

Risk factors associated with malnutrition in hospitalized patients

Fatores de risco associados à desnutrição em pacientes hospitalizados

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ABSTRACT

Objective

To identify factors associated with malnutrition in patients hospitalized in general public hospitals of the city of *Manaus, Amazonas, Brazil*.

Methods

This cross-sectional study included 397 patients of both sexes aged more than 18 years, staying at three public hospitals in *Manaus, Amazonas*. The patients were submitted to anthropometric and subjective global assessments, the latter being the main diagnostic method. For association analyses between malnutrition (dependent variable) and other covariates, we used contingency table for variable selection and multiple logistic regression for independent effect test between exposure and outcome. The strength of association between the variables was expressed as *odds ratio*, with a 95% confidence interval. The analyses were performed by Epi Info 7.0.

Results

Among the risk factors associated with hospital malnutrition, hospital stays longer than 15 days, when analyzed alone, nearly tripled the *odds* of malnutrition. However, in the final model, the variables that remained associated were: persistent change in diet, presence of gastrointestinal symptoms, recent weight loss, weight loss in the last six months, cancer, and age higher than 60 years.

Conclusion

Malnutrition is recurrent in hospitals, and the factors associated with malnutrition can be identified on admission, allowing adequate monitoring during hospital stay. Therefore, a more effective performance of nutritional screening and monitoring programs is critical.

Keywords: Inpatients. Malnutrition. Risk factors.

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Article based on the author's thesis of RFM FRAGAS, intitled "*Prevalência da desnutrição em hospitais públicos de grande porte em Manaus - AM*". Fundação Oswaldo Cruz; 2015.

RESUMO

Objetivo

Identificar fatores associados à desnutrição em pacientes internados em hospitais gerais da rede pública de Manaus, Amazonas.

Métodos

Estudo transversal que envolveu 397 pacientes, de ambos os sexos e idade superior a 18 anos, internados em três hospitais públicos de Manaus, Amazonas. Foi realizada avaliação antropométrica e avaliação subjetiva global, sendo esta última o método de diagnóstico principal. Para análises de associação entre desnutrição (variável dependente) e as demais covariáveis, foi realizado o teste Qui-quadrado para seleção das variáveis e regressão logística múltipla para teste de efeito independente entre exposição e desfecho. A força de associação entre as variáveis foi expressa em valores de odds ratio, com intervalo de confiança de 95%. As análises foram realizadas por meio do programa Epi Info 7.0.

Resultados

Dentre os fatores de risco associados com desnutrição hospitalar, o tempo de internação superior a 15 dias, quando analisado isoladamente, quase triplicou a chance de o indivíduo desnutrir. Entretanto, no modelo final, as variáveis que mantiveram associação foram: mudança persistente na dieta; presença de sintomas gastrointestinais; perda de peso recente; e, nos últimos seis meses, câncer e idade superior a 60 anos.

Conclusão

A desnutrição é recorrente no meio hospitalar, e os fatores a ela associados podem ser identificados no momento da internação, o que permite um monitoramento adequado durante o período de hospitalização. Para tanto, torna-se imprescindível a atuação mais efetiva de programas de triagem e acompanhamento nutricional.

Palavras-chave: Pacientes internados. Desnutrição. Fatores de risco.

INTRODUCTION

The primary causes of hospital malnutrition are the underlying disease and treatment complications. However, some isolated factors or their interaction can increase the risk of hospital malnutrition and consequent undesirable or fatal outcomes¹.

In addition to the epidemiological or pre-pathogenic aspects stemming from exposures before hospital admission, risk factors increase during the disease period and are very common in the hospital environment because they are inherent to the disease, symptoms, and treatment².

Among these risk factors, the hypercatabolic state provoked by conditions such as cancer or infectious diseases worsens nutritional status, as do long hospital stays, age higher than 60 years^{3,4}, recent and involuntary weight loss⁵, changes in dietary consistency⁶, and gastrointestinal symptoms, such as nausea, dysphagia, abdominal pain, and anorexia, which somehow affect adequate food intake and nutrition.

Thus, it is critical to identify the risk factors associated with malnutrition on hospital admission to try to avoid or minimize the deleterious effects on patients' recovery^{7,8}, given that hospital malnutrition is associated with longer hospital stays and higher incidence of infections and postoperative complications⁹, further burdening the public health system.

In this context, the objective of this study was to determine the variables associated with a higher risk of hospital malnutrition in patients staying at public hospitals of *Manaus, Amazonas, Brazil*.

METHODS

This is a secondary analysis of data from a quantitative epidemiological and hospital malnutrition study of three large general hospitals from the public health network of the city of *Manaus (AM)* from March to May 2014.

The eligibility criteria were: age equal to or greater than 18 years, either gender, and

staying at the clinical, surgical, or intensive care wards of the hospitals. Individuals with plaster casts, submitted to limb amputations, or in clinical conditions that prevented anthropometric assessment were included in the study but only submitted to Subjective Global Assessment (SGA).

Pregnant or postnatal women and individuals with altered consciousness, unable to understand or communicate to answer the SGA questions and with no family member present to answer the questions were excluded.

The study included only the *Sistema Único de Saúde* general hospitals and emergency rooms with more than 150 beds that are directly managed by the Ministry of Health, Municipal Health Department, or State Health Department.

The researchers were trained for data collection, which included measuring height, weight, mid-upper arm circumference, physical examination, and filling out the study instrument. The SGA was performed by a single observer in order to minimize a possible diagnostic bias.

Body weight was measured by the portable bioimpedance scale Plenna Linea II® (Plenna *Especialidades* Ltda, São Paulo, Brazil) with maximum capacity of 150 kg and height by the portable stadiometer WCS® (Curitiba, Paraná, Brazil) with a total length of 220 cm and accuracy of one centimeter^{10,11}. The Mid-Upper Dominant Arm Circumference (MUAC) was measured at the midpoint between the acromion and olecranon by an inelastic tape measure with the arm hanging by the side. The patients were assessed barefoot and with light clothing¹⁰.

The Body Mass Index (BMI) of all patients assessed by anthropometry was calculated^{10,12}, and MUAC adequacy and classification relied on the cut-offs provided by Blackburn & Thornton¹³. Nutritional status diagnosis was based on the SGA model systematized by Detsky *et al.*¹⁴ and adapted by Waitzberg & Ferrini¹⁵, classifying the individuals as well nourished, moderately malnourished, or severely malnourished.

Considering a 95% Confidence Interval (95%CI), the sample size was calculated by the

program Epi info 7.0 (Centers of Disease Control and Prevention, Atlanta, Georgia, United States), based on the number of beds in each hospital plus 10% to compensate for eventual losses. Additionally, the estimate considered the prevalence of hospital malnutrition reported in the literature, which varies from 30 to 60%^{16,17}, using a rough prevalence of 50%, reported by the *Inquérito Brasileiro de Avaliação Nutricional Hospitalar*, conducted in 1996⁴.

The sample size of the hospitals was initially obtained by mapping bed distribution and numbering them sequentially from one to the total number of beds of each hospital. Next, to determine the interval between the study patients, the *ratio* of the sampled population and the total number of beds was calculated, resulting in a systematic sample.

The literature was reviewed to select the variables that could be associated with nutritional status. The study variables were: age >60 years; long hospital stay (>15 days); cancer; infection; gastrointestinal diagnosis; neurological diagnosis; gastrointestinal symptoms; weight loss in the last 6 months; current weight loss; and persistent dietary change.

Gastrointestinal symptoms were defined as the presence of one or more of the following self-reported complaints for more than 15 days: dysphagia and/or odynophagia, anorexia, abdominal pain or distention, nausea, vomiting, and diarrhea. Regarding the diet, changes in consistency (fluid/soft) or quantity lasting more than 30 days were defined as persistent dietary changes. These changes were taken into account whether they occurred at the hospital, as part of a diet therapy, or before hospitalization, when patients changed their diets because of inappetence or eating difficulties in order to adapt to their new health condition.

The *Odds Ratio* (OR) was calculated to quantify the strength of association between nutritional status and the study variables, using a contingency table or 2x2.

Of the ten study variables, nine were included in the multiple logistic regression model because they were associated with malnutrition according to the Chi-square test, using as cut-off a p -value ≤ 0.20 or a 20% probability of error of the variable in question not being associated with malnutrition⁵. The strength of association between the variables in the final model was expressed as OR, with a 95%CI. The analyses were performed by the program Epi Info 7.0¹⁸.

The study was approved by the Research Ethics Committee of the *Universidade Federal do Amazonas* under Protocol n° 517,835, on January 29, 2014, and all participants and their buddies signed an Informed Consent Form before enrollment.

RESULTS

Of the 400 study patients from the three hospitals, one refused to participate in the study and two missed the examinations. Therefore, 397 patients were included. The mean age was 53 ± 20 (18-95) years, and most were males (59.7%).

A total of 140 patients (35.26%) were malnourished according to the SGA. Of these, 128 (32.24%) were mildly or moderately malnourished, and 12 (3.02%) were severely malnourished.

Among the risk factors associated with hospital malnutrition, most of the study covariates were highly prevalent in the malnourished patients, and some degree of association with this outcome was demonstrated by the OR, 95%CI, and p -value (Table 1).

The risk factors for hospital malnutrition with the highest associations were persistent dietary change and gastrointestinal symptoms, which were reported by most patients diagnosed with malnutrition.

Regarding the subjective global assessment, patients who reported involuntary weight loss in the last 6 months or those who reported current and continuous weight loss during the assessment were four times more likely to be malnourished than those who denied having had these occurrences.

The results also showed that older adults and individuals with more than 15 days of hospital stay were three times more likely to become malnourished than adults or those with fewer than 15 days of hospital stay.

Regarding the underlying disease, neurological disease doubled the chance of malnutrition compared with other medical diagnoses. Cancer patients were four times more likely to be malnourished, and infection was present in more than half of the malnourished individuals.

Table 1. Chi-square test of the variables possibly associated with malnutrition listed in decreasing *Odds Ratio* (OR). *Manaus* (AM), Brazil, 2014.

Risk factors for malnutrition	Frequency	%	OR	95%CI	p -value
Persistent dietary changes	80	57.1	47.42	20.83-107.94	0.00000
Gastrointestinal symptoms	136	97.1	24.41	8.76-68.04	0.00000
Current weight loss	103	73.5	4.41	2.80-6.93	0.00000
Weight loss in the last 6 months	110	78.5	4.15	2.59-6.66	0.00000
Cancer	10	7.1	3.86	1.29-11.53	0.01321
Long hospital stay (>15 days)	76	54.3	2.96	1.93-4.57	0.00000
Age >60 years	83	59.3	2.82	1.84-4.33	0.00000
Neurological diagnosis	28	20.0	2.21	1.23-3.94	0.00883
Infection	87	62.1	1.82	1.20-2.79	0.00611
Gastrointestinal diagnosis	27	19.3	1.21	0.71-2.07	0.49017

Note: 95%CI: 95% Confidence Interval.

Table 2. Multiple logistic regression analysis of the variables associated with malnutrition at a significance level of 5% ($p \leq 0.05$) after the Chi-square test. *Manaus (AM), Brazil, 2014.*

Risk factors for malnutrition	OR	95%CI	p-value
Persistent dietary changes*	33.40	12.05-92.55	0.0000
Gastrointestinal symptoms*	13.28	3.86-45.68	0.0000
Cancer*	10.32	1.49-71.36	0.0179
Current weight loss*	3.36	1.73-6.50	0.0003
Weight loss in the last 6 months*	2.77	1.40-5.45	0.0032
Age >60 years*	2.24	1.20-4.16	0.0105
Infection	1.42	0.74-2.73	0.2801
Long hospital stay (>15 days)	1.39	0.69-2.77	0.3499
Neurological diagnosis	0.57	0.19-1.67	0.3071

Note: *Factors associated with malnutrition after multiple logistic regression according to their *Odds Ratio* (OR), 95% Confidence Interval (95%CI), and *p*-value.

In multivariate logistic regression (Table 2), the variables that remained associated were: persistent dietary change, gastrointestinal symptoms, cancer, current weight loss, weight loss in the last 6 months, and age >60 years.

Persistent dietary change was the most important variable for the risk of malnutrition.

DISCUSSION

The study frequency of malnutrition was very similar to that found by other Brazilian and foreign studies^{16,19,20}, corroborating the statement that along the last four decades, the prevalence of malnutrition has remained high²¹, increasing the length of hospital stay and risk of death²².

Thus, it is very important to identify and monitor factors that possibly contribute to malnutrition during hospitalization in order to minimize complications.

Regarding long hospital stays, studies^{3,4} have shown that patients with more than 15 days of hospital stay were three times more likely to be malnourished (OR=3.09; 95%CI=2.55-3.74; $p < 0.05$; OR=3.00; 95%CI=2.61-3.45; $p < 0.05$), corroborating the results from the Chi-square test, where length of hospital stay higher than 15 days tripled the odds of patients becoming malnourished compared with shorter hospital stays. However, in multivariate analysis this variable lost strength of association because other

factors proved to be more important with respect to malnutrition.

Regarding these factors, multiple regression analysis identified predictive variables, that is, variables associated with malnutrition in the study sample.

The subjective global assessment proposed by Detsky *et al.*¹⁴, a method widely used in clinical practice, consists of an anamnesis about recent body weight changes, changes in dietary patterns, and gastrointestinal changes. Given the patients' observations regarding food intake, the main study risk factor was persistent dietary change, that is, a change maintained for more than 30 days. Ferreira *et al.*²³ found that decreased food intake is frequently observed in hospitalized patients, which can be related to dissatisfaction with hospital food and disease symptoms. According to Waitzberg *et al.*²⁴, clinical symptoms like diarrhea, nausea, vomiting, and dysphagia generally lead to loss of appetite, food refusal, or food intake difficulties, which can contribute to nutritional status non-recovery or deterioration.

The presence of one or more gastrointestinal symptoms was reported by most of the study malnourished patients, which may somehow justify persistent dietary changes, whether in quantity, type, consistency, or frequency, and consequently, the high occurrence of current weight loss or weight loss in the last six months, given that inadequate food intake is one of the

main causes of involuntary weight loss and malnutrition in hospitalized patients²⁵.

Aquino & Philippi⁸ found that 62% of malnourished individuals reported changes in quantity, type, and consistency of the foods consumed secondary to the very frequent gastrointestinal changes, such as nausea, vomiting, and gastric changes. Consequently, the researchers found that recent and involuntary weight loss was the most important variable associated with risk of malnutrition (OR=58.03; 95%CI=18.46-182.41; $p<0.001$). Hence, determining the influence of hospital food and the factors and symptoms that affect food intake and contribute to malnutrition in hospitalized patients may improve nutritional intervention actions and have a positive impact on length of hospital stay¹.

In multivariate analysis gastrointestinal or neurological diseases did not remain associated with malnutrition in the study sample. Nonetheless, cancer patients were more likely to become malnourished than those with other diagnoses, which corroborates Waitzberg *et al.*⁴, who considered cancer a risk factor for malnutrition because they found that the frequency of malnutrition was three times higher in hospitalized patients with cancer.

Cancer patients' higher vulnerability is due to higher metabolic expenditure, protein deprivation caused by the tumor²⁶, and the side effects of the treatment of choice. According to Ferreira *et al.*²³, symptoms like anorexia, xerostomia, mucositis, and nausea are closely related to low acceptance of hospital food and consequently, with a higher risk of malnutrition.

Considering age as a risk factor for malnutrition, the results of this study corroborate results described elsewhere^{3,4}, showing that changes associated with ageing promote changes in the nutritional requirements²⁷. Older adults are a group at risk of malnutrition because of a number of morphological, motor, and sensory changes throughout the entire gastrointestinal tract, which has an important role in the regulation of appetite, satiety, and dietary pattern²⁸.

The frequency data exposed in Table 1 also show that more than half of the malnourished individuals were older adults. Hence, given the high prevalence of malnutrition in older adults, Fidelix *et al.*²⁹ reported the need of implementing strategies to identify, prevent, and treat this condition both in the hospital setting and after discharge.

One of the limitations of the method used is the reliance on the individual's memory and disposition to provide the necessary information for the association analyses. Additionally, it is important to note that the process of malnutrition is continuous and other variables may not have been considered because of the cross-sectional nature of the study, which prevents the inference of a cause-effect relationship.

CONCLUSION

The analyses suggest two important variables that deserve attention during hospitalization, persistent dietary changes and gastrointestinal symptoms. Generally, hospitalized patients need routine dietary follow-up between hospital routines and the identification of symptoms that may affect food acceptance, which can be easily determined by subjective assessment. Moreover, hospital admission should include body weight measurement and inquiries about recent weight loss.

Thorough knowledge about the current prevalence of malnutrition and the factors that contribute to nutritional status deterioration in hospitalized patients is critical in order to improve the quality and efficiency of nutritional care, given that it is a vital component for the patient's recovery.

CONTRIBUTORS

RFM FRAGAS conceived and designed the study, collected, analyzed, and interpreted the data, discussed the results, and wrote the manuscript under the supervision of MC OLIVEIRA.

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Received: August 20, 2015
Final version: December 14, 2015
Approved: January 25, 2016