Research Paper: Mini Nutritional Assessment and its Correlation With Elderly Nursing Home Residents in Khorramabad, Iran

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ABSTRACT

Objectives: Elderly nursing homes residents are at an increased risk of malnutrition due to a variety of factors. We aimed at investigating the prevalence of malnutrition and its correlation with elderly subjects using Mini Nutritional Assessment (MNA) questionnaire.

Methods: This cross-sectional study was conducted on elderly individuals (N=56; female=28) dwelling in the Sedigh Nursing Home in Khorramabad, Iran, in 2015. Nutritional status was assessed using MNA, which consisted of anthropometric measurements, global assessment, dietary questionnaire and subjective assessment.

Results: The participants' mean age was 74.86 (SD=±11.82) years. The mean MNA-score of the subjects was 19.46 (SD=±3.23). The prevalence of malnutrition and at risk of malnutrition were 20% and 70%, respectively. No significant difference (P>0.05) was observed between male and female, age subgroups, marital status, education levels and different cut-off points of the Body Mass Index (BMI), Mid-Arm Circumferences (MACs) and Calf Circumferences (CCs) regarding the nutritional status of subjects. Malnutrition and risk of malnutrition were observed significantly and more frequently in elderly who had weight loss greater than 3 kg, took more than three prescription drugs per day and had low/moderate protein intake (P<0.05). The MNA-score was independently associated with age, weight, BMI, MACs, CCs and food intake during last 3 months (P<0.05).

Discussion: According to high prevalence of malnutrition and risk of malnutrition among the subjects, proper nutritional interventions are required. Longitudinal studies on elderly and primary prevention by lifestyle interventions according to the culture and habits of the region are recommended.

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1. Introduction

The number of older people around the world has shown an increasing trend in recent years [1]. Based on the report of Iran's Ministry of Health in 2005, the population of seniors who are 65 years and older accounted for 6% of the total population, and it is estimated that this rate will rise to 19% in 2030 [2]. Increasing elderly population is stated as one of the main challenges for health care system [1]. Nearly 50% of seniors over 65 years old have multi-morbidity, which is directly associated with aging, which also influences the needs of nursing homes [3]. Elderly in nursing homes are at an increased risk of malnutrition because of a variety of factors such as loss of appetite, eating disorders, decreased mobility, dementia, acute or chronic diseases and taking multiple medications [4]. The prevalence of malnutrition among the nursing home residents has a wide range in different populations. The results of the several studies assessing nutritional status among nursing home residents in Iran indicated that malnutrition is a major problem of these subjects, which needs more attention [4].

The use of biochemical markers is prolonged and costly, and the criteria for their interpretation in elderly people are unknown [5]. However, only a few community studies have been conducted in Iran to estimate the prevalence of malnutrition among seniors by using Mini Nutrition Assessment (MNA) questionnaire. MNA is an international questionnaire which is widely used in assessment of the nutritional state in aged people with high sensitivity, specificity, and diagnostic accuracy [6-8]. According to our knowledge, this study was the first of its kind in Khorramabad city of Iran. Therefore, we aimed to estimate the prevalence of malnutrition and correlation of nutrition status with related factors among elderly nursing home residents in Khorramabad, Iran.

2. Methods

Study design and population

This cross-sectional study was conducted on elderly individuals dwelling in the only nursing home (Sedigh Nursing Home) in Khorramabad, Iran, in 2017 (April-June). Samples were selected by simple random sampling method using the random number table. The sample size for the present study was calculated based on this equation [9]:

$N=Z^2S^2/d^2$

, where Z=1.96, S=3.0 and D=1.

Therefore, according to this formula, 34 subjects were estimated, which was multiplied by 1.5 due to the design effect. Finally, we recruited 56 subjects to compensate for any possible exclusion. The inclusion criteria were age of 60 years or over, living in nursing home for at least six months, without any hospitalizations for more than one week, signing an informed consent about participating in the study and ability to understand and answer the questions. The exclusion criteria were expired during the study and disapproving with participation in the study. This study was reviewed and approved by the ethics committee of the Lorestan University of Medical Sciences, Khorramabad, Iran (No. Ir.lums.rec.1396.302).

Nutritional status

Nutritional status was assessed with the MNA, a validated questionnaire for older individuals [8]. Clinical and population-based studies in geriatric patients showed that the MNA has a correlation with biochemical (albumin, pre-albumin, transferrin levels, and lymphocyte numbers) and anthropometrical markers (measuring of subcutaneous fat and mid arm circumference) [7]. This questionnaire was translated into Persian language and validated by the statistics experts [10]. The MNA questionnaire consisted of anthropometric indicators measurement (weight, height and weight loss), global assessment (lifestyle, medication and mobility), questionnaire regarding dietary intake (number of meals, food and fluid intake and autonomy of feeding) and subjective health status assessment (self-perception of health and nutrition) [11]. The MNA score <17 demonstrated malnutrition, the score of 17–23.5 demonstrated a risk of malnutrition, and the score >24 demonstrated well-nourished status [11].

Anthropometric measurements

Weight was recorded by a digital weighing machine to the nearest 0.1 kg and height was measured to the nearest 0.1 cm using a stadiometer. The Body Mass Index (BMI) was defined as weight (in kg) divided by height (in m) squared. The Mid-Arm Circumference (MAC) was measured with a millimeter tape at the midpoint of the non-dominant arm, between the olecranon and acromion. The Calf Circumference (CC) was measured by wrapping the tape around the widest part of the calf in a sitting position, left knee raised at a right angle, and the calf uncovered by rolling up the trouser leg. The BMI<21 kg/m^2

indicated low BMI, MAC<23.5 cm indicated low MAC and CC<30 cm indicated low CC [12].

Statistical analysis

All statistical analyses were carried out using the SPSS version 16 statistical software (SPSS Inc., Chicago, Ill). Kolmogorov–Smirnov test was used to evaluate the normality of the data distribution. We reported mean ± SD for parametric data and median (25^{th}, 75^{th} percentile) for non-parametric data. Independent t-test or Mann–Whitney U-test was used for comparisons between the male and female, when appropriate. Qualitative variables were compared between nutritional status categories using Chi-squared test or Fisher's exact test. Binary logistic regression was used to examine the association between gender and MNA score. Moreover, Pearson correlation coefficient was used for determining the correlation between independent risk factors and MNA score. For all tests, two-sided P<0.05 considered statistically significant.

3. Results

According to exclusion criteria, six subjects were initially excluded. So, this study was conducted on 50 elderly individuals, 22 (44%) male and 28 (56%) females. Most of the subjects were 80 years old and over (N=24). The mean MNA score was 19.46±3.23. Table 1 shows that differences in baseline characteristics between male and female groups, which was statistically insignificant (P>0.05). The results of the MNA questionnaire showed that only 10% of the subjects were well nourished, and all of them were females (Table 2). Of the rest, 70% were at risk of malnutrition, and 20% were categorized as malnourished. There was no significant difference (P>0.05) between the male and female, age subgroups, marital status and education levels with respect to the nutritional status of the subjects (Table 2).

As can be seen in Table 3, we did not find any significant difference in nutrition status between different cut-off points of the BMI, MACs and CCs (P>0.05). Moreover, all the subjects who had BMI lower than 18.5 were malnourished or at risk of malnutrition (Table 3). As Table 4 demonstrates, malnutrition and risk of malnutrition are observed significantly and more frequently in elderly who have weight loss greater than 3 kg, take more than 3 prescription drugs per day and have low/ moderate protein intake (P<0.05). Whereas the elderly subjects, who do not have any psychological stress or acute disease since the past 3 months, showed high frequency of malnutrition and risk of malnutrition (P<0.05). The results of the regression analysis of the data are presented in Table 5. The lower MNA-score was independently associated with higher age. Moreover, MNA-score had a significant positive correlation with weight, BMI, MACs, CCs and food intake during the last 3 months (P<0.05).

4. Discussion

We aimed at estimating the prevalence of different levels of malnutrition and related independent risk factors according to MNA, among the elderly nursing home residents in Khorramabad, Iran. To our knowledge, there were no studies conducted in Khorramabad, using the MNA questionnaire to assess the nutritional status. The MNA is a simple, noninvasive, and well-validated screening tool for early detection of malnutrition in elderly people [8, 13]. The present study has shown that the prevalence of malnutrition was 20%, near to the results obtained by Saha et al [14]. The value was 12.8% in another study by Afkhami [15] and 12% in the Aliabadi study [16], which was lower than our study. In Iran, the

Table 1. Baseline characteristics according to gender

Variables	Male (n=22)	Female (n=28)	P
Age (year)	74(63, 84.25)	79.5(66.25, 83.75)	0.76
Wt (kg)	56.75(50.30, 75)	50(44, 63.75)	0.051
BMI (kg/cm^2)	21.92(19.24, 27.44)	22.1(20, 25.5)	0.76
MACs (cm)	21(20.75, 22.25)	21.75(21, 22)	0.58
CCs (cm)	31(29.75, 31.25)	31(30.75, 31.25)	0.71
MNA score*	19.18±2.86	19.67±3.53	0.59

Data are expressed as median (25^{th}, 75^{th} percentiles) and tested by Mann–Whitney U test.

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* The data is shown as mean±SD, and analyzed by independent t test. P<0.05 was considered statistically significant.

Table 2. Baseline characteristics according to nutritional status

Variables		Nutritional Status				P
		Well Nourished n (%)	At Risk of Malnutrition n (%)	Malnourished n (%)	Total Residents N= 50(%)	
Gender	Male	0(0)	17(48.6)	5(50)	22(44)	0.13
	Female	5(100)	18(51.4)	5(50)	28(56)	
Age	60-69	2(40)	6(17.1)	3(30)	11(22)	0.53
	70-79	2(40)	11(34.4)	2(20)	15(30)	
	≥80	1(20)	18(51.4)	5(50)	21(48)	
Marital status	Single	2(40)	15(42.9)	6(60)	23(46)	0.66
	Married or Widow/ widower	3(60)	20(57.1)	4(40)	27(54)	
Education	Illiterate	4(80)	30(85.7)	6(60)	40(80)	0.2
	Primary/Middle school	1(20)	5(14.3)	4(40)	10(20)	

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All data are shown as number (%), and analyzed by chi square test. P<0.05 was considered statistically significant.

results of several studies have indicated that malnutrition is more than 40%, and it is often associated with functional impairment, disability and impaired health [16-18]. Thus, the prevalence of malnutrition among non-institutionalized and independently living elderly is generally low [19, 20]. In contrast, since the elderly generally lives in the nursing home because of disability and their need for help or care, high prevalence rates of malnutrition could be expected more in this group.

The recent studies have reported that within 20% of nursing home residents had some form of malnutrition [21]. However, the definitions of malnutrition were various and the reported prevalence ranged from 1.5% to 66.5% [21]. According to the present study, the prevalence of malnutrition was higher among the males as compared to females; however, it was not significant. The relationship between gender differences and inappropriate nutritional status is complex and unknown [22].

Table 3. Anthropometry indicators according to nutritional status

Anthropometry Indicators		Nutritional Status				P
		Well-Nourished n (%)	At Risk of Malnutrition n (%)	Malnourished n (%)	Total Residents n= 50(%)	
BMI	<19	0	4(11.4)	2(20)	6(12)	0.23
	19 to less than 21	0	8(22.9)	3(30)	11(22)	
	21 to less than 23	0	9(25.7)	3(30)	12(24)	
	23≤	5(100)	14(40)	2(20)	21(42)	
MACs	<21	0	7(20)	2(20)	9(18)	0.28
	21–22	5(100)	20(57.1)	8(80)	33(66)	
	22≤	0	8(22.9)	0	8(16)	
CCs	Normal >31 cm	0	10(28.6)	3(30)	13(26)	0.52
	Weak 31≤	5(100)	25(71.4)	7(70)	37(74)	

BMI: Body Mass Index; MACs: Mid-Arm Circumference; CCs: Calf Circumferences

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All data are shown as number (%), and analyzed by chi square test. P values <0.05 was considered statistically significant.

Table 4. Health factors according to nutritional status

Variables		Nutritional Status				P
		Well-Nourished n (%)	At Risk of Malnutrition n (%)	Malnourished n (%)	Total Residents n= 50(%)	
Food intake in last 3 months	A sharp reduction	0	4(11.4)	4(40)	8(16)	0.11
	A moderate reduction	1(20)	13(37.1)	4(40)	18(36)	
	Without any reduction	4(80)	18(51.4)	2(20)	24(48)	
Weight loss during the last 3 months	No weight loss	0	4(11.4)	0	4(8)	0.02
	1-3 kg	0	5(14.3)	5(50)	10(20)	
	3 kg<	0	12(34.3)	4(40)	16(32)	
	Does not know	5(100)	14(40)	1(10)	20(40)	
Mobility status	Bed or chair bound	1(20)	9(25.7)	4(40)	14(28)	0.27
	Able to get out of bed / chair but does not go out	0	4(11.4)	3(30)	7(14)	
	Goes out	4(80)	22(62.9)	3(30)	29(58)	
Psychological stress or acute disease in the past 3 months	Yes	1(20)	5(14.3)	6(60)	12(24)	0.01
	No	4(80)	30(85.7)	4(40)	38(76)	
Neuropsychological problems	Severe dementia or depression	0	7(20)	2(20)	9(18)	0.66
	Mild dementia	3(60)	9(25.7)	3(30)	15(30)	
	No psychological problems	2(40)	19(54.3)	5(50)	26(52)	
Takes more than 3 prescription drugs per day	Yes	3(60)	20(57.1)	10(100)	33(66)	0.02
	No	2(40)	15(42.9)	0	17(345)	
Pressure sores or skin ulcers	Yes	0	5(14.3)	0	5(10)	0.59
	No	5(100)	30(85.7)	10(100)	45(90)	
Protein intake	Low/ moderate intake	0	21(60)	6(60)	27(54)	0.04
	Adequate intake	5(100)	14(40)	4(40)	23(46)	
Two or more servings of fruit or vegetables Per day	Yes	0	7(20)	4(40)	11(22)	0.21
	No	5(100)	28(80)	6(60)	39(78)	
Fluid intake per day	<3 cups	0	5(14.3)	1(10)	6(12)	0.88
	3- 5 cups	2(40)	16(57.7)	6(60)	24(48)	
	5 cups<	3(60)	14(40)	3(30)	20(40)	
Mode of feeding	Unable to eat without assistance	0	3(8.6)	3(30)	6(12)	0.25
	Self-fed with some difficulty	0	6(17.1)	2(20)	8(16)	
	Self-fed without any problem	5(100)	26(74.3)	5(50)	36(72)	

Variables		Nutritional Status				P
		Well-Nourished n (%)	At Risk of Malnutrition n (%)	Malnourished n (%)	Total Residents n= 50(%)	
Self-view of nutritional status	Views self as being malnourished	0	7(20)	3(30)	10(20)	0.11
	Is uncertain of nutritional state	1(20)	19(54.3)	6(60)	26(52)	
	Views self as having no nutritional problem	4(80)	9(25.7)	1(10)	14(28)	
Consider his / her health status	Not as good	0	10(28.6)	5(50)	15(30)	0.46
	Does not know	2(40)	11(31.4)	3(30)	16(32)	
	As good	1(20)	9(25.7)	1(10)	11(22)	
	Better	2(40)	5(14.3)	1(10)	8(16)	

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All data are shown as number (%), and analyzed by chi square test. P<0.05 was considered statistically significant.

As shown in Table 3, we did not find any significant difference in nutritional status between different cut-off points of the BMI, MACs and CCs. Moreover, all the subjects who had BMI lower than 18.5 were malnourished or at risk of malnutrition. A longitudinal aging study in Taiwan indicated that BMI, MAC, and CC were all associated with current functional ability for elderly adults ≥65 years of age [23]. Also, they suggested that BMI can be used as a long-term predictor of functional decline in elderly Taiwanese adults ≥65 years old, while CC was a good indicator of current functional ability [23]. However, these parameters have important limitations in practice. For example, an elderly patient can have a high BMI but at the same time may be exposed to malnutrition because of inadequate food intake due to an underlying disease such as hip fracture or dementia [11]. On the other hand, an individual could be thin with a low BMI but without malnutrition [11].

As Table 4 demonstrates, malnutrition and risk of malnutrition is observed significantly in elderly who have weight loss greater than 3 kg, take more than 3 prescription drugs per day and are at low/ moderate protein intake (P<0.05). Similar results have been shown in some of the previous studies [9, 24]. The MNA is the most useful tool in assessment of geriatric population those who had recent weight loss [11]. Weight loss due to decreased appetite is mainly caused by depression in the elderly [25]. It is important to identify the people who are at risk of malnutrition before making intense changes in weight or serum levels of albumin. These people are likely to have a low calorie intake that can be easily corrected by proper nutritional intervention [11].

Regarding the association between malnutrition and independent risk factors, our study has indicated that the lower MNA-score was independently associated with higher age. We agreed with Abdelrahman et al.,

Table 5. Correlation between independent risk factors and MNA score

Factors	R	P
Age	-0.305	0.031
Wt	0.493	<0.001
BMI	0.491	<0.001
MACs	0.385	0.011
CCs	0.322	0.023
Food intake in last 3 months	0.424	0.002

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Pearson correlation coefficient was used for determining the correlation between independent risk factors and MNA score. P<0.05 was considered statistically significant.

2014 [26] and Baweja et al., 2008 [27] who showed that with increasing age, the risk of malnutrition also increased. Also Sarah et al., 2005 [28] conducted a cross-sectional study with the aim to measure the effects of aging on nutritional status of the elderly people. Their results demonstrated a significant effect of age on the anthropometric indicators and the variables of nutritional biochemical assessment. They concluded that aging was independently correlated with poor nutritional status. It can be interpreted that aging can make elderly more dependent and with reduced mobility [29]. It can also expose them to various illnesses including hypertension, diabetes mellitus, ischemic heart disease, dementia, dental problems and eating disorders. Moreover, social isolation further aggravates the problem. In the present study, MNA-score had a significant positive correlation with weight, BMI, MACs, CCs and food intake during the last 3 months ($P<0.05$). Our findings are in line with the results of a cross-sectional study conducted by Soini H et al. in 2004 [9]. Moreover, Murphy et al (2000) indicated similar results, with the exception that BMI had the strongest predictive effect on the total score [24].

This study is limited by the cross-sectional nature of the data, which does not provide any indication of the direction of effect or causality.

5. Conclusion

According to the MNA results, 20% were categorized as malnourished, 70% were at risk of malnutrition and only 10% of the subjects were well nourished. We found that all the subjects who had BMI lower than 18.5 were malnourished or at risk of malnutrition, but this difference was not significant. Malnutrition and risk of malnutrition were observed significantly in elderly who had weight loss greater than 3 kg, took more than 3 prescription drugs per day and had low/ moderate protein intake. The study showed that the lower MNA-score was independently associated with higher age. Moreover, MNA-score had a significant positive correlation with weight, BMI, MACs, CCs and food intake during the last 3 months. Longitudinal studies would complement the present study to determine causality and directional effect of the factors. A comprehensive review of the seniors of the city, including residents of nursing homes (public and private) and families, is recommended from various perspectives and providing the guidelines for their proper nutrition according to the culture and habits of the region. Public health policies should be directed towards this area with a focus on primary prevention by lifestyle interventions.

Ethical Considerations

Compliance with ethical guidelines

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare no conflict of interest.

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