Original Article

Using Nutrition Risk Scores to Predict Hospital Length of Stay in Mild Acute Pancreatitis: A Prospective Cohort Study

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Background: Malnutrition increases both morbidity and mortality in patients with acute pancreatitis (AP). However, few studies have investigated degree of malnutrition and their impact on patients' outcomes.

Objective: This study is to investigate the incidence of malnutrition in hospitalized patients with AP and the effect of malnutrition on length of stay (LOS).

Materials and Methods: Data from all patients who were admitted with AP at King Chulalongkorn Memorial Hospital from April 2016 to July 2017 were collected. The degree of malnutrition was evaluated using Nutritional Risk Screening (NRS) 2002 and Subjective global assessment (SGA). The effects of malnutrition on hospital LOS were calculated by Spearman's correlation (r_s).

Results: A total of 32 patients with AP were recruited. Twenty-two (68.8%), eight (21.9%) and two (9.4%) patients were classified as having mild, moderately severe and severe AP by revised Atlanta criteria 2012. Fourteen (43.8%) patients were categorized as at risk of malnutrition by NRS 2002 (score ≥3) and 10 (31.2%) patients were diagnosed with malnutrition by SGA (SGA class B and C). NRS 2002 score, but not SGA, significantly predicted LOS (r_s = 0.5, p = 0.003), which mean LOS (SD) of NRS score 1 to 4 were 3.5 (1.2), 8.6 (8), 8.2 (5.9) and 11.6 (5.7) days, respectively.

Conclusion: Malnutrition was common in patients admitted with AP. As for validated nutrition tools, NRS 2002 had better efficacy than SGA to predict LOS in AP patients.

Keywords: Acute pancreatitis, Malnutrition, Length of stay, Nutrition risk screening, Subjective global assessment

J Med Assoc Thai 2019;102(Suppl.10): 38-42
Website: http://www.jmatonline.com

Acute pancreatitis (AP) is an acute inflammation of the pancreas with an incidence of 13 to 45 cases per 100,000 persons per year[1]. Its severity can be classified by the revised Atlanta criteria 2012 into mild, moderately severe and severe AP and majority of patients have mild AP (75 to 85%) which usually resolves in 5 to 7 days[2,3]. Gallstones is the most common cause of AP[2].

Nutrition is considered as one of the most important aspects in the management of AP. Malnutrition is caused by poor oral intake (from anorexia, nausea, and abdominal pain) and increased catabolism due to systemic inflammation. In addition, in patients with AP, pre-existing malnutrition status is common due to many factors especially alcoholism, which was found in up to 30% of the patients[3]. Early and proper nutritional management not only helps to treat and prevent malnutrition, but it also can decrease morbidity and mortality in patients with AP[4].

Nutrition screening and assessment is the first and important step for nutritional management. It can help identify patients who may need an urgent support on nutrition. Nutrition assessment can be done by several means such as history taking (diet, weight change, activities of daily living [ADLs], severity of disease), physical examination (muscle and subcutaneous fat wasting), anthropometrics (weight, body mass index (BMI), mid-arm muscle circumference), laboratory evaluations (serum protein, mineral and micronutrients level) and nutrition screening and assessment tools[3,5-7].

There are many tools to evaluate the nutritional status. The two commonly used scores in AP are Nutritional Risk Screening (NRS) 2002 which is recommended by American Society for Parenteral and Enteral Nutrition (ASPEN)[8] and Subjective Global Assessment (SGA). The risk and severity of malnutrition can be classified into "low"

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How to cite this article: Kittikundecha T, Lakananurak N, Rerknimitr R. Using Nutrition Risk Scores to Predict Hospital Length of Stay in Mild Acute Pancreatitis: A Prospective Cohort Study. J Med Assoc Thai 2019;102(Suppl.10): 38-42.

and "at risk" of malnutrition by NRS 2002 (score <3 and ≥3), and normal, mild-moderate and severe malnutrition by SGA (SGA class A, B and C, respectively)[9].

Despite the crucial role of nutrition in AP, the studies to evaluate the efficacy for prediction of clinical outcomes of these tools in AP are very scarce. Additionally, only a handful of studies have been conducted in Asian populations, and none was reported from Thailand. In the study by Wakahama, et al, SGA was found as a good prognostic factor in predicting length of stay (LOS) in 262 patients who admitted with gastrointestinal problems including AP[10].

The objective of this study is to investigate the incidence of malnutrition in AP and the efficacy of nutrition evaluated tools (NRS2002 and SGA) for the prediction of LOS in patients with AP.

Materials and Methods

Study design

This is a prospective cohort study in adult patients with AP who were admitted at King Chulalongkorn Memorial Hospital (KCMH) from April 2016 to July 2017. Written informed consent was obtained from all patients.

The following data were collected by a researcher at admission: age, sex, etiologies of AP, comorbidities. Nutrition status was evaluated by history taking (weight history, food history, gastrointestinal symptoms, and primary diagnosis) and physical examination (weight, height, subcutaneous fat, muscle wasting, and signs of fluid retention). These data were used to calculate NRS 2002[7] and SGA[9]. NRS 2002 defined "at risk" of malnutrition at score ≥3. Malnutrition was diagnosed in patients who had SGA B or C. Severity of AP was classified by revised Atlanta criteria 2012.

The management of AP was provided by primary care physicians and consultant gastroenterologists according to the standard of care.

Patients' outcomes, including mortality, complications, and length of hospital stays, were retrieved and reviewed from hospital medical records during admission and at discharge.

The study was approved by the Ethics Committee of the Faculty of Medicine, Chulalongkorn University (IRB No. 553/58).

Inclusion and exclusion criteria

Patients aged 18 or older who were diagnosed with AP were enrolled. Exclusion criteria were pregnancy, active psychological disease within 3 months, and patients on palliative care.

Statistical analysis

Data were analyzed using SPSS Statistics version 18 (SPSS, Inc., Chicago, IL, USA). Incidence of malnutrition was reported as percentage. Association between nutrition status and LOS was investigated using Spearman's correlation (r_s). Chi-square was used to evaluate correlation between severity of disease and nutrition status. Data are shown as number, number and percentage, mean ± standard deviation. A *p*-value of less than 0.05 was regarded as being statistically significant.

Results

The authors recruited 32 patients with AP who admitted to KCMH from April, 2016 to July, 2017. Patient characteristics are shown in Table 1. One patient had pre-existing chronic pancreatitis (3.1%). Twenty-four (75%) of the patients were male and eight (25%) were female. Mean age was 56.4 years old. The etiologies of AP were gallstone (50%), alcohol (28.1%) and unknown (12.5%). Mean LOS was 7.69 days. The number of patients with mild, moderate and severe AP were 22 (68.8%), 8 (25%) and 2 (6.3%), respectively.

In this study, 3 (9%) patients had concomitant acute cholangitis at the time of admission. No patient in the

Table 1. Baseline characteristic of the patients

Characteristics	Results
Sex, n (%)	
Male: female	24 (75):8 (25)
Age (years), mean (SD)	56.4 (14.2)
Body mass index (kg/m^2), mean (SD)	24.1 (4.9)
Weight change (kg), mean (SD)	-1.3 (2.6)
Causes, n (%)	
Stone	16 (50)
Alcoholic	9 (28)
Duct stricture	2 (6.3)
Immune	1 (3.1)
Idiopathic	4 (12.5)
Severity, n (%)	
Mild	22 (68.8)
Moderately severe	7 (21.9)
Severe	3 (9.4)
NRS 2002, n (%)	
Low risk	18 (56.2)
At risk	14 (43.8)
SGA, n (%)	
Normal	22 (68.7)
Mild-moderate	7 (21.9)
Severe	3 (9.4)
Length of stay (days), mean (SD)	7.69 (6.3)
Underlying disease, n (%)	
Hypertension	17 (53)
Dyslipidemia	11 (34)
Diabetes	7 (21)
Cirrhosis	4 (12)
Gout	3 (9)
HIV	1 (3)
Stroke	1 (3)
IgA nephropathy	1 (3)
Major depressive disorder	1 (3)
Myasthenia gravis	1 (3)
Complications, n (%)	
Cholangitis	3 (9)
Volume overload	1 (3)
Death	0 (0)

study died from AP.

Nutrition status

Nutrition status assessed by NRS 2002 score showed low risk in 18 (56.2%) patients and at risk in 14 (43.8%) patients (NRS 2002 score 1, 2, 3, 4 in 8 [25%], 10 [31.25%], 9 [28.12%] and 5 [15.62%], respectively). Nutrition status assessed by SGA showed that 22 (68.8%) patients were diagnosed as normal (SGA class A), 7 (21.9%) as mild-moderate (SGA class B) and 3 (9.4%) as severe malnutrition (SGA class C) (Table 1).

Length of stay in patients with malnutrition

Regarding the prediction of LOS, from NRS 2002 score 1 to 4, the mean (SD) LOS were 3.5 (1.2), 8.6 (8), 8.2 (5.9) and 11.6 (5.7) days, respectively. Spearman's correlation between NRS 2002 score and LOS was 0.5 (p = 0.003). In addition, mean (SD) LOS of normal, mild-moderate and severe malnutrition patients by SGA were 6.18 (4.8), 11 (8.8) and 11 (7.2), respectively. Spearman's correlation between SGA and LOS was 0.34 (p = 0.06) (Figure 1).

By using NRS 2002, in mild, moderately severe and severe AP patients, there were 7/22 (31.8%), 5/8 (62.5%) and 2/2 (100%) patients with at risk for malnutrition, respectively. The correlation between severity of AP and degree of malnutrition by NRS 2002 showed statistically significant (p = 0.005) (Table 2).

By using SGA, in mild, moderately severe and severe AP patients, there were 3/22 (13.6%), 5/8 (62.5%) and 2/2 (100%) patients with malnutrition (SGA class B and C), respectively. The correlation between severity of AP and degree of malnutrition assessed by SGA showed statistically significant (p = 0.002) (Table 3).

Discussion

The authors designed to investigate the degree of malnutrition in patients who admitted to the hospital with AP from any causes and the effect of nutrition status on LOS. There were 32 eligible AP patients and the 2 most common causes of AP were gallstones (50%) and alcohol (28%) and these were in line with other studies which showed gallstone pancreatitis in 40 to 70% and alcoholic pancreatitis in 25 to 35% of the AP patients[2]. In the present study, mortality and the complication rate were very low because mild AP accounted for around two-third of our patients (68.8%).

The incidence of malnutrition in this study was 31.3% by SGA (SGA class B and C) and at risk of malnutrition by NRS 2002 was found in 43.8% of the patients with AP. This result was comparable to the previous studies in which malnutrition was reported in 30 to 62% of AP patients[3,11]. A study including 154 patients with AP reported that 62%

Table 2. Severity of acute pancreatitis and NRS 2002

Severity	NRS 2002			
	Low risk		At risk	
	1	2	3	4
Mild	8	7	6	1
Moderate	0	3	2	3
Severe	0	0	1	1

Table 3. Severity of acute pancreatitis and SGA

Severity	SGA		
	Normal	Mild-moderate	Severe
Mild	19	3	0
Moderate	3	2	3
Severe	0	2	0

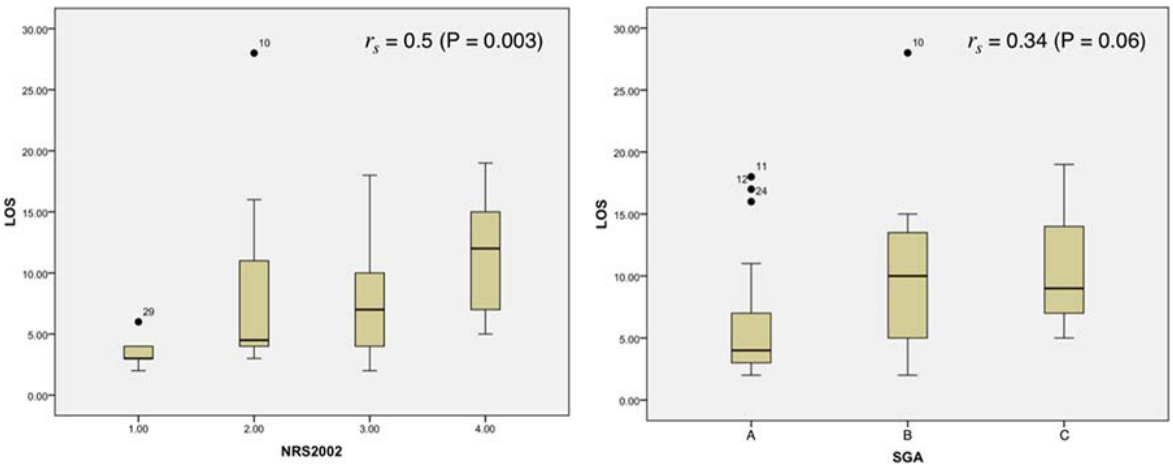

Figure 1. Nutrition status and length of stays.

of the patients had some degree of malnutrition[11]. The higher incidence of malnutrition compared with our study may be due to 2 main factors. Firstly, there was the high percentage of patients with preexisting chronic pancreatitis (CP) in the previous study (36.4%). In contrast, only 1 case (3.1%) in our study had preexisting CP. The incidence of malnutrition in patients with preexisting CP was significantly higher than the patients without this condition (88% vs. 50%)[11]. The second reason is the different in method of nutrition evaluation. Previous study used albumin and total lymphocyte count as the nutrition evaluated tools. Consequently, the incidence of malnutrition may be falsely high since albumin and total lymphocyte count usually decline from acute inflammation rather than malnutrition itself[12].

NRS 2002 was significantly associated with LOS ($r_s = 0.5$, $p = 0.003$) while the significant association was not found in SGA ($r_s = 0.34$, $p = 0.06$)]. The explanation of this finding may result from the disease severity score that is included in NRS 2002 but not in SGA.

Previous studies showed multiple nutrition screening and assessment tools, including SGA, NRS 2002, Malnutrition Universal Screening Tool (MUST), and handgrip strength, could significantly predict hospital LOS[13,14] Nevertheless, both studies included general medical and surgical patients with higher incidence of malnutrition (48 to 64% by SGA), compared with 31.3% in the present study. A study by Rita, et al included general medical and surgical patients with only 3.5% of these patients admitted in gastroenterology unit[13]. In addition, the population in a study by Almeida, et al, was in general surgery ward and there were high proportion of oncological patients (46%), which may affect nutrition status and LOS[14].

As previously mentioned, disease severity is one of the important factors for predicting outcomes in both AP and malnutrition. Despite without statistical significance, SGA also tended to have association with LOS. This non-statistically significant result may be attributable to the small sample size, which could have the effect of underpowering the study.

The severity of AP was significantly associated with degree of malnutrition assessed by both NRS 2002 and SGA. The higher score in severity of AP correlated more to the higher degree of malnutrition. This finding may be explained by the score on severity of disease included in NRS 2002 and the score on gastrointestinal symptoms (abdominal pain, nausea and vomiting) which are usually found more in patients with moderately severe and severe AP in SGA. The finding in our study was similar to previous study that showed incidence of malnutrition was lower in patients with mild AP (55% vs. 70%, respectively)[11].

To the best of the authors' knowledge and based on the authors' review of the literature, this is the first study that validated nutrition screening and assessment tools for prediction of clinical outcomes in AP. NRS 2002 significantly predicted LOS. For this reason, it should be used as validated tool for the evaluation of nutrition status in patients with AP. This study is not without limitations. The first limitation is small sample size and the second is the fact that most patients in our study had mild AP, which is contributed to lower complications and shorter LOS.

Conclusion

Malnutrition was found in up to one-third of hospitalized patients with AP. NRS 2002 was nutrition-evaluated tool that could significantly predict LOS. Therefore, it can be used for prioritizing nutritional management in patients with AP. We highlighted the need to include a larger sample size for the validation of various nutrition screening and assessment tools in the future.

What is already known on this topic?

Malnutrition is associated with higher morbidity and mortality in acute pancreatitis. Early and proper nutritional management can improve these outcomes. However, few studies have evaluated the ability of nutrition screening and assessment tools for prediction of outcomes in this condition.

What this study adds?

Malnutrition or at risk of malnutrition was diagnosed in 43.8% by Nutrition Risk Screening (NRS) 2002 and 31.2% by Subjective Global Assessment (SGA). Only NRS 2002 was significantly associated with longer length of stay in patients with acute pancreatitis.

Acknowledgements

The authors gratefully acknowledge Mr. Wasan Panyasang, the Research Affair, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand, for his helpful advice on statistical matters.

Potential conflicts of interest

The authors declare no conflicts of interest.

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