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Nutritional Assessment of Institutionalized and Free-living Elderly in Alexandria: A Comparative Study

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ABSTRACT

Background: Mini Nutritional Assessment (MNA) can identify malnourished elderly people and those at risk of malnutrition in short time and can guide optimal early nutritional intervention**. Objective:** To compare the nutritional status of institutionalized and free-living elderly in Alexandria. **Subjects and Methods:** A cross-sectional study included fifty institutionalized elderly from two governmental elderly homes in Alexandria and fifty four free-living elderly from the community randomly selected . Data about socio-demographic characteristics, medical history and dietary habits were collected and nutritional assessment was carried out using dietary intake method, anthropometric measurements and the MNA tool. **Results:** Based on body mass index (BMI) estimates, obesity and being at risk of overweight were prevalent among 32% and 18% of institutionalized elderly respectively; among 7.4% and 33.3%, of free-living ones respectively. Using MNA, malnutrition and being at risk of malnutrition were 12% and 40%, respectively among institutionalized elderly; 9.3% and 29.6%, respectively among free-living ones. Calcium and vitamins A and C intake were less than the requirements. **Conclusion:** Malnutrition and being at risk of it were prevalent among the elders in the two studied settings.

Keywords: Free-living elderly, institutionalized elderly, malnutrition, Mini Nutritional Assessment (MNA)

INTRODUCTION

Malnutrition is a serious and frequent condition in elderly.[1] The prevalence of malnutrition in institutionalized elderly (30 – 60%) is considerably higher than that among free-living ones (5–10%).[2] There are many psychological, social and organic conditions related to malnutrition in elderly. Malnutrition can adversely affect the well-being of older persons mainly by causing a decline in functional status, worsening of existing medical problems and even increasing mortality rates. Therefore routine screening for malnutrition has to be considered as a diagnostic standard for all

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those involved in the care of elderly. The Mini Nutritional Assessment (MNA) is a validated assessment instrument for nutritional problems; it has gained worldwide acceptance because it has shown a high prevalence of malnutrition in different settings. The predictive validity of MNA has been evaluated by demonstrating its association with adverse health outcomes, social functioning, mortality and the higher rate of visits to the general practitioner.[3,4] Due to its specific geriatric focus, the MNA has been recommended as the basis for nutritional screening in older people, at times supplemented by laboratory values, anthropometric parameters or determination of body composition.[2]

Geriatric nutritional assessment has become crucial because progressive under nutrition often goes undiagnosed among the elderly.[5] Therefore, as a first-line strategy, MNA was developed to identify the elderly at risk of malnutrition and to guide early and optimal nutritional intervention by health professionals in geriatric clinics or on admission to hospitals and elderly homes.[6] The MNA should be integrated in the comprehensive geriatric assessment as a follow up screening tool with a reliable scale and clearly defined assessment.[7]

On the other hand, the comprehensive nutritional assessment of the elderly includes several anthropometric and dietary intake measurements, but it is not a practical or cost-effective way to assess nutritional status of a large number of elderly or to deal with depressed or demented ones.[8]

Many elderly have special nutritional requirements because aging affects absorption, metabolism and excretion.[9] Dietary intake assessment of this age group is necessary to be compared with the intake of recommended dietary requirements that give a true and accurate judgment of their nutritional status.[10] Insufficient studies were conducted to assess the nutritional status for different groups of elderly. Thus, the purpose

of the study was to compare the nutritional status of institutionalized and free-living elderly.

SUBJECTS AND METHODS

Study design

A comparative cross-sectional survey was conducted in Alexandria, from April to August 2009.

Sampling:

The study included 104 elderly subjects (aged 60 years and above); 54 free-living elders from Ezbet Sekina - a slum area in the East of Alexandria; and 50 institutionalized elders from 2 governmental elderly homes. After stratification of Ezbet Sekina streets numbers into even and odd; 2 even and 2 odd streets were randomly selected and the free-living elderly subjects were randomly selected. Two governmental elderly homes were selected randomly from a list containing all governmental elderly homes in Alexandria; the institutionalized elders were equally allocated from the 2 selected institutions. From each room in each institution, equal numbers of elders were randomly selected after taking their verbal consent.

Study tools:

A pre-structured interview questionnaire was used to collect data from each elderly. The collected data was about socio-demographic characteristics including: age; sex; marital status; educational level and source of income; medical history including: the number of chronic diseases the elderly had and the number of drugs he/she consumed daily; and dietary habits including: the main meal of the day as perceived by the elderly; snacks taken daily; timing of sleeping in relation to eating and watching TV during eating.

The original version of MNA which was used in this study included 18 weighted questions, divided into 4 nutritional areas: anthropometric measurements (four questions about weight, height and body circumferences, with a maximum score of eight points), dietary questionnaire (six

questions related to number of meals, kind of foods, fluid intake and autonomy of feeding, with a maximum score of nine points), global assessment (six questions according to lifestyle, medication and mobility, with a maximum score of nine points) and subjective assessment (self-perceived health and nutrition, with a maximum score of four points). The total score of MNA distinguished between well nourished elderly (score ≥ 24), at risk of malnutrition (score 17- < 24) and malnourished ones (score < 17).[11]

Anthropometric measurements included weight, height and mid-arm, calf, waist and hip circumferences following the method of Jelliffe et al.[12] Body mass index (BMI) was calculated as follows: weight (kg)/height^2 (m^2). An elder was considered obese when BMI was ≥ 95th percentile BMI-for-age, at risk of overweight when BMI was ≥ 85th and < 95th percentile BMI-for-age, and underweight when BMI was ≤ 5th percentile BMI-for-age.[13] Must et al (1991)[14] reference data of BMI-for-age percentiles were used. All circumferences were measured using flexible inelastic graduated tape measure.

Dietary intake data were collected using the 24 hour recall method. This method was used to assess the nutrients intake by asking each subject to recall and identify the specific amount of all foods and drinks consumed in the day before the interview for 3 random consecutive days. The researchers used simple verbal models of household units (e.g. cup and spoonful) for each elderly to recall the foods and drinks which he/she consumed. These units were converted to weight in grams for each food item before nutrients analysis. The nutritive value of the daily diet was computed using the Egyptian Food Composition Tables.[15] Dietary data were presented in the form of mean daily intake of energy, carbohydrates, protein, fat, iron, calcium and vitamins A and C. The results were referred to tables of dietary reference intake (DRI)[16] to calculate percent adequacy of nutrients

(protein, calcium, iron, vitamins A and C and energy) as follows: (nutrient intake/DRI of nutrient) x 100. Nutrient density of the consumed diet was calculated for macronutrients (carbohydrates, protein and fat) as follows: (intake of nutrient x calories of each gram/intake of energy) x 100.

Data management:

Data were presented as mean and standard error of mean using Statistical Package for Social Science (SPSS) version "15" software. Significance level of 5% was adopted. Data were analyzed using Chi square test for analysis of categorical data; and Student's *t*-test for comparison between means of two groups associated with Levene's test for homogeneity of variance.

RESULTS

Table 1 shows socioeconomic characteristics and medical history of the studied sample. The mean age of free-living elderly (68.4 years) was significantly lower (*P*=0.001) compared to the mean age of institutionalized elderly (73.34 years). Free-living elderly were either married (57.4%) or widowed (42.6%), while the majority of institutionalized elderly were widowed (60%), and only 8% were married with high statistically significant difference (*P*=0.000). The majority of free-living (77.8%) and institutionalized elderly (60.0%) had low level of education (illiteracy/ read and write) compared to only 1.9% of free-living elderly and 16% of institutionalized ones who had high level of education (university and above). Pension was the main source of income for the majority of the elders whether free-living (83.3%) or institutionalized (82%)**.**

The table also reveals that 59.3% of free-living elderly had 1-2 diseases (mainly hypertension and diabetes mellitus), while 18.5% of them had 3 or more diseases (mainly hypertension, diabetes mellitus and heart diseases). On the other hand, 40% of institutionalized elderly had 1-2 diseases (mainly hypertension and arthritis) and 36% of them had 3 diseases (mainly hypertension, arthritis and heart diseases). It was also

found that 59.5% of the chronically ill free-living elderly were taking 1-2 medications/day while 71.1% of the chronically ill institutionalized ones were taking 3 or more drugs/day with a statistically significant difference (*P*=0.007).

Table 1 Socio-demographic characteristics and medical history of the study sample

Variables	Free living (n = 54) No. (%)	Institutionalized (n = 50) No. (%)	*P*-value
Age (years)			
Mean ± SEM	68.43 ± 1.06	73.34 ± 0.95	0.001*
Sex			
Males	27 (50.0)	20 (40.0)	0.306
Females	27 (50.0)	30 (60.)	
Marital status			
Single	0	9 (18.0)	
Married	31 (57.4)	4 (8.0)	0.000*
Widowed	23 (42.6)	30 (60.0)	
Divorced	0	7 (14.0)	
Educational level			
Low	42 (77.8)	30 (60.0)	0.104
Middle	11 (20.4)	12 (24.0)	
High	1 (1.9)	8 (16.0)	
Source of income			
Pension	45 (83.3)	41 (82.0)	0.219
Others	9 (16.7)	9 (18.0)	
Number of chronic diseases			
None	12 (22.2)	12 (24.0)	0.107
1-2	32 (59.3)	20 (40.0)	
≥ 3	10 (18.5)	18 (36.0)	
Number of drugs consumed			
1-2	15 (59.5)	9 (28.9)	0.007*
≥ 3	17 (40.5)	27 (71.1)	

SEM: standard error of mean; *significant at *P*<0.05

Table 2 reveals that the majority of elders of both groups used to have 3 meals daily and considered lunch the main meal of the day (88.9% of free-living and 98% of institutionalized elders). The rate of snacks consumption between meals was significantly higher (*P*=0.025) in the free-living elderly (75.9%, mainly tea and fruits) compared to the institutionalized ones (52%, mainly fruits and desserts). The majority of elderly were not

used to sleep immediately after eating (63% of free-living and 68% of institutionalized) or watch TV during eating (72.2% of free-living and 84% of institutionalized).

Table 2. Dietary habits of the study sample

Dietary habits	Free living (n = 54) No. (%)	Institutionalized (n = 50) No. (%)	*P*-value
Main meal			
Breakfast	2 (3.7)	1 (2.0)	0.160
Lunch	48 (88.9)	48 (96.0)	
Dinner	4 (7.4)	1 (2.0)	
Eating snacks between meals			
Yes	41 (75.9)	26 (52.0)	0.025*
No	13 (24.1)	24 (48.0)	
Eating during watching TV			
Yes	15 (27.8)	8 (16.0)	0.288
No	39 (72.2)	42 (84.0)	
Sleeping immediately after eating			
Yes	20 (37.0)	16 (32.0)	0.485
No	34 (63.0)	34 (68.0)	

*significant at $P<0.05$

The mean of BMI, mid upper arm circumference (MUAC) and calf circumference for free-living elderly were less than those for the institutionalized ones with a statistically significant difference between both group while the means of waist and hip circumferences and their ratio (WHR) for free-living elderly were less than those for the institutionalized ones as shown in Table 3.

Table 3. Mean values of anthropometric measurements for the study sample

Measurements	Free living (n = 54) Mean ± SEM	Institutionalized (n = 50) Mean ± SEM	*P*-value
Weight (kg)	76.2 ± 1.9	79.4 ± 2.7	0.331
Height (cm)	163.4 ± 0.9	158.1 ± 1.8	0.008*
BMI (kg/m^2)	28.6 ± 0.7	31.7 ± 0.9	0.009*
MUAC (cm)	29.3 ± 0.7	31.6 ± 0. 9	0.048*
Calf C (cm)	35.9 ± 0.7	38.1 ± 0.9	0.053
Waist C (cm)	105.9 ± 1.8	106.6 ± 2.6	0.837
Hip C (cm)	110.1 ± 1.6	111.6 ± 2. 7	0.613
WHR	0.96 ± 0.01	0.96 ± 0.02	0.887

SEM: standard error of mean; BMI: body mass index; C: circumference; WHR: waist/hip ratio; *significant at $P<0.05$

Table 4 shows the adequacy of nutrients, nutrients density and the mean daily intake of energy and some nutrients. Nutrient density of protein and fat; and percent adequacy of energy, protein, calcium and vitamin A were higher among institutionalized than free-living elderly with a statistically significant difference between both groups. The same finding was observed for daily intake and percent adequacy of carbohydrates and iron but with no significant difference. In contrast, nutrient density of carbohydrates and percent adequacy of vitamin C were higher among free-living than institutionalized elderly with a statistically significant difference between both groups. Daily intake of vitamin C was higher among free-living than institutionalized elderly with no statistically significant difference.

Table 4. Mean values of daily intake, percent adequacy and density of nutrients for the study sample

Variables	Free living (n = 54)	Institutionalized (n = 50)	*P*-value
	Mean ± SEM	Mean ± SEM	
Energy intake (kcal)	1319.0 ± 62.1	1536.4 ± 77.5	0.030*
Carbohydrates intake (gm)	198.4 ± 9.4	207.3 ± 13.0	0.575
Protein intake (gm)	50.4 ± 2.9	64.5 ± 3.1	0.001*
Fat intake (gm)	35.9 ± 2.4	49.9 ± 2.9	0.000*
Calcium intake (mg)	437.7 ± 37.8	694.3 ± 40.9	0.000*
Iron intake (mg)	9.9 ± 0.6	10.2 ± 0.6	0.735
Vitamin A intake (IU)	202.7 ± 56.6	437.3 ± 95.7	0.034*
Vitamin C intake (mg)	19.3 ± 2.7	16.9 ± 3.1	0.552
Protein density (%)	15.5 ± 0.6	17.6 ± 0.8	0.029*
Carbohydrates density (%)	60.3 ± 1.1	52.6 ± 1.3	0.000*
Fat density (%)	24.2 ± 0.9	29.7 ± 1.1	0.000*
Energy adequacy (%)	69.4 ± 3.3	80.9 ± 4.1	0.030*
Protein adequacy (%)	100.9 ± 5.9	129.1 ± 6.1	0.001*
Calcium adequacy (%)	36.5 ± 3.2	57.9 ± 3.4	0.001*
Iron adequacy (%)	98.8 ± 5.9	101.6 ± 5.6	0.735
Vitamin A adequacy (%)	25.3 ± 7.1	54.7 ± 11.9	0.034*
Vitamin C adequacy (%)	32.2 ± 4.5	28.1 ± 5.1	0.552

SEM: standard error of mean; *significant at $P<0.05$

Figure 1 shows the nutritional status of the studied subjects according to the classification of BMI. It reveals that obesity was prevalent among 32% of the institutionalized elderly and

among only 7.4% of the free-living ones. It also reveals that free-living elderly being at risk of overweight were 33.3% compared to 18% of institutionalized ones. Underweight was detected among only 3.7% of the free-living elderly and it was not detected among institutionalized ones. The difference between free-living and institutionalized elderly was statistically significant regarding nutritional status measured by BMI (*P*=0.006).

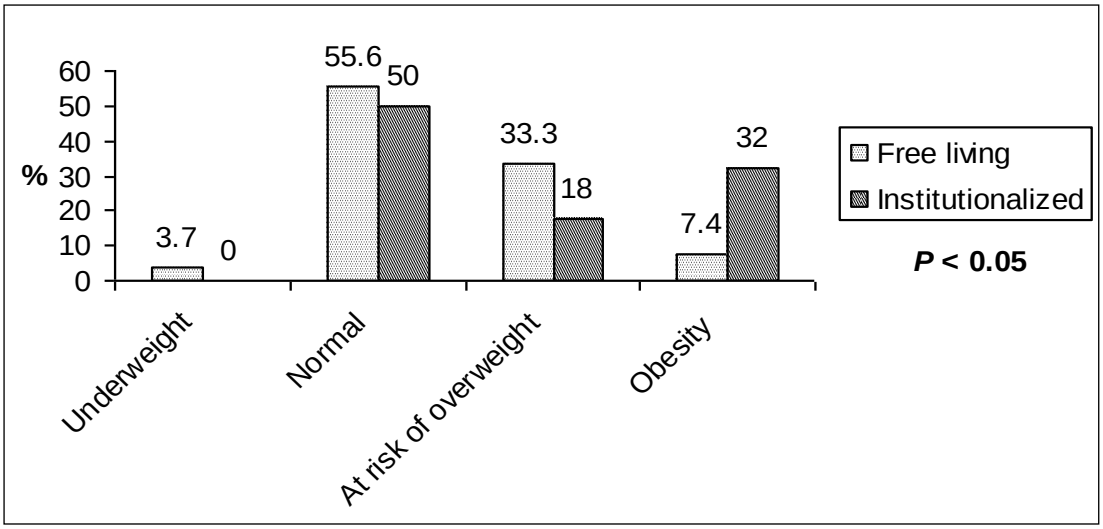

Figure1: Nutritional status measured by BMI

The MNA scores for free-living elderly ranged from 13.5 to 29.5 points (mean ± SEM was 23.75±0.53), while for institutionalized elderly it ranged from 10.5 to 28 points (mean ±SEM was 22.86±0.61). Figure 2 also shows that 29.6% of free-living elderly were at risk of malnutrition and 9.3% of them were actually malnourished. It also reveals that 40% of the institutionalized elderly were at risk of malnutrition and 12% of them were actually malnourished. Added to that, 61% of free-living elderly and 48% of the institutionalized were well nourished as measured by MNA. The difference between free-living and institutionalized

elderly was not statistically significant (*P*=0.406) but this should not underestimate the biological importance of this finding.

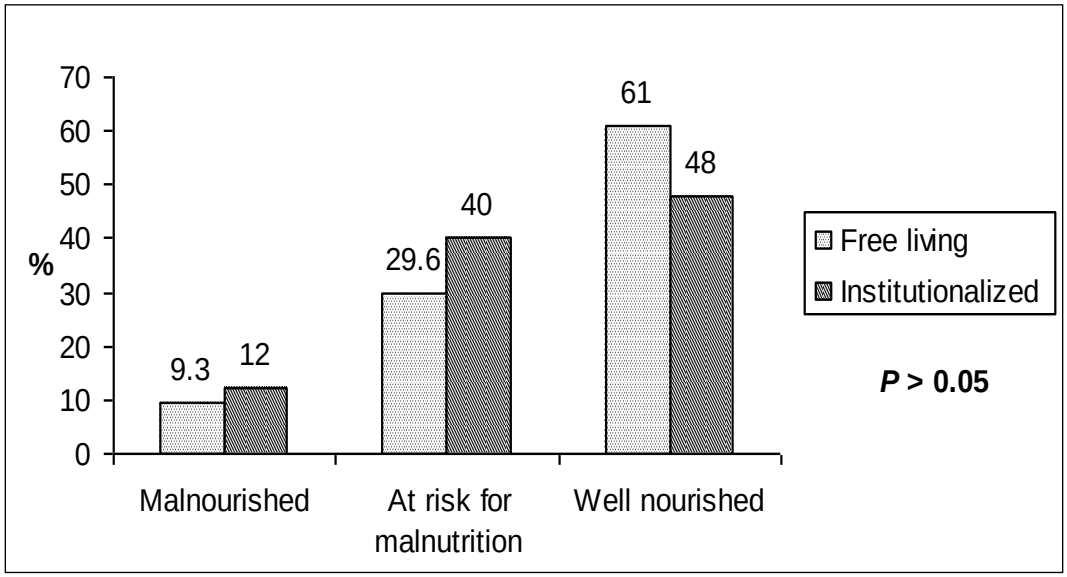

Figure 2: Nutritional status measured by MNA

DISCUSSION

Malnutrition is highly prevalent in both institutionalized and free-living elderly populations.[17,18] Elderly malnutrition is defined as overweight or underweight, deficiency of more than one nutrient or suffering from one or more chronic diseases.[19] Too little attention has been given to identifying those elderly who would benefit from early detection of malnutrition before that.[7]

Obesity is a commonly encountered problem among elderly, however, it is difficult to accurately measure body fat mass; therefore, BMI (kg/m^2) has been widely used and accepted as a simple method to classify medical risk of overweight status.[20] BMI-for-age percentile is used for identification and classification of obesity at all age groups from 6 to more than 75 years.[13,14,21] Using

the classification of BMI, the results of the present study revealed that 7.4% of the free-living elderly compared to 32% of the institutionalized ones were obese. These percentages are lower than another study by Shabayek and Saleh (2000)[22] conducted on a group of institutionalized elderly in Alexandria and can be attributed to difference in cut-off points used to define obesity, dietary habits and socioeconomic factors. These high percentages of obesity among institutionalized elderly may be due to significantly higher consumption of energy than that by free-living ones (P=0.030). In addition, eating desserts and fruits as the most common snacks between meals and sleeping immediately after lunch by some of institutionalized elderly may also contribute to obesity among institutionalized elders. Another contributor to obesity among these elderly may be that the majority of those elderly had 2-3 or more diseases most commonly heart and arthritis which may lead to physical inactivity and cause obesity. Although the prevalence of obesity among institutionalized elderly was higher than among free-living ones, the percentage of being at risk of overweight was higher among free-living elderly (33.3%) compared to institutionalized ones (18%) where lack of physical activity caused by heart diseases may be an important contributor to this higher prevalence.

In our study, underweight was reported by only 3.7% of free-living elderly and none of the institutionalized ones; it is a very low rate that may be attributed to the reliance only on BMI classification in diagnosis. This finding is in accordance with other studies which conclude that nutritional assessment of the elderly has become crucial because progressive under nutrition often goes undiagnosed.[2]

Dietary intake assessment of elderly is necessary to be compared with the intake of recommended dietary requirements to give a true and accurate judgment on their

nutritional status.[10] As previously mentioned, energy daily intake was found to be significantly higher among institutionalized elderly than free-living ones (*P*=0.03). This is in accordance with other studies,[22,23] which reported that free-living elderly may lack interest in food, have poor appetite or have more social problems where as the practice of sitting in groups during meals may result in an overall satisfactory energy intake among institutionalized elderly. This also may be due to higher intake of carbohydrates and fats among institutionalized elderly than free-living ones..

As for carbohydrates, the higher intake among institutionalized elderly may be due to the fact that carbohydrates are easier to chew when having missing teeth or diseased gums among elderly with more advanced age in institutions. Moreover, carbohydrates are more commonly provided in elderly homes due to being cheap and easy to prepare in mass production.

Also the significantly higher intake of fat among institutionalized elderly in the present study may be due to the fact that free-living elderly may tend to not have a choice to select between healthy foods like fruits and vegetables and unhealthy fatty foods a finding which was present in previous studies.[24,25] It was also present in this study that intake of vitamin C (in fresh fruits and vegetables which are more socially accepted) was reported to be higher among free-living than institutionalized elderly .

Protein intake was found to be significantly higher among institutionalized than free-living elderly (*P*=0.001). This goes with another study[22] which reported that close supervision of the Ministry of Social Affairs ensured protein intake fulfilling the daily requirements.

Calcium intake was also found to be significantly higher among institutionalized than free-living elderly (*P*=0.000. This was

supported by other studies which reported that most institutionalized elderly were served milk or any of its products daily and thus were found to have higher calcium intake.[22,25]

Regarding iron intake, it was found to be higher among institutionalized than free-living elderly. This goes with other studies[22,24] where institutionalized elderly were served either meat or fish five times per week and this was not available for most free-living elders.

In general, all elderly whether in institutions or free-living had nutrient intake less than the requirements except for iron and protein when nutrients adequacy was measured and this goes with many studies.[1,2,8,19,24-26]

The present study revealed that malnutrition was present among 9.3% of free-living and 12% of institutionalized elderly as measured by the MNA. Also the assessment). This finding may indicate that the MNA is an easily used, less time prevalence of being at risk of malnutrition among institutionalized elders (40%) was higher than that among free-living ones (29.6%). This goes with other studies[1,7] which revealed similar findings and can be attributed to the fact that although meals in elderly homes are served daily under supervision, yet the higher prevalence of chronic diseases and mean age among institutionalized elders compared to free-living ones bring about more chewing problems and more tendency to leaving meals.

The MNA was validated in a series of studies to assess elderly at risk of malnutrition to identify those who could benefit from early intervention.[5-7] This was observed in the present study where higher prevalence of being at risk of malnutrition could be detected when measured by MNA than by using BMI only (being a single parameter of routine nutritional consuming tool, useful for assessment of the nutritional status of elderly in elderly

homes, to determine an overall prevalence of malnutrition and being at risk of malnutrition, and to give a quick decision about those who may take the opportunity for early nutritional intervention without detecting the causes of this malnutrition. However it is an insufficient tool to assess dietary intake.

CONCLUSION & RECOMMENDATIONS

Dietary intake of calcium and vitamins A and C for both institutionalized and free living elderly is less than their requirements. Protein and iron intake are sufficient for free-living elderly, but deficient for institutionalized ones. All studied anthropometric measurements are higher for institutionalized elderly than for free-living ones. Obesity and being at risk of overweight is prevalent among both groups of elderly. Malnutrition and being at risk of it (measured by MNA) is prevalent among elderly in both studied settings with higher prevalence among institutionalized elderly than free-living ones.

It is recommended that nutritional assessment for elderly should be administered by health care providers and repeated at regular intervals for screening and early detection of malnutrition. Once an elder has been identified as being at risk for malnutrition, the nutritional intervention programs focusing on promotion of eating balanced diet, practicing physical activity and using dietary supplements to meet the requirements from nutrients should be done and repeated regularly.

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