Clinical Nutrition 31 (2012) 69–73

Contents lists available at SciVerse ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Original article

Impact of restrictive diets on the risk of undernutrition in a free-living elderly population☆

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ARTICLE INFO

Article history:
Received 24 February 2011
Accepted 11 August 2011

Keywords:
Elderly
Diet
MNA
Undernutrition

SUMMARY

Background & aims: Elderly subjects are at risk for undernutrition. Restrictive diets may increase this risk. The aim was to evaluate the impact of restrictive diets on undernutrition and its risk in free-living elderly.
Methods: Ambulatory patients over age 75 and under a restrictive diet (low salt, low cholesterol, diabetic) were included prospectively, along with age- and gender-matched controls. Weight and height were measured, and the short-form of the Mini Nutritional Assessment was scored. Groups were compared to determine variables associated with a low MNA-SF®.
Results: 95 patients in the diet group (62 F, 33 M, 80 ± 4 y) and 95 controls (57 F, 38 M, 82 ± 5 y) were included. Restrictive diets (low salt $n = 33$, diabetic $n = 19$, low cholesterol $n = 15$, combination $n = 27$) had been followed since 11.0 ± 5.9 years. Using the cut-off of 12 for MNA-SF®, 44 patients in the diet group were at risk *vs.* 22 among controls ($P < 0.001$). In multivariate analysis, a restrictive diet increased the probability of having an MNA-SF® < 12 (OR = 3.6, $_{95\%}$CI = 1.8–7.2, $P < .001$).
Conclusions: Restrictive diets in patients over 75 increase the risk of undernutrition. On an individual level, these diets may need reassessment. Society guidelines should promote specific recommendations for the elderly.

1. Introduction

Undernutrition in the elderly is a major public health concern, still underdiagnosed[1] Though mostly prevalent in hospitalized (up to 60%) and institutionalized (up to 40%) patients,[2,3] it also affects 5%–10% of free-living elderly, which is the most common situation at that age. Between 2010 and 2050, with a worldwide increase in life expectancy, population over the age of 80 will grow from 1.6% to 4.4% worldwide and from 4.3% to 9.4% in developed countries[4] Consequently, the absolute number of undernourished elderly will pursue its increase. Poor nutritional status in the elderly is an independent risk factor of progressive health decline, reduced physical and cognitive functional status, increased utilization of healthcare services, early institutionalization, and increased morbidity and mortality[5]

Mechanisms leading to undernutrition in elderly imply both intrinsic (such as acute or chronic diseases, isolation, swallowing problems, and poor socio-economic conditions) and extrinsic (such as multiple medications) factors[6] Among intrinsic factors, age-related anorexia is of major importance, as its affects one out of five persons[7] and therapeutic strategies are limited; this complex phenomenon involves peripheral and central alterations in appetite control[8] and usually leads to reduced food intake. Restrictive diets may be another cause of food intake alteration; they are prescribed in patients with diseases such as hypertension, chronic heart failure, diabetes mellitus and dyslipidemia, all strongly influenced by dietary lifestyle. These diets may lead to undernutrition through a number of different mechanisms: in addition to a reduced palatability of low sodium diets[9] elderly people often present alterations of salt taste perception, which worsens food intake.[10] Some studies have demonstrated that low sodium diets induce low energy and protein intakes, thus increasing the risk of undernutrition.[11] Perceived taste and health beliefs are strong motives in

☆ These results were presented as an oral presentation during the 31st Congress of the European Society for Clinical Nutrition and Metabolism in Vienna, 29 August–1 September 2009.

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doi:10.1016/j.clnu.2011.08.007

food selection and influence energy intake in this population.[12] Low fat and diabetic diets are mainly associated with undernutrition through a lower energy density of food.[13,14]

Consequently, several experts consider restrictive diets as a major risk factor for undernutrition and strongly advise against these[6,15,16]; low salt and low fat diets represent one «l» in the famous "Meals on Wheels" acronym.[17]

Nevertheless, to this day no published data has supported the correlation between restrictive diets and poor nutritional status in the elderly. The aim of our study was therefore to evaluate the impact of one or more restrictive diets on undernutrition and its risk in free-living elderly.

2. Materials and methods

2.1. Patients

Between January and May 2008, nine general practitioners from the Alpes-Maritimes department of France agreed to participate in this cross-sectional study. They were asked to screen all their outpatients over the age of 75 for the existence of one or more among three restrictive diets (low salt, diabetic, low cholesterol) followed for more than three months. Patients were included only if they were free-living and able to undergo a geriatric and nutritional assessment. Exclusion criteria were conditions leading to wasting and undernutrition, such as cancer, severe organ failure, insulin-requiring diabetes mellitus, chronic intake of immune suppressants and corticoids, and nutritional support. The ethics committee of Nice approved the study, and all subjects provided signed informed written consent in accordance with the Helsinki guidelines.

Patients were prospectively enrolled. When a patient with a restrictive diet was included, the medical practitioner was asked to enroll his/her next patient of similar age and sex, not following any restrictive diet.

2.2. Data collection

Medical history was recorded (comorbidities, type of diet, medications) according to the patient's self report, and completed by the physician. Physical examination included body height and weight measurements, allowing body mass index (BMI) calculation, and the short-form of the Mini Nutritional Assessment (MNA®), a simple and validated screening tool for nutritional risk in the elderly. BMI levels $\leq$21 (French Guidelines) (6) indicated undernutrition, and MNA score below 12 points (out of a total of 17) indicated undernutrition or a risk of undernutrition.[18] For each diet, duration, indication, patient's adherence (all the time, most of the time, sometimes, never) were recorded. Dietary profile was defined as normal if no quantitative or qualitative food restrictions were recommended. Restrictive diets were based on patients' declarations and verified by the physician.

2.3. Statistical analysis

Data were exploited using professional software (SPSS v12) framed by the Public health Department of the Nice University Hospital. Quantitative measurements normally distributed were compared with ANOVA, else with Kruskall and Wallis tests. Qualitative data were compared with Pearson Chi2 or Fischer tests. Homoscedasticity was explored by Levene's test. The statistical threshold selected was a risk alpha of 5%. A multivariate analysis, for variables significant with a risk of 10%, with logistic regression by the ascending and descending methods of Wald, was also carried out. For analysis purposes, patients were pooled in two groups according to their compliance with diet: good adherence if diet was followed everyday or most of the time, bad adherence if diet was followed sometimes or never.

3. Results

3.1. Characteristics of the study population

190 patients were included in this study: 62 women and 33 men in the restrictive diet group, 57 women and 38 men in the control group. Gender ratio was similar in the two groups (Table 1). Mean age of women in the restrictive diet group was lower when compared to controls.

There was a significant difference between the diet and control groups in terms of prevalence of diseases for which diet had been indicated (Table 1): all diabetic patients and most of those with chronic heart failure and dyslipidemia were in the restrictive diet group; on the contrary, most patients with high blood pressure were in the control group. Combined prevalence of diseases that may be responsible for wasting or/and undernutrition (chronic obstructive pulmonary disease, chronic heart failure, liver disease, hyper/hypothyroidism, rheumatoid arthritis, Crohn's disease) did not differ between groups (34 comorbidities in diet *vs*. 28 in control group, NS).

3.2. Characteristics of the restrictive diets

Three types of diets were represented: low sodium (51 patients), diabetic (36 patients) and low cholesterol (37 patients). 67 patients were under a single diet, 25 patients had a combination of two diets and two patients had a combination of three diets (Table 2).

Mean diet duration was 11.0 $\pm$ 5.9 years. Only 13.6% patients followed their diet everyday, 59.1% most of the time, 19.3% sometimes, 7.5% never.

Table 1
Characteristics of the population.

		Restrictive diet			Controls		
Gender		Women	Men	Total	Women	Men	Total
Number		62	33	95	57	38	95
Mean age		80.4 $\pm$ 1.6*	80.7 $\pm$ 3.8	80.5 $\pm$ 3.9*	82.5 $\pm$ 5.0	80.9 $\pm$ 4.3	81.8 $\pm$ 4.8
BMI (kg/m^2)		24.2 $\pm$ 4.2	27.1 $\pm$ 2.8	25.3 $\pm$ 4.0	24.5 $\pm$ 3.8	25.7 $\pm$ 2.7	25.0 $\pm$ 3.4
Disease leading to diet prescription *n**	Type 2 diabetes	22	14	36	0	0	0
	Hypertension	6	3	9	20	14	34
	Chronic heart failure	27	9	36	4	2	6
	Obesity	2	0	2	4	1	5
	Dyslipidemia	12	12	24	3	4	7

BMI: body mass index; *$p < 0.05$ when compared to controls.