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Health determinants of nutritional status in community-dwelling older population: the VERISAÚDE study

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Abstract

Objective: Malnutrition is a common and relevant syndrome in elderly people due to its influence on quality of life. The main aim of the present study was to identify health determinants of malnutrition or risk of malnutrition.

Design: Cross-sectional study collecting information on sociodemographic and health factors (co-morbidity, cognitive or affective problems, prescription medication use, frailty status, self-rated health) as determinants of nutritional status, assessed by the short form of the Mini Nutritional Assessment.

Setting: Forty-three senior centres from Galicia (north-western Spain) participated to recruit participants.

Subjects: A representative community-dwelling sample of 749 elderly people aged ≥65 years.

Results: Of the total participants, 14·3% were malnourished/at risk of malnutrition. Presence of overweight or obesity, depressive symptoms, polypharmacy (use of five or more prescription medications), presence of pre-frailty or frailty status and poor self-rated health showed the strongest relationship to malnutrition/risk of malnutrition. This model predicted 86·0% of the cases correctly. The best determinants for women were polypharmacy and poor self-rated health, reaching 82·8% of cases of malnourishment/risk of malnutrition predicted correctly. In men, the main determinants were overweight or obesity, depressive symptomatology and polypharmacy, with 89·8% of cases of malnourishmen/risk of malnutrition predicted correctly.

Conclusions: Screening for nutritional status and its determinant factors should be included as part of comprehensive assessments to ensure an early screening of malnutrition and to propose possible intervention strategies that would be important for both elderly people and the health-care system.

Keywords
Prevalence
Malnutrition
Malnutrition risk
Mini Nutritional Assessment
Elderly

Malnutrition is a frequent syndrome in the elderly. It refers to faulty or inadequate nutritional status, undernourishment characterized by insufficient dietary intake, poor appetite, muscle wasting and weight loss[1].

Malnutrition prevalence varies from 10% to 85% in different older age groups around the world due to the different assessment methods used[2]. A combined database[3] from all five continents including 4507 people reported a mean prevalence of 22·8%, with considerable differences among settings (rehabilitation, 50·5%; hospital, 38·7%; nursing home, 13·8%; community, 5·8%). In this combined database, the 'at risk' group had a mean prevalence of 46·2%. In Spain, a prevalence of malnutrition among the elderly living at home of 12·5% was reported and 57·5% for those who were at risk[4].

Nutritional status or nutritional risk screening should be incorporated in comprehensive assessments of the elderly population[5]. Age-associated physiological and psychological alterations, functional or cognitive impairment and socio-economic aspects are considered among the main determinants of malnutrition[6], being associated with multiple risk factors[7–9]: female sex, age more than 85 years, low socio-economic level and health status (higher number of co-morbidities or polypharmacy). Regarding co-morbidity, the presence of chronic diseases, such as depression or cognitive impairment, has been related to increased risk of malnutrition[7,10]. Additionally, a loss of weight was observed among hospitalized depressed elderly people[11]. Furthermore, the effects of drug therapy may have physical manifestations such as

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anorexia or malabsorption of nutrients[12]. Most of the studies on polypharmacy and nutritional status concluded that use of a high number of prescription medications was associated with worse outcomes in the Mini Nutritional Assessment (MNA)[13].

Nutritional deficit, with a significant effect on quality of life, is also a clear determinant of frailty in the elderly. Frail institutionalized or hospitalized elders[14], as well as frail people living in the community[15], have a greater risk of malnutrition.

This health problem is linked to a high risk of morbidity/mortality, longer hospitalizations, along with more frequent readmissions, premature nursing home placements and decreased survival time[1,16]. Therefore, early screening aimed to identify potential risk factors for conducting a preventive intervention is necessary.

To our knowledge, although the determinants of malnutrition have been previously investigated, research has not considered multiple health factors with a possible joint effect providing a joint likelihood for poor nutritional status in a large population study. Besides, most previous studies have involved frail or institutionalized elderly, but not healthy elders as main targets for early screening and prevention.

Based on the above, the aim of the present study was to determine the prevalence of malnutrition or risk of malnutrition in a representative community-dwelling elderly population and to examine the association between nutritional status and variables referred to the person, specifically sociodemographic and health factors (co-morbidity, cognitive or affective problems, prescription medication use, frailty status and self-rated health) that affect their quality of life.

Materials and methods

Selection and description of participants

Data used were from baseline assessments of the VERISAÚDE (Effectiveness of the Comprehensive Gerontological Assessment and longitudinal follow-up in the healthy ageing promotion) project, which is a large longitudinal study (in the present study, we are using the cross-sectional data) covering a sample of 749 community-dwelling elderly people representative of the Galician population (north-western Spain), aged ≥65 years, living at their home and attending senior centres. Older adults were recruited from forty-three local senior centres. They were invited to participate in the project in different ways and through multiple sources. Associations for the elderly in Galicia were asked to issue an announcement of the study in their centres, by using flyers and word of mouth, so that people who were interested in participating could register. The participants were involved on a voluntary basis and were recruited by representatives of the associations involved in the project. The distribution of the sample by age and sex was similar to that of the entire Galician elderly population, according to the municipal register of the 2011 National Health Survey[17]. The level of confidence was 95%, accuracy ±4% and estimation of data losses 20%. From October 2013 through March 2014, a comprehensive gerontological assessment was conducted.

The inclusion criteria for the participants were as follows: (i) being ≥65 years of age; (ii) be actively enrolled in a Galician association or senior centre; and (iii) willingness to sign the informed consent form. The exclusion criterion for the sample was inability to perform the comprehensive gerontological assessment.

Variables and instruments

The instruments were administered by a multidisciplinary team of professionals with experience in gerontological assessment (clinical psychologists, nurses, occupational therapists, social workers) and were trained to unify criteria.

Sociodemographic factors

Information on age, sex and educational level was self-reported. Educational level was categorized into three levels according to years of formal education: ≤8 years, 9–17 years and ≥18 years.

Health aspects

Nutritional status

The Mini-Nutritional Assessment–Short Form (MNA-SF)[18] is made up of six questions extracted from the full MNA questionnaire[19]: (i) appetite loss or eating problem; (ii) recent weight loss; (iii) mobility; (iv) acute disease or psychological stress; (v) neuropsychological problems (dementia or depression); and (vi) BMI. The MNA-SF has been identified, in a study including 22 007 elders, as a suitable screening tool to detect malnourished elders and those at risk for malnutrition, correlating strongly with the full MNA version ($r = 0{\cdot}85$)[20]. The Spanish version of the MNA-SF downloaded from the MNA website was used in the present study[21]. The total score of the MNA-SF screening test ranges from 0 to a maximum score of 14 points. Those receiving ≤11 points were classified as malnourished or at risk of malnutrition, whereas well-nourished individuals had a score of ≥12 points. Two comparison groups were established in the present study: low MNA-SF score (≤11 points) *v.* normal MNA-SF score (≥12 points), following the dichotomization made by other authors with the MNA (normal nutritional status *v.* malnutrition/risk)[22,23].

BMI categorization

The research staff measured weight and height according to standardized protocols. BMI was estimated by dividing weight (kilograms) by the square of height (in metres). A clothing adjustment of approximately 0·8 kg for women and 1·2 kg for men was made[24]. According to the WHO criteria[25], patients were categorized as not

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overweight if BMI < 25·0 kg/m^2 and as overweight or obese if BMI ≥ 25·0 kg/m^2.

Co-morbidity

For all patients, we calculated the value of the Charlson Comorbidity Index (CCI)[26]. All nineteen chronic conditions assessed in the survey were given a CCI weight (from 1 to 6) taking into account both the number and seriousness of the co-morbid disease, which ranged from 0 to 37 points. For each patient, a CCI-aged adjusted score was computed, coding co-morbid diseases as 0 = absent and 1 = present.

Cognitive and affective assessment

Global cognitive status was assessed by qualified clinical psychologists using the Spanish version of the Mini-Mental State Examination (MMSE)[27], which examines five areas of cognitive function: (i) orientation to time and place; (ii) short-term memory; (iii) attention; (iv) visual spatial skills; and (v) language and praxis. MMSE scores, ranging from 0 to 30, were adjusted for age and level of education, and participants were considered as cognitively impaired if they scored ≤24 points[28].

Depressive symptoms were also assessed by a psychologist, using the short form of the Geriatric Depression Scale (GDS-SF)[29], a fifteen-item scale specifically developed for screening depressive symptoms in elderly populations. We specifically administered a Spanish-validated version of the test adapted for patients aged ≥65 years[30], which recommends using a cut-off of ≥5 points to consider the existence of probable clinical depression.

Prescription medication use

The participants were asked to present their drug history (prescribed medications by their general practitioner). Each medication name and current clinical diagnosis were noted. Anatomical Therapeutic Chemical (ATC) classification was used to categorize medications[31]. Polypharmacy has been defined as the concomitant use of five or more different prescription medications[32].

Frailty status

The frailty status of each participant was determined according to the five criteria proposed by Fried *et al.*[33]. In brief, these criteria are the following. (i) Unintentional weight loss (i.e. not due to dieting or exercise): at least 4·5 kg in the past year. (ii) Self-reported exhaustion: identified by two questions from the modified ten-item Center for Epidemiological Studies-Depression (CES-D) scale[34] in its Spanish version[35]. (iii) Weakness: grip strength in the lowest 20 % at baseline, adjusted for sex and BMI. (iv) Slow walking speed: the slowest 20 % at baseline, based on time to walk 4·57 m (15 ft), adjusting for sex and standing height. (v) Low physical activity: the lowest 20 % at baseline, based on a weighted score of kilocalories expended per week, calculated according to the Spanish validation of the Minnesota Leisure Time Activity (MLTA) questionnaire[36], according to each participant's report, and adjusting for sex. Participants with ≥3 positive criteria were defined as frail, with 1–2 positive criteria as pre-frail, and participants without positive criteria as non-frail.

Self-rated health

Self-rated health was assessed with a single question: 'In general, would you say your health is excellent, good, fair, or poor?'[37].

Statistical analysis

Characteristics of the sample were analysed where the quantitative variables were expressed as mean and standard deviation and the qualitative variables as an absolute value and percentage. The normality of the data was tested using the Kolmogorov–Smirnov test, which rejected the assumption of normality. Between-group comparisons were made using the Mann–Whitney *U* test. The χ^2 test was used to test categorical variables and the correlation among quantitative or ordinal variables and the MNA-SF score by the calculation of Spearman's *r*. In order to determine which variables modified a dichotomous dependent variable (MNA-SF categories: well-nourished (normal score, ≥12 points) *v.* malnourished/at risk of malnutrition (≤11 points)), a multiple logistic regression analysis (forward stepwise likelihood ratio) was conducted using that dichotomous variable as dependent variable and all the other variables introduced in the model as covariables (sex, age categories, educational level, BMI ≥ 25 kg/m^2, co-morbidity, presence of cognitive impairment, depressive symptoms, frailty status, self-rated health). Categorical variables with more than two values were converted to dummy variables for inclusion in the multivariate models. Odds ratios and 95 % confidence intervals were calculated for each covariate included in the model. The percentage correctly predicted (with a cut-off value of 0·5 for the estimated probability) in the classification table was calculated to evaluate the fit of the final regression model. A *P* value of <0·05 was taken to define statistical significance. The data analysis was conducted using the statistical software package IBM SPSS Statistics Version 21·0.

The manuscript was written according to the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) statement[38,39].

Results

The mean age of the sample was 75·76 (SD 7·2) years. Significant differences (*P* = 0·010) by sex (Table 1) were found, but no statistical differences between both groups (well-nourished (normal score, ≥12 points) *v.* malnourished/at risk of malnutrition (low score, ≤11 points)) in the mean

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Table 1 Characteristics according to nutritional status (MNA-SF), well-nourished (normal score, ≥12 points) *v.* malnourished/at risk of malnutrition (low score, ≤11 points), of community-dwelling elderly people (*n* 749) aged ≥65 years, Galicia, north-western Spain, October 2013–March 2014 (VERISAÚDE study)

	Normal MNA-SF score (*n* 642)		Low MNA-SF score (*n* 107)			Total (*n* 749)	
	n or Mean	% or SD	*n* or Mean	% or SD	*P* value	*n* or Mean	% or SD
Sex, *n* and %*					0·010†		
Men	265	41·3	30	28·0		295	39·4
Women	377	58·7	77	72·0		454	60·6
Age (years), mean and SD	75·7	7·1	75·9	7·3	0·779‡	75·76	7·2
Education (years), *n* and %					0·412†		
≤8	381	59·3	70	65·4		451	60·2
9–17	155	24·1	24	22·4		179	23·9
≥18	106	16·5	13	12·1		119	15·9
Total MNA-SF score, mean and SD**	13·5	0·8	10·1	1·2	<0·001‡	13·04	1·5
BMI (kg/m^2), mean and SD	29·0	4·1	28·7	5·6	0·272‡	28·96	4·3
Age-adjusted CCI score, mean and SD	4·4	1·4	4·6	1·4	0·114‡	4·40	1·4
Total MMSE score, mean and SD	28·3	2·3	28·1	2·3	0·170‡	28·30	2·3
Total GDS-SF score, mean and SD**	1·3	1·8	2·6	2·9	<0·001‡	1·51	2·1
Number of prescription medications, mean and SD**	4·5	3·2	6·5	3·5	<0·001‡	4·80	3·3
Frailty phenotype, *n* and %**					<0·001†		
No frailty	169	26·3	14	13·1		183	24·4
Pre-frailty	458	71·3	80	74·8		538	71·8
Frailty	15	2·3	13	12·1		28	3·7
Self-rated health, *n* and %**					<0·001†		
Excellent	150	23·4	15	14·0		165	22·1
Good	359	56·0	61	57·0		420	56·1
Fair	121	18·9	21	19·6		142	19·0
Poor	11	1·7	10	9·3		21	2·8

MNA-SF, Mini-Nutritional Assessment–Short Form; CCI, Charlson Comorbidity Index; MMSE, Mini-Mental State Examination; GDS-SF, Global Deterioration Scale–Short Form.
*P<0·05, **P<0·01.
†χ^2 test.
‡Mann–Whitney *U* test.

age or educational level. For nutritional status, 642 participants (85·7 %) were well-nourished, 101 participants (13·5 %) were at risk of malnutrition and six (0·8 %) were malnourished. The combined prevalence for the malnourished/at risk of malnutrition group was 14·3 %.

GDS-SF scores were significantly different between groups (well-nourished: 1·32 (SD 1·84); malnourished/at risk of malnutrition: 2·64 (SD 2·91); only 8·1 % of participants showed depressive symptomatology). Additionally, well-nourished individuals used a significantly lower number of prescription medications than those who were malnourished/at risk of malnutrition (4·52 (SD 3·17) *v.* 6·51 (SD 3·52)). Statistically significant differences were found in the different categories of the frailty phenotype (P < 0·001) and self-rated health (P < 0·001) between groups.

In search of the relationship between MNA-SF score and the different sociodemographic aspects and indicators of health (Table 2), a correlation between MNA-SF score and age (r = –0·088; P = 0·016) and BMI (r = 0·100; P = 0·006) was found. Older individuals with higher BMI had lower MNA-SF scores (higher presence of malnourishment/risk of malnutrition).

Significant negative correlations were also observed with age-adjusted CCI score (r = –0·076; P = 0·038), GDS-SF score (r = –0·228; P < 0·001), number of prescription medications (r = –0·208; P < 0·001), frailty score (r = –0·193; P < 0·001) and self-rated health (r = –0·140; P < 0·001).

Table 2 Associations between all quantitative or ordinal variables listed in Table 1 and the MNA-SF score among community-dwelling elderly people (*n* 749) aged ≥65 years, Galicia, north-western Spain, October 2013–March 2014 (VERISAÚDE study)

	MNA-SF-score
	r
Age (years)	–0·088*
Education (years)	0·042
BMI (kg/m^2)	0·100**
Age-adjusted CCI score	–0·076*
Total MMSE score	0·069
Total GDS-SF score	–0·228**
Number of prescription medications	–0·208**
Frailty total score	–0·193**
Self-rated health	–0·140**

MNA-SF, Mini-Nutritional Assessment–Short Form; *r*, Spearman's rho; CCI, Charlson Comorbidity Index; MMSE, Mini-Mental State Examination; GDS-SF, Global Deterioration Scale–Short Form.
*P < 0·05, **P < 0·01.

Frailty or pre-frailty, presence of higher co-morbidity, depressive symptoms, use of a higher number of prescription medications and poor self-rated health presented lower MNA-SF scores (higher presence of malnourished/risk of malnutrition).

Finally, Table 3 shows the results of a logistic regression model, where five determinants significantly associated with malnutrition/risk of malnutrition are presented. For the total population, the five main determinants were BMI

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Table 3 Logistic regression of five major determinants and malnourished/risk of malnutrition status according to the MNA-SF (≤11 points) among community-dwelling elderly people (*n* 749) aged ≥65 years, Galicia, north-western Spain, October 2013–March 2014 (VERISAÚDE study)

	Total				Women				Men			
	B	*P* value	OR	95 % CI	*B*	*P* value	OR	95 % CI	*B*	*P* value	OR	95 % CI
BMI (≥25·0 kg/m^2)	−0·764	0·004**	2·147	1·275, 3·613	NI	NI	NI		1·471	0·004**	4·351	1·611, 11·752
Polypharmacy (five or more prescription medications)	−0·839	<0·001**	0·432	0·276, 0·677	−0·649	0·014*	0·522	0·311, 0·879	−1·351	0·002**	0·259	0·109, 0·617
Poor self-rated health	−1·127	0·023*	0·324	0·123, 0·855	−1·423	0·005**	0·241	0·089, 0·655	NI	NI	NI	
Presence of depressive symptoms	−0·803	0·015*	0·448	0·234, 0·858	NI	NI	NI		−2·264	<0·001**	0·104	0·035, 0·313
Frailty level (no frail *v.* pre-frail or frail)	−0·680	0·027*	0·506	0·277, 0·927	NI	NI	NI		NI	NI	NI	
% Correctly predicted (cut-off value of 0·5)			86·0				82·8				89·8	

MNA-SF, Mini-Nutritional Assessment–Short Form; *B*, regression coefficient; NI, not included in the model.
**P*<0·05, ***P*<0·01.

(≥25·0 kg/m^2, presence of overweight or obesity), presence of depressive symptoms, number of prescription medications (five or more, polypharmacy), frailty level (pre-frail or frail) and poor self-rated health. The combination of having all the factors increased the risk of reporting malnutrition/risk of malnutrition, with a correct prediction of 86·0 %. Moreover, the regression model identified different determinants according to sex. The best determinants for women were also polypharmacy and poor self-rated health, reaching a correct prediction of 82·8 % of those malnourished/risk of malnutrition. In men, the main determinants of malnutrition/risk of malnutrition were overweight or obesity, presence of depressive symptoms and polypharmacy; when considered together, the correct classification of the cases reporting malnutrition/risk of malnutrition was 89·8 %.

Discussion

A low prevalence of malnutrition or risk of malnutrition was observed in the present study according to MNA-SF score, but we must consider that we conducted our study in healthy elders, living at home independently and with a potentially good health status. Other studies[40,41] involving community-dwelling healthy elderly people have also found similar data for malnutrition (0 % and 0·5 %, respectively) and risk of malnutrition (12·6 % and 9·5 %, respectively). Research done in a rural population of India[42] showed higher prevalences of malnutrition (14 %) and risk of malnutrition (49 %) among free-living elderly than those observed in our study. This difference may be explained by the different place of living. The present study included elderly people residing in both rural and urban areas, and a previous large study done in Iran[43] showed higher malnutrition rates in rural than in urban participants.

Among the sociodemographic aspects investigated in the current study, sex was significantly related to malnourishment/risk of malnutrition in bivariate analysis, with lower MNA-SF scores being observed in women, although sex did not enter the multivariate model. Numerous studies have pointed out that female sex is associated with malnutrition and malnutrition risk[44–47]. In our study, there was a significant although very weak negative correlation between age and MNA-SF score (older participants had poorer nutritional status) that was not reported in bivariate and regression analyses among the well-nourished as compared with those who were malnourished or at risk of malnutrition. These findings are in accordance with data reported in a Spanish cross-sectional study including 22 007 elders, where lower scores were obtained in the oldest subjects[20]. The fact that age determines malnutrition was also found in older Chinese adults[48], although some previous researchers did not find such a correlation or association[42,49]. Most individuals in our study (60·2 %) had a very low

educational level; however, education was not related to poor nutritional status. Contrary to our results, other authors have mentioned that lower levels of education are associated with malnutrition[46,48,50,51]. These data are considering an association between poverty, low levels of education and malnutrition; in fact, lower levels of education are very frequent in low-income people, with greater difficulties in covering nutritional needs.

After the comprehensive gerontological assessment and the multivariate regression model analysis carried out in the present study, associated factors for malnutrition or the risk of malnutrition were a low BMI, depressive symptoms, polypharmacy, presence of pre-frailty or frailty status and poor self-rated health. Other authors[9] who investigated the relationship between socio-economic indicators as well as physical and mental health characteristics and nutritional status found that community-dwelling elderly people suffering from poor financial condition, those with multiple chronic diseases, those reporting chronic pain or presenting mental disorders were at high risk of malnutrition. Unfortunately, no information about the combined effect of all these factors to predict the likelihood of malnutrition/risk of malnutrition was provided.

The association of health factors and poor nutritional status found in our study is in concordance with other researchers. BMI correlated positively with MNA-SF score (as expected; since BMI is also a part of the MNA-SF it is not advisable to use it as the only parameter to detect malnutrition[10]) but bivariate and logistic regression analyses showed that malnourishment/risk of malnutrition was not associated with BMI. Low MNA score was associated with low BMI and increased weight loss[20,23].

Age-adjusted CCI scores correlated negatively with MNA-SF scores but bivariate and logistic regression analyses showed that malnutrition was not associated with co-morbidity, as described earlier[52]; thus, nutritional status is closely related to the accumulation of geriatric conditions, at least in dependant elderly people without acute illness[53]. On the other hand, the number of chronic medical conditions has been found to be one of the best predictors of nutritional status[48]. Among these geriatric conditions, dementia is itself a risk factor for malnutrition[52]. In the present study, however, no association was found between MMSE score and malnutrition or risk of malnutrition. It could be that most of the people attending senior centres are healthy elders without cognitive impairment (only 6·5 % of the participants were found to have cognitive impairment). Nevertheless, the majority of studies have shown that patients affected by cognitive impairment (lower MMSE scores) are characterized by a poor nutritional status[54–57]. Generally, these studies involved elderly patients with dementia and/or were carried out in an institutionalized setting.

Further, in the ageing population, depression is a frequent syndrome that has shown association with nutritional status in several settings[49,58–63]. The current study found the same significant association. Various researchers have demonstrated a positive association between depression and loss of appetite or weight loss; therefore, poor nutritional status could be a factor contributing to depression and apathy in elders[49,58–63]. Nevertheless, new research is needed to determine whether malnourishment or risk of malnutrition is regarded as a consequence of depressive symptomatology or, inversely, if malnourished people have a greater risk of being depressed.

Polypharmacy (five or more prescription medications) was also identified as a marker of poor nutritional status in our study. Other findings indicate that polypharmacy is strongly associated with low MNA scores and a higher number of prescription medications determines the decline in MNA scores[13,16,64,65]. The effects of polypharmacy on nutritional status are estimated from the fact that problems with nutrition occur mainly in elderly patients, who are also more frequently subject to polypharmacy. However, it is unclear if a worsened nutritional status may influence the process of a pharmacological treatment or, inversely, if polypharmacy may influence a limited food intake that would increase malnutrition[65].

Frailty was also found more often in our study participants who were malnourished or at risk of malnutrition. Frailty is a geriatric condition determined by Fried *et al.*'s five criteria that assess, among other factors, unintentional weight loss and weakness adjusted by BMI, items that are already implying an existing close association with malnutrition. Our result may be compared with a previous Spanish study which found a significant association between the five frailty criteria and the categories of MNA, and that the largest proportion of frail subjects were at risk of malnutrition[15]. Additionally, 90 % of malnourished elderly patients were either pre-frail or frail, and about 36 % or 57 % of the frail people were malnourished or at risk of malnutrition[14,66]. These authors also found that the prevalence of malnutrition was six times higher in frail older adults compared with robust individuals.

Lastly, self-perceived health provides a measurement for monitoring the health status of the elderly and its effect on their quality of life and well-being. In our representative sample, only 2·8 % perceived poor health. This can be compared with other studies which found that being at nutritional risk had a negative impact on older people's perceived health[2,63,67]. Lower risk of undernutrition using MNA-SF scores could predict perceived good health[67].

Strengths and limitations

An important strength of the present study is the multiple assessment set of potential determinants (both socio-demographic and health ones) that are included in the analysis to examine their association with the presence of malnourishment or risk of malnutrition in a large representative sample. However, there are several limitations to be mentioned such as the selection of our sample study

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from senior centres and the inclusion of healthy elders that could reduce the prevalence rates of malnutrition or risk of malnutrition.

Likewise, several studies[68,69] have reported higher prevalence rates for malnutrition in the presence of dysphagia. Although dysphagia is a geriatric syndrome and a predictor of malnutrition, it was not considered in our gerontological assessment. Besides, cross-sectional designs do not allow establishing causality, so that future longitudinal data are needed.

Conclusions

The present research provides insight into the factors that could be associated with the presence of malnutrition or risk of malnutrition. We conclude that sex was the only sociodemographic factor associated with nutritional status in our community-dwelling older people. Health factors that demonstrated association were depressive symptomatology, polypharmacy, frailty and poor self-rated health. Our study revealed, in a multivariate analysis, that low BMI, depressive symptoms, polypharmacy (five or more prescription medications), presence of pre-frailty or frailty status and poor self-rated health remained as determinants of malnourishment and risk of malnutrition. Screening for nutritional status and these determinant factors should be included as part of comprehensive assessments to ensure an early screening of malnutrition and to propose possible intervention strategies that would be important for both elderly people and the health-care system.

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