

Nutritional status and risk of refeeding syndrome in hospitalized patients due to acute heart failure at Cardiac Intensive Care Unit

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Summary

Objective: To investigate the nutritional characteristics and risk of refeeding syndrome in acute heart failure patients at 108 Military Central Hospital. **Subject and method:** 90 patients with acute cardiovascular disease at the Cardiovascular Intensive Care Unit - 108 Military Central Hospital from 6/2020 to 6/2021. Assessing some risk factors, outcomes, length of hospital stay, SGA, risk of refeeding syndrome. **Result:** Most patients had moderate (SGA-B) (51.1%) and severe (SGA-C) (28.9%) malnutrition. The risk of refeeding syndrome appeared in 13/45 patients with acute cardiovascular disease (accounting for 28.9%). The total hospitalization duration tended to be prolonged in patients with poor nutritional status or at risk of refeeding syndrome ($p < 0.05$). Rerefeding syndrome increased the risk of mortality in AHF patients ($p < 0.05$). **Conclusion:** Patients with acute heart failure have a high rate of malnutrition. Poor nutritional status is associated with increased treatment duration and mortality.

Keywords: Acute heart failure, nutritional status, SGA, refeeding syndrome.

1. Background

Acute heart failure (AHF) is a syndrome defined as the new onset (de novo heart failure (HF)) or worsening of symptoms and signs of heart failure, mostly related to systemic congestion. Despite new evidence-based managements of AHF has been reported, AHF is still associated with poor outcomes, with 90-day readmission rates and 1-year mortality reaching 10 - 30% [2]. Boban Marko et al found that the risk of malnutrition is common in patients with acute heart failure and is closely related to the duration of hospitalization, rehospitalization, complications, infections and mortality rate in

patients with heart failure, especially those with acute heart failure requiring cardiovascular resuscitation [1].

Recently, the European Society for Clinical Nutrition and Metabolism (ESPEN) as well as the American Society for Parenteral and Enteral Nutrition (ASPEN) recommend the use of the SGA score (Subjective global assessment) and provided the diagnostic criteria for the risk of refeeding syndrome (RFS) which closely assess the nutritional status of critically ill patients as soon as possible, preferably within 48 hours of admission. The SGA score has been shown to have the ability to predict mortality independent of BMI value, easy to use, and was the most commonly used when compared with other scales [3].

We carried out the study: "Nutritional status and risk of refeeding syndrome in hospitalized patients due to acute heart failure" with the following objective: *To describe nutritional status and risk of*

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refeeding syndrome in acute heart failure patients at Cardiovascular Intensive Care Unit (ICU) before and after 1 week of hospitalization. To assess the relationship between nutritional status and ICU stay duration and total hospitalization stay.

2. Subject and method

2.1. Subject

Study population 90 acute heart failure patients were diagnosed according to 2021 European Society of Cardiology (ESC) criteria:

Rapid or gradual onset of symptom and/or sign of heart failure, severe enough for unplanned or emergency hospital admission.

Echocardiography: Objective evidence of cardiac structural and/or functional abnormalities consistent with the presence of LV diastolic dysfunction/raised LV filling pressures.

Natriuretic peptides testing: BNP \geq 100pg/ml or NT-proBNP \geq 300pg/ml.

Exclusion criteria: Pneumothorax, pneumonia /tuberculosis, severe cirrhosis, sepsis/septic shock... Or patients did not agree to participate in the study.

2.2. Method

A prospective, descriptive, longitudinal follow-up study was conducted at Cardiovascular Intensive Care Unit, 108 Military Central Hospital from 6/2020 to 6/2021.

2.3. Study parameters

General characteristics: Age, gender, BMI, causes and type of acute heart failure.

Complete blood count, blood biochemistry (Protein, albumin, transamin, magnesium, phosphorus).

Calculating the hospitalization duration (total duration of patient's hospital stay from admission to discharge).

Assessing the nutritional status of patients at admission and after 1 week of treatment using the SGA score: SGA-A is well-nourished. SGA-B is mildly/moderately malnourished. SGA-C is severely malnourished.

Assessment for refeeding syndrome at admission and after 1 week of treatment according to the criteria of the European Society for Clinical Nutrition and Metabolism [3]: When the patient has one or more of the following factors:

Body mass index $< 16.0\text{kg/m}^2$.

Unintentional weight loss $> 15\%$ of body weight within 6 months.

Little or no nutritional intake for > 10 days.

Low levels of potassium, phosphate, or magnesium before feeding.

Or patient has 2 or more of the following:

Body mass index < 18.5 .

Unintentional weight loss $> 10\%$ in the past 3-6 months.

Little or no nutritional intake for > 5 days.

History of alcohol misuse or drugs, including insulin, chemotherapy, antacids, or diuretics

Assessing survival outcome after 30-day follow up. Finding the association between SGA score, risk of refeeding syndrome and treatment duration as well as survival.

2.4. Statistical methods

Continuous variables are expressed as mean \pm standard deviation, discrete variables are expressed as frequency (percentage). Data were analyzed using SPSS 22.0 software.

3. Result

Table 1. General characteristics of patients

	$\bar{X} \pm SD$ or n,%
Age (years)	76.42 ± 11.91
Male (n, %)	58 (64.4%)

BMI (kg/m ²)		21.12 ± 4.27
Causes of hospitalization	Acute myocardial infarction	38 (42.2%)
	Urgent or emergent HTN	52 (57.8%)

Table 1. General characteristics of patients (Next)

		$\bar{X} \pm SD$ or n,%
Acute heart failure phenotypes	Acute decompensated heart failure	48 (53.3%)
	Cardiogenic pulmonary edema	25 (27.8%)
	Isolated acute right ventricular failure	7 (7.8%)
	Cardiogenic shock	10 (11.1%)
Length of hospital stay	ICU stay (days)	4.53 ± 3.66
	Total hospitalization time (days)	11.69 ± 7.62
30-day outcomes	Discharged	84 (93.3%)
	Death	6 (6.7%)

The mean age was 76.42 ± 11.91 years. The proportion of males accounted for 64.4%. The average length of hospital stay was 11.69 ± 7.62 days. After 30 days of follow-up, there were 6 patients died, accounting for 6.7%.

Table 2. Nutritional characteristics of patients on admission and after a week of treatment

Characteristics (n = 90)		Admission (n, %)	A-week post-treatment (n, %)	p
SGA	A	18 (20.0%)	48 (53.3%)	<0.01
	B	46 (51.1%)	28 (31.1%)	
	C	26 (28.9%)	14 (15.6%)	
RFS	Risk	26 (28.9%)	10 (11.1%)	<0.05
	No risk	64 (71.1%)	80 (88.9%)	
Biochemical parameters	Erythrocytes (T/L)	4.14 ± 0.79	4.13 ± 0.81	>0.05
	Hemoglobin (g/L)	116.67 ± 28.60	120.00 ± 23.54	>0.05
	Protein (g/L)	66.98 ± 7.09	65.71 ± 7.82	>0.05
	Albumin (g/L)	35.44 ± 3.74	33.89 ± 5.22	>0.05
	Transferrin (g/L)	1.70 ± 0.39	1.89 ± 0.68	>0.05
	Potassium (mmol/L)	4.20 ± 0.92	3.87 ± 0.42	>0.05
	Magnesium (mmol/L)	0.87 ± 0.16	0.85 ± 0.14	>0.05
	Phospho (mmol/L)	1.31 ± 0.46	1.29 ± 0.27	>0.05

Most of the patients had moderate malnutrition (51.1%) on admission. There were 13 patients, (28.9%), at risk of refeeding syndrome. After a week of treatment, the nutritional status of patients assessed by the SGA scale was improved significantly $p < 0.01$. The risk of refeeding syndrome in acute heart failure patients was also significantly reduced ($p < 0.05$).

Table 3. Relationship between nutritional status and total hospitalization duration

Total hospitalization duration		Day ($\bar{X} \pm SD$)	p
Characteristics			
SGA	SGA-A (n = 18)	5.27 ± 3.12	<0.05

RFS	SGA-B (n = 46)	11.42 ± 3.54	<0.05
	SGA-C (n = 26)	15.23 ± 4.44	
	Risk (n = 26)	15.54 ± 7.18	
	No risk (n = 64)	9.38 ± 4.95	

The total hospitalization duration tended to be prolonged in patients with poor nutritional status or at risk of refeeding syndrome, the difference was statistically significant with $p < 0.05$.

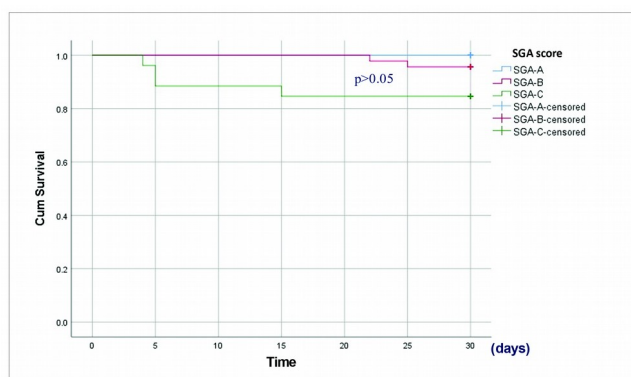


Figure 1. Kaplan–Meier curves showed 30 days survival based on SGA score

The survival rate after 30 days follow-up in AHF patients with mildly/moderately malnourished was higher than that of severely malnourished patients, but the difference was not statistically significant.

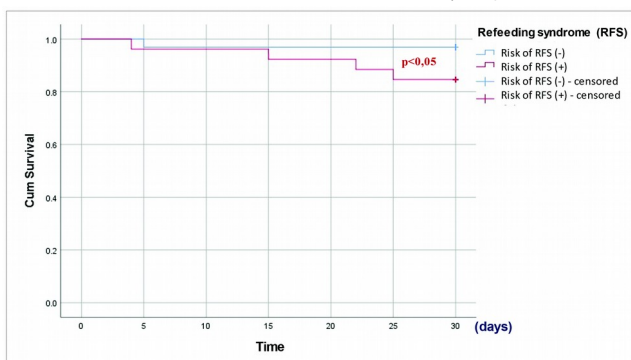


Figure 2. Kaplan–Meier curves showed survival based on RFS risk

The survival rate after 30 days follow-up in AHF patients with no-risk of RFS was higher than patients with risk of RFS, with $p < 0.05$.

4. Discussion

The mean age of patients with acute heart failure treated at the Cardiovascular ICU was $76.42 \pm$

11.91 years, with 64.4% male. The mean total hospitalization duration was 11.69 ± 7.62 days. Regarding biochemical parameters: The average serum glucose concentration of the patient was 9.40 ± 5.03 mmol/L. The serum hemoglobin, albumin and transferrin level tended to be in the lower normal range, averaging 116.67 ± 28.60 (g/L), 35.44 ± 3.74 (g/L) and 1.70 ± 0.39 (g/L), respectively. After 30 days of follow-up, there were 6 patients died, accounting for 6.7%. The results of our study are similar to those of other authors [3], [5].

According to the European Society of Clinical Nutrition and Metabolism (ESPEN), all critically ill patients within the first 48 hours should have a specific nutritional status survey to add to the clinical picture patient's condition as well as for the selection of appropriate nutritional interventions. Through assessing nutritional status using the SGA scale, we found that the majority of patients had moderate (SGA-B) (51.1%) and severe (28.9%) malnutrition (SGA-C). Our results are higher than those of other authors, the reason is that the patient's social and economic conditions in Vietnam are lower than that of developed countries. Yamauti A.K. (2006) surveyed 106 patients with acute heart failure (53 patients with heart failure) using the SGA scale to assess nutritional status and found that the rate of malnutrition of the patients was 60.4% [5]. After 1 week of treatment, we also found that the nutritional status of patients was significantly improved with $p < 0.01$ while the paraclinical parameters did not change significantly.

Refeeding syndrome may occur in severely malnourished or prolonged fasting patients receiving artificial refeeding (whether enterally or parenterally), characterized by severe fluid and electrolyte imbalance, cardiovascular and neuromuscular dysfunction, and even death. Patients with acute heart failure are very sensitive to changes in fluid intake, electrolytes, and central

nervous system functions. Previous studies have shown that patients at risk for refeeding syndrome had a very high mortality rate [6]. Our data showed that the risk of refeeding syndrome appeared in 13/45 patients with acute heart failure (28.9%). After 1 week of treatment, the risk of refeeding syndrome in acute heart failure patients was also significantly reduced ($p < 0.05$).

Regarding the relationship between nutritional status and the duration of treatment, we found that the total hospitalization duration tended to be prolonged in patients with poor nutritional status or at risk of refeeding syndrome, the difference was statistically significant with $p < 0.05$. In addition, we also observed that refeeding syndrome increased the risk of mortality in AHF patients ($p < 0.05$). Similarly, Tevik K (2015) found that the nutritional status was associated with increased complications and length of hospital stay in patients with heart failure [4]. This suggests that improving the nutritional status of patients can contribute to improving treatment efficiency and reducing the burden of care for both medical staff and patient's relatives.

5. Conclusion

Hospitalized patients due to acute heart failure at Cardiovascular Intensive Care Unit with poor

nutritional status and a high risk of refeeding syndrome should have nutritional treatment as an important adjunctive therapy.

References

1. Boban M, Bulj N, Kolačević Zeljković M et al (2019) *Nutritional considerations of cardiovascular diseases and treatments*. Nutr Metab Insights 12:1178638819833705.
2. Greene SJ et al (2015) *The vulnerable phase after hospitalization for heart failure*. Nat. Rev. Cardiol 12: 220-229.
3. Singer P, Blaser AR, Berger MM et al (2019) *ESPEN guideline on clinical nutrition in the Intensive Care Unit*. Clinical nutrition (Edinburgh, Scotland) 38(1): 48-79.
4. Tevik K, Thürmer H, Husby MI et al (2015) *Nutritional risk screening in hospitalized patients with heart failure*. Clin Nutr 34(2): 257-264.
5. Yamauti AK, Ochiai ME, Bifulco PS et al (2006) *Subjective global assessment of nutritional status in cardiac patients*. Arq Bras Cardiol 87(6): 772-777.
6. Friedli N, Baumann J, Hummel R et al (2020) *Refeeding syndrome is associated with increased mortality in malnourished medical inpatients*. Medicine 99(1): 18506.