Nutritional Assessment in the Critically Ill Patients

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ABSTRACT

Background: Malnutrition is a prevalent complication among critically ill patients. It has very detrimental effects on the patients' clinical course. This study aimed to investigate the impact of nutrition in the intensive care unit (ICU) patients.

Methods: In this epidemiologic-analytic study conducted in the surgical ICU of Imam Khomeini hospital, Ahvaz, Iran, 34 patients were selected and divided into two groups. The first group of patients received the appropriate nutrition. The second group received an inappropriate diet, and the nutritional risk was evaluated according to the modified- Nutrition Risk in Critically ill (m-NUTRIC) score. The energy was calculated by using 25 Kcal/kg, also the two groups were compared in terms of ICU mortality, ICU stays, Acute Physiologic Assessment and Chronic Health Evaluation (APACHE) II Scoring, and the Sequential Organ Failure Assessment (SOFA) Score.

Results: Baseline data, such as APACHE II score and mean age, except sex, were not significantly different between the two groups. In this study, results were toward shorter ICU stay, less mortality, and better SOFA score in the group receiving appropriate nutrition compared to the other group. However, due to the low number of patients, no significant differences were observed in the two groups.

Conclusion: Our data suggest that nutritional support should be considered as an essential part of the medication during critical illness.

It is well known the role of nutritional support in critical illness is essential [1-3]. Malnutrition is prevalent complication among critically ill patients [4]. The large numbers of patients hospitalized in the intensive care unit (ICU) suffer from catabolic stress, which refers to be the body inflammatory response to stress or injury. Malnutrition significantly increases mortality and length of stay in critically ill patients [5-10].

The first step in the prevention and treatment of malnutrition is the assessment of nutritional status and correction of diet intake [9,11].

Enteral nutrition (EN) in these patients is superior to parenteral nutrition (PN) [12-13]. There is increasing recognition that aggressive early feeding, as well as prolonged underfeeding both should be avoided [1,3],

although specific amounts of EN required for improved outcomes continue to be questioned [14].

The guidelines suggest that a validated score, such as the Nutrition Risk in the critically ill (NUTRIC) score, be utilized to determine nutrition risk in ICU patients [15]. It was developed to link starvation, inflammation, and clinical outcomes [16]. The incorporation of IL-6 limits the original NUTRIC score, so IL-6 in the modified-NUTRIC (m-NUTRIC) score has been removed. It was shown to contribute very little to the overall prediction of the NUTRIC score [17].

One study reported that the prevalence of malnutrition increased significantly in ICU patients during hospitalization [18]. The amount of malnutrition prevalence and mortality of ICU patients in Iran, due to a few studies, is not clear. The few reviews have been reported in the range of 25-48% [19-20].

The main aim of this study was to make a nutritional assessment of ICU patients referring to Imam Khomeini hospital in Ahvaz, Iran. Furthermore, we documented the length of stay in ICU, the mortality rate in the ICU, and the Sequential Organ Failure Assessment (SOFA) score.

Methods

This study was performed in the surgical ICU of Imam Khomeini teaching hospital in Ahvaz, Iran. This was an epidemiologic-analytic study for Jul 23, 2019, to Oct 22, 2019, which included 50 ICU patients over the age of 18 with an ICU stay for a minimum duration of 3 days and m-NUTRIC score≥5. Patients were excluded if patients were <18 years), ICU stays less than three days, m-NUTRIC score<5, pregnancy, and lactation (Figure 1).

The ethical committee of the university approved the study (file number: IR.AJUMS.REC.1397.857)

Baseline data recorded were age, sex, Acute Physiologic Assessment and Chronic Health Evaluation (APACHE) II Scoring [21], and actual body weight. Also, diagnosis, type of feeding, SOFA score [22], ICU length of stay, and mortality rate in the ICU were documented. Nutritional support status for adult patients during the study period was enrolled for appropriateness evaluation according to the m-NUTRIC score [23].

We collected data on nutrition intake in the duration of ICU admission daily, including volume and type of EN and PN products administered. We divided patients with m-NUTRIC score≥5, into two groups. The first group of patients received the appropriate nutrition. The second group received an inappropriate diet. All the findings of the study were done in these two groups. According to the American Society for Parenteral and Enteral Nutrition (ASPEN) guideline, the energy target was defined as 25Kcal/Kg/d. Patients' requirements were compared to intake food. Findings were assessed and confirmed by a clinical pharmacist.

Baseline characteristics are presented as mean ± standard deviation or median (minimum-maximum) for quantitative variables, and as the number (frequency percentage) for qualitative variables. Quantitative variables were compared using an independent sample t-test, and qualitative variables were compared using a chi-square test. A P-value ≤0.05 was considered significant in outcome analysis. Data analysis was performed using SPSS version 22.

Figure 1- Frequency of patients included in (and excluded from) the study according to screening results
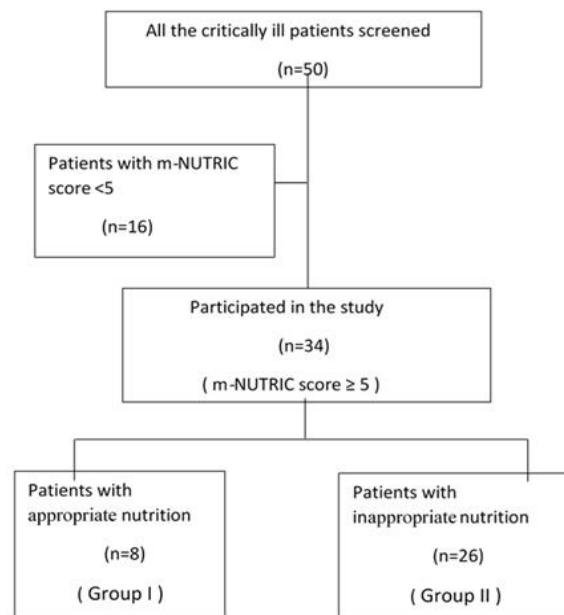
Results

Among the patients admitted to the ICU during in a 3-month study period, 50 patients were included. According to the m-NUTRIC score, 34 patients (68%) were classified as m-NUTRIC score≥5, and 16 (32%) were classified as m-NUTRIC score<5. In this study, only the patients, who had a mNUTRIC score≥5, were evaluated. Out of the 34 patients with a m-NUTRIC score≥5, 8 (23.5%) had appropriate nutrition (group I) and 26 (76.5%) had inappropriate nutrition (group II) (Figure1/Table2). There were 22 (64.7%) men and 12 (35.3%) women (Table1).

The baseline characteristics of the patients are summarized in table1. Fundamental patient characteristics recorded were age, sex, weight, and APACHE II scores. There was a significant difference between the two groups in sex (p=0.00). There were no significant differences between the two groups in the average of the weight (p=0.26), age (p=0.85), and APACHE II scores (p=0.14) (Table1).

The majority of the patients received enteral feeding, and 29.4% of them did not receive any form of feeding for the entire period of stay in the ICU (Table1).

Table2 shows nutritional support status according to the m-NUTRIC score in two groups. There was a significant positive difference between two groups (P≤0.05) (Table2).

Table3 shows the secondary clinical outcomes in the patients over the study period. There were no significant differences between the two groups in ICU length of stay (P=0.96) (Figure 2), SOFA score (P= 0.48) (Figure 3) and ICU mortality (P=0.6) (Table 3).

Table 1- Characteristics of the patients and feeding parameters

Variable		Mean ±SD, median (IQR) or N (%)			P-value*
N= 34		Total	Group I	Group II	
Age (y)		62.82±17.92	61.75±15.98	63.15±18.76	0.85
		65.50 (30,87)	62 (33,85)	66 (30,87)	
Sex	Male	22 (64.7%)	1 (2.9%)	21 (61.8%)	0.00
	Female	12 (35.3%)	7 (20.6%)	5 (14.7%)	
Weight		68.71±11.22	64.75±12.78	69.92±10.67	0.26
		70 (42.90)	69 (43.80)	70 (42.90)	
APACHE II		26.97±7.11	23.75±6.56	27.96±70.09	0.14
		27.50 (13.39)	23 (16.36)	29 (13.39)	
Diagnosis					
Postoperative care		31 (62%)			
Cardiovascular and respiratory arrest		6 (12%)			
Multiple trauma		3 (6%)			
Sepsis		3 (6%)			
Pemphigus Vulgaris		2 (4%)			
Others		5 (10%)			
Type of feeding					
EN: 16(47.1%)					
PN: 3 (8.8%)					
EN, PN: 5 (14.7%)					
Nothing: 10 (29.4%)					

Note: Group I: Patients with appropriate nutrition; Group II: patients with inappropriate nutrition

Abbreviation: N: number of patients; APACHE II score: Acute physiology and chronic health evaluation II score; IQR: Interquartile range (Ist- 3rd quartile); EN: Enteral nutrition; PN: Parenteral Nutrition; SD: Standard deviation; *calculated by chi-square test for qualitative variable and independent sample t-test for the quantitative variable.

Table 2- Nutritional support status according to the m-NUTRIC score in two groups

Nutritional support status			
	N (%)		P-value*
Total	Group I	Group II	
34 (100%)	8 (23.5%)	26 (76.5%)	0.00

Note: Group I: Patients with appropriate nutrition; Group II: patients with inappropriate nutrition

Abbreviation: N: number of patients; m-NUTRIC score: modified- Nutrition Risk in the critically ill score.

* calculated by chi-square test for qualitative variable and independent sample t-test for the quantitative variable.

Table3- The secondary clinical outcomes in the patients over the study period

Clinical outcomes in two groups				
	Mean±SD, median (IQR) or N (%)			P-value*
	Total	Group I	Group II	
Length of ICU. stay N(d)	15.50±19/88	15.25±13/38	15.58±21.72	0.96
	8 (3,89)	13.50 (3,42)	6.50 (3,89)	
ICU mortality	23 (67.6%)	5 (14.7%)	18 (52.9%)	0.6
SOFA score	9.12±3.09	8.43±2.00	9.33±3.36	0.48
	n9.66 (0.33,16)	8.57 (5.67,11.33)	10.16(0.33,16)	

Note: Group I: Patients with appropriate nutrition; Group II: patients with inappropriate nutrition

Abbreviation: ICU: Intensive care unit, SOFA score: sequential organ failure assessment, IQR: Interquartile range (Ist- 3rd quartile), SD: standard deviation

* calculated by chi-square test for qualitative variable and independent sample t-test for the quantitative variable.

Figure 2- The ICU length of stay in two groups
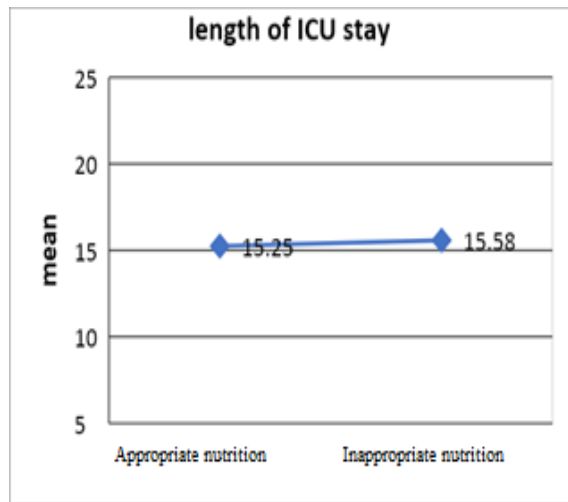
Figure 3- The mean number of SOFA score in two groups
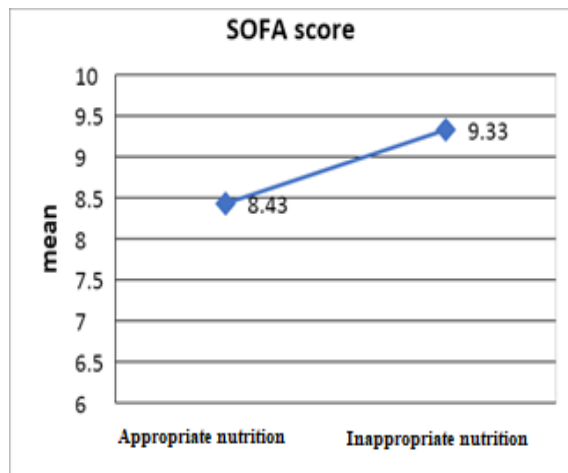
Note: SOFA= Sequential Organ Failure Assessment

Discussion

This epidemiologic-analytic study was conducted on 50 ICU inpatients for three months. Patients who met the inclusion criteria were categorized into two groups. We compared the SOFA score [22], ICU length of stay, and mortality rate in two groups.

In this study, there was a significant difference in appropriate nutrition between the two groups. The appropriate and inappropriate nutrition in two groups was 23.5% and 76.5%, respectively. It may be due to in ICU cure; the focus is more on the treatment of the disease than start proper nutrition. Unawareness that it is an important part of the patient's treatment. Nachvak et al. showed a significant increment in the prevalence of malnutrition among critically ill patients in the ICU discharge day (83.5%) compared to the ICU admission day (42.6%) [18]. At the same time, Hejazi et al. reported a rate of 58.62% for malnutrition on the ICU discharge day compared to 28.8% on the admission day [24]. Based on the studies, malnutrition prevalence has been 13 to 78 percent between the years of 1996 to 2005 [25]. The different prevalence rates of malnutrition can be explained by the use of different nutritional support, disease severity, and performance of medical teams in study populations [25]. Malnutrition is associated with morbidity and mortality during ICU stay [26-27]. Leiva Badosa et al. showed that malnutrition was associated with longer ICU stay and higher ICU mortality [28].

Also, providing a type of nutrition (EN or PN) is another important issue that should be considered. EN nutrition in critically ill patients is superior to parenteral nutrition [12-13]. The benefits of EN in them cause maintenance of the functional and structural integrity of the gut, decreased infectious complications, shorter hospital stays, and lower mortality [15]. Also, high-risk patients should receive nutritional support, initiated within the first 24 to 48 hours after admission [29].

In this study, results were toward shorter hospital stay, less mortality, and better SOFA score in the group receiving appropriate nutrition compared to the other group. However, due to the low number of patients, no significant differences were observed in the two groups.

Similar and opposite results were observed in other studies. For example, the results of Rice et al.'s study showed that there were no significant differences in ventilator-free days, length of stay, and mortality rates among ICU patients [30]. However, Villet et al.'s study found a strong correlation between inadequate feeding and increased incidence of ICU mortality [31].

Raman et al. evaluated patient nutrition by m-NUTRIC score and showed adequate nutrition could decrease mortality in high-risk patients [23]. One possible explanation for this discrepancy is the small sample size in our study. Another limitation of the study was the lack of beds to measure body weight. Of course, to reduce errors, all estimated weights were conducted by one person.

Recommendation

We recommend further studies using a larger sample.

Conclusion

Our data suggest that nutritional support should be considered as an essential part of the medication during critical illness.

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