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Individualized dietary intervention and hospitalized patients, Tehran, Iran

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Abstract

Purpose – The purpose of this paper is first to examine whether standard hospital food met patients' requirements and second, to evaluate the effect of individualized dietary intervention on weight, BMI and body composition of the patients.

Design/methodology/approach – In total, 69 patients (37 in the intervention group and 32 in the control group) were randomly selected. Weight, height and body composition measurements were performed in both groups within 24 h after admission and at discharge. In the intervention group, encouraging with eating and drinking, replacing missed meals with supplements or enteral nutrition were used as strategies to improve dietary intake. Frequency, chi-square, Wilcoxon and paired *t*-test were used to analyze data.

Findings – Before intervention daily energy and protein intake were significantly lower than required amounts in both groups. After intervention energy intake met requirements in the intervention group while it was still less than requirements in the control group. Protein intake met requirements in both groups. There were no significant changes in body weight, BMI and body composition in the intervention group during hospitalization but in the control group weight, BMI and body protein decreased significantly.

Originality/value – This paper shows the importance of individualized dietary intervention to prevent weight and body protein loss of patients during hospitalization.

Keywords Hospitals, Patients, Diet, Iran

Paper type Research paper

Introduction

Several studies have demonstrated the high prevalence of malnutrition among hospitalized patients (McWhirter and Pennington, 1994; Hill *et al.*, 1977; Bistrian *et al.*, 1976; Edington *et al.*, 1977) and it has been shown that if left untreated, nutritional status continues to deteriorate during the inpatient stay (McWhirter and Pennington, 1994). Many patients do not eat and drink sufficiently during hospitalization and most of these patients' protein and energy requirements are not met (Kondrup *et al.*, 2002; Constans *et al.*, 1992). Patients often have reduced appetite, nausea or aversion toward certain types of food, which may partly explain the inadequacy of their food and liquid intake. Their muscular tissue, including their heart and respiratory muscles, is adversely affected by this situation (Lopez *et al.*, 1982) and their immune function is suppressed (Green, 1999; Lesourd, 1995). The clinical consequences include lassitude, difficulty in mobilizing, prolonged convalescence (Green, 1999; Franssen *et al.*, 2002) and an increased risk of pressure wounds (Holmes *et al.*, 1987) phlebitis and infections (Hussain *et al.*, 1996; Langmore, 1999). Systematic review has indicated significant improvements in weight, anthropometry and fatality when nutritional supplements were routinely given to adult patients (Potter *et al.*, 1999).

The aim of this prospective controlled study was first to examine whether standard hospital food met hospitalized patients' protein and energy requirements and second to

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evaluate individualized dietary intervention on weight, BMI and body composition of the hospitalized patients.

Methodology

This was a prospective controlled study carried out in Shariati Educational Hospital, Tehran, Iran. This hospital had more than 400 beds with specialties of cancer, hematology, gastroenterology, gynecology, cardiology and cardiac surgery, endocrinology, nephrology, urology, neurology and neurosurgery, orthopedics, pediatrics, pulmonology, rheumatology, general surgery and maxillofacial surgery.

Prior to the start of the study five dietitians were trained to perform the procedures. Inclusion criteria in both groups were age $\geq$18 years old and hospitalization for four days or longer. Obstetric, pediatric and ICU patients were excluded from the study for short length of hospitalization or inability of the patients to be weighed. Ninety patients were randomly selected within two months from 12 August to 12 October 2006 in both intervention and control groups. Twenty one of the patients were excluded from the study due to death or early discharge. At the end there were 69 patients, 37 in the intervention group and 32 in the control group (see Tables I and II). All patients in both intervention and control group gave informed consent. The distribution of study subjects by service and mean age and sex distribution of the patients are shown.

Medical condition	Intervention group *n* (%)	Control group *n* (%)
General surgery	4 (10.8)	5 (15.6)
Neurosurgery	4 (10.8)	1 (3.1)
Maxillofacial surgery	9 (24.3)	0
Hematology	8 (21.6)	2 (6.3)
Nephrology	0	3 (9.4)
Urology	0	4 (12.5)
Neurology	2 (5.4)	1 (3.1)
Rheumatology	3 (8.1)	6 (18.8)
Gastroenterology	3 (8.1)	2 (6.3)
Pulmonology	2 (5.4)	7 (21.9)
Endocrinology	2 (5.4)	1 (3.1)
Total	37 (100)	32 (100)

Table I.
Distribution of study subjects by service

Factor	Intervention group	Control group	*p*-value
Number of patients (women/men)	37 (20/17)	32 (16/16)	0.737
Age (years) (mean ± SD)	35.7 ± 16.5	52.3 ± 18.8	<0.001*
BMI, kg/m^2	20.35 ± 4.88	23.48 ± 4.97	0.008*
Nausea, *n* (%)	11 (29.7)	7 (21.9)	0.459
Vomiting, *n* (%)	7 (18.9)	5 (15.6)	0.719
Chewing problems, *n* (%)	15 (40.5)	4 (12.5)	0.009*
Anorexia, *n* (%)	14 (37.8)	10 (31.3)	0.567
Diarrhea, *n* (%)	2 (5.4)	3 (9.4)	0.657

Note: *p-value < 0.05 is considered significant

Table II.
Summarized baseline characteristics of participating patients

Anthropometric assessments (weight and height) and body composition analysis were performed in both groups within 24 h after admission. Seca 750 Dial Home Mechanical Scale and The Seca 200 Girth Measuring Tape were used for weight and height measurements. These measurements were done without the patients wearing shoes. Bodystat 1,500 Medical equipment was used to analyze body composition. This device has four main cable leads of which each lead has a crocodile/alligator. Clips attached the exposed tabs on the electrodes. Self-adhesive disposable electrodes are attached to the right hand and right foot. The body composition analyzer works by passing a safe battery generated signal through the body and measuring the impedance at a fixed frequency of 50 kHz. The subject's gender, age, height, weight and activity level are entered into the device using three keypads. Once the test has been performed the patient's complete body composition analysis is displayed on a screen within 3 s including body fat percent and fat weight, lean mass percent and lean mass weight, total body water percent and total body water weight in addition to normal levels.

A 24-h food recall form was done on the day after admission to analyze dietary intake. Patients were asked about their appetite, nausea, vomiting, diarrhea and chewing problems. Medical records were also checked for medical history, nutrition consultation and nutrition support (enteral or parenteral feeding).

In this study BMI < 18.5 was used to detect undernourished patients and the patient was assessed "at risk of malnutrition" when he or she was not underweight but had nausea, vomiting, poor appetite, swallowing or chewing difficulties or needed help with feeding. Harris-Benedict equation with appropriate stress factor (1-1.3) and activity factor (1-1.14) was used to assess energy requirement. Protein requirement was calculated according to the patients' problems (0.8-1.2 g/kg/d).

Both intervention and control groups received routine dietary services of the hospital but these services did not evaluate patients' requirements individually and did not follow up the patients to see whether they are receiving their protein and energy needs.

In the intervention group after evaluating 24-h food recalls of all malnourished or at risk of malnutrition patients, whom did not receive their estimated requirements of protein and energy, nutritionists tried to provide them with their required amounts of protein and energy by following strategies: Encouraging with eating and drinking, replacing missed meals with supplements or using enteral nutrition if energy and protein requirements could not be met via oral intake according to the case. For other patients no action was necessary.

Ensure powder (Abbot, USA) with vanilla flavor was used as the supplement. Each 100 g of this powder contains 431 kcal energy and 15.9 g protein. It was prepared to give 1 kcal per 1 ml.

In both groups, the patients were again weighed for body composition analysis and asked for 24-h food recall before discharge. The mean recorded protein (gram) and energy (kilocalorie) intake were compared with the estimated protein (gram) and energy requirements (kilocalorie).

Statistical analysis was performed by using SPSS 11.5 and 24-h food recalls were analyzed by Nutribase Diet Analysis Software Version IV. The statistical analysis included frequency of all variables, chi-square, nonparametric Wilcoxon test for anthropometric and body composition analysis because the assumption of normality was not fulfilled and paired *t*-test to evaluate significance of difference between energy and protein intakes and estimated requirements on admission and discharge within both groups. $p < 0.05$ was considered statistically significant. This study received

ethics approval from the human research ethics committee of Tehran University of medical science.

Results

The baseline characteristics of the participating patients are presented. Patients in the intervention group were significantly younger ($p < 0.001$), with more chewing problems because of maxillofacial surgery ($p = 0.009$) and had lower BMI ($p = 0.008$). Also the number of malnourished (37.8 percent vs 9.4 percent, $p = 0.006$) or at risk of malnutrition (40.5 percent vs 40.6 percent, $p = 0.994$) patients were more in the intervention group (see Table III).

Mean daily dietary energy and protein intake is shown before intervention and compared with mean estimated requirements in both groups. These information are also presented after intervention (see Tables IV and V).

Before intervention daily energy and protein intakes were significantly lower than estimated requirements in both intervention ($p < 0.001$, $p = 0.044$) and control groups ($p = 0.001$, $p = 0.010$). After intervention there was no significant difference between energy intake and estimated energy requirement in intervention group means energy intake met energy requirements of the patients and protein intake was significantly more than estimated requirements ($p = 0.02$) but in the control group energy intake was still significantly less than estimated requirements ($p = 0.009$) and there was no significant difference between protein intake and estimated protein requirements of the patients.

Table III.
Distribution of malnourished or at risk of malnutrition patients in the intervention group

Factor	Intervention group	Control group	*p*-value
Malnutrition, *n* (%)	14 (37.8)	3 (9.4)	0.006*
At risk of malnutrition, *n* (%)	15 (40.5)	13 (40.6)	0.994

Note: *p-value < 0.05 is considered significant

Table IV.
Comparing energy and protein estimated requirement and intake before intervention in control and intervention groups

	Intervention group			Control group		
Variable	Intake Mean ± SD	Requirement Mean ± SD	*p*-value	Intake Mean ± SD	Requirement Mean ± SD	*p*-value
Energy (kcal/d)	1,338 ± 818.67	2,050 ± 359.91	<0.001*	1,369 ± 979.87	2,010.6 ± 378.69	0.001*
Protein (g/d)	45.95 ± 32.15	56.55 ± 13.65	0.044*	45.14 ± 39.33	63.57 ± 13.87	0.001*

Note: *p-value < 0.05 is considered significant

Table V.
Comparing energy and protein estimated requirement and intake after intervention in control and intervention groups

	Intervention group			Control group		
Variable	Intake Mean ± SD	Requirement Mean ± SD	*p*-value	Intake Mean ± SD	Requirement Mean ± SD	*p*-value
Energy (kcal/d)	2,005 ± 1,114.3	2,050 ± 359.91	0.267	1,532 ± 116	2,012.6 ± 378.69	0.009*
Protein (g/d)	76.37 ± 42.25	56.55 ± 13.65	0.02*	61.35 ± 43.52	63.57 ± 13.87	0.695

Note: *p-value < 0.05 is considered significant

There was not a significant change in body weight, BMI, body water, body protein and fat mass in the intervention group during hospitalization but in the control group body weight ($p < 0.001$), BMI ($p < 0.001$) and body protein ($p = 0.028$) of the patients decreased significantly during hospitalization (see Table VI).

Discussion

Results of food intake analysis showed that before intervention daily energy and protein intakes were less than the estimated requirements in both groups. This mirrors data found in our previous study (Hosseini *et al.*, 2006) when reasons for poor intake included reduced appetite, nausea, vomiting, chewing and swallowing problems or surgery. So meeting estimated energy requirements found among patients in the intervention group indicates that the individualized dietary intervention was responsible for improvement in energy intake rather than other potentially positive effects of being in the study (e.g. increased awareness of nutrition or increased appetite) while energy intake remained less than estimated requirements in the control group during hospitalization.

On the other hand, although there were more malnourished patients the intervention group, with individualized dietary intervention no significant weight reduction or change in body composition was observed in this group but in the control group with better nutritional status significant reduction in body weight and body protein mass was observed.

At discharge daily protein intake met the estimated requirements in the control group but because of inadequate energy intake it did not prevent body protein loss and has been used as a source of fuel and of course a more expensive one.

Malnutrition is frequently undetected and untreated causing a wide range of adverse consequences (Stratton *et al.*, 2003). These adverse effects of malnutrition increase costs to the health centers. Underweight individuals (BMI <20 kg/m^2) have also been shown to consume more healthcare resources than those with a BMI between 20 and 25 kg/m^2, having more prescriptions (9 percent), more GP visits (6 percent) and more hospital admissions (25 percent) (Martyn *et al.*, 1998). In hospital, patients at risk of malnutrition stay in hospital significantly longer and are more likely to be discharged to health care destinations other than home (King *et al.*, 2003). Nutritional screening is the first step in identifying subjects who may be at nutritional risk or potentially at risk, and who may benefit from appropriate nutritional intervention. So using an appropriate nutritional screening tool such as "Malnutrition Universal Screening Tool" (MUST) can prevent most of these adverse consequences.

Using the "MUST" to categorize patients for their risk of malnutrition was found to be easy, rapid, reproducible and internally consistent. "MUST" can also be used in

	Intervention group			Control group		
Variable	Admission Mean ± SD	Discharge Mean ± SD	*p*-value	Admission Mean ± SD	Discharge Mean ± SD	*p*-value
Weight (kg)	56.55 ± 13.65	56.35 ± 12.2	0.59	63.04 ± 13.76	61.38 ± 13.58	<0.001*
BMI (kg/m^2)	20.35 ± 4.88	20.27 ± 4.54	0.54	23.48 ± 4.97	22.88 ± 4.93	<0.001*
Body protein mass (%)	16.54 ± 14.27	16.58 ± 12.51	0.29	14.47 ± 7.49	13.49 ± 7.82	0.028*
Body fat mass (%)	23.52 ± 12.33	22.99 ± 11.66	0.13	27.34 ± 10.46	29.4 ± 12.35	0.065
Total body water (%)	60.01 ± 12.77	60.38 ± 11.49	0.35	58.18 ± 8.33	57.06 ± 10.53	0.14

Note: *p-value < 0.05 is considered significant

Table VI. Changes in BMI, weight, body composition of the patients in intervention and control groups during hospitalization

patients in whom height and weight are not obtainable, as a range of alternative measures and subjective criteria are provided (Todorovic *et al.*, 2003).

In conclusion, this study supports the importance of individualized dietary intervention in preventing deterioration of nutritional status of the patients during hospitalization it also supports other works (Lassen *et al.*, 2004; Lawson *et al.*, 2003) that have shown the benefits of nutritional support in improving clinical outcomes among hospitalized patients.

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