Effective Factors on Dominant Diets among Adults in Gonabad City

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Abstract

Background & Objective: Proper nutrition is a very important factor in maintaining and promoting health and its role has been proven to be a determining factor in chronic diseases. To better understand the relationship between nutrition and diseases, it is best to consider nutrition as a diet and identify the factors associated with it. This study tended to determine the factors related to the dominant diets (demographic, social, economic, anthropometric and physical activity factors) in adults in Gonabad.

Materials & Methods: This cross-sectional study was performed in 2019 on adults in Gonabad. The sampling method was random stratified. The instruments used in this study were the Food Frequency Questionnaire, the Baecke Physical Activity Questionnaire, and scale and measuring tape. Exploratory factor analysis was used to identify the dominant diets. Independent T-tests, analysis of variance, chi-square and multiple regression were used to determine the factors associated with diets. Data was analyzed using SPSS software version 14.5 ($p<0.05$).

Results: The results showed a statistically significant relationship between unhealthy diet with age ($p<0.001$), gender ($p=0.015$), job ($p=0.025$), number of family members ($p=0.038$), income ($p=0.001$), waist circumference ($p=0.013$) and physical activity ($p=0.002$). These variables predict a total of 17.6% of variance in unhealthy diet. Moreover, there was a statistically significant relationship between healthy diet and age ($p<0.001$), number of family members ($p=0.015$), waist circumference ($p<0.001$) and physical activity ($p=0.0288$). These variables predict a total of 32.7% variance in healthy diet.

Conclusion: In general, the results of this study show that demographic, social, economic, anthropometric and physical factors play an important role in determining the type of dominant diet.

Keywords*: Diet, demographic and socioeconomic characteristics, Obesity, Physical Activity, Adults*

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Introduction

Proper nutrition is a very important factor in maintaining and promoting health and its role has been proven to be a determining factor in chronic diseases[1]. Foods provide energy and nutrients[2]. Over the past

half-century, most countries, particularly developing countries, have been transitioning in terms of nutrition and moving toward a diet and physical activity associated with chronic non-communicable diseases[1]. Diets, including healthy, Mediterranean, traditional, and Western diets, have recently attracted attention in assessing the relationship between diet and health[3]. To better understand the relationship between nutrition and diseases, it is best to consider nutrition as a diet[1]. Because foods are not used alone and nutrients are all metabolized together, it seems difficult to assess the relationship between nutrients and diseases[3]. The diet is of great biological importance. Because foods are consumed in complex formulations, interaction and synergy between nutrients, the balance between contents of protective foods and dangerous foods can play a crucial role in the relationship between diet and disease[4]. Therefore, it is necessary to look at the diet with a more comprehensive view and consider it as a diet.

The results of a study showed that high prevalence of diabetes in Iran was due to non-compliance with the Mediterranean diet[5]. It has also been found that there is a significant negative relationship between diets rich in fruits and vegetables and the risk of thyroid cancer, particularly among women aged 50 and older[6].

It is important to note that diets vary according to geographical area[7]. Therefore, identifying the dominant diet in each geographical area is of particular importance. Moreover, most studies have focused on the relationship between consumption of certain foods and disease prevention, and less attention has been paid to factors associated with diets. Identifying the factors associated with diet has critical implications for developing dietary instructions which are effective on health and disease prevention.

In Iran, current nutritional transition, especially in cities, and rapid increase in the prevalence of chronic diseases associated with nutrition and imbalance in intake of some micronutrients, and on the other hand, the increase in energy intake and obesity are occurring[8]. Therefore, considering the importance of evaluating diets, the present study was conducted to determine the factors related to dominant diets (demographic, social, economic, anthropometric and physical activity factors) in adults in Gonabad.

Materials and Methods

Design and Participants

This cross-sectional study was conducted in 2019 on adults in Gonabad. The sampling method was random stratified. In this way, each of the health centers of Gonabad was considered as one stratum and then allocated a quota in proportion to size of each and the required sample was selected from each stratum in a simple random way. The minimum sample size required for exploratory factor analysis is 3 to 10 people per variable[9]. In this study, 10 people were considered for each variable (24 dietary groups in Table 1), i.e. 240 people, and with a probability of 10% sample loss, a total of 264 people were included in the study. Inclusion criteria included: willingness to participate in the study, age 18 to 70 years, at least 5 years living in Gonabad, physiological and psychological stability and the ability to read and write Persian to complete the questionnaires. Moreover, people with thyroid problems or diabetes or a weight loss and weight gain diet, and pregnant and lactating women were not included in the study. People who did not complete more than 50 percent of the food frequency questionnaire were excluded from the study.

Instrument

The Food Frequency Questionnaire containing 168 types of nutrients as well as standard amount of nutrients for each person was used to collect diet data; validity and reliability of the questionnaire were determined by Mirmiran et al. Coefficient of correlation was 0.59 for men and 0.60 for women[10].

The authors asked the participants to report frequency of each item intake in the past year by food type on a daily (e.g., bread), weekly (e.g., rice), or monthly (e.g., fish) basis. Nutritional values of each meal were calculated by a Home-Scale Guide in grams; then, daily food intake was calculated in grams for each participant[11].

Based on coefficients of correlation, food items are grouped into one factor. Each particular diet was scored by multiplying the amount of each food in that diet.

Then, the participants were classified by quota of eating habits. Demographic and socioeconomic variables included age, gender, marital status, number of family members, occupation, education and income.

Anthropometric indicators included height, weight, body mass index, waist circumference and hip circumference by which obesity is determined. Weight of the participants with minimum cloths and no shoes were measured using the German Seca 881 digital scale with 100 g precision. Height of the participants was also measured without shoes and while the shoulders were in normal position with 0.1 cm precision using a non-elastic measuring tape installed on a vertical and flat wall. BMI was then calculated by dividing the weight in kilograms by root square of height in m^2. Waist circumference was measured in its narrowest area at the end of normal exhalation and hip circumference in its most prominent part and without imposing any pressure on the body using a measurement tape with 0.1 cm precision so that it is exactly tangent to skin. Physical activity was measured by the Baecke Physical Activity Questionnaire. The questionnaire contains 16 questions based on the Likert scale which measures physical activity during work, exercise and leisure. Job questions are about type of job, intensity of the activity at work and position at work. Exercise questions are about people who do regular physical activity and determine the duration, severity, and type of activity. In the leisure section, there are questions about cycling, walking, and watching TV that a person does in spare time[12].

Ethical Considerations : This study was conducted with the permission of the Ethics Committee of Gonabad University of Medical Sciences (ethical code: IR.GMU.REC.1397.060). Written consent was received from participants in this study.

Statistical Analysis

Fourteen questionnaires were excluded from the study due to more than 50% missing, and 250 questionnaires were analysed.

SPSS, version 14.5, was used to analyse the data. Explanatory factor analysis was used to identify dominant diets (factors). Varimax rotation was run on 24 food groups to form a more straightforward matrix with better interpretation and extraction of non-relevant factors. The number of factors selected for final analysis was determined by intrinsic interpretability of food groups which are greater than one and shift point in their behavior. Considering the literature and nature of the data and correlations, it was assumed that factor loadings of greater than or equal to 0.2 determined the items selected in each diet. The participants were scored by each diet. According to literature, factors were designated by interpretation of food items for each factor[22].

Using independent t-tests, analysis of variance and chi-square, the relationship between the studied variables and adherence to diet was investigated and the variables with $p<0.2$ entered the multiple regression model. Significance level was lower than 0.05.

Results

The results of this study showed that 55.2% of the subjects were female and most of the subjects were married, undergraduate and employee. Moreover, 42.8% were overweight, 8.4% had general obesity and 23.6% had abdominal obesity. In terms of physical activity index, 80.4% had low physical activity and 19.6% had proper physical activity. The specifications of the samples are shown in Table 1.

Table 1: Specifications of the subjects

Variable	Group	Mean±SD or n (%)
Age (year)		36.40±13.16
Gender, n (%)	Female	138 (55.2)
	Male	112 (44.8)
Number of family members		3.45±1.09
Marital status, n (%)	Married	206 (82.4)
	Single	44 (17.6)
Education level, n (%)	Under diploma	66 (100)
	Undergraduate	109 (100)
	Postgraduate	43 (100)
Income (10 million Rials)		2.74±2.17
Employment, n (%)	Employee	78 (31.2)
	Worker	72 (28.8)
	Housewife	60 (24.0)
	Student	40 (16.0)
BMI (kg/m^2)		25.29±3.53
Waist circumference (cm)		83.72±12.92
Hip circumference (cm)		97.06±12.80
Physical activity work index		2.73±0.81
Physical activity sports index		2.58±0.74
Physical activity leisure index		2.32±0.57
Total physical activity index		7.63±1.27

The food groups considered in this study and the foods within each group and the average daily consumption of people in grams are shown in Table 2.

Table 2: Food groups in the analysis of adult diets in Gonabad

	Food Groups	Ingredients	Mean±SD (g)
1	Refined cereals	Lavash Bread, Baguette Bread, Ice Cream Bread, Starch, Wheat Flour, Pone Bread, Rice, Macaroni, String, Vermicelli, Bread, Bakery, Bakery Flour, Sugar Bread	283.10±142.32
2	Whole grains	Sangak bread, Taftoon bread, Barberry bread, Barley bread, Wheat, Grits, Sprouts, Corn, Hemp	54.69±33.22
3	Potato	Potatoes (all preparation methods)	42.15±34.28
4	Tomato	Tomato, Tomato juice, Tomato paste, Ketchup	89.02±68.11
5	Egg	Egg whites, Egg yolks	36.01±28.39
6	Processed meats	Hot dogs, Sausages	10.74±18.96
7	Cereals	Lentils, Cowpeas, Beans, Peas, Cotyledons, Soybeans, Mung beans	23.62±20.62
8	Nuts, seeds and pips	Chickpea, Walnut, Hazelnut, Almond, Pistachio, Peanut, Indian Almond, Sesame, Seed	17.39±15.04
9	Solid fats	Coconut, Butter, Creamy, Creamy cheese, Skim, Chocolate cheese, Pizza cheese	24.77±20.61
10	Salt	Salt	2.07±1.26
11	Salty snacks	Salted crackers, Pretzels, Chips, Snack, Pickles	22.78±19.71
12	Jam and compote	All kinds of jams and compotes, Juice, Sesame oil	12.89±13.83
13	Vegetables	Lettuce, Spinach, Greens, Herb, Soup, Rice, Parsley, Watercress, Cilantro, Dill, Mint, Basil, Grape leaves, Chard, Onions, Cucumbers, Scallions, Radishes, Turnips, Rhubarb, Artichoke, Eggplant, Zucchini, Celery, Peppers, Bell peppers, Beets, Shallots, Garlic, Mushrooms, Okra, Green peas, Beans, Green beans, Carrots, Squash	202.11±100.46
14	Offal	Liver, Heart, Kidney, Chicken liver, Gizzard, Tripe, Head, Tongue, Brain	10.94±22.11
15	Red Meat	Beef, Mutton, Camel meat, Hamburger	43.96±27.74
16	Mayonnaise	A variety of mayonnaise and salad dressings	2.20±2.57
17	Drinks	Industrial juices with added sugar, Beverages, Syrups, Non-alcoholic beer	50.05±67.89
18	Coffee and tea	Tea and coffee	474.71±311.16
19	Chicken and fish	Fish, Tuna, Chicken (all methods of preparation)	54.05±45.36
20	Fruits, natural juices and dried fruits	Apples, Oranges, Tangerines, Dates, Watermelon, Cantaloupe, Bananas, Lemons, Apricots, Grapes, Green tomatoes, Cherries, Cherry, Chghalh, Pomegranates, Strawberries, Kiwi, Grapefruit, Persimmons, Pears, Peaches, Plums, Nectarine, Cranberry, Wolfberry fruit, Blueberries, Figs, Hawthorn, All kinds of fruit roll-ups and natural juices	470.87±268.85
21	Dairy	Milk, Powdered Milk, Cocoa Milk, Yogurt, Cheese, Pasteurized Whey, Dough, Cranberry, Ice Creams	528.78±275.28
22	Liquid fats	Sunflower oil, Corn oil, Olive oil and olive	7.89±4.89
23	Cookies	Cakes, muffins, donuts, Gaz, Sohan, roulette, Danish cake	40.41±35.11
24	Sweet snacks	Sugar, Chocolate, Toffee, Sohan Honey, Pastel, Jelly, Caramel Cream, Chocolate Biscuit, Creamy Biscuit, Wafer, Chewing gum	24.07±14.18

Decisions about the number of factors that must be maintained for final analysis were based on the inherent interpretability of food groups larger than 1 and shift point in the action curve (Figure 1) to keep them. The results showed that three diets were sufficient to identify the dominant diets, but the two-factor model had a better fit in terms of the logic of the order of the items and naming of the factors.

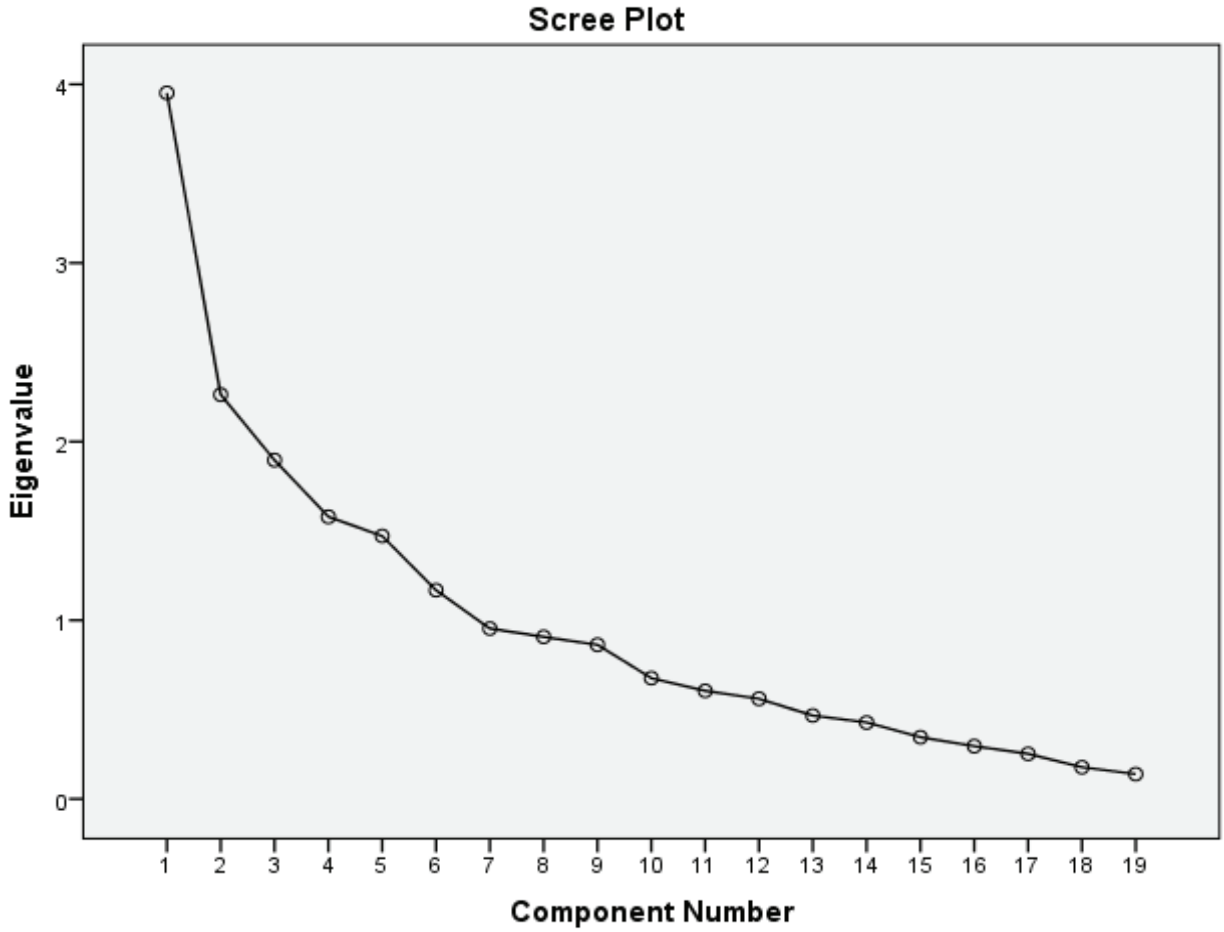

Figure 1: Components of diets using Scree Plot

Factor analysis found that two factors explained 32.71% of variance in diets. The healthy nutritional diet included poultry and fish, vegetables, offal, potatoes, fruits, natural juices and dried fruits, jams and compotes, tomatoes, and dairy, explaining 14.74% of variance in diets. The unhealthy diet including sweet snacks, salty snacks, beverages, coffee and tea, mayonnaise, salt, processed meats, refined cereals, red meats, sweets and solid fats, explaining 17.97% of variance in diets (Table 3). In addition, factor loadings of corn, egg, nuts, seeds and pips, liquid fat, and whole grains were less than 0.2; thus, they did not fit into any dominant diet. According to Table 3, two dominant diets were obtained. The most common factor in the unhealthy nutritional diet was sweet snack (0.77) and the most common factor in the healthy diet was chicken and fish (0.65). Furthermore, minimum load factor was related to solid fat group in the unhealthy diet (0.21) and dairy group in the healthy diet (0.33).

Table 3: Factor analysis of groups used for determining adult diets in Gonabad

Food groups	Dies	
	Healthy	Unhealthy
Sweet snacks		0.77
Salty snacks		0.75
Drinks		0.66
Coffee and tea		0.52
Mayonnaise		0.49
Salt		0.48
Processed meats		0.45
Refined cereals		0.35
Red Meat		0.31
Cookies		0.28
Solid fats		0.21
Chicken and fish	0.65	
Vegetables	0.64	
Offal	0.63	
Potato	0.49	
Fruits, natural juices and dried fruits	0.46	
Jam and compote	0.39	
Tomato	0.36	
Dairy	0.33	

The KMO index is 0.56; hence, the data are sufficient, and the significance of Bartlett's Spear Test shows there is a significant correlation between food groups (χ^2 = 1670.62 and p <0.001).

Table 4 shows the changes in unhealthy diet in relation to various variables based on the results of multiple linear regression analysis. The score obtained from the food frequency questionnaire for food groups in this model was entered as a quantitative dependent variable in the model. The results showed a statistically significant relationship between unhealthy diet and age (p<0.001), gender (p=0.015), occupation (p=0.025), number of family members (p=0.038), income (p=0.001), waist circumference (p=0.013) and physical activity (p=0.002). So that unhealthy diet was directly related to age, number of family members and income, and inversely related to physical activity. Moreover, adherence to unhealthy diet in men, unemployed people and people with abdominal obesity was higher in women, employed people and people with fit waist

circumference, respectively. These variables predict a total of 17.6% variance in unhealthy diet (R^2=0.176).

Table 4: The relationship between unhealthy diet and the studied variables using linear regression

Variable		B	T	P
Age		-9.39	4.41	<0.001
Gender	Female	Reference	Reference	Reference
	Male	133.34	2.46	0.015
Occupation	Unemployed	Reference	Reference	Reference
	Employed	-137.12	2.26	0.025
Number of family members		51.44	2.09	0.038
Income		12.54	3.38	0.001
Waist circumference	Fit	Reference	Reference	Reference
	Abdominal obesity	150.19	2.51	0.013
Physical activity		-62.13	3.15	0.002
Constant		682.68	2.66	0.008

F: ANOVA=7.39, df=7, p<0.001

Table 5 shows the results of multiple linear regression analysis for changes in healthy diet in relation to different variables. The score obtained from the food frequency questionnaire for food groups in this model was entered as a quantitative dependent variable in the model. The results showed a statistically significant relationship between healthy diet and age (p<0.001), number of family members (p=0.015), waist circumference (p<0.001) and physical activity (p=0.028). The healthy diet was directly related to age, number of family members, and physical activity, and adherence to healthy diet was more common in people with a fit waist circumference than in people with abdominal obesity. These variables predict a total of 32.7% of variance in healthy diet (R^2=0.327).

Table 5: The relationship between healthy diet and the studied variables using linear regression

Variable		β	T	P
Age		10.34	5.23	<0.001
Number of family members		58.23	2.46	0.015
Waist circumference	Fit	Reference	Reference	Reference
	Abdominal obesity	-611.48	10.03	0.001
Physical activity		44.78	2.21	0.028
Constant		635.77	3.16	0.002

F: ANOVA=31.27, df=4, p<0.001

Discussion

In this study, factor analysis was run on data obtained from 250 people aged 18-70 years living in Gonabad city and two major diets were extracted. The diets were designated as healthy diet and unhealthy diet according to previous knowledge and nutritional ingredients of each diet.

The results of the present study showed that adherence to healthy diet increased and adherence to unhealthy diet decreased with increasing age. Our observations on adherence to Western and healthy diets based on age were consistent with previous studies. With age, unhealthy diets shift to healthy diets[13-14]. As people get older, they are more likely to worry about their health, leading to a healthy diet. Most studies have shown that younger people were more likely to follow an unhealthy diet, while older people were more likely to follow a healthy diet[15-16]. In fact, younger people prefer to spend less time preparing food and using frozen ready-to-eat and processed foods and canned vegetables and fruits. Moreover, with age, the use of fat decreases and nutrition of people becomes healthier[17].

There was a statistically significant relationship between adherence to unhealthy diet and gender in the present study. Adherence to an unhealthy diet in men was significantly higher than in women. But adherence to healthy diet was not significantly different between men and women. Marks et al. showed that among demographic variables, gender is the most important factor in food intake estimates[18]. According to the results obtained by Shahi et al., men receive significantly more energy and protein than women[19]. Men consume significantly more fat than women, while women consume more vegetables than men[18]. Higher scores of women in healthy diet and scores of men in Western diets can be due to women's higher awareness of nutrition and health, more attention to their appearance, more preference for healthy foods among them, and more time for preparing food than men[15]. However, due to consumption of most meals at home, diets of Iranian men and women may be similar in some studies.

In our study, there was no significant relationship between adherence to unhealthy diet and the number of family members. However, adherence to healthy diet increased significantly with increasing number of family members, which was not consistent with the results of other studies. In other studies, people with the highest quarter of unhealthy diet had larger household dimensions than those with the lowest quarter[20]. People with smaller household dimensions were associated with healthy diet[21]. The results of a study by Lin et al. also show that people with unhealthy diet had a larger household dimension than people with complete fruit and grain diets[22].

In this study, adherence to healthy and unhealthy diets increased significantly with increasing income. In Alizadeh Aghdam's study, tendency to fatty substances increased as income increased[18]. Higher monthly incomes were inversely related to unhealthy diet and positively related to healthy diet[21]. People with higher incomes are more flexible in their food choices than those with lower incomes[23].

In this study, adherence to unhealthy diet was higher in the unemployed than in the employed. In Alizadeh Aghdam's study, employed people were more likely to eat fatty foods. Employees also ate more fruits, vegetables and meat than others[17]. A higher percentage of men had the highest quarter of healthy diet than men with the lowest quarter, workers or unemployed. A higher percentage of women in the highest quarter of unhealthy diet were employed than women in the lowest quarter. Employees received more food from unhealthy diets[20].

In this study, adherence to unhealthy diet was more common in people with abdominal obesity than in people with fit waist. Moreover, adherence to healthy diet was more common in people with fit waist than those with abdominal obesity. However, there was no statistically significant difference between adherence to unhealthy and healthy diets in terms of BMI. Studies have shown that abdominal obesity is more strongly associated with obesity-related health problems than obesity measured with body mass index[20]. Studies in other parts of the world, including the United States[24], Europe[25] and Asia[26], have also shown an inverse relationship between healthy diet and general and abdominal obesity. The positive relationship between unhealthy diet and abdominal

obesity, due to excessive consumption of energy-rich foods (beverages, fast food, red meat, snacks, etc.) existing in the unhealthy diet, has led to an increase in calorie intake, which increases carbohydrate oxidation and its conversion to fats and interferes with the process of fuel storage due to increased fat storage, which in turn plays an important role in increasing the prevalence of obesity and related chronic diseases[26-29]. The negative relationship between healthy diet and abdominal obesity can be explained by low energy density and high fiber in food groups such as legumes, vegetables and fruits, and low fat intake, food intake and appetite. Increasing fiber intake in healthy diet increases the feeling of fullness after eating and reduces hunger. Therefore, high-fiber diets reduce energy intake and weight gain. Overall, healthy diet can help reduce obesity.

In the present study, adherence to unhealthy diet was inversely related to physical activity. While adherence to healthy diet was directly related to physical activity. In the Western diet, people with higher scores had lower physical activity and fiber intake, but more energy and cholesterol intake[30]. Most studies show that people with low physical activity follow a Western diet compared to more active people[14-15]. Mirmiran et al. found that about one third of the population had enough physical activity and women had less physical activity than men[31]. Therefore, more attention should be paid to physical activity. Providing food for the family is a function of capital and time available for each family. Unemployment and poverty are among the factors that endanger people's diet. The healthiest nutrition was for retirees, housewives and then employees and the lowest rate of healthy nutrition was for students and the unemployed. There is also a need to address social, cultural, cultural and economic capital in discussions related to diets. So that families try to eat around the table with all the family members. Revival of some traditional methods in eating and cooking can be effective in improving healthy eating habits and avoiding new methods that somehow require less time to prepare food. It is also better for visual media to teach families how to cook traditional and healthy food instead of learning ready-made food. In TV educational programs, not only presentation should be considered, but also nutritional value and its health.

One of the strengths of the present study was that both genders were examined and the effect of many distorting variables, especially the effect of having a special diet and a history of diabetes was controlled. In assessing food intake with a food frequency questionnaire, there are errors such as measurement errors, including under-reporting or over-reporting of food items. Because dependence on memory and the ability to make direct measurements are the main limitations of food memory. However, because FFQ is designed for routine assessment and is less expensive and easier to implement, it is used in most large epidemiological studies. In this study, this limitation has been partially removed by removing people who did not complete 50% of the feed frequency questionnaire to reduce the reporting error. Another limitation of this study is its cross-sectional nature, which does not allow for causal conclusions, and the findings should be confirmed in prospective studies. There is also no golden standard for determining the number of factors (diets), grouping food items, and naming diets in factor analysis. Although there are ways to find the best solution to determine the number of diets, the decision is ultimately based on the researcher's own experience and judgment and the use of other previous studies. However, validity and reliability of this method have been shown in several studies.

Conclusion

In general, the findings of this study show that demographic, social and economic factors play an important role in determining the type of diet. Therefore, these factors should be considered in design and implementation of intervention programs to improve the nutritional status of people. The results also show that healthy diet is associated with a lower risk and unhealthy diet is associated with a higher risk of abdominal obesity in the subjects. Therefore, adherence to healthy diet and avoiding adherence to western diet can be used to prevent or treat obesity.

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Authors' contributions

Study design: ME, MK, HR, ME.

Data collection and analysis: ME, MK, HR, AB, MK, MP.

Manuscript preparation: All authors.

All authors have read and approved the final version.

Conflict of Interest: The author declares that they have no conflict of interest.

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References

[1] Dabbagh-Moghaddam A, Kamali M, Hojjati A, Foroughi M, Ghiasvand R, Askari G, et al. The Relationship between Dietary Patterns with Blood Pressure in Iranian Army Staffs. Advanced biomedical research. 2018;7:127.

[2] Tapsell LC, Neale EP, Satija A, Hu FB. Foods, nutrients, and dietary patterns: interconnections and implications for dietary guidelines. Advances in nutrition. 2016;7(3):445-54.

[3] Beigrezaei S, Ghiasvand R, Feizi A, Iraj B. Relationship between dietary patterns and incidence of type 2 diabetes. International journal of preventive medicine. 2019;10(1):122.

[4] Borges CA, Rinaldi AE, Conde WL, Mainardi GM, Behar D, Slater B. Dietary patterns: A literature review of the methodological characteristics of the main step of the multivariate analyzes. Revista Brasileira de Epidemiologia. 2015;18:837-57.

[5] Ramezan M, Asghari G, Mirmiran P, Tahmasebinejad Z, Azizi F. Mediterranean dietary patterns and risk of type 2 diabetes in the Islamic Republic of Iran. EMHJ. 2019; 25(12):896-904.

[6] Liang J, Zhao N, Zhu C, Ni X, Ko J, Huang H, et al. Dietary patterns and thyroid cancer risk: a population-based case-control study. American Journal of Translational Research. 2020;12(1):180.

[7] Alves MdA, Souza AdM, Barufaldi LA, Tavares BM, Bloch KV, Vasconcelos FdAGd. Dietary patterns of Brazilian adolescents according to geographic region: an analysis of the Study of Cardiovascular Risk in Adolescents (ERICA). Cadernos de saude publica. 2019;35:e00153818.

[8] Hosseyni Esfahani F, Jazayeri A, Mirmiran P, Mehrabi Y, Azizi F. Dietary patterns and their association with socio-demographic and lifestyle factors among Thehrani adults: Tehran Lipid and Glucose Study. Journal of school of public health & institute of public health research. 2008;6(1):23-36.

[9] Ebadi A, Ausili D, Albatineh AN, Salarvand S, Ghashlagh RG. Psychometric Evaluation of the Farsi Version of the Self-Care of Diabetes Inventory in Iranian Patients with Diabetes. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 2019;12: 2775-2784

[10] Mirmiran P, Esfahani FH, Mehrabi Y, Hedayati M, Azizi F. Reliability and relative validity of an FFQ for nutrients in the Tehran lipid and glucose study. Public health nutrition. 2010;13(5):654-62.

[11] Aghapour B, Rashidi A, Dorosti-Motlagh A, Mehrabi Y. The association between major dietary patterns and overweight or obesity among Iranian adolescent girls. Iranian Journal of Nutrition Sciences & Food Technology. 2013;7(5): 289-299.

[12] Damirchi A, Mehrabani J, Mohebbi H, Sharifi H. Physical Activity, Obesity, Dietary Patterns, and General Health among Males in Arak, Iran. Tabari Biomedical Student Research Journal. 2016;2(2):9-18.

[13] Kesse-Guyot E, Bertrais S, Peneau S, Estaquio C, Dauchet L, Vergnaud A, et al. Dietary patterns and their sociodemographic and behavioural correlates in French middle-aged adults from the SU. VI. MAX cohort. Eur J Clin Nutr. 2009;63(4):521-8.

[14] Park S-Y, Murphy SP, Wilkens LR, Yamamoto JF, Sharma S, Hankin JH, et al. Dietary patterns using the Food Guide Pyramid groups are associated with sociodemographic and lifestyle factors: the multiethnic cohort study. J Nutr 2005;135(4):843-9.

[15] Deshmukh-Taskar PR, O'Neil CE, Nicklas TA, Yang S-J, Liu Y, Gustat J, et al. Dietary patterns associated with metabolic syndrome, sociodemographic and lifestyle factors in young adults: the Bogalusa Heart Study. Public health nutrition. 2009;12(12):2493-503.

[16] Shimazu T, Kuriyama S, Hozawa A, Ohmori K, Sato Y, Nakaya N, et al. Dietary patterns and cardiovascular disease mortality in Japan: a prospective cohort study. Int J Epidemiol 2007;36(3):600-9.

[17] Alizadeh Aghdam MB. A Sociological Analysis of Food-Style among Tabriz Citizens. Social Welfare Quarterly. 2012;12(44):285-318.

[18] Marks GC, Hughes MC, van der Pols JC. Relative validity of food intake estimates using a food frequency questionnaire is associated with sex, age, and other personal characteristics. The Journal of nutrition. 2006;136(2):459-65.

[19] Shahi M, Heidari F, Moula K, Helli B, Ijadi M, Amirian Z, et al. Association of dietary patterns and indicators of disease activity in patients with rheumatoid arthritis. Iranian Journal of Nutrition Sciences & Food Technology. 2014;9(3):9-20.

[20] Nazary F. Major dietary pattern and association with between obesity and central obesity in adult women of Bushehr city. ISMJ. 2015;18(1):1-14.

[21] Rashidkhani B, Rezazadeh A, Omidvar N, Setayeshgar Z. Relationships of major dietary patterns and their association with socioeconomic and demographic factors in 20-50 year-old women in the north of Tehran. Iranian Journal of Nutrition Sciences & Food Technology. 2008;3(2):1-12.

[22] Lin H, Bermudez OI, Tucker KL. Dietary patterns of Hispanic elders are associated with acculturation and obesity. J Nutr 2003;133(11):3651-7.

[23] Zerafati_Shoae N, Omidvar N, Ghazi-Tabatabaie M, Houshiar_Rad A, Fallah H, Mehrabi Y. Is the adapted Radimer/Cornell questionnaire valid to measure food insecurity of urban households in Tehran, Iran? Public Health Nutr. 2007;10(8):855-61.

[24] Khani BR, Ye W, Terry P, Wolk A. Reproducibility and validity of major dietary patterns among Swedish women assessed with a food-frequency questionnaire. The Journal of nutrition. 2004;134(6):1541-5.

[25] Mendez MA, Popkin BM, Jakszyn P, Berenguer A, Tormo MJ, Sanchéz MJ, et al. Adherence to a Mediterranean diet is associated with reduced 3-year incidence of obesity. The Journal of nutrition. 2006;136(11):2934-8.

[26] Djazayery A, Mehrabi Y, Azizi F. Change in food patterns of Tehrani adults and its association with changes in their body weight and body mass index in District 13 of Tehran: Tehran Lipid and Glucose Study. Iranian Journal of Nutrition Sciences & Food Technology. 2008;2(4):67-80.

[27] Naja F, Nasreddine L, Itani L, Adra N, Sibai A, Hwalla N. Association between dietary patterns and the risk of metabolic syndrome among Lebanese adults. Eur J Nutr 2013;52(1):97-105.

[28] Slattery ML. Analysis of dietary patterns in epidemiological research. Appl Physiol Nutr Metab. 2010;35(2):207-10.

[29] Carter P, Gray LJ, Troughton J, Khunti K, Davies MJ. Fruit and vegetable intake and incidence of type 2 diabetes mellitus: systematic review and meta-analysis. Bmj. 2010;341:c4229.

[30] Haghighatdoost F, Zaribaf F, Azadbakht L, Esmaillzadeh A. Association between major dietary patterns and risk factors for cardiovascular disease among women. Iranian Journal of Nutrition Sciences & Food Technology. 2012;7(3):19-30.

[31] Mirmiran, Mohammadi, Allahverdian, Azizi. Estimation of energy requirements for adults: Tehran lipid and glucose study. International journal for vitamin and nutrition research. 2003;73(3):193-200.