

## Nutrition study people over 80 years

Javier Benítez, Nieves Perejón, Marcelino Arriaza and Pilar Bellanco  
Management Unit "La Laguna", SAS-Cádiz (España)

Loneliness has always been associated and reported as a risk factor of malnutrition in the elderly. People over 80 who live alone have deserved this study to detect their situation and potential for action to improve their quality of life. Objectives: To determinate the nutritional status of people over 80 living alone in the area of "La Laguna", Cádiz. Material and method: In PIAMLA'80 program analyse those parameters and their possible correlations in a group of 342 elderly living alone over 80 years old. Different parameters were measured: Integral Geriatric Evaluation, Barthel, Lawton-Brody, Lobo, Gijon, specific analytical blood chemistry and MNA. Results: In a population of 984 people, were selected 342 initially, but finally the group decreases to 247 people. The mean Barthel was 80.42 points, 5.76 Lawton and Gijon from 11.3 Lobo 26.48. The MNA for the whole population was 24.25/30 detecting only a risk age group in women of 85-95. Correlation between nutrition and the biochemical test values showed positive for haemoglobin (0.19), total protein (0.26), Fe (0.32) and albumin (0.46). Conclusions: In our research we have not detected malnutrition in any age group or gender. The use of nutrition test MNA and its MINI version must be generalized as an accurate, clear, quick and easy tool to use.

*Key words:* Elderly, loneliness, nutrition, MNA.

*Estudio de nutrición en mayores de 80 años.* La soledad siempre se ha asociado como factor de riesgo en la vejez. La población de personas mayores de 80 años que viven solas son el objetivo de estudio para determinar su situación y potencial para poder mejorar su calidad de vida. Objetivos: Determinar el estatus nutricional de la población mayor de 80 años que vive sola en el área de "La Laguna" en Cádiz. Material y métodos: El programa PIAMLA'80 analiza estos parámetros y sus posibles correlaciones en un grupo de 342 sujetos. Se han medido diferentes valores como test de Barthel, Lawton-Brody, Lobo, Gijón, MNA y valores bioquímicos sanguíneos. Resultados: En una población de 984 sujetos, fueron seleccionados inicialmente 342, pero finalmente el grupo disminuyó a 247. La media de Barthel fue de 80,42 puntos, 5,76 para el Lawton, 11,3 para Gijón y 26,48 para Lobo. El MNA para la población total fue de 24,25/30, detectando solo un grupo de riesgo en mujeres de 85 a 95 años. La correlación entre nutrición y parámetros analíticos fue positiva para Hemoglobina (0,19), proteínas totales (0,26), Hierro (0,32) y albúmina (0,46). Conclusiones: En nuestro estudio no hemos detectado malnutrición en ningún rango de edad ni género. El uso del test MNA debe generalizarse como rápido, fácil y efectivo.

*Palabras clave:* Anciano, soledad, nutrición, MNA.

Considering the situation of older people in our community and the work within the “Social situation of older people in Andalusia” written by Juan Antonio Lopez Trinidad and Doblas Requena Universidad de Granada (2007), the investigation reveals that 1 in 5 old people with disabilities live alone, all of that was supported with the latest survey of IMSERSO 2010 which point out that 16% of elderly live alone too.

As a result of the investigations about how older people live together, we could say that over 80% of men live in their own home with their wives and/or a relative. In contrast, only 55% of women live with their partner because another high percent age of women live alone or have to move to another residence with other relatives.

The same research reveals a profile about the life of people over 65 years old: about 66% live with their partner and/or a descendant and 20% live alone, the 12% live in a foreign residence and just 2% live in an old people’s home.

Currently, between 25 and 30% of old people who live at home, suffer some level of dependence, and in many cases the food or nutrition is the main problem. Malnutrition is a medical condition characterized by an alteration of the body composition in relation to the benchmarks. It is mainly caused by an imbalance between nutrient intake, its use and nutritional necessities of the person or the group of people involved, as J. Aranzeta indicates in the Manual of Malnutrition Assessment of the Elderly in Primary Care (2011).

Malnutrition caused by factors related to the aging process or risk factors related to the biopsychosocial characterization of elderly people.

Among those related to the causes of aging are:

1. Gradual reduction in lean mass that causes a decrease in basal metabolism and also the protein and energy reserves of the organism. This factor reduces by 1% annual energy needs of the individual and is subject to the degree of physical activity to develop. A higher level of inactivity greater overall muscle mass loss, in limited conditions will lead to the situation of sarcopenia.

2. Gradual substitution in whole or in part in lean mass by fat mass, especially when energy intake is maintained in the presence of previous sedentary lifestyles that can even lead to the development of being overweight or obese.

3. Decreased sensory perception, especially taste and smell, due to a progressive loses of taste buds or zinc deficiency. In this situation the individual loss interest in food and it is necessary to improve the visual presentation and the sense of taste.

4. Global reduction of digestive secretions from the quantitative point of view and enzymatic capacity. The reduction in saliva production hinders the formation of the bolus and means a risk for developing periodontal problems. The reduction in the secretion of gastric juice hinder the absorption of iron, folic acid, vitamin B12, difficulty in digestive processes, and early surfeit. The decrease in pancreatic secretion, biliary and

intestinal tract can induce complete intolerance to fats, lactose, cause worse digestion and absorption of nutrients (lactose, protein, calcium, vitamins ...) and a tendency to chronic constipation.

T. Gomez Gonzalez discusses in the same manual about the social factors of malnutrition, food habits and practices elder by people. He says that those factors are rarely the main cause of malnutrition except when the social changes are meaningful enough in their life to alter the preconditions. In the same way, these social changes are often associated with a psycho affective disorder that turn worse the nutritional status, restoring in this way a vicious cycle of interdisciplinary solution.

On the other hand physical disability with impaired mobility and restrictions on shopping, cooking, eating and performing a minimum energy expenditure induced by walking. In these situations the lack of adequate nutritional support can increase the risk of inducing a more or less latent malnutrition state.

The sensory impairment, with hearing impairment, visual communication that hinder the socialization and self-management chores and self-care. We need external support and use of assistive devices for the adjustment of appliances, housing, etc.

Social difficulties resulting from poverty, isolation, sociopaths, low intellectual level and health education that impact poor planning of the daily dietary intake could summarize the social root causes of malnutrition.

According to the European research Euronut-SENECA, people who eat alone consume 30% fewer calories than those people who live with someone. As a consequence, we could say that eating alone, especially for older people is a risk factor for malnutrition.

A variety of factors such as lack of social and family support, the difficulties of access to your favourite food, the difficulties of transport, decreased ability to cook or buy their own food and the institutionalization of the elderly (day centres, nursing homes, hospitals).

As a general rule, the changes in social conditions affect more men than women, maybe caused by the traditional women model, where women are responsible for housekeeping and food among other things.

Pleasure, communication and companions are the three main elements in the fact of eating for older people. Limiting one of those elements means depriving food pleasure. So old people should avoid too strict diets in order to make room for pleasure and make that sometimes they break the rules.

Within Contract Programme in the UGC "La Laguna" since 2009, was launched the Comprehensive Care Plan over 80 of La Laguna (PIAMLA '80), involving health professionals and social workers equipped with 3 points each year for assessing the productivity of each employee, 2009-2011.

We started with a population of 948 elderly over 80 years old, 1 in 4 live alone or with a relative with a similar age. Many of those old people do not have any kind of aid provided, so it seems that these people are at risk or may be classified as Frail Elderly at Risk, due to their socio-familial situation.

#### *Objectives*

Knowing the nutritional status of those people over 80 who live alone, and the relationship between the various biochemical parameters principles and nutritional assessment test MNA<sup>®</sup>.

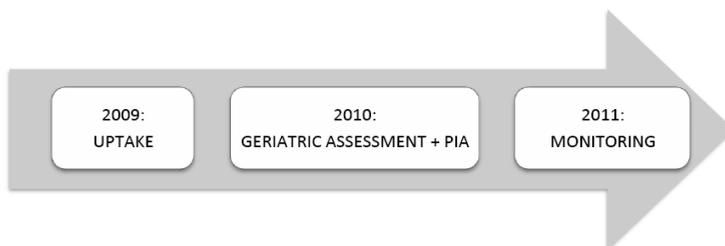
#### *Inclusion criteria*

- ✓ People over 80 years living alone and/or family of similar age.
- ✓ People over 80 years who live alone without family support.
- ✓ Residents in the geographical area of La Laguna, in Cadiz, and belonging to the Andalusian Public Health Service.

## **MATERIALS AND METHODS**

Using DIRAYA application data, the population pyramid of basic health area by the UDB, database users and following inclusion criteria, we could estimate a population at about 250 seniors.

Each family doctor and nurse, joined in pairs to work, in family care, had been given a list of those people over 80, indicating the initial address for the recruitment, action that occurred in 2009. During 2009 they were formed in geriatric assessment, as well as how to record in implementing DIRAYA as we can see in figure 1.



From this point, the actions were separated to be performed by the family doctor, by the nurse and social worker, as follows:

#### For the family doctor:

Review of medical records, which verified the family situation.

Biological assessment of the patient, according to:

Pathologies encountered and monitoring.

Polypharmacy and interactions in those people who consume more than 5 drugs.

Nutritional assessment according to the MNA test.

Assessing risk of falls: Test "Timed get up and go" (TUG).

Cognitive Rating TEST OF WOLF.

Analytical consisting of: CBC, formula, Fe metabolism, biochemistry, total protein and albumin, TSH, vitamin B12 and folic acid.

For the Nurse:

The evaluation was made of ABVD with Barthel, Lawton-Brody instrumental.

Taking vital signs, and ensure taking medication prescribed by your doctor, by prescription sheet.

Assessment of risk of falling through the analysis of extrinsic factors as the registration form attached.

It was found that each patient understands and performs the actions that have been prescribed by your doctor.

For the social worker:

The evaluation was made and it was found, if the patient has requested the application of Law Unit, and if it has, which is the result of the resolution of qualification.

Revised aid measures if they have to move and the new address.

After data collection was studied on a case by case basis between each doctor, social worker and nurse, identified problems and possible solutions to solvable problems, mediating joint scheduled visits.

All information is recorded in the application DIRAYA through the Digital Health Record.

The MNA<sup>®</sup>, nutrition assessment test in the larger version it has been used in this version, in this first part there is a test screening in which if we get a score less than 12 points we have made continuing the test, and is equal to or less than 11 points we should continue.

In the second part, once scored it is added to the initial points and if it is between 23.5 to 30 evaluation is normal, between 17 and 23.5 there is a risk of malnutrition and if less than 17 it is established malnutrition.

The MNA<sup>®</sup> is a standardized test for this kind of study and with ample scientific evidence to endorse it; the MNA<sup>®</sup> is shown in figure 2.

From the standpoint of computer use software designed specifically for the treatment of research information was based on Microsoft Excel.

## RESULTS

After the initial estimate of 250 people over 80 years old, we have an initial population of 342 subjects who meet the inclusion criteria. On the other hand, lost 95 subjects for the following reasons:

- 25 Patients: do not agree to participate in the study.
- 20 Patients: death.
- 30 Patients: secondary to the loss of one doctor for sick leave (whose patients of their quota could not be recorded).
- 30 Patients: other reasons.

Test used:

The average value of the evaluation test for measuring dependency of the subject were (Table 1):

Test used	Results
Lobo	26.48
Barthel	80.47
Lawton-Brody	5.79
Gijón	11.23
MNA	26.55

In the following table no. 2 we present values by gender of the analytical parameters obtained.

*Table 2. Average values of the analytical by gender*

	MEN	WOMEN	TOTAL
GLUCOSE	110.24	114.02	112.85
HEMOGLOBIN A1C	6.84	7.00	6.95
HEMOGLOBIN	13.66	12.84	13.10
HEMATOCRIT	41.73	40.07	40.58
MCV	91.00	90.12	90.39
FE <sup>+</sup>	72.62	67.80	69.18
FERRITIN	95.27	75.13	81.34
TRANSFERRIN	275.50	273.63	274.13
VIT B12	394.42	439.59	427.27
FOLIC ACID	13.63	11.71	12.17
TOTAL PROTEINS	7.06	6.93	6.97
ALBUMIN	42	46.9	45.7
TSH	2.91	3.13	3.06
CHOLESTEROL TOTAL	196.57	204.77	202.28
TRIGLICERIDOS	111.14	129.89	124.21
UREA	5.02	4.68	4.78
URIC	5.61	5.12	5.27
CREATININE	1.20	0.99	1.05
POTASSIUM	4.45	4.47	4.47

The MNA<sup>®</sup> shows the mean values by age and sex in figure 3, in 4 for women and in 5 the total population over 80 whom live alone, on the study.

Figure 3. MNA in men by age group

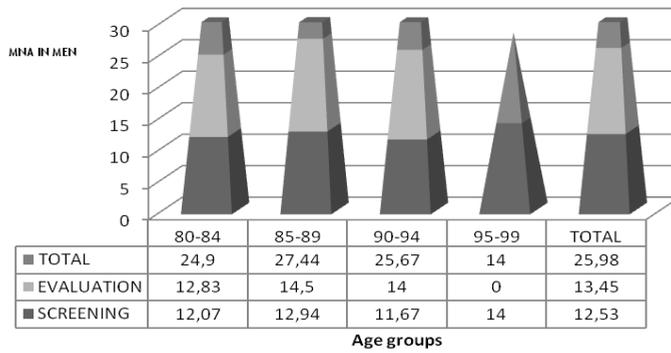


Figure 4. MNA in women by age group

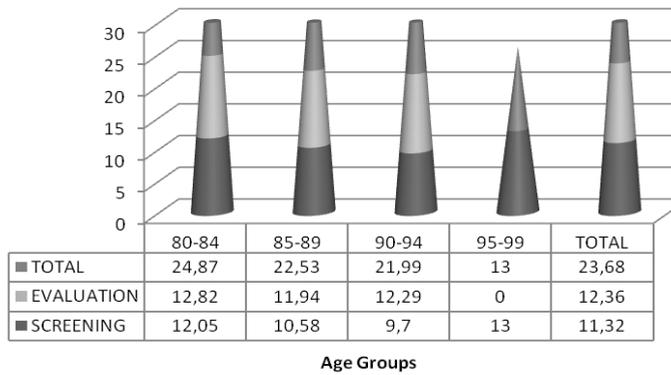
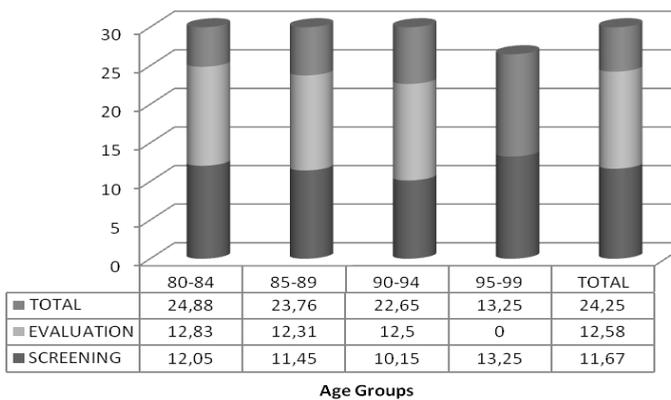


Figure 5. MNA by age group



When performing the statistical analysis using Pearson's R between variables conventionally used in nutrition studies, such as proteins totals, the Albumins, hemoglobin, Fe +, ferritin, vitamin B12, and total cholesterol, with the result of MNA, we objectively observe a significant degree of dispersion, as indicated in the following table 3.

*Table 3. R Pearson Correlations*

MNA / TOTAL PROTEINS	0.26
MNA / ALBUMIN	0.46
MNA / HEMOGLOBIN	0.19
MNA / FE <sup>+</sup>	0.32
MNA / FERRITIN	-0.10
MNA/ TRANSFERRIN	0.12
MNA / VITAMIN B12	0.13
MNA / TOTAL CHOLESTEROL	-0.03

## DISCUSSION

Firstly, we are struck by the high number of > 80 years who are living alone, above the estimate in the literature, taking into account our pyramid of > 80 years of 948 older, we find 342, one in three. Interestingly, we also found elderly that would not participate in the study, which linked to deaths in those three years of research, (20 elderly), and a professional who was off sick and could not participate and those that were discarded due to technical problems resulted a population of 247 elderly over 80 years living alone in our basic health area, coinciding with reports in the literature of one in four, still higher than reflected in the latest study IMSERSO 2010, that stood at 16%.

Nutritional assessment with analytical parameters and MNA<sup>®</sup> test is a simple tool to use in primary care without any complications, and biochemical parameters that are in common usage and are associated with anthropometric measures must be followed when the second part of the MNA<sup>®</sup>, is came out with a tape measure to arm circumference and calf. These parameters shown is table 2, maintain an even distribution between men and women and in total, with no significance whatsoever to the analytical data of the literature.

Carrying out the test MNA<sup>®</sup> in the first part of screening, with average score of 11.67 out of a maximum of 14, we found for women a lower value (11.32/ 14) than men (12, 53/14), oddly enough against that reported in the work of T Gomez Gonzalez in the recent publication in Handbook of Malnutrition Assessment in Primary Care of the elderly, Ergon Edt 2011, in which men are more at risk of malnutrition.

*Table 4. Risk of malnutrition*

Clinical Situation	MNA <sup>(R)</sup>
Normal nutritional status	> 23.25
At risk of malnutrition	17 – 23.5
Malnourished	< 17

When we analyze the age groups, we note that the group between of men aged 90 to 94 years old, is where we find a more pathological screening with a mean value of 10.15/14, at the expense of women (9,7/14), not displayed in men who achieved a score of 11.67/14 much higher.

In women, the age group between 85 to 89 years old there has been, at the same time, a low score in screening for a mean of 10.58/14, not displayed in men.

When we completed the test MNA<sup>®</sup>, the second part of evaluation with a partial result up to 16 points added to the screening score is a maximum of 30 points. In our research, the final result is 24.25/30, initially it is shown the absence of risk of malnutrition or malnourished, because the stratification is done based on the final of the test result that show risk of malnutrition or malnourished, as shown in table 4.

In the distribution by gender, men get 25.98 / 30 and women get 23.68/30.

And in the age group distribution are women who score lower than men in all groups. On the other hand we made correlations between the MNA<sup>®</sup> test and analytical parameters (Table 3), we found that classical parameters used in studies of malnutrition as total protein, albumin, iron and Vitamin B12, that show us a positive correlation but weak being the albumin and iron reaching the highest value (0.46 and 0.32 respectively). Transferrin has a positive value of 0.124.

By contrast, the ferritin and cholesterol in some studies were referred to as indicators of malnutrition, reaching negative values -0.10 and -0.03 correlations respectively.

These results could be justified as the catchment area being of medium average economic and cultural level, being a part of town where there are many seniors officials and professional occupations and in which the assessment by Lobo test, Barthel and Lawton Brody shows us a greater, preferably female, with a high degree of autonomy, Barthel Lawton-Brody of 80.47 5.79 and 26.48 Lobo cognitively stable and in which the correlations with the outcome of MNA<sup>®</sup> in low positive range, as shown in the table 5.

*Table 5. Correlations of Geriatric Assesment and MNA*

Geriatric Assesment	Results	R Pearson with MNA <sup>®</sup>
Lobo	26.48	0.15
Barthel	80.47	0.08
Lawton-Brody	5.79	0.02

## CONCLUSIONS

1.- In our research we have not detected malnutrition in any age group and gender, we have only detected a risk factor but it's not consolidated in groups of women between 85 and 89, and men between 90 and 94, and finally it was ruled out.

2. - The correlation between biochemical parameters and MNA<sup>®</sup> is positive for total protein, albumin, and Fe+, lipid parameters remained negative for existing disparity in the recent publications.

3. - The best analytical parameters are total protein, albumin, Fe +

4. - The use of nutrition test MNA<sup>®</sup> must be generalized to be an accurate, clear, quick and easy tool to use.
5. - There is a reduced version of the MNA<sup>®</sup> as its simplicity is ideal for use in primary care, leaving the larger version or extended for research studies.

*Acknowledgements:* In the baseline study PIAMLA'80, to staff who participated in the study: medicals, nurses, and social worker of the Health Centre “La Laguna” and to Santiago Romero Rodriguez for the development of specific software for this research.

## REFERENCES

- Arellano, M., García-Caselles, M.P., Pi-Figueras, M., Miralles, R., Torres, R.M., Aguilera, A. *et al.* (2004). Clinical impact of different scores of the mini nutritional assessment (MNA) in the diagnosis of malnutrition in patients with cognitive impairment. *Archives of Gerontology and Geriatrics*, 9, 27-31.
- Barbosa-Silva, M.C. & Barros, A.J. (2006). Indications and limitations of the use of subjective global assessment in clinical practice: an update. *Curr Opin Clin Nutr Metab Care*, 9, 263-269.
- Barone, L., Milosavljevic, M. & Gazibarich, B. (2003). Assessing the older person: is the MNA a more appropriate nutritional assessment tool than the SGA? *The Journal of Nutrition Health and Aging*, 7, 13-17.
- Benítez, J. *et al.* (2010). La soledad de los mayores de 80 años que viven en Cádiz: PIAMLA'80. IX Congreso de la Sociedad Vasca de Geriátría y Gerontología. San Sebastian.
- Benítez, J. (2011). Valoración de la nutrición en el anciano. En J.C. Caballero y J. Benítez (Eds.), *Manual de Valoración de la desnutrición del anciano*. Madrid: Ergon.
- Bonnefoy, M., Ayzac, L., Ingenbleek, Y., Kostka, T., Boisson, R.C. & Bienvenu, J. (1998). Usefulness of the prognostic inflammatory and nutritional index (PINI) in hospitalized elderly patients. *International Journal Vitam Nutr Res*, 68, 189-195.
- Camarero, E., Cervera, A.M., Pablo, P., Martín, A., Maturana, N., Schwartz, S. *et al.* (1998). *Estudio nutricional en residencias de ancianos. Estudio epidemiológico del estado nutricional en la población anciana sana de centros residenciales públicos*. Madrid: Nutricia.
- Cereda, E., Limonta, D., Pusani, C. & Vanotti, A. (2006). Geriatric nutritional risk index: a possible indicator of short-term mortality in acutely hospitalized older people. *Journal American Geriatrics Society*, 54, 1011-1012.
- Cereda, E. & Vanotti, A. (2007). The new Geriatric Nutritional Risk Index is a good predictor of muscle dysfunction in institutionalized older patients. *Clinical Nutrition*, 26, 78-83.
- Compan, B., Di Castri, A., Plaze, J.M. & Arnaud-Battandier, F. (1999). Epidemiological study of malnutrition in elderly patients in acute, sub-acute and long-term care using the MNA. *J Nutr Health Aging*, 3, 146-151.
- Contrato Programa del Distrito Sanitario Bahía de Cádiz-La Janda y la Unidad de Gestión Clínica “La Laguna”, año 2009, 2010, 2011.
- Cotton, E., Zinober, B. & Jessop, J. (1996). A nutritional assessment tool for older patients. *Prof Nurse*, 11, 609-612.
- Croghan, N.L. & Pasvogel, A. (2003). The influence of protein calorie malnutrition on quality of life in nursing homes. *J Gerontol A Biol Sci Med Sci*, 58, 159-164.

- Cuesta, F. *et al.* (2008). *Dieta y nutrición del anciano*. Madrid: Aula Médica.
- De Groot, L.C., Beck, A.M., Schroll, M. & Van Staveren, W.A. (1998). Evaluating the DETERMINE Your Nutritional Health Checklist and the Mini Nutritional Assessment as tools to identify nutritional problems in elderly Europeans. *Eur J Clin Nutr*, 52, 877-883.
- Detsky, A.S., McLaughlin, J.R., Baker, J.P., Johnston, N., Whittaker, S., Mendelson, R.A. *et al.* (1987). What is subjective global assessment of nutritional status? *JPEN*, 11, 8-13.
- Donini, L.M., de Felice, M.R., Tassi, L., de Bernardini, L., Pinto, A., Giusti, A.M. *et al.* (2002). A «proportional and objective score» for the mini nutritional assessment in long-term geriatric care. *J Nutr. Health Aging*, 6, 141-146.
- Donini, L.M., Savina, C., Rosano, A., De Felice, MR., Tassi, L., De Bernardini, L. *et al.* (2003). MNA predictive value in the follow-up of geriatric patients. *J Nutr Health Aging*, 7, 282-293.
- Elmstahl, S., Persson, M., Andren, M. & Blabolil, V. (1997). Malnutrition in geriatric patients: a neglected problem? *J Adv Nurs*, 26, 851-855.
- Eriksson, B.G., Dey, D.K., Hessler, R.M., Steen, G. & Steen, B. (2005). Relationship between MNA and SF-36 in a free living elderly population aged 70 to 75. *J Nutr Health Aging*, 9, 212-220.
- Esteban, M., Fernández-Ballart, J. & Salas-Salvadó, J. (2000). Estado nutricional de la población anciana en función del régimen de institucionalización. *Nutr Hosp*, 15, 105-113.
- Gazzotti, C., Albert, A., Pepinster, A. & Petermans, J. (2000). Clinical usefulness of the mini nutritional assessment (MNA) scale in geriatric medicine. *J Nutr Health Aging*, 4, 176-181.
- Gómez, T. (2011). Los Factores Socioeconómicos, familiares y psicológicos en la desnutrición del anciano. En J.C. Caballero y J. Benítez (Eds.), *Manual de Valoración de la desnutrición del anciano*. Madrid: Ergon.
- Guigoz, Y., Lauque, S. & Vellas, B.J. (2002). Identifying the elderly at risk for malnutrition. The Mini Nutritional Assessment. *Clin Geriatr Med*, 18, 737-757.
- Guigoz, I. (2006). The mini Nutritional Assessment (MNA<sup>®</sup>) review of the literature. What does tell us? *J Nutr Health Aging*, 10, 466-485.
- Guillén, F. (2008). *Síndromes y cuidados del paciente geriátrico*. Barcelona: Elsevier-Masson.
- Kondrup, J., Allison, S.P., Elia, M. *et al.* (2003). ESPEN guidelines for nutrition screening 2002. *Clin Nutr*, 22, 415-421.
- Kyle, U.G., Kossovsky, M.P., Karsegard, V.L. & Pichard, C. (2006). Comparison of tools for nutritional assessment and screening at hospital admission: a population study. *Clin Nutr*, 25, 409-417.
- Langkamp-Henken, B., Hudgens, J., Stechmiller, J.K. & Herrlinger-García, K.A. (2005). Mini nutritional assessment and screening scores are associated with nutritional indicators in elderly people with pressure ulcers. *J Am Diet Assoc*, 105, 1590-1596.
- Losada, C. (2011). Valoración del estado nutricional. Curso nutrición. Barcelona.
- Lauque, S., Arnaud-Battandier, F., Mansourian, R., Guigoz, Y., Paintin, M., Nourhashemi, F. *et al.* (2000). Protein-energy oral supplementation in malnourished nursing-home residents. A controlled trial. *Age Ageing*, 29, 51-56.
- Moreiras, O., Carbajal, A., Perea, I., Varela-Moreiras, G. & Ruiz, B. (1993). Nutrición y salud de las personas de edad avanzada en Europa: Euronut-Seneca. Estudio en España. *Rev Esp Geriatr Gerontol*, 28, 197-242.
- Nikolaus, T., Bach, M., Siezen, S., Volkert, D., Oster, P. & Schlierf, G. (1995). Assessment of nutritional risk in the elderly. *Ann Nutr Metab*, 39, 340-345.

- Ottery, F.D. (1996). Definition of standardized nutritional assessment and interventional pathways in oncology. *Nutrition*, 12, 15-19.
- Pattison, R., Corr, J., Ogilvie, M., Farquar, D., Sutherland, D., Davidson, H.I.M. et al. (1999). Reliability of a qualitative screening tool versus physical measurements in identifying undernutrition in an elderly population. *J Hum Nutr Dietet*, 12, 133-140.
- Persson, M.D., Brismar, K.E., Katzarski, K.S., Nordenstrom, J. & Cederholm, T.E. (2002). Nutritional status using mini nutritional assessment and subjective global assessment predict mortality in geriatric patients. *J Am Geriatr Soc*, 50, 1996-2002.
- Piédrola, P. et al. (2006). Malnutrición en el anciano. En E. Hortonedá (Ed.), *Síndromes geriátricos*. SEMER & Lilly. Madrid: Ergon.
- Ramón, J.M. & Subirà, C. (2001). Prevalencia de malnutrición en la población anciana española. *Medicina Clínica*, 217, 766-770.
- Ribera, J.M. et al. (2008). *Geriatría en Atención Primaria*. Madrid: Aula Médica.
- Robles, F. et al. (2007). Malnutrición en el anciano. En: F. Guillén (Ed.), *Síndromes y cuidados en el paciente geriátrico*. Barcelona: Elsevier-Masson.
- Rubenstein, L.Z., Harker, J.O., Salva, A., Guigoz, Y. & Vellas, B. (2001). Screening for under nutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF). *J Gerontol A Biol Sci Med Sci*, 56, 66-72.
- Ruiz-López, M.D., Artacho, R., Oliva, P., Moreno-Torres, R., Bolanos, J., de Teresa, C. et al. (2003). Nutritional risk in institutionalized older women determined by the Mini Nutritional Assessment test: what are the main factors? *Nutrition*, 19, 767-771.
- Salvá, A. & Lucas, R. (2007). *Qualitat de vida a les persones grans a Catalunya*. Barcelona: Fundació Viure i Conviure.
- Sempos, C.T., Johnson, N.E., Elmer, P.J., Allington, J.K. & Matthews, M.E. (1982). A dietary survey of 14 Wisconsin nursing homes. *J Am Diet Assoc*, 81, 35-40.
- Sociedad Española de Geriatría y Gerontología (SEGG) y Sociedad Española de Nutrición Enteral y Parenteral (SENPE) (2007). *Valoración nutricional en el anciano. Documento de consenso*. Madrid: Nestlé HealthCare Nutrition.
- Soini, H., Routasalo, P. & Lagstrom, H. (2004). Characteristics of the Mini-Nutritional Assessment in elderly homecare patients. *Eur J Clin Nutr*, 58, 64-70.
- Stratton, R.J., King, C.L., Stroud, M.A., Jackson, A.A. & Elia, M. (2006). Malnutrition Universal Screening Tool predicts mortality and length of hospital stay in acutely ill elderly. *Br J Nutr*, 95, 325-330.
- Suominen, N., Muurinen, S., Routasalo, P., Soini, H., Suur-Uski, I., Peiponen, A. et al. (2005). Malnutrition and associated factors among aged residents in all nursing homes in Helsinki. *Eur J Clin Nutr*, 59, 578-583.
- Thorsdottir, I., Jonsson, P.V., Astegeisdottir, A.E., Hjaltadottir, I., Bjornsson, S. & Ramel, A. (1999). Fast and simple screening for nutritional status in hospitalized, elderly people. *J Hum Nutr Dietet*, 18, 53-60.
- Trinidad, A. & López, J. (2007). Situación social de los mayores en Andalucía. Universidad de Granada. Consejería de Presidencia.
- Tur, J.A., Colomer, M., Monino, M., Bonnin, T., Llompert, I. & Pons, A. (2005). Dietary intake and nutritional risk among free-living elderly people in Palma de Mallorca. *J Nutr Health Aging*, 9, 390-396.
- Van Nes, M.C., Herrmann, F.R., Gold, G., Michel, J.P. & Rizzoli, R. (2001). Does the mini nutritional assessment predict hospitalization outcomes in older people? *Age Ageing*, 30, 221-226.

- Vellas, B., Guigoz, Y., Baumgartner, M., Garry, P.J., Lauque, S. & Albarede, J.L. (2000). Relationships between nutritional markers and the mini-nutritional assessment in 155 older persons. *J Am Geriatr Soc*, 48, 1300-1309.
- Villarino, A., García-Linares, M.C., García-Arias, M.T. & García-Fernández, M.C. (2002). Anthropometric assessment and vitamin intake by a group of elderly institutionalized individuals in the province of Leon (Spain). *Nutr Hosp*, 17, 290-295.
- Virgili, N. et al. (2010). Nutrición en las personas mayores. En Nestlé, *Manual de recomendaciones nutricionales al alta hospitalaria*. Barcelona: Glosa.
- Wolinsky, F.D., Coe, R.M., McIntosh, W.A., Kubena, K.S., Prendergast, J.M., Chávez, M.N. et al. (1990). Progress in the development of a nutritional risk index. *J Nutr*, 120, 1549-1553.
- Zuliani, G., Romagnoni, F., Volpato, S., Soattin, L., Leoci, V., Bollini, M.C. et al. (2001). Nutritional parameters, body composition, and progression of disability in older disabled residents living in nursing homes. *J Gerontol A Biol Sci Med Sci*, 56, 212-216.

Received: November 1st, 2012

Modifications Received: December 10th, 2012

Accepted: December 12th, 2012