

**Consumption of Fruits and Vegetables in relation to the Risk of
Developing Acute Coronary Syndromes; the CARDIO2000 case-
control study**

Demosthenes B Panagiotakos^{1,2}, Christos Pitsavos¹, Peter Kokkinos², Christina
Chrysohoou¹, Manolis Vavouranakis¹, Christodoulos Stefanadis¹, and Pavlos
Toutouzas¹

¹Department of Cardiology, School of Medicine, University of Athens, Greece

² Veterans Affairs Medical Center and Cardiology Division, Georgetown University,
Washington, DC, USA

Corresponding author:

Demosthenes B Panagiotakos

46 Paleon Polemiston & Heraklitou St. Glyfada,

Attica, 166 74, Greece

Tel. +3210-9603116 & +3210-9600719 (Fax)

d.b.panagiotakos@usa.net

Abstract

Background. The relation between diet and human health has long been investigated.

The aim of this work is to evaluate the association between CHD risk and the consumption of fruit and vegetable, in a large sample of cardiac patients and controls.

Methods. Stratified sampling from all Greek regions, consisted of 848 (700 males, 58±10 and 148 females; mean age 65±9 years) randomly selected patients, admitted to the cardiology clinic for first event of acute coronary syndromes (ACS). In addition, 1078 frequency paired, by sex-age-region, controls selected in the same hospitals but without any clinical suspicion of CHD. Using validated food-frequency questionnaires from the National School of Nutrition we assessed total diet, including fruit and vegetable intake on weekly basis. Multiple logistic regression analysis assessed the risk of developing ACS, by level of fruits and vegetables intake, after taking into account the effect of several potential confounders.

Results. Data analysis revealed that the benefit of fruit or vegetable consumption increases proportionally by the number of servings consumed (P for trend < 0.001). After adjusting for the conventional cardiovascular risk factors, those in the upper quintile of fruit or vegetable consumption (5 or more/day) had 72% lower risk for CHD (OR=0.28, 95% CI 0.11 - 0.54, P < 0.001), compared with those in the lowest quintile of intake (<1 /day). Of particular interest, a 10% reduction in coronary risk was observed for every one piece of fruit or vegetable consumed per day (odds ratio = 0.90, 95% CI 0.85 - 0.97, P = 0.004).

Conclusions: Consumption of fruits and vegetables offers significant protection against CHD.

Background

Coronary heart disease is one of the leading causes of death, universally and one of the most common chronic illnesses in many countries of the developing world [1, 2]. Among the conventional cardiovascular risk factors diet pose its particular challenge for research. Cross-cultural comparisons, case-control and prospective observational studies identified a relationship between diet, blood pressure and lipids levels [3- 6], but there is still considerable scientific uncertainty about the relationship between specific dietary components and cardiovascular risk [7], especially in Mediterranean populations.

In this work we quantified the public health benefit of fruits and vegetables on the primary prevention of acute coronary syndromes (acute myocardial infarction or unstable angina), using a large sample of cardiac patients and frequency-matched controls from all Greek regions.

Methods

The CARDIO2000 is a multicentre case-control study that explores the association between several demographic, nutritional, lifestyle, clinical and biochemical risk factors with the risk of developing non-fatal acute coronary syndromes. From January 2000 to March 2002, we randomly selected 848 coronary patients and 1078 cardiovascular symptom free subjects (controls). The number of the enrolled subjects was decided through power analysis, in order to evaluate (two sided) differences in the coronary relative risk greater than 7%, with statistical power greater than 80%, and significant level less than 5%. According to the population distribution provided by the National Statistical Services (Ministry of Economics, census 1991), we stratified our sampling into all the Greek regions. Controls were, mainly, individuals

who visited the outpatients departments of the same hospital and at the same period with the coronary patients, for routine examinations or minor surgical operations. In few cases (in country hospitals) where the available number of hospitalised controls was not sufficient for the matching procedure, we enrolled into the study friends or colleagues of the coronary patients. All participants were informed about the aims of the study and agreed to give the requested information. In order to eliminate recall bias we tried to retrieve precise information from, cases and controls, medical history through the hospital or the insurance records.

The coronary patients were selected from the admission listing of the cardiological clinics. According to the study's protocol the patients were hospitalised for an acute first event of coronary heart disease in their life (acute myocardial infarction or unstable angina, stable angina was excluded from the analysis). The selection criteria for cardiac patients are:

- diagnosis of first acute myocardial infarction (MI). MI was defined by any two features: electrocardiographic changes, compatible clinical symptoms, and specific diagnostic enzyme elevations (49% of the patients had MI); or
- diagnosis of unstable angina (i.e. one or more angina episodes at rest within the preceding 48 hours) corresponding to class III of the Braunwald classification (51% of the patients had unstable angina).

Afterwards, we randomly selected subjects without any clinical symptoms, signs or suspicious of cardiovascular disease in their medical history (controls), frequently matched to the patients by age (± 3 years), sex, and region. The CARDIO2000 investigators performed the evaluation of clinical symptoms and signs, in the series of cases and controls.

The information regarding the investigated medical factors retrieved from the subjects' medical records, and the information regarding the lifestyle characteristics through a confidential, detailed, questionnaire during a specific interview by a physician, after the 2nd day of hospitalisation, for the cases and at entry for the controls. The subjects' social status investigated through educational and financial level. In particular, the educational level was classified into three groups: Group I up to high school (0 – 9 years of schooling), Group II high school, technical education (9 – 14 years of schooling) but not academic and Group III university. Current smokers were defined as those who smoked at least one cigarette per day. Former smokers were those who have stopped smoking for at least one year, and never smokers those who never smoked a cigarette in their lives. Those who stopped smoking for less than a year were classified as smokers. Quantification of smoking status was based on the calculation of pack-years adjusted for nicotine content equal to 0.8 mg per cigarette. Physical activity was defined as any type of non-occupational physical exercise, at least once/week during the past year, and was graded in qualitative terms such as light (expended calories < 4 Kcal/ min, i.e. walking slowly, stationary cycling, light stretching etc.), moderate (expended calories 4-7 Kcal/ min, i.e. walking briskly, outdoor cycling, swimming moderate effort etc.) and vigorous (expended calories >7 Kcal/ min, i.e. walking briskly uphill, long distance running, cycling fast or racing, swimming fast crawl etc.). The rest of the subjects were defined as physically inactive. Moreover, since physical activity is an important factor for cardiovascular disease we took into account the occupational activity status of all participants.

The evaluation of the nutritional habits was with a validated questionnaire based on the guidelines from the Department of Nutrition of the National School of Public Health [8]. We measured the consumption of several food items as an average

per week during the past year. Then, the frequency of consumption was quantified approximately in terms of the number of times a month this food was consumed, respectively. Thus, daily consumption multiplied by 30 and weekly consumption multiplied by 4 and a value of 0 was assigned to food items rarely or never consumed. In order to describe overall diet we used composite scores, which are necessary for the evaluation of epidemiological associations. Specifically for fruits and vegetables intake the participants reported their average consumption of a specific portion size for these foods over the past year, including apples, grapes, pears, bananas, oranges, etc, as well as broccoli, carrots, spinach, lettuce salad, yellow squash, and tomatoes. Vegetable intake was categorized into <1 serving/day, 1 – 1.49 servings/day, 1.5 – 1.99 servings/day, 2 – 2.49 servings/day, and 2.5+ servings/day, based both on maintaining a natural gradient of exposure and including adequate participants in each category. The provided list of fruits and vegetables was comprehensive enough to capture most fruits and vegetables that our subjects consumed. Although fruit juice was recorded it was not evaluated due to low consumption (< 5%) of our subjects. Alcohol, a potential confounder for total energy intake, was measured by daily ethanol consumption (red or white wine, beer, and other beverages), in wineglasses of 100 ml and 12% ethanol concentration) as done by other investigators [9].

According to the collected medical information, the majority of the controls (86%) and the patients (83%) had at least one-laboratory measurement during the past 12 months. In addition, we measured, both in patients and controls, arterial blood pressure levels in right arm (average of 3 measurements having the patient seated and rested), total cholesterol as well as glucose levels. For the cardiac patients the measurements were collected during the first 12 h of hospitalization, as more appropriate, and for the controls at the end of the interview. The previous information

as well as the patients' and controls' reports assisted us to characterize the subjects as hypertensive, hypercholesterolemic and diabetics. In keeping with the long-standing classification criteria used in several population-based studies, patients whose blood pressure, according to their medical records, were greater or equal to 140 / 90 mmHg or were taking antihypertensive medication were classified as hypertensives.

Hypercholesterolemia was defined, as cholesterol levels greater than 220 mg/dl or greater than 200mg/dl when two other risk factors for coronary heart disease were present or if hypo-lipidemic treatment was administered. Diabetics were those with fasting blood glucose greater than 125 mg/dl or those who were under special diet or treatment. Finally, we measured the height and the weight both in patients and controls and we calculated the body mass index ($BMI = \text{weight} / \{\text{height}\}^2$). In addition, we asked for any significant changes in their body mass during the past years. Obesity was defined as $BMI > 29.9 \text{ Kg} / \text{m}^2$. Presence of premature coronary heart disease among first-degree relatives (< 55 years for male relatives and < 65 for female relatives) was, also, recorded. Further details regarding the aims, design and methodology of the CARDIO2000 study have been previously presented [10 - 13].

Statistical analysis. Continuous variables are presented as mean \pm one standard deviation, while qualitative variables are presented as absolute and relative frequencies. In order to fit a multivariate risk model that evaluates the investigated parameters on the risk of developing acute coronary syndromes an exploratory analysis was initially applied. In particular, stratified by sex contingency tables were conducted in order to investigate associations between categorical variables and groups of study, by the calculation of the overall chi-squared criterion. Also, Wilcoxon non-parametric criterion was applied in order to evaluate differences in continuous measurements (i.e. body mass index) between groups of the study.

Estimations of the relative risks of developing acute coronary syndromes were performed by the calculation of the odds ratio (OR) and the corresponding confidence intervals through multiple conditional logistic regression analysis, adjusting for age (in years), body mass index (BMI) (kg/m²), smoking, alcohol intake, physical activity, history of high cholesterol or hypertension or diabetes or premature CHD, and use of multivitamins. We then conducted a stratified analysis according to smoking status (past, current, never) to evaluate whether the relation between fruits and vegetable intakes and CHD risk differs by these variables. Tests of linear trend across increasing categories of vegetable consumption were conducted by assigning the medians of intakes in categories (servings / day) treated as a continuous variable.

All reported P-values are from two-sided tests and compared to a significant level of 5%. STATA 6 software was used for the calculations (STATA Corp. College Station, Texas, USA).

Results

Seven hundred (83%) of the coronary patients were males and 148 (17%) were females, while 862 (80%) of the controls were males and 216 (20%) were females. Table 1 describes the characteristics of the patients and the controls.

[Table 1]

The data revealed that 365 (43%) of the cardiac patients and 722 (67%) of the controls consumed some fruits and vegetables daily. Of these, 28 (3%) patients and 15 (1%) controls reported consuming <1 serving/day; 351 (41%) patients and 377 (35%) controls reported consuming 1 - 1.49 servings/day; 344 (40%) patients and 428 (40%) controls reported consuming 1.5 – 1.99 servings/day; 100 (9%) patients and 150 (14%) controls reported 2 – 2.49 servings/day, and 33 (7%) patients and 100 (10%) controls

consumed 2.5+ servings/day (P for trend < 0.001). We then examined the association between the consumption of fruits and vegetables and hypertension, diabetes mellitus, hypercholesterolemia, cigarette smoking, body mass index, and physical inactivity, since these factors are considered modifiers of the effect of fruits and vegetables on the coronary risk [9]. After stratifying our analysis by group of study (patients vs. controls), an inverse association emerged between fruit/vegetable consumption and cigarette smoking (P-value = 0.008, P-value = 0.04, respectively), prevalence of hypertension (P-value = 0.038, and P = 0.067, respectively), and diabetes mellitus (P = 0.044, and P-value = 0.04, respectively). No significant interactions were observed between fruit/vegetables intake and the prevalence of hypercholesterolemia (P = 0.574, P-value = 0.804, respectively), alcohol consumption (P-value = 0.939, P-value = 0.919, respectively), obesity (P-value = 0.579, P-value = 0.565, respectively), education group (P-value = 0.589, P-value = 0.637, respectively) and physical inactivity (P-value = 0.384, P-value = 0.067, respectively). Additionally, a positive association was found between fruits consumption and education status in, both, patients and controls (P-value = 0.042, P-value = 0.001, respectively), smoking habits (P-value = 0.021, P-value = 0.001, respectively), physical activity status in controls but not in patients (P-value = 0.024, P-value = 0.385, respectively), prevalence of hypercholesterolemia (P-value = 0.002, P-value = 0.90, respectively), as well as diabetes mellitus only, in controls (P-value = 0.001, P-value = 0.643, respectively). No association was found between fruits consumption and prevalence of hypertension, in both, patients and controls (P-value = 0.737, P-value = 0.271, respectively).

After adjusting for the aforementioned risk factors, those in the upper quintile of fruit or vegetable consumption (5 or more/day) had 72% lower risk for CHD

(OR=0.28, 95% CI 0.11 - 0.54), compared with those in the lowest quintile of intake (<1 /day). Of particular interest, a 10% reduction in coronary risk was observed for every one piece of fruit or vegetable consumed per day (OR = 0.90, 95% CI 0.85 - 0.97). The individual effect of fruit and vegetable consumption on coronary risk is presented in Table 2. Adjusting for the same covariates in an analysis of the overall trend, considering vegetable intake as a continuous variable, we found an odds ratio of 0.81 (95% CI 0.67 – 0.93) for risk of CHD for each additional serving / day of fruits/vegetables.

[Table 2]

Finally, green vegetables intake showed a 12% reduction on coronary risk per item / day (odds ratio = 0.88, 95% CI 0.77 - 0.97), and vitamin C-rich fruits showed an 11% reduction per item/day (odds ratio = 0.89, 95% CI 0.84 - 0.95).

We then stratified the previous analysis by smoking status (current vs. never / former smokers) and found that the protective effect of fruits and vegetables consumption on coronary risk is diminished in the subgroup of heavy (+31 cigarettes per day) current smokers. However, some protection appears to be provided. More specifically, consumption of 2.5+ servings of vegetables per day is associated, with a 27% lower risk of developing acute coronary syndromes compared to those who consumed <1 serving per day (odds ratio = 0.73, 95% CI 0.27 – 1.96, P = 0.544).

Moreover, each 1-piece / day increase of fruits consumption is associated with 5% lower coronary risk (odds ratio = 0.95, 95% CI 0.86 – 1.04, P = 0.231).

Discussion

Our findings support that even a moderate consumption of fruits and vegetables (1 – 2 servings per day), lowers the risk of coronary events significantly, even after

controlling for several potential confounding risk factors (Table 2). Furthermore, the risk was progressively lower as the consumption of fruits or vegetables increased. Those in the highest quintile of consumption (2.5 or more serving per day) had a 72% lower risk when compared to those in the lowest quintile. Nevertheless, a large proportion of our subjects did not consume any fruits or vegetables.

Our findings are in accord with the findings of previous epidemiological studies that the consumption of fruits and vegetables might reduce disease risk, especially, for cancer and cardiovascular disease [9, 14, 15]. However, less is known about the direct association between fruits and vegetable intake and risk of acute coronary syndromes [9, 15]. In a large review of the literature, nine of ten ecological studies, two of three case-control studies and six of sixteen cohort studies reported a significant protective association of CHD with consumption of fruit and vegetables [5]. Moreover, a review of 250 observational studies, reported that increased consumption of fruits and vegetables could reduce cardiovascular deaths from 6% to 22% (8,000 deaths annually) [16]. Our findings support that even low consumption of fruits and vegetables (1-2 servings per week) is associated with about 45% lower coronary risk (Table 2). Consumption of 2 or more servings per week is associated with a 72% reduction in risk. This translates to a considerable prevention of acute coronary events and carries a large public health potential. Consequently, our findings emphasise the importance of following dietary recommendations as a whole.

Finally, our findings on smokers and the consumption of fruits and vegetables are worth mentioning. Although statistical significance was not achieved, a trend was evident, suggesting that the consumption of fruits and vegetables may offer some protection for smokers. Since smokers consume substantially less fruit and fruit juice than non-smokers with heavy smokers eating the least [17], special attention should

be given to dietary interventions for smokers in order to improve their nutrition. However, smoking cessation must remain the primary target for CHD prevention.

A discussion of the mechanisms responsible for the protection fruits and vegetables offer is beyond the scope of this study. However, several investigators reported that the antioxidant, potassium, fiber, and folate content of fruits and vegetables could at least partially explain their protective effect of CHD [18 - 20]. Other compounds such as flavonoids, phytates, lycopenes, other carotenoids, and many unknown phytochemicals in vegetables may also have significant protective effects in reducing coronary risk [21].

Despite our attempt to control for all known confounding factors, it is still possible that the observed inverse association between fruits and vegetable intake and coronary risk could be at least partially explained by other factors associated with heart-healthy behaviours [22]. Also, in retrospective case-control studies two, main, sources of systematic errors may exist, the selection and the recall bias. In order to eliminate selection bias we set objective criteria, both, for patients and controls. However, insignificant misclassification may exist, since a small percentage of asymptomatic coronary patients may be wrongly assigned to controls, even they were evaluated by a cardiologist. Moreover, in case-control studies it is, usually, observed that patients who had a recent adverse event are more likely to place greater emphasis (overestimate) on several factors related to the disease than the control group (recall bias). To reduce this type of bias and analyse precise information, we obtained accurate information from the patients as well as from their relatives or their accompanying persons and compare their responses with Kendall's tau-criterion. Concerning the medical information we avoided recall bias by obtaining detailed data from subjects' medical records. However, over/under estimation may exist, especially

in the measurement of nutritional and smoking habits, and the onset of the investigated cardiovascular risk factors. Moreover, the coronary patients who died at entry or the day after were not included into the study. This bias could influence our results. However, the proportion of deaths during the first two days was less than 4%. Thus, it is unlikely that the exclusion of fatal events has significantly altered our findings. The potential effect of uncontrolled - unknown confounders was reduced through multivariate analysis and the use of the same study base, for patients and controls.

Conclusion

Despite these limitations, the presented scientific evidences are sufficient to give good reason for public health education and promotion aimed at a substantial increase in the consumption of fruits and vegetables. However, our data do not suggest evidences for causality and population trials are needed in order to provide scientific proof of their efficacy.

Competing interests None declared

Authors' contributions

DP: design of the study, statistical analysis and drafted the manuscript, CP: design of the study and drafted the manuscript, CC: drafted the manuscript, PK: editing, MV: editing, CS: editing, and PT: conception of the study and editing. All authors read and approved the final manuscript.

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References

1. Wilson P, D'Agostino RB, Levy D, Belanger AM, Silbershatz H, Kannel WB. **Prediction of Coronary Heart Disease Using Risk Factor Categories.** *Circulation*, 1998; 97:1837-1847.
2. Wood D. **Established and emerging cardiovascular risk factors.** *Am Heart J* 2001; 141:49-57.
3. Keys A, Menotti A, Karvonen MJ, et al. **The diet and 15-year death rate in the seven countries study.** *Am J Epidemiol* 1986; 124:903-915
4. Trichopoulou A, Naska A, Vasilopoulou E. **Guidelines for the intake of vegetables and fruit: the Mediterranean approach.** *Int J Vitam Nutr Res* 2001;71(3):149-53.
5. Ness AR, Powles JW. **Fruit and vegetables, and cardiovascular disease: a review.** *Int J Epidemiol* 1997; 26:1–13.
6. Law MR, Morris JK. **By how much does fruit and vegetable consumption reduce the risk of ischaemic heart disease?** *Eur J Clin Nutr* 1998;52:549–56.
7. Boushey C J, Beresford S A A, Omenn G S, Motulsky A G. **A quantitative assessment of plasma homocysteine as a risk factor for vascular disease: probable benefits of increasing folic acid intakes.** *JAMA* 1995; 274: 1049–57.
8. Trichopoulou A. **From Research to Education: The Greek experience.** *Nutrition* 2000; 16: 528 – 531.
9. Trichopoulou A, Lagiou P, Trichopoulos D. **Traditional Greek diet and coronary heart disease.** *J Cardiovasc Risk* 1994; 1: 9-15.

10. Panagiotakos DB, Pitsavos C, Chrysohoou C, Stefanadis C, Toutouzas PK. **Risk Stratification of Coronary Heart Disease, In Greece: Final Results from CARDIO2000 Epidemiological Study.** *Prev Med* 2002; 35; 548-556.
11. Panagiotakos DB, Pitsavos C, Chrysohoou C, Tzioumis K, Papaioannou I, Stefanadis C, Toutouzas PK. **The Association Of Mediterranean Diet With Lower Risk Of Acute Coronary Syndromes, In Hypertensive Subjects.** *Int J Cardiol* 2002; 82; 141-147.
12. Pitsavos C, Panagiotakos DB, Chrysohoou C, Skoumas J, Papaioannou I, Stefanadis C, Toutouzas PK. **The Benefits From Mediterranean Diet On The Risk Of Developing Acute Coronary Syndromes, In Hypercholesterolemic Subjects: A Case-Control Study (Cardio2000).** *Cor Artery Dis* 2002; 13: 295 – 300.
13. Chrysohoou C, Panagiotakos DB, Pitsavos C, Kokkinos P, Marinakis N, Stefanadis C, Toutouzas PK. **Gender Differences on the Risk Evaluation of Acute Coronary Syndromes: The CARDIO2000 Study.** *Prev Cardiol* 2002;
14. Willett W. **Nutritional Epidemiology.** *New York: Oxford. University Press,* 1990.
15. Marchand JL, Luce D, Goldberg P, Bugel I, Salomon C, Goldberg M. **Dietary factors and the risk of lung cancer in New Caledonia (South Pacific).** *Nutr Cancer* 2002; 42(1):18-24.
16. Van't Veer P, Jansen MC, Klerk M, Kok FJ. **Fruits and vegetables in the prevention of cancer and cardiovascular disease.** *Public Health Nutr* 2000; 3(1):103-7.
17. Birkett NJ. **Intake of fruits and vegetables in smokers.** *Public Health Nutr* 1999; 2(2): 217-22.

18. Rimm EB, Stampfer MJ, Ascherio A, Giovannucci E, Colditz GA, Willett WC. **Dietary antioxidant intake and risk of coronary heart disease among men.** *N Engl J Med* 1993; 328:1450–56.
19. American Heart Association. **Dietary Guidelines for healthy American Adults.** *Circulation* 1996; 94:1795–800.
20. Knekt P, Jarvinen R, Reunanen A, Maatela J. **Flavonoid intake and coronary mortality in Finland: a cohort study.** *Br Med J* 1996;312: 478–81.
21. Liua S, Leea IM, Ajanian U, Colea SR, Buring JE, Mansona JA. **Intake of vegetables rich in carotenoids and risk of coronary heart disease in men: The Physicians' Health Study.** *Int J Epidemiol* 2001;30:130-135.
22. Nestle M. **Fruits and vegetables: protective or just fellow travelers?** *Nutr Rev* 1996; 54(8): 255-7.

Table 1. Characteristics of the study's population

	ACS Patients				Controls				P
	Males		Females		Males		Females		
Number	700 (82%)		148 (18%)		862 (80%)		216 (20%)		
Age (years)	59.1 ± 10		65.3 ± 9		58.8 ± 10		64.8 ± 10		
Education									0.012
<i>Group I (0 – 9 yrs)</i>	406	58%	114	77%	474	55%	147	68%	
<i>Group II (10 - 14 yrs)</i>	182	26%	31	21%	198	23%	41	19%	
<i>Group III (> 14 yrs)</i>	112	16%	3	2%	190	22%	28	13%	
Current smoking	525	75%	44	30%	500	58%	54	25%	< 0.001
Pack years	39.9 ± 14		13.1 ± 9		21.5 ± 13		5.2 ± 6		< 0.001
Hypertension	308	44%	102	69%	216	25%	69	32%	< 0.001
Hypercholesterolemia	413	59%	40	27%	586	68%	67	31%	< 0.001
Diabetes mellitus	168	24%	15	10%	267	31%	17	8%	< 0.001
Family history of CHD	308	44%	77	52%	129	15%	39	18%	< 0.001
Body mass index (Kg/m ²)	27.4 ± 4		27.1 ± 4		27.1 ± 3		26.7 ± 2		0.120
Physical activity	252	36%	37	25%	371	43%	84	39%	0.003
Alcohol consumption	336	48%	25	17%	379	44%	30	14%	0.024

Comparisons were based on the chi-squared test and the Wilcoxon criterion. P is for group differences after controlling for gender.

Table 2. Results from the multivariate logistic model that was developed for the evaluation of the effect of fruits and vegetables consumption on coronary risk

Variable	OR	95% C.I. for OR		P-Value
		Lower	Upper	
Age (years)	1.015	1.006	1.025	0.001
Female gender	0.402	0.320	0.505	< 0.001
Vegetable consumption				
<i><1 serving / day</i>	1.00	-	-	-
<i>1 – 1.49 servings / day</i>	0.562	0.387	0.901	0.012
<i>1.5 – 1.99 servings / day</i>	0.367	0.189	0.712	0.003
<i>2 – 2.49 servings / day</i>	0.297	0.150	0.588	< 0.001
<i>2.5+ servings / day</i>	0.281	0.110	0.541	< 0.001
Fruit consumption (per item)	0.904	0.845	0.967	0.004

The odds ratios were estimated after taking into account the effect of hypertension, hypercholesterolemia, diabetes mellitus, family history of premature coronary heart disease, physical activity status, smoking habits, body mass index, alcohol consumption, and education status of the participants.