreased quality of life. Malnutrition also causes lack of enjoyment in eating and anorexia. In addition, poor nutrition and lack of physical activity can lead to lack of appetite, inability to perform the activities of daily living, changes in quality of life, morbidity and mortality (Amarantos *et al.*, 2001). Patients who were at risk of malnutrition had significantly longer lengths of stay than patients who were not at risk of malnutrition (Susetyowati *et al.*, 2014). Patients who received nutritional support had quality of life scores that were higher than those who received standard care from hospital (37 vs., 32%; p = 0.03) (Starke *et al.*, 2011). Subjects with malnutrition had a lower average score of quality of life than the well-nourished.

However, in the mental health sub-scale, subjects who are malnourished had a higher average score (79.80±8.98) than the well-nourished (78.78±10.3). This was possibly because mental health is an assessment based on subjective perception which includes satisfaction and happiness. The result with Mann-Whitney U test showed that the difference between role emotional (RE) in malnourished subjects and well-nourished subjects is not significant. It might be because, for the subjects with malnourishment and depression, it was easy to get exhausted compared to the well-nourished. The major depressive symptoms are characterized by a combination of symptoms that affect someone's ability to work, sleep, study, eat and enjoy once pleasurable activities (National Institute of Mental Health, 2011). As a result, daily activities being diminished then had an impact on Role-Emotional (RE) subscale.

Conclusion: The nutritional status of patients with non-communicable diseases has significant correlations with quality of life post-hospitalization as well as mortality. There is no correlation between nutritional status and patient readmission. However, patients with less nutritional status have a higher tendency for readmission. A Nutritional Discharge Plan is needed for patients who have been discharged from hospital. This is important given the tendency for poorer outcomes (mortality, readmission and quality of life) in patients with malnutrition status at discharge.

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