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Research Article

Usefulness of nutritional screening for correlation with morbidity and mortality in septic and non-septic patients in the Intensive Care Unit

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Abstract

BACKGROUND: Advances in basic and clinical research have allowed physicians to understand the metabolic response to trauma in postoperative and/or infected patients, which results in exaggerated catabolism due to their underlying pathology, prolonged fasting, and inability to adapt [1].

Nutritional support is a routine part of ICU therapy. Treating and preventing malnutrition and nutrient deficiencies is recommended and generally benefits patient outcomes, although adverse effects and complications can occur.

METHODS: A prospective, longitudinal, observational, comparative study was conducted in the Intensive Care Unit of The Hospital Angeles Metropolitano.

Patients were selected from a cohort admitted to the Intensive Care Unit and who met the inclusion criteria.

Inclusion criteria: Patients admitted to the Intensive Care Unit with various diagnoses for management were calculated as percentage of ideal body weight; percentage of usual body weight, percentage of weight change; Arm circumference, triceps skinfold, arm muscle circumference, creatinine-height ratio, albumin and total lymphocyte count, Karnofsky, indexed body mass index (BMIi), Body Mass Index. A nutritional clinical history was taken with the main focus on changes in body weight, changes in diet in relation to normal, gastrointestinal symptoms (persistent greater than 2 weeks), functional capacity, disease and its relationship with nutritional requirements. Physical examination: loss of skin fat, muscle atrophy, edema

RESULTS: We incluyed Fourty patients, 19 female (47.5%) and 21 male (52.5%) and divided in two groups.

Age	Septic group (9 patients)	Group Non Septic(31 patients)
	56 ±14.72 years old	61.75 ±15.61 years old
Sex: Male	55.55%	51.61%
Female	44.44%	48.38%

The associated pathologies that led to admission to the Intensive Care Unit were the following: Acute Ischemic Heart Disease: (13 patients) 32.5%, Diabetes mellitus and complications (6 patients) 15%; abdominal sepsis (4 patients) 10%, Neurological Vascular Disease: (3 patients) 7.5%; Acute Respiratory Tract Infection (2 patients) 5%, Acute Pancreatitis (2 patients) 5%, hypovolemic shock (2 patients) 5%, Hypertensive Emergency (1 patient) 2.5%, Chronic Obstructive Pulmonary Disease (1 patient) 2.5%; Venous Congestive Heart Failure (1 patient) 2.5%; Status Epilepticus (1 patient) 2.5%; perirenal abscess (1 patient) 2.5%.

Main Measurements and Results: Albumin: 2.59 ± 0.84 g/dL; Total lymphocyte count: 1,500.84 ± 1,530.08; Arm circumference: 28.92 ± 2.97 cm; PCT: 19.57 ± 7.74 cm; % PCI: 117.48 ± 19.62 cm; % PCU: 98.62 ± 4.33; % Weight change: 1.31 ± 4.17%; CMB: 29.28 ± 6.68; IC/T: 170.89 ± 405.75; IMCi: 55.35 ± 7.35; BMI: 27.68 ± 4.54; Costs/Day: $85,843.75 ± $76,973.49; Karnofsky Score: 93.5 ± 13.50; Age: 75.4 ± 22.04 years. Subjective Global Assessment: Well-nourished: 72.50%; Moderately malnourished or at risk of malnutrition: 22.50%; Severely malnourished: 5%.

Regarding the correlation of the different variables, it was as follows: days of stay – Serum albumin level: r = -0.330 < 0.05; days of stay – Karnofsky Score: r = -0.504 < 0.01; Albumin – days of stay.

r = -0.330 < 0.05.; Arm circumference – PCT: r = 0.655 - 0.01; Arm circumference - % PCI: r = 0.658 < 0.01; PCT - % PCI: r = 0.447 - 0.01; PCT - Moderately malnourished or at risk of malnutrition: r = 0.865 - 0.01; %PCI - % Weight change: r = -0.997 - 0.01; Karnofsky score- days of stay: r = -0.504 - 0.01; Severely malnourished - days of stay: r = 1.000 - 0.01; Severely malnourished - albumin:

r = 1.000 - 0.01; Severely malnourished - Total lymphocyte count: r = -1.000 - 0.01; Severely malnourished – arm circumference: r= -1.000 - 0.01; Severely malnourished- PCT: r= -1.000 - 0.01; Severely malnourished- %PCI: r= -1.000 - 0.01; Severely malnourished-%PCU: r= 1.000 - 0.01; Severely malnourished-% Weight change: r= -1.000 - 0.01; Severely malnourished- Karnofsky score: r= -1.000 - 0.01; Severely malnourished - Age: r = -1.000 - 0.01; CMB - arm circumference: r = 0.422 - 0.01; CMB - % PCI: r = 0.353 - 0.05; IC/T - Well-nourished: r = 0.882 - 0.01; Improvement - PCT: r = 0.416 < 0.05; Improvement - Well-nourished: r = 0.986 - 0.01;Improvement - Moderately malnourished or at risk of malnutrition: r = 0.993 - 0.01; BMI - Well-nourished: r = 0.461 < 0.05; BMI - Arm circumference: r = 0.645 - 0.01; BMI – PCT: r= .434 - 0.01; BMI - % PCI: r= .938 -0.01; Costs – days of stay: r= 1.000 - 0.01; Costs – albumin: r= -.330 -0.05; Costs – Karnofsky score: r= -.504 p< 0.01.

Regarding the septic and non-septic groups: The variables that had statistical significance were the following: % change in weight 1.914 r = 0.025 p< 0.05; BMIi 2.579 r= 0.01 p-0.05; Costs/day 3.184 r = 0.01 p < 0.05, Days of stay: 3.184± 0.025 r=-0.01 p < 0.05 p value < 0.05.

Conclusions: The data of more correlation in the evaluation are: the levels of serum albumin, It counts total of lymphocyte , stay days-costs and mortality.

Keywords: Nutritional screening, correlation with morbidity and mortality in septic and non-septic, Intensive Care Unit

Introduction

Rose and colleagues, in 1949, by discovering the essential amino acid threonine, spurred the study of artificial nutrition.

Advances in basic and clinical research have allowed physicians to understand the metabolic response to trauma in post-surgical and/or infected patients, which leads to exaggerated catabolism conditioned by their underlying pathology, prolonged fasting, and inability to adapt [1].

Nutritional support is a routine part of ICU therapy. It is advisable to treat and prevent malnutrition and nutrient deficiencies and generally benefits patient outcomes, although adverse effects and complications can occur. The effects of severe injury or disease on energy, protein, carbohydrate, and fat metabolism combine to influence the nutritional requirements of critically ill patients. Of primary interest are changes in protein metabolism, which can lead to loss of lean body mass, associated with impaired host defenses and increased morbidity and mortality [2].

Methods

Objective

To understand the various techniques used to assess nutritional status, using the Subjective Global Assessment (SGA) system.

Specific Objectives:

- To identify patients who may benefit from nutritional therapy to maintain or restore their nutritional status.
- To assist in identifying the most appropriate nutritional therapy.
- To evaluate the effectiveness of nutritional therapy through routine monitoring of nutritional status.

Inclusion criteria: Patients admitted to the Intensive Care Unit with various diagnoses underwent the following measurements for management: percentage of ideal body weight; percentage of usual body weight; percentage of weight change; arm circumference; triceps skinfold thickness; arm muscle circumference; creatinine-height index; albumin and total lymphocyte count; Karnofsky score performance status; indexed body mass index (BMIi); and body mass index. A nutritional history was taken, focusing primarily on changes in body weight, dietary changes relative to normal, gastrointestinal symptoms (persistent for more than two weeks), functional capacity, the disease, and its relationship to nutritional requirements. Physical examination revealed loss of subcutaneous fat, muscle atrophy, and edema.

Exclusion criteria: These were patients who, during the study, experienced a life-threatening complication requiring urgent management, such as cardiorespiratory arrest, hypovolemic shock, or who were diagnosed with chronic liver disease.

Elimination criteria: These were patients without adequate follow-up. Patients diagnosed with chronic liver disease with ascites, cancer, or chronic protein-losing gastrointestinal disorders were also excluded.

Design: Cohort. Data Collection: Prospective. Setting: 7-bed ICU. Period: 6 months. Number of Patients: 40. Sample: Convenience sample. Variables: Age, length of stay, albumin levels, total lymphocyte count, triceps skinfold thickness (TSF), percent ideal body weight (IBW), percent usual body weight (UBW), percent weight change, mid-upper arm circumference, mid-upper arm muscle circumference, creatinine/height ratio, body mass index (BMI), Karnofsky score performance status.

Statistics: Descriptive. Statistical software: SPSS® v.14.

Statistical Analysis

This was done by determining the mean, standard deviation, and Pearson's correlation coefficient, and by analyzing the differences between means using the t-test for paired and unpaired samples, as well as by performing one-way ANOVA. A statistical value of $p < 0.05$ was used.

Results and Main Measurements

Forty patients were included: 21 (52.5%) male, mean age 57.28 ± 15.96 years, and 19 (47.5%) female, mean age 63.84 ± 14.88 years.

The associated pathologies leading to admission to the Intensive Care Unit were as follows: Acute Ischemic Heart Disease (13) 32.5%, Diabetes mellitus and complications (6 patients) 15%, Abdominal sepsis (4 patients) 10%, Neurovascular Disease (3 patients) 7.5%, Acute Respiratory Infection (2 patients) 5%, Acute Pancreatitis (2 patients) 5%, Hypovolemic Shock (2 patients) 5%, Hypertensive Emergency (1 patient) 2.5%, NOC (1 patient) 2.5%, and Congestive Heart Failure (1 patient) 2.5%. Status Epilepticus (1 patient) 2.5%; perirenal abscess (1 patient) 2.5%.

Main Measurements

Albumin: 2.59 ± 0.84; it counts total of lymphocytes: 1,500.84 ±1,530.08; circumference of the Arm: 28.92± 2.97; PCT: 19.57 ±7.74;% PCI: 117.48 ± 19.62;% PCU: 98.62 ±4.33;% changes Weight: 1.31 ±4.17; CMB: 29.28 ± 6.68; IC/T: 170.89 ± 405.75; BMIi: 55.35 ±7.35; IMC: 27.68 ± 4.54;Costs/Day: US$4,292.18±3,848.67 ; Karnofsky: 93.5 ± 13.50; age: 75.4 ± 22.04 years. Subjective Global valuation: Well Nourished: 72.50%;-moderately undernourished or with risk of Malnutrition: 22.50%; Severely undernourished: 5%.

With regard to the correlation of the different variables it was the following:

Days stay - Level of serum albumin : r = - .330 - 0.05; Days stay-Karnofsky score: r = - .504 - 0.01; albumin - days stay: r = - .330 -0.05; Circumference of the arm - PCT: r =0.655 - 0.01; Circumference of the arm -% PCI: r = 0 .658 - 0.01; PCT-% PCI: r = 0.447 - 0.01; PCT - Moderately undernourished or with risk of malnutrition: r=0.865 - 0.01; % PCU - % Change weight : r = - .997 - 0.01; karnofsky score - days stay: r = - .504 -0.01; Severely undernourished - days stay: r = 1.000 - 0.01; Severely undernourished –serum albumin: r = 1.000 - 0.01; Severely undernourished - total account of lymphocytes: r = -1.000 - 0.01; Severely undernourished - circumference of the arm: r = -1.000 - undernourished 0.01;Severely - PCT: r = -1.000 - 0.01; Severely undernourished -% PCI: r = -1.000 - 0.01; Severely undernourished-%PCU: r = 1.000 - 0.01; Severely undernourished-%Cambio of weight: r = -1.000 - 0.01;Severely undernourished-Karnofsky: r = -1.000 - undernourished 0.01;Severely - Age: r = -1.000 - 0.01;AMC -circumference of the arm: r = .422 - 0.01;CMB -% PCI: r = .353 -0.05; IC/T - Well nourished: r = .882 - 0.01; improvement - PCT: r = .416 - 0.05; Improvement - well nourished: r = .986 - 0.01; Improvement - moderately undernourished or with risk of malnutrition: r = .993 - 0.01; IMCi - well nourished: r = .461 - 0.05; IMC - the arm Circumference: r = .645 - 0.01; IMC - PCT: r = .434 - 0.01; IMC -% PCI: r = .938 -0.01; Costs - days stay: r = 1.000 - 0.01; Costs - albumin: r = - .330 -0.05; Costs - karnofsky: r = - .504 - 0.01.

With regard to the Septic and not septic groups: The variables that had statistical significance were the following: % of change of weight 1.914 0.025 p-0.05; IMCi 2.579 0.01 p-0.05; Costs/day relation 3.184 0.01 p - 0.05, Days stay: 3.184 ± 0.025 -0.01 p <0.05 Value of the p <0.05.

Table 1: Shows the summary of the variables analyzed and their interrelations. Los resultados de las variables analizadas fueron las siguientes:

Variable	Value	Standard
Age	75.4 ± 22.04 years	
Length of Stay	8.37 ± 7.50 days	
Albumin	2.59 ± 0.84	4-6 g% < 2.5 g%
Total Lymphocyte Count	1,500.84 ±1,530.08	<2,500/mcL (microliter)
Triceps skinfold (TSF)	19.57 ±7.74 mm	Hombre 12.5 Mujer 16.5 mm
% Ideal Body Weigth (IBW)	117.48 ± 19.62	90-120%
% Usual Body Weigth (UBW)	98.62 ±4.33	+95%
% Weigth Change	1.31 ±4.17	1-5% moderate to severe
Arm Circunference (AC)	28.92± 2.97	Male 29.3 Female 28.5 cm
Arm Muscle Circumference (AMC)	29.28 ± 6.68	Male 25.3 Female 23.2 cm
Creatinine/Height Index	170.89 ± 405.75	90-100%
Body Mass Index (BMI)	27.68 ±4.54	Male 20.7-27.8 Female 19.1-27.3 (kg/m2)
Indexed Body Mass Index (BMIi)	55.35 ±7.35	
Karnofsky Score	93.5 ± 13.50	

Subjective Global Assessment

Table 2: Subjective Global Assessment evaluated in the total group, where it is observed that the largest percentage 72.50% are the well-nourished group.

Hospital Discharge

Variable	Value
Improvement	60%
Death	22.50%
Costs/Day	USD$ 4,292.18±3,848.67

Table 3: Results of the characteristics of its evolution and the costs per day of the total group. The total group was divided into 2 groups: septic (9 patients) 22.5% and non-septic (31 patients) 77.5%.

	Septic Group	Non-septic Group
Age	56 ±14.72 years	61.75 ±15.61 years
Sex Male	55.55%	51.61%
Female	44.44%	48.38%
Days Stay	16.11± 9.84	6.45 ±5.30 days
Albúmin	1.64 ±0.50 g/%	2.87± 0.71g/ dl
Total Lymphocyte Count	1090.81±494.64	1619.87±1706.81 mcL (microliter)
Triceps skin fold (TSF)	21.22±6.35 mm	19.09±8.12 mm
% Ideal Body Weigth (IBW)	113.21 ±18.49	118.71±20.05 %
% Usual Body Weigth (UBW)	95.88± 6.45	99.41±3.23 %
% Weigth Change	3.85± 6.04	0.58 ±3.23 %
Arm Circunference	28.27 ±2.96 cm	29.11±2.99 cm
Arm Muscle Circumference (AMC)	31.85±13.36 cm	28.51±2.84 cm
Creatinine/Height Index	264.55±553.77%	63.80±34.01%
Body Mass Index(BMI)	42.9± 18.82	27.76±4.40 (kg/m2)
Indexed body Mass Index (BMIi)	60.22 ±7.89	49.90± 13.50
Karnofsky	88.88±19.64	94.83±11.21
Costs	USD$7687.5 ±5272.53)	USD$3,306.45 ± 2717.82

Table 4: Comparison of the different variables in the septic vs non-septic groups, with the greatest alterations predominating in the septic group.

Reason for ICU Discharge

	Septic Group (9)	Non-septic Group (31)
Improvement	66.66% (6)	87.09% (27)
Transfer	11.11%(1)	9.67% (3)
Death	22.22% (2)	0%
Not recoverable	0%	3.22% (1)

Table 5: Mortality was higher in the septic patient group, and survival was lower.

	Septic Group	Non-septic Group
Improvement	44.44% (4)	64.51% (20)
Transfer	11.11% (1)	9.67% (3)
Death	22.22% (2)	0%
NE	0%	3.22% (1)

Survival: In the septic group (9 patients), Only 44.44% (4 patients) were discharged from the hospital due to improvement; with a mortality of 22.22% (2 patients), in the non-septic group (31 patients), 64.51% were discharged from the Hospital due to improvement (20 patients), the overall survival in the non-septic group was 87.09% (20 patients) and in the septic group it was 66.66% (6 patients). Overall mortality non-septic group was 22.58% (7 patients); discharged from the Intensive Care Unit after improvement died.

The results of the correlation between the various variables analyzed are shown below:

Table 6: The conditions of the group of septic patients, upon their hospital discharge, are similar to their discharge from the Intensive Care Unit, with a marked decrease in discharge due to improvement.

Variables	Correlation Index	Value	p Value
Length of stay – serum Albumin Level	-.330	0.038	<0.05
Length of stay -Karnofsky score	-.504	0.001	< 0.01
Serum albumin Level – Length of stay	-.330	.038	<0.05
Arm circumference – Triceps skin fold (TSF)	.655	.000	< 0.01
Arm circumference - % Ideal Body Weigth (IBW)	.658	.000	<0.01
Triceps skin fold (TSF) - % Ideal Body Weigth (IBW)	.447	.004	<0.01
Triceps skin fold (TSF) – Moderately malnourished or at risk of malnutrition	.865	.003	<0.01
% Usual Body Weigth (UBW) - % Weigth Change	-.997	.000	<0.01
karnofsky Score– Length of stay	-.504	.001	<0.01
Severely malnourished - Length of stay	1.000	.0	<0.01
Severely malnourished – Serum albumin Level:	1.000	.0	<0.01
Severely malnourished – Total Lymphocyte Count	-1.000	.0	<0.01
Severely malnourished – Arm circumference	-1.000	.0	<0.01
Severely malnourished - Triceps skin fold (TSF)	-1.000	.0	<0.01
Severely malnourished - % Ideal Body Weigth (IBW)	-1.000	.0	<0.01
Severely malnourished - % Usual Body Weigth (UBW)	1.000	.0	<0.01
Severely malnourished - % Weigth Change	-1.000	.0	<0.01
Severely malnourished -Karnofsky Score	-1.000	.0	<0.01
Severely malnourished - Age	-1.000	.0	<0.01
Arm Muscle Circumference (AMC) - Arm circumference	.422	.007	<0.01
Arm Muscle Circumference (AMC) - % Ideal Body Weigth (IBW)	.353	.026	<0.05
Creatinine Index /Height – Well Nourished	.882	.004	<0.01
Improvement – Triceps skin fold (TSF)	.416	.043	<0.05
Improvement – Well Nourished	.986	.000	< 0.01
Improvement - Moderately malnourished or at risk of malnutrition	.993	.000	<0.01
Indexed body mass index (iBMI) – Well Nourished	.461	.012	<0.05
Body Mass Index (BMI) – Arm circumference (AC)	.645	.000	< 0.01
Body Mass Index (BMI) – Triceps skin fold (TSF)	.434	.005	<0.01
Body Mass Index (BMI) - % Ideal Body Weigth (IBW)	.938	.000	<0.01
Costs – Length of stay	1.000	.000	< 0.01
Costs – serum Albumin Level	-.330	0.38	<0.05
Costs – karnofsky Score	-.504	.001	<0.01

Table 7: Regarding the comparative analysis between the septic and non-septic groups through the analysis of means with the two-tailed t-test:

In the septic and non-septic group: with paired t-test analysis

Variables	Table Value	Significance	p- Value
Length of stay	3.184	0.01	<0.05
% Weigth Change	1.914	0.025	<0.05
Indexed body mass Index iBMI	2.579	0.01	<0.05
Costs/ day	3.184	0.01	<0.05
serum Albumin Level	9.861	0.005	<0.01
Total Lymphocyte Count	6.61	0.01	<0.05

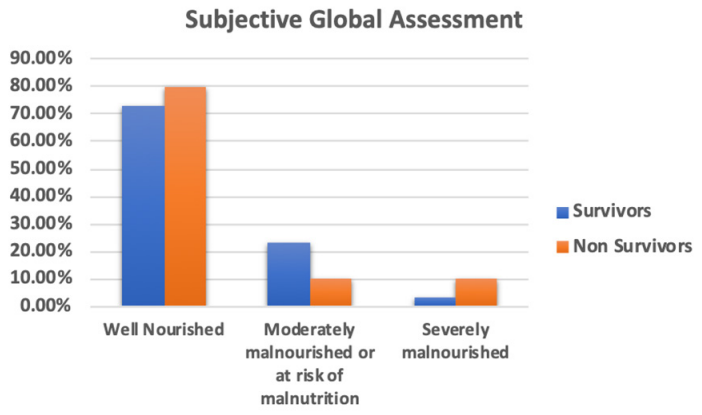
Table 8: The statistical significance in the septic and non-septic group is analyzed, observing the impact on days of stay, cost/day, serum albumin levels and total lymphocyte count.

	Survivors	Non Survivors
Length of stay	6.9 ± 6.46	13 ± 8.85
serum Albumin Level	2.73 ± 0.87	2.17 ± 0.60
Total Lymphocyte Count	1611.73 ± 1702.77 mcL (microliter)	1168 ± 799.04 mcL (microliter)
Arm Muscle Circumference (AMC)	28.51 ± 3.10	30.15 ± 2.26 cms
Triceps skin fold (TSF)	19.06 ± 8.11	20.6 ± 6.99 mm
% Ideal Body Weigth (IBW)	154.23 ± 205.36%	118.46 ± 16.48 %
% Usual Body Weigth (UBW)	98.9 ± 4.20	97.8 ± 4.84
% Weigth Change	1.1 ± 4.20	1.97 ± 4.24
Karnofsky Score	94 ± 13.79	92 ±13.16
Age	58.1±16.19	67.3 ±11.90
Arm Muscle Circumference (AMC)	27.92 ± 2.95	29.48 ± 2.11
Creatinine Index /Height	66.60 ± 37.47	379.43 ± 700.68
Indexed body mass Index (iBMI)	54.58 ± 8.56	55.78 ± 5.64
Body Mass Index (BMI)	27.37 ± 4.65	26.96 ± 3.46
Costs/day	USD$ 3,536.25±3,314.14	USD$ 6,816.25±4,322.11

Table 9: The variables observed with a predominant relevance with respect to the survivors were shorter days of stay, higher serum albumin level, higher total lymphocyte count, lower age in the survivor group, lower creatinine/height index in the survivors which translates to less muscle destruction, and lower costs/day in the patients who survived.

Subjective Global Assessment

	Survivors	Non Survivors
Well Nourished	73.33%	80%
Moderately malnourished or at risk of malnutrition	23.33%	10%
Severely malnourished	3.3%	10%



Graph 1: Subjective Global Assessment/ Group of survivors and non-survivors. Group of survivors and non-survivors

Table 10: The evolution of nutritional status with respect to survival, since it is observed that mortality increases according to the degree of malnutrition.

T-test analysis, for unpaired samples

Variables	Table Value	Significance	p- Value
Length of stay	2.225	0.025	0.05
Costs	2.398	0.01	0.05
Creatinine Index /Height	5.895	0.005	0.01
Arm circumference	50.335	0.005	0.01
Arm Muscle Circumference (AMC)	51.799	0.005	0.01
Total Lymphocyte Count	5.184	0.01	0.05
Serum Albumin Level	17.210	0.025	0.05

T-test analysis, for unpaired samples

Table 11: Anova analysis with analysis of the variables with the greatest impact.

Anova analysis

Variables	Table Value	Significance	p- Value
Length of stay - Total Lymphocyte Count	259.836	.048	< 0.05
Length of stay - Arm circumference	6447.261	.010	< 0.05
Total Lymphocyte Count - % Ideal Body Weigth (IBW)	16.588	.021	< 0.05
Total Lymphocyte Count - Body Mass Index (BMI)	32.598	.008	< 0.01
Costs/day- % Ideal Body Weigth (IBW)	18204.782	.006	< 0.01

Conclusion

Critical illness, both in itself and due to the frequent use of sedation, leads to unconsciousness and immobility. Severe critical illness is associated with inflammation, anorexia, gastrointestinal dysfunction, and metabolic disorders, resulting in pronounced catabolism responsible for protein loss, muscle atrophy and weakness. These alterations in physical function can persist for years [3-7]. Many surviving patients experience post-ICU syndrome, which is variably characterized by ICU-acquired weakness, cognitive impairment, musculoskeletal disorders, fragility, fatigue, endocrinopathies, and mood changes [5]. Therefore, critical illness is considered a pathology of extraordinary vulnerability, leading to dependence and significant change for both patients and their families.

Nutritional support is an integral component of a strategy to counteract the deleterious effects of critical illnesses, providing energy and nutrients to prevent deficiencies in essential vitamins and trace elements for protein synthesis, thereby minimizing protein and muscle mass loss [8,9]. Recent randomized controlled trials challenge the traditional approach of providing intensive and early macronutrient support to all patients [10,12]. This challenge is highlighted in three key areas. First, low calorie and protein intake may improve outcomes, especially at the beginning of the acute phase of critical illness (i.e., typically the first week in the ICU), which can be described as the phenomenon of "autophagy" [13-15]. 1 Second, nutrition alone may be insufficient to restore muscle mass and function [4-16]. Third, pharmaconutrients have not demonstrated benefits in patients with multiple organ failure [17-20].

In our study, we observed that the various statistical tests applied revealed

statistical significance for the different variables studied. The importance lies in preventing critically ill patients from progressively developing malnutrition to the point of severe malnutrition, which impacts all the variables studied, but fundamentally affects length of stay, costs, and increased morbidity and mortality.

Among the multiple variables studied, some in our research are related to others, as mentioned below.

The data with the highest correlation in the evaluation are: Serum albumin levels; Total lymphocyte count; Length of stay, costs, and mortality.

Discussion

The best way to feed a human being is orally. When this is not possible, we can use any of the other modalities of nutritional support.

The purpose of aggressive nutritional support with total parenteral nutrition is to maintain or restore cellular body mass. It is possible to increase nitrogen retention in the body by increasing nitrogen intake with amino acids, or energy intake with calories; the effect will depend on how these nutrients are utilized [1].

The utilization of bodily nutrients depends on the following factors:
a) Metabolic state, especially the extent of catabolism associated with trauma, stress, or infectious diseases.
b) Body nutrient reserves, which are determined by the nutritional status prior to the illness and its duration.
c) Environmental and therapeutic factors. Pain, anxiety, and cold increase metabolic expenditure; conversely, muscle work increases amino acid retention in the muscle.
d) Solution Content. Nutrients do not act in isolation; therefore, appropriate proportions are required for effective nutrition [1,2].

The needs of malnourished patients differ from those of patients with stress or hypercatabolic conditions. If malnutrition and hyper catabolism are present, the metabolic response to stress negatively impacts nutritional support therapy.

Individual nutritional requirements vary throughout the course of the disease. It is important not to overfeed the patient, as this will cause increased energy expenditure during elimination and may lead to undesirable side effects [1,2].

We must distinguish when nutrition is used to maintain nutritional status or to correct established nutritional deficiencies. Nitrogen and energy requirements must be estimated independently when planning nutritional therapy, as they are two distinct nutrients; furthermore, the rates at which body protein and fat are lost during the disease change with the metabolic state [2].

The patient's physical condition should be considered when assessing the need to restrict any component of nutrition [1].

Nutritional Assessment

The most commonly used methods for assessing patients' nutritional status include several

Categories

a) General Assessment (Medical History)
b) Assessment of Somatic Protein and Fat
c) Lean Tissue
d) Visceral Protein
e) Nitrogen Balance

General Assessment: Obtaining a thorough nutritional history is crucial. It is necessary to investigate factors that may have affected the diet, increased nutrient losses or intake, or impaired intestinal absorption [1].

Assessment of Somatic Protein and Fat: This includes several categories:
a) Anthropometric Measurements
b) Creatinine-Height Index (Lean Tissue)
c) Visceral Protein
d) Nitrogen Balance

The Subjective Global Assessment (SGA) is a multi-method indicator of nutritional status. The two basic components of this system are the clinical interview and the physical examination. Neither requires complex equipment or procedures. The SGA provides a general overview; For greater accuracy, it is also necessary to review other parameters that influence the person's overall health, such as the results of laboratory tests and a careful physical examination [1,2].

Nutritional Assessment

a. Weight:
Percentage of ideal body weight = (Current weight x 100) / Ideal weight
Percentage of usual body weight = (Current weight x 100) / Usual weight
Percentage of weight change = (Usual weight – Current weight) x 100 / Usual weight
b. Height:
c. Arm circumference
d. Triceps skinfold thickness (TSF)
e. Mid-arm muscle circumference (MAC): MAC = Arm circumference – (TSF in mm x 0.314)
f. Creatinine-height index (lean tissue):
Current 24-hour urinary creatinine x 100% / Ideal urinary creatinine
g. Visceral proteins:

- Serum transferrin
- Total iron-binding capacity
- Albumin
- Total lymphocyte count
- Response of Delayed cutaneous hypersensitivity.

Nitrogen balance [1].

The early laboratory measurement that received attention for its prognostic value was serum albumin. Serum albumin is the best single assessment parameter for all patients and possibly the best assessment index when the incidence of malnutrition is low. Instant nutritional assessment (INA) predicts the frequency of complications based on two common laboratory values: albumin and total lymphocyte count. Abnormal values (albumin < 3.5 g/dL; lymphocyte count < 1,500/mm^3) predict increased mortality and increased complications in surgical patients [21].

The Nutritional Prognostic Index (NPI) is perhaps the most widely studied. It is based on the objective measurement of serum protein, subcutaneous fat, and immune function. NPI (% risk) = 158% - 16.6 (alb) - 0.78 (TSF triceps skinfold thickness, mm) - 0.2 (tfn serum transferrin, mg) - 5.8 (DSH delayed dermal hypersensitivity, 1 anergy, 2 reactive). It predicts the percentage risk of postoperative complications in patients with underlying gastrointestinal surgery, but its value is limited for other clinical populations. 22 It has been applied to various groups of surgical patients for validation [23-25]. Thus, the NPI can be used in critically ill patients. With an adequate prevalence of malnutrition, an NPI greater than 50 predicts a mortality rate of approximately 65% [26].

The Hospital Prognostic Index is based on a nonlinear discriminant function incorporating serum albumin, the presence or absence of sepsis, and/or cancer and delayed-type hypersensitivity [27].

Probability of survival = 0.91(alb.) - 1.0 (Delayed-type hypersensitivity) - 1.44(SEP) + 0.98(DIA) - 1.09 DSH (anergy = 2, reactive = 1) SEP = sepsis, (no sepsis = 1, septic = 2), DIA (cancer = 1, no cancer = 2).

Abbreviation

TSF Triceps skin fold, IBW Ideal Body Weigth, UBW Usual Body Weigth, AC Arm Circunference, AMC Arm Muscle Circumference, MAC Mid-arm muscle circumference, BMI Body Mass Index, BMIi Indexed body Mass Index, INA Instant nutritional assessment, NPI Nutritional Prognostic Index.

Declarations

There are no conflicts of interest or sources of support

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