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Protein-energy oral supplementation in malnourished nursing-home residents. A controlled trial

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Abstract

Objectives: to validate a nutritional intervention programme for elderly people living in nursing homes.
Design: in a prospective, randomized, controlled study of 88 residents, we determined nutritional status at day 0 and day 60 using a record of dietary intake, anthropometry, hand-grip strength and mini-nutritional assessment. Dietary intake, grip strength and body weight were also recorded at day 30. We divided subjects into four groups according to their mini-nutritional assessment score. Those with a score 24 received no oral supplementation. Those at risk of malnutrition (with a score of 17–23.5) were randomized to oral supplementation. Those with a score <17 received oral supplementation. We recorded the amount of oral supplements consumed daily.
Results: compliance with oral supplementation was good, and daily intake averaged about 400 kcal. The total energy intake on day 60 was significantly higher in both of the groups that received supplements. Following supplementation, most subjects at risk of malnutrition improved their mini-nutritional assessment score and increased their weight (by 1.4 ± 0.5 kg). Neither the mini-nutritional assessment score nor weight improved in subjects at risk of malnutrition who did not receive supplements. Supplementation in the malnourished group resulted in a mean mini-nutritional assessment score increase (from 13.9 ± 2.6 to 17.1 ± 3.9) and a mean weight gain of 1.5 ± 0.4 kg.
Conclusion: oral nutritional supplements are well accepted and result in increased daily protein and energy intake, body weight and nutritional status in most malnourished patients and in those at risk of malnutrition.

Keywords: *body weight, elderly, mini-nutritional assessment, nursing homes, nutritional intake, nutritional status, oral supplementation*

Introduction

Malnutrition is common in nursing homes [1–7]. Causes include poor dental hygiene, impairment of taste, smell, cognition, attention, manual dexterity and inability to chew or swallow. With staff unawareness, inappropriate use of restricted diets and the use of drugs which impair the desire or ability to eat, patients may become malnourished during intercurrent illness [8, 9]. Inadequate food intake in elderly patients is associated with decreased body strength, lower resistance to infections and poor quality of life. Malnutrition is associated with depression, infections, sarcopaenia, falls, fractures, reduced autonomy and increased mortality [10–13].

Our aim was to evaluate a nutrition intervention programme. We also wished to determine whether oral supplementation is well accepted by old people in nursing homes, whether it could prevent malnutrition in those who are at risk of undernutrition and whether it could improve the nutritional status of malnourished subjects. We evaluated nutritional status by the mini-nutritional assessment (MNA) [14, 15], a dietary intake survey. We randomized subjects and performed an oral supplementation compliance survey.

Subjects and methods

We enrolled 88 people (14 men and 74 women) aged

65 and over in the study. We obtained informed consent from the subjects or their legal guardians. We performed the study in eight privately-run 80-bed nursing homes in Toulouse. The protocol was approved by the local ethical committee. Patients with acute disease, uncertain life expectancy or undergoing chemotherapy were excluded as were those with impaired intestinal digestion or absorption.

We performed dietary intake assessments, anthropometry, hand-grip strength and MNA at the beginning (day 0) and at the end of the study (day 60), and recorded dietary intake, hand-grip strength and body weight at day 30. We recorded the amount of the different oral supplements consumed daily by each patient.

We recorded dietary intakes as well as detailed descriptions of all foods and beverages consumed during a 3-day period. Dietary data were coded by the interviewing dietician and nutrient analysis was performed using the EURONUT SENECA database [16]. We averaged the intakes over the 3 days. We measured hand-grip strength in the dominant arm by a grip-dynamometer (Vital Sign TM).

The MNA included anthropometric measurements (calf and arm circumference, height, weight and weight loss) [17, 18], general assessments (lifestyle, medications, mobility), dietary questionnaires (number of meals, fluid and food intake, autonomy of feeding) and subjective assessments (self perception for health and nutrition) [19]. Using the MNA, we classified nutritional status on a 30-point scale, with 24–30 as well nourished, 17–23.5 as at risk of malnutrition and <17 as malnourished. The MNA was always performed by the same investigator (with the help of the families or staff in case of cognitive impairment).

Subjects were divided into four groups according to their MNA score. The 19 well-nourished old people (MNA $\geq$ 24) in group A received no oral supplementation. The 41 elderly subjects at risk of malnutrition (MNA 17–23.5) were randomly allocated into groups B (no oral supplements, $n = 22$) and C (oral supplements, $n = 19$). All 28 malnourished subjects (MNA <17) in group D received oral supplementation.

The nutritional supplements were of 300–500 kcal and were given in addition to regular meals. Four oral supplementation products (Clinutren, Nestle Clinical Nutrition, Sévres, France) were offered, each in three different flavours: Clinutren Soup (200 kcal and 10 g of protein per 200 ml), Clinutren Fruit (120 kcal and 7.5 g of protein per 200 ml), Clinutren Dessert (150 kcal and 12 g of protein per 150 ml) and Clinutren HP (Hyper-Protein; 200 kcal and 15 g of protein per 200 ml). These products were either sweet or savoury, liquid or creamy, and were served hot, warm or cold. They were enriched with proteins, vitamins and minerals and contained high amounts of energy and nutrient in a small volume. We strongly encouraged patients to consume the entire amount offered.

We informed the nursing-home staff of the aim and progress of the study. A dietician visited the homes weekly or bi-weekly and directed the product distribution and intake. Consumption of each portion of supplement was measured by direct observation and recorded as all, three-quarters, half, one-quarter or none of the portion.

We performed data analysis using the Number Cruncher Statistical Systems Software (NCSS, Kaysville, UT, USA). Analysis of data and influence of single independent factors was by one-way analysis of variance (ANOVA). We used the Kruskal–Wallis rank test when the distribution of variables was not normal.

Results

Of the 88 patients enrolled, four from group D died of respiratory infection and six from group C were excluded because they withdrew consent or were admitted to hospital for intercurrent illness. The results are from the 78 patients who completed the study.

The mean age was similar in groups A, B and C; subjects in group D were slightly older but this age difference was not significant ($P > 0.05$; Table 1). Prevalence of dementia increased with impairment of nutritional status, from 47% in group A to 91% in group D. The need for feeding assistance was related to a decrease in MNA score: most of those in group A ate without help, while 65% of group D needed assistance (Table 1).

Table 1. Characteristics on entry of patients who completed the study

	Group			
	A ($n = 19$)	B ($n = 22$)	C ($n = 13$)	D ($n = 24$)
Age (years)	83.7 ± 7.5	84.7 ± 5.5	84.6 ± 5.5	88.4 ± 3.8
Women (%)	78.9	90.9	78.6	91.3
Dementia (%)	47.3	68.2	85.7	91.3
Need for feeding assistance (%)	5.2	36.4	42.8	65.2

Table 2. Nutritional status descriptions of groups A [mini-nutritional assessment (MNA) score ≥ 24], B and C (MNA 17–23.5) and D (MNA <17) at day 0 and day 60

	Mean value ± SEM, by group and day							
	A (n = 19)		B (n = 22)		C (n = 13)		D (n = 24)	
	0	60	0	60	0	60	0	60
Weight (kg)	61.0 ± 2.8[b]	60.5 ± 2.8	52.5 ± 2.4[b]	51.2 ± 2.4	53.9 ± 2.2[b]	55.3 ± 2.5	43.9 ± 1.7[b]	45.4 ± 1.7[c]
Body mass index	25.2 ± 0.8[b]	25.0 ± 0.8	21.8 ± 0.9[b]	21.3 ± 0.9	22.3 ± 0.7[b]	22.8 ± 0.7	18.5 ± 0.5[b]	19.1 ± 0.6
Grip strength (kgW)	8.4 ± 1.7[b]	10.7 ± 2.7	5.9 ± 1.2[b]	5.2 ± 1.2	4.0 ± 1.9[b]	4.3 ± 2.1	2.0 ± 0.6[b]	2.8 ± 0.9
Energy intake (kcal)								
Spontaneous	1689 ± 70	1632 ± 72	1583 ± 56	1562 ± 66	1558 ± 60	1422 ± 122	1489 ± 64	1447 ± 83
Supplementary						393 ± 23		430 ± 20
Total						1815 ± 109[d]		1877 ± 81[d]
Intake/weight (kcal/kg)[e]	28.5 ± 1.6[a]	27.4 ± 1.5	31.1 ± 1.5[a]	30.8 ± 1.4	29.1 ± 1.0[a]	34.2 ± 2.3	34.4 ± 1.4[a]	43.3 ± 1.8
Protein intake (g)[e]	67.5 ± 2.1[b]	65.4 ± 2.2	62.0 ± 2.9[b]	62.0 ± 2.8	57.4 ± 2.7[b]	81.1 ± 5.1[d]	52.9 ± 2.9[b]	85.8 ± 3.9[d]

[a]$P < 0.05$; [b]$P < 0.001$ for differences between the four groups at day 0; [c]$P < 0.05$, [d]$P < 0.001$ for differences in day 60 and day 0 between the four groups.
[e]Including oral supplementation.

On entry, the groups differed significantly with respect to their weight, body mass index, energy and protein intake and hand-grip strength (Table 2). The well-nourished patients in group A had the highest mean values while the undernourished patients in group D had the lowest. Those in groups B and C had similar and intermediate values.

Mean daily supplement energy intake was similar in groups C and D (393 ± 23 kcal and 430 ± 20 kcal respectively). Fruit and HyperProtein were offered every other day, results being expressed as mean daily values. Both groups had good compliance with all products in each nursing home. We noted a slight decrease in the consumption after day 50 and during the weekend in both groups. Spontaneous energy intake decreased slightly in group C from 1558 ± 60 to 1422 ± 122 but remained stable in group B. However, the total energy intake on day 60 significantly increased to reach 1815 ± 109 kcal in group C and 1877 ± 81 kcal in group D ($P < 0.001$; Table 2).

The anthropometric measures remained stable over the 2 months for the two groups that did not receive supplements. In contrast, among those who received supplements there was a mean weight gain of 1.4 ± 0.5 kg (95% confidence interval 0.23–2.53) in group C and 1.5 ± 0.4 kg (95% confidence interval 0.65–2.39) in group D.

The changes in MNA score from day 0 to day 60 for each group are shown in Figure 1. Those in group A remained stable, except for one patient who contracted a chest infection. Group B appeared unstable because four subjects had a fall in their MNA score, five remained unchanged and others had a higher MNA score. Most subjects in group C improved their MNA score, except four who had severe intercurrent illnesses during the study. In group D, 20 of the 24 subjects increased their mean MNA score from 13.9 ± 2.6 to 17.1 ± 3.9.

Discussion

Protein-calorie malnutrition is common in old people in institutions [11]. Untreated undernutrition may result in a high rate of infection, decreased wound healing and eventually lead to death.

Explanations for poor dietary intake and malnutrition include unappetising food, absence of dietician, inadequate nutritional support during intercurrent illnesses, sub-optimal dining environment [5, 7], dietary restrictions [20], multiple illnesses, side effects of drugs and the presence of infections.

The effects of oral supplementation on the nutritional status of elderly people have been studied mainly in hospital. After 1 month of oral supplementation patients in hospital with a fractured femur showed lower complication rates and fewer deaths than controls who did not receive supplements [21]. In high-risk malnourished patients in orthopaedic wards sip feed supplementation avoided loss of muscle mass [22].

Giving oral supplementation at home for 6 months after hospitalization also improves the functional status of compliant patients whose diet is supplemented and increases the proportion who are independent [23]. Frail elderly patients given oral supplementation for 12

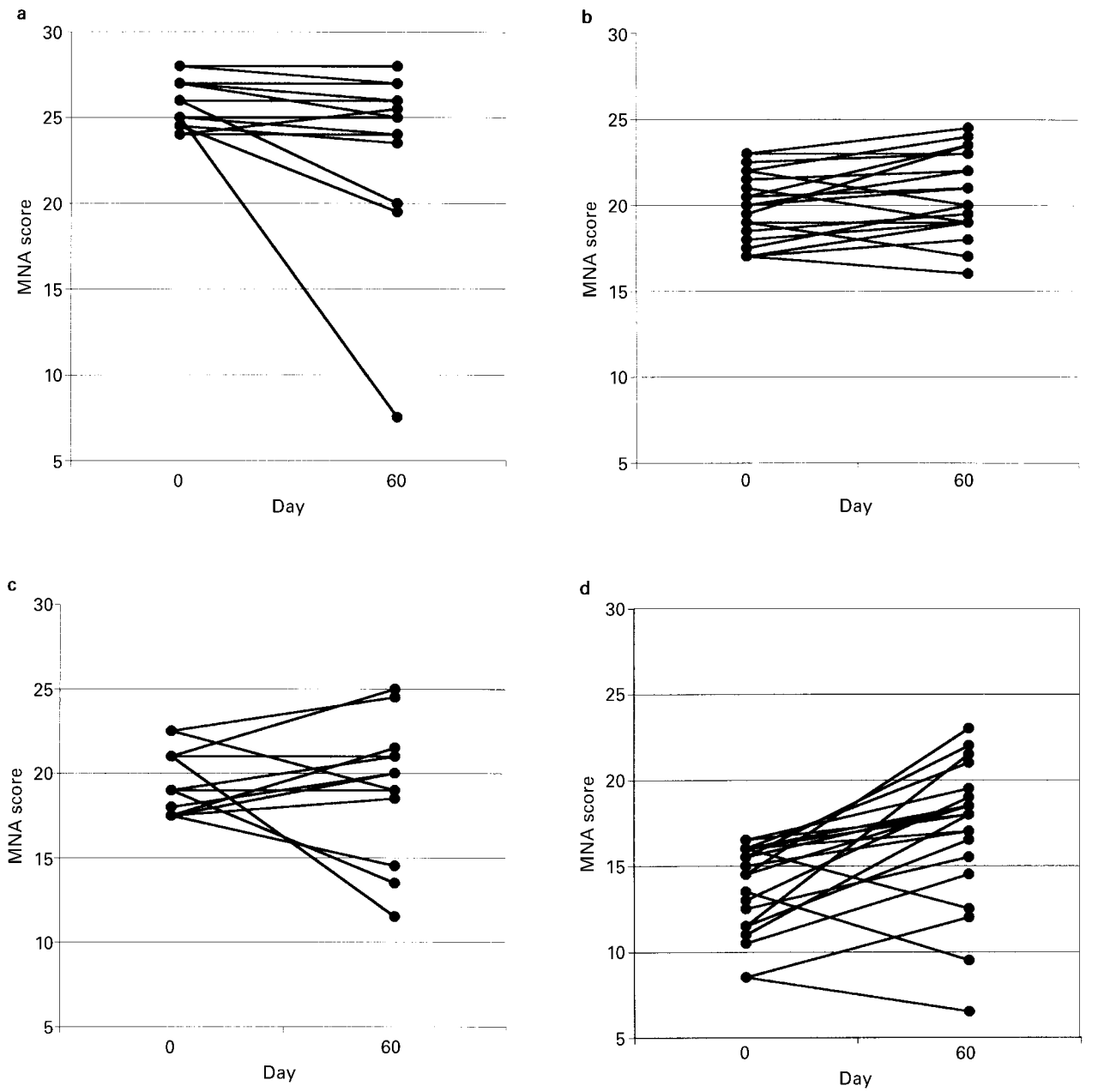

Figure 1. Changes in mini-nutritional assessment score from day 0 to day 60 for **a** group A and **b** group B who did not receive oral nutritional supplements and for **c** group C and **d** group D who received 300–500 kcal of supplementation per day.

weeks have been shown to gain more weight (2.1 ± 2.3 kg) than a group with a non-supplemented diet (0.6 ± 1.6 kg) [24]. Thus, oral supplementation in hospitalized, convalescent or frail elderly subjects accelerates recovery by increasing body weight (as well as well-being and autonomy) [21–23].

Although malnutrition is common in nursing homes, there has been only one study of oral supplementation in residents [25]. In this study, weight slowly increased over 9–10 months in most subjects on oral supplementation. However, this study was retrospective, there was no control group, nutritional status was evaluated only by serial weight measurements without anthropometric measurements or laboratory testing, and food and supplement consumption were evaluated without a written report.

Our study was a prospective controlled trial with biological, anthropometric and dietary measurements. The MNA [26] allowed standardized, reproducible and reliable determination of nutritional status. Accurate observations of acceptance of oral supplementation were recorded by the same care-giver immediately after the supplement was given. Daily oral supplementation intake averaged 393–430 kcal and oral

supplementation compliance remained good during the 60-day study period.

The undernourished subjects with an MNA of <17 who received oral supplements had protein-calorie undernutrition at enrolment, as shown by body weight, grip strength and dietary intake. The weight gain of 43.9 ± 1.7 kg to 45.4 ± 1.7 kg in this group was related to oral supplementation: these patients gained weight, had good compliance and did not reduce their voluntary food intake. Other studies have also found that oral supplementation increases energy and nutrient intake with no reduction in voluntary food intake [23, 27–31] and that oral supplementation acceptance may be maintained even after 2 months [23, 32].

Elderly subjects at risk of malnutrition who received oral supplementation showed improvement in mean weight and MNA score compared with subjects who did not receive supplements but had similar MNA scores at enrolment. This weight gain suggests that nutritional support could be useful not only in overtly undernourished patients but also in elderly people with more subtle earlier features of undernourishment.

The diagnosis of undernutrition may be overlooked and intervention can be haphazard in some nursing homes [25]. Many malnourished patients receive nutritional support at a late stage. Those at risk of malnutrition are often not tested for nutritional status — and therefore not treated — due to the lack of the routine use of a convenient assessment tool. The importance of nutrition in older people is not always recognized [33] by care staff: few consider it to be as therapeutic as other treatments [34]. In our study, the staff were well informed about the protocol and most of the subjects who received supplements had improved their dietary intake, gained weight and increased their MNA score by day 60. Thus, the MNA test could be used not only for nutritional screening but also a follow-up assessment tool.

In conclusion, over a 2-month period, oral supplementation was associated with increased body weight and nutritional status in most malnourished patients and those at risk of malnutrition. The supplements, which were convenient and well accepted, increased daily protein and energy intakes and improved nutritional status.

Key points

- Protein-calorie malnutrition is common in old people in institutions.
- Oral nutritional supplements are well accepted and result in increased daily protein and energy intake, body weight and nutritional status in most malnourished patients and in those at risk of malnutrition.
- The mini-nutritional assessment test is useful for both nutritional screening and follow-up assessment.

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