

IN-HOSPITAL WEIGHT LOSS, PRESCRIBED DIET AND FOOD ACCEPTANCE

Perda de peso hospitalar, dieta prescrita e aceitação de alimentos

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ABSTRACT - Background: Weight loss and malnutrition may be caused by many factors, including type of disease and treatment. **Aim:** The present study investigated the occurrence of in-hospital weight loss and related factors. **Method:** This cross-sectional study investigated the following variables of 456 hospitalized patients: gender, age, disease, weight variation during hospital stay, and type and acceptance of the prescribed diet. Repeated measures analysis of variance (ANOVA) was used for comparing patients' weight in the first three days in hospital stay and determining which factors affect weight. The generalized estimating equation was used for comparing the food acceptance rates. The significance level was set at 5%. **Results:** The most prescribed diet was the regular (28.8%) and 45.5% of the patients lost weight during their stay. Acceptance of hospital food increased from the first to the third days of stay ($p=0.0022$) but weight loss was still significant ($p<0.0001$). Age and type of prescribed diet did not affect weight loss during the study period but type of disease and gender did. Patients with neoplasms ($p=0.0052$) and males ($p=0.0002$) lost more weight. **Conclusion:** Weight loss during hospital stay was associated only with gender and type of disease.

HEADINGS - Weight loss. Prescribed diet. Hospitalized patients. Nutritional status.

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DESCRITORES - Perda de peso. Dieta prescrita. Pacientes hospitalizados. Estado nutricional.

RESUMO - Racional: A perda de peso e a desnutrição podem ser desencadeadas por vários fatores, além de estar relacionada com o tipo de doença e com a terapia empregada. **Objetivo:** Investigar a ocorrência de perda de peso e fatores relacionados, durante a internação. **Método:** Estudo transversal com 456 pacientes hospitalizados, sendo estudadas as seguintes variáveis: sexo, idade, doença, evolução de peso, tipo e aceitação da dieta prescrita. Para comparar o peso entre os três primeiros dias de internação e para o estudo dos fatores que interferiram na alteração do peso, foi utilizada a Análise de Variância (ANOVA) para medidas repetidas. Para comparar a proporção de respostas na aceitação da dieta, foi utilizado o método das Equações de Estimativa Generalizadas (EEG), com nível de significância de 5%. **Resultados:** A dieta mais prescrita foi a geral (28.8%) e 45.5% dos pacientes perderam peso durante a internação. A aceitação da dieta hospitalar melhorou do 1º para o 3º dia de internação ($p=0.0022$), mas mesmo assim, a perda foi significativa ($p<0.0001$). Verificou-se que a idade e o tipo de dieta prescrita não influenciaram na perda de peso no período; mas, o tipo de doença e o sexo, apresentaram influência nos pacientes portadores de neoplasias ($p=0.0052$) e o sexo masculino ($p=0.0002$) apresentou mais perda de peso. **Conclusão:** A perda de peso no decorrer da internação foi relacionada apenas ao sexo e ao tipo de doença.

INTRODUCTION

In the last years, many studies in Brazil^{1,15,16,17} and elsewhere^{5,25} have assessed nutritional status and its relationship with length of hospital stay, patients' energy intake, type of disease and in-hospital weight loss^{1,5,15,16,17,25}. It is already well documented^{5,15,16} but weight loss and malnutrition can be caused by many factors besides type of disease and treatment^{10,16,23}. Studies have shown that inadequate nutrition explains the incidence of nutritional risk in hospitalized patients¹³. Intercurrences, such as low energy intake, inappetence, diet changes, anorexia, nausea, vomiting, hospital meal times and other events may also promote nutritional risk and weight loss in this population^{1,11,13}.

In-hospital nutritional care is still inadequate^{6,11,13} and many actions are necessary to improve it, such as attention to food acceptance and actions that encourage higher energy intake^{6,11,12,13,24}.

Acceptance of hospital food has already been investigated in Brazil²⁶. Sousa et al, 2011²⁶ assessed food acceptance in a public hospital and found that the amount of food left on the plate by this population is above the acceptable limit. One of the authors' suggestions is the development of strategies that encourage food intake. Other studies have shown better treatment outcomes when treatment

is associated with appropriate dietary guidance and control of body weight²⁰.

The objective of the present study was to investigate the occurrence of in-hospital weight loss and related factors, such as type of prescribed diet and food acceptance.

METHOD

The study was approved by the hospital administration and the local Research Ethics Committee.

This cross-sectional study included 456 male and female patients of a surgery ward. Sample size was defined based on a 95% confidence interval, and the population who met the study inclusion and exclusion criteria. The inclusion criteria were: aged 20 or more years; medical records contained nutritional and medical information from hospital admission until discharge or death; type of disease; type of diet prescribed; and length of hospital stay. The exclusion criteria included patients with edema or ascites and terminal diseases, patients aged less than 20 years, and patients admitted only for clinical investigations and tests.

The following variables were studied: gender, age, reason for admission (type of disease), in-hospital weight variation, and type and acceptance of diet prescribed at admission. The diets prescribed at admission were classified as follows: liquid (only liquids), mild (well cooked foods without condiments), regular diet (normal diet without changes or restrictions), enteral or parenteral diet (nutritional support) and fasting. The fasting period varied according to the patient's postoperative recovery.

In-hospital weight variation was classified as follows: weight gain, weight maintenance and weight loss. Only 434 patients were included in the weight variation study because it was only possible to weigh them once. Acceptance of hospital food was assessed by observing meal distribution and visiting the patients daily. Acceptance was defined as good when patients consumed 75% or more of the meal; regular when they consumed 25 to 75% of the meal and poor when they consumed less than 25% of the meal.

The patients were characterized by descriptive analysis, where frequency tables were used for the categorical variables, and dispersion measures were used for the continuous variables (mean, standard deviation and median). The chi-square test was subsequently used for verifying associations or comparing proportions. Repeated measures analysis of variance (ANOVA) was used for comparing the patients' weights during the first three days of hospital stay and determining the weight-related factors during that period. Profile analysis was used for pinpointing the differences. Rank transformation was used because of the non-normal distribution of the data. Finally, generalized estimating equations were used for comparing the rates of food acceptance in the first three days of hospital stay. The significance level was set at 5%.

RESULTS

A total of 456 patients aged 54.4 ± 16.7 years (median=55.5) were studied. Their mean hospital stay was 8.9 ± 6.5 days (median=7); mean body mass index (BMI) was 24.2 ± 5.6 kg/m² (median=23.4); and % habitual energy intake/total energy requirement (HEI/TER) was $81 \pm 32.7\%$ (median=76.7%). Table 1 shows the general distribution of

the study variables. Most patients (56%) were males aged ≥ 60 years (38.8%). The regular diet (28.8%) was the most commonly prescribed diet and 45.5% of the patients lost weight during their stay.

TABLE 1 - General descriptive analysis of the study population (n=456)

Variables	n	%
Gender		
Female	201	44.0
Male	255	56.0
Type of disease		
Digestive tract disease	165	36.2
Neoplasm	158	34.6
Other	133	29.2
Age		
<60 years	279	61.2
≥ 60 years	177	38.8
Prescribed diet (n= 448)*		
Liquid	39	8.7
Mild	83	18.5
Regular	129	28.8
Enteral/Parenteral	33	7.4
Fasting	164	36.6
In-hospital weight variation (n=444)*		
Weight gain	56	12.6
Weight maintenance	186	41.9
Weight loss	202	45.5

* The prescribed diet was not found in the medical records of eight patients and weight variation (patients weighed on the first and third days of admission) was not recorded in the records of 12 patients

Food acceptance improved between the first and third days of stay ($p=0.0022$), (Table 2) but weight loss was still significant, going from 65.2 kg to 64.7 kg ($p<0.0001$) (Table 3).

TABLE 2 - Descriptive analysis and comparison of food acceptance during the first three days of hospital stay

Food acceptance	n	%	p *
First day			0.0022
Good	159	76.1	
Average	31	14.8	
Poor	19	9.1	
Second day			
Good	159	76.1	
Average	32	15.3	
Poor	18	8.6	
Third day			
Good	174	83.2	
Average	21	10.1	
Poor	14	6.7	

* GEE=generalized estimating equations. Profile analysis was used for pinpointing the differences: day 1 and 3; day 2 and 3

TABLE 3 - Descriptive analysis and weight comparison in the first three days of hospital stay

Variable (weight)	n	Mean \pm SD	Median	p *
Weight 1	434	65.2 \pm 15.8	62.0	<0.0001
Weight 2	434	65.1 \pm 15.8	62.0	
Weight 3	434	64.7 \pm 15.8	62.0	

N=434, for the same number of weight measurements in the first three days of hospital stay. * Repeated measures ANOVA following rank transformation. Profile analysis was used for pinpointing the differences: day 1 and 2; day 1 and 3; day 2 and 3

Table 4 shows the weight-related variables during the entire stay (gain, maintenance or loss). There were no significant associations between weight variation during hospital stay and gender (p=0.5950), age (p=0.4724), type of disease (p=0.0934), type of prescribed diet (p=0.5720) and food acceptance (p=0.0506).

TABLE 4 - Descriptive analysis and associations between the study variables and weight variation (gain, maintenance or loss*) during the entire hospital stay

Variables	Gain	Maintenance	Loss	Total	P
	n(%)	n(%)	n(%)	n(%)	
Gender					
Female	25 (44.64)	92 (47.67)	86 (42.57)	203 (45.01)	0.5950
Male	31 (55.36)	101 (52.33)	116 (57.43)	248 (54.99)	
Age					
<60 years	35 (62.50)	111 (57.51)	128 (63.37)	274 (60.75)	0.4724
≥60 years	21 (37.50)	82 (42.49)	74 (36.63)	177 (39.25)	
Disease					
Digestive diseases	17 (30.36)	78 (40.41)	67 (33.17)	162 (35.92)	0.0934
Neoplasm	20 (35.71)	54 (27.98)	82 (40.59)	156 (34.59)	
Others	19 (33.93)	61 (31.61)	53 (26.24)	133 (29.49)	
Prescribed diet					
Liquid	4 (7.27)	15 (7.85)	20 (10.10)	39 (8.78)	0.5720
Mild	7 (12.73)	38 (19.90)	36 (18.18)	81 (18.24)	
Regular	20 (36.36)	52 (27.23)	54 (27.27)	126 (28.38)	
Enteral/ Parenteral	4 (7.27)	9 (4.71)	18 (9.09)	31 (6.98)	
Fasting	20 (36.36)	77 (40.31)	70 (35.35)	167 (37.61)	
Food acceptance					
Good	44 (89.80)	102 (73.91)	119 (73.91)	265 (76.15)	0.0506
Average	5 (10.20)	28 (20.29)	26 (16.15)	59 (16.95)	
Poor	-	8 (5.8)	16 (9.94)	24 (6.9)	

TABLE 5 - Factors associated with weight variation during the first three days of hospital stay

Variable	Weight	n	Mean±SD	Median	p (ANOVA)
Female	Peso 1	195	62.4±15.6	60.0	0.0002
	Peso 2	195	62.3±15.6	60.0	
	Peso 3	195	62.1±15.6	59.0	
Male	Peso 1	239	67.5±15.7	67.0	0.2590
	Peso 2	239	67.4±15.6	66.0	
	Peso 3	239	66.9±15.8	65.2	
Age <60 years	Peso 1	271	66.1±16.9	63.3	0.2590
	Peso 2	271	66.0±16.9	63.3	
	Peso 3	271	65.7±17.0	63.0	
Age ≥60 years	Peso 1	163	63.6±13.8	61.2	0.0052
	Peso 2	163	63.6±13.8	60.9	
	Peso 3	163	63.2±13.6	60.2	
Digestive tract diseases	Peso 1	158	65.6±16.4	62.0	0.0052
	Peso 2	158	65.6±16.4	62.2	
	Peso 3	158	65.3±16.5	62.0	
Neoplasm	Peso 1	151	62.3±14.9	60.0	0.0926
	Peso 2	151	62.3±14.9	60.0	
	Peso 3	151	61.7±14.8	59.0	
Other diseases	Peso 1	125	68.1±15.8	68.0	0.0926
	Peso 2	125	67.9±15.8	67.0	
	Peso 3	125	67.7±15.7	67.0	
Liquid diet	Peso 1	38	62.3±13.9	59.0	0.0926
	Peso 2	38	62.0±14.1	57.8	
	Peso 3	38	61.7±13.8	57.8	
Mild diet	Peso 1	77	65.3±13.7	65.0	0.0926
	Peso 2	77	65.8±13.9	64.8	
	Peso 3	77	64.7±13.7	64.0	
Regular diet	Peso 1	126	67.1±16.9	64.5	0.0926
	Peso 2	126	67.0±16.8	64.3	
	Peso 3	126	66.8±16.8	64.5	
Enteral/Parenteral	Peso 1	30	61.3±18.9	58.0	0.0926
	Peso 2	30	60.9±18.7	57.2	
	Peso 3	30	60.3±19.0	57.0	
Fasting	Peso 1	156	64.5±14.9	62.5	0.0926
	Peso 2	156	64.3±14.8	62.3	
	Peso 3	156	64.2±14.8	62.4	

Later, ANOVA was used to determine the factors associated with weight variation during the first three

days of hospital stay (Table 5). The study variables were gender, age group, disease and prescribed diet. The factor most strongly associated with weight loss during the study period was also investigated. This analysis showed that males lost more weight than females (p=0.0002) and patients with neoplasm lost more weight than other patients (p=0.0052), but age (p=0.2590) and type of prescribed diet (p=0.0926) were not associated with weight loss. Therefore, only gender and type of disease were associated with weight loss during hospital stay. Additional data are shown in Table 5.

DISCUSSION

This study assessed weight variation during hospital stay in hospitalized surgical patients and its possible association with gender, age, type of disease, prescribed diet and food acceptance. Almost half the study population (45.5%) lost weight during their stay. Since this study was performed with hospitalized surgical patients, the fasting period imposed on this population was not but the usual postoperative fasting period.

This is worrisome because weight loss often compromises treatment outcome. Weight loss by itself or combined with biochemical changes during stay can be considered the main indicator of a poor nutritional status⁴ and be attributed to many factors that decrease energy intake, such as inappetence, nausea, vomiting, dysphagia, drug therapy, higher energy requirement and low ability to digest and absorb nutrients secondary to the disease or even to the hospital environment, which can be unfavorable for the patient's recovery^{3,18}. Malnutrition has many causes, but inadequate food intake can have a greater impact on nutritional condition^{7,9}.

Recent studies have shown high indices of malnutrition in hospitalized patients. One study found a malnutrition rate of 60.7% in a sample of hospitalized patients and the factors associated with recent and involuntary weight loss were diminished appetite, diarrhea, low energy intake and being male¹.

The present study found that being male and having a neoplasm was associated with significant weight loss. It is important to emphasize that the study population consisted of patients with digestive tract diseases and neoplasm, head and neck neoplasm, trauma, and other diseases (such as vascular, gynecological, and urologic). These patients were followed from hospital admission to discharge, including undergoing daily clinical and nutritional follow-up. However, body weight was assessed only on the first three days of hospital stay, which was the study objective. Their length of hospital stay varied greatly.

Age and type of prescribed diet were not related to weight loss during hospital stay or to the fasting period, at least in the first three days of assessment. The results show that not even the fasting patients lost weight. This may be explained by the fact that these fasting patients are generally receiving a glucose solution, which could have influenced the study results. In-hospital weight loss has been reported by many studies, some of which investigated only in-hospital weight loss and some in-hospital weight loss associated with other factors^{1,5,15,16}. The amount of intravenous fluids given to the study population depended on surgery type and duration as the objective was to keep an adequate water balance. Weight loss in patients who accepted the hospital diet well may

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REFERENCES

1. Aquino Rde C, Philippi ST. Identification of malnutrition risk factors in hospitalized patients. *Rev Assoc Med Bras.* 2011;57(6):637-43.
2. Barton AD, Beigg CL, Macdonald IA, Allison SP. High food wastage and low nutritional intakes in hospital patients. *Clinical Nutrition* 2000; 19(6):445-449.
3. Beck AM, Balknas UN, Furst P, Hasunen K, Jones L, Keller U, Melchior JC, Mikkelsen BE, Schauder P, Sivonen L, Zinck O, Oien H, Ovesen L. Food and nutritional care in hospitals: how to prevent undernutrition – report and guidelines from the Council of Europe. *Clin Nutr* 2001; 20(5): 455-460.
4. Bozzetti F, Gianotti L, Bragac M, Di Carloc V, Marianid L. Postoperative complications in gastrointestinal cancer patients: The joint role of the nutritional status and the nutritional support. *Clin Nutr* 2007; 26: 698–709.
5. Cabello AJP, Conde SB, Gamero MVM. Prevalencia y factores asociados a desnutrición entre pacientes ingresados em um hospital de media-larga estância. *Nutricion Hospitalaria* 2011; 26(2):369-375.
6. Cereda E, Lucchin L, Pedrolli C, D'Amicis A, Gentile MG, Battistini NC, Fusco MA, Palmo A, Muscaritoli M. Nutritional care routines in Italy: results from the PIMAI (Project: Iatrogenic MALnutrition in Italy) study. *Eur J Clin Nutr.* 2010;64(8):894-8.
7. Dupertuis YM, Kossovsky MP, Kyle UG, et al. Food intake in 1707 hospitalized patients: a prospective comprehensive hospital survey. *Clinical Nutrition* 2003; 22: 115–23.
8. Feldblum I, German L, Castel H, Harman-Boehm I, Bilenko N, Eisinger M, Fraser D, Shahar DR. Characteristics of undernourished older medical patients and the identification of predictors for undernutrition status. *Nutrition Journal* 2007;6:37. doi: 10.1186/1475-2891-6-37.
9. Garcia RWD, Leandro-Merhi VA, Pereira AM. Estado nutricional e sua evolução em pacientes internados em clínica médica. *Revista Brasileira de Nutrição Clínica* 2004; 19(2): 59-63.
10. Garth AK, Newsome CM, Simmance N, Crowe TC. Nutritional status, nutrition practices and post-operative complications in patients with gastrointestinal cancer. *J Hum Nutr Diet.* 2010; 23(4):393-401.
11. Hiesmayr M, Schindler K, Pernicka E, Schuh C, Schoeniger-Hekele A, Bauer P, Laviano A, Lovell AD, Mouhieddine M, Schuetz T, Schneider SM, Singer P, Pichard C, Howard P, Jonkers C, Grecu I, Ljungqvist O; The NutritionDay Audit Team. Decreased food intake is a risk factor for mortality in hospitalized patients: the NutritionDay survey 2006. *Clin Nutr.* 2009;28(5):484-91.
12. Holst M, Rasmussen HH, Laursen BS. Can the patient perspective contribute to quality of nutritional care? *Scand J Caring Sci.* 2011;25(1):176-84. doi: 10.1111/j.1471-6712.2010.00808.x.
13. Kondrup J, Johansen N, Plum LM, Bak L, Larsen IH, Martinsen A, Andersen JR, Baerthsen H, Bunch E, Lauesen N. Incidence of nutritional risk and causes of inadequate nutritional care in hospitals. *Clin Nutr* 2002; 21(6):461-468.
14. Kruizenga HM, Wierdsma NJ, Van Bokhorst MAE, Schueren DVD, Hollander HJ, Jonkers-Schuitema CF, Heijden EVD, Melis GC, van Staveren WA. Screening of nutritional status in the Netherlands. *Clinical Nutrition* 2003; 22(2):147-152.
15. Leandro-Merhi VA, Aquino JLB, Chagas JFS. Nutrition status and risk factors associated with length of hospital stay for surgical patients. *Journal of Parenteral and Enteral Nutrition* 2011; 35(2):241-248.
16. Leandro-Merhi VA, Aquino JLB, Camargo JGT, Frenhani PB, Bernardi JLD, Portero-McLellan KC. Clinical and nutritional status of surgical patients with and without malignant diseases: cross-sectional study. *Arquivos de Gastroenterologia* 2011; 48(1):58-61.
17. Leandro-Merhi, Garcia RWD, Mònaco DV, Oliveira MRM. Comparación del estado nutricional, consumo alimenticio y tiempo de hospitalización de pacientes de los hospitales, uno público y otro privado. *Nutrición Hospitalaria* 2006;21(1):32-7.

have been caused by more extensive surgery, which would consequently lead to a greater metabolic response to the surgical trauma.

A prospective study with 1500 hospitalized patients in medical and surgery wards found that 62.9% lost weight during their stay and 11.7% were malnourished at discharge¹⁹.

An interesting datum found by the present study was that even patients who presented better food acceptance on the third day of stay lost weight ($p=0.0022$ from day 1 to 3). It is noteworthy that the study population lost weight despite better diet acceptance. This is probably because the total energy content (kcal) of the hospital diet was below the individual energy requirement of the patients. This fact could explain weight loss even when patients better accept the diet.

Among other factors, inadequate or inappropriate diets may also cause malnutrition in hospitalized patients. Hence, once the impact of hospital food and other factors on in-hospital malnutrition is determined, this knowledge may help to plan nutritional intervention programs and predict their bear on length of hospital stay.

Kondrup et al.¹³ found that only 25% of the patients hospitalized for more than one week consumed 75% to 99% of their energy requirement. It is critical for patients to consume more than 75% of their energy requirement, otherwise they will lose weight. There are many causes for inadequate nutritional care in hospitals and many patients are already malnourished on admission because of inappropriate diets¹³. A study¹³ found that 22% of hospitalized patients were at nutritional risk and of these, 25% received inadequate amounts of energy and protein during their hospital stay. Many factors contribute to nutritional inadequacy, such as absence of personalized nutritional therapy and operational difficulties of the hospital food service. Appropriate nutritional therapy is essential for maintaining a satisfactory nutritional status²¹ and should be provided routinely for hospitalized patients.

Aiming to investigate persistent in-hospital weight loss, Barton et al.² assessed if a university hospital with 1200 beds provided enough food for its patients and determined the percentage of food left on the plate and mean food intake. They found that the regular hospital diet contained 2000 Kcal/day, enough to meet the patients' energy requirements, but more than 40% of it was not consumed, resulting in inadequate energy intake and the weight loss observed in many hospitalized patients².

Supposedly, advanced age and poor food acceptance could promote weight loss to some degree, but this has not been found by the present study. There are studies showing that low appetite and inefficient mastication are associated with malnutrition in the elderly⁸, but nutritional interventions can prevent weight loss and improve the nutritional status of elderly patients at risk of malnutrition²².

Supposing that patients' nutritional status reflects the nutritional profile of the population and the nutritional problems associated with hospitalization and disease, nutritional therapy should be included as hospitals' many routines.

CONCLUSION

In-hospital weight loss is associated with gender and type of disease.

18. Leandro-Merhi VA, Mônico DV, Lazarini ALG, Yamashiro A, Maciel AC. Estado nutricional de pacientes hospitalizados em um hospital privado. *Revista Brasileira de Nutrição Clínica* 2004; 19(3): 116-122.
19. Liang X, Jiang Z-M, Nolan MT, Wu X, Zhang H, Zheng Y, Liu H, Kondrup J. Nutritional risk, malnutrition (undernutrition), overweight, obesity and nutrition support among hospitalized patients in Beijing teaching hospitals. *Asia Pac J Clin Nutr* 2009;18(1): 54-62.
20. Nakajima Y, Sato K, Sudo M, Nagao M, Kano T, Harada T, Ishizaki A, Tanimura K, Okajima F, Tamura H, Sugihara H, Tsuda K, Oikawa S. Practical dietary calorie management, body weight control and energy expenditure of diabetic patients in short-term hospitalization. *J Atheroscler Thromb*. 2010;17(6):558-67.
21. Ottery FD. Supportive nutrition to prevent cachexia and improve quality of life. *Semin Oncol* 1995; 22(suppl 3):98-111.
22. Persson M, Hytter-Landahl A, Brismar K, Cederholm T. Nutritional supplementation and dietary advice in geriatric patients at risk of malnutrition. *Clinical Nutrition* 2007; 26:216-224.
23. Raslan M, Gonzalez MC, Dias MCG, Nascimento M, Castro M, Marques P, Segatto S, Torrinhas RS, Cecconello I, Waitzberg DL. Comparison of nutritional risk screening tools for predicting clinical outcomes in hospitalized patients. *Nutrition* 2010; 26:721-726.
24. Rufenacht U, Rühl M, Wegmann M, Imoberdorf R, Ballmer PE. Nutritional counseling improves quality of life and nutrient intake in hospitalized undernourished patients. *Nutrition*. 2010;26(1):53-60.
25. Saka B, Ozturk GB, Uzun S, Erten N, Genc S, Karan MA, Tascioglu C, Kaysi A. Nutritional risk in hospitalized patients: impact of nutritional status on serum prealbumin. *Revista de Nutrição* 2011; 24(1):89-98.
26. Sousa AA, Gloria MS, Cardoso TS. Aceitação de dietas em ambiente hospitalar. *Revista de Nutrição* 2011; 24(2):287-294.