Original Article

The association of food quality score and cardiovascular diseases risk factors among women: A cross-sectional study

Manije Darooghegi Mofrad1,2, Nazli Namazi1, Bagher Larijani3, Nick Bellissimo1, Leila Azadbakht1,3,6,*

1Department of Community Nutrition, School of Nutritional Sciences and Dietetics, Tehran University of Medical Sciences, Tehran, Iran
2Students’ Scientific Research Center (SSRC), Tehran University of Medical Sciences (TUMS), Tehran, Iran
3Diabetes Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran
4Endocrinology and Metabolism Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran
5School of Nutrition, Ryerson University, Toronto, Canada
6Department of Community Nutrition, School of Nutrition and Food Science, Isfahan University of Medical Science, Isfahan, Iran

Abstract

Introduction: Limited studies are available regarding the relationship between Food Quality Score (FQS) and cardiovascular disease (CVD) risk factors. Thus, this study was aimed to investigate the association of FQS with CVD risk factors in women.

Methods: This cross-sectional study was carried out among 368 women aged 20–50 years who randomly selected from health centers across Tehran, Iran. Dietary intake was collected using a reliable and validated food frequency questionnaire (FFQ). The FQS includes vegetables, fruits, whole grains, red meats, fried food consumed outside the home, processed meats, potato and potato chips. Standard methods were used to assess blood pressure, biochemical and anthropometric measures. Multivariate logistic regression was used to examine the association between FQS and CVD risk factors.

Results: Participant mean age and body mass index (BMI) were 30.7 ± 6.9 years and 24.3 ± 4.0 kg/m², respectively. After taking potential confounders into account, FQS had no significant association with the risk of overweight and obesity (OR: 1.1, 95% CI: 0.68, 1.8; P = 0.683), diabetes (OR: 0.62, 95% CI: 0.22, 1.74; P = 0.374), metabolic syndrome (OR: 0.36, 95% CI: 0.10, 1.32; P = 0.127), hypercholesterolemia (OR: 0.54, 95% CI: 0.29, 1.01; P = 0.051), or hypertriglyceridemia (OR: 1.63, 95% CI: 0.71, 3.70; P = 0.244).

Conclusion: The results showed that FQS was not significantly associated with CVD risk factors among women. Prospective cohort studies are warranted to confirm our findings.

Please cite this article as: Darooghegi Mofrad M, Namazi N, Larijani B, Bellissimo N, Azadbakht L. The association of food quality score and cardiovascular diseases risk factors among women: A cross-sectional study. J Cardiovasc Thorac Res 2019;11(3):237-243. doi: 10.15171/jcvtr.2019.39.

Introduction

Cardiovascular diseases (CVDs) are the main cause of worldwide death, which are rising in both developing and developed countries. In developed countries, approximately 43% of men and 55% of women have CVDs. In the past decade, CVDs have been recognized as the main cause of mortality in Iran. Dyslipidemia, obesity and metabolic syndrome increase the risk of CVDs. Despite developed countries, CVDs risk factors have been indicated to be more prevalent among women compared with men in Iran. Physical activity and healthy eating patterns can decrease the risk of CVDs. Recently, the examination of the whole diet pattern has been applied to study the role of diet on disease prevention. Several dietary scores such as Dietary Approaches to Stop Hypertension (DASH) score and Dietary Diversity Score (DDS) have been developed to measure adherence to dietary patterns or recommendations. Many of these scores may be associated with the reduced prevalence of CVD and mortality. However, most of these diet-based dietary quality indices consider a combination of both nutrients and foods. The evaluation of nutrient intake requires entering food intake data into nutrient database, which are prone to bias. Food-based scores do not require software or access to specific databases to perform the nutrient assessment.

*Corresponding Author: Leila Azadbakht, Email: azadbakhtleila@gmail.com

© 2019 The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
Several studies have demonstrated that food-based diet quality scores linked with CVD risk factors, such as oxidative stress, obesity, low-density lipoprotein cholesterol (LDL-C) levels, and blood pressure. Only two studies have assessed the relationship between Food Quality Score (FQS) and risk of metabolic syndrome and coronary heart disease (CHD). These studies showed FQS decreased the risk of CHD, while there was no significant association with the risk of metabolic syndrome. Moreover, one study previously identified foods which were components of FQS that associated with long-term weight loss. Based on our knowledge, no study exists to examine the association between FQS and cardiovascular risk factors in Iran. Additionally, it was shown that risk factors of CVDs are more prevalent in Iranian women compared with men. Therefore, we examined the association of FQS with cardiometabolic risk factors among women in Tehran, Iran.

**Materials and Methods**

**Participants and sampling**

This cross-sectional study included 368 women between 20 and 50 years who were recruited from health centers across Tehran, Iran, in 2018. Participants inclusion was conducted by a random sampling method. The sample size was estimated using different cardiometabolic variables such as lipid factors, metabolic syndrome factors and serum fasting blood sugar (FBS). However, because the sample size calculated by FBS was higher compared with the other variables, it was considered as the dependent variable. The sample size was determined using a standard deviation (SD) = 24.4, d = 2.5, α = 0.05 and β = 0.8 with the following formula: N = [(Zα/2)^2 x S^2]/d^2.

To be included, participants were between 18 and 50 years old, not lactating or pregnant, with no history of malignant diseases, and not following a specialized diet. In the current study, participants who had energy intakes outside the range of 500–3500 kcal/d were excluded. All participants should complete the informed consent form before the study.

**Dietary assessments**

Dietary intake was evaluated using a reliable and valid 168-item semi-quantitative FFQ. All FFQs were completed by an expert dietitian through face-to-face interviews. The portion sizes were converted to grams using homebred scales. Mean nutrient and energy intakes were estimated using a modified version of Nutritionist IV software for Iranian foods (version 7.0; N-Squared Computing, Salem, OR, USA).

**FQS calculation**

We used the method defined by Fung et al., for scoring food quality. The components of FQS includes vegetables, fruits, whole grains, yogurt, nuts and legumes, coffee, refined grains, desserts and ice cream, sugar-sweetened beverages, red meats, fried food consumed outside the home, processed meats, potato and potato chips. Yogurt, nuts and legumes, fruits, whole grains, vegetables, and coffee were classified as healthy foods or food groups; red meats, refined grains, processed meats, sugar-sweetened beverages, fried foods prepared away from home, potatoes, potato chips, and desserts and ice cream were classified as unhealthy foods or food groups. We then ranked participant intakes into tertiles and assigned scores between 1 and 3 for healthy foods or food groups, and assigned reversed tertile rankings (scores between 3 and 1) for unhealthy foods or food groups. The scores from each food group were assembled and overall score ranged between 14 to 42. A higher score expresses a healthier dietary pattern.

**Biochemical assessment**

Biochemical parameters were measured following a 12-hour overnight fast. FBS was measured on the blood sampling day and the remaining serum was stored at -80°C until analyzed. Serum levels of FBS, total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), triglyceride (TG), and low-density lipoprotein cholesterol (LDL-C) were quantified using commercially available enzymatic reagents (Pars Azmoon, Tehran, Iran) adapted to an auto-analyzer system (Selectra E, Vitalab, Holliston, the Netherlands).

**Assessment of Anthropometric Indices**

Using digital scale [SECA 813; Seca, Hamburg, Germany], weight measurement was carried out to the nearest 100 g, while participants were barefoot and wore minimal clothing. Height was measured using a non-stretchable tape with participants standing in an upright position, barefoot, and shoulders in a neutral position. Waist circumference (WC) was measured at the narrowest part of the waist, and at the body mass index (BMI) was determined by dividing weight in kilograms by height in meters squared.

**Metabolic syndrome definition**

According to the National Cholesterol Education Program Adult Treatment Panel III (ATP III) guidelines, people with three or more of the following criteria have Metabolic Syndrome (MS): (1) high levels of FBS (≥100 mg/dL), (2) WC > 88 cm in women, (3) increased levels of TG (≥150 mg/dL), (4) low levels of HDL-C (<50 mg/dL), and (5) high blood pressure (systolic ≥ 130 mm Hg and diastolic ≥ 85 mm Hg).

**Assessment of other variables**

Systolic and diastolic blood pressure (SBP & DBP) were measured on the left arm in duplicate, after a minimum of 5 minutes of rest in a quiet sitting position. Trained technicians measured SBP and DBP, which were
determined as the appearance of clear tapping sounds (first Korotkoff phase) and vanishing of sound (fifth Korotkoff phase), respectively. The average of the two blood pressure measurements was calculated and used in the analysis. Several questions regarding education, occupation, income, family number, home ownership, car ownership, travel outside and within the country, having modern furniture at home, and the number of rooms at home were used to determine socioeconomic status. Demographic characteristics were also recorded using a demographic questionnaire. Physical activity was reported as metabolic equivalents (METs) in hours per day. To estimate the METs for each patient, each physical activity duration (h/d) was multiplied by its METs coefficient using standard tables.\(^{20}\)

**Statistical analysis**

Demographic characteristics, dietary intake, blood pressure and biochemical biomarkers were compared based on the median-split of FQS (group 1 (G1) <28, group 2 (G2) ≥28). Student’s \(t\)-test and chi-square test were applied for comparing means ± SDs of continuous variables and numbers and percentages of categorical variables between FQS groups, respectively. Both crude and adjusted models (age, energy intake, physical activity, socio-economic status and BMI) were reported to compare quantitative variables across the FQS medians. To compare the pre-determined parameters between groups, analysis of covariance (one-way ANCOVA) was used. Multivariate logistic regression as crude and controlled models were used to examine the association of FQS with cardiometabolic risk factors. Age, energy intake, physical activity, socioeconomic status, and BMI were adjusted. Group 1 was considered the reference group. The cut off points for high risk of CVD were as follows according to ATP III criteria:\(^{21}\): high TG (>150 mg/dL), FBS (>100 mg/dL), TC (>200 mg/dL), LDL (>130 mg/dL), SBP (>140 mm Hg), DBP (>90 mm Hg). All statistical analyses were conducted by SPSS software (version 18, SPSS Inc., Chicago, IL, USA). \(P < 0.05\) was defined statistically significant.

**Results**

A total of 368 women with an average age of 30.7 ± 6.9 years were included in the analysis. The general participant characteristics by median-split FQS are presented in Table 1. Compared with group 1, group 2 were older, more likely to be married, and higher education \((P < 0.05)\). Other general characteristics of study participants were not significantly different across groups of FQS.

Comparison of dietary intakes between the median-split FQS is provided in Table 2. After adjustment for energy intake, participants in group 2 consumed higher amounts of dietary carbohydrate, vitamin A, vitamin C, calcium, potassium, and magnesium \((P < 0.05)\). There were no significant differences between groups for dietary fat, mono unsaturated fatty acids (MUFA), saturated fatty acids (SFA), poly unsaturated fatty acids (PUFA), vitamin B6 and zinc \((P > 0.05)\). Moreover, participants in group 2 consumed lower protein, cholesterol, folic acid, thiamine and vitamin B12 \((P < 0.05)\). As presented in Table 2, intake of fruits, nuts and legumes, coffee, vegetable, yogurt, and whole grains was significantly greater in the highest FQS group \((P < 0.05)\). In addition, participants in the higher FQS group consumed less red meat, refined grains, sugar-sweetened beverages, processed meat, desserts and ice cream, and potatoes \((P < 0.05)\). However, no significant differences were observed between the highest versus lowest FQS groups for potato chips intake \((P > 0.05)\).

Crude and adjusted models for anthropometric indices,
biochemical markers, and blood pressure between FQS groups are summarized in Table 3. There were not significant differences in SBP, DBP, FBS, HDL-C, TC, and TG between groups after adjustment for known confounders ($P < 0.05$). Women in group 2 had lower LDL-C compared with group 1 ($P < 0.05$).

Multiple-adjusted odds ratio (OR) and 95% confidence intervals (CI) of CVD risk factors between FQS groups are provided in Table 4. There were no differences between groups in FBS ($P = 0.372$), TG ($P = 0.244$), and TC ($P = 0.051$). Furthermore, higher FQS were not associated with obesity and overweight ($P = 0.683$) or metabolic syndrome ($P = 0.127$).

**Discussion**

In the present study, we could not find an association between FQS and risk factors of CVDs. In line with our finding, a recent cross-sectional study failed to find a significant relationship between FQS and risk of metabolic syndrome. In addition, another study using the Elderly Dietary Index, which comprises of 10 food components, did not find any significant associations with prevalence of diabetes, hypertension, and hypercholesterolemia. In contrast to our finding, one study showed that 1 SD increase in FQS was associated with lower risk of CVDs compared with the Dietary Approach to Stop Hypertension (DASH), alternative Mediterranean diet score (aMed), and Alternative Healthy Eating Index-2010 (AHEI-2010). Mozaffarian et al identified food components of FQS were associated with lower long-term weight gain. However, the foregoing studies were cohorts with large follow-up duration and showed long-term weight gain changes.

Differences among studies may been explained by the variation in carbohydrate intake among study participants. In our study, participants in the highest FQS group consumed significantly higher dietary carbohydrate. Moreover, whole grain consumption was low, while

| Variable | G1 ≤ 28 (n=154) | G2 >28 (n=214) | $P$ value† |
|----------|----------------|----------------|------------|
| Protein (g/day) | 94.7±16.3* | 87.6±16.1 | <0.001 |
| Carbohydrate (g/day) | 369.6±39.83 | 382.6±39.49 | 0.003 |
| Fat (g/day) | 78.2±15.01 | 77.3±14.92 | 0.575 |
| Cholesterol (mg/day) | 268.6±124.22 | 217.6±123.46 | <0.001 |
| SFA (g/day) | 24.9±6.53 | 24.6±6.49 | 0.946 |
| MUFA (g/day) | 25.3±5.37 | 24.2±5.33 | 0.128 |
| PUFA (g/day) | 19.0±8.47 | 19.5±7.13 | 0.501 |
| Folic acid (μg/day) | 331.4±115.4 | 329.9±114.83 | 0.49 |
| Vitamin A (RAE/day) | 1279.4±887.08 | 1494.7±746.06 | 0.008 |
| Thiamine (mg/day) | 2.3±0.4 | 2.2±0.4 | 0.009 |
| Thiamine B6 (mg/day) | 1.9±0.61 | 1.9±0.51 | 0.749 |
| Thiamine B12 (μg/day) | 4.4±1.65 | 3.86±1.63 | 0.001 |
| Vitamin C (mg/day) | 123±74.7 | 159.6±74.31 | <0.001 |
| Calcium (mg/day) | 997.8±292.12 | 1078.4±290.38 | 0.11 |
| Magnesium (mg/day) | 277.7±57.33 | 303.6±57.05 | <0.001 |
| Potassium (mg/day) | 3272.9±862.84 | 3664.3±857.82 | <0.001 |
| Zinc (mg/day) | 10.4±2.77 | 9.9±2.76 | 0.077 |
| Fruit (g/day) | 180.4±220.39 | 357.3±219.13 | <0.001 |
| Vegetable (g/day) | 329.6±219.27 | 381.0±217.96 | 0.03 |
| Nut and legumes (g/day) | 12.6±14.89 | 18.5±14.77 | <0.001 |
| Whole grains (g/day) | 38.4±58.69 | 57.8±58.36 | 0.002 |
| Yogurt (g/day) | 115.7±114.91 | 145.7±114.25 | 0.015 |
| Sugar sweetened beverage (g/day) | 77.5±79.04 | 57.5±78.55 | 0.019 |
| Red meat (g/day) | 61.2±43.43 | 41.3±43.15 | <0.001 |
| Processed meat (g/day) | 7.9±10.52 | 4.5±10.47 | 0.003 |
| Refined grains (g/day) | 483.0±175.72 | 408.3±174.66 | <0.001 |
| Desserts and ice cream (g/day) | 34.8±27.25 | 28.6±27.06 | 0.032 |
| Potato (g/day) | 28.8±23.95 | 22.4±23.84 | 0.013 |
| Potato chips (g/day) | 15.1±12.53 | 12.7±12.46 | 0.069 |
| Coffee (g/day) | 72.6±53.36 | 111.0±53.10 | <0.001 |
| Fried food from outside the home (g/day) | 15.8±12.16 | 8.9±12.08 | <0.001 |

FQS: food quality score; SFA: saturated fatty acid; PUFA: poly unsaturated fatty acid; MUFA: mono unsaturated fatty acid; RAE: Retinol activity equivalents.

* Data were reported as mean ± SD.
† ANCOVA (adjusted for energy intake).
In an epidemiologic study, the intake of refined grain was higher in this study population. Whole grains are rich in fiber and nutrients that contribute to improvements in cardiovascular and metabolic function.23 Refined grains are rich sources of energy and contain small amounts of nutrients. According to some reports, refined grain intake has been related to risk of metabolic syndrome24 and stroke.25 Refined grains have high glycemic load, and several studies revealed that glycemic load is positively related to poorer glycemic control or metabolic risk.26 One recent meta-analysis found that high vegetable and fruit intakes reduce CVD risk.27 Another meta-analysis showed that higher nut consumption was associated with a reduced risk of total CVD, total CHD, CVD mortality, CHD mortality, all-cause mortality, and sudden cardiac death.28 In addition, a meta-analysis showed that legume consumption was associated with declined risk of CVD.29 Furthermore, Khosravi-Boroujeni et al reported that potato consumption was positively associated with high fasting blood glucose levels and diabetes mellitus, and low HDL-C.30 However, another review failed to show a significant association between potato consumption and cardiovascular mortality.31 In an epidemiologic study, high processed and red meat intakes were associated with increased BMI and SBP.32 However, results from a meta-analysis of randomized clinical trials showed that consumption of red meat did not affect blood pressures, blood lipids and lipoproteins.33 This inconsistency may be due to differences in fat content among the different studies. Further, we did not find any significant association between FQS and CVD risk factors in our study. This may have been due to the low number of participants in this study with elevated CVD risk factors.

The possible mechanisms for the association between FQS and cardiovascular risk factors are largely unknown. This association has originated from the additive effects of all components of FQS rather than on an individual nutrient or food group. Antioxidant compounds and polyphenols which are high in fruits, vegetables, nuts, legumes, whole grains and coffee might enhance the antioxidant capacity of serum, increase the formation of endothelial prostacyclin, support against in vivo lipid peroxidation, and suppress platelet aggregation. Folate, which is abundant in green leafy vegetables, may decrease plasma homocysteine concentrations, a suggested marker for arterial endothelial dysfunction.35 Furthermore, according to prior investigations, soluble fibers have shown to play cardioprotective roles by lowering serum levels of cholesterol.36 Several minerals, such as magnesium have been shown to improve endothelial function.37 The cardioprotective mechanisms of nuts include cholesterol lowering, reduced inflammation, and improved vascular health.38 Consumption of sugar sweetened beverages and

---

**Table 3. Mean and standard deviation of biochemical markers and blood pressure between FQS groups**

| Variables                  | FQS medians         |   | P value |
|----------------------------|---------------------|---|---------|
|                           | G1 ≤ 28 (n=154)     | G2 >28 (n=214) |         |
| **SBP (mm Hg)**           |                     |               |         |
| Crude model               | 11.44±0.87*         | 11.42±1.06    | 0.009   |
| Model 1                   | 11.39±1.01†         | 11.46±1.00    | 0.521   |
| **DBP (mm Hg)**           |                     |               |         |
| Crude model               | 7.86±0.61           | 7.77±0.64     | 0.495   |
| Model 1                   | 7.84±0.64           | 7.78±0.64     | 0.426   |
| **FBS (mg/d)**            |                     |               |         |
| Crude model               | 88.39±11.03         | 91.18±31.45   | 0.021   |
| Model 1                   | 87.36±23.2          | 91.91±22.96   | 0.073   |
| **LDL-C (mg/dL)**         |                     |               |         |
| Crude model               | 84.13±17.40         | 77.62±20.14   | <0.001  |
| Model 1                   | 82.78±19.00         | 78.32±18.7    | 0.037   |
| **HDL-C (mg/dL)**         |                     |               |         |
| Crude model               | 48.75±7.75          | 47.46±10.13   | 0.005   |
| Model 1                   | 48.44±9.42          | 47.62±9.35    | 0.446   |
| **Cholesterol (mg/dL)**   |                     |               |         |
| Crude model               | 178.18±36.35        | 171.19±32.89  | 0.24    |
| Model 1                   | 177.49±34.99        | 171.69±34.81  | 0.125   |
| **TG (mg/dL)**            |                     |               |         |
| Crude model               | 95.37±47.41         | 104.54±64.28  | 0.001   |
| Model 1                   | 103.59±55.34        | 104.14±54.85  | 0.171   |

FQS: food quality score; FBS: fasting blood sugar; MS: Metabolic syndrome; TG: triglyceride; LDL-C: low density lipoprotein-cholesterol
* Odd ratio (95% Confidence Interval).
† Obtained from ANCOVA (adjusted for age, energy intake, socioeconomic status).

---

**Table 4. Multiple-adjusted odds ratio (OR) and 95% confidence intervals (CI) between FQS groups**

| Variable                  | FQS groups         |   | P value |
|---------------------------|---------------------|---|---------|
|                           | G1 ≤ 28 (n=154)     | G2 >28 (n=214) |         |
| **FBS (>100 mg/dL)**      |                     |               |         |
| Crude*                    | 1.00                | 1.22 (0.57, 2.57) | 0.602  |
| Model 1**                 | 1.00                | 0.62 (0.22, 1.74) | 0.372  |
| **TG (>150 mg/dL)**       |                     |               |         |
| Crude                     | 1.00                | 2.23 (1.11, 4.47) | 0.023  |
| Model 1                   | 1.00                | 1.63 (0.71, 3.70) | 0.244  |
| **Cholesterol (>200 mg/dL)** |                  |               |         |
| Crude                     | 1.00                | 0.73 (0.42, 1.26) | 0.27   |
| Model 1                   | 1.00                | 0.54 (0.29, 1.00) | 0.05   |
| **MS, %**                 |                     |               |         |
| Crude                     | 1.00                | 0.56 (0.19, 1.63) | 293    |
| Model 1                   | 1.00                | 0.36 (0.10, 1.32) | 0.127  |
| **Obesity and overweight** |                     |               |         |
| Crude                     | 1.00                | 1.2 (0.76, 1.88) | 0.421  |
| Model 1                   | 1.00                | 1.1 (0.68, 1.8) | 0.683  |
starchy foods lead to rapid glycemia. Many studies have identified an association between high glycemic load and glycemic index diets and CVD risk factors such as low HDL-C and high TGs. However, in this study scores for refined grains, potatoes, potato chips, red meat, fried foods, sugar-sweetened beverages and processed meat were reversed in the FQS scoring system to resolve this problem.

To the best of our knowledge, this report is the first study that has examined the association between FQS and cardiovascular risk factors. However, this study had some limitations. First, although we tried to take all possible confounders into account, controlling for all residual confounding factors in our study, as in all observational studies, was not possible. Another limitation was probable misclassification of individuals due to the use of semi-quantitative FFQ to collect dietary data. Finally, since our study was only performed in women aged 20–50 years, these findings are not generalizable.

In conclusion, these results showed that FQS was not significantly associated with CVD risk factors among women. Prospective studies are warranted to confirm whether there is a casual relationship between FQS and CVD risk factors.

Competing interests
The authors report no conflicts of interest.

Ethical approval
This study approved by Iran National Institute for Medical Research Development (NIMAD) (No.964124).

Funding
This study is supported by Iran National Institute for Medical Research Development (NIMAD) (No.964124) and Tehran University of Medical Sciences.

Acknowledgments
We would like to express our gratitude to Dr. Mohammad Shariati, Vice Chancellor for Health Affairs, Zahra Beygom Aghamiri, secretary of the Health Research Council of Tehran University of Medical Sciences, and all staff members of subsidiary health centers in Tehran, Iran.

References
1. Khosravi-Boroujeni H, Sarrafzadegan N, MohammadiFard N, Sajjadi F, Maghrour M, Asgari S, et al. White rice consumption and CVD risk factors among Iranian population. J Health Popul Nutr 2013;31(2):252.
2. Petersen S, Peto V, Rayner M, Leal J, Luengo-Fernandez R, Gray A. European cardiovascular disease statistics. London: British Heart Foundation; 2005.
3. Nizal Sarrafzadegan M, Sadeghi M, Shahram Oveisgharan M, Marshall T. Incidence of cardiovascular diseases in an Iranian population: the Isfahan Cohort Study. Arch Iran Med 2013;16(3):138-44.
4. Gupta S, Gudapati R, Gaurav K, Bhise M. Emerging risk factors for cardiovascular diseases: Indian context. Indian J Endocrinol Metab 2013;17(5):806. doi: 10.4103/2230-8210.117212.
5. Leifheit-Limson EC, D’Onofrio G, Daneshvar M, Geda M, Bueno H, Spretus JA, Krumholz HM, Lichtman JH. Sex differences in cardiac risk factors, perceived risk, and health care provider discussion of risk and risk modification among young patients with acute myocardial infarction: the VIRGO study. J Am Coll Cardiol 2015;66(18):1949-57. doi: 10.1016/j.jacc.2015.08.859.
6. Ebrahimi M, Kazemi-Bajestani S, Ghayour-Mobarhan M, Ferns G. Coronary artery disease and its risk factors status in Iran: a review. Iran Red Crescent Med J 2011;13(9):610.
7. Jacobs DR, Steffen LM. Nutrients, foods, and dietary patterns as exposures in research: a framework for food synergy. Am J Clin Nutr 2003;78(3):508S-13S. doi: 10.1093/ajcn/78.3.508S.
8. Waijers PM, Feskens EJ, Ocké MC. A critical review of predefined diet quality scores. Br J Nutr 2007;97(2):219-31.
9. Chiue SE, Fung TT, Rimm EB, Hu FB, McCullough ML, Wang M, et al. Alternative dietary indices both strongly predict risk of chronic disease. J Nutr 2012:142(6):1009-18. doi: 10.3945/jn.111.157222.
10. Atkins JL, Whincup PH, Morris RW, Lennon LT, Papacosta O, Wannamethee S. High diet quality is associated with a lower risk of cardiovascular disease and all-cause mortality in older men. J Nutr 2014;144(5):673-80. doi: 10.3945/jn.113.186486.
11. Struijk EA, May AM, Wezenbeek NL, Fransen HP, Soedamah-Muthu SS, Geelen A, et al. Adherence to dietary guidelines and cardiovascular disease risk in the EPIC-NL cohort. Int J Cardiol 2014;176(2):354-9. doi: 10.1016/j.ijcard.2014.07.017.
12. Fung TT, Pan A, Hou T, Mozaffarian D, Rexzode KM, Willett WC, et al. Food quality score is associated with risk of coronary artery disease: a prospective analysis in 3 cohorts. Am J Clin Nutr 2016;104(1):65-72. doi: 10.3945/ajcn.116.130393.
13. Meyer KA, Sijsma FP, Nettleton JA, Steffen LM, Van Horn L, Shikany JM, et al. Dietary patterns are associated with plasma F 2-isoprostanes in an observational cohort study of adults. Free Radic Biol Med 2013;57:201-9. doi: 10.1016/j.freeradbiomed.2012.08.574.
14. Daneshzad E, Emami S, Daroogheh Mofrad M, Saraf-Bank S, Surkan PJ, Azadbakht L. Association of modified Nordic diet with cardiovascular risk factors among type 2 diabetes patients: a cross-sectional study. J Cardiovasc Thorac Res 2018;10(3):153-61. doi: 10.15171/jcvtr.2018.25.
15. Lavigne-Robichaud M, Moubarak JC, Lantagne-Lopez S, Johnson-Down L, Batal M, Loaun Sidi EA, et al. Diet quality indices in relation to metabolic syndrome in an Indigenous Cree (Eeyouch) population in northern Quebec, Canada. Public Health Nutr 2018;21(1):172-80. doi: 10.1017/S136898001700115X.
16. Mozaffarian D, Hao T, Rimm EB, Willett WC, Hu FB. Changes in diet and lifestyle and long-term weight gain in women and men. N Engl J Med 2011;364(25):2392-404. doi: 10.1056/NEJMoa1104296.
17. Murakami K, Sasaki S, Takahashi Y, Uenishi K. Association between dietary acid–base load and cardiometabolic risk factors in young Japanese women. Br J Nutr 2008;100(3):642-51. doi: 10.1017/S0007114508001288.
18. Azadbakht L, Mirmiran P, Esmailzadeh A, Azizi F. Dairy consumption is inversely associated with the prevalence of...
the metabolic syndrome in Tehranian adults. Am J Clin Nutr 2005;82(3):523-30. doi:10.1093/ajcn.82.3.523.
19. Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, And Treatment of High Blood Cholesterol In Adults (Adult Treatment Panel III). JAMA 2001;285(19):2486-97.
20. Ainsworth BE, Haskell WL, Whitt MC, Irwin ML, Swartz AM, Strath SJ, et al. Compendium of physical activities: an update of activity codes and MET intensities. Med Sci Sports Exerc 2000;32(9 Suppl):S498-S504.
21. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, et al. Diagnosis and management of the metabolic syndrome: an American Heart Association/ National Heart, Lung, and Blood Institute scientific statement. Circulation 2005;112(17):2735-52. doi:10.1161/ CIRCULATIONAHA.105.169404.
22. Kourlaba G, Polychronopoulos E, Zampelas A, Lionis C, Panagiotakos DB. Development of a diet index for older adults and its relation to cardiovascular disease risk factors: the Elderly Dietary Index. J Am Diet Assoc 2009;109(6):1022-30. doi: 10.1016/j.jada.2009.03.004.
23. Song S, Lee JE, Song WO, Paik H-Y, Song Y. Carbohydrate intake and refined-grain consumption are associated with metabolic syndrome in the Korean adult population. J Acad Nutr Diet 2014;114(1):54-62. doi: 10.1016/j.jand.2013.08.025.
24. Bahadoran Z, Mirmiran P, Delshad H, Azizi F. White rice consumption is a risk factor for metabolic syndrome in Tehranis adults: a prospective approach in Tehran Lipid and Glucose Study. Arch Iran Med 2014;17(6):433-40.
25. Liang W, Lee AH, Binns CW. White rice-based food consumption and ischemic stroke risk: a case-control study in southern China. J Stroke Cerebrovasc Dis 2010;19(6):480-4. doi: 10.1016/j.jstrokecerebrovasdis.2009.09.003.
26. Hosseinpour-Niazi S, Sohrab G, Ashgari G, Mirmiran P, Moslehi N, Azizi F. Dietary glycemic index, glycemic load, and cardiovascular disease risk factors: Tehran Lipid and Glucose Study. Arch Iran Med 2013;16(7):401-7.
27. Zhan J, Liu YJ, Cai LB, Xu FR, Xie T, He QQ. Fruit and vegetable consumption and risk of cardiovascular disease: A meta-analysis of prospective cohort studies. Crit Rev Food Sci Nutr 2017;57(8):1650-63. doi: 10.1080/10408398.2015.1008980.
28. Mayhew AJ, de Souza RJ, Meyre D, Anand SS, Mente A. A systematic review and meta-analysis of nut consumption and incident risk of CVD and all-cause mortality. Br J Nutr 2016;115(2):212-25. doi: 10.1017/S0007114515004316.
29. Marventano S, Izquierdo Pulido M, Sanchez-Gonzalez C, Gods J, Speciani A, Galvano F, et al. Legume consumption and CVD risk: a systematic review and meta-analysis. Public Health Nutr 2017;20(2):245-54. doi: 10.1017/ S136898001602299.
30. Khosravi-Boroujeni H, Mohammadifard N, Sarrafzadegan N, Sajjadi F, Maghrour M, Khosravi A, et al. Potato consumption and cardiovascular disease risk factors among Iranian population. Int J Food Sci Nutr 2012;63(8):913-20. doi: 10.3109/09637486.2012.690024.
31. Darooghegi Mofrad M, Milajerdi A, Sheikh A, Azadbakht L. Potato consumption and risk of all cause, cancer and cardiovascular mortality: a systematic review and dose-response meta-analysis of prospective cohort studies. Crit Rev Food Sci Nutr 2019. doi: 10.1080/10408398.2018.1557102.
32. Atalic B, Toth J, Atalic V, Radanovic D, Miskulin M, Lucin A. Red and processed meat and cardiovascular risk factors. Acta Med Croatica 2013;67(3):211-8.
33. O’Connor LE, Kim JE, Campbell WW. Total red meat intake of $>/=0.5$ servings/d does not negatively influence cardiovascular disease risk factors: a systemically searched meta-analysis of randomized controlled trials. Am J Clin Nutr 2017;105(1):57-69. doi: 10.3945/ajcn.116.142521.
34. Bjorklund G, Chirumbolo S. Role of oxidative stress and antioxidants in daily nutrition and human health. Nutrition 2017;33:311-21. doi: 10.1016/j.nut.2016.07.018.
35. Yi X, Zhou Y, Jiang D, Li X, Guo Y, Jiang X. Efficacy of folic acid supplementation on endothelial function and plasma homocysteine concentration in coronary artery disease: A meta-analysis of randomized controlled trials. Exp Ther Med 2014;7(5):1100-10. doi: 10.3892/etm.2014.1553.
36. Fujii H, Iwase M, Ohkuma T, Ogata-Kaiyu S, Ide H, Kikuchi Y, et al. Impact of dietary fiber intake on glycemic control, cardiovascular risk factors and chronic kidney disease in Japanese patients with type 2 diabetes mellitus: the Fukuoka Diabetes Registry. Nutr J 2013;12:159. doi: 10.1186/1475-2891-12-159.
37. DarooghegiMofrad M, Djafarian K, Mozaffari H, Shab-Bidar S. Effect of magnesium supplementation on endothelial function: A systematic review and meta-analysis of randomized controlled trials. Atherosclerosis 2018;273:98-105. doi: 10.1016/j.atherosclerosis.2018.04.020.
38. Ros E. Nuts and CVD. Br J Nutr 2013;113 Suppl 2:S1-110. doi: 10.1017/s0007114514003924.
39. hang X, Zhu Y, Cai L, Ma L, Jing J, Guo L, Jin Y, Ma Y, Chen Y. Dietary glycemic index and glycemic load and their relationship to cardiovascular risk factors in Chinese children. Appl Physiol Nutr Metab 2016;41(4):391-6. doi: 10.1139/apnm-2015-0432.