Food Group Consumption and Glycemic Control in People With and Without Type 2 Diabetes

The ATTICA study

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Results from population-based studies on the effects of food groups on glycemic control seem conflicting (1–10). In this report, we sought to evaluate the association of various food groups with indexes of glycemic control in adults with or without type 2 diabetes without any evidence of cardiovascular disease and randomly selected from the general population.

RESEARCH DESIGN AND METHODS — During 2001–2002, we randomly enrolled 1,514 men (18–87 years old) and 1,528 women (18–89 years old) from the Attica region of Greece (of them, 5% of men and 3% of women were excluded because of history of cardiovascular diseases). Diabetes was defined according to the established criteria of the American Diabetes Association (11). Only subjects with type 2 diabetes were included in the analysis due to the small sample size of people with type 1 diabetes. Details about the aims and methods of the ATTICA study have been presented elsewhere (12).

Anthropometrical, clinical, and biochemical characteristics

Standing height and weight were recorded, and BMI was calculated (weight [in kilograms] divided by the square of height [in meters]). Arterial blood pressure and lipids were measured as previously described (11). Blood glucose levels were measured immediately with a Beckman Glucose Analyzer (Beckman Instruments, Fullerton, CA). Serum insulin concentrations were assayed by means of radioimmunoassay (RIA100; Pharmacia, Erlangen, Germany). Precision was 12% for low (3 μU/ml) and 5% for high (90 μU/ml) serum levels. The intra-assay coefficient of variation was 9% and the limit of detection was 3 μU/ml. Insulin sensitivity was assessed by the calculation of the homeostasis model assessment-R approach (glucose × insulin/22.5).

Statistical analysis

Continuous variables are presented as means ± SD. Categorical variables are presented as absolute and relative frequencies. Associations between categorical variables were tested by Χ² test, while differences between categorical and continuous variables were tested by Student’s t or Mann-Whitney tests. Due to multiple comparisons, Bonferroni correction was used to account for increase in type I error. The association between food intake and markers of glycemic control was also tested with a multiple linear regression model. Reported P values are based on two-sided tests and compared with a significance level of 5%.

RESULTS — Type 2 diabetes prevalence was 210 out of 3,042 (6.9%). Table 1 illustrates participants’ characteristics.

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A table elsewhere in this issue shows conventional and Systeme International (SI) units and conversion factors for many substances.

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this association became insignificant after adjustment for sex, age, and BMI of the participants.

Although whole milk consumption did not correlate with indexes of glycemic control in either diabetic and nondiabetic participants, multiple regression analysis revealed a strong positive association between whole milk consumption and blood glucose (β coefficient ± SE: 16.28 ± 8.27, P = 0.05) and insulin (9.45 ± 4.80, P = 0.05) but not insulin sensitivity in diabetic patients, after adjustment for sex, age, and BMI of the participants. In addition, a trend for a positive correlation was observed between chicken consumption and insulin sensitivity (r = 0.170, P = 0.06) but not glucose or insulin selectively in diabetic patients in a dose-response dependent manner. Although there was a strong trend for consumption of legumes to be positively correlated with insulin (r = 0.054, P = 0.05) in nondiabetic participants, this association became insignificant after adjustment for sex, age, and BMI of the participants. All other foods, such as yogurt, poultry, cheese, vegetables, or fruits were not associated with any of the indexes of glycemic control.

**CONCLUSIONS** — Our study revealed that increased consumption of red meat and whole milk products is associated with insulin resistance. This may lead to the development of chronic diseases, such as obesity, type 2 diabetes, and cardiovascular disease. Higher consumption of both foods is a typical component of a westernized diet. Therefore, health care professionals should encourage people to adopt a healthier dietary pattern to reduce the burden of diabetes and other metabolic diseases.

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**References**


