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Identifying Major Dietary Patterns Among the Elderly in Tehran Health Homes

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Background: Previous studies on diet have primarily focused on individual nutrients or foods. Recently, the analysis of dietary patterns has emerged as a possible approach for examining food consumption. A literature review revealed no studies of dietary patterns in elderly Iranians.

Objectives: Our objective was to identify the major dietary intake patterns among the elderly in the health homes located in Zone 5 of Tehran city, Iran.

Patients and Methods: In this cross-sectional study (descriptive), 368 elderly people (≥ 60 years old) were randomly selected. Their usual dietary intake during the past year was assessed using a 168-item semiquantitative food frequency questionnaire. Major food patterns were derived using factor analysis after the classification of food items into 26 groups.

Results: Four major dietary patterns were identified in the studied population: 1) healthy pattern, characterized by a higher intake of vegetables, tomato and tomato sauce, vegetable oil, olive, and fruits; 2) unhealthy pattern, characterized by a higher intake of red meat, fast food, snacks, sugar, honey and jam, soft drinks, and high-fat dairy products; 3). traditional pattern characterized by intake of whole grains, hydrogenated oil and animal fat, beans, salt, and pickles; and 4) protein-rich pattern, characterized by intake of chicken and poultry, fish, grains, and organ meats. These four major dietary patterns explained 16.3%, 7.5%, 6.7%, and 5.7% of the total variance, respectively.

Conclusions: Four major dietary patterns were identified in the present studied population that can be used to provide tangible dietary advice for the elderly.

Keywords: Factor Analysis; Food Pattern; Elderly; Food Frequency Questionnaire

1. Background

Aging refers to irreversible continuous changes from birth to death. These changes consist of gradual growth to a decline in physical and mental abilities. The rate of this phenomenon varies in different life cycles from one person to another (1). Three major groups of parameters can influence the rate of aging, including physiological parameters (such as changes over time), pathological parameters (such as surgical operations or diseases), and finally changes caused by the persons themselves (such as lifestyle changes) (2). Food intake and nutritional conditions can also be affected by all of these parameters (3). Because of the increasing percentage of elderly throughout the world, including Iran, attention to their nutritional status is essential in order to improve their quality of life and health.

Most of the studies on nutritional epidemiology have investigated the relationship between single or several nutrients or specific foods and various diseases (4). It should be mentioned that most people do not consume solely one food ingredient or nutrient, and every food consists of complex ingredients and nutrients. In fact, we do not eat nutrients; we ingest nutrients in specific and certain patterns (5). Furthermore, studies on individual foods or nutrients can be difficult to interpret because of strong correlations among them (6). However, in dietary pattern analyses, the collinearity of nutrients or foods can be used to advantage because patterns are characterized on the basis of habitual food use (7-9).

Currently, owing to the complexity of the consumed diet and interactions of nutrients, the topic of food patterns has received great interest (10), which could possibly eliminate the limitations of a traditional approach and provide a functional potential for dietary allowances (6). Although currently, there is no specific standard definition of dietary pattern, this term usually includes assessing dietary intake characteristics (foods or nutrients) in a specific population (not in individuals) (4). In this method, a set of foods is considered as a specific pattern based on their degree of correlation (5). These patterns may be the consequence of our cultural

and ethnic heritage and of many environmental factors (such as availability of foods, our ability to purchase and prepare foods, and numerous advertisements for foods) (5, 7, 11).

In recent decades, owing to the increased life expectancy, the percentage of the elderly has been increasing worldwide (12); thus, developing suitable policies for protecting and improving their nutritional status is highly important. Studies of food patterns of the elderly in Iran have been very limited; according to our review, there are only two studies in which the elderly were part of the studied population (13, 14). Since not all of the participants in these studies were older people, the findings are not generalizable to the elderly. Other studies in Iran have mainly focused on nutritional status and micronutrient intake among the elderly. Because of the lack of studies in the context of dietary patterns and the inability to generalize the results of other studies in other countries, this study was conducted to determine the major dietary patterns among the elderly in health homes in Tehran.

2. Objectives

Our objective was to identify the major dietary intake patterns among the elderly in the health homes located in Zone 5 of Tehran City, Iran.

3. Patients and Methods

3.1. Subjects

In this cross-sectional study, the sample size was calculated according to a study conducted by Rashidkhani et al. (15) using following formula:

(1) $$n = \frac{Z^2 p(1-p)}{d^2}$$

Where Z = Z value (e.g. 1.96 for 95% confidence level), p = percentage picking a choice expressed as a decimal (according to Reference 15, 0.42 was considered), d = confidence interval expressed as a decimal (in this study, 0.5 was considered), and n = 368.

Therefore, in this study, 368 elderly (men and women ≥ 60 years of age) who were willing to take part in the study were selected by a random sampling method and considering the weight of population in each center in Zone 5, Tehran City, Iran. Subject recruitment started in November 2013 and was completed in March 2013. Participants who were not able to respond to our questions (owing to mental retardation, Alzheimer's disease, etc.) and/or followed unusual diets (at least 1 year before the study) were excluded from and replaced by others. The specific objective of this study was to examine demographic characteristics of participants in tertiles of extracted food patterns. After obtaining informed consent from all the participants, demographic information (age, sex, marital status, educational level, income, etc.) and dietary intakes were assessed using questionnaires. To assess their economic situation, we asked subjects how many of nine items they possessed. According to a study conducted by Daneshi Maskouni et al. (16), facilities can indicate a person's economic situation, and according to a study by Garmaroudy et al. (17), those reporting fewer than three items are considered poor, whereas those reporting four to six items and more than seven items have average and good economic situations, respectively.

3.2. Dietary Intake Assessment

Dietary intakes were assessed using a 168-item semi-quantitative food frequency questionnaire (FFQ), through a face-to-face interview by trained interviewers. The reproducibility and validity of the FFQ used in this study have been reported in previous studies (14, 18). For each food item, the participants indicated their average frequency of consumption over the past year on a daily, weekly, monthly, or yearly basis.

3.3. Statistical Analysis

Dietary data were entered using Excel, and dietary intakes were converted into grams per day. All of the data analyses were conducted using SPSS software (version 21; SPSS Inc., Chicago, IL). Factor analysis was performed to determine the major food patterns among the studied population. Factor analysis is a useful multivariable statistical method for determining dietary patterns (19, 20). This data reduction method identifies independent vectors of variables in a correlation matrix and provides scores that allow individuals to be ranked in terms of how closely they conform to the total pattern (5). Because of the variety of the recorded food items, we classified the 168 food items in the FFQ into 26 food groups (Table 1). This classification was made based on the similarity of nutrient content of each food item and also considering previous studies (21). In order to achieve a simple and explainable matrix and detect food patterns, a varimax rotation was used. For defining food groups in each pattern and simplifying food pattern tables, factor loads under 0.2 were eliminated (22, 23). The factor load shows the correlation between food groups and food patterns and varies from -1 to +1. A positive load indicates a positive association with the factor, whereas a negative load shows an inverse relationship with the factor. The larger the load of a given food item or group relative to the factor, the greater is the contribution of that food item or group to a specific factor. In determining the number of factors to retain, we considered eigenvalues > 1, the scree plot, and the interpretability of the factors. When a food group was loaded in more than one food pattern, only the pattern with a greater factor load was regarded in the analysis.

Table 1. Food Groupings Used in the Dietary Pattern Analysis

Foods or Food Groups	Food Items
Refined grains	White breads (lavash, baguettes), noodles, pasta, rice, toasted bread, white flour, vermicelli
Whole grains	Dark breads (Iranian), barley bread, popcorn and maize, cornflakes, wheat germ, bulgur
Potatoes	Potatoes
Beans and legumes	Beans, peas, lima beans, broad beans, lentils, soy
Red meat	Beef, hamburger, lamb
Poultry	Chicken with or without skin
Fish	Canned tuna fish, other fish
Organ meat	Beef liver
Fast food	Sausages, pizza
Eggs	Eggs
Low-fat dairy products	Skim or low-fat milk, low-fat yogurt, yogurt drink (doogh), low-fat cheese
High-fat dairy products	High-fat milk, whole milk, chocolate milk, cream, high-fat yogurt, cream yogurt, cream cheese, ice cream, curd
Vegetables	Cabbage, cauliflower, Brussels sprouts, kale, carrots, spinach, lettuce, cucumber, mixed vegetables, eggplant, celery, green peas, green beans, green pepper, turnip, corn, squash, mushrooms, onions
Tomatoes	Tomatoes, tomato sauce
Fruit	Pears, apricots, cherries, apples, grapes, bananas, cantaloupe, watermelon, oranges, grapefruit, kiwi, strawberries, peaches, nectarines, tangerines, mulberries, plums, persimmons, pomegranates, lemons, pineapples, fresh figs, fruit juices (apple juice, orange juice, grapefruit juice, other fresh fruit juices), dried berries, raisins, and other dried fruits and dates
Hydrogenated fats	Hydrogenated fats, animal fats, butter, mayonnaise
Vegetable oils	Vegetable oils (except for olive oil)
Olive	Olives, olive oils
Nuts	Peanuts, almonds, pistachios, hazelnuts, roasted seeds, walnuts
Sugar, sweets, and desserts	Sugars, candies, gaz (an Iranian confectionery made of sugar, nuts, and tamarisk), biscuits, cookies
Snacks	Potato chips, crackers, Blowgun
Condiments	Jam, jelly, honey, canned fruit
Soft drinks	Soft drinks, industrial juice
Tea	Tea, coffee
Salt	Salt
Pickles	Pickles

A factor score for the four major dietary patterns was calculated. Briefly, the factor score weights each variable (food group) by standardizing them (with a Mean of 0 and standard deviation [SD] of 1). Thus, for each person, this score shows the extent to which the dietary pattern is consistent with one of the specified patterns. Higher factor scores show greater consumption of food groups in the pattern and vice versa.

The Kaiser-Mayer-Olkin coefficient, which shows the sufficiency of the sample size for factor analysis and should be greater than 0.5, was calculated, and the obtained value was 0.72 in the present study.

After drawing a box plot for the dietary factors, outlier data that were far from their related SDs by more than three times (± SD) (24) were eliminated, resulting in 21 subjects being excluded from the final analysis. The obtained dietary pattern scores are expressed as tertiles.

The Kolmogorov-Smirnov test was used to test the normality of the distribution. One-way ANOVA and a χ^2 test were applied to determine the significant differences between quantitative and qualitative variables, respectively.

4. Results

After eliminating the outlier data from the 368 participants in this study, the final statistical analyses were conducted on 347 people. The demographic characteristics of the studied sample are shown in Table 2. In the studied population, 28.3% (n = 98) were men, and 71.7% (n = 249) were women. The mean age ± SD of the participants was 70.8 ± 7.1 (range, 60 - 93) years. Approximately 73% of the subjects were married and 26% were not married; 12% were living alone, and the household

size of 24% of the subjects was more than four persons. Approximately 33.5% of subjects were poor, and approximately 17% had a good economic situation. Many subjects had secondary and diploma education, with < 26% having a primary education and < 14% having a university education.

We entered food consumption data for the 26 food groups (Table 1) into the factor analysis procedure. The scree plot of eigenvalues indicated four major patterns: 1) healthy pattern, characterized by a high intake of vegetables, tomato paste and tomato sauce, vegetable oil, olives, and fruit; 2) unhealthy pattern, characterized by a high intake of red meat, fast foods, snacks, sugar, honey and jam, soft drinks, and high-fat dairy products and a low intake of whole grains; 3) traditional pattern, characterized by a high intake of whole grains, hydrogenated oil and animal fat, beans, salt, pickles, tea, and coffee; and 4) protein-rich pattern, characterized by a high intake of chicken and poultry, fish, grains, and organ meats as well as a low intakes of pickles. The factor loading matrices for the four major patterns are listed in Table 3. These four major dietary patterns explained 16.3%, 7.5%, 6.7%, and 5.7% of the total variance, respectively. It should be mentioned that other types of dietary patterns were also observed (minor dietary patterns); but they were excluded because they explained only a low percentage of the total variance.

In this study, the acquired dietary pattern scores were classified as tertiles, and then, demographic indicators were evaluated within the tertiles. Results showed that the mean age in the unhealthy dietary tertiles was significantly different with subjects in the third tertile being younger than those in the first tertile ($P < 0.05$). The proportion of married persons in the upper tertile of the healthy dietary pattern was significantly higher than that of the lowest tertile. The elderly subjects with a university education had a healthier diet than others, and were proportionately more represented in the upper tertile compared with the middle tertile of the healthy pattern. The proportions of subjects with a family size of more than four and those with a poor economic situation were higher in the lowest tertile than those in the highest one ($P < 0.05$). Ethnicity was not different among various tertiles (Table 4).

Table 2. Selected Characteristics of the Study Population by Sex [a]

Variables	Men	Women
Number of subjects	98 (28.3)	249 (71.7)
Age, y [b]	72.4 (6.3)	73.7 (8.2)
Marital status		
Married	77 (78.5)	178 (71.4)
Not married [c]	21 (21.4)	71 (28.5)
Education level		
Illiterate	10 (10.2)	20 (8)
Less than guidance school	19 (19.3)	85 (34.1)
Guidance school and diploma	52 (53.2)	116 (46.6)
University education	17 (17.3)	28 (11.3)
Family size, No. of people per house		
1	12 (11.7)	34 (13.6)
2	36 (37)	72 (28.9)
3	29 (29.1)	70 (28)
≥ 4	21 (22.2)	73 (29.5)
Economic status		
Poor	19 (19.3)	97 (38.9)
Average	54 (55.1)	117 (46.9)
Good	25 (25.5)	35 (14.0)
Ethnicity		
Persian	54 (56.1)	154 (61.7)
Not Persian [d]	44 (43.9)	95 (38.3)

[a] The values are presented as No. (%) unless indicated otherwise.
[b] Reported mean (SD).
[c] Including widowed, divorced, and single subjects.
[d] Including Turkish, Lor, Baloch, Arab, and northern Iranian ethnicity.

Table 3. Factor-Loading Matrix for Major Dietary Patterns [a]

Food Groups	Healthy	Unhealthy	Traditional	High-Protein
Refined grains	-	-	-	
Whole grains	-	-0.2	0.51	0.24
Potatoes	-	-	-	-
Beans and legumes	-	-	0.29	-
Red meat	-	0.44	-	-
Poultry	-	-	-	0.41
Fish	-	-	-	0.63
Organ meat	-	-	-	0.74
Fast food	-	0.52	-	-
Eggs	-	-	-	-
Low-fat dairy products	-	-	-	-
High-fat dairy products	-	0.23	-	-
Vegetables	0.87	-	-	-
Tomatoes	0.87	-	-	-
Fruit	0.46	-	0.30	-
Hydrogenated fats		-	0.64	-
Vegetable oils		-	-	-
Olives	0.51	-	-	-
Nuts	-	-	-	0.41
Sugar, sweets, and desserts	0.25	0.50	0.30	
Snacks	-	0.34	-	-
Condiments	-	0.61	-	-
Soft drinks	-	0.68	-	-
Tea	-	-	0.61	-
Salt	-	-	0.72	-
Pickles	-	-	0.45	-0.21
Percentage of variance explained	16.32	7.5	6.7	5.7

[a] Values < 0.20 were excluded for simplicity. The Kaiser Mayer Olkin measure of sampling adequacy was 0.720. Bartlett's test of sphericity was < 0.001.

Table 4. Characteristics and Dietary Intakes of Study Participants by Tertile (T) Categories of Dietary Pattern Scores [a]

Variables	Healthy			Unhealthy			Traditional			High-protein		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Age, y [b]	70 (7)	70 (6)	73 (7) [c]	74 (6)	71 (7)	69 (7)2	70 (7)	71 (5)	71 (4)	71 (4)	70 (5)	72 (5)
Marital status												
Married	29.5	33.9	36.61	32.1	34.7	33.2	34.6	34.3	31	32.3	33.3	34.4
Not married	43.3	23.7	33	29.1	34.9	37	28.9	35.1	36.1	35.8	33.2	30.9
Education level												
Less than guidance school	39.1	30.9	30	24.5	26.4	49.1	31.8	31.8	36.4	34.5	33.6	31.8
Guidance school and diploma	30.3	35.9	33.8	36.4	37.9	25.8	32.8	34.8	32.3	33.8	34.3	31.8
University education	31.7	30	38.3 [d]	38.1	31.6	30.3	36.7	38.3	25	28.8	28.8	42.4
Family size, No. of people per house												
1	44.2	20.9	34.9	40.2	25.6	34.2	27.9	30.2	41.9	41.9	34.9	23.3
2	38.4	32.2	29.4	37.5	30.1	32.4	35.1	32.4	32.5	32.3	36.9	30.8
3	37.4	31.8	30.8	30.8	38.3	30.8	29	38.3	32.7	33.6	30.8	35.5
≥ 4	42.2	34.1	23.7 [c]	26.8	36.6	36.6	37.8	35.4	26.8	29.6	29.6	40.7
Economic status												
Poor	43.6	38.1	18.3 [c]	41.4	36.9	21.7	38.6	32.2	29.2	39.8	38.6	21.6
Average	30.1	35.3	34.6	36.5	38.2	25.3	34.2	32.7	33.1	34.2	34	31.8
Good	29.7	28.6	41.7	26.2	35.2	38.6	29.4	34.3	36.3	29.7	34.1	36.2
Ethnicity												
Persian	33.9	32.8	35.3	31.2	34.4	34.4	34.4	34.8	30.8	33	35.3	31.7
Not Persian	32	37.4	30.6	36.1	32	32	31.3	34	34.7	32.6	30.1	36.3

[a] ANOVA was used for quantitative variables and χ^2 test for qualitative variables. Unless indicated otherwise, the values are presented as percentages of the study population of 347 subjects. Each tertile consisted of approximately 116 subjects.
[b] Mean ± SD.
[c] P < 0.05 compared with the lowest tertile.
[d] P < 0.05 compared with the middle tertile.

5. Discussion

Using dietary data from the FFQ, four major dietary patterns emerged by factor analysis: healthy, unhealthy, traditional, and high-protein. Some other minor patterns also emerged that were excluded. Because of the ethnic diversity in Tehran (approximately 60% Persian and approximately 40% non-Persian), great diversity in dietary patterns was not unexpected.

According to our review of previous studies, no studies of dietary patterns have been conducted only on the elderly in Iran. This issue made the interpretation and comparison of our findings with those of previous studies more complicated. In the study conducted by Falahi and Anbari (13) on the dietary patterns of people ≥ 18 years of age in Khorram-abad, three dietary patterns were identified: a healthy dietary pattern (consuming more poultry, low-fat and high-fat dairy products, cabbage, yellow and dark green vegetables, other vegetables, legumes, whole grains, fish, olives, and fruits), a western dietary pattern (higher consumption of red and processed meats, organ meats, margarine, flavors, desserts, soft drinks, snacks, nuts, and sweets), and a traditional dietary pattern (higher consumption of eggs, tea, water, fruit juices, refined grains, nuts, pickles, hydrogenated fats, sugar, salt, and spices). Similarly, Mirmiran et al. (14) conducted a two-step study and identified three major dietary patterns: a healthy dietary pattern (higher intake of vegetables, fruits, chicken, yogurt, fish, dairy products, and whole grains), a western dietary pattern (higher intake of refined grains, salty snacks, mayonnaise, processed meats, fast foods, and soft drinks), and a mixed dietary pattern (rich in hydrogenated fats, sugar, coffee, tea, red meat, organ meats, grains, and nuts).

Another study on people 80 - 55 years of age in the United States (25) determined two major dietary patterns using factor analysis: a western dietary pattern (including red and processed meats, high-fat dairy products, fried potatoes, refined grains, and eggs) and an eastern pattern (including fruits and vegetables, legumes, whole grains, tomatoes, and seafood). Yet another work on 1086 elderly subjects (26) identified five major dietary patterns: alcoholic beverages, meat and fruit, bread and vegetables, seasonal products, and a pattern of milk, tea, and confections. Pala et al. (27), in the EPIC prospective study in Italy including 47,749 elderly subjects, determined four major dietary patterns: a healthy food pattern (high intake of cooked vegetables, beans, cabbage, and fish oil), an olive oil and salad pattern (high intake of raw vegetables, olive oil, soup, and chicken), a pasta and meat pattern (pasta, tomato sauce, red meat, processed meat, bread, and wine), and a sweets and dairy pattern (sugar, cakes, ice cream, coffee, and dairy products). Anderson et al. (28) determined six dietary patterns in the elderly subjects in Maryland: a healthy dietary pattern; a high-fat dairy products pattern; a meat, alcohol and fried products pattern; a cereals pattern; and a desserts and sweets pattern.

In most of the previous studies, researchers have suggested two to six dietary patterns with more emphasis on three dietary patterns (healthy, western, and traditional) (13). Although the healthy and western patterns have different names in many studies, both of them consist of similar food groups. A healthy diet consists of fruits, vegetables, whole grains, low-fat dairy products, and in some cases, fish and olives, whereas a western diet often includes high-fat dairy products, red and processed meats, fast foods, commercial beverages, sweets, desserts, and snacks; our findings were consistent with this dietary pattern. Results of previous studies (28-36) have suggested that a healthy diet might reduce, whereas a western dietary pattern can increase, the incidence of chronic diseases. However, a Korean study (37) did not find any relationship between snacks and metabolic syndrome. It seems that cultural differences are the main reason for these differences. For example, most Korean snacks consist of mixed vegetables and tofu soups that do not lead to obesity. Furthermore, a traditional diet is also specific to each region. Owing to the presence of some items in the traditional dietary pattern in the present study (such as hydrogenated fats, salt, and sugar), this pattern cannot be considered a completely healthy food pattern.

The variance explained by western and traditional patterns in this study was similar to that of previous studies (15, 21, 38), but a healthy dietary pattern explained significantly more variance in our study than it did in other studies, a result that is probably related to our study population and sampling methods. As mentioned before, the sampling of this study was made from health houses; training and educational programs presented in these centers may affect an individual's dietary intake. In addition to the three discussed dietary patterns, a protein-rich dietary pattern was also determined in this study. In this pattern, we can see that a combined consumption of healthy protein-rich food items (such as fish) with high-risk food items such as organ meats, and the highest factor loading in this model was related to organ meats. In a study conducted in Shanghai (39) on 61,582 men aged 40 - 74 years, three major dietary patterns, fruit-, vegetable-, and meat-based diets, were identified. The meat pattern identified in the Shanghai study is similar to the protein-rich pattern in our study and was characterized by high loads of meat, poultry, and animal parts (including heart, brain, tongue, and intestine).

According to the results of the present study, the western dietary pattern explained greater variance than the traditional dietary pattern, which is in accordance with other studies (21). The main reason for this result was probably the tendency of the studied population of following a western dietary pattern more than the traditional diet. Indeed, these findings could be considered strong evidence for a transition in nutrition, with western patterns overtaking traditional patterns, although

the study conducted by Jessri et al. (40) showed that, between 1961 and 2005, consumption of fruits, meats, and vegetable oils increased and consumption of energy, milk, and dairy products decreased, which can be considered a positive change. However, it seems that dietary patterns in other Middle Eastern countries tend to be going toward a western dietary pattern. In this study, the variance explained by a healthy dietary pattern (16.5%) was greater than that explained by an unhealthy dietary pattern (7.5%). It seems that the nutritional training presented in health centers may be effective in improving dietary behaviors and patterns. However, further studies with larger sample sizes are necessary to determine the optimal path for shifting Iranian dietary patterns and adopting preventive strategies.

In this study, the mean age of the participants in the third tertile of the healthy pattern was significantly higher than that of the first tertile, and those in the highest tertile of the unhealthy pattern were younger than those in the second tertile of this model.

Subjects with a university education and those who were married followed a healthier dietary pattern. Furthermore, the percentages of people with a poor economic situation and those with a family size of more than four were significantly higher in the lowest compared with the highest tertile of the healthy pattern.

The results of previous studies are largely similar to our findings. Several studies have shown an inverse relationship between age and a western dietary pattern and a positive relationship between age and a healthy dietary pattern (41-45). In the Shanghai Men's Health Study (39), age was negatively associated with the meat-based diet but not associated with the fruit-based diet. Rashidkhani et al. (15) found positive relationships between age, educational levels, and total monthly income and a healthy dietary pattern. Hosseyni Esfahani et al. (21) found that following a western dietary pattern was prevalent among younger subjects and unmarried subjects, but they could not find any significant relationship between age, marital status, or educational level and a traditional dietary pattern. In another study (46), subjects in the rice dietary cluster had fewer years of education, and a majority (60%) of subjects in the rice and starchy vegetables clusters were below the poverty level. A review article (47) concluded a higher socioeconomic status is associated with greater consumption of fruits and vegetables. Another study in Italy (48) showed a positive relationship between educational level and the acquired score for a healthy dietary pattern and the lowest score for the meat and pasta pattern. In the study conducted by Yang et al. (49), consumption of fruits and vegetables was positively associated with the level of education.

It seems that educated people choose foods that are healthier because they have more knowledge about them (50). A higher level of education results in increased knowledge and increased understanding of health-related information in general, leading to health-promoting behaviors and attitudes toward a healthy lifestyle with the positive outcome of following a healthy dietary pattern (47).

Attempts to improve dietary behaviors because of concerns regarding disease in the elderly may be the main factor in the positive relationship seen between age and a healthy dietary pattern (15). Moreover, physiological changes accrued during aging, such as a reduced capacity of the gastrointestinal tract in digestion and absorption, may also account for a decline in the consumption of western foods with age. A larger household size may mean a reduction in each individual's food portion and share of the food budget. Furthermore, the elderly usually sacrifice their own needs to those of younger family members with respect to taking adequate food. In this study, we found married participants had a healthier dietary pattern. Perhaps in the older population, married people are more motivated to live and be more careful about their diet.

A number of methodological limitations of the present study should be noted. First, the study was conducted in Zone 5 of Tehran city, which could limit the generalizability of these findings to the entire city. The method of data collection (from health houses) could be another limitation that could confound dietary intake estimations in the elderly. In addition, the FFQ that was used for assessing dietary intakes had some disadvantages for use in the elderly, especially for those with memory disorders. Furthermore, residual confounding could be a concern because dietary patterns are just one component of a lifestyle, and nutritional behaviors such as timing and number of meals were not evaluated. Finally, the method of factor analysis for defining dietary patterns may be a limitation because decisions about grouping foods and the number of factors are usually made subjectively by researchers rather than based on exact quantitation.

Four dietary patterns (healthy, unhealthy, traditional, and protein-rich patterns) were detected in the studied population. We found that people who were married, university educated, and older had healthier food patterns, whereas those with a family size of more than four and those with a poor economic situation followed less healthy food patterns.

Determining existing dietary patterns is essential in all communities. This information can help dietitians and treatment teams suggest better food recommendations. It also provides background information for a healthcare team to rely on for making preventive and therapeutic food recommendations. Furthermore, understanding food and nutritional transition processes as well as dietary patterns can help food and nutrition policymakers in successful planning. However, designing more studies with the aim of evaluating dietary status in the elderly in all strata of society and assessing other crucial parameters in the life of the elderly, such as physical activity, are recommended for future studies.

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