Journal of Biostatistics and Epidemiology

J Biostat Epidemiol. 2021;7(1):70-85

Original Article

Identifying the Dietary Patterns and Chronic Disease's Effective Factors on the General Health Condition of Tehran's Opposite Gender Adult Twins in 2017

Pegah Hemmatyar[1,*], Sahar Hemmatyar[1], Shahryar Eghtesadi[1], Anahita Hoshyarrad[2], Mahmoud Mahmoudi Majdabadi[3]

[1]Department of Nutrition, Faculty of Medical Sciences and Technologies, Islamic Azad University, Science and Research Branch, Tehran, Iran.
[2]National Nutrition and Food Technology Research Institute, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
[3]Department of Health Services, Faculty of Medical Sciences and Technologies, Islamic Azad University, Science and Research Branch, Tehran, Iran.

ARTICLE INFO

Received 11.01.2021
Revised 13.02.2021
Accepted 05.03.2021
Published 15.03.2021

Key words:
Opposite gender twins;
Dietary patterns;
General health;
Factor analysis;
Birth weight

ABSTRACT

Introduction: The incidence of multiple births in the world has increased significantly .There are few studies on the nutritional status of twins, to our knowledge, no study has been conducted in this field in Iran. These are among many reasons that make this study, which aims to identify major dietary patterns and Chronic Disease's Effective Factors on the General Health Condition of Tehran's Opposite Gender Adult Twins, valuable.

Materials and Methods: 128 people (64 pairs) of Opposite Gender Twins participated in this study. After completing the general information questionnaires, International Physical Activity, Semi-quantitative food frequency, and general health, anthropometric indices, and their blood pressure were measured. Dietary patterns were identified by factor analysis. The relationship between dietary patterns and factors affecting chronic diseases with general health was calculated using the logistic regression method.

Results: Two western and healthy dietary patterns were identified. There was a significant relationship between the Western dietary pattern and age, gender, and father's education. Twin participants who scored higher in a quarter of the Western dietary pattern were younger than those with lower scores, with men increasing and women decreasing. There was a significant difference in the distribution of healthy dietary pattern with age, economic status, and systolic blood pressure. An increasing relationship was observed in age. The results showed that in first Twins, only Birth Weight, and Physical Activity, whereas, in second Twins besides Birth Weight, gender and Marital status were among the most significant factors in determining the general health of participants.

Conclusion: The present study shows that there are two major dietary patterns: healthy and western. The Western dietary pattern has the most variance and this indicates the nutritional transition and prevalence of the Western dietary pattern in Iran. The main finding of this study is the association of birth weight with general health in both twins. Birth weight is directly related to health. Those with low birth weight have more health problems in contrast to those with normal birth weight.

* . Corresponding Author Email: pegahhemmatyar@gmail.com

Introduction

Over the past two decades, the rate of multiple births has increased dramatically. One of the most important factors in this process is using infertility treatments. In addition, women over the age of 30 are more likely to give birth to twins, and the number of women giving birth at this age is increasing (1-6). According to the population database of the Civil Registration Organization in Iran in 1994, about 3% of births were twins.

In previous studies, this group was largely neglected, in contrast to the point that being twin itself is a condition that slows fetal growth, due to the competition for the same nutritional source, which in turn causes metabolic abnormalities in Twins (7-8). It is important to note that low birth weight alone is not the cause of disease and other factors and variables also play a role in causing diseases, such as diet, genetic and biological factors like intrauterine environment, maternal mental state during pregnancy, child-rearing method, education, childhood and adolescence environment, childhood experience, pollution, socio-economic aspects of the family, food consumed at home, method of cooking, parental behaviors (9-10). In many studies, these factors are presented and considered as confounding variables, many of which are uncontrollable, but by studying the community of twins, we can largely control these factors because most of the preceding factors are similar between twins. By studying twins, it is relatively easy to compare the environmental factors that are common and those that are not (including different friends and anything else) among them and observe the role of those factors (11-13).

By changing lifestyle from traditional to western, Iran is experiencing a rapid nutritional transition that has simultaneously led to an increase in problems with chronic diet-related illnesses. Determining food consumption patterns is a useful guide for educating people, promoting food literacy and nutrition policies, and helps researchers to understand better the existing patterns and their relationship to disease risk factors. The American Dietetic Association also suggests that in healthy eating messages to people, the emphasis should be on dietary patterns instead of foods or meals (14-17). Given that the incidence of twins is increasing thus, in this context the study of Iranian twins diet in terms of geographical differences and especially cultural differences that can lead to the separation of Opposite Gender twins in Iran (including school, friends, room, etc) is important and all of which has a unique feature to study.

The study of twins is a promising clue for researchers to identify the role of genetics and the effect of nutrition and can provide valuable data about the etiology of diseases and the effectiveness in their control and management. However, extensive studies will be needed in the future to identify the mechanisms of these observations (18). We hope that this study is the first stepping-stone to further studies in this field and the results might be useful in reducing the burden of disease and costs in this group.

Materials and Methods

This cross-sectional study was performed randomly (based on the phone numbers provided to us by the Iranian Twins Association) on 128 (64 pairs) adult opposite gender twins in Tehran who came to the Iranian Twins and Multiples Association in 2017.

The weight was measured with the least clothes on, without shoes using a German digital scale (beurer) with an accuracy of 100grams. The height was measured with the standing gauge. Participants were standing barefoot and their shoulders were in a normal position. With an accuracy of 0.5 cm, Body mass index was

calculated based on the simple formula of kg/m2 where kg stands for a person's weight in kilograms and m2 is their height in square meters. Blood pressure and heartbeat were measured by a German Digital sphygmomanometer (beurer). The device was placed on the upper arm and the participants were sitting in a relaxed position.

General information including age, birth order (either first or second twins), sex, birth weight(obtained by asking mothers or referring to the health document), occupation, economic status, education, parental education, marital status, years of twins living together(Which were qualitatively divided into three groups: low, medium and high), smoking, history of various diseases such as: gastrointestinal, cancer, kidney, liver, diabetes, Thyroid, etc. were collected through a general questionnaire during an interview.

Usual dietary intakes were collected using a semi-quantitative food frequency questionnaire (FFQ) over the past year. The food frequency questionnaire included a list of 147 foods with a standard size of each food, and individuals expressed their frequent consumption of each food according to the standard size during the last year. This method to determine dietary patterns has been used and validated in previous studies by Esmailzadeh, Azadbakht, Mirmiran et al (19-20). Then the mentioned amounts of each food were converted to grams per day using the manual home scales (21). In order to identify dietary patterns and to reduce the complexity of the data, initially, 147 food items were classified into 28 pre-defined food groups based on previous studies (Table 1) (22-25).

Physical activity was assessed using the IPAQ (International Physical Activity Questionnaires). This questionnaire has been used in various studies in many countries and its validity and reliability have been confirmed (26-31).

This questionnaire is prepared in a way that is reported based on the intensity of physical activity MET (Metabolic Equivalents) over the past week. It includes 7 short questions which was used to collect the number of physical activities other than daily routine activities.

General health was assessed using the GHQ28 (General Health Questionnaire). Goldberg first developed this questionnaire in 1972. The main original form has 60 questions and its short version from12 to 28 questions. The 28-question version has more validity and better sensitivity and specificity (32-33). They have been prepared and translated into 38 languages and psychometric studies have been performed on it in 70 countries. The test evaluates a person's symptoms from one month before the test.

This questionnaire is one of the mental health tools that is widely used in the field of psychometric quality assessment and bears acceptable validity and reliability in scientific societies among which Iran is the one (34-35).

In this version, the questions are classified as follows: first, some are about physical symptoms, second about anxiety and sleep disorders, third the symptoms of Social functioning (ability to do daily tasks and decision-making power) and finally Depression symptoms (hopelessness and suicidal thoughts).

Statistical analysis of data was performed using SPSS software version 19. The questionnaire of physical activity and general health were also analyzed according to their established guidelines as follows:

For physical activity, the metabolic equations of MET are calculated (MET for walking is 3.3, for moderate activity is 4, and for vigorous activity is 8), which is multiplied in minutes and number of days of doing those activities. Finally, the sum of total activities, is obtained.

The general health questionnaire is scored in different ways, each of which has its own application in research and clinical studies. The most common scoring method is the Likert type. In our study, the Likert scoring method has been used.

The Likert scale acts as follow: 0,1,2,3 (0= better than usual, 3= worse than usual). The minimum score for the 28 version is 0, and the maximum is 84. Higher GHQ-28 scores indicate higher levels of distress.

Total scores of 22 or above indicate a general lack of health or a degree of health problem, while scores < 22 shows health.

Major dietary patterns were identified using the Principal Components Analysis method, which is the most popular method for this purpose. Varimax rotation was used to achieve a simple matrix with better interpretability and extraction of unrelated and desirable dietary patterns (factors). Decisions about the number of factors to be retained for the final analysis were based on their inherent interpretability, the eigenvalue being greater than one, and the Scree Plot diagram.

Table 1- Food groups used in the analysis of food patterns

Food groups	**Food items**
Refined grains	Lavash bread, baguette bread, rice, pasta, noodles, vermicelli, others
Whole grains	whole breads(barbari, sangak, taftoon)whole meal bread , barley, oatmeal, corn, other
Potatoes	boiled potato
French fries	French Fries
Tomatoes	Tomatoes, tomato products (red sauce)
Eggs	Egg white, egg yolk
Fast food	Sausages, salami, pizza, fast food
Beans	Lentils, chickpeas, beans, peas, soybeans, mung beans, beans, others
Nut	Chickpeas, walnuts, hazelnuts, almonds, pistachios, peanuts, cashews, seeds, other
Butter	Butter
Hydrogenated fats	Solid oil, animal oil
Salt	Salt
Snacks	Chips, puff pastry, pickles, others
Vegetables	Cabbage, Carrot, Spinach, Lettuce, Cucumber, Eggplant, Onion, different types of Vegetables, Green Beans, Chickpeas, Strawberries, squash, mushrooms, green and bell peppers, turnips, corn, garlic, other
Viscera	Heart, Kidney, liver, tongue, brain, omasum, abomasum
Red meat	Beef and veal, mutton, minced meat, hamburgers
Mayonnaise	A variety of mayonnaise and salad dressings
Soft drink	Different variety of artificial juices, beer, soft drinks, others
Tea & Coffee	Tea and coffee
Poultry	Chicken
Fish	Fish, tuna
Fruits	Cantaloupe, watermelon, melon, greengage, apple, apricot, yellow and red plum, cherry, black cherry, nectarine, peach, pear, date, grape, kiwi, pomegranate, strawberry, banana, persimmon, pineapple, citrus, Different variety of Natural juices, other
Dried fruit	Dried figs, dried berries, Dehydrated fruit
Dairy products	Milk, yogurt, cheese, dogh, ice cream
Vegetable oils	Sunflower, corn oil, olive oil, olive, others
Sweets	Dessert, cake, pudding, biscuits, shirini Tar, shirini Khoshg
Sugar	Sugar, Gaz, sohan, candy, Halva, chocolate, honey, jam
Pickles	Pickle

In this study, factor loading greater than 0.2 were considered to determine food groups in each food pattern.

Factor load indicates the correlation between a food group with each food pattern, and larger loadings indicate greater correlation and a positive or negative sign indicates a direct or inverse relationship between that group and the dietary pattern. The dietary score of the individuals was calculated separately for each template according to the amount of food consumed from each food group in that template. Factor scores were categorized as quartiles for each dietary pattern. Then, the logistic regression analysis was used to calculate the odds ratios (ORs) and 95% confidence interval for a degree of health problem related to dietary patterns and Chronic Disease's Effective Factors.

All values are reported as mean ± quantitative deviation for quantitative variables and as a percentage for qualitative variables; Chi-square test was used to compare the qualitative variables between the quarters of each dietary pattern. For quantitative variables, one-way ANOVA analysis was used. If a one-way analysis of variance was significant, the Tukey test was used to facilitate the comparison of the two groups.

Results

The mean and standard deviation of the age of the participants was 32 ± 12 years. Two major dietary patterns which are extracted by the use of principle component analysis are presented in table 2. Dietary patterns were named based on the food groups in the factors. The factor loading of the food groups are listed separately by the food pattern. Higher factor loading are the expression of the greater share of that food group in the dietary pattern. The first model was named "Western dietary pattern" with a variance of 9.88% and the second pattern was named "healthy dietary pattern" with a variance of 8.53%.

The Western dietary pattern includes: refined grains, whole grains, potatoes, French fries, eggs, fast food, beans, butter, salt, snacks, red meat, mayonnaise, soft drinks, dairy products, sweets, sugar, pickles, and the healthy dietary pattern included: tomatoes, nuts, vegetables, fish, fruits, vegetable oils and low consumption of foods such as fried potatoes, fast food, butter, hydrogenated fats, salty snacks, and poultry. The two extracted dietary patterns accounted for 18.41% of the total variance of the population.

Factor scores were categorized as quartiles for each dietary pattern. The characteristics of the participants in terms of different quarters of known dietary patterns are listed in Table 3.

Gender differences were observed in the distribution of the Western dietary pattern scores. The participants in the top quartile of the Western dietary pattern were significantly more likely to be male compare to participants in the lowest quartile(p=0.001). Participants in the highest quarters of the Western dietary pattern were younger than those in the lowest quarters (p=0.03). Participants in the upper quartiles of the Western dietary pattern were more likely to have more educated father than those in the lowest quartiles(p=0.04).

In addition, age was inversely related to the Western dietary pattern and positively correlated with the healthy dietary pattern. Those who scored higher in the quarters of a healthy dietary pattern had higher systolic blood pressure but just until the third quarter (p=0.04). Also, participants in the highest quartiles of the healthy dietary patterns had a better economic status (p=0.03).

Odds ratios (ORs) and 95% confidence intervals for the degree of health problem associated with the identified dietary patterns are given in Table 4. No significant relationship was observed between dietary patterns obtained from factor analysis and general health in the observed twins.

Table 2- Factor load of food groups in extracted food patterns

Food groups	**Dietary pattern**	
	western	**healthy**
Refined grains	0.49	
Whole grains	0.36	
Potatoes	0.23	
French fries	0.34	-0.21
Tomatoes		0.55
Eggs	0.41	
Fast food	0.41	-0.35
Beans	0.58	
Nuts	0.33	0.53
Butter	0.31	-0.35
Hydrogenated fats		-0.22
Salt	0.22	
Snacks	0.33	-0.28
Vegetables		0.69
Viscera		
Red meat	0.28	
Mayonnaise	0.62	
Soft drink	0.36	
Tea & Coffee		
Poultry		-0.28
Fish	0.28	0.37
Fruits		0.53
Dried fruit		0.37
Dairy products	0.28	
Vegetable oils		0.27
Sweets	0.38	0.27
Sugar	0.22	
Pickles	0.40	
Variance	9.882	8.537

Table 3- Demographic and clinical characteristics of twins according to the quarters of food patterns

Characteristic	quarter of the Western dietary pattern					quarter of the Healthy dietary pattern				
	First n (%)	Second n (%)	Third n (%)	Fourth n (%)	P	First n (%)	Second n (%)	Third n (%)	Fourth n (%)	P
Gender										
Male	10 (15.9)	14 (22.2)	14 (22.2)	25 (39.7)	0.001	19 (30.2)	12 (19.0)	18 (28.6)	14 (22.2)	0.251
Female	22 (33.8)	18 (27.7)	18 (27.7)	7 (10.8)		13 (20.0)	20 (30.8)	14 (21.5)	18 (27.7)	

Characteristic	quarter of the Western dietary pattern					quarter of the Healthy dietary pattern				
	First n (%)	Second n (%)	Third n (%)	Fourth n (%)	P	First n (%)	Second n (%)	Third n (%)	Fourth n (%)	P
Marital status										
Single	19 (22.9)	19 (22.9)	21 (25.3)	24 (28.9)	0.513	24 (28.9)	18 (21.7)	19 (22.9)	22 (26.5)	0.374
Married	13 (28.9)	13 (28.9)	11 (24.4)	8 (17.8)		8 (17.8)	14 (31.1)	13 (28.9)	10 (22.2)	
Education										
High school Diploma	8 (16.0)	10 (20.0)	14 (28.0)	18 (36.0)	0.051	17 (34.0)	11 (22.0)	11 (22.0)	11 (22.0)	0.315
University degree	24 (30.8)	22 (28.2)	18 (23.1)	14 (17.9)		15 (19.2)	21 (26.9)	21 (26.9)	21 (26.9)	
Father's education										
High school Diploma	26 (27.7)	28 (29.8)	20 (21.3)	20 (21.3)	0.042	24 (25.5)	22 (23.4)	22 (23.4)	26 (27.7)	0.623
University degree	6 (17.6)	4 (11.8)	12 (35.3)	12 (35.3)		8 (23.5)	10 (29.4)	10 (29.4)	6 (17.6)	
Mother's education										
High school Diploma	26 (25.0)	29 (27.9)	26 (25.0)	23 (22.1)	0.297	26 (25.0)	29 (27.9)	23 (22.1)	26 (25.0)	0.297
University degree	6 (25.0)	3 (12.5)	6 (25.0)	9 (37.5)		6 (25.0)	3 (12.5)	9 (37.5)	6 (25.0)	
Separation of parents										
Yes	2 (14.3)	7 (50.0)	3 (21.4)	2 (14.3)	*0.195	3 (21.4)	4 (28.6)	2 (14.3)	5 (35.7)	*0.781
No	30 (26.3)	25 (21.9)	29 (25.4)	30 (26.3)		29 (25.4)	28 (24.6)	30 (26.3)	27 (23.7)	
Employed										
Yes	13 (21.7)	17 (28.3)	15 (25.0)	15 (25.0)	0.800	14 (23.3)	19 (31.7)	13 (21.7)	14 (23.3)	0.430
No	19 (27.9)	15 (22.1)	17 (25.0)	17 (25.0)		18 (26.5)	13 (19.1)	19 (27.9)	18 (26.5)	
Job										
Unemployed	18 (27.3)	14 (21.2)	17 (25.8)	17 (25.8)	0.738	18 (27.3)	12 (18.2)	18 (27.3)	18 (27.3)	0.218
Employee or retired	9 (23.7)	13 (34.2)	7 (18.4)	9 (23.7)		6 (15.8)	14 (36.8)	7 (18.4)	11 (28.9)	
On one's own	5 (20.8)	5 (20.8)	8 (33.3)	6 (25.0)		8 (33.3)	6 (25.0)	7 (29.2)	3 (12.5)	
Economic situation										
Low	5 (16.7)	9 (30.0)	7 (23.3)	9 (30.0)	0.564	7 (23.3)	6 (20.0)	14 (46.7)	3 (10.0)	0.037
Moderate	12 (31.6)	6 (15.8)	12 (31.6)	8 (21.1)		12 (31.6)	11 (28.9)	6 (15.8)	9 (23.7)	
High	15 (25.0)	17 (28.3)	13 (21.7)	15 (25.0)		13 (21.7)	15 (25.0)	12 (20.0)	20 (33.3)	

Table 3 continued

Characteristic	quarter of the Western dietary pattern					quarter of the Healthy dietary pattern				
	First n (%)	Second n (%)	Third n (%)	Fourth n (%)	P	First n (%)	Second n (%)	Third n (%)	Fourth n (%)	P
Roommate years										
Moderate	0 (0)	3 (75.0)	1 (25.0)	0 (0)	*0.192	0 (0)	1 (25.0)	1 (25.0)	2 (50.0)	*0.902
High	32 (25.8)	29 (23.4)	31 (25.0)	32 (25.8)		32 (25.8)	31 (25.0)	31 (25.0)	30 (24.2)	
Smoking										
Yes	4 (14.8)	7 (25.9)	8 (29.6)	8 (29.6)	0.569	3 (11.1)	7 (25.9)	10 (37.0)	7 (25.9)	0.200
No	28 (27.7)	25 (24.8)	24 (23.8)	24 (23.8)		29 (28.7)	25 (24.8)	22 (21.8)	25 (24.8)	
Physical activity										
Low	14 (31.8)	10 (22.7)	14 (31.8)	6 (13.6)	0.311	9 (20.5)	14 (31.8)	11 (25.0)	10 (22.7)	0.790
Moderate	10 (21.3)	14 (29.8)	10 (21.3)	13 (27.7)		12 (25.5)	12 (25.5)	12 (25.5)	11 (23.4)	
High	8 (21.6)	8 (21.6)	8 (21.6)	13 (35.1)		11 (29.7)	6 (16.2)	9 (24.3)	11 (29.7)	
Chronic disease										
Have	10 (24.4)	11 (26.8)	11 (26.8)	9 (22.0)	0.941	9 (22.0)	12 (29.3)	11 (26.8)	9 (22.0)	0.809
Do not have	22 (25.3)	21 (24.1)	21 (24.1)	23 (26.4)		23 (26.4)	20 (23.0)	21 (24.1)	23 (26.4)	
General health status										
Healthy	15 (28.8)	11 (21.2)	16 (30.8)	10 (19.2)	0.338	12 (23.1)	13 (25.0)	12 (23.1)	15 (28.8)	0.855
Health problems	17 (22.4)	21 (27.6)	16 (21.1)	22 (28.9)		20 (26.3)	19 (25.0)	20 (26.3)	17 (22.4)	
Weight	69.36± 12.87	73.74± 15.92	73.29± 13.29	74.55± 18.71	0.54	72.30± 15.56	75.95± 15.80	72.01± 15.42	70.67± 14.72	0.56
Birth weight	2.24± 0.59	2.28± 0.59	2.12± 0.69	2.35± 0.48	0.47	2.33± 0.54	2.26± 0.68	2.13± 0.57	2.26± 0.59	0.60
Systolic blood pressure	121.66± 12.72	123.28± 14.99	122.16± 15.82	121.38± 11.85	0.95	118.09± 14.86	125.16± 14.30	126.06± 11.47	119.16± 13.08	0.04
Diastolic blood pressure	78.59± 9.20	79.38± 8.58	79.72± 12.81	80.97± 10.68	0.83	77.78± 10.14	80.72± 9.23	82.22± 9.80	77.94± 11.86	0.24
Heart beat	81.38± 11.41	81.06± 10.51	81.63± 11.50	76.25± 9.48	0.15	80.66± 12.95	83.09± 9.46	77.38± 10.52	79.19± 9.86	0.19
Body mass index	24.34± 3.13	25.81± 5.07	26.15± 4.20	24.49± 5.24	0.27	24.97± 4.45	26.74± 4.83	25.10± 4.60	23.98± 3.85	0.10
Age	33.50± 12.20	36.78± 13.51	32.97± 11.91	27.81± 10.00	0.03	27.88± 8.80	35.22± 10.22	36.53± 15.90	31.44± 11.56	0.02

All values for quantitative variables were obtained as mean ± standard deviation using one-way analysis of variance test and for qualitative variables were reported as percentages;

P-Values were obtained using Fisher's exact test.*

P-Values were obtained using chi-square test.

Table 4 –Odd Ratio and CI 95% for evaluation of the Relation between different dietary patterns and general health

Dietary patterns	B	S.E.	Sig.	Exp(B)	95% C.I.for EXP(B)	
					Lower	Upper
Western dietary pattern			0.364			
Western dietary pattern(second quarter)	0.508	0.522	0.330	1.662	0.597	4.626
Western dietary pattern(third quarter)	-0.114	0.506	0.822	0.892	0.331	2.408
Western dietary pattern(fourth quarter)	0.683	0.529	0.197	1.980	0.702	5.583
Healthy dietary pattern			0.889			
Healthy dietary pattern(second quarter)	0.009	0.532	0.987	1.009	0.355	2.864
Healthy dietary pattern(third quarter)	-0.031	0.531	0.953	0.969	0.342	2.743
Healthy dietary pattern(fourth quarter)	-0.339	0.519	0.514	0.713	0.258	1.970
Constant	0.213	0.465	0.647	1.237		

Data were calculated by logistic regression test. Regarding the dietary patterns variable, first quarter is the reference group.
B Regression coefficient is not standardized. S.E is the standard error. Exp is equivalent to a standard regression coefficient or Odds Ratio. C.I is the confidence interval

The relationship between general health and Chronic Disease's Effective Factors are shown in tables 5 and 6. (In these two tables the first and the second twins are evaluated separately) According to the logistic regression model, the first twins with low birth weight and less physical activity had more health problems compared to those with normal birth weight and moderate physical activity. On the other hand, in the second twins, gender, marital status, and birth weight play a significant role. In this group, men in comparison to women and singles to marrieds had better general health. In case of birth weight, the achieved result was the same as the first twins. However, between second twins, other variables include BMI, blood pressure, heartbeat, physical activity, chronic disease, and smoking had no significance.

Table 5 - the Relation between general health and first twins variables

First twins variables	B	S.E.	Sig.	Exp(B)	95%C.I.for Exp(B)	
					Lower	Upper
Chronic disease(do not have)	-1.378	0.992	0.165	0.252	0.036	1.763
age			0.060			
Age(young)	-0.110	0.866	0.899	0.896	0.164	4.887
Age(Middle-aged)	2.487	1.117	0.026	12.029	1.347	107.412
Physical activity			0.019			
Physical activity (moderate)	2.712	0.966	0.005	15.067	2.270	100.010
Physical activity (high)	1.292	0.924	0.162	3.639	0.595	22.261
Birth weight(normal birth weight)	2.816	0.922	0.002	16.711	2.743	101.804
Systolic blood pressure			0.107			
Systolic blood pressure (normal)	0.428	1.621	0.792	1.535	0.064	36.828
Systolic blood pressure (elevated)	-2.551	1.767	0.149	0.078	0.002	2.492
Systolic blood pressure (high)	-2.163	2.097	0.302	0.115	0.002	7.009
Diastolic blood pressure			0.694			
Diastolic blood pressure(normal)	-1.198	2.373	0.614	0.302	0.003	31.613
Diastolic blood pressure(elevated)	-0.019	2.563	0.994	0.982	0.006	149.055
Diastolic blood pressure(high)	-0.212	3.011	0.944	0.809	0.002	295.363
Heart beat			0.641			
Heart beat(normal)	1.330	2.441	0.586	3.783	0.032	452.217
Heart beat(high)	0.151	2.806	0.957	1.163	0.005	284.655
Constant	-1.199	3.258	0.713	0.302		

B Regression coefficient is not standardized. S.E is the standard error. Exp is equivalent to a standard regression coefficient or Odds Ratio. C.I is the confidence interval
Regarding the chronic disease variable, people with chronic disease are the reference group. Also concerning the age-adolescent variable; In relation to the physical activity variable, low physical activity; with the variable of birth weight, low birth weight about the systolic blood

pressure variable, low systolic blood pressure; In relation to diastolic blood pressure variable, low diastolic blood pressure and in relation to heart rate variable, low heart rate is the reference group.

Table 6 - the Relation between general health and second twins variables

Second twins variables	B	S.E.	Sig.	Exp(B)	95%C.I.for Exp(B)	
					Lower	Upper
Gender(female)	-1.723	0.611	0.005	0.178	0.054	0.591
Marital status(married)	-1.496	0.612	0.015	0.224	0.068	0.744
Constant	2.077	0.572	0.001	7.981		
Birth weight(normal birth weight)	2.594	0.823	0.002	13.380	2.666	67.147
Constant	2.015	1.062	0.058	7.503		

B Regression coefficient is not standardized. S.E is the standard error. Exp is equivalent to a standard regression coefficient or Odds Ratio. C.I is the confidence interval

For the gender variable, men are the reference group and for the marital status variable, singles are the reference group. In the case of the birth weight variable, the low birth weight is the reference group.

Discussion

The present study identified the Dietary Pattern and Chronic Disease's Effective Factors on the General Health Condition of Tehran's opposite Gender Adult Twins in 2017. Two dietary patterns extracted using PCA included the healthy dietary pattern and the Western dietary pattern. The healthy dietary pattern is mostly based on fruits, vegetables, liquid oil, and the western dietary pattern is mostly characterized by the higher intake of meat, processed foods, solid fat, and sweets. In this study, low consumption of poultry in healthy dietary pattern was unexpected. But maybe the reason is that the participants fried their poultry. And this is one of the limitations of those studies that use FFQ and PCA, which do not consider the life style.

The study of the diets of twins is very limited. In Iran, to our knowledge, no study has been done on the diets of opposite-gender twins and no report is available, so it is not possible to cite and compare with previous research in the country. Mentioning and analyzing several relevant and noteworthy studies on the twins' dietary patterns can be valuable.

The patterns obtained in our study are similar to the food patterns extracted in the Bree and Berg studies (36-37).

Bree et al. (36) in a study of the American male and female twins over the age of 50, identified two major dietary patterns: 1- Unhealthy diet with high consumption of fat, salt, and sugar and 2- Healthy dietary including fruits, vegetables, fish, dairy and so on. Berg et al. (37) conducted a study on male twins aged 19 to 92 years old who were asked to consume fruits, vegetables, fruit juices, fish, unhealthy snacks, fast food, and beverages. A healthy and unhealthy dietary pattern were suggested by factor analysis.

On the other hand, there are different studies done on twins' major dietary patterns such as Teucher et al. (38). In a prospective study of female twins aged 18 to 79 years in England, they identified 5 main dietary patterns: 1. Fruits and vegetables, 2. High alcohol consumption, 3. Traditional English, 4. Dietary, and 5. Low meat consumption. Moreover, the other one is Pallister et al. (39) they in a study of English twins who filled out their food questionnaire online, identified 4 food patterns: 1. Fruits and vegetables 2. Distinctive taste 3. High sweetness and carbohydrates 4. Meat. The other one is Keskitalo et al. (40). The researchers identified four dietary factors: 1. Healthy foods, 2. Fat-rich foods, 3. Sweet foods, and 4. Meats.

Since there is no similar study done in Iranian twins, it is also possible to compare our study with previous studies in which they determined

the major dietary patterns by factor analysis in other observed groups. For example, Haddad Tabrizi et al. identified two desirable and undesirable dietary patterns among non-postmenopausal women (24). Similarly, Rezazadeh et al., in a study on adult women in Tehran in 2007, identified two healthy and unhealthy dietary patterns (23).

As can be deduced from the dietary patterns extracted in various studies as well as our study, the healthy dietary pattern and the western dietary pattern(Although the names differ in different studies, the nutrient content of the patterns mostly indicate these two patterns) are not just the major and exclusive patterns of the twins. Most studies in adults ("Twins" and "singleton") have reached these patterns as well (41-43).

At the end of the study, we come to this conclusion that the Western dietary pattern has the most variance and this indicates the nutritional transition and prevalence of Western dietary patterns in Iran. The similarity between the dietary patterns of our society with the Western countries is not that surprising. Because in our country, rapid changes in lifestyle, physical activity, and diet are occurring, which can be attributed to the increase in urbanization in recent years (44). This shows the significance of our result once more.

In the following paragraphs, we discuss other variable results. In the case of Gender, age, and father's education, differences were observed in the distribution of Western dietary pattern scores. With the increasing Western dietary score, the percentage of men increased, but the percentage of women decreased with increasing Western dietary score, which has been shown in studies by other researchers as well. This can be due to the higher awareness of women about food, nutrition, and health, the more attention women pay to their appearance, the more they prefer the taste of healthy food and the more time they spend preparing food in comparison to the men (45). Participants in the highest quarters of the Western dietary pattern were younger than those in the lowest quarters.

Our findings indicated that, in the case of systolic blood pressure, age and economic status, those who scored higher in the quarters of a healthy dietary pattern had higher systolic blood pressure but just until the third quarter These findings are in contrast to other studies, which showed a significant adverse association between healthy dietary pattern and systolic blood pressure. It can be justified in a way that since this study was performed on a different population, we cannot compare this group of twins with other groups of non-twins. Maybe in normal twins, the normal range of blood pressure is another number. To support this, there was a study done on Twins and non-twins in the age range of 18-50 years, which showed that the twins had higher blood pressure than the non-twins did (46).

The regression logistic shows no significant relationship between dietary patterns obtained from factor analysis and general health in the observed twins. The reason for this can be that in FFQ, life style is not considered and on the other hand in this study, according to WHO's definition, (" Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".), we just did not observe one factor.

However, birth weight was directly related to health. Those with low birth weight have more health problems in contrast to those with normal birth weight. In other studies, this theory has been confirmed. For example, Benston et al. in their study evaluate IBS and the symptoms of anxiety and depression among Norwegian twins. Their results showed that low birth weight was associated with an increased risk of IBS (47).

According to the logistic regression model, the first twins with less physical activity had more health problems compared to those with moderate physical activity. On the other hand, in

second twins, gender and marital status play a significant role. In this group, men in comparison to women and singles to marrieds had better general health. Though in the present study, women follow the healthy dietary pattern were not healthier.

There are some limitations to the interpretation of the study results. In assessing food intake using the food frequency questionnaire, there are errors such as measurement error including underreporting or over reporting of some or all of the food items in this method. (48). Another limitation is that there is no gold standard for determining the number of factors (patterns) and naming patterns in the factor analysis method. It is based on the experience and value judgment of the researcher. Some food groups including dairy products were not categorized into subgroups. For example, dairy products include low-fat dairy and high-fat dairy. There is a concern that the results may not be replicated in different populations and even within the same study population (49).

Since our study was cross-sectional and was conducted in a limited period and due to the budget consideration, for further research we highly recommended a similar study to that of Hasselbalch et al. They collected the participants' food intake of Danish male and female twins between the ages of 18 and 67. The results of this study showed that some food groups are under the influence of genetics and others under the influence of the environment.

The results indicate that the intake of macronutrients and food groups was affected by genetic differences among individuals. It also shows the important effect of common environmental factors that has rarely been considered in adult twin studies (50-52)

Conclusion

The present study showed that there are two major dietary patterns: the healthy dietary pattern and the western dietary pattern. The Western dietary pattern has the most variance and this indicates the nutritional transition and prevalence of Western dietary pattern in Iran. Because in our country, rapid lifestyle changes, physical activity, and diet are occurring, which can be attributed to the increase in urbanization in recent years (44).

If our findings are confirmed by prospective studies, recognizing these dietary patterns can be suggestive in improving dietary patterns, dietary recommendations, and nutritional counseling. On the other hand, though studying the nutritional status and health of twins is of high importance, in Iran there is not much done on that.

The main finding of this study was the association of birth weight with general health in both twins. Birth weight was directly related to health. Those with low birth weight have more health problems in contrast to those with normal birth weight.

Further studies are warranted and the development and establishment of a sort of systematic and accurate national archives of twin populations that exist in countries such as the United States, Canada, Norway, Denmark, etc. are recommended. This archive in the future will allow researchers to conduct their studies with large sample size so that they can increase the accuracy, application, and precision of their obtained information. Since the participants in this study were in the adult range, it is suggested that in further studies, extensive research be done on the nutritional status and health of infants and children.

Acknowledgments:

This article is the result of a thesis for obtaining a master's degree in nutrition from the Islamic Azad University, Science and Research Branch of Tehran. We would like to thank the Iranian Twins Association and especially all the twins who participated in the research also we would like to express our special thanks of gratitude to Dr. Niloofar Hemmatyar(PhD holder of English

language and Literature) to help us translating this article.

References

1. Dafallah SE, Yousif EM. A comparative study of twin and triplet pregnancy. Saudi Med J [Internet]. 2004 Apr [cited 2018 Sep 7];25(4):502–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15083225

2. Hayes EJ. ACOG Practice Bulletin No. 144: Multifetal gestations: twin, triplet, and higher-order multifetal pregnancies. Obstet Gynecol [Internet]. 2014;123(5):1118–32. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24785876

3. Martin JA, Hamilton BE, D P, Sutton PD, Ventura SJ, Menacker F, et al. National Vital Statistics Reports Births : Final Data for 2013. Statistics (Ber). 2015;64(1):1–104.

4. Lee YM, Cleary-Goldman J, D'Alton ME. The Impact of Multiple Gestations on Late Preterm (Near-Term) Births. Clin Perinatol. 2006;33(4):777–92.

5. Wright VC, Chang J, Jeng G, Macaluso M. Assisted reproductive technology surveillance. Morb Mortal Wkly Rep [Internet]. 2012;61(7):1–23. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23114281

6. Bortolus R, Zanardo V, Trevisanuto D. [Epidemiology of identical twin pregnancy]. Pediatr Med Chir [Internet]. [cited 2018 Sep 7];23(3–4):153–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/11723849

7. Loos R, Derom C, Vlietinck R, Derom R. The East Flanders Prospective Twin Survey (Belgium): A population-based register. Twin Res. 1998;1(4):167–75.

8. Ramos-Arroyo M a, Ulbright TM, Yu PL, Christian JC. Twin study: relationship between birth weight, zygosity, placentation, and pathologic placental changes. Acta Genet Med Gemellol (Roma). 1988;37(3–4):229–38.

9. Chakravarti A, Little P. Nature, nurture and human disease. Nature. 2003;421(6921):412–4.

10. Guttmacher AE, Collins FS, Ph D, Carmona RH. sounding board The Family History — More Important Than Ever. Am J Med Genet. 2004;351(22):2333–6.

11. Pimpin L, Ambrosini G. Dietary intake of young twins: nature or nurture? Am J … [Internet]. 2013;98(5):1326–34. Available from: http://ajcn.nutrition.org/content/98/5/1326.short

12. Scheibehenne B, Todd PM, van den Berg SM, Hatemi PK, Eaves LJ, Vogler C. Genetic influences on dietary variety - Results from a twin study. Appetite [Internet]. 2014;77:131–8. Available from: http://dx.doi.org/10.1016/j.appet.2014.03.001

13. Rissanen A, Koskenvuo M, Ro T. Acquired preference especially for dietary fat and obesity : a study of weight-discordant monozygotic twin pairs. Int J Obes. 2002;26:973–7.

14. Ghassemi H, Harrison G, Mohammad K. An accelerated nutrition transition in Iran. Public Health Nutr [Internet]. 2002 Feb 22 [cited 2018 Sep 7];5(1A):149–55. Available from: http://www.journals.cambridge.org/abstract_S1368980002000216

15. Hu FB, Hu FB. Dietary pattern analysis: a new direction in nutritional epidemiology. Curr Opin Lipidol [Internet]. 2002;13(1):3–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/11790957

16. Abdi F, Atarodi Z, Mirmiran P, Esteki T. A Review of Nutritional Status in Iranian Population. Focus Sci [Internet]. 2016;2(3):1–10. Available from: http://focsci.com/archive/article/8

17. Freeland-Graves J, Nitzke S, Denny S, Askew EW, McMahon KE, Owen AL, et al. Position of the American Dietetic Association:

Total diet approach to communicating food and nutrition information. J Am Diet Assoc. 2002;102(1):100–8.
18. Cardoso C, Afonso C, Bandarra N. The Importance of Dietary Behavior to the Health of Monozygotic Twins. J Community Med Health Educ [Internet]. 2017;7(3):1–11. Available from: https://www.omicsonline.org/open-access/the-importance-of-dietary-behavior-to-the-health-of-monozygotic-twins-2161-0711-1000526.php?aid=89891
19. Esmaillzadeh A, Azadbakht L KM. Dietary Pattern Analysis: A New Approach to Identify Diet-disease Relations. Iran J Nutr Sci Food Technol. 2007;2(2):71–80.
20. Hosseini-Esfahani F, Asghari G, Mirmiran P, Jalali Farahani S AF. Reproducibility and Relative Validity of Food Group Intake in a Food Frequency Questionnaire Developed for the Tehran Lipid and Glucose Study. RJMS [Internet]. 2010 [cited 2020 Feb 24];17(71):41–55. Available from: http://rjms.iums.ac.ir/article-1-1458-fa.html
21. Ghafarpour M, Houshiar-Rad A, Kianfar H, Ghaffarpour M. The Manual for Household Measures, Cooking Yields Factors and Edible Portion of Food [Internet]. Tehran: Keshavarzi Press; 1999 [cited 2018 Sep 7]. Available from: https://www.scienceopen.com/document?vid=e3b677f8-3b9e-4ca8-9f18-34a31647a44b
22. 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. J Sch Public Heal Inst Public Heal Res [Internet]. 2008 [cited 2018 Sep 7];6(1):23–36. Available from: http://sjsph.tums.ac.ir/browse.php?a_id=149&sid=1&slc_lang=en
23. Rezazadeh1 A, Rashidkhani2 B, Omidvar2 N. Evaluation of major dietary patterns and general and central obesity in adult women of north Tehran in 2007. Res Med [Internet]. 2010 [cited 2018 Sep 7];33(4):246–58. Available from: http://pejouhesh.sbmu.ac.ir/browse.php?a_id=693&sid=1&slc_lang=en
24. Hadad Tabrizi S, Haji Faraji M, Houshiar Rad A, Abadi A, Hosseinpanah F. Association between the metabolic syndrome and food patterns in non-menopause women. Iran J Nutr Sci Food Technol [Internet]. 2010 [cited 2018 Aug 25];5(1):39–48. Available from: http://nsft.sbmu.ac.ir/article-1-277-en.html
25. Hasselbalch AL, Heitmann BL, Kyvik KO, Sorensen TIA. Studies of Twins Indicate That Genetics Influence Dietary Intake. J Nutr [Internet]. 2008;138(12):2406–12. Available from: http://jn.nutrition.org/cgi/doi/10.3945/jn.108.087668
26. Vasheghani-Farahani A, Tahmasbi M, Asheri H, Ashraf H, Nedjat S, Kordi R. The Persian, last 7-day, long form of the International Physical Activity Questionnaire :translation and validation study. Asian journal of sports medicine. 2011;2(2):106.
27. Hazavehei SMM, Asadi Z, Hassanzadeh A, Shekarchizadeh P. Comparing the effect of two methods of presenting physical education ΙΙ course on the attitudes and practices of female Students towards regular physical activity in Isfahan University of Medical Sciences. Iranian Journal of Medical Education. 2008;8(1):121-31.
28. Estebsari F, Shojaizadeh D, Mostafayi D, Farahbakhsh M. Designing and intervention educational to increase physical activity for students girl based on PRECEDE Model to Improve physical activity in female students. Hayat. 2010; 16 (1): 48-54.
29. Craig C, Marshall A, Sjostrom M, Bauman A, Booth M, Ainsworth B. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003;35(8):1381-96.

30. Booth ML, Ainsworth BE, Pratt M, Ekelund ULF, Yngve A, Sallis JF, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003;195:1381-95.
31. Moghaddam MHB, Aghdam FB, Jafarabadi MA, Allahverdipour H, Nikookheslat SD, Safarpour S. The Iranian version of International Physical Activity Questionnaire (IPAQ) in Iran: Content and construct validity, factor structure, internal consistency and stability. World Appl Sci J. 2012;18(8):1073–80.
32. Banks M. Validation of General Health Questionnaire in a young community sample. Psychol Med. 1983;13:349–53.
33. Goldberg D. The Validity of two Versions of the GHQ in the WHO Study of Mental Illness in General Health Care. Psychol Med. 1997;27:191–7.
34. Taghavi M. [Assessment of the validity and reliability of the general health questionnaire]. J Psychol2001; 5: 381-98. (Persian)

35. Noorbala AA, Bagheri Yazdi SA, Mohammad K. The Validation of General Health Questionnaire- 28 as a Psychiatric Screening Tool. Hakim Research Journal. 2009; 11(4): 47- 53. [In Persian]
36. van den Bree MB, Eaves LJ, Dwyer JT. Genetic and environmental influences on eating patterns of twins aged >/=50 y. Am J Clin Nutr [Internet]. 1999;70(4):456–65. Available from: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=10500013
37. Van Den Berg L, Henneman P, Willems Van Dijk K, Delemarre-Van De Waal HA, Oostra BA, Van Duijn CM, et al. Heritability of dietary food intake patterns. Acta Diabetol. 2013;50(5):721–6.
38. Teucher B, Skinner J, Skidmore PML, Cassidy A, Tait SJF, Hooper L, et al. Dietary Patterns and Heritability of Food Choice in a UK Female Twin Cohort How to cite this article : Dietary Patterns and Heritability of Food Choice in a UK Female Twin Cohort. 2012;10(2007):734–48.
39. Pallister T, Sharafi M, Lachance G, Pirastu N, Mohney RP, MacGregor A, et al. Food Preference Patterns in a UK Twin Cohort. Twin Res Hum Genet. 2015;18(6):793–805.
40. Keskitalo K, Silventoinen K, Tuorila H, Perola M, Pietiläinen KH, Rissanen A, et al. Genetic and environmental contributions to food use patterns of young adult twins. Physiol Behav. 2008;93(1–2):235–42.
41. 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 Nutr [Internet]. 2009;12(12):2493. Available from: http://www.journals.cambridge.org/abstract_S1368980009991261
42. Hu FB, Rimm E, Smith-Warner SA, Feskanich D, Stampfer MJ, Ascherio A, et al. Reproducibility and validity of dietary patterns assessed with a food-frequency questionnaire. Am J Clin Nutr [Internet]. 1999;69(2):243–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9989687
43. Rashid Khani B, Ye W, Terry P, Wolk A. Reproducibility and Validity of Major Dietary Patterns among Swedish Women Assessed with a Food-Frequency Questionnaire. Am Soc Nutr Sci. 2004;134(6):1541–5.
44. Fallahi E, Anbari K. Identification of dominant dietary patterns in Iranian adults. Lorestan Univ Med Sci Iran. 2012;14(5):29–39.
45. Turrell G. Determinants of gender differences in dietary behavior. Nutr Res. 1997;17(7):1105–20.
46. Bo S, P.Cavallo, G.Ciccone, L.Scaglione, G.Pagano. Endocrinology &

Diabetes or of being a twin ? Exp Clin Endocrinol Diabetes. 2001;109:135–40.

47. Bengtson MB, Aamodt G, Vatn MH, Harris JR. Co-occurrence of IBS and symptoms of anxiety or depression, among Norwegian twins, is influenced by both heredity and intrauterine growth. BMC Gastroenterol. 2015;15(1):1–9.

48. Kerver JM, Yang EJ, Bianchi L, Song WO. Dietary patterns associated with risk factors for cardiovascular disease in healthy US adults. Am J Clin Nutr [Internet]. 2003;78(6):1103–10. Available from: http://www.ncbi.nlm.nih.gov/pubmed/14668271

49. Martinez ME, Marshall JR, Sechrest L. Invited commentary: factor analysis and the search for objectivity. Am J Epidemiol [Internet]. 1998;148(1):17–9. Available from: http://aje.oxfordjournals.org/

50. Keskitalo K, Silventoinen K, Tuorila H, Perola M, Pietiläinen KH, Rissanen A, et al. Genetic and environmental contributions to food use patterns of young adult twins. Physiol Behav. 2008;93(1–2):235–42.

51. De Castro JM. Genes and environment have gender-independent influences on the eating and drinking of free-living humans. Physiol Behav. 1998;63(3):385–95.

52.Hasselbalch AL, Heitmann BL, Kyvik KO, Sorensen TIA. Studies of Twins Indicate That Genetics Influence Dietary Intake. J Nutr [Internet]. 2008;138(12):2406–12. Available from: http://jn.nutrition.org/cgi/doi/10.3945/jn.108.087668