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INDIVIDUALLY ADAPTED NUTRITIONAL INTERVENTION REDUCES DIETARY PROBLEMS AND IMPROVES PHYSICAL FUNCTION IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS

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Abstract: Dietary problems are common in patients with severe chronic obstructive pulmonary disease (COPD) and affect energy intake and nutritional status. The aim was to investigate effects of dietary counselling on dietary problems during a 12-month rehabilitation programme for patients with COPD. In 73 subjects with severe COPD, nutritional status was assessed by body mass index (BMI) and fat free mass index (FFMI) by single frequency bioelectrical impedance. Energy intake was calculated. The subjects were asked to describe any dietary problem they experienced. A six-minute walking test (6MWT) was performed to assess physical function. After 12 months of individually adapted nutritional intervention, 67 subjects were assessed by the same parameters. The number of dietary problems was reduced from 98 to 68. A significantly smaller group reported " Fear of gaining weight" and "Diarrhoea" ($p<0.05$). The patients succeeding in reducing their dietary problems also improved physical function indicated by significant improvements in 6MWT (mean 29.4 meters) after 12 months compared to baseline ($p=0.023$). Individually adapted dietary counselling can reduce the number of dietary problems. The results underline the importance of identifying dietary problems specific to the individuals as a means for improving nutritional status and physical function.

Key words: COPD, dietary problems, nutritional status, physical function.

Introduction

Chronic obstructive pulmonary disease (COPD) is a serious disease associated with personal suffering and great costs for medical care (1). In severe COPD malnutrition is common. Coincidentally, low body weight is a major mortality risk factor (2). Several factors seem to contribute to low body weight in patients with COPD. Increased energy expenditure both at rest and during activity in conjunction with reduced energy intake constitutes important causes (3, 4). Malnourished patients with COPD suffer more dietary problems and have a lower nutritional intake compared to adequately nourished patients (5). Previously it has been shown that patients with severe COPD had dietary problems commonly related to smoking habits and gender. It was also identified that dietary problems negatively affect energy intake and nutritional status (fat free mass index, FFMI) (6). In the current study a 12-month multidisciplinary rehabilitation programme that included an individually adapted nutritional intervention aimed to ameliorate dietary problems was examined. The aim was to investigate whether the rehabilitation programme could reduce dietary problems.

Methods

The study was conducted at the outpatient clinic, Department of Respiratory Medicine, Sahlgrenska University Hospital, Goteborg, Sweden. The Ethics Committee of the University Hospital approved the trial and patients gave written consent. The patients had a diagnosis of COPD, stages III or IV (7). Exclusion criteria were the presence of any other serious physical illness besides COPD and long- time-oxygen treatment.

The primary outcome variable was the count of Dietary Problems at start and after 12 months. Before

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participating in a diet history interview (DH) the subjects were asked to describe any dietary problem they experienced. The problems were grouped into 14 different categories defined in a previous report (6).

The secondary outcome variables included: Body mass index (BMI). BMI was calculated by weight (kg)/ height2 (m). Weight (kg) was measured by digital scale (Lindelltronic Scales, Jönköping, Sweden) to the nearest 0.1 kg with the subjects wearing light clothing and being barefoot. Height (m) was measured to the nearest centimetre using a horizontal headboard with an attached wall-mounted metric rule with the subjects being barefoot. Fat free mass (FFM) was assessed by single frequency bioelectrical impedance. Impedance was measured by one single measurement of resistance (in Ohms) with BIA-101 equipment (Akern, Florence, Italy). FFMI was calculated as FFM (kg)/ body height2 (m). Energy intake was calculated from the DH interview using the soft ware programme DIETIST (Kost och Näringsdata AB, Bromma, Sweden) using the 'Swedish Food Data Base' (1986).The DH form was standardized and validated (8) and a trained dietician conducted the interviews. The DH consisted of questions on food frequency, type of foods consumed, portion sizes and typical meal patterns over the previous 6 months. As measure of physical function, the six minute walking test (6MWT) was conducted by the same trained nurse on each occasion using standard methods for the test (9). Nutritional intervention was adapted to each subject on basis of the results from the DH interview, BMI, FFMI and weight history.

Statistical analysis: Subject characteristics were presented as mean and standard deviation (SD).

To detect differences in the distribution of dietary problems at baseline compared to study end McNemar´s test was used. Paired sample t-test was used to test outcome variables at baseline and after 12 months.

Results

Seventy-three subjects (37 women and 36 men) were included in the 12-month multidisciplinary rehabilitation programme. Twenty-seven were underweight (BMI$\leq$21 kg/m^2), 25 were of normal weight (21<BMI$\leq$25 kg/ m^2), 18 were overweight (25<BMI$\leq$30 kg/ m^2) and 3 were obese (BMI> 30 kg). Nineteen were current smokers and 54 were former smokers. Two smokers stopped smoking during the follow up. Six patients dropped out because of concomitant cancer disease (n=2), cerebrovascular disease (n=1), long-time oxygen therapy due to respiratory insufficiency (n=2) and death due to COPD (n=1).

The number of dietary problems was reduced from 98 to 68 during the 12 months of rehabilitation.

Figure 1 gives the spectrum of dietary problems at baseline and after 12 months of rehabilitation.

A significantly smaller proportion of the group reported "Fear of gaining weight" and "Diarrhoea" ($p<0.05$). Some subjects (n=24) had the same amount of dietary problems both at start and end of the study. Another group (n=23) reduced the number of self-reported dietary problems. Still another group (n=16) did not report any dietary problems at start and at the end. A small group (n=4) reported an increasing number of dietary problems during the 12 months period.

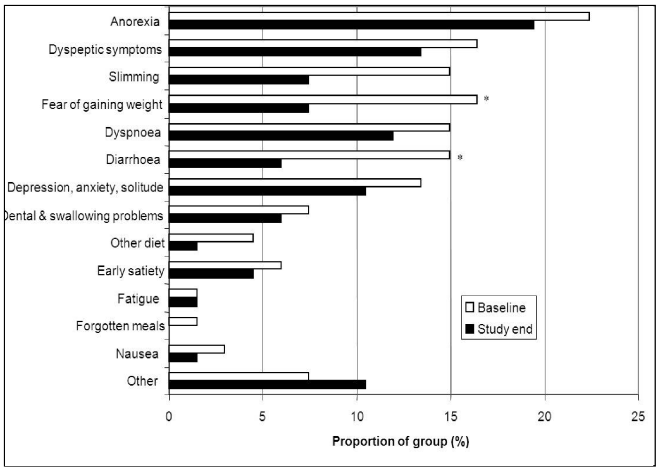

Figure 1. Dietary problems at baseline and after 12 months of rehabilitation

Changes in secondary outcomes during the rehabilitation year are presented in Table 1.

Table 1
BMI, FFMI, energy intake and 6 MWT before and after 12 months of multidisciplinary rehabilitation (mean (SD))

	BMI (kg/m2)		FFMI (kg/m2)		Energy intake (kcal)		6MWT (meter)	
	Baseline	12 m	Baseline	12 m	Baseline	12 m	Baseline	12 m
Same number of d. p (n=24)	23.4 (3.7)	22.6 (4.0)	17.1 (1.9)	16.9 (2.1)	1791 (370)	1709 (391)	308 (70)	317 (105)
Reduced number of d. p (n=23)	22.2 (4.2)	22.3 (3.9)	16.5 (2.0)	16.7 (2.1)	1753 (374)	1841 (540)	327 (88)	357 (110)*
Without d. p (n=16)	23.6 (3.5)	23.8 (3.1)	17.3 (1.5)	17.5 (1.5)	2429 (1103)	2331 (736)	364 (74)	380 (73)
Increased number of d. p (n=4)	22.4 (2.5)	22.8 (2.3)	16.9 (1.0)	16.9 (1.1)	1903 (412)	1693 (266)	380 (22)	397 (6)

d. p = dietary problems; m = months; BMI = body mass index; FFMI = fat free mass index; 6MWT = six minutes walking test; * $p < 0.05$ compared to baseline

The mean BMI in the study group changed from 23.7 kg/m^2 to 23.9 kg/m^2. The mean FFMI was 17.3 kg/m^2 both at baseline and at the end. The mean increase in 6MWT was 5 meters [range: - 130 to +144].

The patients succeeding in reducing their number of dietary problems during the year showed significant increase in the 6MWT compared to baseline (p=0.023). At baseline 15 patients reported a combination of recent weight loss (mean – 1.5 kg [range: - 15 to – 0.4]) and poor

appetite. At study end, 13 patients had had a recent weight loss (mean – 0.7 kg [range: -6.9 to – 0.2] combined with poor appetite. The mean energy intake developed from 1963 kcal/day to 1894 kcal/day. Energy intake increased in underweight subjects and subjects with normal weight and decreased in overweight and obese subjects. The largest increase in mean energy intake, 546 kcal/day, was noted in the group of underweight subjects who were successful in eliminating all their dietary problems (n=4). The underweight group who had a decrease in the number of dietary problems (n=6) had a mean energy intake increase of 390 kcal/day compared to 114 kcal/day in the underweight group that had the same number of dietary problems both at start and end of the rehabilitation (n=8).

Discussion

The main finding of this study is that dietary problems can be reduced by nutritional intervention and counselling. Focus of interventional studies has previously been on attempts of increasing nutritional intake and dietary problems have not been analysed (10, 11).

The findings also indicate that reducing dietary problems is of importance to increase energy intake in malnourished COPD patients. Only giving advice aimed at increasing energy intake is probably not enough. One must also improve the patient's possibilities to actually increase energy intake by removing dietary problems.

Of special interest is the relationship between successful nutritional interventions focusing on dietary problems and functional improvement. The 6 MWT increased most in patients that decreased dietary problems during the 12 months of follow-up.

The results presented in this study must be interpreted with care for several reasons. First, effects of dietary interventions were not the primary study objective of the rehabilitation programme. It was not a controlled study and the same dietician that treated the patients performed the interviews on dietaryproblems. Nevertheless the finding that dietary problems, like "Fear of gaining weight", "Slimming" in spite of low body weight, and eating the diet of another family member ("Other diet") were common and must be dealt with in a clinical setting.

The study indicates that it is possible to reduce these problems. Furthermore, "Diarrhoea" (n=15) was fairly common and found only in former smokers chewing large quantities of nicotine gums that contain Sorbitol, a substance known to cause diarrhoea (12).Those patients were advised to reduce their intake of chewing gums that contained Sorbitol.

The grade of compliance to the nutritional intervention varied greatly among the patients. Some patients declared they didn't want to gain weight although they were underweight and had a low nutritional status. Despite the noted methodological weaknesses this study makes an important contribution.

The results indicate that dietary problems can be reduced by multidisciplinary intervention. Importantly, reduced dietary problems are correlated with an increase in energy intake and improved physical function. It is common practice to give oral nutritional supplements or simply give advice on changes to the diet. The findings in this study indicate that this simple approach might limit the effectiveness of improving nutrition status and functional ability in COPD patients. The importance of identifying and treating dietary problems as a part of the individual nutritional intervention is underlined by this study.

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Conflict of interest: The authors declare that they have no conflicts of interest in connection with this article.

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