Malnutrition on admission, length of hospital stay and mortality of hospitalized patients in a tertiary hospital

Vivian Plaça Teixeira[1]
Renata Costa de Miranda[1]
Deise Regina Baptista[1]

[1]Universidade Federal do Paraná, Setor de Ciências da Saúde, Departamento de Nutrição. Curitiba-PR, Brasil.

Correspondence
Vivian Plaça Teixeira
E-mail: vivi.teixeira0@gmail.com

Abstract

Objective: To determine the frequency of malnutrition on admission of patients and verify the influences related to the length of hospital stay and mortality. *Methods:* This retrospective, cross-sectional, observational study was made up of data collection and medical records analysis of inpatients at the *Clínica Médica do Hospital de Clínicas*, UFPR, from January to July 2013. In order to identify the nutritional risk, the Nutritional Risk Screening – 2002 was used. Patients at nutritional risk were submitted to nutritional evaluation, in accordance to the Service Protocol. *Results:* The sample comprised 148 patients, mainly adult males. The most prevalent disease in the overall sample and among the malnourished patients was hypertension. Cardiovascular disease, genitourinary disorders, neoplasms, hypertension and other diseases were most prevalent in the elderly patients, and autoimmune diseases were the most prevalent in adults. The average number of diseases in the sample was 2.22 ± 1.16, and the elderly patients had the higher number of associated diseases. Patients at nutritional risk were 58.8% of the sample; among these, 54.7% were malnourished, 0.7% had normal weight, 1.4% was overweight and 2.1% was obese. The average length of hospital stay of malnourished patients was 14.05 ± 11.87 days, and of patients not malnourished was 15.43 ± 13.81 days, without statistical difference. The mortality rate of the inpatients was 5.4%, of which 25% were malnourished. *Conclusion:* It was found a high frequency of malnutrition but not related to prolonged hospital stay and mortality of patients.

Key words: Malnutrition. Length of Stay. Mortality; Inpatients. Patient Admission.

Introduction

Among various clinical conditions related to nutritional status is malnutrition, which, as Caldwell et al. define, is a "secondary morbid condition to a deficiency or a relative or absolute excess of one or more essential nutrients, which is clinically manifested or is detected by biochemical, anthropometric, topographic or physiological tests."[1]

The etiology of malnutrition detected on admission to hospital can be primary, resulting from an inadequate and unsatisfactory intake of nutrients, a consequence of poor socioeconomic conditions, which prevent the replacement of the required energy, protein and other nutrients; or secondary, resulting from intrinsic factors relating to the impact of a disease.

The major causes of disease-related malnutrition are associated with deficient food intake, drugs effects, reduced absorption of macro- and micro-nutrients, change of nutritional needs and energy expenditure.[2-5]

In the 1970s, a study conducted by Bollet and Owens[6] drew attention because of the high prevalence of malnutrition in patients who were hospitalized because of the most diverse diseases. Even after 40 years, current studies[7-9] have found similar results, showing that malnutrition in hospital is a recurrent problem, irrespective of the country's development level.

In Brazil, based on the Brazilian Survey on Hospital Nutritional Assessment (IBRANUTRI), a study conducted with 4000 hospital patients in 12 states of the country revealed that 48% of the patients were malnourished, out of these 33.2% already had this condition in the first two days at hospital, showing that much of the malnourished patients already had a deficient nutritional status on admission.[10]

Inpatients may develop malnutrition after admission to hospital, and up to 70% of malnourished patients have their nutritional condition worsened during their stay in hospital, increasing the risk for infections, mortality, length of hospital stay, and costs for the hospital and the healthcare system.[11-14]

The response to stress caused by diseases or other malnutrition causes, such as a decreased daily food intake over the years, makes that the body uses adipose and muscle tissue reserves to produce energy, leading to changes in body composition, reduced functionality, blood disorders in other organs and systems and a fragile metabolic condition.[5,15]

This study aims to determine the frequency of malnutrition on admission to hospital and to correlate malnutrition with the length of hospital stay and mortality of clinical patients.

Methods

This is an observational, cross-sectional, retrospective study, which used 205 medical records of adults and elderly patients, of both sexes, admitted from January to July 2013 to the *Clínica Médica Feminina e Masculina do Hospital de Clínicas*, Federal University of Paraná.

The study is part of a research project entitled "Nutritional Changes During Hospital Stay: Profile of a Public Tertiary Hospital", approved by the Ethics Committee for Research on Humans at the *Hospital de Clínicas*, Federal University of Paraná, with number 880.451.

The data collected from the medical records were filled out by nutritionists of the Service, by means of a previously defined nutritional service protocol designed for recording the patient's identification (age and gender), medical information (medical diagnosis, date of admission and discharge and confirmation or not of death) and the Nutritional Risk Screening - NRS 2002[16]), carried out in the first 48 hours after the patient's admission to the hospital.

The Nutritional Risk Screening (NRS-2002) is recommended by the American Society for Parenteral and Enteral Nutrition (ASPEN) and consists of four objective questions about the patient: body mass index (BMI), unintentional weight loss in the last three months, food intake in the last week and presence of serious disease or critical condition. This information allowed identifying characteristics associated with nutritional problems and possibility of nutritional risks.[16] Identification of nutritional risk was classified as "not at nutritional risk" or "at nutritional risk".

When nutritional risk was detected, a nutritional assessment of the patient was performed, comprising anthropometric, biochemical and an overall subjective and dietary nutritional assessment, according to the hospital protocol, to determine the patient's nutritional status. Diagnosis of the nutritional status was classified as: severe malnutrition, moderate malnutrition, mild malnutrition, normal weight, overweight, obesity grade 1, obesity grade 2 or obesity grade 3. Those diagnosed with severe, moderate and mild malnutrition were included in the group of malnourished patients, and the others in the groups of not malnourished patients. The medical diagnoses reported in the patient's admission records were classified into 14 categories of diseases: autoimmune, cardiovascular, endocrine, genitourinary, systemic blood hypertension, hematologic, immunodeficient, neoplastic, neurological, respiratory, rheumatic, of nervous system, gastrointestinal, and others. The "others" category included diseases and clinical conditions that did not fit into the other 13 categories to avoid more subdivisions, due to the great diversity of diseases.

Fifty-seven medical records were disregarded because information on age, medical diagnosis and/or nutritional diagnosis were missing, making it impossible the data analysis.

The collected data were analyzed statistically using the Statistical Package for the Social Science (SPSS 20.0) software. Mann-Whitney's test was performed to determine the difference between the means of nonparametric data; chi-square test and Fisher's exact test were used to compare the frequency distributions; and ANOVA to compare more than two groups. The confidence interval assumed was 95%.

Results

Of the 148 patients included in the study, 59.5% were men and 40.5% women, aged 52.59 ± 17.48 years on average. The adults accounted for 64.2% of this population and the elderlies for 35.8%, with mean age of 41.94 ± 11.33 and 71.68 ± 7.30 years, respectively (Table 1). According to the medical records, the most frequent diagnosed disease was systemic blood hypertension (SBH) (44.6%) and the less frequent was the group of neurological disorders (0.7%) (Table 1).

Table 1. Demographic and clinical characterization of the population studied at the *Clínica Médica Feminina e Masculina do Hospital de Clínicas*, Federal University of Paraná. Curitiba-PR, 2013.

	Adults	Elderlies	p	Total
Total patients (%)	64.20	35,80		100
Sex (%)	Female: 40 Male: 60	Female: 41.5 Male: 58.5		100
Age ($x \pm$ SD)	41.94 ± 11.33	71.68 ± 7.30		52.59 ± 17.48
Category of diseases (%)				
Autoimmune[a]	10.5	0	0.01*	6.8
Cardiovascular[a]	5.3	24.5	0.00*	12.2
Endocrine[a]	33.7	38.6	0.47	35.8
Genitourinary[a]	13.7	37.7	0.00*	22.3
SBH[a]	37.9	56.6	0.02*	44.6
Hematologic[a]	13.7	11.3	0.68	12.8
Immunologic[b]	1.1	1.9	1.00	1.4
Neoplastic[a]	9.5	22.6	0.02*	14.2
Neurological[b]	1.1	0	1.00	0.7
Others[a]	24.2	34	0.02*	27.7
Respiratory[a]	11.6	17	0.35	13.5
Rheumatic[a]	5.3	11.3	0.17	7.4
Nervous system[b]	6.3	0	0.08	4.1
Gastrointestinal[a]	23.2	13.2	0.14	19.6

[a]Chi-square test

[b]Fischer's exact test

SBH = Systemic blood hypertension

SD = standard deviation

*Significant difference (p<0.05)

The categories of cardiovascular diseases, genitourinary disorders, neoplastic disease, high blood pressure and others had a significant difference between the adults and the elderlies, more prevailing in the elderlies (p < 0.0001, p < 0.0001, p=0.02, p=0.02, p=0.02, respectively). The category of autoimmune diseases also had a significant difference, being more frequent in adults (p=0.01). The other diseases did not show a significant difference considering age (Table 1).

With respect to the nutritional assessment and the patients' nutritional risk detected on admission, 41.2% of the individuals were normal and 58.8% were at nutritional risk. Total malnutrition frequency of the assessed patients was 54.7%. Of the older patients, 62.3% were malnourished, and of the adults 50.5% were malnourished. There was no statistical difference between age and malnutrition condition (p=0.16) (Table 2).

Table 2. Nutritional status and prevalence of malnutrition in the population studied at the Clínica Médica Feminina e Masculina do Hospital de Clínicas, Federal University of Paraná. Curitiba-PR, 2013.

Nutritional status	Adults (%)	Elderlies (%)		Total (%)
No risk	47.7	30.2		41.2
At risk	52.3	69.8		58.8
Severe malnutrition	8.4	15.1		10.8
Moderate malnutrition	17.9	15.1		16.9
Mild malnutrition	24.2	32.1		27
Normal	0	1,9		0.7
Overweight	0	3.8		1.4
Obesity grade I	1.1	0		0.7
Obesity grade II	0	0		0
Obesity grade III	1.1	1.9		1.4
Overall prevalence			p	
Malnourished	50.5	62.3	0.16	54.7
Not malnourished	49.5	37.7		45.3

Chi-square test

*Significant difference (p<0.05)

The most common disease in the malnourished individuals was SBH (44.4%), followed by endocrine diseases (30.9%), others (30.9%), gastrointestinal (27.4%) and genitourinary disorders (23.5%), neoplastic (21%), respiratory (18.5%), hematological (13.6%), cardiovascular (12.3%), rheumatic (7.4%), autoimmune (3.7%), of the nervous system (3.7%), immunologic (1.4%), and neurological diseases (1.2%).

The average number of diseases in the sample was 2.22 ± 1.16. There was no statistical difference (p=0.38) between the number of diseases and the nutritional status. However, when the mean number of diseases was compared with the two different age ranges, it was found that the elderly patients had a greater number of associated diseases compared to the adult patients (p < 0.0001) (Table 3).

Table 3. Number of associated diseases according to the nutritonal status and age of the population studied at the *Clínica Médica Feminina e Masculina do Hospital de Clínicas*, Federal University of Paraná. Curitiba-PR, 2013.

Nutritional status[a]	No. of associated diseases (± SD)	p
No risk	1.95 ± 1.10	
Severe malnutrition	2.38 ± 1.14	
Moderate malnutrition	2.28 ± 1.17	
Mild malnutrition	2.43 ± 1.19	
Normal	3	0.38
Overweight	3 ± 2.82	
Obesity grade I	3	
Obesity grade II	-	
Obesity grade III	3	
Age[b]		0.00*
Adults	1.97 ± 1.14	
Elderlies	2.68 ± 1.07	
Overall sample[a]	2.22 ± 1.16	

[a]ANOVA test

[b]Mann-Whitney's test

*Significant difference (p<0.05)

With respect to the length of hospital stay, the mean number days of the population at the hospital was 14.68 ± 12.76. The statistical analysis showed that there was a significant difference (p=0.03) between the different classifications of nutritional status and length of hospital stay (Table 4). And regarding the length of hospital stay, there was no statistical difference between the malnourished and not malnourished individuals (p=0.47) (Table 4).

Table 4. Length of hospital stay associated with the nutritional status of the population studied at the *Clínica Médica Feminina e Masculina do Hospital de Clínicas*, Federal University of Paraná. Curitiba-PR, 2013.

Nutritional status[a]	Length of hospital stay	
	(days ± SD)	*p*
No risk	14.31 ± 11.63	
Severe malnutrition	14.25 ± 17.47	
Moderate malnutrition	10.32 ± 6.75	
Mild malnutrition	16.3 ± 11.38	
Normal	12	0.03*
Overweight	24 ± 16.97	
Obesity grade I	14	
Obesity grade II	-	
Obesity grade III	43.5 ± 48.79	
Malnourished individuals[b]	14.05 ± 11.87	0.47
Not malnourished individuals[b]	15.43 ± 13.81	
Overall sample[a]	14.68 ± 12.76	

[a]ANOVA test
[b]Mann-Whitney's test
*Significant difference (p<0.05)

The percentage of deaths was 5.4%, all of them of adult patients, representing 8.4% of total adult population, showing a statistical difference (p=0.03) when compared to the older population. Of the individuals who died, 25% had some degree of malnutrition; however, there was no significant difference between mortality and malnutrition (p=0.14).

Discussion

It is known that malnutrition is a major nutritional disorder most commonly observed in the elderlies and occurs from secondary aging causes such as physiological and nutritional changes, socioeconomic conditions, pathologies and other relating clinical factors. Malnutrition in older individuals has significant consequences to the patients and aggravates their morbid condition.[15,19] However, in this study, there was no significant difference between the frequency of malnutrition with the age range studied, as also found by McWhirter and Pennington,[20] who observed malnutrition at hospital admission in patients of general surgery, general clinic, respiratory medicine, orthopedic surgery and medical geriatric assessment. The results found were similar and evenly distributed among the different groups, suggesting, as in the present study, that malnutrition may be a factor not related to age.

Systemic blood hypertension and endocrine diseases - diabetes *mellitus* being the most common (81% - data not shown) – were the most found diseases, both in the overall sample as in the sample of malnourished individuals. Patterns of diseases occurrence have changed in the last four decades as a result of demographic, epidemiologic and nutritional transition processes in the world population, with a progressive increase of noncommunicable chronic diseases, which account for two thirds of the disease burden in Brazil.[21,22]

In the quantitative systemic review conducted by Pereira et al.[23] between 2003 and 2008, which included 44 studies in 35 countries, a global mean prevalence of 37.8% of hypertensive men and 32.1% of hypertensive women was found.

Similar to the systemic blood hypertension and equally of great concern, diabetes *mellitus* also affects the world population. According to the International Diabetes Federation, 382 million of people live with diabetes today, and in 2035 this number will increase by 55%.[24] Therefore, considering the scientific findings and global indices, the results are coherent, revealing a high prevalence of these diseases in the population studied due to the progressive increase of the world population.

Following hypertension and endocrine diseases, the most common diseases found in malnourished patients were, respectively, of gastrointestinal tract, genitourinary tract and neoplastic diseases.

The association between neoplasia and nutritional status has been studied since Shields Warren suggested that malnutrition was the main cause of death of individuals with cancer.[25] Neoplasias contribute to aggravate the nutritional condition, and several other studies[3,14,26] also mention, in addition to spontaneous loss of appetite, changes in taste and smell, involuntary loss of weight and anorexia, which can be related to the disease itself, development of cachexia, drugs and gastrointestinal symptoms.[27]

Gastrointestinal symptoms such as anorexia, nauseas, bloating and abdominal pain are also causes of reduced food intake, involuntary loss of weight and aggravation of the nutritional status of patients diagnosed with gastrointestinal-related diseases as well as changes in the metabolism of nutrients, digestion and absorption, leading to a higher risk for malnutrition.[14,28]

The data on the patients' average length of hospital stay and mortality were analyzed to determine possible correlation with the presence or absence of malnutrition in patients. The data suggest that the patients diagnosed with obesity grade III remained in hospital longer. It was also found that the malnourished patients did not stay in hospital longer than the patients who were not malnourished. The deaths and age were not influenced by malnutrition either.

The impact of malnutrition on a longer period of time at hospital was similarly addressed in the study conducted by Thomas et al.[29], where it was also found no significant statistical difference between these variables. However, other studies[10,11,30] show that malnourished patients have a prolonged stay at hospital and higher rates of mortality, compared to patients not nutritionally debilitated. This occurs because malnutrition affects the respiratory function due to consequent muscle loss, increases susceptibility to infections, reduces cardiac function, impairs the immune system and the overall metabolic condition.[18]

The nutrition team, therefore, becomes vitally important due to its supportive role to the medical therapy, being capable of delaying the protein catabolic process and the organs failure.[31] Based on previous malnutrition diagnosis, implementation of an appropriate nutritional therapy becomes indispensable in order to maintain or recover the patient's nutritional status and prevent the establishment or progress of malnutrition and its complications.[32]

Conclusion

A significant percentage of malnourished patients on admission to hospital was found. However, regarding the variables in analysis, length of hospital stay and mortality, these were not affected by malnourishment.

It would be advisable to conduct further longitudinal studies, with similar objectives, to observe over a period of time the patients' stay at hospital, from admission to discharge, in order to enable an analysis of other factors and variables resulting from the patients' time in hospital.

References

1. Silva SRJ, Waitzberg DL. Gasto energético. In: Waitzberg DL. Nutrição oral, enteral e parenteral na prática clínica. 3ª ed. São Paulo: Atheneu; 2002. p. 327-342.

2. Leandro-Merhi VA, Garcia RWD, Tafner B, Florentino MC, Casteli R, Aquino JLB. Relação entre o estado nutricional e as características clínicas de pacientes internados em enfermaria de cirurgia. Rev. Ciênc. Méd. 2000; 9(3):105-114.

3. Leandro-Merhi VA, Mônaco DV, Lazarini ALG, Yamashiro A, Maciel AC. Estado nutricional de pacientes internados em um hospital privado. Rev. Bras. Nutr. Clin. 2004; 19(3):116-122.

4. Beghetto MG. Estado nutricional como preditor de morte, infecção e permanência hospitalar [tese]. [Porto Alegre]: Universidade Federal do Rio Grande do Sul, Faculdade de Medicina; 2007.

5. Saunders J, Smith T. Malnutrition: causes and consequences. Clinical Medicine 2010; 10(6):624-627.

6. Bollet AJ, Owens S. Evaluation of nutritional status of selected hospitalized patients. Am. J. Clin. Nutr. 1973; 26(9):931-938.

7. Ordoñez AM, Schieferdecker MEM, Cestonaro T, Cardoso Neto J, Campo ACL. Nutritional status influences the length of stay and clinical outcomes in hospitalized patients in internal medicine wards. Nutr. Hosp. 2013; 28(4):1313-1320.

8. Támer GL, López MDR, Cruz AJP. Hospital malnutrition: relation between the hospital length of stay and the rate of early readmissions. Med. Clin. (Barc). 2009; 132(10):377-84.

9. Borghi R, Meale MMS, Gouveia MAP, França JID, Damião AOMC. Perfil nutricional de pacientes internados no Brasil: 19222 pacientes (Estudo BRAINS). Rev. Bras. Nutr. Clin. 2013; 28(4):255-63.

10. Waitzberg DL, Caiaffa WT, Correia MITD. Hospital Malnutrition: The Brazilian National Survey (IBRANUTRI): a study of 4000 patients. Nutrition 2001; 17(7/8):573-580.

11. Warnold I, Lundholm K. Clinical significance of preoperative nutritional status in 215 noncancer patients. Ann. Surg.1984; 199(3):299-305.

12. Waitzberg DL. Nutriçao enteral e parenteral na pratica clinica. 2ª ed. Atheneu; 1995.

13. Correia MITD, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. Clin. Nutr. 2003; 22(3):235-239.

14. Rezende IFB, Oliveira VS, Kuwano EA, Leite APB, Rios I, Dórea YSS, et al. Prevalência da desnutrição hospitalar em pacientes internados em um hospital filantrópico em Salvador (BA), Brasil. R. Ci. Méd. Biol. 2004; 3(2):194-200.

15. Kyle UG, Unger P, Mensi N, Genton L, Pichard C. Nutrition status in patients younger and older than 60 y at hospital admission: a controlled population study in 995 subjects. Nutrition 2002; 18(6):463-9.

16. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN Guidelines for Nutrition Screening 2002. Clinical Nutrition 2003; 22(4):415-421.

17. Campolina AG, Adami F, Santos JLF, Lebrão ML. A transição de saúde e as mudanças na expectativa de vida saudável da população idosa: possíveis impactos da prevenção de doenças crônicas. Cad. Saúde Pública 2013; 29(6):1217-1229.

18. Correia MITD, Campos ACL. Prevalence of hospital malnutrition in latin america: The Multicenter ELAN Study. Nutrition 2003; 19(10):823-825.

19. Stratton RJ, King CL, Stroud MA, Jackson AA, Elia M. Malnutrition universal screening tool predicts mortality and length of hospital stay in acutely ill elderly. Br. J. Nutr. 2006; 95:325-330.

20. McWhirter JP, Pennington CR. Incidence and recognition of malnutrition in hospital. BMJ 1994; 308(6934):945-948.

21. Toscano CM. As campanhas nacionais para detecção das doenças crônicas não-transmissíveis: diabetes e hipertensão arterial. Ciênc. Saúde Coletiva 2004; 9(4):885-895.

22. Malta DC, Cezário AC, Moura L, Morais Neto OL, Silva Junior JB. A construção da vigilância e prevenção das doenças crônicas não transmissíveis no contexto do Sistema Único de Saúde. Epidemiol. Serv. Saúde 2006; 15(1):47-65.

23. Pereira M. Lunet N, Azevedo A, Barros H. Differences in prevalence, awareness, treatment and control of hypertension between developing and developed countries. J. Hypertens. 2009; 27(5):963-75.

24. International Diabetes Federation. IDF Diabetes Atlas. Sixth Edition. Bruxelas: IDF; 2013.

25. Guimarães GC. Nutrição e câncer. Acta Oncol. Bras. 2002; 22(1):227-232.

26. Kruizenga HM, Wierdsma NJ, Bokhorst MA, van der Schueren, Haollander HJ, Jonkers-Schuitema CF, et al. Screening of nutritional status in The Netherlands. Clin. Nutr. 2003; 22(2):147-52.

27. Silva MPN. Síndrome da anorexia-caquexia em portadores de câncer. Rev. Bras. Cancerologia 2008; 52(1):59-77.

28. Sena FG, Taddeo EF, Andrade Neto ER, Ferreira MSR, Rolim EG. Estado nutricional de pacientes internados em enfermaria de gastroenterologia. Rev. Nutr. 1999; 12(3):233-239.

29. Thomas JM, Isenring E, Kellett E. Nutritional status and length of stay in patients admitted to an Acute Assessment Unit. J. Hum. Nutr. Diet. 2007; 20(4):320-8.

30. Goiburu ME, Goiburu MM, Bianco H, Díaz JR, Alderete F, Palacios MC, et al. The impact of malnutrition on morbidity, mortality and length of hospital stay in trauma patients. Nutr. Hosp. 2006; 21(5):604-610.

31. Maicá AO, Schweigert D. Nutritional assessment of severely ill patient. Rev. Bras. Ter. Intensiva 2008; 20(3):286-295.

32. Garcia RWD, Leandro-Merhi VA, Pereira AM. Estado nutricional e sua evolução em pacientes internados em clínica médica. Rev. Bras. Nutr. Clin. 2004; 19(2):59-63.