

DOES FRUIT AND VEGETABLE INTAKE DIFFER IN ADULT FEMALES AND MALES IN ISFAHAN?

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Abstract

INTRODUCTION: Adequate intake of fruits and vegetables (at least five servings a day) is recommended as a nutritional behavior of great importance in prevention of chronic diseases. This study aimed to compare the intake of fruits and vegetables in adult males and females of Isfahan and to assess its association with personal and demographic factors, as well as seasons.

METHODS: This cross-sectional study was performed on 123 healthy adults (64 males and 59 females) during the cold season (fall and winter) and warm seasons (spring and summer). Study samples were aged 30 to 60 years and were residents of Isfahan. Fruit and vegetable consumption was assessed using a 110-item semi-quantitative food frequency questionnaire on fruits and vegetables. Validity of the questionnaire was evaluated in a pilot study through comparison with two 24-hour food recalls and four food diaries. Mean consumption of fruits and vegetables was analyzed in males and females, as well as in age and educational groups. The relationship between the amount of fruit and vegetable consumption and different factors including age, sex, level of education and occupation was determined through stepwise linear regression.

RESULTS: Mean fruit consumption in men and women in cold seasons was 275.3 ± 100.8 and 234.5 ± 116.5 grams per day, respectively ($P < 0.05$), and in warm seasons 217.6 ± 95.5 and 185.3 ± 77.1 grams per day, respectively ($P < 0.05$). Vegetable consumption in men and women in cold seasons was 291.5 ± 93.5 and 245.7 ± 76.6 grams per day, respectively ($P < 0.05$) and in warm season 197 ± 76.3 and 166.4 ± 60.7 grams per day, respectively ($P < 0.05$). The proportion of men who consumed more than 5 servings of fruits and vegetables in a day was significantly greater than women ($P < 0.05$). Fruit and vegetable intake in men educated below junior school and high school was significantly higher than in their female counterparts ($P < 0.05$). Fruit and vegetable intake in single men was significantly lower than in their female counterparts ($P < 0.05$).

DISCUSSION: The findings show the effectiveness of social and cultural factors on the pattern of fruit and vegetable intake.

Keywords • Fruits • Vegetables • Gender • Adults • Isfahan • Food frequency questionnaire

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Introduction

Chronic diseases, including cardiovascular diseases, cancers, diabetes and hypertension are among the leading causes of mortality worldwide.¹

Cardiovascular diseases, accidents, and cancers are the top causes of death in Iran, respectively.² Mortality due to chronic diseases has been found to have a rising trend in Iran.³⁻⁴

Ischemic heart disease and strokes account for 31% and 11% of 2.7 million deaths occurring due to chronic diseases each year.⁵

Unbalanced nutrition, including inadequate intake of fruits and vegetables is considered as important underlying factors. Increasing daily intake of fruits and vegetables to five servings (at least 400 grams a day, excluding potatoes) is regarded as an important nutritional intervention for prevention of chronic diseases.⁶⁻¹² This is similar to the amount of fruit and vegetable intake in Mediterranean countries.¹³ Despite the presence of clear evidence supporting the protective effects of fruits and vegetables, they are still consumed in inadequate amounts in developed and developing countries.¹⁴

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Based on data on fruit and vegetable consumption in twenty-one countries (mainly developing nations), fruit and vegetable intake meets the minimum WHO recommended amount only in 3 countries.¹⁴ Studies have shown that fruit and vegetable consumption has a significant positive association with various socioeconomic factors, including level of education, age, marital status, and income.¹⁵

Gender has also been proposed as a factor affecting the amount of fruit and vegetable intake; women's consumption of fruits and vegetables is generally higher than men's.^{15,16} Higher levels of nutritional knowledge,^{17,18} women's greater desire towards healthy and low-calorie diets, and differing tastes of the two genders are held to account or this difference.^{19,20}

Women's overall food intake is less than men's. There is some evidence suggesting that the difference between fruit and vegetable intake in the two genders forms in early childhood.²¹ The per capita net consumption of fruits and vegetables in urban areas of Iran has been estimated at 169 g and 239 g per day, respectively.²² This amount is significantly lower in low-income deciles of the country.²³ However, there has not yet been an accurate assessment of the amount of fruit and vegetable intake in Iranians according to age, sex, and socioeconomic status. The existing assessments are limited to household per capita consumption.^{22,23}

The present study aimed to assess and compare the amount of fruit and vegetable consumption in adult male and female residents of the city of Isfahan and to determine the effect of some individual, social and demographic factors (i.e. age, marital status, education, occupation) as well as seasons on the intake of these food groups.

Materials and methods

This descriptive analytic study was conducted as part of a research project to assess the reliability of a food frequency questionnaire to evaluate the amount of fruit and vegetable intake in fall/winter 2004, and spring/summer 2005. The samples included individuals aged between 30 and 60 years residing in the city of Isfahan, who were non-diabetic and had no history of cardiovascular, renal, thyroidal, hematological, or mental diseases. Cigarette smokers, those on special diets or receiving vitamin supplements, and pregnant or breast-feeding women were excluded. The study samples were selected using the randomized-cluster method from amongst urban residents of the city of Isfahan who were samples of Isfahan Healthy Heart Program (IHHP).

As participation rate was nearly 30% and the sample did not reach the expected number, 56 subjects were selected from healthy individuals attending clinics of Isfahan Cardiovascular Research Center. Overall, the study samples in fall/winter and spring/summer numbered 123 (64 men and 59 women) and 101 of the same samples (53 men and 48 women), respectively.

Assessment of fruit and vegetable consumption was performed using a 110-item food frequency questionnaire (FFQ) completed through interviews. Number of intakes of every fruit and vegetable item during the past month was determined as "... times per day", "... times per week", "... times per month", "rarely", and "never". The amount of consumption per serving was also questioned.

Household units, such as ordinary glasses and tablespoons were used to determine the share of each vegetable or fruit item in the subject's daily food intake. To determine the amount of intake based on food frequency, all intake frequency figures were converted and expressed as "times per day". The frequency of daily intake (times per day) was then multiplied by the serving size. The amount of every individual's intake of fruits and vegetables was calculated by adding these figures based on the food frequency questionnaire. Face and content validity and practicability of the questionnaire were determined through a pilot study on 30 samples. The correlation coefficient for the amount of fruit and vegetable intake compared to the average of three 24-hour food recalls was $r=0.65$ and $r=0.58$ ($P<0.05$), respectively.

Statistical analysis: Data analysis was performed using SPSS 11.5. Average fruit and vegetable intake in the two sexes and in the two age groups of 30-44 and 45-60 years was compared with Student's t-test.

Comparison of different educational groups (junior school and lower, high school, university) was performed by analysis of variance test. Comparison of the frequency of men and women who took five or more servings of fruits and vegetables a day was performed by χ^2 test. The correlation between the amount of fruit and vegetable intake and various factors including age, sex, level of education, marital status, and occupation was analyzed using multivariate regression test within four statistical models. The variables sex, sex/education, sex/education/marital status and sex/education/marital status/age were entered into statistical models 1, 2, 3 and 4, respectively. This study deals with net intake of fruits and vegetables. P values below 0.05 were considered as significant.

Results

One-hundred and twenty-three samples (64 males and 59 females) and 101 of the same samples (53 males and 48 females) were studied in fall/winter and spring/summer, respectively. Table 1 shows the characteristics of the subjects, including age, weight, height, body mass index (BMI) by sex, seasons, and frequency distribution of the subjects according to level of education and marital status. Table 2 compares mean daily intakes of fruits and vegetables in women and men. Mean overall consumption of fruits and vegetables, separately and totally, was higher in both cold and warm seasons in men ($P<0.05$).

Citrus fruits, vegetables and onions in fall/winter, and leafy vegetables and potatoes in spring/summer were consumed in significantly higher amounts by men ($P<0.05$). However, in spring/summer, women's mean consumption of citrus fruits was significantly higher than men's ($P<0.05$).

Table 3 compares the amount of fruit intake in men and women according to age, education, marital status, and season. The male and female subjects were not significantly different in any of the age groups under study in respect of fruit intake. Nonetheless, in fall and winter, men with high school education, as well as junior school education and lower, had significantly higher fruit intakes than women ($P<0.05$); in spring and summer, men with high school education consumed significantly higher

amounts of fruit than women ($P<0.05$). Mean intake of fruit in married men was significantly higher than women in the two seasons ($P<0.01$). In spring and summer, mean fruit intake in single men was significantly less than women ($P<0.05$). Table 4 compares the amount of vegetable intake according to age, education, marital status and season. This difference was not significant in different age groups. However, in different educational groups in fall and winter, men with high school education, as well as those with junior school education and lower consumed significantly greater amounts of vegetables than women ($P<0.05$). In spring and summer, mean consumption of vegetables in married men and single women was higher than married women and single men, respectively ($P<0.05$).

Tables 3 and 4 represent a comparison of daily fruit and vegetable consumption between two age groups and at different educational levels, respectively.

Comparison showed that daily consumption of fruits and vegetables is greater in older age groups, with the exception of men's vegetable intake in spring and summer ($P<0.05$). Daily fruit and vegetable intake of subjects with university education was significantly higher than the other two groups ($P<0.05$).

Married men and single women consumed significantly greater amounts of fruits and vegetables compared to single men ($P<0.05$).

TABLE 1. Characteristics of men and women under study in Isfahan according to season

	Spring/Summer		Fall/Winter	
	Women (n=48)	Men (n=53)	Women (n=59)	Men (n=64)
	Mean \pm SD*		Mean \pm SD	
Age (years)	41 \pm 8.4	41.1 \pm 8	40.2 \pm 8.2	41.6 \pm 8.1
Weight (kg)	62.3 \pm 10.5	73.7 \pm 9	62.5 \pm 9.9	74.7 \pm 8.3
Height (cm)	159.1 \pm 5.4	174.9 \pm 6	159.8 \pm 5.6	174.5 \pm 5.5
BMI (kg/m ²)	24.6 \pm 4.2	24.1 \pm 2.7	24.5 \pm 4	24.6 \pm 2.7
Education	N (%)	N (%)	N (%)	N (%)
Primary/Junior school	18 (37.5)	6 (11.3)	21 (35.6)	8 (12.5)
High school/high school diploma	13 (27.1)	30 (56.6)	18 (30.5)	21 (56.3)
Higher school/Bachelor's and higher	17 (35.4)	17 (32.1)	20 (33.9)	20 (31.3)
Marital status				
Married	33 (68.8)	47 (88.7)	45 (76.3)	56 (87.5)
Single	15 (31.2)	6 (11.3)	14 (23.7)	8 (12.5)

*SD: Standard Deviation

TABLE 2. Comparison of daily intake of fruits and vegetables in adult males and females in Isfahan (winter)

	Spring/Summer			Fall/Winter		
	Women Mean \pm SD*	Men Mean \pm SD	P value	Women Mean \pm SD	Men Mean \pm SD	P value
Fruits (g/day)						
Total	185.3 \pm 77.1	217.6 \pm 95.5	0.03	234.5 \pm 116	275.3 \pm 100.8	0.04
Citrus fruits	6 \pm 7.3	3.5 \pm 4	0.03	245.7 \pm 76.6	291.5 \pm 93.5	0.049
Melons	127.9 \pm 60.3	163.2 \pm 70.1	0.008	105.9 \pm 70.7	125.1 \pm 66.5	NS**
Other fruits	111.7 \pm 58.7	124.9 \pm 6.5	NS	7.1 \pm 20.5	4.8 \pm 11.5	NS
Dried fruits	5.7 \pm 8	4.6 \pm 3.2	NS	4.8 \pm 15	6.6 \pm 3.7	NS
Natural juice	16.2 \pm 19.3	18.15 \pm 14.5	NS	12.6 \pm 19.2	14.1 \pm 17.6	NS
Industrial juice	14.1 \pm 19.5	15.9 \pm 20.4	NS	5 \pm 14.4	7.8 \pm 31.5	NS
Vegetables (g/day)						
Total	166.4 \pm 60.7	197 \pm 76.3	0.03	245.7 \pm 76.6	291.5 \pm 96.5	0.009
Root, bulb, or tuberous vegetables	8 \pm 6.8	10.4 \pm 9.4	NS	25 \pm 29.9	32.7 \pm 29.6	NS
Leafy vegetables	19.9 \pm 10.8	29.3 \pm 17.3	0.002	40.4 \pm 21.2	42 \pm 22.4	NS
Non-leafy vegetables	118.7 \pm 51	135.5 \pm 62.3	NS	97.4 \pm 57.8	107.3 \pm 70.8	NS
Onions	19.2 \pm 8.3	21.7 \pm 13.5	NS	20.4 \pm 11.5	32.9 \pm 17.9	0.000
Potatoes	8.8 \pm 0.3	16.8 \pm 14.3	0.002	16.3 \pm 16.1	19.7 \pm 15.4	NS
Dried vegetables	0.4 \pm 0.4	0.3 \pm 0.4	NS	0.5 \pm 0.8	0.4 \pm 0.5	NS
Various pickles	1.8 \pm 2.9	1.9 \pm 2.8	NS	2.9 \pm 3.3	2.6 \pm 6.6	NS
Fruits/Vegetables (Total: g/day)	412.1 \pm 101	488.5 \pm 134.1	0.002	419.8 \pm 153.8	429.9 \pm 140.4	0.007

*SD: Standard Deviation

**NS: non-significant

TABLE 3. Comparison of the amount of fruit consumption (grams per day) according to age, education, marital status and season in adult males and females in Isfahan

	Spring/Summer			Fall/Winter		
	Women (n=48) Mean \pm SD*	Men (n=53) Mean \pm SD*	P value	Women (n=59) Mean \pm SD*	Men (n=64) Mean \pm SD*	P value
<i>Age group (years)</i>						
30-44	235 \pm 80.4	284 \pm 102.3	NS	207.6 \pm 108.6	251.3 \pm 70.3	NS
45-60	271.8 \pm 60.8	308.9 \pm 68.8	NS	243.6 \pm 118.8	285.3 \pm 110.3	NS
<i>Education</i>						
Primary & Junior school	252.5 \pm 79.6	288 \pm 75.9	NS	222.3 \pm 116.9	259.2 \pm 96.1	0.04
High school/high school diploma	219.1 \pm 75.7	272.7 \pm 88.6	0.01	211 \pm 94.4	288.2 \pm 96.1	0.01
Higher school & above	257.9 \pm 74.6	312.3 \pm 98.5	NS	256.9 \pm 66.2	288.5 \pm 103.9	NS
<i>Marital status</i>						
Married	244.8 \pm 73.8	301.6 \pm 89.2	0.004	242.6 \pm 125.5	283.9 \pm 98.9	0.04
Single	288.7 \pm 55.4	212.3 \pm 95.2	0.04	219.3 \pm 82.4	215 \pm 98.5	NS

*SD: Standard Deviation

**NS: non-significant

TABLE 4. Comparison of the amount of vegetable intake (grams per day) according to age, education, marital status and season in adult males and females in Isfahan

	Spring/Summer			Fall/Winter		
	Women (n=48) Mean ± SD*	Men (n=53) Mean ± SD*	P value	Women (n=59) Mean ± SD*	Men (n=64) Mean ± SD*	P value
<i>Age group (years)</i>						
30-44	157.8±64.1	195.8±79.4	NS	181.2±81.3	207.9±95	NS
45-60	169.6±60	199.7±70	NS	197.2±64.2	240.5±95.2	NS
<i>Education</i>						
Primary & Junior school	153.9±71.2	153.1±33.5	NS	155.6±66.2	193.5±78.6	0.03
High school/high school diploma	164.8±61.9	197.5±83	0.04	182.9±77	213.9±98.1	0.04
Higher school & above	183.3±43.8	201.5±73.6	NS	203.6±94.1	223.9±96.9	0.1
<i>Marital status</i>						
Married	161.4±62	197.7±79.9	0.03	185.5±77.8	218.8±97.3	NS
Single	191.2±42.9	163.7±65.7	0.04	209±87.3	172.3±79.8	0.03

*SD: Standard Deviation

**NS: non-significant

TABLE 5. Comparison of the percentage of men and women consuming five or more daily servings of fruits and vegetables, according to age, education, marital status and season in Isfahan

	Spring/Summer			Fall/Winter		
	Women (n=48) Mean ± SD*	Men (n=53) Mean ± SD*	P value	Women (n=59) Mean ± SD*	Men (n=64) Mean ± SD*	P value
<i>Age group (years)</i>						
30-44	8.6	35	NS	30	46.7	NS
45-60	8.6	43.8	0.04	26.7	58	0.007
<i>Education</i>						
Primary & Junior school	5.6	50	0.04	33.3	37.5	NS
High school/high school diploma	7.7	33.3	NS	38.9	52.8	NS
Higher school & above	11.8	41.2	NS	25	50	NS
<i>Marital status</i>						
Married	6.1	40.4	0.000	31.1	51.8	0.03
Single	22.2	16.6	NS	30	37.5	NS

*SD: Standard Deviation

**NS: non-significant

TABLE 6. Correlation between intake of fruits and vegetables and sex (model 1), sex & education (model 2), and sex, education & age (model 3) in adult males and females in Isfahan

	Model I Sex	Model II Education/Sex	Model III Education/Sex Marital status	Model IV Education/Sex Marital status/Age
	β	β	β	β
Fall/Winter				
Sex	** -0.3	*** - 0.27	*** -0.3	
Education		*** 0.2	*** 0.2	
Marital status			*** 0.3	
$r^2 \div$ adjusted r^2	0.09 \div 0.8	0.13 \div 0.12	0.20 \div 0.18	
Spring/Summer				
Sex	** - 0.3	*** -0.3	*** -0.3	*** -0.3
Education		*** 0.3	*** 0.3	*** 0.3
Marital status			***0.29	*** 0.2
Age				*** 0.2
$r^2 \div$ adjusted r^2	0.1 \div 0.09	0.17 \div 0.15	0.21 \div 0.19	0.28 \div 0.27

*P Value<0.05

**P Value<0.01

***P Value<0.001

Table 5 shows the frequency of women and men with intakes of more than five servings of fruits and vegetables per day, according to age, education and marital status. As can be observed, the difference was significantly greater in men of older age groups, compared to women ($P<0.01$). Comparisons based on the level of education showed that only in subjects with junior school education and lower in spring and summer, was the percentage of men consuming larger amounts of fruits and vegetables greater than women ($P<0.05$). The percentage of married men consuming five or more servings of fruits and vegetables daily was higher than women ($P<0.05$), whereas no such significant difference could be observed in single subjects.

In fall/winter, the frequency of men and women consuming less than one serving of fruits daily was 3.1% and 11.9%, respectively; the figures for spring/summer were 1.9% and 10.4%, respectively.

In fall/winter, the frequency of men and women consuming less than one serving of vegetables daily was 4.7% and 3.4%, respectively; the figures for spring/summer were 7.5% and 8.3%, respectively. This difference was not significant according to sex.

Table 6 shows linear correlations for the overall amounts of fruit and vegetable consumption in different statistical models.

There was a significant relationship between sex and consumption of fruits and vegetables in all statistical models. In model 1, fruit and vegetable intake has a significant correlation with the male sex ($r^2=0.08$, $P<0.01$, $\beta=0.3$). In model 2 which included the level

of education, the amount of daily fruit and vegetable consumption significantly correlated with the male sex and level of education ($P<0.01$).

In model 3, sex, level of education and marital status correlated with the amount of fruit and vegetable intake in spring and summer. In model 4 which included all variables but occupation, 27% of the change in daily consumption of fruits and vegetables was related to the mentioned variables. Occupation was not included in any of the statistical models.

Discussion

This study showed the daily fruit and vegetable intake of Isfahani men in both warm and cold seasons to be higher than that of their female counterparts. This finding is in contrast with the results of studies in other countries which are often suggestive of higher fruit and vegetable consumption in women.^{16,24} A WHO report assessing the effect of low fruit and vegetable intake on disease burden throughout the world was the only one of its kind showing fruit and vegetable intake in men aged 30-59 years to be higher than in their female counterparts in African, American, Eastern Mediterranean, European, Southeast Asian, and West Oceanian countries.²⁵ Studies reporting higher fruit and vegetable intake in women have attributed this to their greater awareness and willingness to follow a healthy diet. Nonetheless, as the present study did not gauge the samples' nutritional awareness, no judgments can be made as to the effect of this parameter.

Other studies suggest that lower intake of fruits and vegetables in women may be related to the dominant cultural concepts about nutrition and their relationship with sex roles in the society.²⁴

For instance, men's intake of citrus fruits and onions was higher than women's in fall and winter; their consumption of other tree fruits and leafy vegetables was greater than women's in spring and summer.

Women's intake of citrus fruits was greater than men's only in spring and summer. Differing consumption levels of fruits and vegetables by men and women may be accounted for by the fact that lemons are the predominant citrus fruit in summer and spring. Lemons are merely used to flavor food and are generally less favored by men owing to their sour taste. Oranges and tangerines are the predominant citrus fruits during winter and fall and are very often consumed in these seasons. Some earlier studies have provided evidence on the differing tastes of genders in Iran and women's greater tendency towards more sour flavors, compared to men.²⁷ In this study, the effect of gender on the amount of fruit and vegetable intake was resolved after adjusting for age and no difference was seen between male and female subjects within the age groups in respect of fruit and vegetable intake.

Comparison of fruit and vegetable intake between the two studied age groups in a given sex or season showed that fruit and vegetable intake increases with age. Other studies too, have shown that with increasing risk of chronic diseases (especially cardiovascular diseases) at older ages, people find additional incentive to consume fruits and vegetables for their health benefits.^{15,28} Comparison of the amount of fruit and vegetable consumption based on level of education in Isfahani men and women showed higher intakes in men educated at high school diploma level and lower. This difference, however, is not significant in subjects with university education.

Moreover, comparison of fruit and vegetable consumption in different educational groups according to age and season showed intake in subjects with university education to be higher than in the other two groups. Other studies have also reported higher fruit and vegetable intakes in individuals with higher education.^{15,18,29} Responding to the question whether this difference is due to higher awareness, higher socioeconomic class, or differing social norms regarding fruit and vegetable consumption warrants further studies. Comparison of fruit and vegetable intake in the two sexes according to marital status showed that married men and single women consume greater amounts of fruits and

vegetables compared to married women and single men, respectively. The difference is probably due to the fact that women have higher awareness of the benefits of fruits and vegetables, thus paying greater attention to their husbands' dietary health.

Hence, married men consume more fruits and vegetables than single men, and single women's intake is higher than that of married women (especially in spring and summer).

A number of other studies have also reported on the relationship between being married and increased intake of fruits and vegetables in men.^{18,30}

An extended European study revealed a higher intake of fruits and vegetables in married men compared to single men, which was more prominent than the difference between married women and their single peers.³⁰

Comparison according to sex, level of education, and marital status of men and women receiving five or more daily servings of fruits and vegetables showed a significant difference only in the higher age groups.

In groups with junior school education and lower, a significantly greater percentage of men received five or more daily servings of fruits and vegetables, compared to women. These figures are higher in married men than in married women. No significant difference was seen in singles. On the other hand, the frequency of men and women receiving less than one daily serving of fruits or vegetables showed a higher frequency of people (especially women) using small amounts of fruits and vegetables, despite the adequacy of mean fruit and vegetable consumption in the two sexes. Assessment of the correlation between the overall amount of fruit and vegetable intake and individual, social and cultural factors showed gender to be the first and most important factor. A relatively strong correlation was observed between the male sex and the individual's overall fruit and vegetable intake. The effect of gender on the amount of fruit and vegetable intake is independent of education. In a study performed by Baker and Wardle, the effect of gender decreased with the elimination of variables such as awareness and attitude.²⁴ Based on model 3 regression in this study, there was a positive relationship between intake of fruits and vegetables and being married ($\beta=0.3$). In this model too, the correlation coefficient for gender remained unchanged; this is suggestive of the independent effect of gender on the amount of fruit and vegetable intake. On the whole, 20% of changes in fruit and vegetable intake are dependent upon three variables, namely sex, education, and marital status ($r^2=0.20$).

The correlation between age and intake of fruits and vegetables was positive, but weak ($\beta=0.2$) and 27% of changes in fruit and vegetable intake was determined by 4 factors, namely sex, education, marital status, and age. This finding is similar to those of a number of other studies, which have also highlighted a significant positive correlation with education, age and marital status.^{18,24,25} In this study, there was no significant correlation between occupation and intake of fruits and vegetables, however, one study has reported a significant correlation between the two.¹⁸ One possible explanation for lack of any significant relationship between occupation and intake of fruits and vegetables may be that sampling was not performed based on occupational or income groups. One of the advantages of this work was that it was preceded by a pilot study to determine the validity of the questionnaire, which was relatively high. Also, given the postulated effect of seasons on intake of fruits and vegetables, the study spanned both warm and cold seasons and it was concluded that mean overall intake of fruits and vegetables does not vary across seasons.

This study was not without limitations. The most important limitation was the non-randomized selection of samples. Owing to the low participation of random samples and the fact that this study was initially designed to assess the validity of a food frequency questionnaire, sampling was partly conducted among healthy individuals referring to clinics of Isfahan Cardiovascular Research Center using the accessible method.

The other possible limitation was that despite the wide range of fruit and vegetable intake, its mean value was within recommended limits; this might have resulted from the limitations of the food frequency questionnaire, which has also been highlighted in other studies.^{18,31-32} However, it must be noted that the effect of gender difference, as well as other factors on fruit and vegetable intake has been considered for all samples in this study; hence the results, which concern comparison of the two genders remain undistorted. For the first time in Iran, this study evaluated the effects of various social and demographic factors, including sex, education and marital status on daily intake of fruits and vegetables. Since other factors such as level of awareness, attitude, and economic well-being can also affect the amount of fruit and vegetable intake, a larger study addressing the influence of all psychological, behavioral, asocial and economic parameters is essential for obtaining a clearer picture of the

multitude of factors affecting the consumption of fruits and vegetables.

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