Short Communication

# Prevalence of malnutrition in free living elderly people in Iran: a cross-sectional study

Maliheh Aliabadi MSc[1], Masood Kimiagar PhD[5], Majid Ghayour-Mobarhan MD PhD[2], Mohammad Taghi Shakeri PhD[3], Mohsen Nematy MD PhD[4], Ali Akbar Ilaty MD[1], Ahmad-Reza Moosavi PhD[4] and Sue Lanham-New PhD[6]

*[1]Dargaz Health Center, [2]Cardiovascular Research Center, Avicenna Research Institute, [3]Social Medical Center, [4]Department of Nutrition and Biochemistry, Faculty of Medicine; Mashhad University of Medical Sciences, Iran*
*[5]Department of Clinical Nutrition, National Nutrition and Food Technology Research Institute, Beheshti University of Medical Sciences, Tehran, Iran*
*[6] Centre for Nutrition and Food Safety, School of Biomedical and Life Sciences, University of Surrey, Guildford, Surrey, England*

**Introduction:** The elderly are a particularly vulnerable group. Malnutrition is common and increases an old person's vulnerability to disease. We determine the prevalence of malnutrition in free living elderly people and its relationship with nutritional status and some ocioeconomic conditions. **Methods:** Nutritional status and its relationship with socioeconomic conditions were evaluated using Mini Nutritional Assessment in free-living elderly people (n=1962 using cluster sampling, 917 male/1045 female, aged>60). **Results:** Among the population, 42.7% were well nourished, 12.0% malnourished and 45.3% at risk of malnutrition. There was more malnutrition in females compared to males (13% vs. 10.8%; $p<0.001$), rural than urban (14.8% vs. 9.9%; $p<0.001$), non educated than educated (13.3% vs 6.9%; $p<0.001$), lonely than living with family (17.5% vs. 10.3%; $p<0.001$), unemployed than employed (13.3% vs. 6.3%; $p<0.05$), elderly on income support (Behsisty charity) compared with elderly on retirement salary, (41.7% vs. 3.3%; $p<0.05$). Total Mini Nutritional Assessment scores correlated significantly with length of education, age, waist circumference, and body mass index (r =0.426, -0.142, 0.355 and 0.269 respectively). **Conclusion:** This study revealed a 12% malnutrition prevalence in this elderly group, with higher percentages in special socioeconomic conditions. Health care providers need to be aware of this problem and its scope. These results reinforce the need to screen, monitor and support elderly people.

**Key Words: Free living elderly people, nutritional status, socioeconomic conditions (SEC), Body mass index (BMI)**

## INTRODUCTION

Malnutrition is highly prevalent in the elderly population.[1,2] It has been reported in other places that 15% of community-dwelling and home-bound elderly individuals, up to 62% of hospitalized elderly patients, and up to 85% residents of nursing homes are malnourished.[3-6] It increases morbidity, mortality and decreases quality of life.[2,7]

Although there has been some work done regarding nutritional status of home care elderly individuals,[8] there are no comprehensive data of the prevalence of malnutrition in community–dwelling elderly individuals in Iran. The objectives of this study were to determine the prevalence of malnutrition in free living elderly people and its relationship with nutritional status, place of living (rural and urban), education, gender, type of living (alone or with family), occupation, source of income and taking supplement in Razavi-Khorasan, Iran.

## MATERIALS AND METHODS

This was a prospective cohort study undertaken at Razavi Khorasan Province, Iran. Local ethics committee approval was obtained (Beheshti University Research Ethics Committee). Subjects (n=2000) were all recruited using a cluster-stratified sampling method from the free living elderly people of Razavi-Khorasan province, with total elderly population of 463329, and included individuals from rural and urban areas aged over 60 years old. Among them, 1962 subjects completed the Mini Nutritional Assessment (MNA). The MNA method was used to assess the nutritional status of elderly people in this study. MNA as a simple, noninvasive, and validated clinical tool, is a relatively new comprehensive method that was developed for nutritional assessment in geriatric settings.[9-11] It is both a screening and an assessment tool for the identification of

**Corresponding Author:** Dr Majid Ghayour–Mobarhan, Avicenna Research Institute, Mashhad University of Medical Science, Mashhad, Iran postal code: 9196773117
Tel: +98511-7112610-5; Fax: +98511-7112596
Email: ghayourm@mums.ac.ir
Manuscript received 16 June 2007. Initial review completed 27 November 2007. Revision accepted 5 March 2008.

malnutrition in the elderly and consists of 18-items including anthropometric measurements [body mass index (BMI), mid-arm and calf circumference, and weight loss] combined with a section regarding dietary intake (number of meals consumed, food and fluid intake, and feeding autonomy), a global assessment (lifestyle, medication, mobility, presence of acute stress, and presence of dementia or depression), and a self-assessment (self perception of health and nutrition).[10] A scoring algorithm assigns subjects to well-nourished (scores 24-30), at-risk of malnutrition (scores 17-23.5) and malnourished categories (scores less than 17).[12] Medication was scored based on the assessment part of the MNA form (section H) when more than 3 prescription drugs were taken per day. This tool avoids the need for more invasive test such as blood sampling.

The MNA was completed by Health care officers by answering the questions on the questionnaires based on interviews. Socioeconomic questions were set in the final part of questionnaire to avoid bias.

A power calculation using cluster sampling suggested a sample of 2000 people would be enough to show significant results. The data were analysed using SPSS 13.0 for windows (SPSS Science, Apache Software Foundation, Chicago, IL, USA). All data were checked for normality, continuous variables are presented as mean plus minus standard error of the mean (SEM) and categorical variables expressed as frequencies and percentages. Differences in nutritional status were analyzed by the chi-square test for categorical variables. Pearson correlation coefficients were performed for linear relations between total MNA scores and continuous variables. Multivariate analyses with multinomial logistic regression were used to determine the effects of the MNA factors and socioeconomic conditions (SECs) variables.

## RESULTS

Demographics of subjects are displayed in Table 1. Table 2 shows the nutritional status of the elderly subjects and their anthropometric profile. Results showed that 12.0% of subjects were malnourished. Malnutrition was more prevalent in females, elderly in rural areas, none educated, subjects living alone, unemployed, in the elderly people under charities support, and in the elderly people on medications compared to the other subgroups. Education, self-employment and farming variables showed a positive effect in reducing the prevalence of malnutrition, compared with illiteracy, unemployment, different occupations and retirement (Table 3). Total MNA scores were positively correlated with BMI, and length of education (r = 0.43, and 0.27, respectively, $p<0.01$) and negatively with age (r = 0.14, $p<0.01$). The results showed that" weight loss during last months" and "BMI" of the MNA questionnaire were the most effective and significant nutritional factors affecting the MNA score. The "source of income", "education" and "occupation " were the most effective significant SECs determinants nutritional score ($p<0.001$).

## DISCUSSION

The main finding of this study is the prevalence of 12.0% malnutrition in elderly people residing in Razavi Khorasan province. From the total number of subjects studied, 42.7% were well nourished and 45.3% were at risk of malnutrition. The prevalence of malnutrition ranges from 5-10% in free-living elderly to 30-85% in homebound, nursing home, and hospitalized elderly.[13] In Asian countries, for example a study on a frail elderly Japanese population, according to the original cut off point of the full MNA, suggested that 19.9% of those

**Table 1.** Demographic data of the elderly (N = 1962), in Razavi Khorasan province, Iran.

| Variable | Value |
|---|---|
| Age (years) | 70 ± 7.8 |
| Gender [*n* (%)] | |
| Female [*n* (%)] | 1045 (53.3) |
| Male [*n* (%)] | 917 (46.7) |
| BMI (kg/m$^2$) | 24.2 ± 4.8 |
| Men (kg/m$^2$) | 23.5 ± 4.3 |
| Women (kg/m$^2$) | 24.8 ± 5.1 |
| Educated [*n* (%)] | 393 (20.1) |
| Men [*n* (%)] | 258 (65.6) |
| Women [*n* (%)] | 135 (34.4) |
| Urban [*n* (%)] | 1119 (57.0) |
| Rural [*n* (%)] | 843 (43.0) |

Values express as Mean ± Standard Deviation or number (percentage)

**Table 2.** Association between MNA scores and anthropometric measurements of elderly people (N = 1962), in Razavi Khorasan Province, Iran.

| Variable | Well nourished MNA > 23.5 | At risk of malnutrition MNA 17-23.5 | Malnourished MNA < 17 | *p value* |
|---|---|---|---|---|
| *n* (%) | 835 (42.7) | 887 (45.3) | 235 (12.0) | |
| Age (mean ± SD) | 69.3 ± 7.1 | 70.6 ± 8.2 | 72.2 ± 8.1 | <0.001 |
| Male / Female | 460/375 | 355/532 | 99/136 | <0.001 |
| Weight (kg) | 65.2 ± 12.0 | 57.4 ± 12.8 | 47.8 ± 10.3 | <0.001 |
| Height (cm) | 158 ± 9.4 | 156 ± 9.5 | 155 ± 10.9 | <0.001 |
| BMI (kg/m$^2$) | 26.0 ± 4.2 | 23.7 ± 4.7 | 19.8 ± 3.3 | <0.001 |
| Waist (cm) | 95.3 ± 12.6 | 89.2 ± 13.8 | 80.6 ± 12.1 | <0.001 |
| Hip (cm) | 98.8 ± 10.8 | 94.2 ± 11.5 | 86.5 ± 9.6 | <0.001 |
| Waist/Hip Ratio | 0.96 ± 0.11 | 0.94 ± 0.10 | 0.93 ± 0.10 | <0.001 |

Values express as Mean ± Standard Deviation or number (percentage). Categorical data were compared by chi-square test and between-group comparisons were assessed by one-way ANOVA. MNA = Mini Nutritional Assessment; BMI = Body Mass Index.

**Table 3.** Comparison of socio economic indices with nutritional status according to mini nutritional assessment (MNA) scores of elderly people (N = 1962) in Razavi Khorasan province, Iran.

| Variable | | Well nourished MNA > 23.5 | At risk of malnutrition MNA 17-23.5 | Malnourished MNA < 17 | *p* value |
|---|---|---|---|---|---|
| Gender [Male (%)/Female (%)] | | 50 / 36 | 39 /51 | 11 / 13 | <0.001 |
| Place of living [rural (%) / urban (%)] | | 35.5 / 48.1 | 49.6 / 42 | 14.8 / 9.9 | <0.001 |
| Education [educated (%) / non educated (%)] | | 66.3/36.6 | 26.8 / 50 | 6.9 / 13.4 | <0.001 |
| Type of living | Alone (%) | 31.2 | 51.3 | 17.5 | <0.001 |
| | With family (%) | 47.9 | 41.8 | 10.3 | |
| | With others (%) | 31.7 | 54.3 | 14.0 | |
| Occupation | Employee (%) | 43.8 | 50.0 | 6.3 | <0.001 |
| | Labourer (%) | 51.4 | 37.1 | 11.4 | |
| | Self employed (%) | 70.7 | 24.1 | 5.3 | |
| | Farmer or animal farmer (%) | 49.0 | 42.1 | 8.9 | |
| | Unemployed (%) | 38.6 | 48.1 | 13.3 | |
| Source of income | Behsisty charity (%) | 8.3 | 50.0 | 41.7 | <0.001 |
| | Emdad committee charity (%) | 23.2 | 55.7 | 21.1 | |
| | Retirement salary (%) | 60.0 | 36.8 | 3.3 | |
| | Family support (%) | 33.3 | 51.9 | 14.8 | |
| | Personal wealth (%) | 51.4 | 40.1 | 8.4 | |
| | Others (%) | 43.9 | 43.9 | 12.1 | |
| †Drug consumption | Yes (%) | 34.2 | 51.8 | 14 | <0.05 |
| | No (%) | 44 | 44.3 | 11.7 | |

Values express as a percentage. Comparison between groups were assessed by chi-square test, as the data is categorical.
† taking more than 3 prescription drugs per day based of the MNA method.
MNA= Mini Nutritional Assessment.

assessed were malnourished, 58.0% were at risk of malnutrition, and 22.1% were well nourished.[14] This difference may be explained by the older age of the Japanese elderly population and also the relatively higher percentage of elderly people in the population in Japan than many other populations. Also we defined elderly as more than 60 years old rather than 65 years which was used in the Japanese study. Mini Nutritional Assessment of rural elderly people in Bangladesh, revealed a prevalence of 26% for protein-energy malnutrition and 62% for risk of malnutrition.[15]

The nutritional status in this study was associated with some of socio-economic conditions such as the place of living, education, gender, type of living, occupation, income and supporting system, as well as medication. Malnutrition in the elderly is a multidimensional concept encompassing physical and psychological elements. It is precipitated by loss, dependency, loneliness and chronic illness and potentially impacts morbidity, mortality and quality of life.[16] Social and economic conditions can adversely affect dietary choices and eating patterns.[17] Elderly people become vulnerable to malnutrition owing to inappropriate dietary intake, poor economic status and social deprivation.[18]

Though food consumption patterns of rural and urban elderly show distinct differences, these are greatly influenced by regional dietary patterns.[18] In some studies, the level of education was directly associated with nutritional status.[15] In the present study, nutritional status was also associated with education. A higher level of education was possibly associated with higher income and better lifestyle, which in turn resulted in a better nutritional status in these elderly.

The percentage of malnutrition in the elderly people that were under protection of charities was higher than those elderly who live out of charities support. This difference may indicate the insufficient financial support of these governmental associations. By addressing nutritional risk, interventions can be targeted to meet these needs. A new, restorative and comprehensive meal program improved nutritional status and decreased nutritional risk.[19]

It was found that the percentage of malnutrition and at risk of malnutrition in subjects that lived alone were higher than those who lived with their families. Poverty, loneliness, and social isolation are the predominant social factors that contribute to decreased food intake in the elderly.[20] Psychological and socio-economic problems such as depression, life events and loneliness may reduce appetite.[21] Loneliness and reluctance to eat may complicate an already marginal situation for nutritional risk in the elderly.[17]

Results revealed that, elderly people on medication (taking more than 3 prescription drugs per day based of the MNA method) were more malnourished than those who were not on drug prescriptions. This finding may possibly be due to the fact that elderly people taking medication had conditions that required medications as a result of malnutrition in the first place. Elderly people often have higher prevalence of diseases leading to lower food intake due to pain, nausea, confusion, immobility and drug side-effects. The reasons for the poor food in-

take in the elderly are likely to be linked to both physiological and pathological factors. Furthermore malnutrition is more common in older adults than in younger people because diseases and psychological problems are prevalent in this population. Malnutrition may escalate very rapidly during severe acute illnesses, which cause net hypercatabolism of lean tissue.[22]

Inadequate micronutrient intake among older adults is common. Although many older adults take multivitamin supplements in an effort to compensate, studies examining the benefits of this behavior could not be found. Short-term nutritional supplementation in old people at nutritional risk is offset by simultaneous reduction in voluntary food intake. Appropriate nutrition support can address the problem of malnutrition among elderly individuals living in the community and may contribute to health care cost reduction.

Consist with other reports, we found that the MNA score highly correlated with the BMI [6,14] and age. [14] In community-dwelling elderly people, the MNA detects risk of malnutrition and life-style characteristics associated with nutritional risk.[6] In Iran, the culture and lifestyle are different from those seen in the industrial countries, so that we intended to examine the effect of factors indicated in the MNA on the nutritional status of free living elderly people in this country. The results showed that "weight loss during last months" and "BMI" of the MNA questionnaire had a more significant impact on the nutritional status score. Among the socioeconomic factors, “source of income", "education" and “occupation" were the most effective significant factors that affected nutritional status.

The results of the present study show that the prevalence of malnutrition in free living elderly people was high (12.0%) in this population. In the elderly, malnutrition is an ominous sign. Without intervention, it presents as a downward trajectory leading to poor health and decreased quality of life. It is precipitated by loss, dependency, loneliness and chronic illness and potentially impacts morbidity, mortality and quality of life.[16]

Results of this study showed a 12% malnutrition prevalence in elderly group with higher percentages in special socioeconomic conditions. Health care providers need to be aware of this problem and its scope. These results reinforce the need to screen, monitor and support elderly people.

**ACKNOWLEDGMENTS**

We would like to thank the Mashhad University of Medical Sciences, Avicenna Research Institute and Beheshti University of Medical Sciences for their help, as well as financial, and scientific support**.**

**AUTHOR DISCLOSURES**

Maliheh Aliabadi, Masood Kimiagar, Majid Ghayour-Mobarhan, Mohammad Taghi Shakeri, Mohsen Nematy, Ali Akbar Ilaty, Ahmad-Reza Moosavi and Sue Lanham-New, no conflicts of interest.

**REFERENCES**

1. Constans T. Malnutrition in the elderly. Rev Prat. 2003;53: 275-9.
2. Kagansky N, Berner Y, Koren-Morag N, Perelman L, Knobler H, Levy S. Poor nutritional habits are predictors of poor outcome in very old hospitalized patients. Am J Clin Nutr. 2005;82:784-91.
3. Visvanathan R. Under-nutrition in older people: a serious and growing global problem! J Postgrad Med. 2003;49: 352-60.
4. Morley JE, Thomas DR. Anorexia and aging: pathophysiology. Nutrition. 1999;5:499-503.
5. Thomas DR, Zdrowski CD, Wilson MM, Conright KC, Lewis C, Tariq S, Morley JE.. Malnutrition in subacute care. Am J Clin Nutr. 2002;75:308-13.
6. Compan B, di CA, Plaze JM, Rnaud-Battandier F. Epidemiological study of malnutrition in elderly patients in acute, sub-acute and long-term care using the MNA. J Nutr Health Aging. 1999;3:146-51.
7. Zazzo JF. Physiopathology and consequences of malnutrition. Rev Prat. 2003;1;53:248-53.
8. Ahrari M, Kimiagar M. Food intake and Body Mass Index in the privately institutionalized elderly in Tehran. Int J Vitam Nutr Res. 1997;67:41-6.
9. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN guidelines for nutrition screening 2002. Clin Nutr. 2003;22:415-21.
10. Guigoz Y, Lauque S, Vellas BJ. Identifying the elderly at risk for malnutrition. The Mini Nutritional Assessment. Clin Geriatr Med. 2002;18:737-57.
11. Guigoz Y, Vellas B, Garry PJ. Assessing the nutritional status of the elderly: The Mini Nutritional Assessment as part of the geriatric evaluation. Nutr Rev. 1996;54:S59-S65.
12. McGee M, Jensen LJ. Mini Nutritional Assessment (MNA): Research and Practice in the Elderly. Am J Clin Nutr. 2000; 71:158.
13. Guigoz Y, Vellas BJ. Malnutrition in the elderly: the Mini Nutritional Assessment (MNA). Ther Umsch. 1997;54: 345-50.
14. Kuzuya M, Kanda S, Koike T, Suzuki Y, Satake S, Iguchi A. Evaluation of Mini-Nutritional Assessment for Japanese frail elderly. Nutrition. 2005;21:498-503.
15. Kabir ZN, Ferdous T, Cederholm T, Khanam MA, Streatfied K, Wahlin A. Mini Nutritional Assessment of rural elderly people in Bangladesh: the impact of demographic, socio-economic and health factors. Public Health Nutr. 2006;9:968-74.
16. Chen CC, Schilling LS, Lyder CH. A concept analysis of malnutrition in the elderly. J Adv Nurs. 2001;36:131-42.
17. McClain CJ, McClain M, Barve S, Boosalis MG. Trace metals and the elderly. Clin Geriatr Med. 2002;18:801-viii.
18. Wadhwa A, Sabharwal M, Sharma S. Nutritional status of the elderly. Indian J Med Res. 1997;106:340-8.
19. Kretser AJ, Voss T, Kerr WW, Cavadini C, Friedmann J. Effects of two models of nutritional intervention on homebound older adults at nutritional risk. J Am Diet Assoc. 2003;103:329-36.
20. Donini LM, Savina C, Cannella C. Eating habits and appetite control in the elderly: the anorexia of aging. Int Psychogeriatr. 2003;15:73-87.
21. Volkert D, Frauenrath C, Kruse W, Oster P, Schlierf G. Malnutrition in old age--results of the Bethany nutrition study. Ther Umsch. 1991;48:312-5.
22. Elia M, Stroud M. Nutrition in acute care. Clin Med. 2004; 4.5: 405-7.

Short Communication

# Prevalence of malnutrition in free living elderly people in Iran: a cross-sectional study

Maliheh Aliabadi MSc[1], Masood Kimiagar PhD[5], Majid Ghayour-Mobarhan MD PhD[2], Mohammad Taghi Shakeri PhD[3], Mohsen Nematy MD PhD[4], Ali Akbar Ilaty MD[1], Ahmad-Reza Moosavi PhD[4] and Sue Lanham-New PhD[6]

*[1]Dargaz Health Center, [2]Cardiovascular Research Center, Avicenna Research Institute, [3]Social Medical Center, [4]Department of Nutrition and Biochemistry, Faculty of Medicine; Mashhad University of Medical Sciences, Iran*
*[5]Department of Clinical Nutrition, National Nutrition and Food Technology Research Institute, Beheshti University of Medical Sciences, Tehran, Iran*
*[6] Centre for Nutrition and Food Safety, School of Biomedical and Life Sciences, University of Surrey, Guildford, Surrey, England*

# 伊朗居家老人之營養不良盛行率：一橫斷面研究

老年人是一個較脆弱的族群。營養不良普遍存在於老年人中，並且會增加老年人罹病的風險。我們評估在家居住老人的營養不良盛行率及營養狀態與社經狀況的關係。方法：利用迷你營養評估表（MNA）來評估在家居住老人（利用群集抽樣，抽取 1962 位研究對象，包含 917 位男性及 1045 位女性，年齡大於 60 歲）的營養狀態及其與社經狀況的相關性。結果：在研究對象中，有 42.7%的人有良好的營養狀況、12%營養不良、以及 45.3%有營養不良的風險。而營養不良的比例：女性比男性高（13% vs. 10.8%; $p$<0.001）、鄉村地區高於城鎮地區（14.8% vs. 9.9%; $p$<0.001）、沒有受教育高於有受教育者（13.3% vs 6.9%; $p$<0.001）、獨居高於與家人同住（17.5% vs. 10.3%; $p$<0.001）、失業高於有工作者（13.3% vs. 6.3%; $p$<0.05）、領取收入津貼（Behsisty charity）的高於有退休金的老年人（41.7% vs. 3.3%; $p$<0.05）。此外，總迷你營養評估分數與受教育的年限、年齡、腰圍、以及 BMI 之間有顯著的相關性（相關係數分別為 0.426、-0.142、0.355、以及 0.269）。結論：本研究發現，在這一個老年族群中有 12%的營養不良盛行率，並且某些特殊社經狀況的老年人佔有較高的百分比。健康照護的提供者需要了解這個問題及其範疇。這些結果加強了需要篩選、監測、及支持老年人的重要性。

**關鍵字：伊朗、居家老人、營養狀態、社經狀況、身體質量指數**