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Original article

The impact of nutritional risk screening 2002 and subjective global assessment upon prognosis for intensive care patients

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Summary. *Aims:* The assessment of nutritional status aims to specify individuals and communities that are malnourished or under malnutrition risk, to develop healthcare programs aimed at meeting society's needs in the wake of the assessment. Subjective Global Assessment (SGA) and Nutritional Risk Screening (NRS) 2002 is assessed for intensive care patients, it turns out to be indicative of their prognosis simply and effectively. *Methods:* The age, weight, body mass index (BMI), APACHE II, SOFA score, biochemical parameters (albumin, prealbumin, total lymphocyte levels), triceps thickness from anthropometric measurements were recorded during the hospitalization process. The patients were classified as nutritionally risk (NRS2002 +) or nutritionally risk-free (NRS2002 -) after NRS2002 assessment. According to SGD, the patients were categorized as well-fed (SGD-A), slightly or moderately malnourished (SGD-B), and heavy malnourished (SGD-C). The nutritional changes in the patient were categorized as NRS2002 -/SGD A (good nutrition), NRS2002 +/SGD B (slight or moderate malnutrition), or NRS2002 -/SGD C (severe malnutrition). *Results:* It is found that 49,8% of the patients were in the well-fed group, 42,2% of them in the slightly-moderately malnourished group, and 8% of them in the heavy-malnourished group. While the rate of malnutrition increases as the patients' age increases, and as their weight and BMI decrease, albumin, prealbumin, total lymphocyte, triceps skinfold thickness values decrease as malnutrition increases. For the patients with higher malnutrition rate, the duration of stay in the intensive care unit and mechanic ventilators and the mortality rate increase. *Conclusions:* We found that mortality increased with malnutrition. The nutritional status should be followed, and a treatment plan should be drawn up in critical care patients. Thus; SGA, NRS 2002 and other objective methods for assessing nutritional status with high sensitivity and specivity can be recommended for evaluation of critically ill patients.

Key words: malnutrition, intensive care, Nutritional Risk Screening (NRS 2002), Subjective Global Assessment (SGD)

Introduction

Nutritional support is regarded as the life-sustaining component of intensive care patients owing to organ functions, epithelising, adequacy of cardiopulmonary functions, and the integrity of immune system (1, 2).

Malnutrition refers to the outcrop of structural deficiencies and malfunctioning of organs as a result of low or excessive intake of macro nutritional elements or specific micro needs, which are critical to tissues (3-5).

Because of physicians' inadequate nutrition training and the lack of appropriate scanning, assessment, and treatment protocols, malnutrition is usually unable to be diagnosed and treated, especially among hospitalized patients (6,7).

The aim of assessing the nutritional status is to detect individuals and communities who are either undernourished or under malnourishment risk, to devise healthcare programs oriented towards meeting the society's needs following the assessment, and to measure the efficacy of programs. The assessment of nutrition begins with scanning process and is followed by a comprehensive assessment for those at risk (8-10). American Society for Parenteral and Enteral Nutrition (ASPEN) recommends a nutritional scanning for all hospitalized patients in the beginning (10).

Even though nutritional scanning is carried out for usual hospitalization, there seems to be a limited number of pertaining studies aimed at intensive care patients. Once Subjective Global Assessment (SGA) is assessed for intensive care patients, it turns out to be indicative of their prognosis simply and effectively (11). European Society for Parenteral and Enteral Nutrition (ESPEN) recommends Nutritional Risk Screening (NRS) 2002 to consider the nutrition risk of hospitalized patients. This test reveals the plan for nutritional support by taking into consideration the patient's nutrition risk at the time of assessment and the risks that might be posed through the severity of the existing illness (12).

Among the objective measurements, weight and skinfold thickness are the most widely employed anthropometric measurements (13,14). Body Mass Index (BMI) refers to the weight for height, which is valid for both genders and all age groups (8,9). Subcutaneous fatty tissue accounts for about 50% of the total fat in the body, reflects the total body fat portion accurately (13-15), and is usually measured from biceps, triceps, subscapular, and suprailiac parts (3,8,15,16). Skeletal muscle reflects 60% of the total body protein and constitutes the main source of aminoacids essential for the body to make use in the case of hunger and stress (15). When it comes to assessing the nutritional status, the levels of serum protein measured in the lab are employed along with other parameters. The serum proteins employed for this purpose are Albumin, Transferrin, and Prealbumin (Transthyretin) (17).

A considerable number of functions involved in body defense mechanism are damaged during malnutrition. Much as a good many immunological tests are used while assessing nutrition, the most frequently used ones are skin tests and total lymphocyte count. If the number of lymphocytes is 900-1500 cell/mm^3, it is considered "moderate" malnutrition; if it is <900 cell/mm^3, it is considered "serious" malnutrition (4).

Assessing the nutritional status to present the degree of nutritional deficiency and potential problems is more complicated than scanning process. No flawless method has yet to be devised to this end. In order to cope with the problems, objective and subjective methods are supposed to co-exist (4).

This study tries to gain an insight into the effect of patients' nutritional status during their hospitalization in the intensive care unit upon their duration of stay in the intensive care and mortality by assessing it through NRS 2002, body mass index, skinfold thickness and prealbumin and albumin as serum proteins, and total lymphocyte count as immunological tests.

Materials and Methods

Following the Faculty Ethics Committee's approval, the study took place in Surgical Intensive Care (10 bedspace) and Reanimation Intensive Care (6 bedspace) within the Discipline of Intensive Care, the Department of Anesthesiology and Reanimation, Medicine Faculty of Trakya University. After the signed approval of all the participants or their legal representatives between August 8, 2011 and January 31, 2013, this study began with 500 patients staying in the intensive care unit for more than 24 hours out of 1425 patients over 18 who were admitted there.

Those excluded from the scope of the study are under-18 patients, the pregnants, over-18 patients who refused to take part in the study, the patients who suffered cerebral death, and the patients who were admitted to the intensive care unit but stayed less than 24 hours.

In our cross-sectional study, the age, weight, body mass index (BMI), APACHE II, SOFA score, biochemical parameters (albumin, prealbumin, total lymphocyte levels), triceps thickness from anthropometric measurements (measured with Triceps thickness Baseline® Economy Plastic Skinfold Caliper - 25 Each) were recorded during the hospitalization process.

The patients were classified as nutritionally risk (NRS2002 +) or nutritionally risk-free (NRS2002 -) after NRS2002 assessment. According to SGD, the patients were categorized as well-fed (SGD-A), slightly or moderately malnourished (SGD-B), and heavy malnourished (SGD-C). The nutritional changes in the patient were categorized as NRS2002 -/SGD A (good nutrition), NRS2002 +/SGD B (slight or moderate malnutrition), or NRS2002 -/SGD C (severe malnutrition).

The patients were followed up until they were discharged from the intensive care unit or died. The hospital stay in the intensive care and mechanic ventilator was recorded. Whether NRS2002 -/ SGD A or NRS2002 + /SGD B or NRS2002+/SGD C patients' mortality rates correlate with the duration of stay in the breathing apparatus and intensive care unit, APACHE II, SOFA, biochemical parameters, anthropometric measurements was sought after.

Statistical analysis

The findings obtained at the end of the study were evaluated in the Biostatistics Department of Trakya University Medical Faculty. The statistical assessment was carried out by using the 730d5c28659bb06bd7fe licensed-coded SPSS 20 statistics program. After the convenience of commensurable data to the normal distribution was assessed through single sample Kolmogorov Smirnov test, variance analysis and post-hoc Bonferroni test were carried out in intergroup comparisons for normal distributions, while Kruskal-Wallis variance analysis and Mann Whitney U were conducted in the comparisons for those who didn't show normal distribution. For intragroup comparisons, two Wilcoxon matched sample tests were employed.

Pearson χ^2 test was preferred for qualitative data. As for the descriptive statistics, Median (Min-Max) values and arithmetic mean±standard deviation were provided. For all the statistics, the significance limit was $p<0.05$, and for Mann Whitney U test results which are used after the Kruskal-Wallis variance analysis, $p<0.017$ was selected by revising with Bonferroni.

Results

The patients in our study were divided into 3 groups: a well-feed group (NRS2002-/SGD A), mild-to-moderate malnourished group (NRS2002 +/SGD B), and heavy malnourished (NRS2002 +/SGD C) group. The incidence of well-feed group was 49.8% (n=249), 42.2% for mild-to-moderate malnourished group (n=211), and 8% of heavy malnourished group (n=40). The age, gender, height, weight, body muscle index, underlying disease and patients coming place were all shown in Table 1.

39,6% (n=198) of the patients come from emergency department, 47.6% (n=238) surgical departments and 12,8% (n=64) internal medicine departments. The incidence of well-feed patients taken from emergency department was 55.1%, mild-to-moderate malnourished incidence was 39.9% and heavy malnourished patients was 5.1%. The incidence of well-feed patients taken from surgical departments was 52.5%, mild-to-moderate malnourished incidence was 39,5% and heavy malnourished patients was 8%. The well-feed patients incidence taken from internal medicine departments was 23.4%, mild-to-moderate malnourished incidence was 59,4% and heavy malnourished patients was 17.2% (Tab. 1).

The mean age of well-feed patients was found as 50,16±16.69 years, 71.90±12.62 years in mild-to-moderate malnourished group and 71.45±16.74 years heavy malnourished patients. There is statistically significant difference between well-feed group and other groups (p=0.0001). No statistically difference was foud between mild-to-moderate malnourished group and heavy malnourished group (Tab. 1).

The mean weight of well-feed patients was found as 80.16±18.33 kg, 74.40±15.62 kg in mild-to-moderate malnourished group and 60.04±14.84 kg in heavy malnourished patients. There is statistically significant difference between well-feed group and other groups (p=0.0001) (Tab. 1).

The BMI of well-feed patients was 28.95±6.68 kg/m^2, 27.50±5.18 kg/m^2 in mild-to-moderate malnourished group, and 22.36±4.82 kg/m^2 in heavy malnourished group. There is statistically significant difference between well-feed group and other groups (p=0.0001) (Tab. 1).

Due to underlying diseases, patients with sepsis-MODS, respiratuar insufficiency and malignencies had higher malnutrition levels (p=0.0001).

The mean duration of mechanical ventilation was

Table 1. Demographic data

	Well-feed (NRS 2002 -/SGD A) (n=249)	**Mild-to-moderate malnourished (NRS 2002 +/SGD B) (n=211)**	**Heavy Malnourished (NRS 2002 +/SGD C) (n=40)**
Age (year) (mean+SD) (max-min)	50,16+16,69* (83-18)	71,9+12,62 (97-19)	71,45+16,74 (94-19)
Height (m) (mean+SD) (max-min)	1,66+0,09 (1,89-1,35)	1,64+0,09 (1,85-1,40)	1,63+0,10 (1,85-1,33)
Weight (kg)(mean+SD) (max-min)	80,16+18,33 * (169-47)	74,40+15,62$^{\beta}$ (125-43)	60,04+14,84 (96-31)
BMI (kg/m^2)(mean+SD) (max-min)	28,95+6,68* (62,43-18,36)	27,50+5,18$^{\beta}$ (45,20-17,30)	22,36+4,82 (37,34-15,73)
Gender (Male/Female)	141/108	118/93	23/17
Insufficiency (n,%)			
Sepsis-MODS	19 (%7,6)	37 (%17,5)$^{\gamma}$	10 (%25)$^{\gamma}$
Trauma	34 (%13,7)	2 (%0,9)	1 (%2,5)
Surgical operation	76 (%30,5)	69 (%32,7)	7 (%17,5)
Cranial events	54 (%21,7)	30 (%14,2)	3 (%2,5)
Respiratory distress	33 (%13,3)	57 (%27)$^{\gamma}$	7 (%17,5)
Intoxication	27 (%10,8)	0 (%0)	0 (%0)
Malignancy	6 (%2,4)	16 (%7,6)$^{\gamma}$	12 (%30)$^{\gamma}$
Taken From (n,%)			
Emergency Department	109 (%43,8)	79 (%39,7)	10 (%25)
Surgical Department	125 (%50,2)	94 (%44,5)	19 (%47,5)
Medical Department	15 (%6)	38 (%18)	11 (%27,5)

**p=0,0001: Compared of well fed group with mild-to-moderate malnourished and heavy malnourished groups $^{\beta}$ p=0,0001: Compared of mild-to-moderate malnourished group with heavy malnourished group.*

6.59±10.63 days in well-feed patients, 11.48±15.36 days in mild-to-moderate malnourished group and 9.63±10.11 days in heavy malnourished group. There is statistically significant difference between well-feed group and other groups (p=0.0001). No statistically difference was foud between mild-to-moderate malnourished group and heavy malnourished group (Tab. 2).

The duration of stay in intensive care was 9.23±11.77 days in well-feed group, 13.65±16.07 days in mild-to-moderate malnourished group and 10.83±10.43 days in heavy malnourished group. There is statistically significant difference between well-feed group and mild-to-moderate malnourished group (p=0.0001) (Tab. 2).

The APACHE II scores during admission to the Intensive Care was 15.05±8.26 in well-feed group, 22.06±6.72 in mild-to-moderate malnourished group and 24.05±7.25 in heavy malnourished group. The scores during discharged from Intensive Care was 16.07±15.56 in well-feed group, 29.20±14.35 in mild-to-moderate malnourished group and 37.05±11.28 in heavy malnourished groups. There is statistically significant increase between admission scores of well-feed group, and mild-to-moderate malnourished group (p=0.001). No statistically significant difference was detected between mild-to-moderate malnourished group and heavy malnourished group.

Table 2. Duration of mechanical ventilation and duration of stay

	Well-feed (NRS 2002 -/SGD A) (n=249)	**Mild-to-moderate malnourished (NRS 2002 +/SGD B) (n=211)**	**Heavy malnourished (NRS 2002 +/SGD C) (n=40)**
Duration of mechanical ventilation (day) (mean±SD)	6,59+10,63*	11,48+15,36	9,63+10,11
Duration of stay in intensive care (day) (mean±SD)	9,23+11,77[β]	13,65+16,07	10,83+10,43

**p=0,001: Compared with mild to moderate and heavy malnourished groups; [β] p=0,0001: Compared with mild to moderate group; NRS2002: Nutritional Risk Screening 2002; SGD: subjective global assessment.*

There is also statistically significant increase between discharged APACHE II scores of groups (p=0.001) (Tab. 3).

The SOFA scores during admission to the intensive Care was 5.23±3.36 in well-feed group, 7.55±3.16 in mild-to-moderate malnourished group and 9.02±2.84 in heavy malnourished group. The SOFA scores during discharged from Intensive Care was 5.06±5.07 in well-feed group, 9.19±5.13 in mild-to-moderate malnourished group and 11.68±4.71 in heavy malnourished groups. There is statistically significant increase between admission SOFA scores of groups. There is also statistically significant increase between discharged SOFA scores of groups (p=0.04) (Table 3).

The albumin levels were recorded during admission and discharge from Intensive Care. The albumin levels during admission was 3.32±0.75 g/dl in well-feed group, 2.95±0.70 in mild-to-moderate malnourished group and 2.40±0.57 g/dl in heavy malnourished group. The discharge albumin levels were 3.00±0.62 g/dl in well-feed group, 2.49±0.54 in mild-to-moderate malnourished group and 2.26±0.48 g/dl in heavy malnourished group. There is statistically decrease between admission and discharge albumin levels. Statistically difference was detected on admission albumin levels of groups (p=0.0001). (Tab. 4).

There is statistically significant decrease between discharge albumin levels of well-feed group, and mild-to-moderate and heavy malnourished groups (p=0.001). No statistically significant difference was detected between mild-to-moderate malnourished group and heavy malnourished group (Tab. 4).

The prealbumin levels during admission was 18.72±5.92 mg/dl in well-feed group, 13.10±5.53 mg/dl in mild-to-moderate malnourished group and 9.56±4.26 mg/dl in heavy malnourished group. The discharge prealbumin levels were 15.97±6.21 mg/dl in well-feed group, 10.48±5.21 mg/dl in mild-to-moderate malnourished group and 8.73±4.36 mg/dl in heavy malnourished group. There is statistically decrease between admission and discharge prealbumin levels. Statistically decrease was detected on admission

Table 3. The APACHE II and SOFA scores

	Well-feed (NRS 2002 -/SGD A) (n=249)	**Mild-to-moderate malnourished (NRS 2002 +/SGD B) (n=211)**	**Heavy malnourished (NRS 2002 +/SGD C) (n=40)**
APACHE II score admision (mean±SD)	15,05+8,26*	22,06+6,72	24,05+7,25
APACHE II score discharge (mean±SD)	16,07+15,56*	29,20+14,35[β]	37,05+11,28
SOFA score admision (mean±SD)	5,23+3,36*	7,55+3,16[γ]	9,02+2,84
SOFA score discharge (mean±SD)	5,06+5,07*	9,19+5,13[γ]	11,68+4,71

**p=0,001: Compared of well fed group with mild-to-moderate malnourished and heavy malnourished groups; [β] p=0,001: Compared with mild-to-moderate malnourished and heavy malnourished groups; [γ] p=0,04: Compared with mild-to-moderate malnourished and heavy malnourished groups; NRS2002: Nutritional Risk Screening 2002; SGD: subjective global assessment.*

prealbumin levels in all groups (p=0.0001) (Tab. 4).

There is statistically significant decrease between discharge prealbumin levels of well-feed group, and mild-to-moderate and heavy malnourished groups (p=0.001). No statistically significant difference was detected between mild-to-moderate malnourished group and heavy malnourished group (Tab. 4).

The triceps skin fold thickness measurement during admission was 15.01±7.83 mm in well-feed group, 13.37±7.30 mm in mild-to-moderate malnourished group and 7.60±4.61 mm in heavy malnourished group. The discharge triceps skin fold thickness measurements were 15.97±7.68 mm in well-feed group, 13.31±7.62 mm in mild-to-moderate malnourished group and 7.58±4.49 mm in heavy malnourished group. There is statistically decrease between admission and discharge triceps skin fold thickness measurements (p<0.05) (Tab. 5).

The total lymphocyte numbers during admission was 1267.75±1031.17/mm^3 in well-feed group, 1616.16±5373.96/mm^3 in mild-to-moderate malnourished group and 484.75±347/mm^3 in heavy malnourished group. The discharge total lymphocyte levels were 1351.08±970.86/mm^3 in well-feed group, 1195.44±2707.57/mm^3 in mild-to-moderate malnourished group and 659.00±579.74/mm^3 in heavy malnourished group. There is statistically decrease between admission and discharge total lymphocyte levels (p<0.05) (Tab. 6).

The overall mortality rate was 46.8%. The mortality rate was 29.3% in well-feed group, 60.2% in mild-to-moderate malnourished group and 85% in heavy malnourished group. Statistically difference was detected between groups (p=0.0001), (Tab. 7).

Discussion

Our aim was to gain an insight into the effect of patients' nutritional status during their hospitalization in the intensive care unit upon their duration of stay in the intensive care and mortality by assessing it through NRS 2002, BMI, skinfold thickness and prealbumin and albumin as serum proteins, and total lymphocyte

Table 4. The albumin and prealbumin values

	Well-feed (NRS 2002 -/SGD A) (n=249)	**Mild-to-moderate malnourished (NRS 2002 +/SGD B) (n=211)**	**Heavy malnourished (NRS 2002 +/SGD C) (n=40)**
Albumin admission (gr/dl) (mean±SD)	3,32±0,75*	2,95±0,70^β	2,40±0,57
Albumin discharge (gr/dl) (mean±SD)	3,00±0,62*	2,49±0,54	2,26±0,48
Prealbumin admission(mg/dl) (mean±SD)	18,72±5,92*	13,10±5,53^β	9,56±4,26
Prealbumin discharge (mg/dl) (mean±SD)	15,97±6,21*	10,48±5,21	8,73±4,36

**p=0,0001: Compared of well fed group with mild-to-moderate malnourished and heavy malnourished groups; ^{β}p=0,0001: Compared with mild-to-moderate malnourished and heavy malnourished groups.*

Table 5. Triceps skin fold thickness measurements

	Well-feed (NRS 2002 -/SGD A) (n=249)	**Mild-to-moderate malnourished (NRS 2002 +/SGD B) (n=211)**	**Heavy malnourished (NRS 2002 +/SGD C) (n=40)**
Triceps skin fold thickness admission (mm) (mean±SD)	15,01±7,83*^{γ}	13,37±7,30^β	7,60±4,61
Triceps skin fold thickness discharge (mm) (mean±SD)	15,97±7,68*^{γ}	13,31±7,62^β	7,58±4,49

** p=0,011: Compared of well fed group with mild-to-moderate malnourished group; ^{γ} p=0,0001: Compared of well fed group with heavy malnourished group; ^{β} p=0,0001: Compared with mild-to-moderate malnourished and heavy malnourished groups; mm: milimetres*

Table 6. Total lymphocyte measurements

	Well-feed (NRS 2002 -/SGD A) (n=249)	Mild-to-moderate malnourished (NRS 2002 +/SGD B) (n=211)	Heavy malnourished (NRS 2002 +/SGD C) (n=40)
Total Lymphocyte admission (/mm3)	1267,75±1031,17*	1617,16±5373,96$^{\beta}$	484,75±347,23
Total Lymphocyte discharge (/mm3)	1351,08±970,86$^{\gamma}$	1195,44±2707,57$^{\beta}$	659,00±579,74

** p=0,004: Compared of well fed group with mild-to-moderate malnourished group; $^{\beta}$ p=0,0001: Compared with mild-to-moderate malnourished and heavy malnourished groups; $^{\gamma}$ p=0,0001: Compared of well fed group with mild-to-moderate malnourished and heavy malnourished groups.*

Table 7. Mortality incidence

Gruplar	Well-feed (NRS 2002 -/SGD A) (n=249)	Mild-to-moderate malnourished (NRS 2002 +/SGD B) (n=211)	Heavy malnourished (NRS 2002 +/SGD C) (n=40)
Exitus	73 (%29,3)*	127 (%60,2)$^{\beta}$	34 (%85)
Admission	176 (%70,7)*	84 (%39,8)$^{\beta}$	6 (%15)

**p=0,0001: Compared of well fed group with mild-to-moderate malnourished and heavy malnourished groups; $^{\beta}$ p=0,0001: Compared with mild-to-moderate malnourished and heavy malnourished groups.*

count as immunological tests. These results suggested that the ratio of malnutrition in intensive care was 50.2%. These result was similar to the literature. Giner et al (18) and Küçükardalı et al (19) used NRS 2002 in their study and they found 42-43% as malnutrition ratio. Gomez Ramos et al (13) made a study on 200 elderly patients and found that the malnutrition ratio was 50%. In another study made by Martinez Olmos et al (14) reported 46% ratio for malnutrition and they used SGA criteries. Mercadal-Orfila et al (20) used NRS-2002 scala and found that 62% of the patients had malnourished. Sungurtekin et al (21) found that, 62% of the patients were classified as well nourished, 26% as moderately malnourished, and 11% as severely malnourished according to SGA

In our study we found that the median age of malnutrished patients were higher than non-malnourished patients. Similar top our study Küçükardalı et al (19) and designed a study on general medicine intensive care patients, used NRS-2002 and found similar results. Atalay et al (9) reported that the geriatric intensive care patients had higher malnutrition ratios than other patients. Another study made by Brantervik et al (21) found 51% ratio for malnutrition in geriatric patients.

30% of all hospitalized patients, 50% of critical care patients and more than 80% of the surgical intensive care patients were under risk of systemic inflamмautuar reaction syndrome (SIRS). The second ladder of this is MODS. Nutrition support was a corner stone of avoiding and treatment of SIRS and MODS (22).

In our study; sepsis, MODS, respiratuar insufficiency and malignities were higher in patients with malnutrition. Mercadal-Orfila et al (20) found that respiratuar and urinary infections were higher in patients with malnutrition. Another study made by Scheneider et al. (23) reported that nazocomial infections were higher in malnutrished patients. Rodriguez-Pecci et al. (24) also reported that pneumonia was higher in patients with malnutrition.

Studies reported the positive correlation between the development of malnutrition and the patient's hospital stay and mechanical ventilation duration (25,26). Sheean et al (26) found that hospital stay were longer in malnutrished patients by using the SGA.

In our study we found statistically significant difference between well-feed group and other groups on the duration of mechanical ventilation. Also we found statistically significant difference between well-feed group and mild-to-moderate malnourished group on the duration of stay in intensive care. We found no correlation with the other groups, the reason for this was the higher mortality rate of the heavy malnutrished patients.

Evaluation of the nutritional status, serum protein levels and other parameters were all used (27). In our study there was statistically difference between admission and discharge prealbumin and albumin levels in all group of patients. We found that when malnutrition increases, albumin and prealbumin values decreased, with an increasing mortality. Sungurtekin et al found that The SGA scala correlated significantly with, percentage of weight loss, serum albumin level and mortality.

Seltzer et al (28) reported that mortality increased with low albumin and low lymphocytes in the critical care patients. Sheean et al. (26) reported a coorrelation with malnutrition and mortality. Although used as a malnutrition marker, the value of albumin for determining malnutrition is debatable (3, 28). Severe liver diseases, enteropathy and renal diseases can affect albumin levels (27). Albumin generally do not reflects the severity of nutritional status, but reflects the severity of illness (4). Prealbumin with a half life of 2 days may be valuable for assessing the severity of nutritional status, and also prealbumin do not affected with liver diseases and hydration changes (28).

Skeletal muscle create 60% of the total body protein. The measurement of triceps skin fold thickness may be useful for follow-up malnutrition. Subcutaneous adipose tissue constitutes about 50% of the total body fat and reflects the total body fat amount (4,12). Sungurtekin et al found that the SGA scala correlated significantly with triceps skinfold thickness and mid-arm circumference. In our study we found pozitive correlation with mortality and triceps skin fold thickness. Large volume infusions during resuscitation caused an expansion of interstitial and intracellular compartmants and this case leads to the anthropometric measurements errors (3, 4).

Malnutrition affects all organs and systems adversely affects the immune system. The distortion of cellular immunity deteriorate much earlier. Thymus atrophy and downsizing of spleen may be develop (29). Total number of lymphocytes and T cell ratio decreased and the number of afonksiyonel cells increases. Total number of lymphocytes can reflect the nutritional status (27, 29). Infection and immunsupresive therapy can affect the total number of lymphocytes. In our study we found that total number of lymphocytes decreases, malnutrition and mortality increases.

The main limitation of this study was the heterogenity of the patients. Postoperative and other chronic patients can affect the results.

In conclusion, we found that mortality increased with malnutrition. The nutritional status should be followed, and a treatment plan should be drawn up in critical care patients. Thus; SGA, NRS 2002 and other objective methods for assessing nutritional status with high sensitivity and specivity can be recommended for evaluation of critically ill patients.

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