MALNUTRITION IN ELDERLY: SOCIAL AND ECONOMIC DETERMINANTS

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Abstract: Malnutrition occurs frequently in the frailest groups of the population, especially in people who are on a low income and elderly subjects, overall if they are institutionalized. The aim of this study was to assess the prevalence of malnutrition in a sample of elderly people living in different settings and to identify the determinants of malnutrition. *Methods:* A total of 718 subjects, 472 females (F) and 246 males (M), were recruited from nursing homes or were free living in three different regions in Italy. Nutritional status, depression, social, functional and cognitive status, were evaluated. *Results:* According to the Mini Nutritional Assessment (MNA), a high prevalence of malnutrition was found out in both genders: 26% of F and 16.3% of M were classified as being malnourished (MNA<17); 40.9% of F and 35% of M were at risk of malnutrition (MNA 17-23,5). The prevalence of malnutrition was significantly higher in NH subjects in both sexes. Moreover, a relationship was shown between malnutrition and inability to shop, prepare and cook meals because of a low income, distance from markets or supermarkets as well as impossibility to drive the car or to use public transportation. This study confirms the necessity to routinely perform nutritional status evaluation in elderly subjects, to carry out training courses for health workers (doctors, nurses, psychologists, dietitians), to implement nutritional education of the geriatric population, to develop tools and guidelines for health workers and caregivers, to identify and reduce clinical, functional, social or economic risk factors for malnutrition.

Key words: Malnutrition, elderly, poverty.

Introduction

A close relationship exists between nutritional status and health. The homeostasis of body composition and function determines the health status through the exchange of energy and nutrients with the environment.

Malnutrition is a very frequent condition in the frailest groups of the population, especially in low- income people and elderly subjects overall when they are institutionalized. In these subjects malnutrition is the consequence of energy and protein deficiencies that cause adverse effects on body composition and on body function such as impaired muscle function, decreased bone mass, immune dysfunction, anemia, reduced cognitive function, poor wound healing, delayed recovering from surgery, higher hospital and readmission rate, and mortality (1). These phenomena are amplified in case of hospitalization, and the presence of malnutrition may deeply affect the prognosis, the length of hospitalization, the incidence of acute events and complications (2)

Moreover, social factors like poverty, loneliness, low levels of education may affect food availability and, subsequently, nutritional status (3, 4).

Available data in the literature demonstrate that up to 15% of community- dwelling and home-bound elderly, 23% to 62% of hospitalized subjects and up to 85% of nursing home residents are malnourished (5, 6).

The aim of the study was to analyze the prevalence of malnutrition in a sample of elderly people living in different geographical areas in Italy and to identify the psychological, social, economic, environmental, cultural and demographic determinants of malnutrition.

Materials and methods

The study was promoted by the Italian National Institute for Health, Migration and Poverty (NIHMP) and conducted in collaboration with Sapienza University of Rome. The study was approved by local ethics committee.

Different research centres across Italy (in Lazio, Emilia-Romagna and Sicily regions) participated to the study. The subjects were enrolled in two different settings with characteristics that we can suppose to influence the prevalence of malnutrition: community dwelling persons and nursing homes (NH) people were chosen.

All the subjects were screened according to the following inclusion or exclusion criteria :
- inclusion criteria
- age > 65 years old;
- exclusion criteria
- subjects on artificial nutrition;
- grade "4" comorbidity or severely disabling conditions or at high risk of death according to the Cumulative Illness Rating Scale (CIRS) (7)

Anamnesis, physical examination and nutritional assessment were performed:

- Mini Nutritional Assessment (MNA) to assess the nutritional status. The MNA test consists of 18 questions grouped into 4 parts: anthropometry (BMI, weight loss, mid upper arm and calf circumferences), clinical state (medications, mobility, pressure sores and skin ulcers, lifestyle, psychological stress or neuropsychological problems), dietary assessment (autonomy on feeding, quality and number of meals, fluid intake) and self perception about health and nutrition. The total score ranges from 0 to 30 points. MNA score < 17 points indicates malnutrition; MNA score from 17 to 23,5 is an indicator of a risk of malnutrition, instead a good nutritional status is defined by MNA score ≥ 24 (8);
- Multidimensional Geriatric Assessment through:
- CIRS (Cumulative Illness Rating Scale) (7) for the evaluation of comorbidities; it is divided in two parts: the comorbidity index (CI) and the severity index (SI);
- SPMSQ (Short Portable Mental Status Questionnaire) was performed to identify cognitive impairment (9);
- GDS (Geriatric Depression Scale) (10);
- psychosocial aspects, education level, income, family support, presence of a caregiver, social support, distance from supply centres, availability of transportation services, nutrition knowledge, current social role and social role previously assumed;
- IADL (Instrumental Activities of Daily Living) scale and ADL (Activities of Daily Living) test evaluating the current functional ability (11,12)

Data analysis

Statistical analysis of clinical and functional characteristics of subjects was performed by unpaired Student's t-test or ANOVA test for continuous variables, and by chi-squared test for the comparison of proportions. Statistical significance was set at p value < 0,05. Data were analyzed using the SPSS for Windows 10.0 software package (SPSS Inc., 1989-1999).

Results

Subjects' Characteristics

A total of 718 subjects were enrolled over a 2- year period (from 2009 to 2011): 472 were females (mean age: 78,2±8 years) and 246 males (mean age: 76,8±7 years). Subjects (table 1) came from nursing homes (41,3% females and 49,2% males) or were free living (FL).

The prevalence of malnutrition estimated by the MNA was high in both genders: 23,1% of females (F) and 14.5% of males (M) were classified as being malnourished (MNA score <17); 40,3% of F and 35,2% of M were at risk of malnutrition (MNA score: 17- 23,5). The prevalence of malnutrition was significantly higher in NH subjects in both sexes when compared to their FL counterparts (table 1).

Table 1
Sample description

| | Nursing Home | | Free living | | |
	F	M	F	M	
N 195	121	277	125		
Age (years)	81.6±8	77.5±8	75.6±7	76.1±6	* **
MNA (score)					
Malnourished (%)	42,5	30,8	14,5	2	*
Patients at risk of malnutrition (%)	43,4	34,6	39	35,6	**
Normal nutritional status (%)	14,2	34,6	46,5	62,4	

* p < 0.05 between nursing home and free living subjects (regardless of gender); ** p < 0.05 between males and females (regardless of setting). Legend: MNA: Mini Nutritional Assessment

The average level of comorbidity defined by the Cumulative Illness Rating Scale was high (similar in both sexes); a high level of disability and depression were very frequent. Clinical and functional parameters were more impaired in NH subjects

Table 2
Clinical and functional status

| | | Nursing Home | | Free living | | |
		F	M	F	M	
Cumulative Illness Rating Scale (CIRS)	Comorbidity index	3±1	2.9±2	2.1±1	2.1±1	*
	Severity index	2±0.5	1.8±0.7	1.7±0.4	1.6±0.5	ns
IADL	score	4±5	6.4±5	9.2±5	10.4±5	* **
	Less autonomous subjects (%)	72.9	49.1	25.2	19.8	**
ADL	Score	5.9±4	7.3±4	8.8±4	9.8±3	*
	Lost functions/6	2.8±2	2.3±2	1.5±2	1±1	* **
	> 2 functions lost (%)	53.2	37.9	25.2	17.4	* **
SPMSQ	score	4.3±3	3.6±3	3±3	2.6±3	*
	cognitive status impairment (score > 7) (%)	18.9	16.4	8.9	6.7	*
GDS	score	6.2±3	5.4±4	4.6±4	2.8±3	* **
	mood depression (score > 10/15) (%)	60.6	44.3	38.5	17.4	* **

* p < 0.05 between nursing home and free living subjects (regardless of gender); ** p < 0.05 between males and females (regardless of setting); ns: not significant, Legend: CIRS: Cumulative Illness Rating Scale; IADL: Instrumental Activities of Daily Living; ADL: Activities of Daily Living; SPMSQ: Short Portable Mental Status Questionnaire; GDS: Geriatric Depression Scale

Table 3
Socio-economic characteristics

		Nursing Home		Free living		
		F	M	F	M	
Marital status (%)	Single	22	15,6	9,9	4,9	* **
	Married	27,5	55,6	46,2	77	
	Widowed	48,6	23,3	39,9	16,4	
	Separated/Divorced	1,8	5,6	4	1,6	
Educational level (%)	Illiterate	12,6	4,5	10.6	10,7	* **
	Elementary	48,6	38,2	55,7	39,3	
	Media Lower	26,1	20,2	17,6	16,4	
	Media Higher	10,8	28,1	12,1	20,5	
	Degree	1,8	9	4	13,1	
Occupation /employment (%) (°)	Housewife	26,6	4,5	32,4	2,5	* **
	Employee	11	6,8	16,2	23,8	
	Worker	6,4	15,9	5,9	13,9	
	Retired	56	72,7	45,6	59,8	
Income level (%)	< 500 €	29,5	11,5	7,4	1,6	* **
	From 501 to 1000 €	49,5	32,2	55,1	40,2	
	From 1001 to 1500 €	16,2	37,9	30,9	39,3	
	From 1501 to 2000 €	3,8	12,6	5,5	13,1	
	> 2000 €	1	5,7	1,1	5,7	
People who cohabits (%) (°)	None	43,9	22,9	18	10,7	* **
	Spouse	25,5	56,6	44,5	70,5	
	Children	10,2	10,8	26,1	13,1	
	Grandchildren	4,1	0	1,8	3,3	
	Friends	1	1,2	2,9	2,5	
	Care-giver	15,3	8,4	6,6	0	
Food purchase (°)	By him/herself (%)	30,7	26,8	51,5	38,5	* **
	Distance from market (mn)	13,7±8	12.7±8	11.7±7	11±7	ns
	Distance from supermarkets (mn)	11.2±8	17.4±8	12.4±7	19±8	* **
Use of the car (%) (°)	Yes	40,2	71,8	89,2	97,5	* **
	Who is the driver?					
	By him/herself	23,1	53,7	15,4	52,9	* **
	Spouse	11,5	9	23,9	11,8	
	Sons or daughters	44,2	31,3	47,5	27,7	
	Grandchildren	3,8	4,5	5,8	4,2	
	Friends	13,5	1,5	5,8	2,5	
	Care-giver	3,8	0	1,5	0,8	
Use of public transport (%) (°)	Yes	27,6	34,9	54,9	56,6	ns
	By him/herself	30,8	43,5	39	33,3	ns

* p < 0.05 between nursing home and free living subjects (regardless of gender); ** p < 0.05 between males and females (regardless of setting); ° for Nursing Home subjects, before admission in this setting; ns: not significant

(table 2).

Socio-economic data (table 3) showed that 13,3% of women were unmarried and 3,6% divorced versus only 9,4% of men were single and 3,3% separated or divorced (p< 0,05); 39,5% of women and 64,9% of men lived with their husband or wife while 22% of women and 12,2 % of men lived with their sons or daughters. 8,9% of women and only 3,4% of men lived with a caregiver (p<0,05). Loneliness (being unmarried, widowed or separated/ divorced) was more frequent in NH subjects).

According to degree of education, most of subjects (53,5% of females and 38,9% of males; p<0,05) achieved the primary education. Only 3,4% of women and 11,4% of men graduated (p< 0,05). A lower level of education was more frequent in NH subjects.

About two thirds of men (68,1%) had no occupation (3,3% unemployed and 64,8% retired) while 78% of women did not work (30,6% were housewives and 47,4% retired). The lack of employment clearly exerted an important impact on the income: about two thirds of women (68,9%) and 42,3% of men had an income less than 1000 € per month (p<0,05). A lower income and the lack of an occupation were more frequent in NH subjects (for NH subjects data about the occupational status are referred to the period preceding the admission to the nursing home).

The distance of grocery stores and supermarkets from home was respectively about 11,9±7 and 14,3±8 minutes: therefore only 46,3% of females and 33,8% of males did the shopping by themselves. In addition, only 16,7% of F drove the car by themselves and 47,8% used public transportation without any help, when compared to the male counterparts (53,2 and 47,6%, respectively). The necessity of a support for food purchase or mobility was more frequent in NH subjects even considering that data are referred to the period preceding the admission to the nursing home.

Parameters related to nutritional status

A relationship was shown between the presence of malnutrition defined by Mini Nutritional Assessment and the

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Table 4
Multidimensional Geriatric Assessment and nutritional status (according to MNA)

Nutritional status (MNA)		malnutrition		at risk of malnutrition		normal		
		NH	FL	NH	FL	NH	FL	
CIRS	comorbidity index	3,9±2	3.2±1	3.2±1	2.4±1	2.6±1	1.7±1	* **
	severity index	2±0.6	2±0.4	1,8±0,4	1.8±0.5	1.6±0.4	1.6±0.4	**
IADL	score	1.9±3	4.2±5	5.8±5	7.7±5	10.7±4	12.4±3	* **
	less autonomous subjects (%)	91.2	64,9	55.4	33.8	16.7	4	* **
ADL	score	2.9±3	5±5	7.7±4	8.2±3	10.7±2	10.9±2	**
	lost functions/6 (%)	3.6±2	3.4±2	2.1±2	1.9±2	1±2	0.5±1	**
	> 2 functions lost (%)	66.2	59,5	37	34,6	16.7	5,1	**
SPMSQ	score	5.1±3	6.1±2	2.8±2	4.1±3	1.4±1	1.5±2	**
	cognitive status impairment (score > 7) (%)	16,2	32,4	4,1	10.8	0	2,3	* **
GDS	score	7.1±4	5.1±5	5.6±3	5.7±4	3.7±3	2.9±3	**
	mood depression (score > 10/15) (%)	69,1	37.8	50	53.8	26,2	19,4	* **

* p < 0.05 between nursing home and free living subjects (regardless of nutritional status); ** p < 0.05 between nutritional status classes according to MNA (regardless of setting).
Legend: NH: Nursing Home; FL: Free Living; CIRS: Cumulative Illness Rating Scale; IADL: Instrumental Activities of Daily Living; ADL: Activities of Daily Living; SPMSQ: Short Portable Mental Status Questionnaire; GDS: Geriatric Depression Scale; MNA: Mini Nutritional Assessment.

Table 5
Demographic and socio–cultural data related to nutritional status (according to MNA)

Nutritional status (MNA)		malnutrition		at risk of malnutrition		normal		
		NH	FL	NH	FL	NH	FL	
Age (years)		82.1±7	80.8±6	80.4±7	77.8±6	75±7	72.9±6	*
Marital status (%)	Single	22.6	8.1	14.5	10	19	7.4	***
	Married	29	48.6	43.5	52.3	52.4	63.4	
	Widower	48.4	43.2	36.2	36.9	21.4	25.7	
	Divorced	0	0	5.8	0.8	7.1	3.4	
Educational level (%)	Illiterate	15.6	16.2	8.6	19.2	2.4	5.1	**
	Elementary	45.3	73	47.1	60.8	43.9	45.7	
	Media Lower	20.3	8.1	28.6	10	17.1	18.3	
	Media Higher	14.1	2.7	12.9	6.9	29.3	21.7	
	Degree	4.7	0	2.9	3.1	7.3	9.1	
Occupation /employment (%) (°)	Housewife	17.2	21.6	16.2	23.8	22	26.3	* **
	Employee	9.4	0	13.2	6.2	4.9	26.9	
	Worker	6.3	0	11.8	3.1	14.6	12	
	Retired	67.2	78.4	58.8	66.9	58.5	34.9	
Income level (%)	< 500 €	25.4	18.9	19.7	8.5	16.7	2.3	* **
	from 501 to 1000 €	57.6	75.7	45.5	65.4	28.6	45.1	
	from 1001 to 1500 €	15.3	5.4	27.3	26.2	38.1	43.4	
	From 1501 to 2000 €	1.7	0	7.6	0	16.6	9.2	
People who cohabits (%) (°)	None	43.4	2.7	32.3	17.1	31	18.3	* **
	Spouse	24.5	40.5	41.9	48.1	59.5	62.3	
	Children	11.3	45.9	9.7	25.6	0	13.7	
	Grandchildren	3.8	2.7	3.2	0.8	0	1.7	
	Friends	1.9	5.4	1.6	2.3	0	2.3	
	Care-giver	15.1	2.7	11.3	6.2	9.5	1.7	
Food purchase (°)	By him/herself (%)	4.4	27.8	33.9	35.4	42.9	64.6	* **
	Distance from market (mn)	15.4±9	14.4±7	12.2±7	12.4±6	12.9±9	9.6±7	ns
	Distance from supermarket (mn)	10.3±7	6.5±3	14±7	12.5±7	15.5±6	15.6±7	ns
Use of car (%) (°)	Yes	43.4	97.1	52.4	92.2	68.3	92	* **
	Who is the driver ?							
	By him/herself	12.1	2.7	21.6	9.7	81.3	45.2	* **
	Spouse	6.1	5.4	8.1	12.9	9.4	20.5	
	Sons or daughters	51.5	78.4	56.8	63.7	9.4	25.3	
	Grandchildren	12.1	10.8	2.7	6.5	0	4.2	
	Friends	12.1	2.7	10.8	5.6	0	4.2	
	Care-giver	6.1	0	0	1.6	0	0.6	
Use of public transport (%) (°)	Yes	16.7	29.7	25.4	44.6	40.5	72.6	* **
	By him/herself	77.8	36.4	37.5	46.7	13.3	73	* **

* p < 0.05 between nursing home and free living subjects (regardless of nutritional status); ** p < 0.05 between nutritional status classes according to MNA (regardless of setting); ° for Nursing Home subjects, before admission in this setting; ns: not significantLegend: NH: Nursing Home; FL: Free Living; MNA: Mini Nutritional Assessment.

following parameters (table 4 and 5):
- mean age of recruited subjects: MNA score was lower in older subjects;
- the recruitment site: malnutrition was more common in institutionalized subjects;
- the clinical condition: malnourished subjects, especially those at risk of malnutrition, had higher levels of severity and comorbidity.

Malnourished subjects or individuals at risk of malnutrition were less autonomous and needed for assistance in performing ADLs (63,8% of malnourished subjects and 7,4% of normal nutritional status patients were characterised by an important impairment in ADLs; p<0,05). Psychological and emotional aspects were more compromised (depression was present in 58,2% of malnourished subjects and in 20,7% of normal nutritional status patients; p<0,05) and the prevalence of cognitive impairment was higher in malnourished subjects (severe cognitive impairment was observed in 21,8% of malnourished subjects and in 1,9% of normal nutritional status patients; p < 0,05).

These differences were more pronounced in NH subjects: in fact, in these patients the correlation between nutritional status, clinical condition and functional ability was more evident. At the same time demographic and socio- cultural data were not only related to nutritional status, but even less favourable for NH subjects.

Discussion

In this study the prevalence of malnutrition, according to MNA scores, seems to be relevant both in free-living and institutionalised subjects. Nutritional status turns out to be related to the clinical status and to different socio- economic parameters. Globally, the considered aspects were less favourable for NH subjects .

This study confirms the need to perform a nutritional status screening for elderly subjects, to carry out training courses for health workers (physicians, nurses, psychologists, dietitians), to implement nutritional education for the geriatric population, to develop tools and guidelines for health workers and caregivers (13, 14).

Nutrition is an important determinant of health status in the elderly people because it affects the ageing process. Unfortunately, elderly people are at an increased risk of inadequate diet and malnutrition: paradoxically, in the industrialized countries, malnutrition is very frequent especially in hospitalized elderly subjects or in subjects admitted in nursing homes (15).

Malnutrition is usually associated with decreased muscle and immune function, impaired quality of life, impaired wound healing and even with increased length of hospital stay, mortality as well as costs of health care (16, 17). It should be noted that the majority of these subjects develops malnutrition

during hospital stay (18). Therefore, in clinical practice, it is necessary to identify malnourished subjects or individuals at risk to become malnourished by routinely administered screening tools (19, 20). Then, on this basis, it is possible to perform a precocious nutritional intervention to prevent malnutrition consequences.

It is also important to determine and remove the causes of malnutrition. In this study a correlation between a high prevalence of malnutrition and clinical, functional and socio-cultural aspects was found.

Senile anorexia and, hence, malnutrition may be related to clinical status and to a higher level of comorbidity (21, 22). Moreover, the occurrence of intercurrent diseases can be responsible for increased nutrient losses (bronchitis, kidney failure, etc..) and an involuntary loss of fat- free mass or body cell mass because of hypercatabolism. The activation of the immune system and the increased synthesis of inflammatory cytokines, especially in the absence of an adequate nutritional intake, have a profound effect on malnutrition because of the amplification of chronic hypercatabolic conditions (23, 24). This study confirms previous data reported in literature: the indices of severity and comorbidity were significantly higher in malnourished subjects. Institutionalization, as verified by this study, can facilitate the onset of a state of malnutrition.

Weight loss and malnutrition in elderly people may be due to poor dietary intake caused also by psychological factors. The loss of an active social role, deprivation of affection, and finally, institutionalization may induce a state of depression that can appear clinically as the symptom of anorexia. Reality is often perceived by elderly people with a sense of futility and lived with an attitude of passivity, and the sedentary lifestyle worsens paralleling the ageing process. Elderly subjects usually are not able to succeed in their choices and to express their will, and they often direct their aggression against themselves. The first manifestation of depression is the lack of interest in food (25, 26). In our sample depression is very frequent (294/718; 40,9%) and it seems to be related to institutionalisation and to nutritional status.

Elderly people often show inability to shop, prepare and cook meals. This inability creates a vicious cycle where malnutrition and progressive functional and mental deterioration feed off each other (27-31). In our sample as in other studies, frailty, characterized by low autonomy, cognitive impairment and depression, was significantly associated with malnutrition.

Also the socio- environmental conditions can affect the nutritional status. Physical barriers, motor traffic, distance from supply centres may hamper a proper nutrition. Especially, the availability of grocery stores (even more than supermarkets) seems to affect positively nutritional status. Elderly persons may not often be able to consume fresh foods because of the distance from market or supermarkets. Elderly people use to carefully select what they buy and then carry home because of inability to use public transportation (32). Data from this study

are consistent with previous observations in literature ascertaining that the distance from food stores is related to nutritional status.

Among risk factors associated with environmental and social conditions, poverty plays a pivotal role (24, 33, 34). According to the United Nations Organization there is an increase in the number of poor people: one billion and 140 million inhabitants of the earth have, practically, no future, no possibility of working with an acceptable sanitary condition. Women, children and the elderly are the most affected by this phenomenon (35).

Even in Italy, as in the rest of otherwise economically advanced countries, poverty is a real concern: data from the ISTAT (Italian National Institute for Statistics) show that in our country 975000 families are in poverty, and almost 2,5 million people face to monthly costs at or below the threshold for acquiring goods and services to afford a minimum socially acceptable standard of living. In households with elderly members the prevalence of poverty is above the average level in general population: when the elderly person is the family reference, the prevalence of poverty corresponds to 5,6%. It rises to 6,6% among elderly subjects living alone, showing a higher value than those observed not only among younger singles (3,2%), but also among older couples (3,7%). In Italian population poverty is strongly associated with low levels of education, low occupational profiles, exclusion from the labor market and, therefore, leading to greater difficulties in achieving minimum nutritional needs (36, 37).

Epidemiological studies have deeply analysed the relationship between poverty and nutritional status in the geriatric age and found that scarce economic resources limit the availability of access to food (34, 38, 39). Elderly people often have to decide what foods to give priority to purchase, with an increased risk of having a non- balanced diet in terms of macro- and micronutrients (40, 41). Especially, foods such as vegetables and fruits that are naturally rich in nutrients such as vitamins, minerals, antioxidants, may be too expensive and may be, for this reason, excluded from the diet: it is likely that economic hardship can lead to the use of more energy- dense foods, that are less expensive, but with a lower nutritional quality (34, 42).

Poverty is also strongly associated with lower levels of education, and it can affect the ability to make reliable and aware food choices. In fact the new estimation method for the calculation of absolute poverty, responding to internationally agreed standards, is based on evaluation of three main areas: goods and services (health, education, clothing, transportation, communications), home (heated and equipped with the essential appliances) and food, in fact, by defining the minimum nutritional requirements. In this study also the relationship between poverty, low levels of education and malnutrition is strong. These data are particularly evident in NH patients and represent a confirmation of data reported in the literature (43, 44).

Some limitations can be described in our study. The subjects enrolled in the study were selected in three different Regions of Italy (northern, central and southern Italy) and in two different settings (free living setting and institutional care). However the selection of the recruitment centres was based only on voluntary availability and this may represent a bias in selection criteria. Moreover females are more represented and gender are not equally distributed in the two settings, but it grossly corresponds to the real distribution in Italian elderly population

MNA was used to assess nutritional status. Although it is universally considered one of the most reliable instrument in elderly, some limitations have to be considered. Measuring midarm and midcalf muscle circumferences is not a routinary part of nursing care while determining BMI requires measuring height, but a number of older adults cannot stand erect. For this reason a proportional score was proposed (45) and more recently calf circumference was adopted as an alternative parameter to BMI (46, 47). However, in our study all these parameters were correctly gathered. MNA test was developed more than 20 years ago, using BMI and anthropometric reference ranges that were standard at that time in particular in Caucasian population. Obesity in the elderly was less common (in our sample 35,2% of subjects were obese considering a BMI > 30 kg/m2). Moreover, the standards for BMI and midarm and midcalf circumferences may be outdated according to cultural or anthropometric features of the target population. Finally, MNA test was designed to assess nutrient intake under normal conditions and even for patients receiving oral liquid supplementation, thus questions concerning eating habits may be difficult to be answered. In our sample for subjects receiving oral liquid supplementation, those questions were scored as 0 but it may represent a bias in nutritional status evaluation.

This study confirms the high risk of malnutrition in elderly people, in particular in NH subjects, and the necessity to routinely perform nutritional status evaluation in these subjects, to carry out training courses for health workers (doctors, nurses, psychologists, dietitians), to implement nutritional education for the geriatric population, to develop tools and guidelines for health workers and caregivers to identify and reduce risk factors for malnutrition (clinical, functional, social or economic aspects) (48, 49).

Key messages

1. Malnutrition occurs frequently and remains one of the largest cause of morbidity, disability and mortality in the elderly.
2. Clinical, functional, social or economic parameters, separately or together, may be linked to malnutrition occurrence and must be considered in the prevention and treatment of malnutrition.
3. Institutionalised patients are at higher risk of malnutrition than free living subjects.
4. Nutritional status screening is effective in detecting subjects at risk of malnutrition and in early performing nutritional

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intervention.

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