Low compliance with dietary recommendations among Iranian women: a dietary pattern survey

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Summary. *Background:* Identification of dietary behaviors of women is one of the most substantial concerns in order to improve family nutritional behaviors. Due to primary influence of a mother in family food choices, this study aimed to investigate the nutrition behaviors according the dietary recommendations of the food guide pyramid among women living in Hamadan, Iran. *Methods:* This cross-sectional study on the mothers' nutritional behaviors was carried out from May to June 2014. In this study 1084 mothers aged 23-49 years of elementary school children were selected to participate in this study using stratified cluster random sampling method. Data were collected using the validated Iranian 168-item semi-quantitative Food Frequency Questionnaire (FFQ). The dietary assessment was based on the five major groups of food guide pyramid. Stata version 11 was used for data analysis. *Results:* Our results revealed that 72.7%, 67.8%, 52.9% and 55.5% of subjects consumed less dairy products, vegetables, fruits and meat/alternatives, respectively, as compared to the food pyramid recommendations. However, bread and grains intake in 40.4% of subjects were more than recommendations. Consumption of pizza and processed meats in about 40% of subjects were monthly and in about 20% were weekly. There was a significant relationship between the household income and education level with the intake of five major groups of food guide pyramid. *Conclusion:* There were unhealthy dietary habits and low compliance with dietary recommendations among majority of women. Our findings may be considered in policy-making process involving development of health promotion interventions that are appropriately tailored according to different incomes and educational levels to improve family healthy eating habits.

Key words: dietary habits, caloric intake, food insecurity, nutrition policies, health, family

Introduction

Lifestyle factors, including adherence to dietary recommendations, play an important role in the prevention of non-communicable diseases such as cardiovascular diseases, cancer and diabetes (1-4). In addition, chronic diseases incur considerable costs on health care system (5).

Among the main risk factors of non-communicable diseases based on the disability-adjusted life year (DALY) rates for the years 1990 and 2010 in Iran, the highest rate belongs to nutritional factors (6). According to Third National Surveillance of Risk Factors of Non-Communicable Diseases in Iran, the prevalence rates of obesity and central obesity were 22.3% and 53.6% respectively, which were higher among women

(7). Moreover, Iranian women are more likely to have higher rates of obesity than US women (8).

Iranian people often report inadequate consumption of whole grains, fruits, vegetables, dairy products and unsaturated fatty acids, while they mostly consume added sugar, salt and saturated fats (9-11). Furthermore, unhealthy dietary habits such as intake of fast foods and unhealthy snacks are common in Iran (9, 12). Therefore, Iranian people, especially women, are advised to improve their dietary habits through reducing the consumption of unhealthy foods such as fast foods, added sugars, sweetened beverages and unhealthy snacks, while they are encouraged to increase the consumption of healthy foods according to dietary recommendations (13). Assessment of dietary intake can provide a measure of eating habits in order to develop the nutritional interventions for modification of unhealthy dietary habits (14). A mother has important responsibilities in managing household food basket, so mother`s nutritional behaviors directly affects the family dietary habits (15). Since identification and prioritization of a mother's unhealthy diet directly affect the family food choices (15), the nutritional behaviors of a mother are of importance to be studied. There is emotional interaction between mother and her child for food choices and dietary habits (16). Furthermore, attachment theory is defined as emotional tone between child and caregiver (17). Therefore, the elementary school children were considered as a mediator between mothers and school in this study. A previous study conducted on adults living in Hamadan has only assessed fruit and vegetable intake, whereas other groups of food guide pyramid, the consumption of unhealthy foods and the dietary patterns have not been evaluated (18). Therefore, this study aimed to investigate the dietary pattern and nutrition intake recommended by food guide pyramid (19) among the women living in Hamadan, west of Iran, for development of nutritional interventions to modify their unhealthy dietary habits.

Methods

This cross-sectional study was approved by the Ethic Committee (P/16/30/9/715) and Research Council of Hamadan University of Medical Sciences, Hamadan, Iran.

Study population

A random sample of 1084 mothers aged 23-49 years were selected to participate in this cross-sectional study, between May and June 2014. The inclusion criterion was mothers who had at least one child in fourth grade in one of 20 selected elementary schools. The exclusion criteria were pregnant women, lactating women, as well as women following a special diet due to diabetes or cardiovascular diseases.

Sampling method

We used stratified cluster random sampling method. Then, each region of the city was considered as a stratum (1 stratification level). Due to sex-segregated schools in Iran, we divided the schools of each region based on the student's sex into boys and girls schools (2nd stratification level). Then, five elementary schools from each subgroup were selected based on a random number table (1st clustering level). Two classes in each school were then selected randomly (2st clustering level). The mothers of students in each class were included into the study (3rd stratification level). Considering the prevalence rate of 0.251 as reported by Poorolajal et al. (18) and significance level of 0.05, we obtained a sample size of 510 individuals. Due to use of cluster random sampling, we increased the sample size by 1.5 times to reach 765 individuals. Regarding the probability of sample size reduction due to refusal, the exclusion criteria and probability of the low response rate, we increased the sample size by 40% to reach a total number of 1084 individuals.

Data collection tool

The dietary assessment was performed using the self-administered Iranian 168-item semi-quantitative Food Frequency Questionnaire (FFQ). Its reliability (20) and validity (21) were confirmed in the Tehran Lipid and Glucose Study (TLGS).

The women reported the frequency of intake for each food item in a specific serving size during the last

year on a daily, weekly, or monthly basis. Portion size was determined from the recommended servings of the U.S. Departments of Agriculture (USDA) (e.g. one slice of bread, a medium orange or a glass of milk). Also, for some other food items that were not included in the USDA list, household measures were considered (e.g. chicken meat, one breast, leg or wing), based on the study by Esfahani et al. (21). Daily intake of each food item in grams was obtained by multiplying the portion size in grams to frequency of consumption (20, 21).

Assessment of dietary intake

To collect the mother's nutritional information, the four steps were followed. In the first step, for investigation of the implementation barriers and explanation of the questionnaire to the mothers and students, a pilot study was done on 48 mothers and 48 students. Based on the results obtained, the required items were modified. In the second step, the students were taught in a 20-minute session to understand the needed concepts such as serving sizes and method of filling out the questionnaire. The questionnaires for mothers were delivered to their houses, and the trained students were responsible to help their mothers to fill out the questionnaires. Then, the questionnaires were returned to us after one week. In the third step, in order to raise the response rate, teachers and school health educators advised the students to return the questionnaires as fast as possible. In the fourth step, the students were encouraged by giving them a gift such as balloon and hat, on which the pictures of fruit and vegetables were printed, after they returned their mothers' questionnaires. The data were collected within two months to prevent the effects of seasonal variation in fruit and vegetable intake. The training was only conducted by one researcher for all students to prevent interviewer bias. The anonymous questionnaires were identified by the separate codes to prevent respondent's identity and information bias. Based on the recommendation of 2010 Dietary Guidelines for Americans (22) and Dietary Reference Intakes (23), the estimated energy requirement for women aged 31-50 years old is 1800-2200 kcal. Therefore, we divided women (n=823) into three energy groups as follows: (a) low energy (LE, n=245) group who received less than 1800 kcal/day, (b) normal energy (NE, n=202) group who received 1800–2200 kcal/day, and (c) high energy (HE, n=376) group who received equal or more than 2200 kcal/day.

Statistical analysis

Descriptive statistics were presented as percentages (%) as well as mean value and standard deviation (mean ± SD). Analysis of variance (ANOVA) was used to detect differences in the mean serving values of daily intake of major food groups among the various socioeconomic and demographic groups. Stata version 11 (Stata Corp., College Station, TX, USA) was used for data analysis with 95% confidence interval (CI). The significance level was set at $p<0.05$.

Results

Sample characteristics

Of 1084 women who were eligible for this study, 947 were voluntarily participated with response rate of 87%. Furthermore, 2 pregnant women, 2 breastfeeding women, as well as 6 other women due to diabetes and cardiovascular diseases were excluded. We considered some checking questions to determine the response accuracy. Moreover, after returned questionnaires were evaluated, 106 questionnaires were excluded due to the low response accuracy or more than 5% missing data. Six other people were also excluded because their daily energy intakes were under or over reporting range (24). Finally, 823 questionnaires were analyzed. There was no significant difference between mothers who were excluded from the study and those who were included in terms of demographic variables.

Our findings revealed that 29.76%, 24.54%, and 45.68% of women were in LE, NE, and HE groups, respectively (Table 2).

Table 1 shows the demographic characteristics of women. There was a similar pattern for education level, employment status and household income among three energy groups. Our findings also showed that 30% of women had primary and secondary education, 33.1% had high school education, 36.5% had academic degree, 24.3% of women worked out of the house, 75.6% were housewives and 85.6% stated a monthly income of less than $600.

Table 1. Demographic variables of women by three energy classification.

	Distribution within energy groups		
Characteristics of women	Low Energy group (< 1800 Kcal/d)	Normal Energy group (1800 – 2200 Kcal/d)	High Energy group (> 2200 Kcal/d)
Age/years Mean (SD)	36.23 (4.89)	37.14 (4.78)	36.51 (5.03)
Educational Level *N* (%)			
Primary school	43 (17.70)	26 (13.07)	50 (13.33)
Secondary school	31 (12.76)	36 (18.09)	60 (16.00)
High school	73 (30.04)	70 (35.18)	128 (34.13)
Academic	96 (39.51)	67 (33.67)	137 (36.54)
Employment status *N* (%)			
Working	54 (22.13)	51 (25.25)	95 (25.33)
House wife	190 (77.87)	151 (74.75)	280 (74.67)
Household income *N* (%)			
≤149$	50 (21.37)	32 (16.49)	56 (15.82)
150-299$	81 (34.62)	84 (43.30)	137 (38.70)
300-599$	70 (29.91)	56 (28.87)	104 (29.38)
600-899$	26 (11.11)	16 (8.25)	41 (11.58)
≥900$	7 (2.99)	6 (3.10)	16 (4.52)

Intake of five food groups

Table 2 compared the frequency of food consumption among the three energy groups, indicating that the consumption of dairy products was less than the minimum recommended servings in 91.4%, 78.7% and 57.4% of women in HE, NE and LE groups, respectively. In addition, vegetable consumption was less than the minimum recommended servings in 88.5%, 72.7% and 51.6% of women in HE, NE and LE groups, respectively. Fruit consumption in 71.4%, 58.9% and 37.7% of subjects in HE, NE and LE groups was less

Table 2: Percent of women according to compliance to the food pyramid in consumption of food groups.

Energy groups	Low Energy Group (< 1800 Kcal/d) mean (SD) of Energy: 1465 (245)			Normal Energy Group (1800 – 2200 Kcal/d) mean (SD) of Energy: 2007 (114)			High Energy Group (> 2200 Kcal/d) mean (SD) of Energy: 2768 (497)			Total		
N (%)	245 (29.7)			202 (24.5)			376 (45.6)			823 (100)		
Acceptable recommendation	< than AR[a]	AR[a]	> than AR[a]	< than AR[a]	AR[a]	> than AR[a]	< than AR[a]	AR[a]	> than AR[a]	< than AR[a]	AR[a]	> than AR[a]
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Bread and Grains	57 (23.27)	173 (70.61)	15 (6.12)	7 (3.47)	129 (63.86)	66 (32.67)	6 (1.60)	118 (31.38)	252 (67.02)	70 (8.51)	420 (51.03)	333 (40.46)
Dairy products	224 (91.43)	20 (8.16)	1 (0.41)	159 (78.71)	38 (18.81)	5 (2.48)	216 (57.45)	119 (31.65)	41 (10.90)	599 (72.78)	177 (21.51)	47 (5.71)
Vegetables	217 (88.57)	26 (10.61)	2 (0.82)	147 (72.77)	49 (24.26)	6 (2.97)	194 (51.60)	145 (38.56)	37 (9.84)	558 (67.80)	220 (26.73)	45 (5.47)
Fruits	175 (71.43)	50 (20.41)	20 (8.16)	119 (58.91)	64 (31.68)	19 (9.41)	142 (37.77)	143 (38.03)	91 (24.20)	436 (52.98)	257 (31.23)	130 (15.80)
Meat/ alternatives	212 (86.53)	33 (13.47)	-	126 (62.38)	67 (33.17)	9 (4.46)	119 (31.65)	182 (48.40)	75 (19.95)	457 (55.53)	282 (34.26)	84 (10.21)

[a] Acceptable recommendation

Table 3: Mean (SD) servings of daily intake of food groups in women according to food pyramid recommendations (by energy groups)

Energy groups		Low Energy Group (< 1800 Kcal/d) mean (SD) of Energy: 1465 (245)			Normal Energy Group (1800 – 2200 Kcal/d) mean (SD) of Energy: 2007 (114)			High Energy Group (> 2200 Kcal/d) mean (SD) of Energy: 2768 (497)			Total		
N (%)		245 (29.7)			202 (24.5)			376 (45.6)			823 (100)		
Acceptable recommendation		< than ARᵃ	ARᵃ	> than ARᵃ	< than ARᵃ	ARᵃ	> than ARᵃ	< than ARᵃ	ARᵃ	> than ARᵃ	< than ARᵃ	ARᵃ	> than ARᵃ
	ref	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)
Bread and Grains	6-11	4.39 (1.30)	7.99 (1.35)	12.7 (1.49)	4.56 (1.82)	8.83 (1.31)	13.15 (2.17)	5.52 (0.38)	9.10 (1.32)	15.52 (4.05)	10.03 (4.13)	11.63 (4.44)	12.10 (5.36)
Dairy Products	2-3	1.06 (0.45)	2.23 (0.22)	3.45 0	1.26 (0.45)	2.35 (0.24)	3.19 (0.25)	1.41 90.40)	2.36 (0.28)	3.55 (0.55)	1.37 (0.68)	1.80 (0.75)	2.22 (0.86)
Vegetables	3-5	1.71 (0.67)	3.67 (0.57)	8.24 0	1.93 (0.60)	3.63 (0.44)	6.53 (1.25)	2.06 (0.58)	3.81 (0.53)	6.09 (1.25)	2.21 (1.17)	2.90 (1.17)	4.01 (1.77)
Fruits	2-4	0.97 (0.50)	2.79 (0.56)	4.66 (0.61)	1.16 (0.52)	2.75 (0.59)	4.91 (0.99)	1.27 (0.53)	2.89 (0.58)	6.03 (2.01)	1.84 (1.40)	2.80 (1.84)	3.78 (2.64)
Meat/ alternatives	2-3	1.31 (0.37)	2.32 (0.25)	0	1.50 (0.31)	2.35 (0.26)	3.47 (0.50)	1.60 (0.26)	2.43 (0.27)	3.72 (0.67)	1.44 (0.35)	2.40 (0.27)	3.70 (0.66)

a Acceptable recommendation

than minimum recommended servings. Consumption of meat/alternatives in 86.5%, 62.3% and 31.6% of subjects in HE, NE and LE groups was also less than minimum recommended servings.

Table 3 depicts the mean serving values of daily intake of food groups. Totally, over 50% of subjects consumed dairy products, vegetables, fruits and meat/ alternatives less than the recommendations (Table 2), so the mean serving values of daily intake were 1.3, 2.2, 1.8 and 1.4, respectively.

Table 4 shows the relationship between the mean servings of daily intake of food groups with the educational level, employment status and household income. The findings indicated that there was no significant re-

Table 4: shows the relationship between the mean servings of daily intake of food groups based on educational level, job and income.

Food groups	Bread and Grains	Dairy Products	Vegetables	Fruits	Meat and its alternatives
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Educational Level					
primary school	10.69 (4.29)	1.39 (0.68)	2.11 (1.16)	1.61 (1.44)	1.83 (0.88)
Secondary school	11.66 (3.65)	1.43 (0.63)	2.44 (1.28)	1.87 (1.49)	1.87 (0.67)
High school	10.84 (4.40)	1.61 (0.82)	2.69 (1.29)	2.37 (1.68)	1.96 (0.72)
Academic	10.58 (4.94)	1.76 (0.79)	2.85 (1.48)	2.85 (2.03)	2.15 (0.90)
p value	0.077	0.001	0.001	0.001	0.001
Job					
Working	10.71 (4.78)	1.71 (0.81)	2.70 (1.23)	2.95 (2.24)	2.12 (0.89)
Hose wife	10.83 (4.35)	1.57 (0.76)	2.61 (1.40)	2.18 (1.65)	1.96 (0.78)
p value	0.740	0.076	0.389	0.001	0.012
M/Income					
≤149$	10.80 (4.23)	1.32 (0.67)	2.11 (1.12)	1.61 (1.54)	1.77 (0.82)
150-299$	11.01 (4.30)	1.55 (0.70)	2.69 (1.34)	2.30 (1.75)	1.96 (0.74)
300-599$	10.11 (4.04)	1.72 (0.80)	2.75 (1.36)	2.61 (1.68)	2.09 (0.81)
600-899$	10.99 (4.53)	1.80 (0.80)	2.61 (1.25)	2.79 (2.09)	2.03 (0.68)
≥900$	11.61 (7.26)	2.27 (1.20)	3.44 (1.95)	3.47 (2.72)	2.67 (1.35)
p value	0.122	0.001	0.001	0.001	0.001

lationship between bread and grains with the demographic variables. Higher education level (*p*=0.001) and household income (*p*=0.001) were related to more consumption of dairy products and vegetables. Furthermore, more intakes of fruits and meat/alternatives were related to education level (*p*=0.001), employment status (*p*=0.001) and household income (*p*=0.001).

Table 5 demonstrates the frequency of consumption of unhealthy food items based on the daily, weekly, monthly, yearly, or no intake. Intakes of pizza and processed meats such as hamburger, sausage and kielbasa in about 30% of subjects were monthly, while in about 25% were weekly. Intakes of soft drinks and salty cucumber in about 50% of the subjects were monthly, and in about 40% were weekly. More than 50% of the subjects consumed pickled vegetables daily and weekly.

Discussion

In this nutrition survey, we tried to present the useful information about unhealthy eating habits among women living in Hamadan, Iran. Our results indicated that the consumption of the five major groups of food guide pyramid including dairy products, vegetables, fruits and meat/alternatives were less than the recommended amounts (19). Due to great importance of daily energy intake, the analysis was performed according to distribution of subjects in three energy groups included HE, NE and LE groups. 45.6% of the participants were located in HE group. High calorie intake caused overweight and obesity (25) which are the most important factors of chronic diseases (1-4).

More than 50% of the subjects in HE group consumed less than 2 servings of dairy products. The mean intake values of fruit and vegetable in HEI group were less than those of other food groups. They received most of their energy from unhealthy and empty calorie foods such as fast foods, junk foods and soft drinks. In an international study, Braithwaite et al. have reported that 39% and 13% of adolescents belonged to the frequent and very frequent consumption fast-foods groups, respectively (26). In a study by Arechavala et al. on Spanish adolescents, they have indicated that

Table 5: the frequency of consumption of unhealthy food items based on the daily, weekly, monthly, yearly, or no intake.

Energy groups	Low Energy Group (< 1800 Kcal/d)					Normal Energy Group (1800 – 2200 Kcal/d)					High Energy Group (> 2200 Kcal/d)				
N (%)	245 (29.76)					202 (24.54)					376 (45.69)				
	Daily	Weekly	Monthly	Yearly	Non Consumer	Daily	Weekly	Monthly	Yearly	Non Consumer	Daily	Weekly	Monthly	Yearly	Non Consumer
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Hamburger	_	15 (6.09)	62 (25.41)	69 (28.16)	99 (40.40)	-	22 (10.78)	69 (34.16)	39 (19.31)	72 (35.64)	_	51 (13.52)	151 (40.05)	68 (18.03)	107 (28.38)
Sausage	_	48 (19.59)	67 (27.34)	55 (22.44)	75 (30.61)	_	51 (25.24)	69 (34.15)	31 (15.34)	51 (25.24)	_	98 (25.99)	117 (31.03)	65 (17.24)	97 (25.73)
Kielbasa	_	16 (6.53)	72 (29.38)	68 (27.75)	89 (36.33)	_	16 (7.92)	83 (41.08)	39 (19.30)	64 (31.68)	_	54 (14.32)	145 (38.46)	65 (17.24)	113 (29.97)
Pizza	_	32 (13.06)	76 (31.02)	87 (35.51)	50 (20.40)	_	33 (16.34)	67 (33.16)	68 (33.66)	34 (16.83)	_	69 (18.30)	171 (45.35)	88 (23.34)	49 (12.99)
Puffs	3 (1.22)	31 (12.65)	91 (37.14)	47 (19.18)	73 (29.79)	4 (1.98)	56 (27.72)	80 (39.60)	31 (15.34)	31 (15.34)	22 (5.83)	126 (33.42)	115 (30.50)	28 (7.43)	86 (22.81)
Potato chips	2 (0.81)	13 (5.30)	87 (35.51)	42 (17.14)	101 (41.22)	2 (0.99)	29 (14.36)	79 (39.11)	27 (13.37)	65 (32.17)	15 (3.98)	113 (29.97)	129 (34.22)	29 (7.69)	91 (24.14)
Soft drinks	6 (2.45)	66 (26.94)	108 (44.08)	28 (11.42)	37 (15.10)	10 (4.95)	74 (36.63)	85 (42.08)	9 (4.45)	24 (11.88)	49 (12.99)	164 (43.50)	116 (30.76)	20 (5.30)	28 (7.42)
Pickled vegetables	24 (9.79)	66 (26.93)	70 (28.57)	29 (11.83)	56 (22.85)	28 (13.86)	77 (38.11)	50 (24.75)	11 (5.44)	36 (17.82)	102 (27.05)	151 (40.05)	62 (16.44)	13 (3.44)	49 (12.99)
Salted cucumber	10 (4.08)	91 (37.14)	100 (40.81)	21 (8.57)	23 (9.38)	12 (5.94)	104 (51.48)	58 (28.71)	7 (3.46)	21 (10.39)	48 (12.73)	190 (50.39)	96 (25.46)	10 (2.65)	33 (8.75)

50% of subjects did not adhere to food recommendation intakes (27).

Similarly, the results of the present study demonstrated that 40% of women consumed bread and grains higher than recommendations. 67.0% of subjects in HE group and 32.6% in NE group consumed more than 11 servings of bread and grains, indicating that a high percentage of daily energy intake in these groups came from bread and grains.

High consumption of bread and grains increases the chances of obesity. In addition, in a review study by Serra-Majem on the relationship between bread consumption and obesity, they have showed that the white bread is more likely associated with abdominal fat, whereas following a Mediterranean diet is related to weight loss (28). In a cross sectional National Nutrition Survey by Albertson et al., they have revealed that whole grain intake is inversely associated with overweight and central obesity (29).

Although it is recommended that half of the grains have to be from the whole grains, refined grains are the most favorite foods in Iran and other countries such as China, India, Tanzania, Nigeria, Malaysia, Brazil and Costa Rica (30). White rice is the primary staple food in most parts of Iran that is due to the traditional customs, low price, greater palatability, ease of preparation, and variety of preparation methods (30). Based on previous studies, higher consumption of white rice is associated with cardiovascular diseases, type 2 diabetes and metabolic syndrome (31-33). The nutrition education interventions are special programs focusing on the reduction of daily energy intake and replacement of unhealthy foods. Therefore, for planning the nutrition education interventions, the emphasis on replacing whole grains instead of refined grains should be considered.

Our findings also showed that more than 70% of women consumed dairy products less than the recommended servings. . In a study by Azadbakht et al., the mean dairy consumption was less than the recommendations (34), which is in agreement with our findings. Bhandrai et al. have also reported that dairy consumption in women at fertility age in Nepal was less than the recommended amounts. (35). Our results showed that dairy consumption had a significant relationship with increasing educational level and household

income, indicating to raise awareness of the risk of osteoporosis and adjust the prices for dairy products. Calcium deficiency is one of the most common health problems in women (14). Intake of dairy products in childhood and adolescence can increase bone mineral density (BMD) and reduce the risk of osteoporosis among adult women (36). However, increasing calcium intake in elderly cannot reduce the risk of fracture due to a small non-progressive increases in BMD (37). In a study by Vartanian et al., they have reported that soft drink consumption is related to lower intakes of milk, yogurt, calcium and other minerals that leads to overweight and obesity (38). In our study, 43.5% of HE, 36.6 of NE and 26.9% of LE group consumed soft drinks weekly. Carbonated soft drinks, especially colas, may have adverse effects on BMD due to caffeine and phosphoric acid (39).

Insufficient intake of fruit and vegetable linked to poor health and increased risk of non-communicable diseases is considered as a major nutrition problem worldwide (13, 40). In a study by Franchini et al. on Portuguese mothers, they have revealed that 46% of mothers adhered to the recommendations of WHO for fruit and vegetable consumption (41). De-Abreu et al. in the CoLaus study have mentioned that women adhered to the recommendations of the Swiss Society of Nutrition (SSN) for vegetable (45%) and fruit (9.1%) intake (42). In another study by Poorolajal et al., only 27% of Hamadani people consumed at least five servings of fruit and vegetable (18). In our study, 67.8% of women consumed vegetable and 52.9% of women consumed fruit less than the dietary recommendations of the food guide pyramid, while their average intake values for vegetable and fruit were 2.21 and 1.84 servings, respectively. In Bogalusa Heart Study by Deshmukh-Taskar et al., they have reported the average consumption values of vegetable and fruits in women were 2.26 and 1.28 servings (43). In present study, there was a significant relationship between fruit and vegetable consumption with education level and household income, suggesting that it can be due to high nutrition knowledge and greater purchasing power. Our results also comply with the study by Deshnukh-Taskar et al., in which they have indicated that people with higher education consumed more fruit and vegetable (43). The study by De-Abreu et al.

has shown that there was a significant relationship between education level and vegetable consumption but not for fruit (42). Similarly, in the study by Franchini et al., fruit consumption was higher in mothers with higher social status (41). Our result showed that about 40% of subjects consumed unhealthy snacks instead of fruit and vegetable monthly, while about 30% used them weekly. Junk food consumption in HE group was more than that in two other groups. The unhealthy snacks replace the essential food groups through creating a feeling of fullness. One of the main reasons of low consumption of vegetable in Iran, especially in Hamadan, is replacement of fresh salads with pickled vegetable and salted cucumber. Averagely, 40.0% of HE, 38.1% of NE and 26.9% of LE group consumed pickles and 50.3% of HE, 51.4% of NE and 37.1% of LE group consumed salted cucumber weekly, which increases the daily salt intake. High salt intake increases blood pressure that leads to cardiovascular diseases. Furthermore, a diet high in salt is considered as a risk factor for stomach cancer that (44) is one of the most common cancers in Iran (44) and the second common cancer in Hamadan (45). Therefore, a low sodium diet and replacement of pickled vegetables with fresh vegetables are recommended. Two of the favorable and traditional desserts that Hamadani people consume regularly with their meal are jam and marmalade. Jam and marmalade containing a large amount of sugar increase daily energy intake that can be replaced by fresh fruit and vegetables.

In the present study, more than 50% of the women consumed meat/alternatives less than the food pyramid recommendation. In the LE and NE groups, twice of subjects had insufficient intake of meat/alternatives as compared to the HE group. The study by De-Abreu et al. on the adherence of Swiss adults to food recommendations has showed that 68% of women consumed meat/alternatives according to food recommendations (42). In Bogalusa Heart Study by Deshmukh-Taskar et al., they have reported the average daily intake of meat/alternatives in women was 1.12 servings (43). In our study, better employment status, higher education level and higher household income had a significant relationship with increased intake of meat/alternatives. In such cases, meat substitutes such as eggs and legumes as the inexpensive sources of protein are recommended in the nutrition education interventions. Our findings also indicated high consumption of processed meat and fast foods instead of meats. Fast food causes obesity that is considered as a risk factor for diet-related non-communicable diseases (26). This study had some limitations. Firstly, women relied on their memory to fill out the self-report FFQ, so data were more likely to be subjected to under- or over-reporting of dietary intakes. Secondly, sending the questionnaires by students to mothers reduced the response rate. Finally, due to presence of different ethnic groups and food cultures in Iran, our results may not be generalized to other cities of Iran.

Conclusion

The results of this study may provide valuable information in terms of understanding unhealthy dietary habits and low compliance with dietary recommendations among women living in Hamadan. Furthermore, these results are more likely to create a basis for planning nutritional policies to improve dietary behavior by developing appropriately tailored nutritional interventions for women in order to have a positive impact on dietary habits of their families.

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