

The relationship between nutritional status based on nutritional risk index (NRI) and length of stay of digestive surgery patients



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ABSTRACT

Background: Malnutrition is a common concomitant illness that can be found in digestive surgery patients. The risk of malnutrition in digestive surgery patients is often overlooked even though malnutrition has been known to be associated with poor postoperative outcomes. The study aimed to analyze the relationship of nutritional status based on the Nutritional Risk Index (NRI) and length of stay of digestive surgery patients in Sanglah General Hospital.

Patients and methods: The design of this study is an analytical cross-sectional using secondary data from the medical record of the digestive surgery patients in Sanglah General Hospital. Data on body weight and serum albumin level were used to identify the preoperative nutritional status of the patients based on NRI.

Results: Of the 42 patients involved in this study, 54.8% of patients have poor nutritional status and the remainder 45.2% of patients have good nutritional status. The result of the statistical analysis showed a significant relationship between nutritional status and length of stay. The result of the logistic regression test showed that the prevalence of long hospitalizations (≥ 11 days) were 5.2 times greater in digestive surgery patients with poor preoperative nutritional status compared to patients with good nutritional status.

Conclusion: This study shows that poor nutritional status is a significant problem for digestive surgery patients and it is one of the factors that contribute to a longer hospital stay.

Keywords: *nutritional status, nutritional risk index, length of stay, digestive surgery*

Cite This Article: Kusuma, D.R., Putra, K.A.H., Kurniyanta, P. 2019. The relationship between nutritional status based on nutritional risk index (NRI) and length of stay of digestive surgery patients. *Bali Journal of Anesthesiology* 3(1): 14-18. DOI:10.15562/bjoa.v3i1.110

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INTRODUCTION

Poor nutritional status or malnutrition is a condition that results from lack of intake or uptake of nutrients in the body which trigger changes in body composition and body cell mass which leads to a decrease in physical and mental function and poor clinical outcome of the disease.¹

A study reported that 40% of surgical patients were at risk for malnutrition.² Previous studies indicated that the prevalence of digestive surgery patients at risk of malnutrition was 66-88%.³ Another study found that 33.3% of patients underwent digestive surgery were malnourished based on Body Mass Index (BMI).⁴

Digestive surgery patients are at high risk to face nutritional problems. In surgical patients, there was an increase in catabolism triggered by surgical stressors.⁵ Clinical symptoms such as nausea, vomiting, pain, gastric distension, and fasting also tend to reduce the patient's nutritional intake.⁶ Digestive surgery patients are also susceptible to postoperative bowel function disorders that can also reduce the patient's nutritional uptake.⁷

Assessment of nutritional status in digestive surgery patients is needed to identify the risk of malnutrition. Malnutrition is known as one of the factors associated with postoperative wound

healing, postoperative complications, length of hospital stay, and high treatment costs.²

There are several anthropometric and biochemical indicators that can be used to identify the nutritional status of patients. Nutritional Risk Index (NRI) is a simple screening method that combines body weight and serum albumin indicators to determine the risk of malnutrition.³

Considering the risk of malnutrition in patients undergoing digestive surgery is quite high, a proper nutritional status screening method is needed to reduce the negative impact on postoperative outcomes. This study was conducted to analyze the relationship between nutritional status based on NRI and the length of stay of digestive surgery patients at Sanglah General Hospital.

PATIENTS AND METHODS

This study is a cross-sectional analytic study involving digestive surgery patients at Sanglah General Hospital who were operated from December 2017 to June 2018. Sample size calculation for different proportion of two independent groups was used to estimate the minimum sample size of this study. The patients included in this study were patients who were ≥ 18 years old who underwent digestive surgery at Sanglah General Hospital. Patients with a history

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of heart disease, renal failure, multiple traumas, or HIV/AIDS were excluded from this study. Patients who died during the hospitalization or discharged against medical advice were also excluded from this study. Data of the patients including gender, age, types of disease, nutritional support, body weight, serum albumin levels, and length of stay were collected from medical records. This study protocol was approved by the Committee of Ethical Research of Udayana University/Sanglah General Hospital.

Data on serum albumin levels and body weight were used for calculating NRI scores which formed the basis for determining preoperative nutritional status. The NRI score is calculated using this following formula³: $(1.519 \times \text{serum albumin levels}) + (0.417 \times \text{current body weight/usual body weight} \times 100)$. Then, the NRI score is categorized as poor nutritional status (NRI score <100) or good nutritional status (NRI score ≥ 100). Data on the length of stay of patients were categorized into long hospitalization (≥ 11 days) or short hospitalization (<11 days). An 11-day cut-off point was used based on previous research in Europe conducted by Kyle et al.⁸

The data that have been collected and categorized are analyzed using IBM SPSS Statistics version 20 software. Data analysis used was the Chi-square test and Fisher's exact test. Multivariate analysis with logistic regression was performed to simultaneously analyze the nutritional status and characteristics of the sample towards the length of stay. A p-value of <0.05 was considered statistically significant.

RESULTS

There were 42 patients who met the criteria to be included in this study. The characteristics of the patients can be seen in Table 1. The results showed that 24 patients (57.1%) were male and 18 patients (42.9%) were female. Most of the patients in this study (78.6%) were adults (aged 18-59 years). Digestive surgery patients in this study were mostly treated for the neoplastic disease, 22 patients in total (52.4%) while those treated for the non-neoplastic disease were 20 patients (47.6%). Twenty-four patients (57.1%) in this study received perioperative nutritional support of protein or amino acids. Based on preoperative nutritional status, there were 23 patients (54.8%) who had poor nutritional status while the remaining 19 patients (45.2%) had good nutritional status. Eighteen patients of this study (42.9%) were hospitalized for a long period (≥ 11 days) and as many as 24 patients (57.1%) were hospitalized for less than 11 days.

The characteristics of the patients based on preoperative nutritional status can be seen in Table 2. The results showed that 70.8% of patients who received nutritional support had poor nutritional status. The results of statistical tests revealed a significant relationship between nutritional support and nutritional status ($p = 0.016$). Meanwhile, the variables of gender, age, and type of disease do not have a significant relationship with the nutritional status of patients before surgery ($p > 0.05$).

Table 3 shows the results of the bivariate analysis of the nutritional status and other variables towards the length of stay. Patients who have poor nutritional status tend to have longer hospital stay compared to patients with good nutritional status. Hypothesis testing with Chi-square test showed a significant relationship between the nutritional status of patients before surgery and length of stay ($p = 0.009$). Patients with poor nutritional status were hospitalized for 15.91 ± 10.3 days, while patients with good nutritional status had an average length of stay of 7.79 ± 5.03 days.

The results of the bivariate analysis showed a significant relationship between gender and nutritional support towards the length of stay. Meanwhile, age and type of disease were not significantly associated with length of stay.

Multivariate analysis using logistic regression test was conducted to analyze the relationship of nutritional status towards the length of stay by taking into consideration several other variables. The results of the logistic regression test for gender, nutritional support, and nutritional status on the length of stay can be seen in Table 4. The results showed that nutritional status had a significant relationship towards the length of stay with a prevalence

Table 1 Characteristics of Patients

Characteristics	n	%
Gender		
Male	24	57.1
Female	18	42.9
Age		
Adult (18-59 y.o)	33	78.6
Elderly (≥ 60 y.o)	9	21.4
Type of the disease		
Neoplastic	22	52.4
Non-neoplastic	20	47.6
Nutritional support		
Yes	24	57.1
None	18	42.9
Nutritional status		
Poor	23	54.8
Good	19	45.2
Length of stay		
Long (≥ 11 days)	18	42.9
Short (<11 days)	24	57.1

Table 2 Characteristics of the patients based on nutritional status

Variables	Nutritional Status				Total		P
	Poor		Good		n	%	
	n	%	n	%			
Gender ^a							
Male	14	58.3	10	41.7	24	100	0.591
Female	9	50	9	50	18	100	
Age (years) ^b							
Adult (18-59)	16	48.5	17	51.5	33	100	0.177
Elderly (≥60)	7	77.8	2	22.2	9	100	
Type of disease ^a							
Neoplastic	14	63.6	8	36.4	22	100	0.226
Non-neoplastic	9	45	11	55	20	100	
Nutritional support ^a							
Yes	17	70.8	7	29.2	24	100	0.016
None	6	33.3	12	66.7	18	100	

^aChi-square test; ^bFisher's exact test

Table 3 Results of bivariate analysis of the nutritional status and other variables towards the length of stay

Variables	Length of Stay				Total		p
	Long		Short		n	%	
	n	%	n	%			
Gender ^a							
Male	14	58.3	10	41.7	24	100	0.019
Female	4	22.2	14	77.8	18	100	
Age, years ^b							
Adult (18-59)	14	42.4	19	57.6	33	100	0.602
Elderly (>60)	4	44.4	5	55.6	9	100	
Type of Disease ^a							
Neoplastic	10	45.5	12	54.5	22	100	0.721
Non-neoplastic	8	40	12	60	20	100	
Nutritional Support ^a							
Yes	14	58.3	10	41.7	24	100	0.019
None	4	22.2	14	77.8	18	100	
Nutritional Status ^a							
Poor	14	60.9	9	39.1	23	100	0.009
Good	4	21.2	15	73.9	19	100	

^aChi-square test; ^bFisher's exact test

ratio (PR) of 5.276 (95% CI = 1.085-25.656, p = 0.039) while gender and nutritional support were not significantly related with the length of stay.

DISCUSSION

Malnutrition is one of the health problems common in hospitalized patients. In this study, 54.8% of

patients admitted to digestive surgery were at risk of malnutrition based on NRI scores. This prevalence is lower compared to a study conducted in Brazil which found that 88% of digestive surgery patients were at risk of malnutrition based on NRI.³ A study conducted in Albania obtained a prevalence of gastrointestinal surgery patients at risk for malnutrition based on the Nutritional Risk

Table 4 The result of Multivariate Analysis

Variables	Length of Stay				Total		p	PR	95 % CI
	Long		Short		n	%			
	n	%	n	%					
Gender									
Male	14	58.3	10	41.7	24	100	0.056	4.666	0.962-2.625
Female	4	22.2	14	77.8	IS	100			
Nutritional Support									
Yes	14	58=3	10	41,7	24	100	0.334	2.1S4	0.44S-10.655
None	4	22=2	14	77:8	IS	100			
Nutritional Status									
Poor	14	60.9	9	39.1	23	100	0.039	5.276	1.085-25.656
Good	4	21.2	15	78.9	19	100			

Screening 2002 (NRS 2002) to be 65 %.⁹ Another study conducted in Hong Kong found that 32.9% of patients with gastrointestinal surgery were at risk of moderate to severe malnutrition based on the Chinese version of the Malnutrition Universal Screening Tool (C-MUST).¹⁰

The risk of malnutrition in digestive surgery patients is caused by the patient's own disease condition and metabolic changes that occur due to the surgical procedure. Inadequate nutritional intake, surgical stressors, and increased metabolic rates make digestive surgery patients at risk of depletion of reserved protein in the body.^{7,9} Reduction of reserved protein has an impact on the process of wound healing, impairs of the immune system and reduced muscle strength which then contribute to the impairment of the recovery process and post-operative morbidity.⁷

The assessment of preoperative nutritional status based on NRI was related to the length of stay of patients. Digestive surgery patients who had poor nutritional status (NRI score <100) were 5.2 times more likely to have long hospitalization (≥ 11 days) compare to patients with good nutritional status. This result is in line with the research conducted by Susetyowati et al (2010) which showed that major surgical patients with malnutrition (NRI <100) were 5.5 times more at risk of having a long postoperative length of stay (> 7 days) compared to patients with good nutritional status.¹¹

Another study conducted in Brazil revealed that surgical patients who were malnourished were hospitalized longer (10.1 ± 8.7 days) compared to patients at risk of malnutrition (7.5 ± 6.5 days) and those with good nutritional status (5.7 ± 5.8 days).¹² Another study also found that surgical patients who were severely malnourished based on the Subjective Global Assessment (SGA) had a longer median length of stay compared to moderately

malnourished patients and non-malnourished patients.¹³ Another studies conducted in Hong Kong found that the increased risk of malnutrition was significantly associated with increased duration of hospitalization of digestive surgery patients.¹⁰

Further assessment and nutritional support needs to be done in patients who have been identified as at risk of malnutrition. There was a significant relationship between nutritional support and preoperative nutritional status where nutritional support tended to be given to patients who had poor nutritional status. This is consistent with the previous study which also found a significant relationship between providing nutritional support and nutritional status of patients.¹¹ The European Society for Clinical Nutrition and Metabolism (ESPEN) recommends providing nutritional support to surgical patients who are known to be malnourished or patients at risk of malnutrition. Nutritional support during the perioperative period is also recommended to be given to patients who are expected to experience low or insufficient oral intake of 50% of the recommended intake for more than 7 days.¹⁴ A proper nutritional supports during the perioperative period is known to reduce the incidence of infections, complications, and length of stay of digestive surgery patients.²

NRI is used as a simple method to assess nutritional status and screen the risk of malnutrition. NRI combines anthropometric and biochemical parameters, which is represented by body weight and serum albumin levels. NRI uses the ratio of the patient's current weight and usual weight. Calculation of these ratios can determine the patient's weight loss which is a sign of metabolic risk that can contribute to the occurrence of malnutrition.¹⁴ A study conducted in Taiwan showed that a decrease in pre-operative weight was significantly associated with length of stay for colorectal cancer

patients.¹⁵ Meanwhile, albumin is the main protein composing blood plasma in the body which can be used as an indicator of severe nutritional risk in surgical patients.¹⁴

Besides being associated with length of stay, a number of studies also revealed that the risk assessment of malnutrition based on NRI scores was also associated with wound healing and the incidence of postoperative complications. Research conducted at Dr. Sardjito Hospital revealed that major surgical patients with poor nutritional status were 4.8 times more likely to have bad wound healing compared to patients with good nutritional status.¹¹ Another study revealed that digestive surgery patients with non-infectious complications had a lower NRI score than patients who did not experience non-infectious complications.³

By looking at the high prevalence of digestive surgery patients who are at risk of malnutrition and the negative effects caused by postoperative outcomes, it is necessary to screen for malnutrition in each digestive surgery patient before surgery. NRI is a simple method to evaluate nutritional status that can be used as a screening of the risk of malnutrition and has been known to be associated with postoperative outcomes. Patients at risk of malnutrition based on NRI are expected to get a further nutritional assessment and nutritional support so that postoperative outcomes, especially the length of stay, can be more optimal.

The limitations of this study were that some variables like the existing chronic diseases (such as hypertension and diabetes mellitus), the severity of the disease, and ICU admission were not controlled. Those factors may have an effect on the clinical outcome and length of stay. Classification of the patients based on hospital service was also not performed, which may contribute as confounding variable.

CONCLUSION

Poor nutritional status is a significant health problem for digestive surgery patients and is one of the factors that contribute to long hospitalization of the patients. In this study, the prevalence of digestive surgery patients who were at risk of malnutrition was 54.8%. Digestive surgery patients who had poor nutritional status (NRI score <100) were 5.2 times more likely to have long hospitalization (≥ 11 days) compare to patients with good nutritional status.

ACKNOWLEDGMENT

The authors report no conflict of interests.

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