

## The Determination of Total Energy and Nutrient Intake in Older Adults in Turkey

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**ABSTRACT** Nutritional assessment is closely related to mortality and morbidity of the elderly. The study examined the total energy intake and nutrients among a diverse sample of older adults. The study sample consisted of 549 subjects (250 men and 299 women) aged 65 and above, who live in Ankara, Turkey. Dietary intakes were obtained using a 24-hour recall method. The averages of daily energy intakes were 1653.3±596.7 kcal in men and 1614.1±612.7 kcal in women. The insufficient intake of thiamine, vitamin B<sub>12</sub>, calcium, magnesium and zinc were 46.2, 31.7, 69.6, 59.4, and 42.3 percent, respectively in both men and women. Inadequate intakes of total energy and nutrients identified in this study may provide a useful basis for dietary interventions targeted at older adults in Turkey. To meet recommended dietary intake among older adults, it is important to provide a simple approach that encourages choosing high quality diets.

### INTRODUCTION

Developments in the medical sciences and technology result in an increase in the elderly population and their life expectancy (World Health Statistics 2009). The decline in birth rate and the rise in life expectancy result in an increase of elderly population globally (Bao et al. 2015).

Studies on the improvement of the nutritional and health status of elderly people resulted in an increase in their life quality (Daradkeh et al. 2014; Michishita et al. 2015). Although aging is associated with decline of physiological functions and psychological issues caused by loneliness, studies suggested that nutritional status is an important determinant of successful aging

(Donini et al. 2010; Sharkey et al. 2002). For older adults their nutritional status may be affected by the inability to make their own food choices and food preparations, drug-food interactions due to their chronic diseases, and living dependent on someone. Understanding the nutrition status may help in developing intervention and improving overall quality of life in older adults (Camina-Martin et al. 2015). Thus, the primary aim of this study was to examine the total energy and key nutrients intakes in older adults living in Turkey. The nutritional status, which is directly related to the quality of life, should be assessed in the elderly regularly. Therefore, this study was planned and conducted to assess energy and nutrient intake of a group of Turkish elderly people.

### MATERIAL AND METHODS

#### Participants

Five hundred and forty nine older adults (250 men and 299 women) aged 65 years and above (mean ages ±SD) (70.7±5.9 in men, 70.8±6.3 in women) who were living with their family partic-

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ipated in this study. Exclusion criteria were, that none of the participants had dementia affecting their cognitive function or health problems that may affect their response.

Data was collected using face-to-face interviews, between January and May 2011, from the elderly living in the area of Ankara University, which is located in the city of Ankara, the district of Tandoğan and Bahçelievler/Ankara. All participants were informed about the study. The study was performed as appropriate to the Helsinki Declaration and each elderly approved and signed an informed consent form.

### Data Collection

In-home interviews were conducted to collect age, general health, self-reported height and weight, and other demographic information. Body Mass Index (BMI) was calculated as weight (kg) divided by the square of the height (m<sup>2</sup>) for all participants (Gibson 1990). Underweight was diagnosed with a BMI of <18.5 kg/m<sup>2</sup>, normal weight when the BMI was between 18.5-24.9 kg/m<sup>2</sup>, whereas for overweight the BMI was between 25.0-29.9 kg/m<sup>2</sup>, and BMI exceeding 29.9 kg/m<sup>2</sup> was classified as obese (WHO 1997).

Energy and nutrient intakes of all participants were assessed using 24-hour dietary recall conducted by a trained dietitian. This method is a widely used methodology for collecting data on nutritional status and measuring energy and nutrient intakes, including for elderly people (Sharkey et al. 2002). Participants were asked to report all food and beverage items consumed in the previous 24 hours, including details about the name, place and time of consumption of the meal, method of preparation, amount consumed, condiments added, recipes, brand names or name

of menu items for restaurants, take-out foods, or other foods eaten outside of their home. During the interview, participants were shown a food photography catalog (Rakicioglu et al. 2006) to assist them in estimating the amount consumed.

Energy and nutrients intake data were analyzed using a program Bundeslebensmittelschlüssel (BLS) 11.3 and USDA 15, including the Turkish foods and ingredients (BeBis 4 Bebispro for Windows, Stuttgart, Germany; Turkish Version. Istanbul, 2004). Energy and nutrient intakes of the elderly were compared to the Turkish Dietary Guidelines developed by the Ministry of Health in Republic of Turkey and Department of Nutrition and Dietetics at Hacettepe University (Anon 2004). These were used for calculating each individual's level of recommendations of energy and nutrient daily intakes, sufficient (67-133%), insufficient (<67%), and over consumption (>133%) (Pekcan 2008).

### Statistical Analysis

Data was analyzed using the SPSS for Windows V.15.0 package program. Frequencies and percentages were used as descriptive statistics and described by using mean± standard deviations. Normally distributions were evaluated by one sample Kolmogorow Smirnov test. Inter-group comparisons performed using a chi square and t tests. Statistically significance was set at p level is 0.05.

## RESULTS

A total of 549 individuals aged 65 years and above participated in this study. The participants' age (years), gender and education statuses are presented in Table 1 showing that 82.3

**Table 1: Demographic characteristics of elderly according to gender**

	Man (n:250)		Woman (n:299)		Total (n:549)	
	S	%	S	%	S	%
<i>Age (Years)</i>						
65-74	203	81.2	233	77.9	436	79.4
75-85	43	17.2	57	19.1	100	18.2
Over 85	4	1.6	9	3.0	13	2.4
$\chi^2 = 1.59, p=0.452$						
<i>School Education</i>						
Less than high school	183	73.2	269	90.0	452	82.3
High school	44	17.6	23	7.7	67	12.2
College	23	9.2	7	2.3	30	5.5

$\chi^2 = 27.32, p < 0.001$

percent of the participants had lower than a high school education.

The average BMI was higher in women than in men ( $p=0.006$ ). There were 42.3 percent of participants with BMI 25.0-29.9 kg/m<sup>2</sup>, classified as overweight (Table 2).

Energy intakes of elderly men and women were 1653.3±596.7 kcal and 1614.1±612.7 kcal, respectively. There were no significant differences in any variable between men and women, except for iron, calcium, and zinc, which were higher in men ( $p<0.05$ ) than women (Table 3).

The energy and nutrient intakes of the elderly were evaluated using the Dietary Guidelines for Turkey. Daily dietary intakes of the elderly were evaluated as insufficient, sufficient and over consumption. According to the reference level for the Turkish Dietary Guidelines, 36.4 percent of men and 26.8 percent of women did not meet recommended total energy intakes, and insuffi-

cient energy intake was significantly greater in men ( $p<0.05$ ). The percentages of subjects that had insufficient intake of protein, thiamin, riboflavin, vitamins A, D, B<sub>12</sub>, calcium, magnesium and zinc were 25.0, 46.2, 18.0, 21.7, 98.5, 31.7, 69.6, 59.4, and 42.3 percent, respectively (Table 4).

Energy consumption of all participants was 50.7±10.1 percent from carbohydrates, 15.7±5.0 percent from proteins and 33.3±10.2 percent from fat. The percentage of total energy intake derived from the macronutrients was within the recommended value for men (50% carbohydrate, 16% protein, 34% fat) and women (51% carbohydrate, 16% protein, 33% fat), with the exception of fat for two groups (Table 5).

Significant correlations were found between energy, macronutrients, and body weight for all participants. Older participants tended to consume less fat and carbohydrates ( $p<0.01$ ). There

**Table 2: Classification of BMI of the elderly**

	Man (n:250)		Woman (n:299)		Total (n:549)	
	S	%	S	%	S	%
Underweight (BMI<18.5 kg/m <sup>2</sup> )	2	0.8	3	1.0	5	0.9
Normal weight (BMI 18.5-24.9 kg/m <sup>2</sup> )	96	38.4	107	35.8	203	37.0
Overweight (BMI 25.0-29.9 kg/m <sup>2</sup> )	112	44.8	120	40.1	232	42.3
Obese (BMI>29.9 kg/m <sup>2</sup> )	40	16.0	69	23.1	109	19.8

$\chi^2=4.450$ ,  $p=0.217$

**Table 3: Daily energy and nutrient intakes of the elderly**

Energy and nutrient	Daily Intakes				$p^a$	RDA %				$p^b$
	Man (n:250) mean±SD		Woman (n:299) mean±SD			Man (n:250) mean±SD		Woman (n:299) mean±SD		
Energy (kcal)	1653.3±	596.7	1614.1±	612.7	0.451	78.7±	28.4	90.2±	34.2	<0.001*
Energy (MJ)	6.92±	2.49	6.75±	2.56	0.451					
Protein (g)	62.4±	25.5	59.7±	25.7	0.228	94.0±	38.7	100.1±	45.9	0.099
Fiber (g)	22.4±	8.9	22.4±	10.3	0.999	77.4±	30.9	106.9±	48.9	<0.001*
Thiamine (mg)	0.9±	0.3	0.8±	0.3	0.550	71.0±	26.9	75.9±	30.2	0.046*
Riboflavin (mg)	1.2±	0.5	1.2±	0.5	0.280	94.5±	40.6	107.5±	42.6	<0.001*
Vitamin A (mcg)	1595.4±	1855.0	1501.3±	1881.0	0.557	177.3±	206.1	214.5±	268.7	0.074
Vitamin D (mcg)	1.7±	5.6	1.8±	10.5	0.882	17.0±	56.1	18.1±	104.6	0.882
Vitamin C (mg)	159.7±	102.0	154.5±	98.0	0.548	177.4±	113.3	171.7±	108.9	0.549
Folate (mg)	353.45±	121.7	346.2±	134.4	0.510	88.4±	30.4	86.5±	33.6	0.510
Vitamin B <sub>12</sub> (mcg)	3.6±	6.0	2.8±	4.6	0.109	148.7±	251.6	118.3±	192.5	0.109
Calcium (mg)	682.0±	306.4	676.5±	291.4	0.830	56.8±	25.5	56.4±	24.3	0.830
Iron (mg)	12.3±	5.5	11.2±	5.1	0.021*	122.6±	55.3	112.0±	51.2	0.021
Zinc (mg)	8.8±	4.1	8.1±	3.6	0.026*	80.2±	37.0	80.9±	36.3	0.831
Magnesium (mg)	243.4±	98.9	240.3±	112.9	0.735	57.9±	23.6	75.1±	35.3	<0.001*

<sup>a</sup> Daily energy and nutrient intake, the differences between man and woman

<sup>b</sup> RDA %, the differences between man and woman

\* $p<0.05$  (t-test)



**Table 5: Composition of daily energy and macronutrients intakes of the elderly**

Energy (%)	Man (n:250) mean±SD	Woman (n:299) mean±SD	Total (n:549) mean±SD	p	Recommended Energy (%)
Carbohydrate	50.3±10.6	51.0± 9.7	50.7±10.1	0.384	55-60
Protein	15.8± 5.1	15.6± 4.9	15.7± 5.0	0.727	10-15
Fat	33.9± 10.6	33.3± 10.0	33.3±10.2	0.473	25-30

was a significant positive correlation between body weight and fiber, thiamine, riboflavin, folic acid, calcium, iron, zinc and magnesium ( $p < 0.05$ ,  $p < 0.01$ , Table 6).

**Table 6: Correlations between of age and weight with energy and nutrients intakes**

Energy and Nutrients intakes	Correlations (r)	
	Age	Weight
Energy (kcal)	-0.004	0.125**
Protein (g)	0.004	0.148**
Protein (TE%)	-0.009	0.047
Total fat (g)	-0.10*	0.112**
Total fat (TE%)	-0.134**	0.023
Carbohydrate (TE%)	-0.138**	-0.043
Fiber	-0.02	0.103*
Thiamine	-0.005	0.089*
Riboflavin	0.038	0.113**
Vitamin A	-0.002	0.058
Vitamin D	0.019	0.038
Vitamin C	0.04	0.065
Folate	-0.046	0.129**
Vitamin B <sub>12</sub>	-0.005	0.072
Calcium	0.004	0.098*
Iron	-0.016	0.134**
Zinc	-0.041	0.162**
Magnesium	-0.043	0.091*

## DISCUSSION

The current study presents an evaluation of energy and nutrient intake of a group of elderly people who live in Ankara, Turkey. Ankara is a metropolitan and capital city of Turkey. Older adults are at a greatest nutritional risk (Guyonnet and Rolland 2015). To determine the nutritional status, a variety of methods can be used for the elderly. The Mini Nutritional Assessment or MNA (Sanlier and Yabanci 2006), food frequency, diet history (Ortiz-Andrellucchi et al. 2009), and dietary record (Ongan and Rakicioglu 2015; Rakicioglu et al. 2015) are among the methods used to evaluate the nutritional status of elderly people. In this study, the nutritional status was determined by 24-hour recall, which is a frequently used, validated method. In gen-

eral, energy and nutrient intake can be determined by  $\pm 10$  percent accuracy (Pekcan 2008). The SENECA study (De Groot et al. 1996), the FINE study (Menotti et al. 2001), the HALE (Knoops et al. 2004) and Ageing-Nutrition Project (Lesser et al. 2008) are among the important studies conducted on the nutritional status of elderly people using 24-hour recall.

The European Nutrition and Health Report, published in the recent years, shows energy and nutrient intakes of children, adolescents, adults and the elderly people, in detail, in eleven European countries (Fabian and Elmadfa 2008). Even though there are comprehensive studies published in Europe on the energy and nutrient intake of the elderly, in Turkey, only a few studies were encountered. So this study presents valuable information to find out and discuss the nutritional consumptions of the elderly in Turkey. According to the Dietary Guidelines for Turkey (Anon 2004), men and women aged over 65 are recommended 2100 kcal and 1790 kcal per day, respectively. In this study the mean intake of energy was found as 1653.3±596.7 kcal in men and 1614.1±612.7 kcal in women, which are under the recommended levels. 36.4 percent of the elderly men's and 26.8 percent of the elderly women's energy intakes were insufficient. Similar results of the energy intake in elderly compared to young adults were reported in the European Nutrition and Health Report (Fabian and Elmadfa 2008). The energy intake of elderly men who live in Austria, Belgium, Denmark, Germany, Greece, Hungary, Italy, Norway, Portugal, Spain, United Kingdom were found higher compared to Turkish elderly men in this study. In contrast with this result, the energy intakes of Turkish elderly women were higher than elderly women who live in Portugal, Spain and United Kingdom. In Ongan and Rakicioglu's (2015) and this study, despite the fact that the Turkish elderly's energy intake is not high, the obesity ratio is high. It may be due to their lack of physical activity, which might be related to the Turkish traditional factors. In Turkish tradition general-

ly elderly people live with their families and their families do not have them do any work at home or outside due to traditional respect for them. Even a glass of water is taken to elderly where they sit at home, so families limit the physical activity of elderly in the name of respect. In this study, physical activity of the elderly was not measured, but it is an interesting area of study on energy balance in Turkish elderly.

Obesity is a problem in the elderly (Porter Starr and Bales 2015). Most notable findings in this study were that despite more than sixty-two percent of men and women being classified as overweight (42.3%) and obese (19.8%), 36.4 percent of the men and 26.8 percent of the women do not have enough energy intakes. This study may be uncovering the paradox of dietary habits in older adults. Why are people overweight, even though they are not eating enough? Based on the correlation table, this contradictory result may be due to the fact that older adults, above 75 years old (27 to 37%) have significantly low energy intakes, even though they are still overweight. This study highlights the important issues of obesity and lack of energy and many nutrients intakes in older, older adults. It is also interesting to note that weight and thiamine, riboflavin, folic acid, calcium, iron, zinc and magnesium levels are significantly correlated. This means that an elderly who has a lower weight does not take enough energy and nutrients. The elderly, who are heavier, have enough energy and macronutrients intakes. But this does not mean that "obesity is good for better intake of nutrient", because obesity is due to not only extra energy intake, but due to lack of energy expenditure especially for the elderly in Turkish culture.

Based on the factors that were found in this study, lots of programs, policies and dietary guideline works must be held for older adults in Turkey. Especially policies on increasing physical activity are required for elderly.

The recommended amount for protein intake is 60-75g for elderly men and 52-65g for elderly women (Anon 2004). Daily average protein intake of the elderly in this study is mostly sufficient in both genders. Main protein source for elderly in this study was yogurt. In Turkey, yogurt is consumed without sugar and eaten nearly in every meal. Traditional foods are mostly served with yogurt. According to the recommendations of the Dietary Guidelines for Turkey, the

daily dietary energy should come fifty to sixty percent from carbohydrates, ten to fifteen percent from proteins and twenty-five to thirty percent from fat (Anon 2004). In the Ageing Nutrition Project, the percentage of energy from carbohydrate, protein and fat were forty to fifty percent, eleven to seventeen percent and thirty-four to forty-three percent, respectively in the elderly (Lesser et al. 2008). This European data is similar to the results of this study; in other words, the intake of carbohydrate was low while intake of fat was high. In a study done in Japan, the percentages of energy from carbohydrate, protein and fat were fifty-eight percent, sixteen percent and twenty-six percent respectively in elderly men, and sixty-two percent, sixteen percent and twenty-two percent respectively in elderly women (Watanabe et al. 2004). In this study, percentage of energy from fat was around thirty-three percent. Also, total fat intake (g) was negatively correlated with age. Thus, the message on fat intake should be more age specific for the older adults in Turkey.

Fiber intakes at recommended amounts play important roles in the regulation of body weight, serum lipid profile, blood glucose level and hypertension (Donini et al. 2009; McKeown et al. 2009). Daily recommended fiber intake for healthy nutrition is 29 g for elderly men and 21 g for elderly women (Anon 2004). In this study, it is found that fiber intake of 37.2 percent of elderly men and 19.1 percent of women were insufficient ( $p < 0.001$ ). Similar to this study, in European elderly people it is reported that intake of fiber and complex carbohydrates were much lower than recommended amounts (Fabian and Elmadfa 2008; Lesser et al. 2008).

Food intake reduces with age, however, it is more important to take sufficient and balanced amount of vitamin and minerals. In the elderly, the deficiency of micronutrients reduces the quality of life (Montuclard et al. 2000). This study demonstrates that insufficiency in thiamin intake (46.3%) had the most frequency among the nutrient intakes of the elderly. While the recommended amount for vitamin D is 10 mcg, elderly men take seventeen percent and elderly women take eighteen percent of this recommended amount. The most important reason for vitamin D deficiency is the lack of adequate amount of vitamin D in natural foods. Thus, it is recommended for the elderly to take regular sunbaths. Vitamin B<sub>12</sub> and folate play important roles in the

elderly nutrition, but this study showed that intakes for folate were 22.4 percent and 31.8 percent while for vitamin B<sub>12</sub> were 36.8 percent and 37.2 percent being below the recommended levels in elderly men and women, respectively. In a study performed in Spain, similar to this study, it was found that insufficient intakes of vitamin B<sub>12</sub> occur. In their study, twelve percent of the elderly were found to have vitamin B<sub>12</sub> deficiency while 8.6 percent were detected with anemia. Vitamin B<sub>12</sub> deficiency was found more commonly in elderly men, while anemia was found more commonly in elderly women (Sanchez et al. 2010). In this study, insufficient iron intake was detected as more common in elderly women (p<0.05). It was also noted in other studies that European elderly people took quite less iron than the required amounts (De Groot et al. 1999; Volkert 2005), which supports the results.

In this study, calcium and magnesium intakes were found to be most insufficient minerals. For example, the average calcium intake in the elderly was found as 680 mg/daily. Similar to this study, intake of calcium was detected as very low compared to the recommended amounts in the elderly living in Europe (Fabian and Elmadfa 2008; Lesser et al. 2008) and Turkey (Ongan and Rakicioglu 2015). In the elderly recommendations for calcium is 1200 mg for their bone health (Anon 2004). Insufficient intakes of calcium and vitamin D can cause serious problems for bone health in the elderly. Similar findings were presented in a study that was done in Germany (Volkert et al. 2004). Osteoporosis that is common in elderly is known to decrease their life quality and causing expenses on health (Rizzoli et al. 2009). SENECA presented that nutrition habits showed big differences from people living in different countries in Europe. As an example, in some countries, the intake of vitamin A shows a five-fold difference and intake of vitamin C shows three-fold differences (Volkert 2005). The results of this study for intake of thiamin, riboflavin, vitamin A and vitamin C were found to be different other than the findings of the European Nutrition and Health Report (Fabian and Elmadfa 2008). Ethical and cultural differences of the elderly affect their energy and nutrient intake.

### CONCLUSION

As a result, in this study it is shown that energy intake and nutrients intake like vitamin

D, calcium, magnesium, thiamin and zinc were below the recommended levels in elderly people. Hence, it is necessary to give importance to the nutrition of the elderly.

### RECOMMENDATIONS

Community nutrition programs should be prepared for the elderly and they should be informed on this subject. Nutrition education may positively affect the nutrition status and life quality of the elderly.

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