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Research Article
Nutritional Risk Assessment in Critically ill Adult Patients: A Study from Ras Al Khaimah, United Arab Emirates

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Abstract

Background and Objective: Malnourished patients have worse clinical outcomes than their well-nourished counterparts; unfortunately, this relationship is often exacerbated in the intensive care unit (ICU) due to the hyper metabolic nature of critical illness. Accurately identifying patients at risk for malnutrition is essential to decrease negative outcomes during hospitalization. This study aims to assess the nutritional risk in critically ill patients using NUTRIC score-an ICU specific nutrition risk assessment tool. **Materials and Methods:** Adult patients (>18 years) who were admitted in the ICU and stayed for more than 24 h were included in the study. To identify the patients at nutritional risk, modified NUTRIC score (m-NUTRIC score without IL-6 values) was used. Patients having a NUTRIC sore of 0-4 were classified to have low malnutrition risk and those having a score of 5-9 were associated with worse clinical outcomes. SPSS 24 software was used to analyze the data. Data of 50 patients was analyzed. **Results:** A total of 84% patients had a high NUTRIC score (5-9) and 16% had a low NUTRIC score (0-4). This clearly indicates that the patients with high NUTRIC score are at nutritional risk. The mortality rate in this study was 12.5% for patients with low NUTRIC score in comparison to 28.6% among patients with high NUTRIC score. **Conclusion:** The prevalence of nutritional risk in critically ill patients using m-NUTRIC score was 84% in this study. It was observed that high NUTRIC score is associated with increased mortality and increased ICU length of stay and these patients are most likely to benefit from aggressive nutrition therapy.

INTRODUCTION

Malnutrition is found to be a prevalent consequence of hospitalization in critically ill patients[1]. Hyper metabolism and inadequate intake of macronutrients can be the cause of malnutrition among these patients[2,3]. Nutrient deficiencies and prolonged Intensive care unit (ICU) length of stay are strongly related to increased morbidity and mortality among critically ill patients[4,5]. The percentage of malnutrition prevalence among ICU patients varies between 39% and 50% and it depends on the study population and the screening tools used[1,6]. Among these patients malnutrition is linked with prolonged hospitalization, infections and increased mortality[7]. Stress induces metabolic responses such as skeletal muscle wasting, changes in body composition and hyperglycemia[8]. Patients who are malnourished have poor clinical outcomes compared to their well-nourished counterparts which is related to the hyper metabolic nature of critical illness. Hence these patients need to be started on early nutritional support to overcome the stress related in response to metabolic changes[9]. Assessing the nutritional risk in patients with critical illness is cumbersome as it is difficult to obtain diet history and edema gives a false impression of rates of muscle wasting. NUTRIC score helps to identify patients at risk of malnutrition, to support them with aggressive nutritional therapy and to overcome the risk of malnutrition[10]. Heyland *et al.*[11] commented that patients admitted in the ICU do not get exposed to the same nutritional risk, so they introduced the Nutrition Risk in Critically ill (NUTRIC) score. Therefore to decrease the negative outcomes during hospitalization it is essential to screen and identify malnutrition among these patients[12]. Nutritional risk is identified by applying tools which include physical examination, anthropometric data, functional assessment, laboratory data and food nutrient intake. Assessing the nutritional status is often cumbersome in sedated/unconscious or mechanically ventilated (MV) patients and traditional scoring systems cannot be used as these patients are incapable of providing information about diet history or weight loss[1]. Therefore, the aim of this study was to assess the nutritional risk in critically ill adult patients using m-NUTRIC score-an ICU specific nutrition risk assessment tool.

MATERIALS AND METHODS

Study area: A prospective study was carried out in the ICU for a period of eight months (June, 2017 to January, 2018) on total of 66 patients at Ibrahim Bin Hammad Obaidullah Hospital, Ras Al Khaimah, United Arab Emirates.

Institutional ethics committee approval was obtained. Adult patients (>18 years) who were admitted in the ICU and stayed for more than 24 h were included in the study. Patients transferred to other hospitals, if their ICU length of stay was less than 24 h or those who were readmitted were excluded from the study. To identify the patients at nutritional risk m-NUTRIC score was used. "NUTRIC score is an ICU-specific nutrition risk assessment tool used to assess nutritional risk in critically ill patients. It is designed to quantify the risk of critically ill patients developing adverse events that may be modified by aggressive nutrition therapy"[11]. The score of 1-10 is based on six variables that are age, APACHE II score ("Acute Physiology and Chronic Health Evaluation which is a severity score and mortality estimation tool used to predict hospital mortality. It is calculated at the beginning of the ICU admission to help determine the patient's mortality risk for admission. It is not calculated sequentially and is not meant to show improvement or effect of interventions")[13], SOFA score ("Sequential Organ Failure Assessment Score is a clinical prediction tool which numerically quantifies the number and severity of failed organs. This score can be measured on all patients admitted to the intensive care unit in order to determine level of acuity and mortality risk. It Predicts ICU mortality based on lab results and clinical data")[14], number of comorbidities, days from hospital to ICU admission and IL-6 values. Patients having a NUTRIC sore of 0-4 were classified to have low malnutrition risk and those having a score of 5-9 were associated with worse clinical outcomes.

Statistical analysis: SPSS 24 software was used to analyze the data. Z test was used to test the difference in the mean of the variables, for variables following normal distribution and for all other variables which do not follow normal distribution, non-parametric test such as median test and wilcoxon rank sum test were used. The $p<0.05$ was considered statistically significant.

RESULTS

A total of 66 patients were admitted to the ICU during the study period. Sixteen patients were excluded from the study based on the exclusion criteria. Data of 50 patients was analyzed. The median age of the patients was 74 years, where majority of the subjects were males (60%) and the remaining were females (40%). Among these subjects 52% of them were Emiratis and the other 48% were Non-Emiratis (Table 1).

The median for BMI of these patients was 24.3 kg m[2]. The median of APACHE II score was 25 and SOFA score was 12.5. The median of NUTRIC score was 7 and ICU length of stay was 8 days (range from 1-72 days) (Table 2).
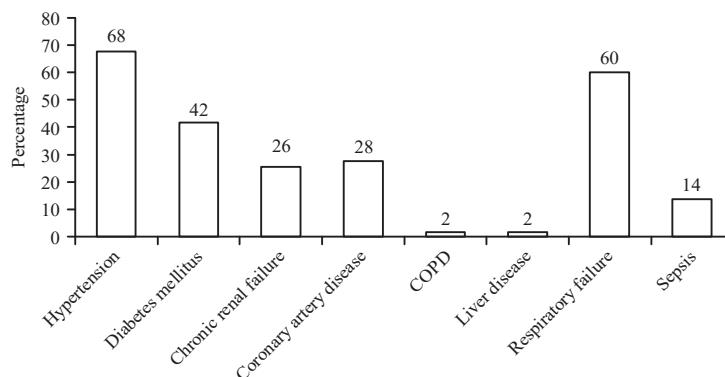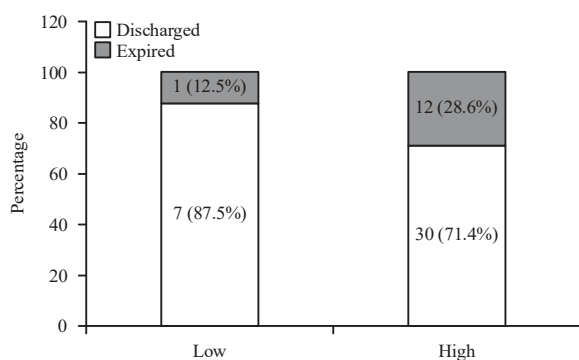
Fig. 1: Distribution of comorbidities

Fig. 2: Mortality in patients with high and low NUTRIC score

Table 1: Patients characteristics

Variables	Groups	Number	Percentage
Nationality	Emirati	26	52.0
	Non-Emirati	24	48.0
Gender	Female	20	40.0
	Male	30	60.0
Comorbidity	No comorbidity	12	24.0
	One comorbidity	13	26.0
	>2 comorbidity	25	50.0
Days from hospital to ICU admission	<1	4	8.0
	>1	46	92.0
NUTRIC score	2.0	3	6.0
	3.0	1	2.0
	4.0	4	8.0
	5.0	3	6.0
	6.0	7	14.0
	7.0	15	30.0
	8.0	12	24.0
	9.0	5	10.0

Table 2: Descriptive statistics for the baseline variables

Variables	Minimum	Maximum	Mean	Median
Height	145	175.0	160.8	160.5
Weight	30	129.2	65.5	61.0
NUTRIC score	2	9.0	6.6	7.0
BMI	12	46.0	25.0	24.3
Age	25	104.0	69.5	74.0
APACHE score	13	38.0	25.6	25.0
SOFA score	4	21.0	12.2	12.5
ICU length of stay days	1	72.0	13.8	8.0

Seventy two percentage of patients had ICU stay ≥5 days. From the total patients admitted 74% of patients were discharged and 26% expired. The 24% of admitted patients had no comorbidities, followed by 26% having one comorbidity and the remaining 50% having two or more than two comorbidities (Table 1). Hypertension (68%), diabetes (42%), coronary artery disease (28%) and chronic renal failure (26%) were the most common comorbidities (Fig. 1).

In this study, patients with low NUTRIC score had a mortality rate of 12.5% compared to the patients with high NUTRIC score with 28.6% mortality rate (Fig. 2).

Patients with high NUTRIC score had a median age of 76 years whereas the median age of those patients with low NUTRIC score was 44.5 years. The APACHE- II score had a median of 25.5 in patients with high NUTRIC score and 15.5 in patients with low NUTRIC score. The SOFA score for patients with high NUTRIC score had a median of 13.0 followed by a median of 7.5 in patients with low NUTRIC score. The length of ICU stay had a median of 9 days for patients with high NUTRIC score and 5 days for those with low NUTRIC score, while higher the NUTRIC score, the length of stay in ICU also increased to 9 as presented in Table 3.

The NUTRIC score with nationality (Emiratis and Non- Emiratis) was also compared. The median score for Emiratis was 7 whereas for Non-Emiratis it was 6. The difference observed was statically significant (p<0.01). NUTRIC score was also compared with gender and the median for both males and females was 7 which was not statistically significant (Table 4).

Mean BMI among patients with low NUTRIC score was 31 compared to 23.9 in patients with high NUTRIC score. This shows that the patients with low NUTRIC score had a higher BMI compared to patients with high NUTRIC score who had low BMI values (Table 5).

Table 3: Cross tabulation of NUTRIC score with age, APACHE II score, SOFA score and ICU length of stay

NUTRIC score	Descriptive statistics	Age (years)	APACHE II score	SOFA score	ICU length of stay (days)
Low (≤4)	Median	44.5	15.5	7.5	5.0
	Minimum	25.0	13.0	4.0	1.0
	Maximum	71.0	24.0	9.0	20.0
High (≥5)	Median	76.0	25.5	13.0	9.0
	Minimum	26.0	20.0	7.0	1.0
	Maximum	104.0	38.0	21.0	72.0
Total	Median	74.0	25.0	12.5	8.0
	Minimum	25.0	13.0	4.0	1.0
	Maximum	104.0	38.0	21.0	72.0

Table 4: Comparison of nutrition risk in critically ill (NUTRIC) score with nationality and gender

Variables	Parameters	Median	Minimum	Maximum	p-value
Nationality	Emirati	7	4	9	p<0.01
	Non-Emirati	6	2	9	
Gender	Male	7	2	9	NS
	Female	7	2	9	

NS: Not significant

Table 5: Comparison of nutrition risk in critically ill (NUTRIC) score with body mass index (BMI)

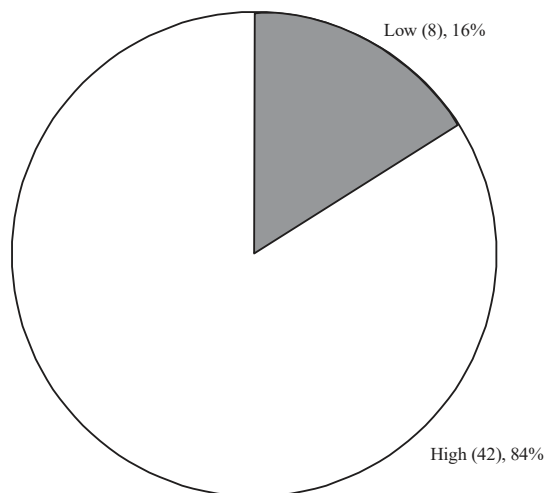|	BMI		
NUTRIC score	Mean	SD	p-value
Low (≤4)	31.0	7.8	<0.01
High (≥5)	23.9	5.5	

Fig. 3: NUTRIC score in critically ill patients

Eighty four percentage of patients had a high NUTRIC Score and 16% had a low NUTRIC score. This clearly indicates that high NUTRIC score is associated with nutritional risk (Fig. 3).

DISCUSSION

Malnutrition is associated with factors like poor wound healing and frequent infections which results in poor outcomes, thereby increasing mortality[15,16]. Chronic, acute starvation and the underlying pathophysiological processes leading to ICU admission influence the nutritional status of critically ill patients. Marked catabolic responses are induced during the first 10 days of ICU admission resulting in rapid loss of lean body mass, ranging from 5% in patients with single-organ failure to 25% in patients with multi organ dysfunction syndrome (MODS)[17]. Aggressive nutrition therapy will result in greater improvement in the outcomes of malnourished patients. Better screening tools are needed to identify and assess the nutritional status to provide adequate nutritional support through artificial nutrition therapy[10].

In this study, 84% of the patients admitted in the ICU had a high NUTRIC score. Similarly Kalaiselvan *et al.*[1] reported that 42.5% of MV patients admitted in ICU are at risk for malnutrition. In some studies the prevalence of malnutrition in ICU patients varies from 38-78% depending upon the nutritional screening tool applied. The median NUTRIC score was 7 which is more than the original validation study where the NUTRIC score was found to have a mean of 4.7 (Median and mean are the measures of central tendency, so median was used to compare with the mean of the other study). This might be due to higher age of the study patients. The median age of the patients was 74 compared to the original study by Heyland *et al.*[16] APACHE-II (median 25 vs. 23) and SOFA score (median 12.5 vs. 7) were higher to that of the original validation study. The mortality rate was found to be 26% which was similar to the results of the second validation study by Adam *et al.*[10] where the mortality rate was 29%. Among the 26% of patients expired 92.3% had a high NUTRIC score and the remaining 7.7 had a low NUTRIC score. This clearly indicates higher the NUTRIC score, higher the mortality rate. Patients with high NUTRIC score had high mortality and increased ICU length of stay. Similar results were reported by Mendes *et al.*[18] using NUTRIC score in their ICU population. The major limitations of this study was that the nutritional support provided to the patients was not calculated as this was not the main aim of this study. Also, the sample size was small (50) due to which strong positive correlation between NUTRIC score and ICU length of stay could not be shown.

CONCLUSION

The prevalence of nutritional risk in critically ill patients using m-NUTRIC score was 84%. There is a statistically significant difference observed in the NUTRIC score among Emiratis and Non Emiratis. Significant high BMI was observed among the patients with low NUTRIC score. Low NUTRIC score is also associated with decreased mortality and reduced ICU length of stay. Therefore it was observed high NUTRIC score is associated with increased mortality and prolonged ICU length of stay and these patients are most likely to benefit from aggressive nutrition therapy.

SIGNIFICANCE STATEMENT

This study discovers the prevalence of Malnutrition among critically ill adult patients admitted in the ICU using NUTRIC score. This study will help the clinical practitioners to uncover the critical area of malnutrition and the factors influencing the nutritional status of these patients thereby paving way for appropriate nutritional therapy.

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