Original Article

Patterning of Food Preferences Among Iranian Adults: Results from SEPAHAN Study

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Abstract

Background: The present study was conducted to evaluate the pattern of food preference among a large sample of Iranian adults. **Methods:** In a cross-sectional study within the study on the epidemiology of psychological alimentary health and nutrition (SEPAHAN) projects, a total of 6239 of 8694 subjects completed a 106-item food preference questionnaire. Subjects indicated whether they liked, disliked or had gastrointestinal symptoms for each food item separately. They also reported the frequency of consumption for each food item. **Results:** We observed that presence of some foods such as yogurt, fruits and vegetables in the list of the most preferred food items and presence of kalbas, sausages and chips in the list of the most disliked food items, were representative of healthy dietary pattern in this population. Results also revealed that women liked unhealthy foods more than men (P value <0.05 for all significant food items). Moreover, in most of the food items, men reported less gastrointestinal symptoms than women (P value <0.05 for all significant food items). Our findings revealed that smokers disliked most of the healthy food items. We also observed that pregnant women regardless of the trimesters, reported dislike for sweet-tasting food items. **Conclusions:** More researches are suggested in order to indicate the origins of preferences and recommend some practical alternatives to improve the dietary pattern in society.

Keywords: *Feeding behavior, food intolerance, food preferences, gastrointestinal diseases*

Introduction

Preference is used to indicate that a person chooses one item over another.[1] Food preference can also be defined as a comparison between two or more foods which leads to choice.[2] Liking is a major cause of preference but not the only cause.[3]

Cultural factors such as societal beliefs, gender differences and food availability can determine a food preference. Most of the time however, what we choose is unconscious which is based on habit and custom. Cultural influences lead to differences in the habitual consumption of certain foods.[4] At the individual level, sensory properties are important. Taste may be important in selection of high fat items as fats are responsible for the texture and smell of many foods.[5]

Weight control is also a major determinant of food choices for individuals concerned about their weight.[5] The simplest classification of foods might be those that are preferred and those that are rejected. Within these categories, preference may be related to good sensory properties or beneficial consequences. Moreover, rejecting or no preference may be related to negative feeling towards the sensory properties or dangerous consequences of ingestion called gastrointestinal symptoms.[6,7]

Post-injective consequences like nausea, diarrhea, rashes, regurgitation or heartburn, bloating, abdominal pain and postprandial fullness could result in food avoidance.[8,9]

In a study in a French-Canadian urban environment, cereal products and pasta in particular were the most frequently mentioned types of food likes and cereal products were favored by women more than men.[10] Meat and meat substitutes were the second most liked food. However, according to another research, meat and meat substitutes also were defined as the most frequently disliked food. In this study, beef and chicken were the most frequently liked meat items.[11] It should be noted that

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among the many aspects of sensory properties, texture, smell and appearance represented the major origins of dislikes.[6] In this study and similar studies in this field, distribution of individuals among preference and no preference categories is considered for food categories.

Studies show that smokers consumed more fat, sour and spicy food than non-smokers. So smoking could be an important factor affecting food preference.[12]

A positive association was found between preference for fatty foods and adiposity measured by Body Mass Index (BMI) and waist circumference in a sample of men. Fat preference, proved the best dietary determinant of cardiovascular disease risk factors.[13]

There are several articles regarding food preferences in Iran none of which has evaluated the food preferences for all food items being consumed and the impact of food preference on food intakes and gastrointestinal symptoms.[14-16] In the present study, distribution of individuals among preference and no preference categories is considered for food items among gender, pregnancy, age, disease, smoking, physical activity, BMI and WHR. This could lead the dieticians to make the exact food choices for subjects considering their preferences toward food items. Moreover, studies evaluating the association between preference statuses and eating behavior have reached inconclusive results. Whether food preference could affect food intake or not is an important matter to be considered by dieticians. That's because, knowledge about this matter could help them find appropriate substitutions regarding the nutrient content for not preferred food items.[5,10] In the current study, we also aimed to assess the association between food intakes and food preference vs. no preference as well as the association between food intakes and food preference versus gastrointestinal symptoms categories.

Methods

The current study was conducted within the framework of the Study on the Epidemiology of Psychological, Alimentary Health and Nutrition (SEPAHAN) project, a cross-sectional study aimed to evaluate the preference status of population, gastrointestinal function, their determinants and their association with dietary intakes. Detailed information about study design, sampling method, participants' characteristics and data collection procedures have been published elsewhere.[17] Staff members of Isfahan University of Medical Sciences (IUMS), Isfahan, Iran, who were working in hospitals, university campus and health centers affiliated with IUMS were included in this study. Data were collected in two phases to elevate the accuracy of data collection and response rate. A total of 8694 subjects completed questionnaires about demographic information, medical history, anthropometric measures, lifestyle, dietary habits and food intakes in the first phase with 86.16 percent response rate. In the second phase, of 9652 questionnaires containing information on gastrointestinal function, 6239 completed forms were returned. Ethical approval was obtained from the Isfahan University of Medical Sciences (approval date: 89/11/10, approval code:189069).

Assessment of food preferences

Participants were given preference questionnaire and were asked to report their feeling of liking, disliking or experience of gastrointestinal disorders about 106 food items separately. The mentioned food items were listed in the Table 1. Subjects were classified into two main categories of preference and no-preference. Subjects with the feeling of "like" towards food items, belonged to "preference category", while those with the feeling of "dislike" and/or "experience of gastrointestinal disorders" belonged to no-preference category.

Dietary assessment

Participants were given a validated Willett-format self-administered Dish-based 106-item Semi-quantitative Food Frequency Questionnaire (DS-FFQ). This questionnaire was validated among Iranian adult population and the reliability of this questionnaire was tested.[18] A total of five categories of foods and dishes were considered in the questionnaire: 1) mixed dishes (cooked or canned, 29 items); 2) fruits and vegetables (22 items); 3) dairy products (dairies, butter and cream, 9 items); 4) miscellaneous food items and beverages (including sweets, fast foods, nuts, desserts and beverages, 36 items and 5) grains (different types of bread, cakes, biscuits and potato, 10 items). At the first step, a complete and detailed list of commonly-used foods among Iranian adults was provided to design the questionnaire. Then the most nutrient-rich foods with reasonable consumptions were excerpted from the list of foods. Finally, a total of 106 food items remained in the questionnaire. The determination of portion size for each item was based on the most common portion size in the population. 9 multiple choice frequency response categories were devised in the questionnaire varying from "never or less than once a month" to "12 or more times per day". For food items consumed infrequently, the response categories reached 6 rather than 9. At last the daily consumption of each food item was computed and then converted to grams per day.

Table 1: Distribution of individuals and medians of frequency of daily food intake among categories of food preference, food intolerance and gastrointestinal symptoms status for each food item and association between food intakes of preference vs. no preference and preference vs. GI categories

Food items	Preference		No Preference					
			Dislike		Gastrointestinal symptoms		OR† for *P* vs NP Food intakes (95%CI for OR)	OR for *P* vs FGIDs Food intakes (95%CI for OR)
	Frequency (%)	<Median‡	Frequency (%)	<median	Frequency (%)	<median		
1-Olovieh[ǀ]	6272 (81.40)	0.54			1435 (18.60)	0.61		0.74 (0.66-0.84)*
2-Canned tuna fish	5865 (77.70)	0.54	1163 (15.40)	0.76	519 (6.90)	0.60	0.38 (0.33-0.44)*	0.79 (0.66-0.95)
3-Broth	5915 (75.80)	0.69	399 (5.10)	0.76	1488 (19.10)	0.80	0.67 (0.53-0.85)*	0.56 (0.50-0.65)*
4-Soup	6577 (84.80)	0.71	415 (5.30)	0.78	766 (9.90)	0.77	0.67 (0.56-0.87)*	0.73 (0.61-0.87)*
5-Egg	6983 (87.90)	0.60	358 (4.50)	0.82	607 (7.60)	0.68	0.34 (0.26-0.41)*	0.71 (0.60-0.85)*
6-rice	7493 (96.10)	0.59	65 (0.80)	0.71	242 (3.10)	0.57	0.60 (0.35-1.0)*	1.00 (0.83-1.40)
7-minced meat stew	7116 (96.60)	0.55	267 (3.40)	0.82	471 (6.00)	0.49	0.26 (0.20-.36)*	1.30 (1.00-1.60)*
8- pans Roast	7224 (73.30)	0.66	260 (3.40)	0.74	262 (3.40)	0.61	0.69 (0.52-0.91)*	1.30 (0.98-1.60)*
9- Beaten roast	7224 (92.20)	0.63	235 (3.00)	0.72	380 (4.80)	0.61	0.68 (0.51-0.91)*	1.00 (0.88-1.30)
10- Roast with lean meat	6934 (93.30)	0.51	320 (4.30)	0.72	178 (2.40)	0.57	0.40 (0.32-0.52)*	0.80 (0.60-1.00)
11- Chicken roast	7582 (96.50)	0.66	156 (2.00)	0.67	116 (1.50)	0.53	0.99 (0.70-1.40)	1.80 (1.20-2.60)*
12- Chicken rice	7760 (95.60)	0.55	213 (2.60)	0.67	148 (1.80)	0.55	0.62 (0.46-0.82)*	0.10 (0.72-1.40)
13- Chicken stew	7347 (92.80)	0.55	410 (5.20)	0.72	162 (2.00)	0.51	0.49 (0.39-0.60)*	1.10 (0.90-1.70)
14- Gheime stew	6508 (81.50)	0.59	342 (4.30)	0.23	1140 (14.30)	0.19	4.70 (3.70-6.00)*	6.70 (5.20-7.20)*
15- Ghorme sabzi stew	6586 (82.50)	0.50	203 (2.60)	0.50	1158 (14.60)	0.56	0.97 (0.73-1.30)	0.76 (0.67-0.86)*
16-peas eggplant stew	6217 (79.80)	0.71	598 (7.70)	0.75	977 (12.50)	0.77	0.80 (0.66-0.97)*	0.73 (0.62-0.85)*
17-Green bean stew	6198 (80.60)	0.44	1012 (13.20)	0.69	477 (6.20)	0.47	0.36 (0.31-0.41)*	0.86 (0.71-1.00)
18- Istambuli, rice with lentil, beans	7223 (90.90)	0.50	327 (4.10)	0.61	395 (5.00)	0.53	0.64 (0.51-0.80)*	0.88 (0.72-1.00)
19- Fish	7286 (92.30)	0.69	457 (5.80)	0.78	150 (1.90)	0.78	0.63 (0.51-0.80)*	0.63 (0.43-0.93)*
20- Pizza	5533 (74.10)	0.64	873 (11.70)	0.74	1057 (14.20)	0.71	0.64 (0.54-0.75)*	0.72 (0.62-0.83)*

*Indicated significant comparisons at $P<0.05$ resulted from Chi-square test. [ǀ]Olovieh is a kind of fast food including mixture of mashed potato, mashed boiled eggs, chicken breast and mayonnaise; gheime stew is national Iranian food including mixture of crushed potatoes, meat, Cotyledon and crushed onions and some spices; ghorme sabzi stew is national Iranian food including mixture of crushed some vegetables, red beans, meat and fried onion which are cooked with them. [‡]Medians of frequency of daily food consumption. †Odds ratio, *P*=Preference, N=No preference, FGIDs=Functional gastrointestinal disorders

Assessment of gastrointestinal symptoms

Participants were asked to report the detailed information on the exact gastrointestinal symptoms they experience after consuming each of the 106 food items. The relevant questionnaire on this term, included responses such as: nausea, vomiting, constipation, diarrhea, bloating, headache and dizziness.

Other variables

Data on gender, age, height, weight and waist circumference (WC), marital status and pregnancy in women were provided by the use of self-reported questionnaire. BMI was calculated by dividing weight in kilograms by height in meters squared. Based on data on smoking habits, Subjects were categorized as smokers and non-smokers. General Practice Physical Activity Questionnaire (GPPAQ) was used to assess physical activity levels of study participants. Participants were asked to report their activities based on questions in GPPAQ.[19] Then participants were classified into two categories: active and inactive. History of any predisposing chronic diseases including diabetes mellitus and cardiovascular diseases was asked.

Statistical analysis

Quantitative and categorical variables have been reported as mean ± standard deviation (SD) and frequency (percentage). Chi-square test and analysis of variance were used for comparing the categorical and quantitative variables between groups of people who liked, disliked or had intolerance to the food items due to gastrointestinal disorders, respectively. The odds ratio and 95% confidence interval (CI) for odds ratio for evaluating the odds of preferring of each food item compared with no-preference and intolerance due to gastrointestinal disorders. All statistical analyses were performed by using SPSS version 16 (SPSS Inc., Chicago, IL, USA).

Results

In order to examine the distribution of individuals among categories of food preferences, participants were asked to report their feelings (liking, disliking, gastrointestinal

symptoms) about 106 dish-based food items. Across the whole sample, we found that the five most well-liked items were yogurts, date, candy, tea, citrus fruits. In the no preference category, the five most disliked included: canned foods, porridge (sweets), yogurts stew (yogurts and sugar), sausages, kalbas, chips. Furthermore, the 10 food items which were not preferred because of gastrointestinal symptoms were ash (vegetables, legumes and carbohydrate), olovieh (boiled potato, eggs, mayonnaise and kalbas), broth (meat and legumes), canned beans, milk, raw onion, gheime stew (legumes and meat), ghorme sabzi stew (legumes, vegetables and meat), pickles and macaroni. Results of Chi-square for goodness of fit test revealed that there was a significant difference in distribution of subjects in 3 categories (P value <0.05 for all significantly distributed food items). Results of analysis of for 20 out of 106 food items are randomly presented in Table 1.

Table 1 presents the distribution of individuals' medians of frequency of daily food consumption for 10 of 106 food items according to food preference categories. In most of the food items, there was a significant difference in food consumption between liking and disliking categories (P value <0.05 for all significantly distributed food items). However, in food items such as chicken roast, cucumber, salad and ghorme sabzi stew we didn't observe any significant difference in food intakes between liking and disliking categories. Furthermore, in most of the food items, there was a significant difference in food consumption between preference and gastrointestinal symptoms (P value <0.05 for all significantly distributed food items). However, in food items such as croquette (rice, meat and vegetables), sugar, candy, walnut, raisins and barbary bread no significant difference was found in food intakes between preference and gastrointestinal symptoms categories.

The ten most consumed food items in the preference category included: strawberries, banana, plum, kashk (condensed yogurt), yoghurt, citrus fruits, and sangak bread (a kind of whole grain product), biscuit, sugar and chocolate.

The 10 least consumed food items in the preference category included: shole zard (rice and sugar), porridge, yogurt stew, gushfeel (sweaty foods), kale pache (fatty meat and viscera), beryani (fatty meat), canned beans, ash, dried berries and lentils stew.

The least consumed food items in the no preference category were due to subjects' dislike towards food items rather than gastrointestinal symptoms except from food items such as macaroni, ghorme sabzi, peas and eggplant stew, broth and olovieh. The presented ORs for food items in Table 1 show that they are mostly less preferred due to dislike or gastrointestinal intolerability (OR <1, P value <0.05, for all significantly distributed food items).

Table 2: Distribution of demographic variables (gender, pregnancy status, age, smoking status, physical activity, BMI, WHR and diseases for each food item among categories of food preferences, no preference and gastrointestinal symptoms

No.	Sex					Pregnancy					Age				
	P		*N*		FGID	*P*		*N*		FGID	*P*		*N*		FGID
1	41.60%	58.40%	32.50%	67.50%	41.40%	58.60%	97.40%	2.60%	96.70%	3.30%	98.10%	1.90%	36.8±8.1	37.6±9.2	37.8±8.4
2	41.40%	58.60%	43.40%	56.60%	56.60%	43.40%*	97.50%	2.50%	93.60%	6.40%	96.30%	3.70%*	36.8±8.1	37.0±9.5	39.0±8.7*
3	41.50%	58.50%	39.60%	60.40%	52.50%	47.50%*	97.70%	2.30%	93.80%	6.20%	95.70%	4.30%*	36.9±8.1	35.3±8.4	37.1±8.1*
4	43.40%	56.60%	34.30%	65.70%	35.50%	64.50%*	97.20%	2.80%	99.50%	0.50%	97.20%	2.80%	36.7±8.1	36.0±9.0	38.1±7.9*
5	41.70%	58.30%	63.10%	36.90%	39.00%	61.00%*	97.50%	2.50%	100.00%	0.00%	96.50%	3.50%	36.7±8.2	37.3±8.8	37.6±7.9*
6	41.00%	59.00%	58.00%	42.00%	36.80%	63.20%*	97.30%	2.70%	96.50%	3.50%	97.30%	2.70%	36.6±8.1	36.3±8.6	38.2±7.7*
7	41.60%	58.40%	41.60%	58.40%	46.60%	53.40%	97.50%	2.50%	96.30%	3.70%	97.40%	2.60%	36.8±8.1	35.6±8.4	38.6±7.9*
8	40.40%	59.60%	61.70%	38.30%	48.30%	51.7%*	97.20%	2.80%	99.20%	0.80%	98.30%	1.700%	36.7±8.1	37.4±9.0	38.5±7.9*
9	42.40%	57.60%	33.70%	66.30%	35.80%	64.2%*	97.40%	2.60%	96.40%	3.60%	95.20%	4.80%	36.8±8.1	36.3±8.6	37.8±8.9
10	39.30%	60.70%	60.70%	39.30%	34.10%	65.9%*	97.50%	2.50%	95.60%	4.40%	97.40%	2.60%	36.1±8.0	39.6±8.5	36.6±7.5*

Table 2: Contd...

No.	Smoking									Physical Activity					
	P			*N*			FGID			*P*			*N*		FGID	
1	90.60%	4.40%	5.00%	87.20%	4.60%	7.80%	83.20%	14.60%	2.10%*	65.40%	34.60%	34.60%	34.10%	74.80%	25.20%
2	90.60%	4.90%	4.40%	85.10%	6.40%	8.50%	82.80%	13.80%	3.40%*	65.60%	34.40%	62.90%	37.10%	68.60%	31.40%
3	90.50%	5.20%	4.4%	87.20%	5.20%	7.70%	79.70%	16.30%	4.01%*	65.40%	34.60%	64.20%	35.80%	71.10%	28.90%
4	90.4%	5.00%	4.60%	89.20%	5.20%	5.60%	89.20%	6.80%	4.20%	64.60%	35.40%	62.80%	37.20%	70.80%	29.2%*
5	90.70%	5.00%	4.30%	78.50%	7.20%	14.40%	78.50%	6.40%	4.40%*	64.70%	35.30%	61.10%	38.90%	70.80%	29.2%*
6	90.7%	4.80%	4.50%	87.20%	7.30%	5.50%	88.90%	7.10%	4.00%*	65.00%	35.00%	63.70%	36.30%	69.70%	30.3%*
7	4.90%	90.90%	4.10%	5.60%	87.70%	6.70%	7.00%	88.20%	4.80%*	65.00%	35.00%	67.00%	33.00%	69.80%	30.20%
8	4.80%	90.90%	4.30%	10.70%	81.90%	7.50%	8.40%	85.00%	6.60%*	65.30%	34.70%	61.90%	38.10%	70.40%	29.60%
9	5.10%	90.50%	4.50%	5.80%	89.40%	4.80%	11.60%	86.00%	2.3%*	64.80%	35.20%	73.30%	26.70%	69.10%	30.9%*
10	4.30%	91.80%	3.90%	8.40%	83.40%	8.30%	6.10%	90.50%	3.4%*	65.10%	34.90%	63.10%	36.90%	70.50%	29.5%*

Table 2: Contd...

No.	BMI			WHR			Disease[I]								
	P	*N*	FGID	*P*	*N*	FGID	*P*			*N*			FGID		
1	24.9±4.1	24.2±4.1	25.7±3.9*	0.88±0.20	0.88±0.22	0.93±0.15	70.30%	21.60%	8.00%	63.00%	25.90%	11.10%	53.10%	34.40%	12.50%
2	24.9±4.0	24.8±4.5	25.8±4.9*	0.88±0.21	0.87±0.16	0.92±0.13	70.40%	21.60%	8.00%	72.20%	22.20%	5.60%	59.30%	25.40%	15.30%
3	25.0±4.10	23.9±3.90	25.5±4.2*	0.88±0.20	0.86±0.17	0.93±0.20*	70.50%	21.70%	7.80%	67.20%	16.40%	16.40%	60.00%	29.10%	10.90%
4	24.9±4.0	23.8-3.90	25.7±4.3*	0.89±0.19	0.87±0.22	0.88±0.15	75.40%	18.20%	6.40%	62.10%	27.60%	10.30%	53.70%	32.20%	14.1%*
5	24.9±4.0	24.1-3.90	25.4±4.0*	0.88±0.19	0.91±0.23	0.90±0.23	74.90%	18.80%	6.30%	59.00%	30.80%	10.30%	54.70%	31.40%	13.9%*
6	24.9±4.1	24.4±4.10	25.3±3.9*	0.88±0.18	0.90±0.28	0.89±0.15	76.30%	17.70%	6.00%	66.00%	21.00%	13.00%	52.60%	34.20%	13.2%*
7	24.9±4.0	24.1±3.90	25.5±4.8*	0.88±0.19	0.89±0.22	0.91±0.29*	73.80%	19.80%	6.40%	60.60%	23.90%	15.50%	51.00%	35.20%	13.8%*
8	24.9±4.0	24.7±4.10	25.3±4.0	0.88±0.19	0.88±0.19	0.90±0.28	71.50%	20.40%	8.10%	75.00%	20.00%	5.00%	47.00%	35.90%	17.1%*
9	25.0±4.0	24.7±4.5	24.9±4.1	0.88±0.19	0.87±0.18	0.93±0.43	70.90%	21.50%	7.50%	72.10%	19.80%	8.10%	34.80%	34.80%	30.4%*
10	24.8±4.0	25.1±4.5	25.2±3.8	0.88±0.18	0.92±0.25	0.88±0.22*	77.00%	17.40%	5.50%	63.40%	28.60%	8.00%	52.60%	29.70%	17.7%*

*Indicated significant comparisons at $P<0.05$ resulted from Chi-square test for categorical data and analysis of variance (ANOVA) for continuous variables. [I]Diseases included cardiovascular disease, digestive symptoms and diabetes mellitus, BMI=Body mass index, WHR=Waist to hip ratio, *P*=Preference, N=No preference, GS=Gastrointestinal symptoms. P=Preference, N=No preference, FGIDs=Functional gastrointestinal disorders

Table 2 represents the results of comparing the demographic variables across categories of people who liked, disliked or had intolerability due to gastrointestinal disorders. Age-related differences were found in most food items except from food items such as canned bean, beaten roast, chicken roast, fish, sugar, chocolate, yoghurt, walnut coffee and banana. In most of the food items, older subjects showed more gastrointestinal symptoms significantly. Furthermore, most of the disliked status were occurred at a younger age except from macaroni, snacks, sandwiches, citrus fruit and chips. BMI-related differences were found for 3 categories of food items such as cakes, chips, boiled potatoes, sweets, sausages, red sauce and chicken roast. Although, no BMI-difference was found between 3 categories for some foods such as honey and fish. Results showed that subjects who preferred beryani, kale pache and halva shekari (sweet food from sesame and sugar) had higher BMI in comparison with those who disliked them. In some food items such as olovieh, broth, egg and snacks, we found a significant WHR-related difference between 3 categories (P value <0.05 for all significantly distributed food items). Subjects with biscuit preference had higher WHR. In addition, subjects with gastrointestinal symptoms for food items such as salad, citrus fruits, legumes and tea were higher in WHR.

Results of Chi-square test revealed that among pregnant and no pregnant women, there was a significant difference in preference toward chocolate, beryani, viscera, sweets and French fries. We found smoking-related differences between 3 categories in food items such as sweets, French fries, cakes, chips and pickles (P value <0.05 for all significantly distributed food items).

Gender-related differences between categories were detected in pickles, honey, and sugar and halva shekari. Women reported more gastrointestinal symptoms towards soup. In addition, women reported more dislike towards tuna and egg. However, men reported more dislike toward macaroni and snacks.

Smoking is also associated with food preference. Our results revealed that smokers disliked some food items such as banana, citrus fruits, salad, legumes and dairy products (dough and curd). The most liked food items among smokers included: sugar, jams, halva shekari, chocolate, yoghurt stew, candy, ice cream (sweets), kale pache, viscera, butter and cream (fatty foods). Disease-related differences in most food items were found between 3 categories, except from items such as jams, candy and biscuit.

Table 3 represents the number of food items which reported by study population as intolerable among men and women separately. Results revealed that 14.9, 8.9, 5.8, 5.1, 4.9 and 3.8% of the men reported intolerability for 0, 1,2,3,4 and 5 food items, respectively. In addition, 10.5, 7.8, 5.4, 4.2, 3.8 and 4.1% of the women showed intolerability for 0, 1,2,3,4 and 5 food items, respectively, suggesting that women experience more food intolerability significantly higher than men (P value <0.05 for all significantly distributed food items).

Discussion

Across the whole sample and regardless of genders, the five most liked food items were yogurts, date, candy, tea, citrus fruits. Presence of yogurts, fruits, vegetables like onion and tea in the list of the five most preferred food items, were representative of healthy dietary pattern in this population. In addition, presence of canned foods, porridge, yogurts stew, sausages, kalbas and chips in the list of the 10 most disliked food items affirmed the assumption. It should be noted that the five food items which are not preferred because of generating "gastrointestinal symptoms" are ash, olovieh, broth, canned beans, milk, raw onion. It should be considered that some food items such as milk and onions would not be dismissed in the subjects' dietary basket.

Whether preference status could affect the participant's food consumption is of great importance. In most of the food items, there was a significant difference in food consumption between liking and disliking and gastrointestinal" categories. Our result is in accordance with another research by Sukalakamala, *et al*.[20] Gender- and age-related differences were also important variables to be considered. These findings challenged the idea that food preferences may differ in men and women in some special food items. Women reported higher percentage of preference to food items than men. For instance, women liked pizza, sandwiches, macaroni, snacks and halva more than men. Moreover, in most of the food items, men reported less gastrointestinal symptoms rather than women. The food items with the most reported gastrointestinal symptoms among women were viscera (animal's organs), croquette and date. Our results, to some extent, explained the women's preferences to harmful food items. In a study by Ansari *et al.*, gender differences were observed suggesting that men had better adherence for sweets, cake/cookies, snacks, and raw vegetables but not for fast food/canned food or cooked vegetables.[21]

Whether food preferences predict current dietary intake is a disputable issue. The relation between food preferences and

Table 3: The frequency distribution of number of food items that men and women (percentage) reported as no preference due to gastrointestinal disorders

Number of food intolerability[I]	0	1	2	3	4	5	6	7	8	9	10	11
Men	14.9%	8.9%	5.8%	5.1%	4.9%	3.8%	4%	3%	2.8%	3.1%	2.6%	41%
women	10.5%	7.8%	5.4%	4.2%	3.8%	4.1%	3.5%	3%	3.5%	3%	2.9%	48.5%

[I]Food intolerability is defined as gastrointestinal symptoms and complaints

reported food consumption is stronger in adolescents than in adults, and can be influenced by attitudinal, social, and economic variables such as income.[5] Furthermore, subjects in this study were health system workers, so their food consumption pattern may be healthier than the reported food preferences.

Results revealed that in most of the food items, gastrointestinal symptoms increased significantly among older rather than younger subjects which is inconsistent with a study by Hee Han *et al.* who reported that irritable bowel syndrome (IBS) were more prevalent in younger subjects in a Korean population.[22] Furthermore, most of the disliked status were occurred at a younger age except from macaroni, snacks, sandwiches, citrus fruit and chips. A study by Wansink revealed that younger people preferred more snack-related comfort foods compared to those over 55 years of age.[23]

BMI-related differences were found for food items such as cakes, chips, boiled potatoes, sweets, sausages, red sauce and chicken roast. Results showed that subjects who preferred beryani, kale pache and halva shekari had higher BMI in comparison with those who disliked them. Subjects with biscuit preference had higher WHR which is consistent with a study by Ghosh et el who demonstrated that sweets and fried snacks consumption were positively and significantly related with all central obesity measures.[24] In addition, subjects with gastrointestinal symptoms for food items such as salad, citrus fruits, legumes and tea had higher WHR.

Food preferences and dietary patterns during pregnancy have attained a great deal of clinical attention. The current study suggested that food preferences differed during pregnancy. In consistent with some researches, our result showed that pregnant women, regardless of the trimesters, reported dislike for sweet-tasting food items.[5] This is inconsistent with another research suggesting that pregnant women like and consume more of sweet-tasting food items during the second trimester.[12] Our result also elicited the fact that there was dislike for food items such as chocolate, French fries, beryani and chicken. In accordance with a study by Bayleya, *et al*. high protein dishes and caffeine-containing sources were the most disliked items among pregnant.[25] The reason why pregnant women disliked the mentioned food items may be related to nausea and vomiting they experience or it may attribute to the fact that women in this study were all graduated and aware of the consequences of consuming fatty meals. Women's awareness of the adverse consequences of consuming caffeine-containing sources (chocolate), fatty foods (French fries, beryani) and sweets, may have restrained them to like and consume these food items.

Smoking is also associated with food preference. Our results revealed that smokers disliked some food items such as banana, citrus fruits, salad, legumes and dairy products (dough and curd). These results support data showing that smokers are less likely to consume dairy products and vegetables than nonsmokers. In addition, our results showed that smokers preferred more sweets and fatty foods rather than healthy foods. According to a study by Wilson *et al.*, it may possibly be due to nicotine-induced changes in metabolism or lifestyle changes in smokers.[26]

Above all, it important to detect the number of not preferred food items among the population (dislike and gastrointestinal symptoms). The results of this study revealed that a number of people of both genders showed intolerability to several food items which could adversely affect their nutrient intake. Being aware of the people's food preferences, the dieticians are likely to be more cautious about their food recommendations. It seems to be vital for dieticians to seek for the alternative food items (in case of intolerability to several food items) in order to prevent low intake of essential nutrients.

There are some limitations in the study that should be mentioned. The present research is conducted within the framework of the Study on the Epidemiology of Psychological, Alimentary Health and Nutrition (SEPAHAN). The results therefore may not be necessarily representative for the whole population. Children, adolescents and the elderly are not considered in this study. Future studies should include a broader representation in other areas of Iran and for all ages. In addition, we didn't classify the food items into food categories to assess the preference status for food categories.

We assessed food preferences for 106 commonly consumed dish-based food items rather than focusing on food categories like fruits, dairy products and vegetables[27] or only a few foods.[28] Another strength of the current study is its high sample size. Furthermore, the participants were all lettered so their reporting were precise enough. The current study is the first one in Iran discussing on food preferences. This study is unique because we assessed food preferences for 106 national commonly consumed dish-based food items.

Detailed research is required to determine the exact sources of preferences such as texture, taste, smell, previous experience, visual appearance, temperature, physiological consequences (nutritional value, satiety; anticipated reactions like allergic reactions; health), and functional aspect (innovation, variety and price).

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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