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A study of nutritional status, development of malnutrition and food consumption in hospitalized patients

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Abstract

Purpose: To investigate the nutritional status of patients on admission and during hospital stay, the factors leading to weight loss, and to evaluate patient satisfaction of hospital food. **Methods:** On admission, Nutritional Risk Screening (NRS-2002), weight, height, Body Mass Index (BMI), mid upper arm circumference (MAC) measurements were carried out; serum total protein and albumin levels were recorded. Upon discharge, measurements of weight, MAC were repeated, along with a food satisfaction questionnaire. **Results:** Patients with NRS-2002>3, BMI<20, were classified as nutrionally at risk which were 43.6% and 9.4% respectively. Of the patients, 77% lost weight (2.6±1.9 kg). Patients who were determined to be malnourished on admission by BMI and NRS-2002 stayed longer in hospital ($p<0.0$ and $p<0.001$, respectively). The relationships between weight loss and lenght of stay, use of medications and period of starvation were significant ($p<0.0001$, for each). Of the patients, 49.9% did not satisfy with the hospital food. **Conclusions:** Nutritional status of hospitalized patients should be screened with NRS-2002, assessed and monitored.

Keywords: NRS-2002, hospital malnutrition, hospital food services

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1. Introduction

In case of an illness, the disease itself, complications, medication or other treatments may adversely affect the patient's nutritional status. As a result, a negative balance is observed that is characterized by the acceleration of catabolism and the decrease in food consumption, which may be reflected in clinical and biochemical findings. The clinical process in which a negative balance occurs is defined as malnutrition (Arslan, 2007). Hospital malnutrition, also called as “iatrogenic malnutrition”, may lead to deterioration of nutritional status or to deepen the existing nutritional status disorder of the patients. Hospital malnutrition is a common problem (Waitzberg, 2001), which has received consirable attention as shown by the number of studies made in the last 25 years. The prevalence of hospital malnutrition has been reported to range between 20% and 60% (Wyszynski, 2003). Malnutrition in hospitalized patients usually causes muscle, respiratory, and impaired immune system functions along with decreased quality of life and delayed wound healing (Pablo, 2003). Additionally, postoperative morbidity and mortality, hospital stay, and costs increase significantly (Pennington, 1998). Hospital malnutrition may also be due to deficiencies in food service and inadequate quality and flexibility of hospital catering. The inadequate food delivery service was reported to be a cause of hospital malnutrition (Tarbuck, 1997).

Together with the screening tests for patients whose nutritional intake are inadequate, observation of the nutrients consumed by the patients daily has a key role in determining their nutritional status. The hospital food has a pivotal role in blancing the patients' energy and nutrient requirements and presentation of food, compliance, cooking technique, cost, and the patient’s satisfaction (Kondrup, 2001). When this common point is reached from the economic point of view, it has been shown that there is a 67% reduction in food waste in the hospital (McWhirter, 1994). Nutritional consumption of hospitalized patients decreases due to disease-related causes and diagnostic and therapeutic applications (test diets, pre- and post-operative fasting). As a result of this process, mortality and morbidity increase (Kondrup, 2001). Hence, the present study aimed to investigate the nutritional status of adult patients during hospitalization by examining the effects of disease, hospital food consumption, and hospital food service.

2. Patients and Methods

The study was conducted between May 2006 and June 2007 on 617 patients (301 female and 316 male) who were hospitalized in Hacettepe University Adult and Oncology Hospitals for at least three days and longer. According to the literature, the rate of hospital malnutrition was assumed to be 45% and the number of patients to participate in the study was found to be 617 with 4% error. The number of patients to participate in the study was determined by stratified random sampling method and distribution proportional to stratum size. The distribution of the general sampling according to the services was shown in Table 1.

Table 1. Distribution of general sample according to services

Service	Number of patients	Chosen
Neurology	1791	56
Internal medicine	5389	141
Dermatology	237	6
General Surgery	4179	107
Thoracic Surgery	1163	37
Ophtalmology	1484	39
Gynaecology	2271	58
Ear, Nose, Throat	921	32
Neurology	779	22
Orthopedics	1961	50

Plastic Surgery	808	20
Urology	1954	49
Total	**22937**	**617**

The study was conducted in full accordance with the World Medical Association Declaration of Helsinki. It was approved by Hacettepe University Senate Ethics Commission (No: 410-2300 Date: November 12, 2007).

The patients were interviewed within the first 24 hours of their admittance. The nutritional history and physical activity status of the patients were recorded and the anthropometric measurements were made. In addition, diagnoses, serum albumin levels, previous hospitalizations, medications, operations and medical treatments were recorded. Nutritional status of the patients was evaluated with Nutritional Risk Screening-2002 (NRS-2002) according to their own statements on the day of hospitalization. The aim of the Nutritional Risk Screening-2002 is to identify the patients who are at risk of developing malnutrition or malnutrition in hospitalized patients. The NRS-2002 which was developed by Kondrup et al. (Kondrup, 2003), consists of a nutritional status score based on weight loss, food intake, body mass index (BMI) (1–3 points), a severity of disease score (1–3 points), and an age adjustment for patients older than 70 years (+1). The total score ranges from 0 to 7, and patients are classified as “at no nutritional risk” (score less than 3) or as “at nutritional risk” (score of 3 or higher).

Meal satisfaction survey (Appendix-3) was applied to the patients two days before discharge. In order to measure hospital food satisfaction, 18 questions were asked to the patients. The responses to those questions were as “very good”, “good”, “moderate”, “bad”, “very bad”. The rating of those responses were as follows: “very good” = 1,“good” = 2, “moderate” = 3, “bad” = 4,“very bad” = 5. The median value obtained from the responses was accepted as the limit in determining the food satisfaction of the patients. The median value and values below this value were accepted as the range in which patients were satisfied with the food.

2.1. Anthropometric measurements

In the first 24 hours of hospitalization, patients’ body weight (kg) and height (cm) were obtained. Body weight measurement was repeated on the day of discharge. BMI was calculated from the weight (kg) / height (m2) formula and the values were evaluated according to the World Health Organization (WHO) BMI classification. Anthropometric measurements (length, body weight) were taken after necessary conditions in accordance with the method (Baysal, 2008).

2.2. Biochemical tests

In the present study, no blood samples were collected from the patients. The data for biochemical indices were obtained from the patients’ records which were on file by the doctors’ orders for diagnosis and treatment of the patients. Serum albumin and total protein values were also gathered from the patients’ records (Shopbell, 2001; Nursal, 2005).

In order to determine the average energy and nutrient amounts of the food consumed by patients, standard recipes developed by Hacettepe University Adult Hospital Department of Diet and Nutrition were used. The amounts in these tariffs are recorded as new tariffs in Nutrition Information Systems (BeBis) (Amaral, 2007) program and calculations were made on these tariffs. In addition, the

proportion of residual amounts in meals was calculated based on the amount of food consumed before and after the service of the patients.

2.3. Data Analyses

At the beginning and end of the study, Mean, standard deviation, median, upper and lower values of the data obtained from individuals at the beginning Additionally, energy and nutrients intakes of the patients were calculated. Number (n) and percentage (%) distributions were used to evaluate the quantitative data of the individuals. Pearson $\chi 2$ was used for the qualitative data. The qualitative data, from the first and last evaluations, were made by using Mc Nemar test in four-well (2x2) tables. McNemar-Bowker test was used for multi-well tables (nxn).

When comparing the BMI values, NRS-2002, serum total protein and serum albumin values of the patients who are nutritionally at risk and not at risk (well-nourished), t-test in independent groups was used. One-way analysis of variance (ANOVA) was used for three and more groups. Tukey HSD test was used for binary comparisons. In the numerical data, the difference before and after was examined by t-test in dependent groups.

3. Results

A total of 617 patients, 301 male (48.6%) and 316 female (51.2%), participated in the study. Of the patients, 40.8% were diagnosed with malignancy. Mean length of hospital stay, for all patients, was 13.6±10.4 days. Patients with malignancies had stayed in hospital for 15.6±11.5 days. However, the longest hospital stay was related to liver disease (23.1±17.8 days), which was followed by rheumatologic diseases (20±12.2 days), infectious diseases (19.6 ±19.6 days), and hemodialysis (16.1±9.3 days). The shortest period of hospitalization was for gynecological diseases (10.2±9.6 days). It was found that 22.9% of the patients were in the internal medicine service which has the longest hospitalization period (18±13.2 days). Liver diseases, chronic renal failure, hematological malignancies, various types of cancers, and diabetes mellitus were mostly observed reasons among these patients.

3.1. Weight loss and the affecting factors

Patients' weight losses observed during hospital stay (in kg and %) were analysed with parameters such as length of stay, period of starving, chemotherapy. (Tablo 2).

A significant relationship was found between the duration of hospitalization and weight loss in patients ($p<0.001$). While 17.9% of the patients with more than 10% weight loss were hospitalized for more than 30 days, this rate was 5.6% for those hospitalized for less than 7 days. The percentage of patients who had fasted for 2-5 days in the hospital for examination or other reasons and who lost more than 10% weight was 7.6. This figure was 1.8% in those who were hungry for less than two days. Statistically significant relationship existed between the duration of fasting in hospital for various reasons and weight loss ($p <0.001$). It was found that 36% of the patients receiving chemotherapy, and 26.3% of those using immunosuppressive drugs lost 5-10% of their body weight during hospitalization. Weight losses, between the above rates, were also observed in 44.4% of the patients receiving total parenteral nutrition therapy and in 40.5% of those receiving enteral nutrition therapy. The association between chemotherapy, use of immunosuppressive drug, total parenteral and enteral nutrition treatment and the percentage of weight loss was statistically significant ($p<0.001$, for each).

Table 2. Comparison of body weight loss with respect to different parameters (n=462).

Parameters	Body Weight Loss (kg)							
	≤ 5		5-10		> 10			
	S	%	S	%	S	%	χ^2	P
Length of Hospital Stay (day) (n=462)								
≤ 7	101	93.5	1	0.9	6	5.6		
8-14	152	86.9	19	10.9	4	2.3		
15-21	72	78.3	19	20.7	1	1.1		
22-30	26	44.1	28	47.5	5	8.5		
> 30	11	39.3	12	42.9	5	17.9	97. 6	0.001
Starving (day) (n=284)								
< 2	107	84.9	15	11.9	4	3.2		
2-5	107	67.7	39	24.7	12	7.6	11.2	0.004
Operation (n=462)								
Did not have	235	59.6	49	12.4	10	2.5	3.49	0.478
Did have	127	57.0	30	13.5	11	4.9		
Chemotherapy (n=462)								
Did not receive	328	81.8	57	14.2	16	4.0		
Received	34	55.7	22	36.0	5	8.3	23.18	0.001
Insulin (n=462)								
Did not receive	323	79.7	71	17.5	11	2.8		
Received	39	68.4	8	14.0	10	17.6	26.62	0.001
Immunsupressive (n=462)								
Did not receive	326	80.4	64	15.8	15	3.8		
Received	36	63.1	15	26.3	6	10.6	17.55	0.001
Enteral Nutrition (n=462)								
Did not receive	344	80.9	64	15.0	17	4.1		
Received	18	48.6	15	40.5	4	10.9	26.15	0.001
Total Parenteral Nutrition (n=462)								
Did not receive	352	80.9	67	15.4	16	3.7		
Received	10	37.0	12	44.4	5	18.6	37.57	0.001

Table 3 shows the average body weight loss (kg) with respect to duration of hospital stay and fasting period in hospital for various reasons. During their hospital stay, the patients lost 2.5±1.4 kg. In patients hospitalized for more than 30 days, this loss was 4.6±3.0 kg. As the length of hospitalization period increased, the mean weight loss increased ($p < 0.001$). The mean body weight loss, for the whole patient population, was 2.6±2.0 kg. The average body weight losses according to the duration of patients' hospital stay were examined. Patients with a fasting period of less than two days lost 2.1±1.8 kg, while patients with a 2-5 day fasting period lost 3.2±2.3 kg ($p<0.001$). The mean weight loss of the patients who received chemotherapy and immunosuppressive medication and who did not receive these treatments but also lost weight were compared. The averages of weight loss were statistically higher in patients receiving the treatments mentioned above ($p<0.001$, for each).

While it was determined that 180 patients had BMI in the range of 20-24.9 at the time of admission (n = 600), 85.6% (154 patients) of these patients were in the same range at the exit, 12.2% (22 patients) had a BMI of less than 20 It was determined. While it was determined that 166 patients (80.3%) had BMI in the range of 25-29.9 at the time of admission, 39 (18.8%) of these patients were found to be in the range of 20-24.9 at the time of hospital discharge. It was found that BMI values of the patients at the hospital entrance were decreased compared to the values at the exit and these decreasing values were found to be statistically significant ($p < 0.001$). The duration of hospitalization was evaluated according to the patients' nutritional status (malnourished, BMI<20 vs. well-nourished,

BMI ≥ 20). It was found that patients having BMI<20 on admission were hospitalized 4 days longer than those with a BMI≥20 (p <0.05).

Table 3. Comparison of body weight loss with respect to different parametersp (n=462).

Parameters	Body Weight Loss (kg)					
	N	$\bar{X}$ ±SS	Min.	Max	F	P
Length of Hospital Stay (day)						
≤ 7	108	1.6±1.5[a]	0.0	7.0		
8-14	175	2.2±1.6[a,b]	2.0	11.0		
15-21	92	2.7±1.3[b]	0.5	7.8		
22-30	59	3.8±2.9[c]	10.0	13.7		
> 30	28	4.6±3.0[c]	1.0	12.0		
Total	**462**	**2.5± 1.4**	**10.0**	**13.7**	**23.6**	**0.001**
Starving period (day)				**t**	**p**	
< 2	126	2.1±1.8	0.2	11.0		
2-5	158	3.2±2.3	0.4	13.7		
Total	**284**	**2.6±2.0**	**0.5**	**13.7**	**4.3**	**0.001**

[a, b, c] Different superscripts indicate statistically significant difference

Total protein and albumin values were used for malnutrition assessment. The mean total protein and albumin values were 7.0±0.9 g/dL and 4.0±1.8 g/dL on admittance, respectively. On discharge, those values decreased to 6.5 g/dL and 3.5 g/dL, respectively (p<0.001). On admission, 1l.2% and 13.3% of the patients had lower than normal values of total protein and albumin, respectively. On discharge, those figures changed to 30.1% for total protein and to 31.8% for albumin (p <0.001). While albumin levels of 481 (82.5%) patients were found to be normal on admission, 246 patients (65.3%) had normal albumin levels and 120 patients (31.8%) had below normal values during discharge (p<0.001).

The nutritional status of the patients on the day of admission was evaluated with NRS-2002, and 43.6% of them were at risk. It was found that the patients whose nutritional status were at risk during hospitalization stayed 5.13 days longer than the patients who were not at risk (p <0.001).

In patients' nutritional status according to NRS-2002 on admittance was presented. Patients of internal medicine (62.4%), general surgery (55.1%), urology (51%), ear nose throat (48.4%) and thoracic surgery (40.9%) services were found to be at most risk for nutritional status (p<0.001).

3.2. Hospital Food Consumption and Patient Satisfaction

The patients most commonly consumed breakfast (44.4%). While 41.2% of the patients stated that they consumed most of the lunch, this rate was 40.7% for dinner. The percentages of patients who do not consume breakfast, lunch, dinner, and snack were 1.5 (n=9), 1.1 (n=7), 1.3 (n=8) and 3.4 (n=11), respectively.

A big majority of the patients evaluated the served meals as normal (79.7%), while twenty-four patients (3.6%) stated that the meals served in the hospital were completely different from the preferred meals in their daily lives. Breakfast was the least satisfying meal with a rate of 43.4%. Of the patients, 66% stated that they did not provide food and beverage from outside the hospital during their stay. It was found that 29.8% of the patients who provided food and beverages from outside the hospital preferred fruit juice, 18.8% preferred biscuit types, bagels, donuts, and 13.9% preferred meals from their homes. While 232 of the patients (37.6%) think that there is no need for a change in the hospital food services, 220 (35.7%) of them suggested a change in meal serving times, 165 (26.7%)

asked for improvement in variety of foods and 163 (26.4%) stated that the meal ingredients should be chosen more properly.

With regard to the patients' satisfaction with the meals served, 59.6% of them considered the taste and smell of the hospital food as good and 7.8% as bad. The temperature of the hot dishes was evaluated as good by 72%, and poor by 6.2%. Of the patients, 55.8% evaluated meal times as good, 27.6% as acceptable, and 10.2% as bad. It was found that 86.4% of the patients considered the meals as suitable for their diet. The food repetition frequency was regarded as acceptable by 22.0% of the patients, while the oil, tomato paste and salt content of the foods was rated as fair by 28.2%. The color, taste, smell and harmony of the menus was appreciated by only 19.3% of the patiens.

With the answers given to the hospital food satisfaction survey, which consisted of 18 questions, a median value of 37 for patient satisfaction was calculated. The percentage of patients who were satisfied with hospital food (score>37) was 50.1. A statistically significant relationship was found between patients' food satisfaction and consumption of breakfast, lunch, dinner and snack ($p < 0.005$). Of the patients, 45.3% who were satisfied with the meal served consumed all the food at breakfast, However, 60% and 61% of the patients who were satisfied with the lunch and dinner service ate most of the food, respectively. Of the patients, 54% who were staying in the hospital for less than 7 days stated that they were satisfied with the hospital meals and 46% said they were not satisfied. The satisfaction rate of the patients staying in the hospital for more than thirty days was 42.9% and the rate of dissatisfaction was 57.1%. The relationship between the length of hospital stay and satisfaction with hospital food was statistically insignificant ($p > 0.005$).

4. Discussion

The disease and its complications, malnutrition present during hospital admission are the factors that adversely affect patients' nutrition, which also increase the length of hospital stay and health expenditures (Sorensen, 2008). The majority of patients (20-50%) were shown to be malnourished during hospital admission due to the presence and and severity of chronic diseases, disease complications, frequent hospitalization, medical and surgical treatments (Sungurtekin, 2004). A study with 5051 patients from 26 countries reported that 32.6% were malnourished at the time of hospitalization, as determinde by NRS 2002 (Sungurtekin, 2004). Nursal et al. (Nursal, 2005), by using SGA, reported the malnutrition rate of 2211 general surgery service patients as 11%. Sungurtekin et al. (Sungurtekin, 2004) reported malnutrition rates as 30% and 32% in the hospitalized patients in internal medicine and surgery serrvices, respectively. Kuzu et al. (Kuzu, 2006) investigated the rate of malnutrition by using Nutrition Risk Index (NRI), Maastricht Index and SGA in surgical service patients. According to the methods they used, malnutrition rates were 58.3%, 63.5% and 67%, respectively. In a multicentre study by Korfali et al. (Korfali, 2009), 29139 patients were assessed with NRS-2002 during hospitalization. The rate of patients with nutritionally at risk status was reported 15%. In the study conducted by Ozkalkanli et al. (Ozkalkanli, 2009), the malnutrition rate at the time of admission was 33% and 23%, which were evaluated by SGA and NRS-2002 methods, respectively. With NRS-2002, the present study found 43.6% of the patients were malnourished on admission. The differences between these findings may be related to the methodologies employed which were affected by the hospital sizes, the evaluation methods, the type of diseases. NRS-2002, which was also used in this study, was proposed by the European Enteral Parenteral Nutrition Association in 2002 to determine the nutritional status of hospitalized patients. It is a widely accepted and reliable method, which takes into account the disease risk, BMI value, food consumption and patient age (Kondrup, 2002).

The present study comprised patients who stayed in the hospital longer than 3 days. According to 2004 data used to determine the number of days, the average length of hospital stay was 9.8 days. The present study found an average length of hospital stay as 13.6 days. This may be explained by the fact that patients with more severe illness were included in the study instead of patients who were thought to be hospitalized for less than 3 days, which increased the length of stay.

Disease-associated malnutrition develops as a result of interactions between disease and nutritional status, and it becomes difficult to understand what leads to malnutrition alone. The relationship of malignant or benign diseases with malnutrition has been investigated by many studies. High rates of malnutrition have been observed in individuals with malignant diseases and it has been stated that this is one of the factors for the development of malnutrition (Pennington, 1998; Sorensen, 2008; Sungurtekin, 2004). Pirlich et al. (Pirlich, 2005) reported that malnutrition rates were 40% in patients with chronic inflammatory bowel disease, 37.5% in patients with chronic heart failure, 30.8% in patients with chronic heart failure, 28.9% in patients with chronic liver disease and 29.8% in patients with rheumatoid arthritis, during hospital admission. This rate varied between 10-14.5% in patients with digestive system disease. In patients who were hospitalized and who would not undergo surgery, malnutrition rates were 45% and 62%, with SGA and Maastricht Index, respectively (Naber, 1997). Correia et al. (Correia, 2003) reported that malnutrition rate was 1.6-fold higher in internal medicine patients.

In the present study, it was found that 62.4% of internal service patients were found to be nutritionally at risk. The duration of hospitalization in internal service was 5.3 days higher than the average length of hospital stay. Amaral et al. (Amaral, 2007) found that 39% of surgical patients were nutritionally at risk, assessed by NRS-2002. Mowe et al. (Mowe, 1994) and Brunn et al. (Brunn, 1999) reported malnutrition at 37% and 39% in surgical patients, respectively. In this study, the rate of patients who were at risk of nutritional status in the surgical services such as general surgery, thoracic surgery, plastic surgery and urology ranged from 25% to 55%. In the national malnutrition study conducted by the Dutch Dietetic Association on 7606 patients, only the involuntary loss of body weight was used to determine malnutrition. The rate of malnourished patients was 12%, and the rate of patients with nutritionally at risk was 13%. It was concluded that involuntary weight loss in the last 6 months was a suitable method (Kruizenga, 2005). In another study, body weight loss was reported to be 3.8 times higher in malnourished patients (Liang, 2008).

Of the patients, 30.9% had more than 5% weight loss during the last 6 months in the present study. Loss of appetite originates from physical and psychosocial reasons. Loss of appetite is the leading manifestation of many acute and chronic diseases (infection, malignancy, traumatic, etc.) and is an important factor leading to reduced food intake. In this study, 37.6% of the patients reported loss of appetite in the last month prior to hospitalization. the patients also reported nausea, swallowing and chewing difficulties due wounds in mouth, dry mouth and taste changes. In addition, 49.4% of the patients had decreased physical activity. The decrease in muscle strength due to loss of appetite, unintentional weight loss and the increase in dependence on the bed seen in patients can be explained by these interactions. The results of muscle function tests have been reported to be impaired with the severity of malnutrition (Stratton, 2003).

It has been reported that the two most important factors that cause nutritional risk are decreased nutritional intake and weight loss (Pirlich, 2006). Studies have shown that treatments applied to patients are effective in reducing body weight. It was learned rom the patients that 64.5% of them had

undergone surgical operations and 27.6% of them had received dietary treatment prior to hospitalization in the present study. Restrictions on the type and amount of meals by diet therapy may cause a decrease in food consumption.

Pirlich et al. (Pirlich, 2006) reported that malnutrition had three independent causes. These include increased age, malign diseases and multiple drug use. Lucchin et al. (Lucchin, 2009) found a statistically significant relationship with the increase in the number of daily medications used by malnourished and non-malnourished patients. There are studies reporting that there is a relationship between malnutrition and use of multiple medicines (Naber, 1997). The number of drugs prescribed to patients increase in chronic diseases, which decrease the absorption of nutrients, reduce saliva production, adversely affect the appetite and disrupt taste. One-third of the patients of this study received more than 3 drugs per day. However, the effect of number of drugs on the development of malnutrition was not studied since it was not possible to determine the type of medicines received by the patients.

In epidemiological studies, BMI (kg / m2) is generally used to assess the body weight of individuals due to its quick and easy applicability. In many studies, patients with BMIs <20 were considered malnourished (Amaral, 2007). Campillo et al. (Campillo, 2004) examined BMI values of 1052 patients with chronic diseases and the sensitivity of BMI in determining severe malnutrition. According to their results, especially in patients with fluid retention, the sensitivity of BMI was limited. They stated that BMI should not be used as a stand-alone method for identifying malnutrition. In another study, nutritional status of the patients who underwent surgical services were evaluated with three simple parameters (percentage of body weight loss, upper middle arm muscle circumference, BMI). It was found to be important to use these three methods together in order to make better nutritional assessments (Kelly, 2000). On the other hand, in some studies, it was reported that there was a significant relationship between BMI values (<20 patients) and mortality, postoperative complication (infection) and prolongation of hospital stay (Nightingale, 1999; van Venrooij, 2008). The number of patients with BMI <20 during hospital admission was reported as 14% by Kondrup et al. (Kondrup, 2001) 17.3% by Kelly et al. (Kelly, 2000) while Lucchin et al. (Lucchin, 2009) reported that the rate of patients with a BMI <18.5 was 3.5%. In the German national study (Pirlich, 2006), the rate of patients with malnutrition was reported as 27.4% with SGD and the rate of patients with BMI <20 was found to be 4.8%. In another study using the Nutritional Risk Index, 24.6% of patients were evaluated as malnourished at admission and the rate of patients with BMI <18.5 was reported to be 3.8% (Pirlich, 2005). An Italian study on iatrogenic malnutrition, used body weight loss, biochemical and anthropometric measurements to evaluate hospital malnutrition rate which was 30.7% for the whole country (Lucchin, 2009). The rate of patients with BMI <18.5 was 3.1%. In the present study, malnutrition status of patients was examined with BMI and BMI percentiles. The rate of patients with BMI <20 was 9.4% and it was 12.6% on discharge. The rate of patients with less than 25th percentile was 26.1% and 29% on discharge. However, according to the assessment made with NRS-2002, only 20% of the patients who were found to be at risk of admission to the hospital were found to have BMI >20. According to these, the rate of patients who were determined to be at risk during admission was 4.5 times higher according to NRS-2002. In other words, 4 out of 10 patients were found to be at risk with NRS-2002 during hospitalization, whereas only 1 out of 10 patients were defined as malnourished according to BMI. In this study, it was determined that there was a 3.2% increase in the number of patients with BMI <20 at the time of discharge. Of the patients, whose BMI values were in the 20-24.9 range on admission, 22 had BMI <20 on discharge. It was observed that patients with BMI percentile between 25-50 on admission, dropped to a lower range on discharge. All these findings indicate that

although BMI has a limited use for detecting malnutrition, it can be used to simply assess the presence of hospital malnutrition in hospitalized patients. Disease-related malnutrition is common in the hospital and BMI does not consider the severity of the disease. Therefore, it can be stated that the use of BMI alone will not be sufficient to accurately detect the patients who really need nutritional support.

In this study, the relationship between hospital stay and malnutrition was investigated by using BMI, NRS-2002, SGD and NRI. Pichard et al. (Pichard, 2004) reported that BMI was not associated with prolonged hospital stay. In the present study, patients assessed to be malnourished or nutritionally at risk with BMI and NRS-2002 had longer hospital stay. Malnourished patients according to BMI had longer hospital stay than well-nourished, which was also observed in nutritionally at risk patients assessed with NRS-2002.

Decreased albumin levels, which has a half-life of 18 to 20 days, were reported to be associated with lean muscle mass and decreased fat mass during prolonged hospital stay. In contrast to the researchers who reported that albumin level was not a powerful method to determine the nutritional status of the patient and could not predict any complications in advance, there are also researchers reporting that it is a very strong indicator (Vincent, 2003).

In this study, albumin levels of 583 patients were examined at the time of admission and 13.3% of them were found to have low levels of albumin. When examined on discharge (377 patients), it was observed that the rate of patients who were below the normal value was 2.4 times higher (78/120 patients). This may be explained by the high rate of patients who had malignancy, received chemotherapy (approximately 1/4), undergone surgery (more than half) and decreased appetite (more than 1/3). Therefore, albumin level may be an indicator of malnutrition for inpatient chronic patients and patients with high disease severity. Indeed, in the present study, the proportion of patients with nutritional risk assessed with NRS-2002 on admission was approximately 3.4 times that of malnourished patients assessed with albumin levels (78 vs. 263 patients).

Sungurtekin et al. (Sungurtekin, 2004) reported significantly lower levels of total protein and albumin, increased weight loss and decreased BMI in malnourished patients on admission. Similar to these findings, 64 patients of the present study were found to have lower levels of albumin and total protein on admission. The number of patients with low total protein values increased by 1.64-fold (105 patients) on discharge.

Gariballa et al. (Gariballa, 1998) examined the nutritional status of 225 hospitalized acute stroke patients on admission and discharge. At the end of the first two weeks, 64% of the survivors were found to have lost weight, while 45% of the patients lost weight in the following two weeks. McWhirter et al. (McWhirter, 1994)) evaluated the nutritional status of 500 patients on admission and found 200 patients as malnourished. In the same study, 112 patients were reevaluated on discharge and a weight loss of 5.4% on avarage was reported. The majority of these patients were assessed to be malnourished on admission. In another study, weight loss of 202 patients, who were assessed with BMI, were evaluated on admission and discharge. Among those, 65% of obese patients (median hospital stay, 11 days), 66% of patients with normal body weight (median hospital stay, 13 days), 31% of underweight patients (median hospital stay, 15 days) lost weight during their stay in hospital. Kondrup et al. (Kondrup, 2001) reported that patients who were found to be malnourished during the

hospitalization period had both longer hospitalizations and increased weight loss during stay in hospital.

The patients who stayed in the hospital for more than 30 days lost more of their body weight (2.97 kg) than the patients who had less than 7 days in the hospital. The proportion of patients who were hospitalized for 8-14 days and who lost weight is higher than the proportion of patients who were hospitalized between 15-21 days and who lost weight (2.22 kg vs 2.67 kg). It can be stated that the amount of lost body weight increases as the duration of hospitalization is prolonged. This can also be interpreted as part of the patients recovered their weight loss during their hospitalization period. However, it is possible to state that the catabolic process of the patient is accelerated by looking at the increase in the average weight lost by the patients who can not gain weight. The above-mentioned data of the present study is consistent with other researches.

The fact that individuals stay in hospital for a long time depends mainly on the nutritional status of the patient during admission but also depends on the severity of the disease. Patients with longer hospital stays have cancer, infectious diseases or chronic diseases. The long duration of treatment in such groups and the negative effect of the treatment on nutritional status result in decreased food consumption of individuals. In addition to this, the psychological problems caused by the disease and hospital environment during stay, unattractive eating environment, serving the dishes that the patient is not accustomed to, taste and odor changes due to the causes of the disease, dry mouth, wounds in the mouth, chewing and swallowing difficulties. According to the findings in the present study, 43 of the hospitalized patients were treated with diet therapy. In the hospital, dietary treatments are often incompatible with the patients' tastes, include many restrictions, may be more limited in the amount of energy and nutrients previously consumed by the patient and reduces the desire to consume food. It has been reported that appetite decreases due to physical treatments such as medical treatments during hospital stay, negative emotional effects of being in hospital, and pain due to physical reasons (Tarbuck, 1997). In this study, 273 patients reported that their appetite changed during hospital stay, while 4.7% of patients reported severe appetite changes. Resting (dependence on bed, inactivity) is one of the factors that reduce food intake. The above mentioned problems and lack of appetite negatively affect food consumption and cause insufficient food consumption which causes the patient to lose weight in the hospital.

The majority of patients receiving chemotherapy have lost body weight prior to treatment due to illness and hospital stress. In chemotherapy, oral ulceration is associated with nausea, vomiting, and gastrointestinal failure, which results in diarrhea. It has long been known that this toxicity leads to reduced food intake and deterioration of nutritional status. In a study, it was found that 20% of cancer patients who were were assessed to be underweight by BMI on admission. All of those patients lost weight after chemotherapy. It has been reported that negative nitrogen balance occurs in patients even all their energy and protein requirements are met (Gundy, 2008). When nutritional status of 561 patients with head, neck, digestive system and lung tumors were evaluated, nutritional problems (loss of appetite, nausea, dysphagia) were found in almost all of them and weight loss was found in 90% (Kondrup, 2002). In this study, it was found that chemotherapy was a factor causing weight loss. Of the patients, 16.4% had head and neck, 11.5% had rectal or colon carcinomas and 7.2% had gastric cancer. Hence, weight loss may have been inevitable due to the treatments they received during hospital stay and the operations they had undergone which might have decreased nutrient consumption.

Weight loss was observed in more than one third of the patients of the present study. Ulander et al. (Ulander, 2013) reported weight loss in 4.7% of patients undergoing colorectal surgery during hospital stay. Krakau et al. (Krakau, 2007) reported weight loss in 4.4% of the patients undergoing neurosurgery, while Fettes et al. (Fettes, 2001) reported weight loss in patients undergoing major gastrointestinal surgery. Weight loss in patients undergoing surgery is the expected outcome with the severity of the operation and psychological reasons. In this study, weight loss was found in one of the patients who were on irnmunsupressive therapy for the duration of hospital stay. The most common side effects of immunosuppressive drugs are bone marrow suppression, immune suppression and infections. It is recommended that many drugs be used together to suppress the side effects of these drugs. This situation causes the use of multiple drugs in patients. The adverse effects of multiple drug use on food intake are discussed above. In addition, patients receiving such treatment have a higher severity of disease, which might have been another cause of weight loss.

It has been reported by ESPEN that enteral and / or parenteral nutrition therapy for patients with weight loss or oral intake will be restricted for longer than 7 days after the operation (Vincent, 2003). Nutritional services are among the factors that affect the preference of the hospital when needed. In the study of Şahin et al. (Şahin, 2006), it was reported that approximately half of the patients found food quality sufficient and the two most important factors affecting the satisfaction of food were the appearance and taste of the dishes. In the UK hospital satisfaction survey, most of the patients were satisfied with the patient's meals. However, it was reported that patients' not knowing that the menus used in the hospital were suitable for their treatment, and the environmental factors that prevent eating during meal times (meal cleaning in the room, nurse arrival, noise) significantly reduces patient satisfaction (Correia, 2003). It has been reported that less than half of the lunch and dinner meals for the hospitalized patients were consumed, and the lack of appetite, smell and warmness of the meals were among the main reasons limiting eating (Tarbuck, 1997). Among the factors that frequently affect food satisfaction negatively, the taste of food, unsuitable food hours and inadequate temperature of the meals were reported (Tarbuck, 1997).

In this study, it was found that the food consumption increased as the food satisfaction increased. This result is consistent with other studies in the literature. One of the factors affecting food satisfaction in hospital is the length of hospital stay. The longer the hospital stay, the lower the satisfaction of eating (Sorensen, 2008). Although there was no significant relationship between reduced food satisfaction and prolonged hospital stay, the rate of dissatisfaction with food increased as the duration of hospitalization increased. The psychological status of the patient should be taken into consideration in the factors affecting the food satisfaction in the hospital. Even if the patient is eating at a desk rather than a bed during his stay in the hospital is a factor that increases eating (Correia, 2003).

5. Conclusions and Recommendations

Malnutrition is often unrecognized and/or undefined. It increases morbidity and mortality in acute and chronic diseases, costs and prolongs with treatment and convalescence periods. Therefore, assessment of nutritional status of the patient on admission to the hospital, and malnutrition is essential. Early nutritional support to patients with malnutrition (oral, enteral, parenteral) should be provided. The length of hospital stay is among the factors that decrease body weight. In order to prevent hospital malnutrition, the nutrition should be reassessed by the dietitian during the

hospitalization period. Preparing delicious meals, increasing food intake of the hospitalized patients, adjusting and scheduling the food delivery according to the needs of the patients are important steps of creating alternative approaches to traditional menu systems. Questionnaires should be applied to determine the satisfaction level of meals and food service, and the features that are thought to be negative should be corrected. Since the only source of hospital food service is hospital kitchen, menu diversity should be ensured; the points that require change should be corrected by following the results.

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