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Effects of enteral nutritional support on malnourished patients with inflammatory bowel disease by subjective global assessment

SMALL BOWEL / COLON

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Original Article

ABSTRACT

Background/Aims: To investigate the prevalence of malnutrition in patients with inflammatory bowel disease (IBD) by subjective global assessment (SGA) and the effects of oral nutritional support on the clinical parameters, consumption of energy, macronutrients and fiber intake in the Study and Control groups, prospectively.

Materials and Methods: A total of 38 (28 Male; 10 Female) hospitalized patients with moderate or severe IBD (13 with Crohn's disease (CD); 25 with Ulcerative colitis (UC)) were included. At stage 1, the disease severity, clinical symptoms and, signs, food consumption and nutritional status by using subjective global assessment (SGA) were recorded. At stage 2, the patients were blindly randomized into a Study Group and Controls. In the Study Group, a standard enteral product was added into the regulated hospital diets, but for the Controls, deficits were regulated by only hospital diets for 3 weeks. the independent variables were the group, the disease and its activity, age, Body body mass index (BMI), weight loss history, the hospitalization period; the dependent variables were SGA, bowel movements, change in nutritional status, disease severity, clinical findings, and also consumption of macronutrients.

Results: Prevalance of malnutrition (SGA-B or SGA-C) for all the patients was 92.1% at the beginning and 71.1% at the end of study. Improvements in disease activity score for the patients with UC were statistically significant in both the Study Group and the Controls (p=0.006 for the Study Group and p=0.001 for the Controls, respectively). Macronutrients, total and water soluble fiber consumption levels improved, with statistically significant differences for all the groups.

Conclusion: The prevalence of malnutrition is a major problem in patients with IBD. Not only the regulation of hospital food, but also enteral nutritional support, improved their levels of malnutrition, as well as their energy, macronutrients, and fiber consumption, and SGA is an easy method for nutritional monitoring.

Keywords: Ulcerative colitis, Crohn's disease, oral-enteral nutritional support, malnutrition, subjective global assessment

INTRODUCTION

Crohn's disease (CD), a form of inflammatory bowel disease (IBD), effects every segment of the gastrointestinal tract from the mouth to the anus, resulting in tissue necrosis by inflammation. The most important result of this disease is that it effects all layers such as intestinal mucosa, submucosa and serosa. Ulcerative colitis (UC), effecting large bowel mucosa, and continuing with relapse and remissions, is considered to be idiopathic.

The prevalence of protein-calorie malnutrition in the general medical wards has been reported to be as high as 44-48% in single-center studies in which there was active screening and evaluation for malnutrition (1,2).

Data extracted from the Nationwide Inpatient Sample NIS, between 1998 and 2004, shows that after adjustment for age, comorbidity, sex, health insurance, income and, hospital characteristics, the odds ratio for malnutrition among IBD admissions compared with

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non-IBD admissions was 5.57 (95% CI 5.29-5.86). According to the same study, a greater proportion of IBD patients with malnutriton received parenteral nutrition (PN): 26% of patients with CD; and 25% with UC received PN, whereas 6% of non-IBD patients received PN (3).

The malnourishment ratios of patients with IBD also increase with the onset of the disease. The percentage of malnutrition in patients with CD in the remission phase was reported to be 38.9%, whereas it was 82.8% in the active phase (4). However, malnutrition is thought to be frequently underdiagnosed and the situation may be even more common among patients who are hospitalized for IBD (5).

The degree of malnutrition shows a wide spectrum. Nutritional deficiencies result from disease onset (nausea, vomiting, abdominal pain, diarrhea), malabsorption (protein loss from inflamed and, ulcerated mucosa), bacterial overgrowth, translocation, blood loss, fasting-investigations for diagnosis, restricted/decreased food intake (anorexia, supression of appetite, taste changes, fear of eating and oral aphtous ulcerations, sitophobia), medications (side effects) intestinal loss at each hospitalization, surgical resections and increased requirements of nutrients for healing. These deficiencies will differ between individual patients depending on the location of the disease activity and the specific nutrient absorption found at these sites. This situation also creates a vicious circle that causes a more frequent repetition of the disease (6-11).

Clinical problems and nutritional deficiencies have been investigated for a long time. These are, weight loss (65-75% in CD; 18-63% in UC (12,13)), growth failure (25-40% for CD (13,14), 5% for UC (15)), pubertal delay (30% for CD (16), 20% for UC (17)), hypoalbuminemia (25-80% for CD, 15-50% for UC (13)), anemia (54-80% for CD, 66% for UC (13,18)), iron deficiency (25-53% for CD, 81% for UC (13,19)), folic acid deficiency (10-62% for CD (13,19), 30-41% for UC (13,20)), vitamin B_{12} deficiency (3-48% for CD (13,19), 5%for UC (13)), calcium deficiency (13% for CD (13)), magnesium deficiency (14-33% for CD (13)), vitamin A deficiency (11-50% for CD (13,19), 93% for UC (19)), vitamin D deficiency (23-75% for CD (13,19), 35% for UC (20)), vitamin E deficiency (40% for UC (21)), zinc deficiency (1-40% for CD (19,22)), copper deficiency (1-3% for CD (19)) and, selenium deficiency (35-40% for CD (23)) as percentages in patients with CD and UC, respectively.

The mechanism, spectrum, severity, progression and management of malnutrition in patients with CD and UC are partly different. Although UC patients generally have better diets than those with CD, acute malnutrition develops as a result of nutritional deficiencies during a hospitalization period (7-11).

Nutritional assessment is a process by which changes in body nutritional composition are estimated, in part to predict the risks of stressful therapeutic activity such as surgery, chemotherapy, immune suppression, or treatment of patients with IBD. Valid methods of assessment should facilitate patient selection for instituting artificial nutrition and for determining the efficacy of nutritional interventions. Although the functional measures of lean body mass, such as skeletal muscle strength, respiratory and cardiac performance, hepatic synthesis function, renal status, and immunologic reactivity, seem most desirable, in practice such approaches have proved difficult. Additionally, although acceptable studies of nutritional assessment techniques should be randomized, prospective and blind, most published studies were retrospective for selected patients. A careful history plus physical examination by an experienced clinician yields the same accuracy as extensive testing for the estimation of nutritional risk, particularly when functionality is assessed (24).

The nutritional status of hospitalized patients can be assessed by a variety of methods including clinical history (weight loss, anorexia, weakness, inability to carry out normal functions, subjective assessment) plus physical examination (muscle wasting, loose or otherwise abnormal skin, edema of hypoproteinemia, weakness, loss of body fat and pallor), a body composition analysis (methods for the determination of lean body mass such as bioelectric impedance, displacement of water volume in various part of the body, exchange of labeled ions (exchangeable sodium /exchangable potassium ratio, neutron activation analysis, total body contours, decrease in phosphocreatine in magnetic resonance imaging, organ size and volume measurements in computerized tomography), indirect calorimetry (oxygen consumption, CO_2 production, determination of respiratory quotient), anthropometric measurements (ideal body weight, creatinine-height index, skinfold thickness, arm muscle circumferences, body-mass index), biochemical measurements (albumin, transferrin, prealbumin, portal vein insulin/glucagon ratio, cholesterol, glucose, measurement of nitrogen balance, measurement of protein breakdown), measurements of the hematologic or immunologic functions (lymphocyte count, anergy), analysis of muscle function (handgrip dynamometry, force-frequency characteristics, rate of recovery from fatigue after electrical stimulation of the ulnar nerve), nutritional risk index (NRI), SGA, and the basal metabolic rate (BMR) (24-26).

After 1987, the SGA method was advanced by using clinical criteria (the findings of a routine history and physical examination) in order to assess nutritional status; using this method a good correlation (convergent validity) was demonstrated between the subjective and objective measurements. Malnutrition diagnosed by the SGA was demonstrated depending on the length of hospitalization. According to this method, in the history of the five features (1. Weight loss in kg and proportion in the previous six months. 2. Changes in to amount and type of diet. 3. Gastrointestinal symptoms such as nausea, vomiting, diarrhea, anorexia, and their duration. 4. Functional capacity-performance status. 5. Stress factors and their relationship with the disease).

During the physical examination four features (1. Loss of subcutaneous fat, 2. Muscle wasting, 3. Edema in both the ankles and the sacral region and, 4. The presence ofascites)is noted and a subjective global assessment status is completed (26,27).

This study was planned and carried out in order to examine the nutritional status and growing malnutrition in hospitalized CD and UC patients and to investigate the effects of oral and / or enteral nutritional support on the subjective global assessment, the clinical findings and the consumption of energy, macronutrients and fibers.

MATERIALS AND METHODS

A total of 38 consecutive hospitalized patients with IBD receiving medical treatment and without any surgical history (13 patients with CD; 25 patients with UC; 28M, and 10F; mean age: 37.1±14.5 years; median: 37; range: 18-70) in our hospital between 2000 and 2004, participated in this research.

This study was prepared as a doctoral thesis for Hacettepe University, the Institute of Health Sciences, the Nutrition and Dietetics Program in Ankara in 2004, and the ethics committee approval was secured. Oral permission was taken from the IBD Study group at the hospital and the study was conducted by the Nutrition Department of Hospital with a multidisciplinary approach by joining Gastroenterology and Gastrointestinal Surgery. All the patients were informed in detail and documented through informed consent about the study.

Independent variables of the study: The group, disease (CD or UC), activity, age, body mass index, weight loss history, and hospitalization period.

Dependent variables of the study: SGA, BMI, nausea, vomiting, bowel movements, change in malnutrition state, general status, disease severity, changes in clinical findings (anorexia, nausea, weight loss or weight gain diarrhea, rectal bleeding, bloody/mucoid diarrhea, and consumption of macronutrients, fiber and water soluble-fiber).

The study was conducted in two stages:

Stage 1: A detailed personal history was taken for applied-medical treatment, eating habits and statement of disease. After physical examination and laboratory investigations (i.e. glucose, urea, creatine, total protein, albumin, CRP, hemoglobin, hematocrit sodium, potassium, phosphorus, magnesium, calcium, chlorine), the severity of illness for CD was evaluated according to Best's Crohn's Disease Activity Index (CDAI), published in 1979 (28) and patients with ileitis, ileo-colitis, and colitis whose CDAI score ≥220, were included in the study. The severity of the disease in patients with UC was evaluated according to the Truelove and Witts criteria published in 1955 (29), and patients with moderate, severe ulcerative colitis and pancolitis were also included in the study, whereas patients with left type or 15-20 cm of distal involvement were not included. In all the patients, an SGA was done at the beginning and the end of study, to determine the level of malnutrition according to Detsky's definition in 1987. According to this definition (27):

SGA-A; well-nourished:
There is no effect of disease on nutrition or weight loss, having a normal diet.

SGA-B, moderate, suspected of being malnourished:
Weight loss of more than 10% in the last 6 months;
or 5-10% weight loss,
or deceleration of weight loss in the last 2 weeks;
or, a definite reduction in dietary intake,
or a hypocaloric (full-liquid, suboptimal-solid) diet at least in the last 2 weeks;
or, significant gastrointestinal symptoms (anorexia, nausea, vomiting, diarrhea) for less than the last 2 weeks.
Or, 2 out of the following 3 findings in a physical examination:

- Mild or severe loss of subcutaneous tissue,
- Muscle wasting,
- Some edema in the ankle, in the sacrum, ascites,

or pleural effusion.

SGA-C, severe malnutrition:
Significant gastrointestinal symptoms (anorexia, nausea, vomiting, diarrhea) over a period of more than 2 weeks;

or, all of the three following findings according to a physical examination:

- Mild or severe loss of subcutaneous tissue,
- muscle wasting,
- some edema in the ankle, in the sacrum, ascites,

or, pleural effusion;
or weight loss of more than 10% in the last 6 months,
or accelaration of weight loss in the last two weeks;
or, a hypocaloric (full-liquid, suboptimal-solid) diet for more than the last 2 weeks;
or starvation.

By measuring the weight and body heigth of patients, weight loss and duration were calculated according to ideal body weight.

Food consumption: Food consumption was observed by the same author and the amounts of patients' daily energy and nutrients were calculated for 3 consecutive days for their first week at the hospital. Then, the mean amounts of macro and micro nutrients were calculated by using the BeBiS® (Beslenme Bilgi Sistemi, 2007, İstanbul: A Turkish Food Code and Nutrient Database; Ebispro for Windows, Stuttgart, Germany, Version II.3 [http://www.bfr.bund.de/cd/801]) program with these observational data.

The patients' energy requirements were calculated using by the Schofield equation (30).

In addition, taking into account stress factors such as fever, stress, status (daily activity, physical capacity, etc.), the necessary additions were added to the Basal Metabolism Energy (BME) (31).

Stage 2: After the first week of observation, patients were randomized into study and Control groups. Patients who rejected the oral consumption of enteral products voluntarily were assigned straight to the Control groups. The average amount of energy and nutrients for each patient was calculated by consuming hospital food for a period of 3 weeks.

Both the needed (required) and the consumed (realized) energy and nutrients were recorded for all the patients. Deficiencies between consumption and needs were supported using oral enteral nutrition product (Novasource® GI control-Nestle Nutrition) for 3 consecutive days per week during the 3- week period in the Study group. The amounts of enteral product were supported, and were changed if necessary. At least 500 mL of enteral product, of which 1 mililiter equals 1kcal, was added to the diet. (This commercial product also includes a benefiber in the form of guar gum, a water-soluble dietary fiber resistant to digestive system enzymes, and can be fermented to form short-chain fatty acids with intestinal bacteria as probiotics (lactobacillus, bacteria bifido etc.). They produce more butyrate than pectin; increased water and sodium absorption prevents the translocation of intestinal bacteria and increases blood flow to small bowel and colon. It has been reported that benefiber prolonges the duration of the passage of the colon's contents and significantly reduces the incidence of diarrhea. Guar gum does not change the bsorption of glucose, fat or protein in the intestine, but decreases the incidence of diarrhea by increasing the passage time of the contents of colon (32,33)). For the Control groups, consumption was also calculated by the same way, and any deficiencies were supported by adjusting the hospital food and the same for the beverages. At the end of three weeks, the BMI and clinical findings were re-assessed and compared to the first-week data for all the patients.

When discharging the patients, they were all consulted and educated by the same dietician for individualized nutrition and also monitored by the IBD department for their medical and nutritional status.

The data were coded and recorded in a computer using an IBM Statistical Package for the Social Sciences (SPSS; Armonk, NY, USA) for the Windows version 17.0 (2009). The Chi-square, Fisher's exact, Student's t, Mann-Whitney U, ANOVA with repeated measures, Friedman, Paired-Samples T,and, Wilcoxon Signed-Ranks tests were all used for comparing the groups. After the statistically significant ANOVA with repeated measures and Friedman Test, we used post hoc multiple comparison tests in order to identify statistically significant pairs. $P<0.05$ was considered statistically significant in all the tests.

RESULTS

The patients characteristics are shown in Table 1. There were no significant differences in gender distribution, mean age, duration of disease, number of hospitalizations, height, weight and BMI both at onset and during the last hospitalization, current hospitalization period, usage of drugs as 5-ASA, azathioprine and corticosteroids, depression, neurosis, or other underlying medical conditions that may have infuenced the nutritional status between the Study and Control patients in the UC and all the IBD groups (for all $p>0.05$); whereas, there was only one significant difference of mean hospitalization period between the Study and Control groups in patients with CD. The average current hospitalization period was longer for the Study group than the Controls (40.0±13.3 days for the Study vs 26.3±5.7 days for the Control groups, respectively ($p=0.044$; for other parameters of patients with CD p values were higer than 0.05)

The mean body weight (and BMI) losses before the last hospitalization period were 12.5 kg (3.9 kg/m^2), 6.5 kg (2.2 kg/m^2) for the patients in the Study group and the Control group with UC, respectively; 18.0 kg (6.7 kg/m^2) 3.0 kg (1.8 kg/m^2) for patients with CD; and 14.0 kg (5.0 kg/m^2), 5.7 kg (2.1 kg/m^2) for all the IBD, respectively. 60.0% of patients in the Study group and 26.1% of patients in the Control groups gained weight.

The prevalences of malnutrition (SGA-B+SGA-C) was calculated as (35/38) 92.1% at the beginning of the study and still (27/38) 71.1% at the end of the study for all the IBD patients (Table 2). The prevalence of malnutrition was (22/25) 88.0% for patients with UC and (13/13) 100.0% for patients with CD at the beginning of the study; and (16/25) 64.0% for patients with UC, and (11/13) 84.6% for patients with CD at the end of study, respectively.

Tables 3a and 3b show the initial and final disease activities of the patients according to the Study group and the Control groups with UC and CD, respectively. There was a statistically significant difference in disease activity levels between the Study group and the Controls in patients with UC at the beginning ($p=0.040$). The ratios of patients with a severe activity of UC was higher in the Study group than the Controls (8/9, 88.9% for the Study group, 7/16, 43.7% for the Controls), but there was no significant difference at the end of study ($p>0.05$). At the end of study the ratios of patients with mild or medium disease activity of UC were higher than those initially. Improvements in the disease activity scores of patients with UC were statistically significant in both the Study group and the Controls ($p=0.006$ for the Study group and $p=0.001$ for the Controls, respectively) (Table 3a).

There was no significant difference in the distribution of disease activity levels between the Study group and the Controls in patients with CD at the beginning, nor at the end of the study ($p>0.05$) (6/6, 100.0% were active or severely active for Study group, 7/7, and 100.0% for the Controls, respectively). There was no significant difference at the end of study ($p>0.05$). At

Table 1. Patient characteristics according to gender, age, weight, height, BMI, disease, duration and group

Characteristics	UC (n=25)			CD (n=13)			IBD (38)		
	Study (n=9)	Control (n=16)	p	Study (n=6)	Control (n=7)	p	Study (n=15)	Control (n=23)	p
Gender (M/F)	7/2	11/5	1.000	3/3	7/0	0.070	10/5	18/5	0.473
Age (years)	32.6+12.3	39.3+15.0	0.268	31.0+8.5	43.0+18.6	0176	31.9+10.6	40.4+15.9	0.078
Duration of disease (mo)	48.1+50.1	51.3+62.1	0.902	42.5+28.0	46.0+52.3	0.886	45.9+41.5	49.6+58.1	0.832
Number of hospitalizations	2.8+1.5	2.9+2.2	0.951	3.3+1.0	3.4+3.1	0.944	3.1+1.3	3.1+2.3	0.391
Height (cm)	168.4+8.8	167.8+9.8	0.874	168.5+7.8	168.0+10.3	0.925	168.5+8.1	167.9+9.7	0.845
Weight at onset of disease (kg)	69.0+14.4	73.3+16.5	0.545	75.8+19.6	59.2+16.5	0.160	71.6+16.1	69.2+17.4	0.693
Weight at last hospitalization (kg)	57.5+11.3	66.8+14.6	0.115	57.8+12.2	56.0+12.0	0.801	57.6+11.2	63.5+14.5	0.192
BMI at onset of disease (kg/m2)	24.1+4.5	25.8+5.1	0.425	26.9+5.2	21.7+6.6	0.181	25.2+4.8	24.6+5.7	0.777
BMI at hospit. (kg/m2)	20.2+3.4	23.6+4.3	0.055	20.2+2.2	19.9+4.1	0.886	20.2+3.2	22.5+4.5	0.101
Current hospitalization days**	33.0+5.3	32.9+10.2	0.973	40.0+13.3	26.3+5.7	0.044*	35.8+9.6	30.9+9.4	0.059

BMI: body mass index; IBD: inflammatory bowel disease; CD: Crohn's disease; UC: Ulcerative colitis

Data are expressed as mean+SD.

*p<0.05

**Patients inthe Control group were discharged at the end of medical therapy with special advanced diets, but patients in the Study group were hospitalized until 3 weeks of enteral support as planned.

According to Table 1;

•There were no statistically significant gender distribution differences between the study and control cases in the UC, CD and total IBD groups.

•There were no significant differences between the study and control cases according to the mean age and mean duration of the disease in the UC, CD and total IBD groups.

•There were no significant differences between the study and control cases according to the mean number of hospitalizations in the UC, CD, and total IBD groups.

•There were no significant differences between the study and control cases according to the mean height andweight at the onset of disease and the last hospitalizations in the UC, CD, and total IBD groups.

•There were no significant differences between the study and control cases according to the mean BMI at the onset of disease and the mean BMI during hospitalization in the UC, CD, and total IBD groups.

•There were no significant differences between the study and control cases according to the mean hospitalization days (current) UC, and total IBD groups, but there was a significant difference between the study and control groups in patients with CD. The average current hospitalization period was longer in the Study group than the Controls (Study group's hospitalization period: 40.0+13.3 days vs control's hospitalization: 26.3+5.7 days and p=0.044 <0.05).

Table 2. Malnutrition status of patients with IBD according to the initial and end SGA

			SGA at the end							
			A		B		C		TOTAL	
			n	%	n	%	n	%	n	%
Study group	SGA at the beginning	A	-	-	-	-	-	-	-	-
		B	4	57.1	3	42.9	-	-	7	46.7
		C	-	-	7	87.5	1	12.5	8	53.3
		Total	4	26.7	10	66.7	1	6.7	15	100.0
			X^2=6.562; p=0.038<0.05							
Control group	SGA at the beginning	A	3	100.0	-	-	-	-	3	13.0
		B	4	40.0	5	50.0	1	10.0	10	43.5
		C	-	-	5	50.0	5	50.0	10	43.5
		Total	7	30.4	10	43.5	6	26.1	23	100.0
			X^2=13.581; p=0.009<0.01*							

SGA: subjective global assessment

*p<0.05

There were statistically significant differences between the initial and end-SGA scores in both the Study group and the Controls. In both groups, the number and ratio of patients with high (B or C) SGA scores decreased at the end of the hospitalization period.

Although the patients in the Control groups showed improvements, the SGA scores in the patients in the Study group were better than those in the controls in terms of ratio, at the end of study with statistically significant differences.

Table 3a. Initial and the final disease activity of patients with ulcerative colitis*

	UC (Initial) (n=25)						UC (Final) (n=25)						
	Study (n=9)		Control (n=16)		Total		Study (n=9)		Control (n=16)		Total		p (within the Group)
UCAI* activity	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Mild	-	-	-	-	-	-	5	55.6	7	43.8	12	48.0	Z=- 2.739
Medium	1	11.1	9	56.3	10	40.0	4	44.4	7	43.8	11	44.0	p=0.006*
Severe	8	88.9	7	43.7	15	60.0	-	-	2	12.4	2	8.0	study group
Total	9	100.0	16	100.0	25	100.0	9	100.0	16	100.0	25	100.0	Z=-3.464 p=0.001* for controls
p (between groups)			X^2=4.890; p=0.040**						X^2=1.293;p=0.524				-

*UCAI: Ulcerative colitis activation index according to Truelove and Witts' Classification

**p<0.05

•There was a statistically significant difference in disease activity levels between the Study and Control groups in patients with UC at the beginning, whereas there was no difference between the Study and Control groups at the end of study. Patients whose activity was medium and severe were higher in the Study group than in the Controls at the beginning. Improvements in the disease activity score of patients within UC were statistically significant in both the Study group and the Controls.

•At the end of the study the ratios of patients with mild or medium disease activity were higher than those initially.

Table 3b. Initial and the final disease activity of patients with Crohn's disease**

	CD (Initial) (n=13)						CD (Final) (n=13)						
	Study (n=6)		Control (n=7)		Total		Study (n=6)		Control (n=7)		Total		p (Within the Group)
Disease Activity Score	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Inactive(<150)	-	-	-	-	-	-	2	33.3	4	57.1	6	46.2	Z=-2.264
Mild (150-220)	-	-	-	-	-	-	3	50.0	1	14.3	4	30.8	p=0.024*
Active (220-450)	1	16.7	3	42.9	4	30.8	1	16.7	2	28.6	3	23.0	study group
Severe active (>450)	5	83.3	4	57.1	9	69.2	-	-	-	-	-	-	Z=-3.464
Total	6	100.0	7	100.0	13	100.0	6	100.0	7	100.0	13	100.0	p=0.001* for controls
p (between groups)			X^2=1.040; p=0.559						X^2=1.935; p=0.380				-

*p<0.05

** CD was evaluated according to Best's Crohn's Disease Activity Index (CDAI)

- There was no significant difference in disease activity between the Study and Control groups in patients with CD at the beginning, or at the end of study.
- At the end of the study the ratios of patients with inactive, mild or medium disease activity were higher than those initially, with statistically significant differences.
- Improvements in the disease activity scores of patients with CD were also statistically significant in both the Study group and the Controls (P=0.024 for the Study group and P=0.001 for the Controls, respectively).

the end of study the ratios of patients with active or severely active CD were lower than those initially (1/6: 16.7% for the Study group, and 2/7: 28.6% for the Controls, respectively). Improvements in the disease activity score for patients with CD were also statistically significant in both the Study group and the Controls (p=0.024 for the Study group and p=0.001 for the Controls, respectively) (Table 3b).

Positive changes in the clinical findings were observed during the hospitalization period in both the Study and Control groups (Table 4). There were no significant differences between the Study and Control groups in respect to vomiting, nausea, anorexia, abdominal pain, fever, weakness, skin rashes, joint pain, rectal bleeding, bloody diarrhea, or diarrhea but, there was only a statistically significant difference in mucoid diarrhea between the Study group and the Controls during the 2nd week (0.0% vs 43.5%) for all patients with IBD (UC+CD).

The daily intakes of energy, macro-nutrients and fibers according to the number of weeks of hospitalization for patients with UC, CD and all the IBD for the Study and Control groups are shown in Tables 5a-e.

Energy and nutrients consumptions

Energy consumption after the 1st week for all the patients in the Study groups were improved and calculated as >2000 kCal/d, whereas it was still <2000 kCal/d in the Controls. There were statistically significant differences between the weeks regard-

Table 4. Clinical symptoms during the study period for patients with IBD (UC+CD) (n=38)**

Clinical Symptom	Weeks	Study (n=15) N	%	Control (n=23) N	%	p
Vomiting	Beginning	6	40.0	10	43.5	0.832
	1	4	26.7	7	30.4	1.000
	2	1	6.7	3	13.0	1.000
	3	-	-	1	5.6	1.000
Nausea	Beginning	9	60.0	13	56.5.	0.832
	1	7	46.7	10	43.5	1.000
	2	2	13.3	4	17.4	1.000
	3	-	-	1	5.6	1.000
Anorexia	Beginning	14	93.3	19	82.6	0.630
	1	11	73.3	16	69.6	1.000
	2	9	60.0	7	30.4	0.071
	3	2	13.3	2	11.1	1.000
Abdominal pain	Beginning	13	86.7	16	69.6	0.273
	1	11	73.3	14	60.9	0.429
	2	6	40.0	10	43.5	0.832
	3	2	13.3	4	22.2	0.665
Fever	Beginning	8	53.3	14	60.9	0.646
	1	5	33.3	6	26.1	0.722
	2	1	6.7	4	17.4	0.630
	3	-	-	1	5.6	1.000
Weakness	Beginning	14	93.3	21	91.3	1.000
	1	10	66.7	17	73.9	0.630
	2	8	53.3	8	34.8	0.258
	3	1	6.7	4	22.2	0.346
Skin rashes	Beginning	3	20.0	3	13.0	0.663
	1	3	20.0	2	8.7	0.365
	2	1	6.7	1	4.3	1.000
	3	-	-	1	5.6	1.000
Joint pain	Beginning	9	60.0	13	56.5	0.832
	1	8	53.3	7	30.4	0.158
	2	6	42.9	4	17.4	0.132
	3	3	20.0	2	11.1	0.639
Rectal bleeding	Beginning	12	80.0	21	91.3	0.365
	1	11	73.3	16	69.6	1.000
	2	5	33.3	10	43.5	0.532
	3	3	20.0	2	11.1	0.639
Bloody diarrhea	Beginning	12	80.0	20	87.0	0.663
	1	10	66.7	15	65.2	0.927
	2	5	33.3	9	39.1	0.717
	3	2	13.3	2	11.1	1.000
Mucoid diarrhea	Beginning	8	53.3	18	78.3	0.157
	1	6	40.0	16	69.6	0.071
	2	-	-	10	43.5	0.030*
	3	-	-	2	11.1	0.486
Diarrhea	Beginning	14	93.3	22	95.7	1.000
	1	13	86.7	19	82.6	1.000
	2	8	53.3	10	43.5	0.552
	3	2	13.3	5	27.8	0.413

*p<0.05

**IBD: inflammatory bowel disease; CD: Crohn's disease; UC: Ulcerative colitis

These were no significant differences between the Study and Controls groups with regard to vomiting, nausea, anorexia, abdominal pain, fever, weakness, skin rashes, joint pain, rectal bleeding, bloody diarrhea, mucoid diarrhea, or diarrhea but, there was a statistically significant difference in mucoid diarrhea between the Study and the Controls for only 2 weeks (0.0% vs 43.5%).

ing the energy consumption of patients with UC, CD and all the IBD in the Study and Control groups, with the exception of patients with CD in the Control groups. These differences were seen after the 1st week in all the Study groups, whereas a statistically significant difference was noticed after the 2nd week in patients with UC and all the IBD in the Control groups.

There was no statistically significant difference in energy consumption between the Study and Control groups at the beginning, but differences were statistically significant after the 1st and 3rdweeks in patients with UC and total IBD. At the beginning, the energy consumption of patients with CD in the Study group was lower than the Controls with a statistical significance, but after the 1st week patients with CD in the Study group improved (Table 5a).

The protein consumption of all the patients in Study groups improved (initially 38.2 g/d for patients with CD, and initially 60 g/d for patients with UC, which increased up to >100 g/d), whereas it was still between 80-90 g/d in the Control groups after the 1st week. There were statistically significant differences between the weeks with regard to the protein consumption of patients with UC, CD and all the IBD Study groups. These differences were seen after the 1st week in all the Study groups, whereas a statistically significant difference was noted after the 2nd week for patients with UC and all the IBD in the Controls. There was no significant difference in patients with CD in the Controls.

There was no statistically significant difference in protein consumption between the Study and Control groups at the beginning, but the differences were statistically significant after the

Table 5a. Patients' energy consumption according to groups and weeks

		UC (n=25)			CD (n=13)			IBD (UC+CD; n=38)		
	Weeks	Study(n=9) X±SD	Control (n=16) X±SD	p	Study (n=6) X±SD	Control (n=7) X±SD	p	Study (n=15) X±SD	Control (n=23) X±SD	p
Energy (kCal/d)	Beginning (Beg)	1186.8±453.2	1341.7±621.2	0.520	871.0±356.4	1666.5±805.4	0.048	1060.5±434.0	1440.5±680.7	0.063
	1	2057.2±441.3	1454.3±679.9	0.026	2011.9±435.1	1512.1±558.2	0.160	2011.9±435.1	1471.9±633.1	0.007
	2	2129.4±349.9	1682.1±804.3	0.129	2063.1±478.8	1686.3±745.6	0.311	2102.9±391.1	1683.4±769.9	0.059
	3	2340.7±541.7	1684.9±810.2	0.045	2123.1±415.9	1842.7±541.6	0.379	2253.7±491.6	1719.9±747.2	0.024
p (Within groups)		F=79.286; p=0.000	F=5.324; p=0.019	-	F=106.692; p=0.000	F=0.122; p=0.945	-	F:177.010; p=0.000	F:4.610; p=0.018	-
Post hoc multiple comparisons		Beg-1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg -3rd week		Beg -1st week Beg -2nd week Beg -3rd week	-		Beg 1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg 3rd week	-

IBD: inflammatory bowel disease; CD: Crohn's disease; UC: Ulcerative colitis

Energy consumption levels were low or very low at the beginning of the periods for all the groups (i.e. 871.0 kCal/d for patients with CD in the Study group, 1186 kCal/d for patients with UC in the Study group). After the 1st week, the energy consumption of all the patients in the Study groups were improved and calculated as >2000 kCal/d, whereas this level was still <2000 kCal/d in the Control groups.

There were statistically significant differences between the weeks with regard to the energy consumption of patients with UC, CD and total IBD in the Study and Control groups, except in the patients with CD in the Controls. These differences were seen after the 1st week in all the Study groups, whereas, statistically significant differences were noticed after 2nd week in patients with UC and all IBD in the Controls.

There was no statistically significant difference in energy consumption between the Study group and the Controls at the beginning, but the differences were statistically significant after the 1st and 3rd weeks in the patients with UC and total IBD. At the beginning, the energy consumption of patients with CD in the Study group was lower than that of the Controls, with statistical significance, but after the 1st week the patients with CD in the Study group improved.

Table 5b. Protein consumption in grams and as a percentage of total energy requirements according to groups and weeks

		UC (n=25)			CD (n=13)			IBD (UC+CD; n=38)		
	Weeks	Study (n:9) X±SD	Control (n:16) X±SD	p	Study (n:6) X±SD	Control (n:7) X±SD	p	Study (n:15) X±SD	Control (n:23) X±SD	p
Protein (g/d and %)	Beginning (Beg)	60.8±24.8 (20.5)	60.3±29.5 (18.7)	0.964	38.2±17.5 (17.3)	80.0±32.4 (19.9)	0.017	51.8±24.3 (19.5)	66.2±931.1 (18.4)	0.135
	1	101.5±24.8 (20.1)	65.4±29.8 (19.8)	0.005	96.3±25.7 (19.4)	71.4±30.0 (19.5)	0.313	96.3±25.7 (19.1)	67.3±29.3 (18.3)	0.004
	2	98.4±23.3 (18.6)	77.2±33.9 (19.6)	0.111	95.9±15.8 (19.1)	83.2±34.2 (20.9)	0.420	97.4±20.1 (18.5)	79.0±33.4 (18.7)	0.063
	3	112.1±28.9 (19.6)	79.9±36.2 (19.7)	0.036	96.8±30.1 (18.3)	90.7±18.9 (21.1)	0.731	105.9±29.4 (18.8)	82.4±32.9 (19.2)	0.039
p (Within groups)		F=11.876 P=0.000	F=5.218 P=0.017	-	F=12.120 P=0.000	F=0.699 P=0.464	-	F=78.168 P=0.000	F=5.619 P=0.009	-
Post hoc multiple comparisons		Beg-1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg -3rd week		Beg -1st week Beg -2nd week Beg -3rd week	-		Beg 1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg 3rd week	

IBD: inflammatory bowel disease; CD: Crohn's disease; UC: Ulcerative colitis

Energy consumption levels were low or very low at the beginning of the periods for all the groups (i.e. 871.0 kCal/d for patients with CD in the Study group, 1186 kCal/d for patients with UC in the Study group). After the 1st week, the energy consumption of all the patients in the Study groups were improved and calculated as >2000 kCal/d, whereas this level was still <2000 kCal/d in the Control groups.

There were statistically significant differences between the weeks with regard to the energy consumption of patients with UC, CD and total IBD in the Study and Control groups, except in the patients with CD in the Controls. These differences were seen after the 1st week in all the Study groups, whereas, statistically significant differences were noticed after 2nd week in patients with UC and all IBD in the Controls.

There was no statistically significant difference in energy consumption between the Study group and the Controls at the beginning, but the differences were statistically significant after the 1st and 3rd weeks in the patients with UC and total IBD. At the beginning, the energy consumption of patients with CD in the Study group was lower than that of the Controls, with statistical significance, but after the 1st week the patients with CD in the Study group improved.

1st and 3rd weeks in patients with UC and total IBD. There were no significant differences between the weeks or between the Study group and Controls for patients with UC, CD or total IBD with regard to the ratio of protein consumption in energy requirements (Table 5b).

After the 1st week, the fat consumption of all the patients in the Study groups had improved and were calculated as >60g/d, whereas it was <50 g/d in the Control groups. There were statistically significant differences between the weeks with regard to the fat consumption of patients with UC, CD

Table 5c. Fat consumption in grams and as a percentage of the total energy consumption of patients according to groups and weeks in patients with UC, CD and total IBD

		UC (n=25)			CD (n=13)			IBD (UC+CD; n=38)		
	Weeks	Study (n:9) X±SD	Control (n:16) X±SD	p	Study (n:6) X±SD	Control (n:7) X±SD	p	Study (n:15) X±SD	Control (n:23) X±SD	p
Fat (g/d and %)	Beginning (Beg)	36.9±14.3 (28.9)	37.8±14.9 (26.1)	0.882	23.0±13.1 (22.8)	44.9±21.7 (24.4)	0.055	31.1±15.0 (26.4)	39.9±17.1 (24.9)	0.120
	1	60.7±12.9 (26.4)	38.6±37.1 (24.8)	0.003*	60.3±13.2 (27.4)	39.4±15.3 (22.5)	0.034*	60.3±13.2 (26.9)	38.8±15.2 (23.7)	0.000*
	2	61.8±6.9 (26.1)	44.2±18.2 (24.5)	0.013*	63.9±13.8 (27.4)	44.6±17.1 (24.3)	0.049*	62.6±9.8 (26.8)	44.3±17.5 (23.6)	0.001*
	3	65.4±15.4 (25.0)	46.7±18.5 (25.2)	0.020*	63.8±16.3 (26.4)	47.5±13.3 (23.3)	0.136	64.8±15.2 (25.8)	46.9±17.1 (24.5)	0.004*
p (Within groups)		F=41.545; p=0.000	F=4.501; p=0.026	-	F=60.597; p=0.001	F=0.041; P=0.853	-	F=83.010; p=0.000	F=3.835; p=0.034	-
Post hoc multiple comparisons		Beg-1st week Beg -2nd week Beg -3rd week	Beg -3rd week		Beg -1st week Beg -2nd week Beg -3rd week			Beg 1st week Beg -2nd week Beg -3rd week	Beg 3rd week	

*p<0.05

IBD: inflammatory bowel disease; CD: Crohn's disease; UC: Ulcerative colitis

Fat consumption levels were low or very low at the beginning for all the groups (i.e. 23.0g/d for patients with CD in the Study group, 36.9g/d for patients with UC in the Study group). After the 1st week, the fat consumption of all the patients in the Study group had improved and was calculated as being >60 g/d, whereas it was <40g/d in the Control groups.

There were statistically significant differences between the weeks with regard to the fat consumption of patients with UC, CD and total IBD in the Study group and the Control groups, except in patients with CD in the Controls. These differences were seen after the 1st week in the Study Group, whereas a, statistically significant difference was noticed after 3rd week in patients with UC and all those with IBD in the Controls.

There was no statistically significant difference in fat consumption between the Study group and the Controls at the beginning, but the differences were statistically significant after the 1st, 2nd and 3rd weeks in patients with UC and total IBD. At the beginning the fat consumption of patients with CD in the Study group had lower than that in the Controls, without any statistically significance, but after the 1st and 2nd weeks, the fat consumption of patients with CD in the Study group had improved (as an amount in grams and also as percentages) with statistical significance.

There were no significant differences between the weeks or between the Study group and the Controls in patients with UC, CD or total IBD with regard to the ratios between the consumption of protein and energy requirements.

Table 5d. Patients' carbohydrate consumption according to groups and weeks

		UC (n=25)			CD (n=13)			IBD (UC+CD; n=38)		
	Weeks	Study (n:9) X±SD	Control (n:16) X±SD	p	Study (n:6) X±SD	Control (n:7) X±SD	p	Study (n:15) X±SD	Control (n:23) X±SD	p
CHO (g/d and %)	Beginning (Beg)	147.7±60.2 (50.3)	184.6±98.4 (55.3)	0.320	122.0±44.6 (59.7)	228.3±124.2 (55.7)	0.073	137.5±54.4 (51.9)	197.9±105.9 (54.9)	0.049
	1	268.7±59.9 (53.4)	204.9±109.8 (55.5)	0.122	254.9±53.9 (54.2)	211.4±79.1 (57.9)	0.280	263.2±56.0 (52.3)	206.8±99.6 (56.2)	0.054
	2	287.0±49.8 (55.2)	236.8±134.4 (55.8)	0.294	268.4±76.1 (53.3)	230.8±117.1 (54.8)	0.516	279.6±59.8 (53.2)	234.9±126.7 (55.8)	0.212
	3	317.3±77.0 (55.3)	229.3±132.6 (55.2)	0.086	281.9±39.9 (55.0)	250.8±94.2 (55.6)	0.527	303.2±65.4 (53.8)	234.7±122.9 (54.6)	0.062
p (Within groups)		F=108.963; p=0.000*	F=4.753; p=0.026*	-	F=90.310; p=0.000*	F=0.049; p=0.839	-	F=209.218; p=0.000*	F=3.798; p=0.033*	-
Post hoc multiple comparisons		Beg-1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg -3rd week		Beg -1st week Beg -3rd week	-		Beg 1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg -3rd week	

IBD: inflammatory bowel disease; CD: Crohn's disease; UC: Ulcerative colitis

*p<0.05

There were statistically significant differences between the weeks with regard to the carbohydrate(CHO) consumption of patients with UC and total IBD in the Study group. There were statistically significant differences after2nd week with regard to the CHO consumption of patients with UC and all those with IBD in the Contro groups, but this difference was not significant between the weeks for Controls in patients with CD.

There were no statistically significant differences between the Control and Study Groups with regard to theCHO consumption of patients with UC, CD and all those with IBD in the Study and Control groups, but in there was in the first week of the total IBD Group.

There were no significant differences between the weeks or between the Study group and the Controls in patients with UC, CD or total IBD with regard tothe ratio between consumption of CHO and energy requirements.

and total IBD in the Study and Control groups, except in patients with CD in the Controls. This difference was noticed after the 3rd week fo patients with UC and all those with IBD in the Controls.

There was no statistically significant difference in fat consumption between the Study and Controls groups at the beginning, but the differences were statistically significant after the 1st, 2nd, and 3rd weeks in patients with UC and total IBD. At the beginning the fat consumption of patients with CD in the Study group was lower than in the Controls without any statistical significance, but after the 1st and 2nd weeks, the fat consumption of patients with CD in the Study group had improved (as an amount in grams and also as a percentage) with some statistical significance (Table 5c).

The carbohydrate (CHO) consumption of all the patients was very low at the beginning (122 g/d for patients with CD, 147.7 g/d for patients with UC) in the Study groups. These levels improved and were calculated as >280 g/d for the 3rd week for the patients with CD, and 317.3 g/d for the patients with UC, whereas it was still <250 g/d in the Control groups after the 1st week.

There were statistically significant differences between the weeks with regard to the CHO consumption of patients with UC and total IBD in the Study Groups. There was a statistically significant difference after the 2nd week with regard to the CHO consumption of patients with UC and all those with IBD in the Control groups. But this difference was not significant for patients with CD in the Control groups.

There was no statistically significant difference between the Control and Study groups with regard to the CHO consumption of patients with UC, CD and all those with IBD in the Study and Control groups, but there was during the 1st week for all those in the IBD group.

There was no significant difference between the weeks or between the Study group and Controls for patients with UC, CD, or total IBD with regard to the ratio between consumption of CHO and energy requirements (Table 5d).

The fiber (total and water soluble) consumption was 6.9 g/d for patients with CD in the Study group, and 11.5 g/d for patients with UC in this group). After the 1st week, the fiber consumption of all the patients in the Study groups had

Table 5e. Patients' fiber and water soluble fiber consumption according to groups and weeks

		UC (n=25)			CD (n=13)			IBD (UC+CD; n=38)		
	Weeks	Study (n:9) X±SD	Control (n:16) X±SD	p	Study (n:6) X±SD	Control (n:7) X±SD	p	Study (n:15) X±SD	Control (n:23) X±SD	p
Total fiber (g)	Beginning (Beg)	11.5±4.7	14.6±8.5	0.320	6.9±3.7	16.8±10.1	0.045*	9.7±4.8	15.3±8.8	0.032
	1	28.6±8.0	16.9±10.4	0.008*	26.3±4.6	14.8±7.9	0.011*	27.6±6.8	16.3±9.6	0.000*
	2	28.5±3.6	18.3±10.1	0.009*	27.7±8.8	17.8±8.9	0.070	28.2±5.9	18.2±9.6	0.001*
	3	31.5±8.1	19.6±11.6	0.015*	24.1±5.0	20.1±7.0	0.317	28.5±7.8	19.7±10.5	0.012*
p (Within groups)		F=19.497; p=0.000*	F=10.988; p=0.006*	-	F=53.490; p=0.001*	F=1.386; p=0.324	-	F:128.206; p=0.000*	F:12.205; p=0.003*	
Post hoc multiple comparisons		Beg-1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg -3rd week		Beg -1st week Beg -2nd week Beg -3rd week	-		Beg -1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg -3rd week	
Water soluble fiber (g)	Beginning	3.9±1.7	4.9±2.9	0.350	2.4±1.2	5.9±3.4	0.035*	3.3±1.7	5.3±3.0	0.030*
	1	19.1±6.9	5.6±3.3	0.000*	19.3±5.2	5.4±2.7	0.003*	19.2±6.1	5.5±3.1	0.000*
	2	18.8±2.5	6.3±3.6	0.000*	19.4±6.1	6.4±3.2	0.000*	19.0±4.1	6.3±3.3	0.000*
	3	18.2±4.5	6.3±4.0	0.000*	16.7±4.4	7.0±2.5	0.004*	17.6±4.4	6.4±3.7	0.000*
p (Within groups)		F=71.685; p=0.000*	F=9.131; p=0.010*	-	F=90.111; p=0.000*	F=1.436; p=0.317	-	F:157.529; p=0.000*	F:10.267; p=0.005*	
Post hoc multiple comparisons		Beg -1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg -3rd week		Beg -1st week Beg -2nd week Beg -3rd week	-		Beg -1st week Beg -2nd week Beg -3rd week	Beg -2nd week Beg -3rd week	

IBD: inflammatory bowel disease; CD: Crohn's disease; UC: Ulcerative colitis

*p<0.05

There were statistically significant differences between the weeks with regard to the (both total and water soluble) fiber consumptions in patients with UC, CD and all those with IBD in the Study group. There was a statistically significant difference after 2nd week with regard to the total fiber and water soluble fiber consumption of patients with UC and all those with IBD in the Controls, but there were no significant differences between the weeks in patients with CD in the Controls.

There were no significant differences in with regards to the total and water-soluble fiber consumption between the Study group and Controls at the beginning of the study in patients with UC, but the differences were statistically significant in the patients with CD and all those in the IBD group. After the 1st week, all the patients in the Study group had improved with a statistical significance.

improved and maintained at between the advised levels (20-30 g/d).

There was a statistically significant difference after the 2nd week with regard to the total fiber and water soluble fiber consumption of patients with UC and all those with IBD in the Controls, but no significanct difference between the weeks for patients with CD in the Controls (Table 5e).

There were no significant differences with regard to the total and water-soluble fiber consumption between the Study group and Controls at the beginning of the study for the patients with UC, but the differences were statistically significant for patients with CD and all those with IBD. After the 1st week, all the patients in the Study groups had improved with statistical significance.

Improvements in malnutrition: There were statistically significant differences between the initial and the end-SGA scores in both the Study and Control groups (p=0.038 for the Study group and p=0.009 for the Controls, respectively). Initially, the SGA-B and C patients were 15/15 (100.0%) in the Study group and 20/23 (87.0%) in the Controls. Although the patients in the Control groups also showed some improvement, at the end of the study SGA scores of the patients in the Study group were better than those of the Controls in terms of ratio. Changes in the degree of malnutrition in patients with IBD were re-evaluated during and at the end of hospitalization period; 7/8 patients (87.5%) in the Study group and 5/10 patients (50.0%) in the Controls improved from an "SGA-C" level to an "SGA-B"; and 4/7 (57.1%) in the Study group and 4/10 patients (40.0%) in the Controls improved from an "SGA-B" level to an "SGA-A", respectively. In the Control groups, 5/10 patients (50.0%) with an "SGA-C" did not improve, and 1 patient (10.0%) deteriorated from an "SGA-B" to a "C" level (Table 2).

DISCUSSION

The prevelance of malnutrition was calculated as 92.1% at the beginning for all patients with IBD, 88.0% for patients with UC and 100.0% for patients with CD, respectively.

The prevalence of protein-calorie malnutrition in the general medical wards was reported to be 44-48% (1,2,34) and, the Odd's ratio for malnutrition among IBD admission patients compared with non-IBD admission patients was 5.57 (95% CI 5.29-5.86). According to different assessment methods, the prevalence of undernutrition and severe undernutrition in active IBD were 25.0-69.7% and 1.3-31.6%, respectively (35). According to the NIS study, a greater proportion of IBD patients (26.0% of patients with CD; and 25.0% of those with UC; but 6.0% of non-IBD patients) with malnutriton received parenteral nutrition (3).

Weight loss was reported to be 80.0% in patients with CD, and 18-62% in those with UC (36,37). The prevalence of malnutrition in patients with CD was calculated during the onset period as being higher than those patients in remission (82.8% for onset, 38.9% for remission) (4).

Anorexia, nausea, vomiting, diarrhea and fasting/diets for tests or colonoscopy are the most common reasons for malnutrition in patients with IBD, and body weight, BMI, biochemical analyses, anthropometric, and SGA measurements are essential to prevent the underdiagnosis of malnutrition in hospitalized patients with IBD. Our prevalance figures were higher than those in the literature, because we preferred to use all of the BMI and/or weight loss, biochemical, anthropometric, and SGA measurements, as well as the inclusion criteria of patients with moderate or severe activity, in this study in order to prevent an under diagnosis of malnourished patients.

There was a weight gain (mean 1.6±1.0 kg) in 60.0% and a weight loss (mean 3.1±2.7 kg) in 40.0% of the patients in the Study group; whereas there was a weight gain (mean 4.0±2.8 kg) in 26.1% and a weight loss (mean -3.6±4.0 kg) in 60.9%,as well as 13.0% showing no change, of the patients in the Controls. Together with medical treatment, not only oral enteral support, but also regulating the hospital diets, prevented weight loss in our patients.

In the literature, disease activity or nutritional status (mostly by using anthropometric measurements) or changes in body composition were evaluated by comparing the effects of hospital diets as elementary or polymeric diets vs. medical treatments (ie. corticosteroids, immunosupressive drugs) or the route of administiration of enteral products, and the subjects in the Control groups were selected from healthy populations (6,7,38-43), but there has been no published report comparing enteral products in addition to hospital-regulated diets vs. hospital-regulated diets only.

The prevalence of malnutrition (SGA-B + SGA-C) was calculated as (35/38) 92.1% at the beginning of the study and was still (27/38) 71.1% at the end of the study for all the IBD patients. Statistically significant positive differences between the initial and end-SGA scores in both the Study and Control groups shows that nutritional support improves the nutritional status of patients. In the literature, the prevalence of malnutrition has been reported as being less than in our study. The reasons for this difference may be a result of our patients' disease activities (active or severely active), and an underestimation of the prevelance of malnutrition resulting from non-sensitive diagnosis methods in the literature. According to one study, by using a face-to-face questionnaire interview method, 94% of patients with CD and 64% of patients with UC reported problems with their weight (44).

Although patients in the Control group also showed some improvement, at the end of study the SGA scores of the patients in the Study group were better than those of the Controls in terms of ratio.

There are no or few published studies on malnutrition in patients with IBD either on diagnosis or after enteral nutritional support using a SGA. Research into situation assessment is more about the body composition changes caused by disease and the anthropometric measurements which can be seen as a reflection of disease (6,7,43,45).

In one study, the BMI, lean body mass (LBM), bone mineral content and the upper mid-arm circumference were compared in patients with CD in long-term remission and who were receiving high doses of cortisone versus healthy subjects, and there were no differences in the BMI, LBM, bone mineral content, or in the upper mid-arm circumference between the two groups, but the cortisone itself was found to be the probable reason for the functional and nutritional deficiencies in the patients with CD who were in long-term remission (6).

The energy substrate metabolisms of 32 patients with active (CDAI >150) CD, when compared to 19 healthy control subjects of an appropriate age and sex, were found to be less than those of the healthy subjects according to the BMI and LBM values of the patients with active CD (45).

The body weight and fat mass were lower, and the basal metabolic rate of fat-free mass was higher in patients with ileal, ileocolonic, and colonic CD than those of healthy controls (43).

In another study, when comparing between 69 newly diagnosed patients with IBD (23 CD, 46 UC) and 69 healthy individuals' data regardless of gender difference, for CD patients the upper mid-arm circumference, the body fat percentage, the fat mass, and the body weight were found to be insignificant ($p>0.05$), but for UC patients the reductions in body weight and BMI values were reported as significant ($p<0.05$) (7).

The patients in our study could eat normal food, but this was inadequate. So the patients were continuously encouraged to increase the amount of their advised consumption. The ratios of patients with severe activity were higher in the Study groups than the Controls in both the UC and CD groups, but there were no significant difference at the end of the study. At the end of the study, the ratio of patients with mild or medium disease activity were higher than those initially. Enteral nutritional support and the monitoring of food consumed led to reductions in disease severity for the CD and UC patients.

In the literature, the consumption of macronutrients, biochemical parameters, antropometric measurements, changes in disease activity, duration, short or long term remissions, and relapses were accepted as result variables, and the efficacy of enteral products was compared with steroids, parenteral nutrition, probiotics, different elementaries, monomeric and polymeric formulas enteral in composition, acupuncture, aromatherapy, herbal therapy, and specific carbohydrate diets (9,41,42,46-55). According to one study, a nutritionally balanced IBD nutrition formula enriched with n-3 fatty acids from fish oil, prebiotics, and antioxidants, has the potential to improve nutritional status and reduce disease activity (47).

Standard polymeric structures, short-chain fatty acids, low amounts of fat, guar gumas, a low osmolality of oral-enteral products, an oral route, intestinal mucosal integrity, the prevention of bacterial translocation, the protection of gastrointestinal functions, the replacement of many inadequate nutrients in the intestinal lumen, the removal of dietary antigens, changes in intestinal microbiata, reduction of the intestinal synthesis of inflammatory mediators, an the provision of specific nutrients such as glutamine were the possible mechanisms of improvements in disease activity (36,38,40-42,56-58).

Clinical symptoms, especially diarrhea, abdominal pain, and fever, are considered an important symptom in determining the severity of a disease (27,28,29). Positive changes in clinical findings were observed during the hospitalization period in both the Study and Control groups, but improvements in clinical findings in the Study group were better than those in the Controls. The most improved clinical findings were diarrhea, bloody/mucoid diarrhea, anorexia, rectal bleeding, and weight gain. Improvements in the severity of the disease activity in our patients can be considered as evidence for the positive effects of oral enteral nutrition support.

The advised energy comsumption for a healthy adult subject is 2000-2500 kCal/d, which should be composed of 55-60% carbohydrates, 25-30% lipids, and 10-15% proteins (59). In our study, energy and nutrient consumption levels were low or very low at the beginning periods for all the groups (Tables 5a-e), but all of them increased over the weeks with statistically significant differences.

The lowest energy consumption levels reported in the literature are 871.0 kCal/d for patients with CD in Study groups and 1186 kCal/d for patients with UC in Study groups. The energy consumption was calculated as 1816 kCal/d (675-3350) for those in remission and 1607 kCal/d (720-2851) for those in the active phase of CD; 1725 kCal/d (500-2458) for patients with IBD (4,46). We think that these levels as reported in the literature are questionable.

The consumption of energy increased with both oral-enteral nutritional support and regulation of hospital food in different groups. After the 1st week, the energy consumption of all the patients in the Study group had improved and was calculated as >2000 kCal/d, whereas it was still <2000 kCal/d in the Control groups. These findings, together with more weight gain in the Study group, are evidence for the effects of oral enteral support.

The initial protein consumption was 38.2 g/d for patients with CD in the Study group and 60 g/d for patients with UC in the

Study group. According to the literature, protein consumption was reported as 52.2-90 g/d for patients with CD during remission, 80.2 g/d for patients with active UC, and 92.3 g/d after remission (4,60). Our results are similar to the literature.

Inflammatory bowel disease patients generally have increased protein requirements than normal subjects. Inflammation occurs in response to endogenous proteolysis and then negative nitrogen balance occurs. These effects are related to catecholamines, endogenous and exogenous glucocorticoids, eicosanoids, and cytokine. A positive nitrogen balance for IBD patients can only occur with 1-1.5 g/kg/day protein intake. Infected and malnourish patients may need 2 g/kg/day (9). Enteral products recovered the protein consumption in most of our patients in the Study groups, especially after the 2nd week, with a statistical significance.

Fat consumption was 23.0 g/d for patients with CD in the Study group, 36.9 g/d for patients with UC in the Study group. The advised level of fat consumption (25-30%) was reached in all the groups over the weeks.

According to the literature, fat consumption was reported as 48.5 g/d and 25.4-35.1% of the energy requirements of patients with CD, 54.1 g/d in patients with active UC and 61.4 g/d in those in remission (4,60).

The initial CHO consumption levels were 122.0 g/d for patients with CD in the Study group, 147.7 g/d for patients with UC in the Study group, which improved with nutritional support.

In the literature, CHO consumption was calculated as 129-271 g/d for patients with CD in remission (4,6,42), 228.8 g/d for patients with active UC, and 248.4 g/d for those in remission (60).

The total fiber consumption was 6.9 g/d for patients with CD in the Study group and 11.5 g/d for patients with UC in the Study group, which improved. There were statistically significant differences between the weeks with regard to both types of fiber consumption in patients with UC, CD and all those with IBD in the Study groups. According to one study, the total fiber consumption was reported to be about 12.9 g/d in patients with UC (60). Our results regarding fiber consumption are similar to those literature.

There was a relatively low number of cases of patient who refused the enteral products who had initially been randomized into the enteral product group (these 3 patients were assigned to the Control group).

In chronic disease in particular, where recovery from the disease is not always achievable, quality of life is essential and its measurement should be integrated into one main intervention target. It is therefore crucial to better understand the relationship between more objective measures such as disease parameters, nutritional status and the subjective quality of life (61).

The SGA method is an easy, reproducible, and feasible evaluation method for diagnosing and monitoring malnutrition in patients with both active and in-remission IBD. Because of non-sensitive evaluation criteria malnutrition is mostly under diagnosed in hospitalized moderate or severe-active patients with IBD. The prevalence of malnutrition (SGA-B or SGA-C) was calculated as 100% of patients with CD and 88.0% of patients with UC during the hospitalization period. Not only the regulation of hospital food but also oral enteral nutritional support with specific or standard commercial products may help increase body weight and BMI, as well as improves disease activity, clinical signs and symptoms, energy, protein, fat, carbohydrate, fiber and water soluble fiber consumption. Because there is a 71.1% prevalence of malnutritionat patients' discharge, after the hospitalization period all patients should be monitored for their nutritional status, and nutritional support using enteral products and regulation of diets should be maintained by a dietician.

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Informed Consent: Written informed consent was obtained from patients who participated in this study.

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