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Assessment of Food Security Status with lipid profile and body mass index in patients with type 2 diabetes

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ABSTRACT

Food insecurity is defined as limited or uncertain availability of adequate and safe food for an active and healthy life at all times. Diabetes is the most common metabolic disease that has recently been proposed as a health priority in Iran. Recent studies have indicated widespread food insecurity and diabetes in the population of Iran. This study aimed to investigate the relationship between food security with serum lipids and body mass index in type 2 diabetic patients who were referred to diabetes centers of Tehran. This descriptive study included 243 individuals over 25 years old with type 2 diabetes who were selected from two diabetes center in south and east of Tehran. The required information was collected by demographic and validated 18-item food security questionnaire that was proposed by United States Department of Agriculture (USDA). ANOVA and Chi-squared test were used for data analysis. 31% of diabetic patients were located in the food secure group, 59.7% were among insecure group without hunger and 8.6% of patients were in the insecure group with hunger. No significant relationship was observed between food security with lipid profiles and body mass index of type 2 diabetic patients ($p>0.05$). No significant relationship was seen between food security with lipid profile and body mass index in patients with type 2 diabetes. Due to the high prevalence of food insecurity in patients with type 2 diabetes, applying a longitudinal study in this area is recommended.

Key words: Food security, Tpe 2 diabetes, Lipid profile, Body mass index.

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1. INTRODUCTION

Food insecurity is defined as limited or uncertain access to adequate and safe food. Or it is described as limited or uncertain ability to access acceptable foods in socially acceptable ways (1). Food insecurity is a complex and multidimensional phenomenon that is not experienced similarly at individual and household level and appears different between adults and children too. Food insecurity not only includes access to food, but also comprises the concepts such as inadequacy in terms of quantity and quality, unacceptable and worrying. This chain starts by concern and anxiety about food and progresses up to emergence of hunger among children (2). Although food insecurity and hunger arise from the limited financial resources, measuring the income and poverty,

does not give clear information on household food security status. The studies have shown that many low-income households have food security while a small percent of non-poor households are food insecure (3). Of the main factors affecting food insecurity the following items are noted in various studies: age, householder education, economic situation, losing job, lack of full time job and saving, single-parent, ethnicity, increased household size and losing food assistances (4-6). Direct and in direct methods have used to assess the household food security in Iran (7, 8). On the other hand, diabetes is a universal issue and a major cause of disability and death in current societies (9) and can lead to changes in lifestyle and economic status of the patients (10). Chronic and costly nature of this disease imposes a large financial burden on the society (11). It is estimated that health care costs for a

person with diabetes are about 6.4 times more than a non-diabetic person (12). Evidently, diabetes is associated with lifestyle, especially with inadequate food intake and physical inactivity (1). Food insecurity status in diabetic patients in the world, was conducted only in a cross-sectional study in Canada (13) and another study in America (14). In the Canadian study, food insecurity prevalence was higher among diabetics compared to non-diabetics (9.3% vs 8.6%) (13). Also in the American study, diabetes prevalence in the groups of food secure, slight, and intensive food insecure was 11.7%, 10%, and 16.1% respectively. After adjusting socio-demographic and physical activity factors, a higher level of diabetes prevalence was observed in subjects with severe food insecurity compared to those with mild food insecurity or without food insecurity (14). So it was necessary to evaluate the prevalence of food insecurity in type 2 diabetic patients due to recent studies which indicate the relatively widespread prevalence of food insecurity (15) and the growing prevalence of type 2 diabetes in Iranian society (16).

2. MATERIALS AND METHODS

This cross-sectional study was done in Tehran diabetes centers and after getting approval by Ethics Committee of Qazvin University of Medical Sciences in 1394(QUMS.REC.1394.27). For determining the sample size, a pre-test was conducted on 30 diabetic patients in order to educate them about the study and how to respond. According to the pre-test, correlation and food security score -0.18. According to the following formula (equation 1) and the results of the pilot study, the sample size was estimated at 243 (Type I error of 5% and statistical power of 80%).

(1)

$$z' = 0.5 \ln \left(\frac{1+r}{1-r} \right)$$

$$n = \left[\frac{z_{1-\alpha/2} + z_{1-\beta}}{|z_{r0} - z_{r1}|} \right]^2 + 3$$

The required data were collected and recorded by interview, biochemical and anthropometric methods. The questionnaire consisted 2 parts of general information and food security. General information included age, sex, family size, the mean duration of illness and anthropometric data. Body weight was measured to the nearest 0.1 kg using a SECA Scale (SECA, Hamburg, Germany) while participants were dressed in light clothing (i.e. no shoes, sweaters, jackets, or belts) and height was assessed to the nearest 0.1 cm using a stadiometer with shoes removed. Localized food security questionnaire of USDA (17) and a written consent was obtained from all

participants prior to testing. Also 3 cc of venous blood sample was taken from all patients after 12 hours of fasting. All blood samples were collected at 7-9 am. Serum concentrations of triglycerides, cholesterol, LDL and HDL were measured by kit and enzymatic colorimetric and total cholesterol was assessed using kit and enzymatic photometric method and spectrophotometer. Inclusion criteria were as follow: diabetes (fasting blood glucose > 125), age above 25 years old, living in the East and South of Tehran, and patient satisfaction to participate in the study. Also exclusion criteria were as follow: less than 25 years old, having special diets, cardiovascular diseases, heart attack, cancer, pregnancy, lactation and the patient dissatisfaction to participate in the study. The data were completed by a trained nutritionist and each questioning lasted an average of 20 minutes. In order to scoring household food security 18-item questionnaire, a positive score was allocated to often true, sometimes true, almost every month, some months and yes. The 0 score was given to the "incorrect, I do not know, just 1 or 2 times in a month, and No" answers. Eventually, the following scores were allocated to the related groups: 0 to 2 in food secure group, 3 to 7 in food insecure group without hunger, 8 to 12 in food insecure group with moderate hunger, and score 13 and higher was given to the insecure group with intensive hunger. Using the spss 20 statistical software, the data were analyzed via statistical tests including chi-squared test (evaluating the qualitative variables) and variance analysis (evaluating the quantitative variables). The significance level was set at 0.05.

3. RESULTS AND DISCUSSION

Of the 243 diabetic patients, females comprised 68.7% (n=167) of total population and males 31.3% (n=76). The mean age of participants was 59±11.2 years (Table 1). Of 167 women in the current study, 50 cases (29.9%) were placed in food secure group, 100 cases (59.9%) in food insecure group without hunger and 17 (10.2%) in food insecure group with hunger. Of the 76 men under study, food secure, food insecure without hunger and food insecure with hunger groups included 27(35.5%), 45(59.2%) and 4(5.3%) cases, respectively. Percent of diabetic patients in the groups of food secure, food insecure without hunger and food insecure with hunger was 31.7%, 59.7% and 8.6% respectively. In addition, the chi-squared test showed no significant relationship between gender and food security (p=0.372). The mean, standard deviation and analysis of variance of variables is proposed in Table 2. Although the mean age and number of family members in insecure group without hunger and duration of the illness in insecure group with hunger was higher than other groups, but no significant difference was observed between secure and insecure food groups. In addition, no significant difference was seen between food security with lipid profiles and body mass index.

Table 1. Sex and food security status in type 2 diabetic patients in Tehran, 1394

Sex	Food secure (%)	Food insecure without hunger (%)	Food insecure with hunger (%)	Total	P-value
Female	50(29.9%)	100(59.9%)	17(10.2%)	167(100%)	0.372
Male	27(35.5%)	45(59.2%)	4(5.3%)	76(100%)	
Total	77(31.7%)	145(59.7%)	21(8.6%)	243(100%)	

Chi-squared test($k^2=1.97$) were used for comparisons.

Table 2. Mean and SD analysis of variance for demographic and biochemical variables in terms of food security in type 2 diabetic patients in Tehran, 1394

	Food secure(n=77)	Food insecure without hunger(n=145)	Food insecure with hunger(n=21)	Total(n=243)	P-value
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	
Age	58.33(11.14)	59.95(11.55)	56.95(9.48)	59.18(11.26)	0.38
Family size	6.23(1.76)	6.44(1.84)	5.57(1.85)	6.30(1.82)	0.11
Duration of disease	7.85(4.99)	6.37(4.71)	7.90(6.50)	6.97(5.01)	0.75
TG	69.37(163.8)	185.17(106.26)	156.66(85.40)	175.94(95.67)	0.17
Chol	193.49(45.83)	189.30(47.26)	172.33(33.38)	189.16(45.95)	0.17
LDL	114.74(40.04)	10.88(36.89)	101.09(25.59)	110.09(37.18)	0.27
HDL	45.45(8.85)	45.20(9.79)	96.46(19.78)	45.43(10.69)	0.78
BMI	29.70(6.49)	54.30(4.72)	30.66(4.88)	30.22(5.38)	0.6

*TG:triglyceride,Chol:cholesterol, LDL:low-density lipoprotein, HDL:high-density lipoprotein,BMI:body mass index Analysis of Variance (ANOVA) were used for comparisons

In the current study, according to the examinations of 243 type 2 diabetic patients, it was found that 7.31% of diabetic patients were in food secure group, 7.59% in food insecure group without hunger, and 6.8% were categorized within food insecure group with hunger. While in Najibi et al. study (1391), the percent of food insecurity without and with moderate and severe hunger was 47.4, 14.9 and 4.4, respectively (17). The current study is the first survey that has assessed food security status in type 2 diabetic patients of Iranian population. Other recent researches have studied total population (both healthy and diabetic) in such a way that the mean percent of food insecurity in Iranian community is reported about 0.045 (3, 15, 17). The current results showed a high prevalence of food insecurity and lack of an association between food security with lipid profiles and body mass index. Based on the results it can be conclude that a part of relationship between food insecurity with non-communicable diseases is most likely resulted from effect of food insecurity on food pattern. Since the afflicted population is driven toward consuming cheap food with high density, low level of micro-nutrients (18), and food patterns with low healthiness levels. This pattern can lead to metabolic diseases such as diabetes (3). In David et al. study (19) no relation was observed between blood pressure, total cholesterol and fasting blood sugar with food security but BMI had a relation with food insecurity. In the current study, 48% of insecure food group and 35% of secure food group were obese and this study demonstrated that alteration in dietary pattern is likely to cause obesity in people with food insecurity. No significant difference was seen between lipid profiles and BMI in diabetic patients with food security. Therefore, the results showed no association between the patient's weight and hyperlipidemia by food security. Globally, studies in the field of food security are mainly related to obesity. Results of a number of such studies suggest a meaningful

relationship between obesity and gaining weight with food insecurity, which offer results contrary to the current study's results. According to a study on food insecure households women of rural areas in Malaysia, a possible relationship was found between waist circumference and food security, however, it was not confirmed regarding obesity (20). Morales (13) and his colleagues carried out a study on food security in Mexican women and examined the relation between obesity and insecurity. Therefore, they observed higher rate of obesity in insecure women than secure women. In contrast, a study in Colombia found that food insecurity was only the predictor of underweight in adults and had no relation with overweight (21). Similar to our results, Sirotin et al. (22) study found no relationship between overweight and obesity with food insecurity. Najibi et al. cross-sectional study, which was done on 135 diabetic patient in Shiraz, the prevalence of food insecurity was reported 66.7%. As a result, a significant and direct correlation was seen between food insecurity with overweight and obesity. But variables such as family history of disease, height, age and sex had no association with food security (16). Similar to our results, their results showed high prevalence of food insecurity in diabetic patients too. In general, no significant relation was observed between food insecurity with body mass index and lipid profiles in diabetic patients.

4. CONCLUSION

Due to the high prevalence of food insecurity in patients with type 2 diabetes, and because diabetes is one of the three factors of mortality in the world, and the pathogenesis of this disease is very high in terms of medical expenses and disablement, and since it's association with obesity and hyperlipidemia increases the chance of cardiovascular diseases as the first leading cause of death in humans, it is recommended to conduct a

longitudinal study in this area.

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AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this paper.

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