Dietary intakes in relation to carotid intima-media thickness in subjects with subclinical atherosclerosis

Eman M Alissa [1,2], Maisa'a M Al-Salmi [1], Sara R Helmi [1]

1 Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
2 Elemental Spectroscopy Unit, King Fahd Medical Research Center, King Abdulaziz University, Jeddah, Saudi Arabia.

Introduction

Identification of the dietary factors influencing cardiovascular diseases is critical. The impact of dietary changes on cardiovascular risk factors has shown that modification of diet restricts the progress and facilitates the regression of atherosclerotic lesions. Therefore, demonstrating a relationship between diet and atherosclerosis should provide an opportunity for potential risk reduction at an early stage of the known long disease process instead of the need to intervene at the symptomatic disease stage.

Methods

One hundred eighty nine patients, aged between 40-78 years, were randomly recruited from the internal medicine clinics at King Abdulaziz University Hospital in Jeddah, Saudi Arabia. Exclusion criteria were individuals with a history of heart disease, or the use of medications known to influence cardiovascular risk factors (e.g., estrogen, oral hypoglycemic, insulin, lipid-lowing, antihypertensive, thyroid, and antioxidant supplementations). The study was approved by the institutional review board at the hospital.

Each participant provided details of their medical history and lifestyle behaviors. Dietary intake data were collected by a 92 item, semi-quantitative FFQ designed to assess average food intake over the previous 12 months. Standard portion sizes were listed with each food. For each food item, participants indicated their average frequency of consumption over the previous year in terms of the specified serving size by checking one of 5 frequency categories ranging from "almost never" to "2-4 times per day." Reported consumption frequencies of related foods items were summed to calculate the daily servings for each specific food group. The nutrient value of the food item was multiplied by the frequency of consumption in order to obtain macro- and micro- nutrient intake. Macronutrient intakes were adjusted for total energy intake using the nutrient residual method and were also presented as the percentage of total energy intake (nutrient density). The nutrient database used was based on UK food composition tables together with food composition tables for use in East Asia and the US handbook of food composition.

Common, internal and external carotid arteries on both sides were scanned and the presence of plaques was noted using high resolution B-mode ultrasonography. The mean values of maximum left and right CIMT were determined. The presence of atherosclerotic plaque was defined as any stenosis in either the right or left carotid artery.

Data are presented as mean ± SEM. The associations between CIMT and dietary intake levels were examined by univariate analysis while adjusting for potential confounders. All statistical analysis was conducted using the SPSS 21.0 statistical packages, and statistical significance was set at $P < 0.05$. All P values were two-tailed.

Table (2): Correlation coefficients between CIMT and all nutrient intakes among the study population (N=189). All correlations were adjusted for age and gender.

CIMT vs.	r	*p*
% of energy from carbohydrates	0.465	<0.0001
% of energy from protein	0.269	<0.0001
% of energy from SFA	0.224	0.002
% of energy from MUFA	-0.280	<0.0001
% of energy from PUFA	-0.610	<0.0001
Fiber	-0.401	<0.0001
Vitamin E	-0.488	<0.0001
β-carotene	-0.205	0.006
Vitamin C	-0.214	0.003
Selenium	-0.227	0.002
Zinc	-0.278	<0.0001
Copper	-0.333	<0.0001

Objectives

We aimed to evaluate the relationship between levels of nutrients intake as determined by food frequency questionnaire (FFQ) with the degree of atherosclerotic lesions as measured by carotid intima-medial ratio (CIMT).

Results

Table (1): Total caloric and nutrients intake levels of the study population (N=189)

	RNI	Mean	SEM
Energy (Kcal)	2550♂ 2110♀ (19-59) 2380♂ 1900♀ (60-74) 2100♂ 1810♀ (75+)	1555.9	44.7
Unadjusted carbohydrate (gm)		192.2	4.9
Energy-adjusted carbohydrate (gm)		198.6	1.8
% of energy from carbohydrates	55%	50.4	0.5
Unadjusted total fat (gm)		64.9	2.2
Energy-adjusted fat (gm)		65.9	0.7
% of energy from fat	30%	36.8	0.4
Unadjusted protein (gm)		56.4	1.8
Energy-adjusted protein (gm)		57.6	0.7
% of energy from protein	15%	14.6	0.2
Unadjusted SFA (gm)		20.8	0.7
Energy-adjusted SFA (gm)		20.7	0.3
% of energy from SFA	10%	13.4	0.2
Unadjusted MUFA (gm)		20.2	0.7
Energy-adjusted MUFA (gm)		20.6	0.3
% of energy from MUFA	10%	12.7	0.2
Unadjusted PUFA (gm)		17.5	0.8
Energy-adjusted PUFA (gm)		17.4	0.4
% of energy from PUFA	10%	10.8	0.3
Cholesterol (mg)	200	163.7	9.2
Fiber (gm)	18	14.8	0.4
Vitamin D (µg)	10 (19–50 year) 15 (50+ year)	7.06	0.3
Vitamin E (mg)	20	7.31	0.3
Vitamin C (mg)	40	38.8	1.5
Vitamin B12 (µg)	1.5	1.22	0.0
Folic acid (µg)	200	235.7	6.9
β-carotene (µg)	NA	5522.6	262.1
Calcium (mg)	1000 (19-50yr) 1200 (50+yr)	679.5	22.2
Selenium (µg)	75 ♂ 60 ♀	34.8	
Zinc (mg)	9.5 ♂ 7 ♀	7.18	0.2
Copper (µg)	1.2	1.34	0.0

MUFA: monounsaturated fatty acid, NA: not available, PUFA: polyunsaturated fatty acid, RNI: reference nutrient intake, SFA: saturated fatty acid.

Conclusions

Our results suggest that dietary intake levels might affect the risk of subclinical atherosclerosis. Significant findings were consistent with dietary recommendations and lifestyle intervention. An aggressive cardiovascular risk factor modification exerted early on in life might have a potential to reduce the risk of developing atherosclerosis and the incidence of heart attack at later stages.