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Energy and Nutritional Deficit in Obese Traumatic Patients in Intensive Care Units

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Abstract:

Solid Background: Several years, obesity has been well identified as a major risk factor for cardiovascular disease, cancers, and diabetes mellitus leading high mortality and morbidity.
Aim: The present study aimed to assess energy and nutritional deficit in obese patients in intensive care units.
Methods: In this cross-sectional study, all consecutive traumatic patients admitted to ICU ward at Mobasher Kashani hospital in Hamadan were included that among them, 38 obese patients with body mass index higher than 30 kg/m2 were included as the case group and 72 non-obese with body mass index lower than 25 kg/m2were considered as the control group. Malnutrition and its severity were assessed based on the required and intake energy and nutrients on admission and discharge times.
Results: The prevalence of malnutrition was similar in obese and non-obese patients (86.8% versus 85.2%). Assessing the changes in anthropometric parameters showed higher decrease in BMI and weight in obese patients compared with non-obese ones. The mean level of energy intake at 4th week of admission was similar in obese and non-obese patients; however daily energy intake was significantly lower in former group. Also, in both groups, required energy was significantly lower than energy intake at 4th week of admission. Despite similarity in energy and nutrients needed, there was a significant lower energy as well as nutrient intakes in obese patients compared with non-obese ones.
Implications for Practice: Obese traumatic patients admitted to ICU wards suffer lower energy intake and also malnutrition compared with non-obese ones.
Keywords: Obesity; Intensive care; Trauma; Energy; Nutrition

Introduction:

Several years, obesity has been well identified as a major risk factor for cardiovascular disease, cancers, and diabetes mellitus leading high mortality and morbidity. The prevalence of this problem has an increasing trend especially in industrial countries due to inappropriate lifestyle, improper nutritional behaviors and also tends to sedentary jobs [(1)]. Obesity not only is a main risk factor for life-threatening problems, it has been also introduced as an underlying factor predisposes critically ill patients to adverse events and poor outcome [(2)]. In fact, ill obese patients receiving intensive cares may face more with adverse consequences by affecting vital organs [(3)]. Furthermore, greater frequency of comorbid conditions in obese patients can result in increasing complexity of care in ICU wards [(4)]. It seems that one of the main factors responsible for the complexity of caring in this population may be related to the existence of imbalance between energy and nutrients intake and demand in obese patients. On the other hand, although nutritional support is a key component in managing critically ill patients, this role is more critical in obese patients because of higher rate of metabolic disturbances in obese ones [(5)]. Moreover, obesity can be accompanied with higher complicated feeding. The present study aimed

to assess energy and nutritional deficit in obese patients in intensive care units.

Methods:

In this cross-sectional study, all consecutive traumatic patients admitted to ICU ward at Mobasher Kashani hospital in Hamadan were included with the purpose of assessing malnutrition status. In this study, only those who were admitted to ICU ward within first 24 hours of trauma were included. Among those, 38 patients were obese with body mass index higher than 30 kg/m2 asthe case group and 72 were non-obese with body mass index lower than 25 kg/m2 as the control group. The main parameters indicating nutritional condition included patients' weight, serum albumin level, height to serum creatinine ratio and total count of serum lymphocytes. In addition to determine malnutrition status, anthropometric indices including weight, height, body mass index and REE were also assessed on admission and also weekly during hospitalization. Furthermore, according to stress factors related to the diseases, patients' needs to different nutrients including calorie, carbohydrate, protein, fats, vitamins, and other micronutrients were assessed. The nutrients received were calculated based on the analysis of received liquid lavage; the required nutrients were calculated based on the anthropometric parameters multiply with 1.25 as coefficient for increased nutritional needs for traumatic patients. Results were presented as mean ± standard deviation (SD) for quantitative variables and were summarized by frequency (percentage) for categorical variables. Continuous variables were compared using t test or Mann-Whitney U test whenever the data did not appear to have normal distribution or when the assumption of equal variances was violated across the study groups. Categorical variables were, on the other hand, compared using chi-square test. The trend of the changes in quantitative variables was measured using the repeated measure ANOVA test. Also, the paired t test was used to assess the difference in measured variables on admission and discharge times. For the statistical analysis, the statistical software SPSS version 16.0 for windows (SPSS Inc., Chicago, IL) was used. P values of 0.05 or less were considered statistically significant.

Results:

There were no significant differences between obese and non-obese patients in regard to gender and age distributions (obese patients mean age 38.59 ± 12.26 years, male gender 79%, non-obese patients mean age 37.79 ±11.19 years, male gender 75%). In overall, 83.6% of patients had malnutrition on admission to ICU, the prevalence of malnutrition was similar in obese and non-obese patients (86.8% versus 85.2%); however, the prevalence of malnutrition on discharge from ICU was significantly higher in obese than in non-obese patients (92.1% versus 86.1%) indicating more increase of the prevalence of malnutrition in obese than in non-obese patientsduring hospitalization in ICU. Assessing the changes in anthropometric parameters showed higher decrease in BMI in obese patients than non-obese ones. (table 1) Regarding changes in body weight, both groups faced with weight loss during ICU stay, but it was more in obese patients at 4th week of admission compared with admission time. As shown in table 2, mean level of energy intake at 4th week of admission was similar in obese and non-obese patients, howeverdaily energy intake was significantly lower in former group. Also, in both groups, required energy was significantly lower than energy intake at 4th week of admission. The mean level of carbohydrate required and intake in obese patients was 220.55 gr and 76.36 gr and in non-obese patients was 229.58 gr and 88.68 gr, the mean level of fat required and intake in obese patients was 68.22 gr and 19.18 gr, and in non-obese patients was 76.25 gr and 23.28 gr. However, the mean level of protein required and intake in obese patients was 55.36 gr and 18.61 gr and in non-obese patients was 57.99 gr and 15.58 gr respectively indicating more protein intake in obese patients compared with non-obese ones.

Discussion:

The present study interestingly showed that although both obese and non-obese patients may face malnutrition, the former group may experience more malnutrition as lower intake of energy and nutrients than non-obese ones. This finding is more important in traumatic obese patients because any traumatic injurycan potentially trigger hyper-metabolic and inflammatory responses to physiologic stress, directed at promoting needs, whichaffects different types of macronutrient including proteins, lipids, and carbohydrates [6]. These responses is more vital in obese patients because obesity has been well demonstrated to be associated with an increased risk for developing different chronic medical conditions such as congestive heart failure, hypertension, myocardial infarction, dyslipidemia, hypoventilation syndrome, obstructive sleep apnea, asthma, respiratory failure, and metabolic syndrome andthus, obese individuals are probably at higher risk forhospitalization and ICU admission as well as face with ICU-related morbidities than the non-obese [7-9]. Besides, obese individuals are often malnourished

because of unbalanced intake of nutrients.Because of higher prevalence rate of metabolic abnormalities in obese traumatic patients, urgent reservation of energy and macronutrients in these patients is very vital [10]. In our study, obese patients experienced lower rate of energy and nutrients intake when compared with non-obese subjects. It has been demonstrated that enteral feeding in ICU wards often fails to provide an adequateamount of calories and nutrients in the critically ill population due to patient intolerance ofappropriate tube feeding volumes; this is especially true among obese patients, who are atincreased risk for having conditions predisposing to enteral feeding failure [11]. However, it should be pointed that weight loss and low-calorie intake may be very beneficial in obese patients. Multiple studies have demonstrated positive outcomes in the ICU related to reduced calorie intake [12,13]. Dickerson et al. [14] showed that hypocaloric enteral feeding in obesesurgical patients was associated with improved nitrogen balance, shorter length of stay in theICU, and decreased use of antibiotics.Krishnan et al. [12] found improved ICU outcomes, including mortality, return ofspontaneous ventilation, and nosocomial sepsis rates among patients receivingapproximately 9–18 kcal/kg/d (33–65% of the ACCP target). The strongest evidence againsthypocaloric feeding was provided by Villetet al. [15], who found a higher rate of infectionsand poor outcomes associated with increasing negative energy balance in a prospectivestudy of 48 ICU patients.In this regard, international societies endorseshypocaloric feeding of critically ill obese patients with enteral feeds, with the goal to provide no more than 60–70% of target energy requirements or 11–14 kcal/kg actual body weight per day [16].Thus, the regulation of energy intake in obese patients is more vital in comparison with non-obese patients because both lack of and excess energy and nutritional intakes can be deleterious in obese ICU patients.

Implications for Practice:

Because of developing obesity in societies, nowadays the obese patients form a considerable part of trauma ICU patients. Because of unbalanced intake of nutrients and co-existing diseases before admission, this category of patients is disposed to malnutrition with higher severities and needs to special attention in regard to nutritional support in intensive care wards.

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Table 1: Changes in anthropometric parameters and malnutrition status in obese and non-obese groups

Characteristics	Obese patients	Non-obese patients	p-value
Body weight			
On admission	98.46 ± 9.58	64.62 ± 12.12	P < 0.001
At 4th week	86.25 ± 11.45	60.54 ± 9.89	P < 0.001
Body mass index			
On admission	35.55 ± 2.26	20.25 ± 1.49	P < 0.001
At 4th week	30.20 ± 1.44	19.29 ± 1.11	P < 0.001
Malnutrition			
On admission	86.8%	85.2%	0.089
At 4th week	92.1%	86.1%	0.026

Table 2: Daily energy and nutrients required and intake in obese and non-obese groups

Characteristics	Obese patients	Non-obese patients	p-value
Carbohydrate			
Required	220.55	229.58	0.525
Intake	76.36	88.68	0.012
Fat			
Required	68.22	76.25	0.122
Intake	19.18	23.28	0.046
Protein			
Required	55.36	57.99	0.446
Intake	18.61	15.58	0.031
Energy			
Required	1945.52	1953.88	0.689
Intake	658.77	512.54	0.010