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Original article

Assessment of nutritional status of elderly individuals: a Mini-Nutritional Assessment

Pınar Sökülmez Kaya
Ondokuzmayıs University School of Health, Kurupelit Campus, 55139 Samsun Atakum/Samsun

Summary. *Aim:* The study was designed and conducted in order to identify the nutrient consumption of the elderly individuals aged 65 years and over living at home or at a nursing home in Samsun City using the MNA test. *Materials and Methods:* A total of 182 elderly people aged 65 years and over participated in the study. 82 of them were staying at a nursing home and 100 were living at their own home. The study used a questionnaire including socio-demographic characteristics, the Mini-Nutritional Assessment (MNA), and the records of nutrient consumption. Anthropometric measurements were also taken. The data collected by interview method was analyzed using SPSS Version 13.5. The mean and ± SD were expressed as continuous variables, and the number and the percentage as categorical variables. The data was compared using Student's t test, Crosstabs chi-square test and Fisher's exact chi-square test. In all tests, $p < 0.05$ was considered significant. *Findings:* The risk of malnutrition increases with age ($p<0.05$). BMI value showed a statistically significant decrease with advancing age ($p<0.05$). The elderly staying at a nursing home mostly suffer from hypertension (65.9%) while other health problems (56%) and osteoporosis (32%) are mostly observed in those living at their own home ($p<0.05$). All the elderly individuals consumed less than the recommended amount of energy, fiber, calcium, magnesium, iron (women), zinc, iodine (only those living at their own home) vitamin D, thiamine, riboflavine (excluding the men living at their own home), vitamin B_6 and vitamin B_{12} (women). *Conclusion:* Reasons of the lack of energy and nutrients in the elderly should be investigated; and special diets should be planned according to daily needs of each elderly person. Preventive measures should be taken against health problems in old age.

Key words: Elderly, malnutrition, nursing home, nutritional status, chronic diseases

Introduction

In Turkey as in all over the world, the rate of the elderly population has been increasing rapidly. The changes which occur in the body composition and organic functions with the aging process adversely affect the nutrient intakes of older individuals and the utilization of nutrients in the body (1, 2). Malnutrition in the elderly is a common clinical condition. Without a proper diagnosis and treatment, malnutrition not only hinders the treatment of other current diseases but also increases morbidity and mortality by enhancing patient complications (3). It has been reported that 37-40% of the elderly cannot eat properly to satisfy the daily energy needs, two out of three elderly individuals skip a meal, and it has been defined as "anorexia of aging" in recent years (4).

The factors which negatively affect the nutritional status of the elderly include physiological changes emerging with aging, acute and chronic diseases, dental and oral health problems. Furthermore economic matters as well as environmental factors such as inability to shop, cooke food and eat alone (1, 2). In addition to these, indifference to some foods, narrowing of the social milieu, difficulties of staying at a nursing home, and decrease in the sense of taste are among factors

which hinder the food consumption of the elderly individuals and lead to mal- and under- nutrition (1, 2).

Within 1 to 2.5 years following the start of weight loss in the elderly for any reason, the rate of mortality increases by 9-38% for only this reason (1, 2). The daily secretion of growth hormone decreases by 29-70% with aging in addition to a reduction in oral food intake, and thus it leads to sarcopenia (5). Each nutrition-related factor plays an important role in the nutritional status and food consumption and the quality of life of the elderly (6). Malnutrition often begins insidiously and is unnoticeable (7). Apart from inadequate diagnosis, people diagnosed are given inadequate treatment; 75% of the elderly with weight loss are provided with no treatment (8). The parameters which can be used to identify the nutritional status of the elderly include anthropometric measurements, laboratory and clinical assessments, and the evaluation of dietary contents (9). A European guideline for nutrition screening recommends the Mini-Nutritional Assessment (MNA) in the elderly (10).

This data illustrates the importance of screening for malnutrition in the elderly living in the community or receiving institutional care. Although it is impossible to stop aging, taking measures related to nutrition and lifestyle can enhance the quality of life. Identification of health and nutritional problems provide the basic data for measures promoting the health status of the elderly. The present study was conducted to identify the health and nutritional status of the elderly staying at their own home or at a nursing home with the MNA.

Materials and methods

Research place and time: The research was conducted in accordance with the descriptive study principles between 15.09.2013 and 15.06.2014 in Samsun City.

Research population: It consisted of 182 elderly people age range of 65-99 years (84 male, 98 female) living in Samsun City. The study aimed for the entire elderly group staying at Samsun Nursing Home Care and Rehabilitation Centers under Samsun Governorship Provincial Directorate of Family and Social Policies; however 82 were accessible. Whilst other 100 elderly individuals were easily accessible who were living at their own homes were recruited as the control group.

Data collection tools: Data were collected with a questionnaire including demographic characteristics, presence of chronic diseases, frequency of food consumption, nutritional status, and the MNA.

Identification of malnutrition status: Nutritional assessment was made with the MNA test. A total score of 23.5-30 was assessed as normal nutritional status, a total score of 17-23 as at risk of malnutrition, and a total score of <17 as malnourished. The anthropometric measurements performed along with the MNA included height, weight, calf circumference, and mid-upper arm circumference (11). The respondents weight was measured on portable weight scales and their height was measured using a non-flexible measuring tape. To determine the obesity status of the elderly, their body mass index (BMI: weight (kg)/height (m^2)) was calculated. According to the classification established by the World Health Organization, BMI <18.50 kg/m^2 was regarded as "severe malnutrition", 18.50-24.99 kg/m^2 as "normal", 25.00 and over as "overweight". According to the reported that Pauly et al. for the elderly, BMI <18.50 kg/m^2 was regarded as "severe malnutrition", 18.50-20.99 kg/m^2 in terms of the risk of moderate malnutrition, 21-24.99 kg/m^2 as "normal", 25.00 and over as "overweight" (12, 13). Therefore <20.99 kg/m^2 were evaluated as risky in terms of malnutrition or malnutrition.

Identification of nutritional status: The food consumption of the elderly was recorded for three days, one of which was a weekend day. The amount of nutrients per serving of meals the elderly individuals consumed was identified; mean amounts of energy and macro-and micro-nutrients were calculated using BeBiS® Version 7.0 (Nutrition Information Systems Software) (14). The data was evaluated with the nutrients amounts recommended for this age group (ages 65 to 74 are the young old; 75 to 84, old; and 85+, oldest old) (13).

Ethical compliance: Necessary permissions were received from Samsun Governorship Provincial Directorate of Family and Social Policies before the research was commenced. Informed consent was obtained from the respondents involved in this research and the study abided by the principle of voluntary participation.

Statistical evaluation of the data: The data collected was analyzed using SPSS Version 13.5. The mean ± standard deviation (SD), the median and the range were expressed as continuous variables, and the number and the percentage as categorical variables. The data was compared using Student's t test, Crosstabs chi-square test and Fisher's exact chi-square test. The differences were considered as significant at 95% confidence of interval ($p < 0.05$).

Results

As mentioned earlier, a total of 182 elderly individuals (84 M, 98 F) participated in the research aiming to determine their nutritional status.

One hundred elderly people with the mean age (M/F) 71.0±4.9 / 69.8±5.9 were living at their home and eighty-two elderly people with the mean age (M/F) 79.0±9.1 / 78.2±8.9 were staying at a nursing home. No training of 48.3% of individuals are either uneducated or barely literate; 58.2% are widow/widower or single; 83.5% have at least one diagnosed comorbid disease (72.5% have more than one). According to the MNA scores, 27.5% are at risk of malnutrition and 2.2% are malnutrition (Table 1).

Table 1. Concerning the elderly general features (n=182)

Status	n	%
Age group		
65-74	96	52.7
75-84	72	39.6
85+	14	7.7
Marital status		
Married	76	41.8
Single	4	2.2
Widow	102	56.0
Education status		
Uneducated	31	34.1
literate	13	14.2
Primary school	34	37.4
Secondary and higher	13	14.3
Diagnosed co morbid disease		
Yes	152	83.5
No	30	16.5
Total MNA skor		
23.50 scor and↑	128	70.3
23.50-17.00	50	27.5
17.00 scor and↓	4	2.2
Stay in a nursing home (n=82)		
1 year↓	10	12.2
1-5 years	38	46.4
6-10 years	32	39.0
10-15 years	2	2.4

No statistically significant difference was found between the MNA scores and gender, marital status, place of residence, duration of staying at a nursing home, and living alone (Table 2). According to the MNA scores, 23.8% of the male participants and 34.7% of the female participants were malnourished or at risk of malnutrition. The risk of malnutrition increases with age ($p<0.05$). The age group at the highest risk of malnutrition covers those aged 85 years and over (71.4%). The rates of risk of malnutrition are 18.4% for the couples and 35.3% for the widows/widowers ($p>0.05$). Malnourishment and the risk of malnutrition are higher (34.2%) in the elderly staying at a nursing home ($p>0.05$). No statistically significant difference was found between the MNA scores and duration of staying at a nursing home; however, the risk of malnutrition increased as the duration of stay increases ($p>0.05$). The risk of malnutrition is higher in the elderly living alone (60%) (Table 2).

The BMI values are less than 18.5 kg/m^2 in 2% of the female participants, 14.5% of the participants aged 85 years and over, and 2.4% of those staying at a nursing home. BMI showed a statistically significant decrease with age ($p<0.05$). 2% of the participants living at their own home and 9.7% those staying at a nursing home had a BMI value less than 21 kg/m^2 (at risk of malnutrition). Ninety-eight percent of those living at their own home and 75.6% of those staying at a nursing home had a BMI value higher than 25 kg/m^2 ($p<0.05$) (Table 3).

Hypertension, cardiovascular diseases, digestive system problems, and diabetes are respectively among the most common diseases observed in the participants staying at a nursing home. Those living at their own home mostly suffer from other types of problems (migraine, varix, anemia, goiter, urinary tract diseases, etc.), which are followed by hypertension, diabetes, and cardiovascular diseases. The elderly staying at a nursing

Table 2. MNA score for elderly individuals according to socio-demographic characteristics (n=182)

Features	Total MNA Score						
	Malnutrition risk no		Malnutrition risk yes		PEM		p
	n	%	n	%	n	%	
Gender							
Male	64	76.2	20	23.8	0	0.0	0.29
Female	64	65.3	35	30.6	4	4.1	
Ages groups (years)							
65-74	72	79.2	20	20.8	0	0.0	0.05
75-84	48	66.7	20	27.8	4	5.6	
85+	4	28.6	10	71.4	0	0.0	
Marital status							
Married	62	81.6	14	18.4	0	0.0	0.21
Single	4	100.0	0	0.0	0	0.0	
Widow	62	60.8	36	35.3	4	3.9	
Place of residence							
Own home	74	74.0	26	26.0	0	0.0	0.25
Nursing home	54	65.9	24	29.3	4	4.9	
Stay in a nursing home							
1 year↓	6	60.0	2	20.0	2	20.2	0.56
1-5 years	28	73.7	10	26.3	0	0.0	
6-10 years	18	56.3	12	37.5	2	6.3	
11 years↑	2	100.0	0	0.0	0	0.0	
Living alone							
Yes	4	40.0	6	60.0	0	0.0	0.24
No	124	72.1	44	25.6	4	2.3	

Table 3. According to socio-demographic characteristics of older BMI status (n=182)

Features	BKİ								
	<18.5		18.6-20.99		21-24.99		>25		p
	n	%	n	%	n	%	n	%	
Gender									
Male	0	0.0	6	7.1	10	11.9	68	81.0	0.11
Female	2	2.0	2	2.0	2	2.0	92	93.9	
Age group (year)									
65-74	0	0.0	2	2.1	6	6.3	88	91.7	0.02
75-84	0	0.0	4	5.6	6	8.3	62	86.1	
85+	2	14.3	2	14.3	0	0.0	10	71.4	
Place of residence									
Own home	0	0.0	2	2.0	0	0.0	98	98.0	0.01
Nursing home	2	2.4	6	7.3	12	14.6	62	75.6	

home mostly suffer from hypertension (65.9%) while other health problems (56%) and osteoporosis (32%) are mostly observed in those living at their own home ($p<0.05$) (Table 4).

Seventy-two percent of those living at their own home and 90.2% of those staying at a nursing home regard dieting as necessary ($p=0.02$) (Table 5).

The consumption of nutrients (excluding zinc, iodine and vitamin B_{12}) of the men living at their own home was found higher than those staying at a nursing home. However, they consumed less than the recommended amount of energy, fiber, calcium, magnesium, iron (women), zinc, iodine, vitamin D, thiamine, riboflavine (women), vitamin B_6 and vitamin B_{12} (women).

Table 4. According to place of residence of older disease status (n=182)

Diseases	Place of residence						
	Nursing home(n=82)		Own home (n=100)		p	Total	
	n	%	n	%		n	%
Hypertension	54	65.9	42	42.0	0.02	96	52.7
Cardiovascular disease	38	46.3	36	36.0	0.32	74	40.7
Diabetes	30	36.6	30	30.0	0.51	60	33.0
Chronic renal failure	6	7.3	4	4.0	0.49	10	5.5
Rheumatic diseases	22	26.8	40	40.0	0.19	62	34.1
Digestive system diseases	26	31.7	24	24.0	0.41	50	27.5
Respiratory system diseases	10	12.2	16	16.0	0.61	26	14.3
Neurological disorders	2	2.4	8	8.0	0.25	10	5.5
Osteoporosis	8	9.8	32	32.0	0.01	40	22.0
Other (migraines, anemia, goiter ..)	18	22.0	56	56.0	0.01	74	40.7

Table 5. According to place of residence care about the nutritional status of the elderly

Place of residence	Diet necessary		Diet unnecessary		Total*	
	n	%	n	%	n	%
Own home	72	72.0	28	28.0	100	100.0
Nursing home	74	90.2	8	9.8	82	100.0
Total	146	80.2	36	19.8	182	100.0

*P=0.02

All the elderly staying at a nursing home consumed less than the necessary amount of energy, fiber, calcium, magnesium, iron (women), zinc, vitamin D, thiamine, riboflavine, vitamin B_6 and vitamin B_{12} (women) (Table 6).

Discussion

The prevalence of malnutrition in elderly people living independently in the community was reported to be generally low (17-19). In the present study, according to the MNA scores, approximately one in three of the elderly are at risk of malnutrition and malnourished. Study conducted in Kayseri reported that the rates of those at risk of malnutrition and those malnourished were 49.2% and 5.8%, respectively (20). When the nutritional status of elderly patients followed up from a geriatric outpatient clinic was scanned with the MNA test, the rate of malnutrition was 13% and the rate of risk of malnutrition was 32%. An increase in the prevalence of depression, faecal incontinence, loss of cognitive function and physical dependence was found especially in patients malnourished (21). Kaiser et al. reported the rate of malnutrition was 5.8% in elderly people living in the community and 13.8% in those staying at a nursing home (22). The results of the present study show similarities with those of these studies although the rates are slightly lower. This may result of regional differences and the selection of the population from elderly people admitted to a hospital in other studies as well as the close follow-up of the elderly at nursing homes under the supervision of a dietitian.

No statistically significant difference was found between the MNA scores and gender, marital status, place of residence, duration of staying at a nursing home, and living alone. According to the MNA scores, the male participants are not malnourished; however, one of every four is at risk of malnutrition. Two of every five elderly women are malnourished or at risk of malnutrition. Study conducted in Ankara reported the prevalence of malnutrition was 6.5% in men and 8.8% in women as a result of the MNA test (23). In another study, the rate of malnutrition with the MNA was

Tabella 6. According to place of residence daily consumed amount of energy and nutrients (15, 16)

Energy and nutrients	Recommended (Male/Female)	Nursing home consumed (Male/Femal)	Own home consumed (Male/Female)
Ages (yıl)		79.0±9.1 / 78.2±8.9	71.0±4.9 / 69.8±5.9
Weight (kg)	75 / 65	74.5±13.4 / 73.6±19.4	84.0±14.6 / 74.3±11.6
Height (cm)	173 / 159	170.1±8.8 / 159.1±9.0	170.9±5.0 / 154.8±6.6
Energy (kkal/day)	2100 / 1790.3	1728.6±169.0 / 1718.1±363.0	2009.8±473.9 / 1431.3±410.3
Protein (g/day)	60-75 / 52-65	65.9±6.9 / 63.1±13.4	66.0±20.0 / 50.8±14.1
Dietary fiber (g/day)	30 / 25	21.9±5.5 / 19.5±6.3	26.9±8.7 / 19.4±6.1
Calcium (mg/day)	1300 / 1300	611.5±135.8 / 563.2±142.8	724.7±287.4 / 552.2±223.4
Magnesium (mg/day)	420 / 320	241.5±69.6 / 227.0±69.7	266.5±92.6 / 191.3±62.7
Iron (mg/day)	10 / 10	11.2±2.2 / 9.9±2.8	13.0±3.4 / 8.3±2.8
Zinc (mg/day)	15 / 15	11.1±2.1 / 9.5±2.4	9.6±3.0 / 6.0±2.0
Iodine (mcg/day)	150 / 150	180.6±37.1 / 167.4±40.2	155.4±82.6 / 127.6±52.5
Vitamin A (RE/day)	900 / 750	1064.8±163.8 / 934.1±197.7	2275.4±1766.6 / 1520.1±834.3
Vitamin D (mcg)	10 / 10	1.0±0.4 / 1.2±0.4	1.5±5.3 / 1.3±3.3
Thiamin (mg/day)	1.2 / 1.1	0.7±0.1 / 0.7±0.3	0.9±0.3 / 0.6±1.2
Riboflavin (mg/day)	1.3 / 1.2	1.2±0.2 / 1.1±0.2	1.4±0.5 / 0.9±0.3
Vitamin B6 (mg/day)	1.7 / 1.5	1.1±0.2 / 1.0±0.2	1.2±0.5 / 1.0±1.3
Vitamin B12 (mcg/day)	2.4 / 3.0	3.5±0.8 / 2.9±0.8	2.5±6.8 / 1.9±1.2

2.4% in elderly people living at a nursing home, 0.4% in those living with family at home, and 5.4% in those living alone at home (18).

The risk of malnutrition increases with age ($p<0.05$). The age group at the highest risk of malnutrition covers those aged 85 years and over. The prevalence of weakness generally increases with advancing age (6, 24). A physiological anorexia occurs with aging and it leads to a reduction in food intake of the elderly. Weight loss and malnutrition lead to sarcopenia, muscle loss and impairment of muscle functions, which eventually results in a decline in the quality of life (19). "Malnutrition" or "risk of malnutrition" may aggravate the existing diseases in old age, reduce the success of treatment and lead to higher costs.

In the present study, malnutrition or risk of malnutrition is higher in the widows/widowers than in the married and in those staying at a nursing home than in those living at their own home but no statistical significant. No significant relationship was found between malnutrition and duration of staying at a nursing home; however, the risk of malnutrition increased as the duration of staying increased. The risk of malnutrition was found higher in those living alone. The frequency of widows/widowers increases depending on the death of one spouse with advancing age. Studies on the elderly also found the frequency of widows/widowers high (25, 26). Nourishment of elderly persons living alone is affected by the inability to shop and prepare and eat meals. This leads to weight loss, which is reflected on their BMI.

BMI is one of the most common parameters used in the determination of nutritional status. The present study found a significant relationship between BMI and gender, age and place of residence. BMI value showed a statistically significant decrease with advancing age. The percentage of those with a BMI value less than 21 kg/m^2(at risk of malnutrition) is less in those living at their own home than in those staying at a nursing home. Two elderly persons with a BMI value of <18.5 kg/m^2 live at a nursing home. One the other hand, the rate of having a BMI value of 25 kg/m^2 and over is higher in those living at their own home than in those staying at a nursing home. Aging-related factors such as the decrease in basal metabolic rate, the increase in body fat percentage and limitation of motion lead to an increase in BMI (22). In the study carried out in Kayseri, 43.6% of men had a BMI value of 25.00 to 29.9 kg/m^2, while 58.8% of women had a BMI higher than 30.00 kg/m^2 (20).

Almost four of five elderly persons living at their own home and nine of ten elderly persons staying at a nursing home suffer from at least one or more diseases. Hypertension was mostly observed in the elderly staying at a nursing home while osteoporosis and other type of health problems were more common in those living at their own home. Chronic diseases are rapidly increasing depending on the increase in the elderly population. Sahyounet al. found the prevalence of multiple diseases 70.7% at nursing homes and 78% in a home environment. The most common chronic diseases were reported to be hypertension, cardiovascular diseases, rheumatic diseases and diabetes, respectively (27). Olgun et al. (28) found out that 61.8% of the elderly (131 persons) suffer from at least one chronic disease, primarily hypertension, diabetes and heart failure. Aksoydan indicated that the frequency of diseases was higher in women (79.5%) than in men (75%) and in those living at their own home (91.1%) than in those staying at a nursing home (70.8%). These results are in parallel with those of the present study. They reveal the importance of investigation of chronic diseases in the identification of nutritional problems of the elderly.

Diet requirements also increased due to the increase of diagnosed diseases in the elderly. The elderly persons staying at a nursing home regard dieting necessary more than those living at their own home. The elderly can not comply with their diet, cook and prepare their meal and thus it is more difficult for them to organize their diet. The study demonstrated that many of the elderly who should follow a diet could not comply with their diet; and the men and the elderly staying at a nursing home followed their diet more frequently than the women and the elderly living at their own home, respectively. The elderly staying at a nursing home followed their diet more regularly. It may result from the supervision of a dietitian working at nursing homes and the planning of diets in accordance with the needs of the elderly. Demircioglu reported the frequency of the elderly recommend following a diet due to their illness was 64.1%, and 78.7% of elderly people had difficulty in following a diet (29). In Aksoydan's study conducted in Ankara, the elderly staying at a nursing home followed their diet more regularly (25).

Certain changes occur in the body during the aging process, which also affects the nutritional status of a person. Lean body mass decreases while adipose tissue increases. The amount of total body water and basal metabolic rate also decrease. Thus calorie needs decrease with aging whereas the need for protein and micronutrients (e.g. calcium, vitamin D, vitamin B_{12}, folate, etc.) increases. Chewing problems caused by oral and dental health problems, gastrointestinal and urinary tract problems, taste and smell problems, inaccessibility to food and dependency on others lead to malnutrition (30, 31). Food consumption is known to generally decline with age. In the present study, the amount of nutrient consumption was higher in the elderly living at their own home than in those staying at a nursing home. A large proportion of the elderly in the home or nursing home remains the recommended energy and nutrients they consume for themselves inadequate. The study of Rakicioglu et al. also yielded similar findings (32). It may result from not the higher awareness of the elderly at nursing homes, but from the menus arranged according to their needs under the supervision of a dietitian, regular meals, and training organizations. It is known that an increase occurs in the consumption of sugary foods due to changes in taste perception in the elderly. A decrease in the consumption of other food groups accordingly may have an influence on mineral deficiencies. Although the said studies are in parallel with the present one, lack of related studies has made it difficult to draw comparisons with the literature.

The research's being based on the voluntariness of the elderly, and communication problems are the limitations of this study.

Conclusion

For the elderly living at a nursing home, appropriate diets should be planned in accordance to their diseases and needs; adequate and balanced nutrition should be provided; and dietary compliance should be controlled with the cooperation of health and care personnel. Both the elderly living at their own home and those staying at a nursing home should be informed about the effect of nourishment on health and quality of life.

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Correspondence:
Yrd Doç Dr Pınar Sökülmez Kaya
Ondokuzmayıs Üniversitesi Samsun Sağlık Yüksekokulu Kurupelit Kampüsü 55139 Atakum/Samsun
Telephone number:0 362 457 60 20
GSM: 05325055115
Fax:0 362 457 69 26
E-mail: sokulmezpinar@gmail.com