ORIGINAL ARTICLE

Comparison of Healthy Eating Index between Individuals with and without Metabolic Syndrome

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Abstract

Objective: The aim of this study was to compare the quality of diet measured by Healthy Eating Index (HEI) between individuals with and without metabolic syndrome.

Materials and Methods: This case-control study was performed in Tehran and consisted of 103 overweight and obese individuals (52 cases and 51 controls) within age range of 20 to 55 years. Case and control were matched for age and sex. The NCEP ATPIII criteria were used for identifying metabolic syndrome. Appropriate instruments were used for anthropometric measurement of weight, height and waist circumference. The participants were asked to record their food consumption of three days (two week days and one weekend day) and technical report was used to calculate HEI-2005. Independent t-test was used to compare Healthy Eating Index.

Results: There was no significant difference between case and control groups for mean of HEI (p-value=0.1). Mean score of whole fruit consumption in control group was significantly higher than case group (p-value=0.04). Mean score of oil consumption (p-value=0.03) and saturated fat consumption (p-value=0.05) in case group were significantly higher than control group.

Conclusion: The comparison of HEI between overweight/obese individuals with and without metabolic syndrome in this study shows that the quality of diet in both groups needs to be improved.

Keywords: Metabolic syndrome, Obesity, Healthy Eating Index.

Introduction

Obesity has been considered as one of the important health problems over the last decades. Although other studies have been reported the epidemic of obesity in several regions, there is no study to indicate the current epidemic of obesity in all regions (1). The World Health Organization estimated that about 2.3 billion and at least 700 million of adults around the world will be overweight and obese in 2015, respectively. In

a study by Janghorbani and colleagues (2007) it is indicated that, excess body weight is common in Iran (2). Obesity can lead to numerous chronic diseases such as diabetes, hypertension, heart disease and stroke, which are called metabolic and cardiovascular risk factors (1). It should be mentioned that all the obese individuals do not show cardiometabolic disorders, which are called Metabolically Healthy but Obese (MHO) individuals (3, 4, 5). The MHO individuals comprise 20% of the obese population (3). Despite having large amounts of fat mass, they show normal or low level of homeostasis model assessment (HOMA). On the other hand, they have high levels of insulin sensitivity (3,4). In contrast to MHO individuals, normal and overweight individuals show metabolic syndrome sign and symptoms (4,5,6). There are several factors affecting metabolic syndrome, among them are dietary habits that have an important role in developing and controlling of metabolic syndrome (7,8). Diet and life style with their fundamental impacts on health and nutritional status (9), have been changed along with economic development over the last several decades in Iran. The exceed quantity of calorie intake results in weight gain and energy imbalance, which occurs when energy intake is greater than energy expenditure (10). Therefore, measuring the quality of diet using the Healthy Eating Index (HEI) can show level of adherence to the dietary guidelines (9). To our knowledge, this is the first study of diet quality measurement done in Iran. The aim of this study was to compare the quality of diet using HEI between overweigh/obese individuals with and without metabolic syndrome.

Materials and Methods

This case-control study was performed in Tehran and consisted of 103 individuals with age range of 20 to 55 years who had referred to Endocrine Center of Imam Khomeini Hospital between August 2011 and February 2012. All participants were overweight and obese. We used NCEP ATP III criteria for identifying subjects with metabolic syndrome. Metabolic syndrome was diagnosed when an individual had at least 3 of the following criteria: central obesity (waist circumference≥102 cm in men and ≥88 cm in women), high systolic blood pressure and/or high diastolic blood pressure (blood pressure≥130/85 mmHg) or taking medication for high blood pressure, fasting blood sugar (FBS)≥100 mg/dl, serum triglyceride level≥150, High-Density Lipoprotein (HDL) cholesterol <40 mg/dl in men and <50 mg/dl in women (7).

Exclusion criteria included pregnant, lactating and menopausal women, athletes, smokers, individuals with uncontrolled thyroid diseases, individuals with special or vegetarian diet, those who were taking nutritional supplement, fat and blood sugar reduction drugs, sleep medication and sedative, and individuals with cancer and renal disease.

Weight was measured to nearest 0.1 kg by balanced beam scale (Seca Corp. Scale, Germany) with light indoor clothing, and height was measured to nearest 0.5 cm by standard stadiometer. After calculating BMI, individuals were categorized to overweight and obese by using WHO cut-off point (1997) (10). Waist circumference was measured by non-elastic tape measure. Demographic data (marital status, education level, occupation, family history of obesity and the time spent watching television) were asked by a trained interviewer.

The participants were asked to record their food consumption of three days (two weekdays and one weekend day). All the necessary training was given to all participants about food serving sizes and how to record them. We used technical report for calculating HEI-2005 (11).

Statistical analysis

Data analysis was performed using SPSS software (ver.18). Independent-samples T test was used to compare healthy eating index score. Chi-square test was used to compare

qualitative variables. P-value<0.05 was considered significant.

Results

Total number of participants was 103 (66 men and 37 women). The mean values of some quantitative variables are compared in table 1. The mean age of participants in case group was case 35.85±6.9 and in control group was 34.98±8.1. There is no significant difference between the mean ages of two groups (p-value=0.5). Mean weight in case group was higher than control group (p-value=0.02). Mean BMI in case group was higher than control group (p-value=0.01).

Comparison of qualitative variables between the two groups is shown in table 2. As shown, there is no significant difference between two groups for these variables.

Comparison of mean of HEI score is shown in table 3. As presented, there is no significant difference between case and control groups for mean of HEI (p-value=0.1). Mean score of whole fruit consumption in control group was significantly higher than case group (p-value=0.04). Mean score of oil and saturated fat consumption (p-value=0.03 and 0.05 respectively) in case group were significantly higher than control group. Mean score of saturated fat consumption in case group was higher than control group. Since there was no correlation between BMI and HEI (p-value=0.572), the multivariate analysis was not used.

Discussion

The results of this study show that the quality of diet in both overweight/obese individuals with and without metabolic syndrome needs to be improved. Our study also resulted that there is no difference between the diet quality of the two groups, which also has been concluded in a study by Azadbakht and colleagues in Tehran 1997-2001 (11). The Framingham

Table 1- Comparison of age, weight, height and BMI between the two groups

Variables	Case Mean ± SD n=52	Control Mean ± SD n=51	Total Mean ± SD	P-value
Age	35.85 ± 6.9	34.98 ± 8.1	35.14 ± 7.5	0.5
Weight	93.85 ± 13.7	87.26 ± 15.6	90.56 ± 14.7	0.02
Height	169.7 ± 8.8	167.9 ± 8.3	168.8 ± 8.6	0.2
BMI	32.5 ± 4.2	30.6 ± 3.7	31.61 ± 4.02	0.01

Table 2- Comparison of demographic factors between the two groups

Variables	Case n (%)	Control n (%)	P-value
Gender			
Male	34 (65.38%)	32 (62.74%)	0.7
Female	18 (34.62%)	19 (37.26%)	
Marital Status			
Single	11 (21.15%)	8 (15.68%)	0.5
Married	41 (78.85%)	43 (84.32%)	
Education Level			
Primary school	9 (17.30%)	10 (19.60%)	
Diploma	27 (51.92%)	27 (52.94%)	0.3
Bachelor or higher	16 (30.78%)	14 (27.46%)	
Occupation			
Housekeeper	12 (23.07%)	7 (13.72%)	
Employee	18 (34.61%)	19 (37.25%)	
Worker	19 (36.53%)	23 (45.09%)	0.7
Others	3 (5.79%)	2 (3.94%)	
Family history of obesity*			
Yes	40 (76.92%)	38 (74.50%)	
No	12 (23.07%)	13 (25.50%)	0.7

Offspring-Spouse Study after 12 years follow ups demonstrated that higher nutritional risk led to abdominal obesity and metabolic syndrome (8). Although few studies (9,13) such as Tardio et al. study (2010) have been showed an association between HEI and metabolic risk in postmenopausal women (13).in this study, we did not find any significant difference between the case and control groups. The reason is that in Tardio et al. study the mean of HEI score was 56.6, which was lower than the one in our study (73.64). They concluded that the poor quality of diet was related to low whole-grain intake and high saturated fat consumption. One of the components of HEI that showed significant difference between case and control groups was whole fruit score. The results of our study showed that the whole fruit score in case group is lower than control group. Although we did not find any significant differences in total vegetables, dark green, orange vegetables and legumes scores between two groups, these components had the lowest scores in both groups. In a cross-sectional study (14) it is demonstrated that higher intake of fruits and vegetables is related to lower risk of metabolic syndrome. They implied that this relationship was mediated by CRP.

Another study by Liu and colleagues (15) showed that only intake of green leafy vegetables might reduce the incidence of type 2 diabetes among women. They did not conclude any relationship between fruits and vegetables intake and incidence of diabetes. Contrary to Esmaillzadeh et al. (14) cross-sectional study, the prospective study of Lutsey et al. (16) demonstrated no significant relationship between fruits and vegetables intake with incidence of metabolic syndrome. According to the above-mentioned studies, it seems that relationship between fruits and vegetables intake and metabolic syndrome may be conflicting. Although there is no significant relationship between whole grains score in case and control groups in this study, the whole grain score was the lowest score. Sahyoun and colleagues (17) in their cohort study identified that higher intake of whole grain food is associated with lower prevalence of metabolic syndrome in elderly. In contrast, in other study by Yoo and colleagues there is no significant relationship between whole grain intake and prevalence of metabolic syndrome in young adults (18). The Cross-sectional study of Esmaillzade et al. showed that whole grains intake is associated with metabolic syndrome, which can be related to its dietary fiber, vitamin E, folate and magnesium contents (19). In our study, oil and saturated fat score in case group was higher than control group, which concluded a statistically significant relationship. It has been shown that in Japanese Brazilians population, the dietary total fat intake may increase the risk of metabolic syndrome (20). Although the high level of fat in diet decreases insulin receptors in both muscle and adipose tissue, it does not change the affinity of receptors. Several conditions are involved in glucose metabolism such as the degree of saturation and type of the fat (20).

Americans dietary guidelines recommend the consumption of saturated fatty acid (SFA) less than 10% of total calories. The primary goal of this recommendation is prevention of atherosclerotic vascular disease, due to its negative effect through oxidative stress on weight and insulin resistance (20,21). Although there is likely evidence about beneficial effects of n-3 PUFAS on metabolic syndrome components (21,22), few studies have been conducted in relation to n-6 PUFA and metabolic syndrome. One of the beneficial effects of n-6 PUFA is its anti-inflammatory features. It should be mentioned that the relationship between dietary fat and the regulation of body weight and metabolic syndrome are conflicting (21). In present study, the results related to oil and saturated fat scores may be resulted in following a healthier diet by case group. The mechanisms responsible for the onset of metabolic syndrome have not been totally clarified yet. They certainly involve a combination of genetic and behavioral factors. No significant

difference between two groups in this study may be related to acknowledge of obese individuals, both with and without metabolic syndrome, about the risks related to obesity and trying to change them. Underreporting of diet content should be considered when obese individuals are under investigation.

Our study had several limitations including small sample size, possibility of error in food records, lack of dietary patterns, Lack of access to the participant's quality of their past

diets. Some strengths of this study also include performing of all the study procedures by a trained person and administrating of three days food records, both in weekdays and weekends.

Conclusion

There was no significant difference between HEI in overweight/obese individuals with and without metabolic syndrome.

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