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Diet diversity and nutrient intakes in patients with Prinzmetal angina

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ABSTRACT

Objective: Dietary diversity has been recommended to be effective in achieving an adequate nutrient intake. Few studies have investigated dietary diversity and nutrient intake in Prinzmetal angina patients. This case-control study aimed to assess the association between dietary diversity and Prinzmetal angina incidence.

Method: Energy and nutrient intakes were measured using three day 24-h recall. Dietary diversity was measured by summing the number of food groups consumed over 12 weeks. Independent-samples t test was used to compare quantitative variables between the groups.

Results: The mean score for Prinzmetal angina patients was 3 ± 0.025 groups/day, for controls was 4.5 ± 0.053 groups/day. There was a significant difference in diet diversity score between the groups ($p = 0.01$). There were significant differences in macro and micronutrient intakes between the groups with the exception of copper ($p < 0.05$). Intake of vitamin B12 in cases was 0.8 ± 0.02 µg/day and in controls was 1.5 ± 0.01 µg/day. Iron and zinc intakes in cases were lower than in controls.

Conclusion: Increasing dietary diversity in patients with Prinzmetal angina can be an important approach to declining the clinical symptoms of Prinzmetal angina.

key words:
Dietary diversity,
Prinzmetal angina,
nutrient intake

Introduction

Cardiovascular disease (CVD) is a leading cause of death in the world [1]. Prinzmetal angina is a kind of angina that occurs in a resting state and is characterized by an elevation in the ST segment on electrocardiogram [2]. In addition to age and sex, lifestyle factors such as smoking, physical inactivity, hypertension, diabetes, obesity, and dyslipidemia are considered modifiable risk factors for Prinzmetal angina. Most of the risk factors are clearly related to diet and food intake and can be changed by nutritional modification [3]. Dietary factors play an important role in the incidence of many chronic diseases. Low diversity in the diet is a serious challenge identified in developing countries. Eating patterns reflect different dietary traditions worldwide. According to the recent evidence, coronary heart disease is in close relationship with dietary diversity and nutrient intake [4]. Iron, vitamin A, and calcium deficiencies are among the most common nutrient deficiencies [5]. Dietary diversity is considered a key element of high-quality diets [6, 7]. Increasing the consumption of a variety of foods has been recommended to achieve adequate nutrient intake. According to the studies, consumption of 30 different food items per day in the Japanese population and intake of a variety of foods and beverages through main food groups in the US have been recommended [8]. Considering the lack of studies investigating the diet diversity and nutrient intake status in patients with Prinzmetal angina, the

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present study aimed to assess diet diversity and nutrient intake in Prinzmetal angina patients of Imam Khomeini hospital of Ardebil, Iran.

Methods

Subjects

This case-control study was conducted on 69 cases of Prinzmetal angina reporting to Imam Khomeini hospital of Ardebil, Iran, in August 2014. Sixty-nine sex- and age-matched healthy individuals were recruited as controls. The ethics committee at Tabriz University of Medical Sciences approved the study protocol (ethics code: 619/A). The inclusion criterion was being 40 to 60 years old. Exclusion criteria included having other metabolic diseases, being pregnant, or taking nutritional supplements in the past 6 months. A written consent form was signed at baseline. A demographic information questionnaire including age, sex, education, occupation, marital status, and medication use was completed face-to-face by a trained interviewer.

Anthropometric measurements including height, weight, and body mass index (BMI) were taken at the beginning of the study. Weight was measured without shoes and with light clothing by a Seca scale (Seca, Hamburg, Germany). Height was assessed using a stadiometer (Seca) without shoes. BMI was calculated by dividing the weight in kilograms by the square of the height in meter).

Assessing the dietary diversity

Energy and nutrient intakes were measured using three days 24-h dietary recall (two weekdays and one weekend). Energy and nutrient intakes were analyzed by Nutritionist IV software (N-Squared Computing, Salem, OR, USA). A validated food frequency questionnaire consisting of all food groups (22 items) (7) was used to assess dietary habits of the participants. Dietary diversity was defined as the total number of different foods or food groups consumed at least once per day. The following food items were considered: potatoes, cabbages and other Cruciferae, carrots, spinach, lettuce, tomatoes, pulses, and peppers (vegetable group); apples, citrus fruits, and watermelon (fruit group); beef, veal, poultry, fish, liver, ham, raw ham, salami and other sausages and canned meat (meat and fish group); pasta, rice, bread, polenta, and pastries (carbohydrate group). Subjects were subdivided into approximate quartiles of total diversity and approximate quantiles of specific food group diversity based on the distribution of controls[9].

Statistical analysis

Data were analyzed by SPSS software (Version 18; SPSS Inc., Chicago, IL). Normality of the data was assessed by the Kolmogorov-Smirnov test. Quantitative variables were reported as mean ± SD and qualitative data were presented as frequency (percent). The independent-samples t test was used to compare differences of quantitative variables between groups. Sex differences in both groups were analyzed with the chi-square test. A p value of less than 0.05 was considered significant.

Results

The mean ages for cases and controls were 51.26 ± 0.86 and 51.20 ± 0.96 years, respectively. Sex distribution was homogenous, with men making up about 50% of the subjects. Systolic and diastolic blood pressures in cases were significantly higher than controls (p = 0.039). Baseline characteristics of participants are presented in Table 1.

Table 1. Baseline characteristics of the Prinzmetal angina patients and healthy controls

Variables	Cases (n = 34)	Controls (n = 35)	p
Age (year)	51.26 ± 0.86	51.20 ± 0.96	0.356
Sex, n (%)			
Male	17 (50)	17 (48.57)	0.529
Female	17 (50)	18 (51.43)	0.390
Weight (kg)	88.30 ± 2.29	88 ± 2.60	0.410
Height (m)	1.70 ± 0.007	1.70 ± 1.006	0.039*
Systolic blood pressure (mm Hg)	13.60 ± 0.56	11.61 ± 0.93	0.001*
Diastolic blood pressure (mm Hg)	8.98 ± 0.46	8.16 ± 0.26	

Data presented as mean ± SD
**Statistically significant*

Table 2. Dietary diversity score in Prinzmetal angina patients and healthy controls

Variables	Cases (n = 34)	Controls (n = 35)	p
Diet diversity score/day	3 ± 0.025	4.5 ± 0.053	0.010*
Food diversity score/day	10.01 ± 0.02	12.54 ± 0.05	0.0001*

Data presented as mean ± SD
**Statistically significant*

Table 3. Macronutrient and fat-soluble vitamin intakes in subjects of study

Variables	Cases (n = 34)	Controls (n = 35)	p
Energy (kcal/d)	1985 ± 373.34	1766 ± 156.6	0.023*
Carbohydrate (g/d)	266 ± 8.53	294 ± 8.54	0.056
Protein (g/d)	85.5 ± 6.75	92.8 ± 5.64	0.049*
Fat (g/d)	63.4 ± 5.62	25.2 ± 2.56	0.015*
Vitamin A (μg/d)	243.5 ± 2.51	354.5 ± 3.82	0.040*
MUFA (mg/d)	8.25 ± 1.14	12.56 ± 3.28	0.025*
PUFA (mg/d)	12.35 ± 4.39	18.43 ± 2.56	0.010*
SFA (mg/d)	22.52 ± 5.19	15.23 ± 6.35	0.015*
Vitamin E (μg/d)	4 ± 0.02	10.02 ± 1.02	0.010*
Vitamin D (μg/d)	2 ± 0.002	3.2 ± 0.02	0.0001*
Vitamin K (μg/d)	50 ± 1.02	100 ± 1.52	0.020*

Data presented as mean ± SD
**Statistically significant*

Diet diversity scores of the study population are summarized in Table 2. The mean score for Prinzmetal angina patients was 3 ± 0.025 groups/day, for controls was 4.5 ± 0.053 groups/day. There was a significant difference in diet diversity score between the groups ($p = 0.01$).Significant differences were also observed in energy, fat, and protein intakes between the groups ($p < 0.05$). The level of soluble fat vitamins in cases was significantly lower than in controls ($p < 0.05$). The data on energy, macronutrients, and soluble fat vitamin intakes in Prinzmetal angina patients and healthy controls are summarized in Table 3.

There were significant differences in micronutrient intakes between the groups with the exception of copper ($p < 0.05$). Intake of vitamin B12 in cases was 0.8 ± 0.02 μg/day and in controls was 1.5 ± 0.01 μg/day. Iron and zinc intakes in cases were lower than in controls. The mean magnesium intake was 158.5 ± 2.36 mg/day in Prinzmetal angina patients versus 311 ± 8.53 mg/day in controls. Micronutrient intakes of subjects are presented in Table 4.

The consumption of fruit and vegetable were significantly lower in cases than in controls ($p = 0.023$). There were significant differences in fruit and vegetable, meat, fat, and sugar intake between the groups ($p < 0.05$). Dietary habits of participants in terms of the five food groups are summarized in Table 5.

Table 4. Micronutrients intake in Prinzmetal angina patients and healthy controls

Micronutrient	Cases (n = 34)	Controls (n = 35)	Dietary recommendation intake	p
Vitamin C (mg)	53 ± 2.53	85 ± 1.97	50-120	0.026*
Vitamin B1 (mg)	0.25 ± 0.002	1.6 ± 0.02	0.4- 1.4	0.000*
Vitamin B2 (mg)	0.36 ± 0.002	0.75 ± 0.015	0.3- 1.6	0.040*
Vitamin B5 (mg)	2.3 ± 0.02	5.3 ± 0.15	1.7-7	0.020*
Iron (mg)	3.5 ± 0.001	7.3 ± 0.020	8-18	0.021*
Zinc (mg)	5.7 ± 0.003	7.9 ± 0.025	8-11	0.0001*
Selenium (μg)	28.3 ± 1.25	36.4 ± 2.36	55	0.0001*
Vitamin B9 (μg)	123 ± 3.65	253 ± 1.02	65- 600	0.010*
Vitamin B12 (μg)	0.8 ± 0.02	1.5 ± 0.01	0.4- 2.8	0.002*
Cupper (mg)	0.5 ± 0.02	1.2 ± 0.1	0.2- 1.3	0.070
B6 (mg)	0.7 ± 0.05	1.5 ± 0.01	0.1-2	0.010*
B3 (mg)	5.5 ± 0.25	12.3 ± 2.35	2- 18	0.020*
Phosphorus (mg)	562 ± 8.53	986 ± 11.25	1250	0.0001*
Magnesium (mg)	158.5 ± 2.36	311 ± 8.53	240-410	0.0001*
Calcium (mg)	352 ± 2.05	658 ± 5.53	1000	0.010*
Iodine (μg)	83.2 ± 1.85	136.9 ± 5.63	150	0.020*

Data presented as mean ± SD
**Statistically significant*

Table 5. Dietary habits of Prinzmetal angina patients and healthy controls

Food groups	Cases (n = 34)	Controls (n = 35)	p
Fruit and vegetable	0.53 ± 0.002	1.02 ± 0.035	0.023*
Dairy products	1.02 ± 0.003	1.04 ± 0.002	0.060
Cereals	6.07 ± 1.02	6.53 ± 2.05	0.075
Meat	3.25 ± 0.02	2.02 ± 0.08	0.020*
Fats and sugars	2.56 ± 0.10	1.06 ± 0.05	0.011*

Data presented as mean ± SD of servings per day
**Statistically significant*

Discussion

Diversity in diet is a major component of a healthy lifestyle. The results of this study indicated that there was a significant difference in diet diversity score between Prinzmetal angina patients and healthy people, with Prinzmetal angina patients having a less diverse diet than the healthy controls. There was also a significant difference in fruit and vegetable consumption between cases and controls. However, the intake of dairy products and cereals was not different between the groups. Elwood et al. [10] found an inverse association between dietary diversity and overall mortality and cause-specific mortality.

In our study, there was a significant difference in fat intake between the groups, and fats intake of Prinzmetal angina patients was more than healthy persons. Most dietary recommendations advise reducing the intake of saturated fatty acids up to 10% of the total energy. Food-based recommendations are more practical for the general public [11]. In contrast, the high–unsaturated fat diet is predicted to reduce coronary incidence [12].

In this study, meat intake in Prinzmetal angina patients was more than that in controls. The epidemiologic data provide strong evidence that high intake of processed meat products, a major source of saturated fatty acids and carcinogens, is associated with an increased incidence of CVD [13]. Furthermore, the association between the consumption of red meat, a major source of iron and fat, and the risk of CVD was confirmed [14]. Many studies reported that higher intake of red meat was associated with a significantly elevated risk of total, CVD, and cancer mortality, and this association was observed for unprocessed and processed red meat, with a relatively greater risk for processed red meat [15, 16].

Many cohort studies have shown a protective association between the consumption of vegetables and fruit and the risk of CVD [17]. Similar to the findings of Francesca et al [18], the results of this study indicated that fruit and vegetable consumption in Prinzmetal angina patients was less than in controls. Bhupathiraju [19, 20] in a prospective cohort study with 20 years of follow-up observed that higher quantity, but not variety, of fruit and vegetable consumption was associated with a lower risk of CVD. A meta-analysis of 9 prospective cohort studies showed that the risk of CVD incidence decreased by 4% (95% CI: 1%, 7%, $p = 0.003$) with the intake of each additional portion of fruit and vegetable [21]. Several bioactive components in fruit and vegetables, such as carotenoids, vitamin C, fiber, magnesium, and potassium, may synergistically exert beneficial effects against CVD risk [12].

This study had some limitations. The small sample size was an important limitation. This study did not measure heart rate and it is a limitation for our study. The results of this study may not be generalizable to other racial/ethnic groups or to those living in different geographical latitudes and altitudes.

This was the first study assessing dietary diversity and nutrient intakes in Prinzmetal angina patients in Iran, and this can be considered the main strength of the study.

Conclusion

Dietary diversity score, as well as fruit and vegetable consumption, in patients with Prinzmetal angina was significantly lower than in healthy controls. In contrast, cases had significantly higher dietary fat and meat intake compared with controls.

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Conflict of interest

The authors declare that there is no conflict of interests.

References:

1. Goff D, Lloyd-Jones D. 2013 ACC/AHA Guideline on the Assessment of Cardiovascular Risk A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines JACC. 2014;63:25-7.
2. Kheiruri S, Mohajeri M, Khadem H. nitric oxide,omega-3 fatty acids and blood pressure in Prinzmetal angina. CTNR. 2015;2:89-94.
3. Hu F, Willet tW. Optimal diets for prevention of coronary heart disease. JAMA. 2002;288:2569– 78.
4. Kennedy G, Pedro M, Seghieri C, Nantel G, Brouwer L. Dietary Diversity Score Is a Useful Indicator of Micronutrient Intake in Non-Breast-Feeding Filipino Children. J N. 2007;137:472–7.
5. Teyn N, Nel J, Nantel G, Kennedy G, Labradarios D. Food variety and dietary diversity scores; are they good indicators of dietary adequacy? Public Health Nutr. 2006;9:644-50.
6. Bolnick DI, Snowberg LK, Hirsch PE, Lauber CL, Knight R, Caporaso JG, et al. Individuals' diet diversity influences gut microbial diversity in two freshwater fish (threespine stickleback and Eurasian perch). Ecology letters. 2014; 17(8):979-87.
7. Mok E, Vanstone C, Gallo S, Li P, Constantin E, Weiler H. Diet diversity, growth and adiposity in healthy breastfed infants fed homemade complementary foods. International Journal of

Obesity. 2017;41(5):776-82.
8. Clements KW, Si J. Engel'S Law, Diet Diversity And the Quality Of Food Consumption. 2015.
9. Slattery M, Berry T, Potter J, Caan B. Diet diversity, diet composition, and risk of colon cancer (United States). CCC. 1997;8:872–82.
10. Elwood P, Pickering J, Givens D, Gallacher J. the consumption of milk and dairy foods and the incidence of vascular disease and diabetes: an overview of the evidence. Lipids. 2010;45:925–39.
11. Boeing H, Bechthold A, Bub A, Ellinger S. Critical review: vegetables and fruit in the prevention of chronic diseases. Eur J Nutr. 2012;51:637–63.
12. Sacks F, Katan M. Randomized Clinical Trials on the Effects of Dietary Fat and Carbohydrate on Plasma Lipoproteins and Cardiovascular Disease. Am J Med. 2002;113:13–24.
13. Pan A, Sun Q, Adam M. Red Meat Consumption and Mortality. Arch Intern Med. 2012;70:555-65.
14. Micha R, Wallace S, Mozaffarian D. Red and processed meat consumption and risk of incident coronary heart disease, stroke, and diabetes mellitus: a systematic review and meta-analysis. Circ. 2010;121:2271-83.
15. Pan A, Bernstein A, Schulze M, Manson J, Willett W, Hu F. Red meat consumption and risk of type 2 diabetes: 3 cohorts of US adults and an updated meta-analysis. Am J Clin Nutr. 2011;94:1088–96.
16. Roussell M, Hill A, Gaugler T, West S, Vanden Heuvel J, Alaupovic P, et al. Beef in an Optimal Lean Diet study: effects on lipids, lipoproteins, and apolipoproteins. Am J Clin Nutr. 2012;95:9-16.
17. Dauchet L, Amouyel P, Hercberg S, Dallongeville J. Fruit and vegetable consumption and risk of coronary heart disease: a meta-analysis of cohort studies. J Nutr. 2006;136:2588–93.
18. Francesca L, Roddam A. Fruit and vegetable intake and mortality from ischaemic heart disease: results from the European Prospective Investigation into Cancer and Nutrition (EPIC)-Heart study. EHJ. 2011;32:1235-43.
19. Bhupathiraju S, Wedick N. Am J Clin Nutr. Quantity and variety in fruit and vegetable intake and risk of coronary heart disease. 2013;4:1-10.
20. Wang X, Ouyang Y, Liu J, Zhu M, Zhao G, Bao W, et al. Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. Bmj. 2014;349:g4490.
21. Crowe L, Key T. Dietary fibre intake and ischaemic heart disease mortality: the European Prospective Investigation into Cancer and Nutrition-Heart study. EJCN. 2012;66:950-6.