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Dietary factors related to the increase of cardiovascular risk factors in traditional Tepehuanos communities from Mexico. A 10 year follow-up study☆

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Abstract *Background and aims:* Tepehuanos Indians, a traditional Mexican ethnic group, followed a vegetarian diet exhibiting a low prevalence of obesity and the absence of diabetes. However, from the year 2000 the traditional diet of the Tepehuanos was modified by the introduction of western food. In this study we examine the changes in their customary diet and its impact on the prevalence of cardiovascular risk factors in this group.

Methods and results: Individuals from 12 Tepehuanos communities were randomly enrolled during 1995–1996 and 2006–2007. Using a 64-item semiquantitative food frequency questionnaire macronutrient intakes were calculated from values of Mexican food-composition tables. Cardiovascular risk factors such as obesity, hypertension, hyperglycemia and dyslipidemia were determined.

The median (25, 75 percentile) of total caloric intake (1476 [1083, 1842]–2100 [1366, 2680] kcal/day, $p < 0.001$) as well as the percentage of energy consumed from saturated fat (3.0 [2.7,4.1]–7.2 [3.9,7.4], $p < 0.0001$) and protein (8.2 [7.8,8.9]–16.8 [16.3,17.1], $p < 0.0001$) increased, whereas the percentage of total calorie intake from carbohydrates (66.4 [61.3,69.5]–61.3 [61,68.8], $p < 0.0001$), polyunsaturated fat (11.2 [10.3,12.1]–4.0 [3.9,4.3], $p < 0.0001$), and the polyunsaturated:saturated fat ratio (3.84–0.53%, $p < 0.0001$) decreased during the period of study. The prevalence of obesity (11.1–21.9%, $p = 0.04$),

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impaired fasting glucose (5.9—14.9%, $p = 0.04$), diabetes (0.0—0.88%, $p = 0.48$), hypertension (1.7—3.4%, $p = 0.43$), triglycerides (2.6—16.7%, $p = 0.0006$), and low HDL-cholesterol (10.2—71.1%, $p < 0.0001$) increased.
Conclusions: Changes in the customary diet introduced in the Tepehuanos communities are related to the increase of cardiovascular risk factors.

Introduction

Cardiovascular disease (CVD) and type 2 diabetes are relatively low among individuals following vegetarian diets [1] suggesting that diet is a major cause for development of the disease [2]. In this regard, the beneficial effects of diets high in fiber and low in saturated fat intake have been associated with a reduced risk of diabetes and CVD [3—5]. In addition, it has also has been reported that some groups such as the white Seventh-day Adventists, who are encouraged by their church to avoid the consumption of meat, exhibit a significantly lower rate of diabetes than that of the whole US white population [6].

Therefore, nutritional advice has emerged as an important component not only for the treatment of diabetes and CVD, [7] but for its prevention [8]. Evidence consistently shows the beneficial effects of intervention in lifestyle [9,10], emphasizing that modification in the dietary patterns of people at high risk prevents or at least delay the onset of CVD and diabetes [10].

Tepehuanos Indians, who live in the Sierra Madre Occidental Mountains in northern Mexico, are one of the traditional Mexican ethnic groups living in extreme poverty who farm and grow their own food. In the middle of the nineties, they had a diet based on a high intake of vegetarian products with the occasional consumption of meat, and exhibited a low prevalence of obesity and the absence of diabetes [11,12]. However, from the year 2000, as part of the social assistance programs, their traditional diet was modified by the introduction of western food. These programs regularly provided free food to the communities living in conditions of extreme poverty and, in addition, stores were created that offered food at very low cost.

In this study, we examine the changes in customary diet and its impact on the prevalence of cardiovascular risk factors in Tepehuanos Indians.

Methods

With the approval of the protocol by the Scientific Research Committee of the Instituto Mexicano del Seguro Social, a follow-up study was carried out from 1995 to 2007 and all the subjects gave their informed consent.

Study population

Based on two-stage cluster sampling during 1995—1996 inhabitants from Tepehuanos communities were randomly enrolled. In the first stage of sampling, geographical areas from the Sierra Madre Occidental Mountains were divided into clusters of traditional aboriginal villages. A total of 12 communities of less than 100 inhabitants were selected; this figure represents approximately 60% of the total available. In the second stage of sampling households from these communities were randomly selected and a single individual per dwelling was visited by field workers [11,12]. At baseline a total of 119 individuals were enrolled. About 10 years later, the same communities were visited by field workers and based on the same second stage of sampling strategy, a total of 114 Tepehuanos Indians were randomly enrolled. The response rate was 97% and 90% for the first and second survey, respectively.

Measurements

Questionnaires were administered covering demographic characteristics, medical conditions, customary diet and family history of diabetes. Measurements included blood pressure, weight, height, waist, overnight fasting plasma glucose, insulin, triglycerides and HDL-cholesterol levels.

Dietary pattern was assessed using a 64-item semi-quantitative food frequency questionnaire that has previously been validated, [13] which provided data on the frequency of food intake in the previous seven days. We asked how often, on average, a participant consumed a particular amount of specific type of food. The questionnaire included multiple foods that are among the customary diet of Mexican people. In addition, because typical portion sizes are different in the communities, the portion size was estimated based on the weight and frequency of food intake for each individual. Macronutrient intakes were calculated from the results of the food frequency questionnaire using values from Mexican food composition tables [14]

In the standing position, weight and height were measured with the subjects in light clothing using a fixed scale with stadimeter (Tanita TBF-215, Tokyo, Japan). The precision of weight and height measurements was 0.1 kg and 0.01 m. Body mass index (BMI) was calculated as weight (kilograms) divided by height (meters) squared. Waist circumference (WC) was measured to the nearest centimeter with a flexible steel tape measure while the subjects were in a standing position. The anatomical landmarks used were: laterally, midway between the lowest portion of the rib cage and iliac crest, and anteriorly midway between the xiphoid process of sternum and the umbilicus.

Using Baumanometer (microlife AG, Heerbrugg, Switzerland) and a stethoscope (3M Littman Classic II, Neuss, Germany), the technique for measurement of blood pressure was that recommended in the Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure [15].

Venous blood samples were collected after an overnight fasting of 10—12 h for measuring fasting plasma glucose (FPG), insulin concentrations and lipid profile. Because the