Nutritional changes and effects in hospitalized patients

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ABSTRACT

Objective: To determine the effect of hospitalization in the internal disease clinics on nutrition variables.

Method: This study was a cohort-type study performed in the Internal Diseases Clinics, University Hospital in Turkey. We included 208 patients who were hospitalized in the Internal Diseases Clinics of the University between June and August 2003. The clinical nutrition parameters of all the patients were evaluated from anthropometric measurements and laboratory results at admission and discharge.

Results: Of 208, 105 were females, and 103 were males. The average age was 57 ± 13.5 (18-85) years. Average hospitalization period of the cases was 14 ± 10 (1-73) days. While the average body weight at admission was 71.6 ± 10.9 kg and it was found to be 70.7 ± 1.3 kg at discharge (paired sample t test, $p<0.001$). We noted the statistically significant decrease in the body mass index, waist and hip measures, muscle-skin folds thickness, and body adipose mass ($p<0.05$). Decreases were observed in all the clinical parameters of laboratory test results of the patients indicating end products of fat, protein, and carbohydrate metabolism ($p<0.05$). It was observed that the demographic characteristics of the patients (age, gender, occupation, education, and so forth) did not affect the decrease in nutritional parameters ($p>0.05$).

Conclusion: It was observed that decreases occurred in all the nutrition parameters of the patients who were hospitalized in the internal diseases clinics. It is suggested that these decreases are related to entire fat, protein, and carbohydrate metabolism. Nutritional parameters of patients should be followed during hospitalization with the purpose of preventing regression in nutrition parameters.

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A healthy life is possible by maintaining the physiological and metabolic functions of the organism. The role of a sufficient and balanced nutrition is important in maintaining these functions in a regular manner.[1-3] Sufficient and balanced nutrition also play an important role in the treatments of diseases as well as in maintaining health.[4,5] The course of illnesses can be longer and more severe, productivity of the individual can be reduced, and life period can be shorter if nutrition is insufficient.[6-8] Consummation of nutrients, clinical findings, and anthropometric measures are used in the evaluation of nutritional status. Changes in the parameters used in the evaluation of the nutritional status are important indicators in some diseases.[6,9,10]

Proper nutrition of, and applying nutritional support to the patient during the stay in the hospital can increase the efficiency of the medical treatment and reduce the complications of the disease, and can also be beneficial for the patient by reducing the time spent in the hospital, whatever the type of the disease is.[11,12] Relieving the patients from malnutrition,

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who are in this status for any reason, preventing the patients who are candidates of malnutrition due to nutritional problems, reducing the morbidity and mortality related to malnutrition, and shortening the periods of hospitalization and being bedridden are extremely important. Therefore, we must have adequate knowledge and skill in nutrition; and the nutritional status of patients should be evaluated routinely. Measurements of body weight and height, and relative body weight (current weight/required weight), and body mass index (BMI) based on these are generally used in the evaluation of nutritional status. Weight for frame size, skin fold thickness, and body adipose tissue ratios are included in other bedside measurements.[1,12,13-15] It has been shown in the studies performed that malnutrition ratio in hospitalized patients ranges between 15-85%, according to the type of the disease and period of stay in the hospital. According to recent studies, prevalence of hospital malnutrition changes between 20-80% even in the most developed countries.[1,3,16]

In order to prevent bad nutrition or to treat the current malnutrition in patients, all the care providers, and doctors, nurses, and dietitians in the first place, should have a certain level of knowledge and skill in this area. A coordinated "nutrition team" that is well-informed, and able to follow innovations in this field, is required to determine the patients who need nutritional support and to create a treatment program. Health organizations are basic social organizations helping individuals in acquiring desired/conscious behavior patterns in subjects of health/illness. The individuals with the most active tasks in these organizations are doctors and nurses. A subject that doctors and nurses should handle with carefulness together with dietitians is nutrition with no doubt. Therefore, we evaluated the nutritional changes of patients while staying in hospital in the internal diseases clinics (anthropometric measurements), and investigated the effects of hospitalization on the nutrition variables of the patients.

Methods. Two hundred and eight patients were included in the study out of a total 340 patients who were hospitalized in the University Hospital Internal Diseases Clinic between June and August 2003 for at least 24 hours, who did not take diuretics, who were free from hypo/hyperthyroidism, end-stage kidney, liver, and cardiac failure, and diarrhea, and who were able to communicate. This study was performed with the purpose of investigating the effects of hospitalization on the nutrition variables in University Hospital Internal Diseases Clinics as a cohort-type study.

For the evaluation of nutritional status, socio-demographical characteristics of the patients (age, gender, educational status, marital status, occupation, monthly income, diagnosis, social security, dates of admission to, and discharge from the hospital, drugs taken at home and in the hospital, diet, diabetes) were requested, and anthropometric measurements were taken. Laboratory blood test results, ordered by the physicians at admission and discharge were included in the evaluation. Evaluation of nutritional status and anthropometric measurements were performed at admission and discharge. Bio impedance technique, which used Omron Body Fat Monitor (BF 306, Omron Matsusaka Co. LTD) was used in the calculation of body fat ratio. Patients were evaluated according to the changes at admission and discharge. Patients were grouped as those without changes in nutritional parameters, those with increases, and those with decreases; and risk factors affecting nutrition were determined. Skin folds (biceps, triceps, and subscapularly) were measured with the help of a caliper. Height, weight, waist measure, and hip skin folds (with caliper) were taken among the anthropometric measurements in the patients who were included in the study, and the arm line and body fat ratio were calculated. A portable scale was used for measuring the body weight. Height was measured with a non-elastic measure. Body weight was measured with minimal clothing on, after taking off coats, waistcoats, cardigans, and so forth, and shoes and slippers. Body height was measured as the distance from the highest point of the head to the floor when barefoot, head in upright position, chest slightly thrust out, abdomen pulled in, heels together, knees tight, and external meatus and eye level on the same plane (Frankfurt plane).

The Statistical Package for Social Sciences, was used for the evaluation of data. Frequency and percentile values of grouped variables, and mean values and standard deviations of numeric values were calculated in the statistical evaluation. All the questions in the study questionnaire have descriptive features. In the evaluation, t-test, paired sample test and correlation test were used. Statistical significance level was accepted as $p<0.05$. T-test was used for the mean of 2 separate variables and correlation analysis to study the relation between nutritional level, and other variables thought to affect it. Changes between the laboratory findings at admission and discharge, and anthropometric measurements were found. Mean values of the differences found were analyzed. These analysis values were shown in the **Tables 3-5.**

Results. When the socio-demographical distribution of the patients included in the study is

examined, it was seen that 50.5% were females and 49.5% were males, 33.7% were graduates of primary school, 22.1% were illiterate, 18.8% were graduates of high school, and 10.1% secondary school, 7.7% were literate, and 7.6% were graduates of universities, 81.7% were married and 4.8% were single, and 13.5% were widows/widowers. When occupations are considered, 43.3% were housewives, 29.8% were public officials, 7.7% were retired blue-collars, 5.7% were farmers, and 0.5% were unemployed. Average age was 57 ± 13.5 years, and average stay in hospital was 14 ± 10 days. Among the anthropometric measurements of the patients included in the study, statistically significant changes were noted in initial values of BMI, body weight, waist and hip measurements, triceps skin fold thickness (TSFT), biceps skin fold thickness (BSFT), subscapularly skin fold thickness (SSFT), body fat ratio, and arm line at admission to, and final values at discharge from the hospital ($p<0.05$) (**Table 1**).

Distribution of the patients included in the study is shown according to laboratory findings at admission to, and discharge from the hospital. Significant changes between the initial values during the admission and final values at discharge of cholesterol, triglycerides, total protein, albumin, urea, creatinine, prothrombin time (PTT), calcium, hemoglobin (Hb), and fasting blood glucose of the patients included in the study ($p<0.05$) (**Table 2**). Mean of the differences of initial BMI taken at admission and final BMI at discharge according to marital status, age groups, educational status, and occupational groups are not statistically significant ($p>0.05$) (**Table 3**).

When the relation between the laboratory findings of the patients included in the study and their stay in the hospital was examined, a statistically significant difference was noted between the change in the average value of cholesterol measured at the admission in the hospital and measured at discharge, and period of hospitalization. This relation is a weak one in reverse direction. Difference between the initial and final values of cholesterol decreases with the increasing hospitalization period (r=-0.180, $p<0.05$) (**Table 4**). No statistically significant relation was found between initial values measured at admission and final values measured at discharge and period of hospitalization was found for fasting blood glucose (r=-0.101, $p>0.05$), triglyceride (r=-0.060, $p>0.05$), albumin (r=0.033, $p>0.05$), urea (r=0.130, $p>0.05$), creatinine (r=0.128, $p>0.05$), uric acid (r=0.058, $p>0.05$), PTT (r=0.039, $p>0.05$), Ca (r=0.073, $p>0.05$), and K (r=0.055, $p>0.05$), which are among the measured laboratory tests performed (**Table 4**).

There is a significant relation between the initial values measured at admission and of BMI, body weight, hip line, TSFT, and arm line, and final values of BMI, body weight, hip Line, TSFT, and arm line measured at discharge and period of hospitalization of the patients included in the study (r=0.25, $p<0.05$). This relation has a positive direction. Difference between the initial and final values of BMI increase with the increasing hospitalization period (**Table 5**). No statistically significant relation was found between other anthropometric measures, namely, waist/hip ratio (WHR), BSFT, SSFT and body fat ratio and hospitalization ratios ($p>0.05$) (**Table 5**).

Discussion. This study was performed with the purpose of determining the effects of hospitalization on nutritional variables of the patients staying in the Internal Diseases Clinic by evaluating their nutritional statuses (anthropometric measurements). In our study, it was found that hospitalization caused reducing in nutritional parameters, body weight, BMI, waist, arm, and hip lines, thickness of biceps, triceps, and subscapularly skin folds, and in body fat ratio. Increase in body fat distribution with the increase in BMI, and especially with central obesity is the most important factor affecting mortality. These factors have been shown with various studies performed on adults.[17,18-20] Adults have been grouped according to BMI, which is not dependent on age and gender, as low-weight, normal weight, overweight, and obese in 1995.[1-4]

Body mass index standardization studies in Turkey have been limited in provincial level, and there are BMI references in the literature for the year 2001 for Istanbul and Izmir.[18] Using BMI in studies has increased during the last 2 decades with the development in BMI concept, improvements in the reliability of the studies, arranging of national BMI percentiles, and its being accepted by WHO as the main criterion.[1,4]

In our study, it was observed that hospitalization caused a decrease in body weight. In our study also, it is possible that control of energy intake and use was inadequate. This suggests that the diet therapy applied to the patients, and the hospital environment might cause decrease in body weight. In can be suggested that energy taken from the foods decreases spontaneously due to the decrease in the physical activities of the patients staying in the hospital, and this in turn can cause loss in body weight. Some disease groups also affect feeding of the patients. However, disease that might mislead us in anthropometric measurements have been eliminated. Being WHR less than 1.0 in males, and 0.8 in females are the limit values for obesity. It was found in a studies, that WHR is higher in males as compared with females.[21,22-24] This

Table 1 - Distribution of patients included in the study according to anthropometric measurements at admission to the hospital and discharge (N=208).

Anthropometric measurements	Mean value at admission	Mean value at discharge	*P*-value*
Body mass index (kg/m^2)	26.5 ± 4.4	26.3 ± 4.5	0.004
Body weight (kg)	71.6 ± 10.9	70.7 ± 11.3	0.000
Waist line (cm)	93.4 ± 12.3	92.6 ± 12.4	0.002
Hip line (cm)	97.6 ± 11	96.9 ± 10.9	0.000
Waist / hip ratio	0.95 ± 0.02	0.95 ± 0.03	0.465
Triceps skin fold thickness (mm)	14.1 ± 7.8	13.5 ± 7.7	0.000
Biceps skin fold thickness (mm)	8.7 ± 6.4	8.1 ± 6.3	0.000
Subscapularly skin fold thickness (mm)	17 ± 6.5	16.3 ± 6.6	0.000
Arm circumference (cm)	29.5 ± 7.4	29.1 ± 7.4	0.000
Body fat ratio (%)	32.1 ± 9.7	31.7 ± 9.9	0.003

*Paired samples test

Table 2 - Distribution of patients included in the study according to laboratory findings at admission to the hospital and discharge (N=208).

Laboratory findings	Mean value at admission	Mean value at discharge	*P*-value*
Cholesterol (mg/dl)	202 ± 67	179 ± 46	0.000
Triglyceride (mg/dl)	171 ± 136	142 ± 94	0.001
Total Protein (g/dl)	6.8 ± 0.8	6.6 ± 0.8	0.000
Albumin (g/dl)	4 ± 0.6	4 ± 0.6	0.756
Urea (mg/dl)	41.4 ± 26.2	38.1 ± 24.8	0.024
Creatinine (mg/dl)	1.2 ± 1.4	1 ± 1.1	0.007
Uric acid (mg/dl)	6.6 ± 6.6	6.3 ± 5.5	0.041
Prothrombin time (sec)	13.7 ± 5	15.8 ± 10.3	0.091
Calcium (mg/dl)	9.2 ± 0.8	9.3 ± 0.6	0.111
Hemoglobin (g/dL)	13 ± 2.2	12.7 ± 1.9	0.009
Fasting blood glucose (mg/dl)	150 ± 95	116 ± 39	0.000
Potassium (mEq/l)	4.3 ± 0.5	4.4 ± 0.4	0.061

*Paired samples test

Table 3 - Distribution of changes between body mass index values in admission to the hospital and discharge of the patients included in the study according to demographic characteristics (N=208).

Demographic characteristics	N	Mean ± SD	*P*-value*
Marital status			
Married	170	0.29 ± 3.06	0.773
Single and widow/widower	38	0.15 ± 0.74	
Age			
60 years of age and more	114	6.36 ± 3.01	0.237
60 years of age and less	94	0.52 ± 2.47	
Education			
More than primary school	132	0.30 ± 0.81	0.807
Primary school graduate or less	76	0.20 ± 4.50	
Monthly income			
$300 and over	113	0.47 ± 2.30	0.256
$300 and less	95	3.14 ± 3.26	
Occupation			
Housewife	170	0.29 ± 3.06	0.773
Public official, blue collar, farmer, unemployed	38	0.15 ± 0.74	

*t-test

Table 4 - Relationship between changes in laboratory findings of the patients included in the study and hospitalization periods.

Laboratory findings	Hospitalization period	
	r	*P*-value
Cholesterol	0.180	0.037
Triglyceride	0.060	0.488
Albumin	0.033	0.971
Urea	0.130	0.094
Creatinine	0.128	0.079
Uric acid	0.058	0.481
Prothrombin time	0.039	0.781
Calcium (Ca++)	0.073	0.333
Potassium (K+)	0.055	0.448
Hemoglobin	0.138	0.058

r - correlation

Table 5 - Relationship between the changes in anthropometric measurements of the patients included in the study and hospitalization periods.

Anthropometric measurements	Hospitalization period	
	r	*P*-value
Body mass index	0.25	0.000
Body weight	0.29	0.000
Waist line	0.03	0.628
Hip line	0.20	0.003
Waist/hip ratio,	0.05	0.461
Triceps skin fold thickness	0.20	0.003
Biceps skin fold thickness,	0.10	0.148
Subscapularly skin fold thickness.	0.07	0.281
Arm line	0.17	0.011
Body fat ratio	0.11	0.98

r - correlation

finding parallels our study. It was observed during the study that the patients did not like the dishes offered to them, and did not eat. We believe that this could be important in loss of body weight. Effects of energy intake and spending have been emphasized in many of the studies performed. It has been noted that individuals with greater body weights spend less energy as compared with those with less body weight, and their activities decreased with the diet.[17]

In our study, decreases in all the laboratory findings during the hospitalization period, and the presence of significant changes between them suggests that the treatment applied and the diet were effective. It was found that the average values of cholesterol and triglycerides measured at admission were higher than the average of the final values taken at discharge. Keskin[24] suggests that the diet applied to patients in hospitals can be the cause of decrease in body fat ratios. In our study, decrease in BMI can be the cause of decrease in triglyceride values. Low-calorie feeding also can be the cause of decrease in cholesterol and triglyceride values of the patients (**Table 2**). A positive correlation was found between the nutritional status and Hb concentration; and it was observed that Hb values decreased in insufficient nutrition.[18] Anemia worsens the ability of working and learning, and resistance against illness. It worsens health status, and increases mortality ratios. Failure to meet the increased iron need with diet is among the basic causes of iron deficiency anemia.[19] It is believed that consuming drinks with caffeine like coffee and tea, more in males as compared with females, can cause decrease in Hb ratio.[18] A significant positive relation was found between creatine and uric acid (*p*: 0.016, r: 0.19). A decrease can be expected since these are substances excreted through kidneys. In our study, it was found that anthropometric measurements and laboratory findings of the patients at admission and discharge were not affected by socio-demographical characteristics such as gender, age, educational status, marital status, occupation groups, and social security.

As a result, we saw in our study that hospitalization period affected the nutritional variables (laboratory findings and anthropometric measurements). Proper eating of the patients during their stay in the hospital, and applying nutritional support whenever required, can increase the efficiency of medical therapy, and reduce the complications of the disease whatever the type of the disease is, as well as reducing the costs by shortening the hospitalization period.

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References

1. Kupusoglu OH. Evaluation of nutritional statuses of patients in neurosurgery and urology clinics-concept of hospital malnutrition [specialty thesis]. Istanbul, Turkey: Istanbul University Cerrahpasa Medicine School, Anesthesiology Department; 1998. p. 1-3.
2. Ozturk M, Unser E. Nutritional problems and legal status. Isparta, Turkey: Suleyman Demirel University Medicine School Public Health Department; 1997. p. 8.
3. Urpek O. Effects of radiotherapy applied to hospitalized patients with neck and head cancer on nutritional statuses of the patients, and importance of nutritional support [specialty thesis]. Ankara, Turkey: Hacettepe University; 2001. p. 1.
4. Soyak I, Koca E. Total parenteral nutrition (review). Ankara, Turkey: ***Hacettepe Medical Journal*** 2000; 31: 207.
5. Egemen A, Demir N, Aksit S. An indicator of healthy eating. In: Unser E, Ozturk M. Nutritional problems and legal status [Report Summary Book]. Isparta, Turkey.Ege University Medicine School Public Health Department; 1997. p. 32.
6. Lloyd C, James L, Mullen MD. Nutritional assessment and indications for nutritional support. ***Surgical Clinics of North America*** 1991; 3: 71.
7. Tuzcu N. Role of nurse in nutritional support therapy. In: Yurtkuran M, Parlak M, Uludag I. Internal Diseases Nursery [Symposium Summary Book]. Bursa, (Turkey): U.U. Medicine School Chief Nurses, Dialysis and Transportation Nurses Association; 2003.
8. Kiziltan G, Boyacioglu S. Basic Internal Diseases, Nutritional Disorders and Diseases in Nutritional Requirements, Recommended Food Intake, Vol 2. Ankara, Turkey: Guner Press; 1996.
9. Boyacioglu S. Nutritional Support and Gastrointestinal System. In: Ozden A, Fiahin B, Yilmaz U, Soykan I, editors. Nutritional support and gastrointestinal system. Istanbul, Turkey: Turkish Gastroenterology Foundation Publishing. 2002. p. 777-785.

10. Ilicin G, Unal S, Akalin S, Biberoglu K, Suleymanlar G. Basic Internal Diseases Book, Nutritional disorders and Diseases, Vol. 2. Ankara, Turkey: Guner Press; 1996. p. 57-1615.
11. Metin N. Upper arm anthropometric parameter values in determining body fat amount in obese women [master thesis]. Istanbul, Turkey: Istanbul University Health Sciences Institute, Internal Diseases Department; 2000. p. 2.
12. Carpenter J, Griggs CR, Loscalzo J. Principles of supportive nutrition in adult patients in Cecil Essentials Of Medicine, Turkish Translation. In: Carpenter J, Cavusoglu H, editors. Philadelphia: Nobel Medicine Press Inc. Co., Tavasli Press; 2002. p. 522-523.
13. Taner Z. Importance of evaluation of nutritional and inflammation status in patients with cystic fibrosis [specialty thesis]. Istanbul, Turkey: Istanbul University Medicine School, Pediatric Health and Diseases Department; 1996.
14. Demirel I. Comparison of different nutritional methods for providing nutritional support in patients with head trauma, [specialty thesis]. Istanbul, Turkey: Istanbul University Anesthesiology Department; 2001.
15. Ozturk Y, Buyukgebiz B, Arslan N, Ellidokuz H. Effects of hospital stay on nutritional anthropometric data in Turkish children. ***J Trop Pediatr*** 2003; 49: 189-190.
16. de Kruif JT, Vos A. An algorithm for the clinical assessment of nutritional status in hospitalized patients. ***Br J Nutr*** 2003; 90: 829-836.
17. Kavas A. Nutritional elements recommended for a healthy life. Book of Accurate Eating for A Health Life, Winston-Salem, North Carolina:Winston Salem; 1999. p. 147.
18. Saruhan S. A study on determining the validity of anthropometric measurements used in evaluating the nutritional status in the aged [thesis for specialty in science]. Ankara, Turkey: Hacettepe University Health Sciences Institute; 1996.
19. Yucecan S. A study on the relation between body mass index and hematological parameters, Nutrition and Dietetics Program [thesis for specialty in science]. Ankara, Turkey; 1993.
20. Sarigul Y. Characteristics of lipid profile in central and peripheral obesity cases, and relation with other anthropometric and metabolic parameters [doctorate thesis]. Istanbul, Turkey: Istanbul University Health Sciences University Biochemistry Department; 1999.
21. Akpinar R. Determining of the problems of the hospitalized patients concerning eating and drinking [master thesis]. Erzurum, Turkey: Ataturk University Health Sciences Institute, Essentials of Nursery Department; 1998.
22. Bertan M, Cagatay G. Nutrition in chronic and degenerative diseases, Public Health Basic Information Book. 1994. p. 292.
23. Yildiray K. Characteristics of lipid profile in central and peripheral obesity cases, and relation with other anthropometric and metabolic parameters [doctorate thesis]. Istanbul, Turkey: Istanbul University Health Sciences University Biochemistry Department, Istanbul University Health Sciences Institute, Biochemistry Department; 1999.
24. Keskin G. A study on the relation between body mass index and hematological parameters [thesis for specialty in Science]. Ankara, Turkey: Hacettepe University Health Sciences Institute, Nutrition and Dietetics Program; p. 1993.