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The Relationship between Nutritional Knowledge and Food Habits and Some Cardiometabolic Risk Factors in Patients with Diabetes in Shiraz, Iran

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ABSTRACT

Background: Diabetes is an increasing health problem. Diet and nutritional knowledge are the most important factors in diabetes. This study was done to investigate the association between nutritional knowledge and food habits in relation to cardiometabolic risk factors in the patients with diabetes.

Methods: This cross-sectional study was conducted on 260 subjects with diabetes in Motahhari Diabetes Clinic in Shiraz, southern Iran. Dietary intakes were evaluated using a 147-item food frequency questionnaire (FFQ). Also socio-economic, demographic and nutritional knowledge questionnaires were completed. Weight, height and waist circumference were measured. Fasting blood glucose (FBG), low density lipoprotein cholesterol (LDL), high density lipoproteincholesterol (HDL) and triglyceride TG were extracted from patients' medical records.

Results: Of 73 male and 187 female patients, 39.2% were overweight and 33.5% were obese. There was a significant correlation between nutritional knowledge and vegetables intake. Also, getting more dairies and fats were significantly correlated to the levels of FBS. A positive significant correlation was seen between serum HDL and beans and cereals intake.

Conclusion: Nutritional awareness cannot lead to a healthy diet alone because socioeconomic status, motivation, and other factors also affect dietary intake. Dietary habits can affect blood lipids and FBG. Therefore, improving the diet of diabetic patients is essential.

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Introduction

Diabetes is one of the most important health problems and the most common metabolic disease in the world that requires continuous health care (1). The prevalence of diabetes is increasing in the world including Iran (2). According to the World Health Organization (WHO) report, global prevalence of diabetes has increased from 4.7% in 1980 to 8.5% in 2014, which has grown faster in developing countries than in developed countries (3). According to the national study on the risk factors of chronic diseases, prevalence of diabetes

among Iranian adult population has estimated to be about 8% (4, 5).

Diabetes has many acute and chronic complications, such as visual impairment, renal, cardiovascular and neurological disorders that lead to blindness, severe renal failure, heart attack or brain injury. If proper actions are not taken to prevent, control and cure this disease, it will cause many problems for patients (6-8). Diet is one of the most important factors which are involved in the initiation, prevention, and control of diabetes. In fact, nutritional factors are key factors in the etiology of diabetes (9). One of the most effective factors in prevention of short-term and postponing of long-term complications of diabetes is patients' knowledge about the principles of nutrition and food choices (6).

Also dietary habits have long been linked with the control and prevention of several metabolic disorders, such as insulin resistance, obesity, type 2 diabetes, as well as progression of cardiovascular diseases (10, 11). It has been shown that dietary patterns with high intake of red meat, refined grain, snacks, sweets and fried foods increased the risk of type 2 diabetes (12, 13). In contrast, dietary patterns with high intake of non-refined cereals, fruits, and vegetables, moderate intake of dairy, poultry, and fish could reduce the incidence of diabetes (14, 15). Since the pattern of dietary intake in Iran is different from western countries and also due to the importance of nutritional knowledge in controlling of diabetes complications, this study was undertaken to investigate the association between nutritional knowledge and food habits in relation to cardiometabolic risk factors in patients with diabetes.

Materials and Methods

This cross-sectional study was conducted on 260 people with diabetes in Motahhari Diabetes Clinic in Shiraz, southern Iran between 2014 and 2015. Using the list of patients in the clinic, participants were selected by systematic random method among the patients referred to the diabetes clinic during the last year. After calling the selected people and explaining the purpose and methods of the study, those who were willing to participate in the study came to the clinic according to a preplanned schedule.

Then, following criteria were used to select the final participants. Being able to answer questions and fill out the questionnaires, diagnosed with type 2 diabetes at least for one year and having biochemical test results in her/his medical records. Patients with thyroid, kidney, liver and digestive disorders or use any hormonal medications were not included in the study. The study protocol was approved by Shiraz University of Medical Sciences (No 92-01-21-7102). Before starting the study, an explanation about the study was presented to the participants and then all of them signed written informed consent.

Usual dietary intake of participants were evaluated using a validated 147-item food frequency questionnaire (FFQ) (16) of common foods that are consumed by Iranian. All questionnaires were completed by trained dietitians. Amounts of consumed foods were evaluated by asking the standard common portion sizes. Reported amounts for each food items were then converted to daily intakes. Then portion sizes of consumed foods were converted to grams using household measures. Also, total energy, carbohydrate, protein and fat intake were calculated by summing up intakes of individual foods using Nutritionist IV.

Required information about socio-economic status (SES) and demographic characteristics (sex, age, education, and occupation), medical history, physical activity and smoking status were taken using questionnaires via face to face interview. Weight measurement was done with a digital scale (Glamor, China) in light clothing to the nearest 100 g. Height was measured with bare foot using an non-stretchable tape measure to the nearest 0.1. Waist circumference (WC) was measured at the narrowest waist area by a non-stretch tape measure. Body mass index (BMI) was calculated as weight (kg) divided by squared height (m^2). A digital barometer was used to measure blood pressure at sitting position after 10 minutes rest. Serum fasting blood glucose (FBG), low-density lipoprotein (LDL), high-density lipoprotein (HDL), triglycerides (TG) were extracted from patients' medical records in diabetes clinic.

To assess nutritional knowledge, a questionnaire included 30 multiple-choice questions about relationship of different foods intakes with obesity, blood pressure, FBG and blood lipids was used. Data were analyzed using SPSS (Version 19, Chicago, IL, USA). Kolmogorov-Smirnov test showed that all variables had normal distribution. For reporting variable frequency, descriptive analyses were used. To assess the relationship between dietary intakes, nutritional knowledge, anthropometric data and cardiometabolic risk factors, Pearson correlation was applied. Then regression analysis determined the correlation between variables. At first, univariate linear regression was used for each variable, then variables with p values<0.2 (intakes of cereals, fast foods, fruits, vegetables, dairy, beans, nuts, simple sugar, meat and fats, nutritional knowledge, age and total calorie intake) were entered into the regression models. A P value less than 0.05 was considered as significant.

Results

A total of 260 patients with diabetes including 73 (28.1%) males and 187 (71.9%) females with mean age of 53.7±10.2 years, participated in this study. Socioeconomic and demographic characteristics of the participants were shown in Table 1. Among the participants, 26.5%, 39.2% and 33.5% were normal weight, overweight, and obese, respectively (Table 2). According to Table 2, most of the participants had normal systolic blood pressure (SBP), diastolic blood pressure (DBP), TG and LDL (43.1%, 61.9%, 52.7% and 76.9%, respectively). Also, 32.7% of them had a FBG above 180 mg/dL. The mean score of nutritional knowledge of participants was 48.32±4.9 out of 60 points (Table 3).

The outcomes of the correlational analysis were presented in Table 4. As the results of Pearson analysis showed, nutritional knowledge had a positive significant correlation with HDL (P=0.023) and vegetables intake (P=0.031) and a negative relationship with TG (P=0.03). Furthermore, there was a significant positive correlation between FBG levels and fats and dairy intake (P=0.048, P= 0.025, respectively). We found a negative correlation between cereals intake and HDL (P=0.038). Also, fat intake and FBS (P=0.048) had a positive relationship.

Discussion

Purpose of current study was to assess the relationship between nutritional knowledge and food habits with cardiometabolic risk factors in patient with diabetes in Shiraz, Iran. Our results demonstrated that half of the participants had low nutritional knowledge and participants with higher nutritional knowledge consumed more vegetables. Correlation of nutritional knowledge and vegetable intake was reported by Asakura et al. (17). But the result of Sharma et al.'s study was the opposite. They found that nutrition knowledge could influence eating behavior for all food groups except for vegetables and fruits (18). Many studies, such as Sharifirad et al. (19) in Iran and other studies outside of Iran showed that nutrition education for diabetic patients can lead to improve dietary intake (20, 21).

We found that the level of education was directly linked to the increase in the consumption of healthy food groups, and also there was a positive correlation between education, income and nutritional knowledge. So we showed that, it is possible that association between education level and food groups intake is through education's correlation with income and nutritional knowledge. And since the relationship between knowledge and food intake was not significant, it can be expected that people's income is an important factor in their diet.

As shown in Daranizad et al.'s (22) study and other studies, socioeconomic problems can increase the risk for diabetes and its complications (7, 23). These results are in agreement with Peltzer findings showing the choice of everyday foods not to be influenced by nutrition knowledge (24). However,

Table 1: Demographic and socioeconomic characteristic of participants

Variables	Min-Max	Mean±SD	Frequency	
			Number	Percent
Age (years)	24-80	53.7±10.2		
Sex				
Female			187	71.9
Male			73	28.1
Education level (years)				
Illiterate			46	17.7
Primary and Secondary school (<11)			132	50.8
Diploma (12)			53	20.4
Graduated (14-16)			26	10
Post-graduated and above (16<)			3	1.2
Diabetes duration	1-40	9.36±7.7		
1 year			31	11.9
1.1-3 years			38	14.6
3.1-10 years			105	40.4
Above 10 year			86	31.1
Income level				
Low income			137	52.7
Lower-middle income			91	35
Upper-middle income			24	9.2
High income			8	3.1

Data are presented as mean±SD or Number- percent

Table 2: Prevalence of some cardiometabolic risk factors among the participants

Variables	Min-Max	Mean±SD	Frequency	
			Number	Percent
SBP	90-180	126.117.3		
Normal			112	43.1
Prehypertension			89	34.2
Stage 1 hypertension			50	19.2
Stage 2 hypertension			9	3.5
DBP	57-114	79.2±9.5		
Normal			161	61.9
Prehypertension			66	25.4
Stage 1 hypertension			26	10
Stage 2 hypertension			7	2.7
BMI	16.44-42.12	28.37±4.8		
<18.5			2	0.8
18.5-25			69	2.5
25-30			102	39.2
>30			87	33.5
Waist circumference	62-138	97.39±11.3		
Female<88, Male<102			84	32.3
Female>88, Male>102			176	
			67.7	
TG	37-765	175.57±101.78		
<150			137	52.7
150-200			40	15.4
200-500			78	30
>180			5	1.9
FBS	58-449	171.4±78.27		
<100			21	8.1
100-125			72	27.7
125-180			82	31.5
>180			85	32.7
LDL	35-300	106.46±42.48		
<130			200	76.9
130-160			37	14.2
160-190			13	5
>190			10	3.8
HDL	14-81	43.44±10.66		
Female<50, Male<40			175	67.3
Female≥50, Male≤40			85	32.7

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, BMI: Body mass index, TG: Triglycerides, FBS: Fasting blood sugar, LDL: Low density lipoproteincholesterol, HDL: High density lipoproteincholesterol. Data are presented as mean±SD or Number- percent

economic factors, food availability and cultural factors may alsobe involved in choosing everyday food (25).

The other part of our work was related to the association of nutritional knowledge and dietary intake with the blood glucose and lipid profiles and blood pressure of diabetic patients. Studies in this field have yielded different results. Kim et al. (26) found that nutrition education in diabetes men could reduce blood sugar, total cholesterol and LDL. Whereas, there were no significant differences between HDL and TG levels before and after nutrition education. Also, Summer et al. (27) reported an improved LDL level after nutrition education. This also accords with our earlier observations, which showed that higher levels of nutritional knowledge could make the levels of HDL, TG and FBS better.

Also Pon et al. (28) reported that higher levels of nutritional knowledge could lead to lower levels of total cholesterol (TC) and they suggested that women in higher levels of income and education had greater nutritional knowledge, which led to more informed food choices and lifestyle which resulted in having a better health status. However, some studies did not support these findings and they reported that there was no significant relationship between nutritional knowledge and blood lipids (29, 30).

The observed inverse relationship between

Table 3: Food intakes and nutritional knowledge of participants

Variables	Min-Max	Mean±SD	Frequency	
			Number	Percent
Nutritional Knowledge score	32-59	48.32±4.9		
Very low			73	28.1
Low			57	21.9
Medium			79	30.4
High			51	19.6
Food groups: (servings per day)				
Cereals	1.08-24.43	12.17±5.56		
Dairy	0.13-4.44	1.9±0.8		
Fruits	0-10.23	3.74±2.06		
Vegetables	0.79-9.45	4.1±1.76		
Meats	0.14-7.69	1.71±1		
Fats	0-15.84	4.83±2.76		
Simple sugars	0-5.34	4.83±2.76		
Beans	0-2.29	1.14±1.01		
Nuts	0-5.72	0.69±0.41		
Fried and fast-food	0-1.27	0.83±0.8		
		0.24±0.22		

Data are presented as mean±SD or Number- percent

Table 4: Correlation of nutritional knowledge and food intakes with cardiometabolic risk factors among the participants

	FBS	TG	HDL	Nutritional knowledge
Cereals				
P value			0.038	
r			0129	
Vegetables				
P value				0.031
r				0.134
Dairies				
P value	0.025			
r	0.139			
Fats				
P value	0.048			
r	0.123			
Beans				
P value			0.004	
r			0.178	
Nutritional knowledge				
P value		0.03	0.023	
r		-0.135	0.141	

FBS: Fasting blood sugar, TG: Triglycerides, HDL: High density lipoproteincholesterol, Data were analyzed using Pearson correlation

intakes of cereals with blood LDL levels was similar to the study results of Borgi et al. (31) and Sanjeevi et al. (31). But our finding about the negative linear correlation between fruits intake and LDL cholesterol was opposite the previous studies which did not observe any significant relationship (32). A possible explanation for these results may be the several major nutrients in cereals that can reduce risk factors for CHD, for example some of the fibers and polyunsaturated oils (50% linoleic acid) that could lower plasma LDL-cholesterol (33). Also we observed more intakes of fats, meats and fast foods in patients with lower intake of cereals.

Meat and fat pattern that identified in Htun et al. (34) study was directly associated with TC, LDL-C and blood pressure (35). These positive correlations can be explained in part by the unhealthy cardiovascular risk components in meat and fat pattern (such as red meat, cholesterol and saturated fats) (36). Our study has several strengths. It was a population-based study used avalidated FFQ (16). This study had also many limitations. It

was a cross-sectional study, which cannot derive any causal correlation. Also, there were many measurement errors in the use of FFQs for dietary intake assessment including possible over-reporting or under-reporting of usual food intake, selective over-reporting or under-reporting of the intakes of certain foods, or both (22).

Conclusion

We concluded that having better nutritional knowledge could help eating more vegetables, which could attenuate some cardiometabolic risk factors in patients with type 2 diabetes.

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Conflict of Interest

None declared.

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