A nutritional study of 45 elderly patients admitted to a general medical ward

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Abstract

Introduction: This paper reviews the problems associated with the diagnosis of under-nutrition in the hospitalised, bedridden, elderly patient. It aims to assess the nutritional status of patients aged 65 years or older, admitted to the general medical ward of a Central Hospital.

Methodology: The triceps skin fold thickness (TST) and mid-arm circumference were measured using the standard manner and the mid-arm muscle circumference (MAMC) calculated using the recommended formula. The TST or the MAMC were considered diminished when below the 10th percentile of the reference table, matched for age and gender. The albumin, transferrin, pre-albumin, retinol binding protein, haemoglobin, total number of lymphocytes and total cholesterol were also measured and compared to the hospital's laboratory reference values.

Results: The percentage of undernourished patients, in accordance with the previously defined parameters, revealed a wide range of values, varying from 11.1 to 35.6 %, with respect to each of the anthropometric values measured; and from 30.6 to 88.6 % with respect to each of the laboratory values.

Discussion and conclusion: There is no single anthropometric measurement or laboratory parameter, that is, in isolation, a good indicator of the nutritional status in an individual patient. There is a large disparity between the information given by each variable in relation to the nutritional status of an individual patient. In the elderly, bedridden patient, who often has a serious inter-current illness that leads to hospitalisation, there is an urgent need for the development of a nutritional index which could be used in daily clinical practice. Furthermore, there is a great need for large-scale anthropometric studies in healthy adults, in particular in the elderly population, in Portugal. The correct identification of under-nutrition in individual cases and groups of patients needs to be made.

Key words: nutrition, elderly, anthropometry, albumin, transferrin, pre-albumin, retinol binding protein

Introduction

Elderly patients are subject to a series of factors that decrease their capacity to eat properly.[1] Anorexia, the impossibility of carrying out activities of daily living (ADL), the lack of choice of foods, difficulty chewing due to loss of teeth, the social and psycho affective environment, and immune deficiencies, all contribute to malnutrition. When an elderly patient is admitted to hospital, the malnourishment can be aggravated. Furthermore, no nutritional assessment of elderly patients admitted to hospitals with acute medical problems is carried out as a matter of routine. Prolonged use of intravenous infusions of sodium chloride and dextrose is common, the amount of foods ingested is not recorded, and dietary restrictions are introduced in preparation for certain diagnostic tests. There is often a failure to recognize the patient's nutritional needs, and a delay in the institution of feeding support.[2] There is a close correlation between malnutrition and higher frequency of infections,[3] higher intra-hospital mortality and hospitalization times,[4] as well as with a higher frequency of hospitalization.[5]

Nutritional assessment and the identification and classification of malnourished patients require a synthesis of the information on the patient´s dietary history, physical examination, anthropometric measures and laboratory tests.[6] In adults, the weight and fat measurement are the most commonly used indicators of caloric status. The protein distribution is assessed by two compartments: the somatic, of

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which the muscle area of the arm is a good indicator, and the visceral, which is assessed through the serum protein levels. In relation to the laboratory tests, it is considered that determining the retinol-binding protein (RBP), with a half-life of 12 hours, and the pre-albumin (PALB), with a half-life of 1 to 2 days, are indicators of very recent protein malnutrition, while transferrin (TFR), with a half-life of 8 days, and albumin (ALB), with a half-life of 20 days, are indicators of chronic malnutrition. None of these proteins, however, is specific for malnutrition, and in the context of chronic malnutrition, their levels may not be decreased. The metabolic response to infection can also cause the concentrations of these proteins to be decreased; the TFR concentration increases in ferropenic anemia, and the RBP depends on the rate of glomerular filtration.[7]

There are multiple problems related to the methods used. The dietary history is difficult to determine, and its analysis is slow and complicated. In the majority of patients, there is no quantified history of weight loss, and if the patients are bedridden with an acute or chronically disabling disease, the non-existence of scales to weigh the patient in bed does not enable the weight to be determined. The most sophisticated anthropometric methods require a thickness caliper, which does not exist on most wards, and specialized personnel to perform the measurements. The appropriate use of anthropometric characteristics of individuals and populations requires a comparison of the data obtained from a large number of healthy individuals with the same age, gender, genetic characteristics and environmental influences, given that there are important differences in terms of height and weight. A panel of experts in Nutrition from the World Health Organization recommends that in countries where there are no charts, anthropometric studies previously carried out should only be used to compare between different population groups, and not as a reference for identifying malnourished individuals.[8] There are no Portuguese tables for comparison of anthropometric indices in adults or the elderly, and even at international level, there are few tables that present detailed anthropometric indices on patients over 75 years of age.[9,10,11]

In 1991[1] it was proposed that in Portugal, any individual aged over 65 years who presents 3 or 4 of the six indices referenced should be considered malnourished (i.e. anthropometric values lower than 80% of the normal values, or biochemical values lower than the reference values, namely, body mass index < 18 kg/m^2, triceps skinfold in men < 10.0 mm, in women < 13.2 mm, transferrin < 200 mg /dL, arm muscle circumference in men < 202.4 mm, in women < 185.6 mm, prealbumin < 13.6 mg /dL and albumin < 3.5 g /dL). There are still no published studies on these new criteria. The only study to be carried out in Portugal on the prevalence of malnutrition in elderly hospitalized patients in Medicine services[12] found a prevalence of malnutrition of 29.7% in a study of 64 elderly patients. In this study, the creatinine/height ratio was used instead of prealbumin, using criteria defined in previous studies.[13,14]

The main objective of the present study was to evaluate the nutritional state of a population of elderly patients admitted to our service, based on comparison of the anthropometric measurements with tables adjusted for age and gender[15] and to evaluate the laboratory parameters traditionally used in studies on nutrition. Pre-hospital factors were considered that may have influenced the patients' state of nutrition.

Material and methods

The study population consisted of elderly people (aged 65 or over) resident in the western area of Lisbon and in the Council of Oeiras, admitted to the Medicine Service II of the Hospital de Egas Moniz with acute or chronic acute diseases, through the General Emergency of the Hospital de São Francisco Xavier. The average stay of patients at the Hospital de São Francisco Xavier was 24 hours. The study was carried out between the 1st of March and the 31st of August 1996, including, in this period, patients admitted consecutively from Sunday to Thursday.

The patients were included in a protocol that included anthropometric measurements and a range of biochemical tests, as parameters for estimating the different body compartments. The anthropometric measurements were carried out by the dietician of the service, using a Harpenden skinfold caliper, with resolution of 0.20 mm (British Indicators Ltd. West Sussex, UK) to measure the triceps skinfold (TSF), which represents fat on the limb. Both the TSF and the mid-upper arm circumference (MAC) were measured in mm, and in triplicate, according to the recommended methods.[16] According to the established formulas,[16] the mean of these parameters was used to calculate the arm muscle circumference (AMC),

which indirectly reflects the muscle circumference. TSF or AMC were considered to have decreased when the value found was lower than the 10th percentile of the reference chart, based on age and gender.[15] It was only possible to obtain the weight (kg) and height (cm) for 13 of the 45 patients (29%), due to their inability to get out of bed, and the non-existence, in our service, of electronic scales that can take measurements with the patient sitting down. Anthropometric data were obtained for 27 of the 45 patients (60%) in the first 72 hours, in 11 patients between the 4th and 5th days, and in the remaining 7 cases, after the 5th day of hospitalization.

Blood samples were taken for hemoglobin, lymphocyte count, immunoglobulins, creatinine, glycemia, transaminases, g-glutamyl transferase (g-GT), alkaline phosphatase and cholesterol. Representing the protein-visceral compartment, albumin (ALB), transferrin (TRF), prealbumin (PALB) and retinol-binding protein (RBP) were measured. The quantitative determination ALB, TFR, PALB and RBP was carried out by kinetic nephelometry (Beckman). The reference values used were: for ALB, 3.4 to 5.0 g/L, for TFR, 2.12 to 3.6 g/L, for PALB 0.18 to 0.45 g/L and RBP, 3 to 6 mg/dL. For the other parameters, the reference values of the hospital laboratory were used. The value of a laboratory parameter was considered to have decreased when it was lower than the normal limit. The laboratory data were obtained in the first 72 hours after admission in 34 cases (75%) and in the remaining cases, after the 3rd day of hospitalization. The presence of hepatic, gastrointestinal, kidney or infectious disease was taken into account.

The clinical data considered were the disease that led to the hospitalization, and pre-hospital factors, in particular, the presence of chronic pathology that lead to the nutritional deficiency, the number of diseases associated with the number of daily medications, absence of own teeth and a dental prosthesis, choice of food, and where the patient was referred from (retirement home or patient's own home).

The physiotherapists of the service evaluated the activities of daily living (ADL) according to the Barthel scale,[17] in the period immediately preceding the current disease, registered on a scale of 0 to 20. The patient's mental status was also evaluated in the first 72 hours after admission, using an adaptation of the Abbreviated Mental Test Score,[18] registered on a scale of 0 to 10, annexed (Annex I), and the hospitalization time and intra-hospital mortality were considered.

Results

A total of forty-five patients were studied, the majority female (63.3%), with an mean age of 78.87 years (*Table I*); 15.6% of the patients were from a retirement home, and the remainder came from their own homes; 21.4% of the patients did not have either their own teeth or a dental prosthesis, and 22.5% had no opportunity to choose the foods they ate. The mean

TABLE I

Characteristics of the population studied

Total number of patients	45
Gender:	
Male	12 (26.7%)
Female	33 (63.3%)
Mean age and standard deviation (years)	78.87 ± 6.32
Male	80.9 ± 5.6
Female	78.1 ± 6.5
Disease that led to admission	
Ccerebrovascular	10 (22.2%)
Pneumonia	8 (17.8%)
Congestive heart failure	5 (11.1%)
Neoplasm	4 (8.9%)
Other	18 (40%)
Presence of acute bacterial infection	17 (37.8%)
Comorbidity	2 ± 1
Mean number of medications per patient	3 ± 3
Patients without own teeth or prosthesis	9 (21.4%)
Number of patients able to choose their own foods	31 (77.5%)
Origin	
Own home	38 (84.4%)
Retirement home	7 (15.6%)
Activities of daily living at the start of hospitalization (Barthel Score – mean and standard deviation)	13.68 ± 5.94
Mental status Not obtained (aphasia. coma, sedation)	6.60 ± 3.36
Hospitalization time	15.76 ± 11.39
Intra-hospital mortality	6 (13.3%)

TABLE II

Laboratory parameters (mean and standard deviation)

Albumin (g/L) (N=35)	25.94 ± 8.45
Transferrin(g/L) (N=26)	1.93 ± 0.67
Prealbumin (g/L) (N=31)	0.17 ± 0.05
Retinol-binding protein (g/L) (N=23)	3.43 ± 1.88
Hemoglobin (g/L) (N=37)	11.19 ± 2.24
Lymphocytes (X 106 /L) (N=37)	1720.54 ± 1217.87
Cholesterol (mg/dl) (N=36)	165.61 ± 45.04

TABLE III

Percentage of malnourished patients per variable

TSF (N=45)	35.6
AMC (N=45)	11.1
TSF + AMC (N=45)	4.44
Hemoglobin (g/L) (N=37)	40.5
Albumin (g/L) (N=35)	88.6
Hemoglobin albumin (N=32)	37.5
Transferrin(g/L) (N=26)	65.4
Prealbumin (g/L) (N=31)	67.7
Retinol-binding protein (g/L) (N=23)	60.9
Lymphocytes (X 106 /L) (N=37)	45.9
Cholesterol (mg/dl) (N=36)	30.6
All the variables (N=14)	0

modified Barthel score was 13.68 ± 5.94 and the score for mental state was 6.6 ± 3.36.

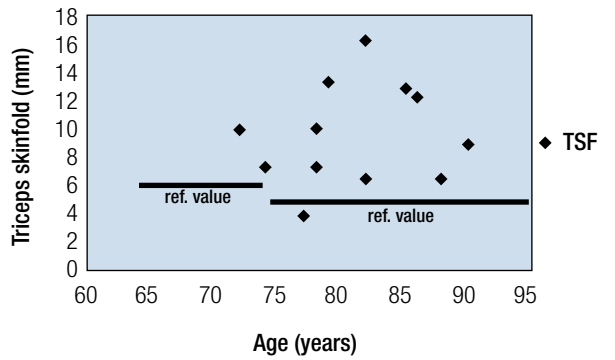
The main diagnoses that led to the admission were ischemic stroke (10/45), pneumonia (8/45), congestive heart failure of multifactorial etiology (5/45) and neoplasm (4/45). Around half of the patients had acute disease (23/45), while the remainder had worsening of chronic diseases. The presence of acute bacterial infections was observed in 37.8% of the patients. Fifteen patients had chronic disease: Chronic obstructive pulmonary disease (six patients), neoplasm (four patients), chronic liver disease (six patients) and renal failure (3 patients) which alone, could have led to the malnutrition. The average number of medications taken before the hospitalization was 3 ± 3 (median=2). A comorbidity of 2 ± 1 associated diseases was found (median=1). The mean hospitalization time was 15.76 ± 11.39 days (median=11) and the intra-hospital mortality was 13.3%.

The mean values and standard deviation of the laboratory variables studied are shown in *Table II*. *Figures 1, 2, 3 and 4* represent the skinfold thickness and arm muscle circumference distribution by age and gender, in relation to the 10th percentile of the reference chart. The percentages of malnourished patients per variable are shown in *Table III*.

Discussion and conclusions

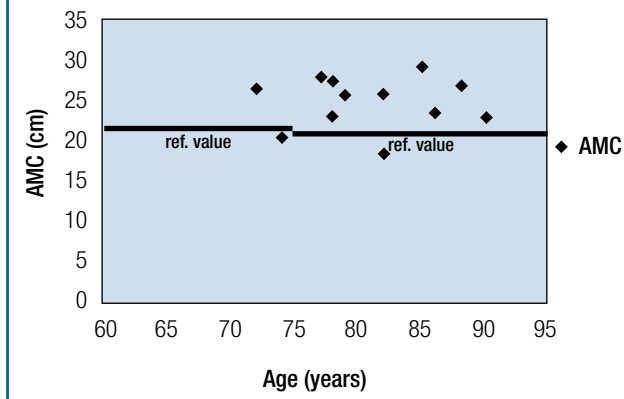
There are certainly some incorrections in this work, given that comparison with a population from another country was used for the classification of the anthropometric data.[14] However, a reference relating to the most comparable population to ours was selected; healthy Italians, comprising 1250 individuals aged between 65 and 95, the use of this group being preferable to the use of a local control group, which would have had to be smaller, or a population from the UK or the USA, where average height, and environmental conditions are different from ours. The choice of this reference population required the use of just one of the varied parameters that can be calculated based on the TSF and arm circumference, particularly the AMC. The anthropometric parameters that can be compared with the reference population were therefore limited to TSF and AMC. We deliberately did not use the anthropometric reference values suggested in previous studies carried out in Portugal, since there was no reference to the criteria used in the choice of parameters. In any case, since it was only possible to obtain the body mass index in 29% of the patients, the criteria for diagnosis of malnutrition referred to above[1,12,13,14] could not be used.

In the four patients with normal albumin (11.4%), two patients presented RBP and PALB, while in the other two, RBP and PALB values were decreased. Given the small number of patients, the determination of serum proteins with short half-life did not enable us to identify those that developed acute malnourishment in the absence of chronic malnourishment. The presence of bacterial infection in 37.8% of the patients, which could influence the production of proteins, makes the interpretation more difficult, giving it low specificity as an indicator of malnutrition.



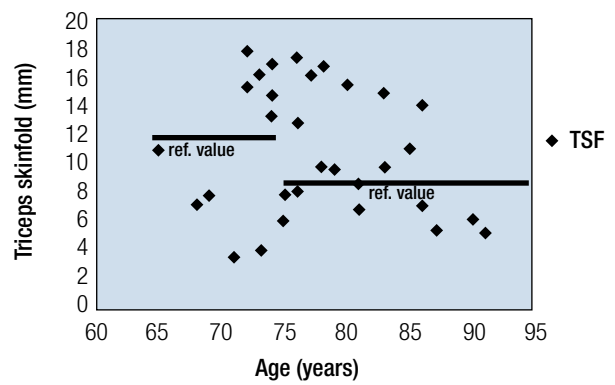
Distribution of the triceps cutaneous skinfold according to the age (male gender).

FIG. 1



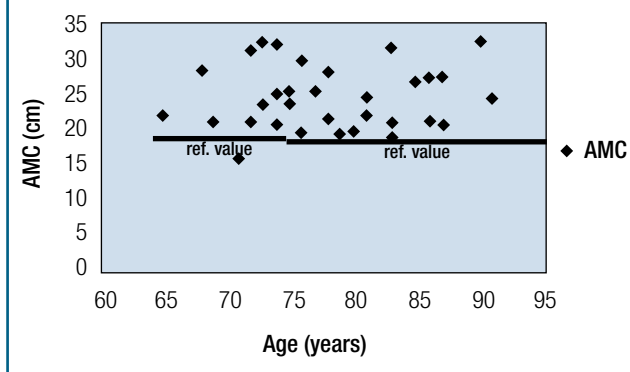
Arm muscle circumference according to age (male gender).

FIG. 2



Triceps skinfold according to age (female gender).

FIG. 3



Triceps skinfold according to age (female gender).

FIG. 4

In fact, some authors suggest that objective examination and anthropometric are more valid methods for defining malnutrition than hematological and biochemical tests.[4,19]

When the anthropometric parameters (AMC and TSF) and the other laboratory values presented in *Table II* were analyzed individually (*Table III*), an enormous divergence was seen in the percentages of malnourished patients: 11.1% to 35.6% for the first and 30.6% to 88.6% for the second. This fact leads us to consider these parameters as imprecise indicators of malnutrition. Given that there was no convergence between the results, it was decided not to draw correlations between these variables and the characterization of the elderly patients, hospitalization time and hospital mortality.

The great divergence of results that define the presence of a state of malnutrition, when each of the variables is used in the same patient, led to the following considerations that we believe are relevant in relation to this study. It is important to define in advance the nutritional parameters in a population of healthy elderly individuals in our country. This fact is essential in relation to the anthropometric parameters, but it also applies to the laboratory variables, for which values have varied in published studies. Anthropometric and/or laboratory parameters should be selected as the basis for the creation of a

ANNEX I

Adaptation of the abbreviated mental test (kahn):

1. What is the name of the place where you are now?
2. What is the address of the place where you are now?
3. What is today's date?
4. What month is this?
5. What year is this?
6. What is your age?
7. What month were you born?
8. What year were you born?
9. What is the name of the President of the Republic?
10. What is the name of the former President of the Republic?

nutritional index, given that the use of a single variable is not sufficient to diagnose malnutrition. How many, which and what complimentarity the selected variables should have will, therefore, be the next step. The application of this indicator to bedridden elderly patients may have to be adapted, due to the possible repercussions of inactivity and immobilization in the bed, on the parameters studied. ■

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