Dietary habits and lifestyle among long-lived residents from the Nicoya Peninsula of Costa Rica

Hábitos dietéticos y estilo de vida entre losresidentes longevos de la Península de Nicoya de Costa Rica

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Resumen

Las dietas saludables y la actividad física son recomendables para prevenir la aparición temprana de enfermedades crónicas. Sin embargo, se sabe poco sobre las características del estilo de vida asociadas con la longevidad, particularmente en países de bajos y medianos ingresos. Se analizaron las características dietéticas y de estilo de vida de hombres (n=18) y mujeres (n=16) entre 90 y 109 años de edad, residentes de la "Zona Azul" de la Península de Nicoya en Costa Rica. Todos los participantes fueron visitados en su casa para realizar mediciones antropométricas y recopilación de datos utilizando cuestionarios de estilo de vida y frecuencia de consumo de alimentos previamente validados. La mayoría de los participantes (89% de los hombres y 69% de las mujeres), reportaron ser físicamente activos a lo largo de su vida. Hubo muy pocos individuos con sobrepeso u obesidad (9% y 3%, respectivamente); donde el 75% de las mujeres y el 44% de los hombres fueron clasificados con obesidad abdominal, y 56% de las mujeres y 44% de hombres con bajo peso. Más del 65% reportaron un consumo de frutas y vegetales, frijoles negros, tortillas de maíz, arroz blanco, gallo pinto, productos lácteos y fresco entre 1 y 3 veces por día. Ninguno de los participantes reportó un consumo diario de carne roja, dulces o bocadillos salados. Asimismo, el 65% reportó un consumo de carne roja entre 2 y 6 veces por semana comparados con el 82% y el 56% de los que reportaron un consumo de pollo y pescado, respectivamente. Por lo tanto, los habitantes longevos de la "Zona Azul" de la Península de Nicoya en Costa Rica, se caracterizan por tener una dieta y estilos de vida consistentes con las recomendaciones basadas en la evidencia para promover vidas largas y saludables.

PALABRAS CLAVE:
Hábitos dietéticos, estilos de vida, longevidad, Península de Nicoya; Costa Rica.

Abstract

Healthy diets and physical activity are recommended to prevent early onset of chronic diseases. However, little is known about the lifestyle characteristics associated with longevity particularly in low and middle-income countries. We examined dietary and lifestyle characteristics of men (n=18) and women (n=16) aged 90 to 109 years old living in the "Blue Zone" of the Nicoya Peninsula in Costa Rica. All participants were visited at their home for anthropometric measurements and data collection using validated lifestyle and food frequency questionnaires.(6) Most participants (89% of men and 69% of women), reported being physically active throughout their life. There were very few overweight or obese individuals (9% and 3%, respectively); whereas 75% of women and 44% of men were classified as having abdominal obesity, and 56% of women and 44% of men as being underweight. Over 65% reported intake of fruits and vegetables, black beans, corn tortillas, white rice, "gallo pinto", dairy products, and "fresco" 1-3 times per day. None of the participants reported daily intake of red meat, sweets or salty snacks. In addition, 65% reported intake of red meat 2-6 times per week compared to 82% and 56% who reported intake of chicken and fish, respectively. Thus, the long-lived inhabitants of the "Blue Zone" of the Peninsula de Nicoya in Costa Rica are characterized by a diet and lifestyle that is consistent with evidence-based recommendations to promote long and healthy lives.

KEY WORDS:
Dietary habits; lifestyles; longevity; Nicoya peninsula; Costa Rica.

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INTRODUCTION

Improved sanitation and public health in low and middle-income countries during the past 30 years resulted in unprecedented increases in life expectancy and aging of the population.(1) Currently, the long-lived, or people 90 years old and above, represent one of the fastest growing segments in the global population, where it is estimated that by 2050 the centenarian population will reach 3.2 million worldwide.(2) Global differences in life expectancy have led to the identification of specific regions known as "Blue Zones" where residents live for many years in good health.(3) There are currently five "Blue Zones" worldwide: the island of Sardinia in Italy, the island of Okinawa in Japan, the community of Loma Linda in California (USA), the island of Ikaria in Greece and the Nicoya Peninsula in Costa Rica. (4–6) Enjoying such a long healthy life has been termed "successful aging".[7]

Residents of the Nicoya Peninsula aged 90 years and above have 10% lower total mortality and 23% lower cancer mortality than the rest of Costa Rica.[8] Nevertheless, the basis for such a long and healthy life is not well understood. It has been hypothesized that diet and other lifestyle factors may play a role in the "successful aging" of this population.[7] Studies show that diets that are high in fruits and vegetables, whole grains, healthy oils, and low in salt and animal products, as well as not smoking and keeping a healthy weight and active lifestyle are strongly associated with lower risk of chronic diseases and could promote exceptional longevity.[4,5,9–11]

We examined dietary and lifestyle characteristics of inhabitants of the Nicoya Peninsula of Costa Rica 90 years old and above to determine whether their dietary habits are in agreement with those recommended to promote longevity.

MATERIALS AND METHODS:

Potential participants were identified through the Costa Rican Longevity and Healthy Aging Study.[7] Eligible men and women were those 90 years old and above and that lived in the Nicoya Peninsula of Costa Rica. All participants sign an informed consent as stated in the Declaration of Helsinki.[12]

Trained and standardized fieldworkers visited the participants' home for data collection. A general questionnaire was used to collect personal information, health history and lifestyle habits. Dietary data was obtained with a modified version of a food frequency questionnaire (FFQ) previously validated for the Costa Rican population.[13,14] The questionnaire inquired about the frequency of fruits, vegetables, tubers, plantains, black beans, cereals such as rice, bread and corn tortillas, animal products, sweet beverages and sweets using nine intake categories: < 1/m, 1-3/m, 1/wk, 2-4/wk, 5-6/wk, 1/d, 2-3/d, 4-5/d and 6+/d. An "Aging Questionnaire" was used to inquire about lifestyle and health conditions, and the MMSE was used to assess five areas of cognitive function; orientation, registration, attention and calculation, recall, and language.[15,16] To avoid possible errors because of fatigue, the order in which the instruments were applied was randomly assigned and there was a 10-minute rest period between each instrument. The anthropometric measurements taken were weight (kg), height (cm) and abdominal circumference (cm). The interpretation of body mass index (BMI) and abdominal circumference was based on the World Health Organization (WHO) classification for elderly people.[17] The Statistical Package for Social Sciences (SPSS) version 23 was used for data analyses.

RESULTS

Table I shows the socio-demographic and health characteristics of study participants. The mean age was 99 for women and 97 for men. There were very few overweight and obese individuals, 9% and 3%, respectively; whereas 75% of women and 44% of men were classified as having abdominal obesity, and 56% of women and 44% of men as being underweight. None of participants finished elementary school with the average years of education being 3 years in both men and women. None of the participants lived alone. Most men reported working in agriculture while women held a variety of occupations. Most participants were categorized as physically active. More than 50% manifested the presence of at least one chronic disease (mostly hypertension) as well as some level of cognitive impairment. Only one male participant reported being a current smoker, although 31% of women and 67% of men reported being past smokers. Almost all women (94%) reported never drinking alcohol, while 67% of men reported being past drinkers and 17% being current drinkers.

Table 1.
Socio-demographic and health characteristics of men and women 90 years old and above living in the Nicoya Peninsula of Costa Rica.

	Women	Men
Variable	N= 16	N=18
Age, yr (mean ± SD)	99 ± 5	97 ± 4
Body mass index, kg/m^2 (mean ± SD)	22.2 ± 5	23.8 ± 3
Waist circumference, cm (mean ± SD)	90.3 ± 13	94.5 ± 9
Overweight*	1(6%)	2 (11%)
Obesity†	1(6%)	0 (0%)
Underweight‖	9 (56%)	8 (44%)
Abdominal obesity§	12 (75%)	8 (44%)
Education, yr (mean ± SD)	3 ± 2	3 ± 2
Living alone, n (%)	0 (0%)	0 (0%)
Past occupation n (%)		
Agricultural workers	0 (0%)	11 (61%)
Farmer owners	3 (19%)	5 (28%)
Other jobs (cook, teacher, artists, drover)	6 (38%)	2 (11%)
Unskilled worker	4 (25%)	0 (0%)
Maid service	3 (19%)	0 (0%)
Physically active‡	11 (69%)	16 (89%)
Health history n (%)		
Hypertension	5 (31%)	6 (33%)
Other (diabetes, high cholesterol, asthma-bronchitis, cardiovascular disease)¶	6 (38%)	3 (17%)
Cognitive status¥		
Mild cognitive impairment	3 (19%)	5 (28%)
Moderate cognitive impairment	10 (63%)	7 (39%)
Smoking		
Current	0 (0%)	1 (6%)
Past	5 (31%)	12 (67%)
Never	11 (69%)	5 (28%)
Alcohol intake**		
Current	0 (0%)	3 (17%)
Past	1 (6%)	12 (67%)
Never	15 (94%)	3 (17%)

N=34
*BMI >28 and ≤ 32 Kg/m2.
†BMI >32 kg/m2.
‖ BMI ≤ 23 kg/m2.
§ Men ≥ 102 cm and women ≥ 88 cm.
‡Walking or gardening at least three times a week for at least 30 min.
¶ Diabetes n=4, high cholesterol n=2, asthma-bronchitis n=2, cardiovascular disease n=1;
¥Mild cognitive impairment ≥ 21 and < 23 points; moderate cognitive impairment, 10-20 points.
**At least one glass of beer or liquor per day.

Table 2 shows the frequency of food intake among participants. Over 65% reported intake of fruits and vegetables, black beans, corn tortillas, white rice, "gallo pinto", dairy products, and "fresco" 1-3 times per day. The mean + SD dairy intake was 3.3 + 1.4. portions among those who reported daily intake. Fresh cheese and milk were the most widely consumed; mean + SD, 1.7 + 0.7 and 0.9 + 1.0 portions per day, respectively. None of the participants reported daily intake of fish or red meat, only one participant reported daily intake of chicken, and 56% reported daily intake of eggs. Most participants reported intake of sweets and commercial drinks less than once per week. None of the participants reported intake of salty snacks and/or chips one or more times per week (data not shown).

Table 2.
Dietary intake among men and women 90 years old and above living in the Nicoya Peninsula of Costa Rica.

	Frequency		
Food group	≤ 1 times per week	2-6 times per week	1-3 times per day
Fruits and vegetables	0 (0%)	9 (26%)	25 (74%)
Tubers* and plantains	4 (12%)	20 (59%)	10 (29%)
Black beans	3 (9%)	3 (9%)	28 (82%)
Cereals			
Gallo pinto†	5 (15%)	6 (18%)	23 (68%)
Corn tortillas	3 (9%)	6 (18%)	25 (74%)
White rice	1 (3%)	1 (3%)	32 (94%)
White bread	12 (35%)	8 (24%)	14 (41%)
Sweets ||	25 (74%)	7 (21%)	2 (6%)
Beverages			
Fresco§	2 (6%)	4 (12%)	28 (82%)
Soft drinks or sodas	28 (82%)	5 (15%)	1 (3%)
Dairy‡	3 (9%)	4 (12%)	27 (79%)
Meats and eggs			
Eggs	6 (18%)	9 (26%)	19 (56%)
Chicken	5 (15%)	28 (82%)	1 (3%)
Fish	16 (47%)	18 (53%)	0 (0%)
Red meat¶	12 (35%)	22 (65%)	0 (0%)

N=34
* Mostly potato, cassava and sweet potato.
† A traditional dish that consists of a mixture of rice and beans, usually consumed at breakfast.
|| Sweets as candies and chocolates.
§A homemade drink made with water, tropical fruit and sugar.
‡ Dairy includes milk, buttermilk, fresh cheese, and yogurt.
¶ Red meat includes beef and pork.

Table 3 presents age, anthropometric measurements, physical activity and dietary intake of study participants by abdominal obesity. Overall, data are comparable for those with and without abdominal obesity. Most participants without abdominal obesity were underweight (71%), whereas only 15% of participants with abdominal obesity were overweight and 5% obese. Among those with and without abdominal obesity, 60% and 57% reported walking every day, respectively. Daily intake of fruits, vegetables, tubers and black beans was comparable in those with and without abdominal obesity. In contrast, there were more participants reporting intake of cereals among those with abdominal obesity compared to those without. The average portions per day of refined cereals was 4.5 + 1.7 among those with abdominal obesity and 3.7 + 1.9 among those without abdominal obesity (p>0.05).

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Table 3. Dietary intake and general characteristics by presence of abdominal obesity among men and women 90 years old and above living in the Nicoya Peninsula of Costa Rica.

	Abdominal obesity§	
	No	Yes
Variable	N=14	N=20
Age, yr (mean ± SD)	99 ± 5	97 ± 4
Education, yr (mean ± SD)	3 ± 2	3 ± 2
Body mass index (mean ± SD)	21.0 ± 2	24.6 ± 5
Overweight*	0 (0%)	3 (15%)
Obesity†	0 (0%)	1(5%)
Underweight‖	10 (71%)	7 (35%)
Walk every day	8 (57%)	12 (60%)
Dietary intake	1-3 times per day	1-3 times per day
Fruits and vegetables	11 (79%)	14 (70%)
Tubers‡ and plantains	5 (36%)	5 (25%)
Black beans	11 (79%)	17 (85%)
Cereals		
Gallo pinto¶	9 (64%)	14 (70%)
Corn tortillas	9 (64%)	16 (80%)
White rice	13 (93%)	19 (95%)
White bread	4 (29%)	10 (50%)
Sweets¥	0 (0%)	2 (10%)
Fresco**	11 (79%)	17 (85%)
Soft drinks or sodas	1(7%)	1 (5%)
Dairy††	12 (86%)	15 (75%)
Meats and eggs	2-6 times per week	2-6 times per week
Eggs	1 (7%)	8 (40%)
Chicken	9 (64%)	19 (95%)
Fish	9 (64%)	9 (45%)
Red meat§§	9 (64%)	14 (70%)

N=34
*BMI >28 < 32 Kg/m2.
†BMI >32 kg/m2.
‖ BMI ≤ 23 kg/m2.
§Men ≥ 102 cm; women ≥ 88 cm.
‡Tubers include potato, cassava and sweet potato.
¶Gallo pinto is a traditional dish that consists of a mixture of rice and beans, usually consumed at breakfast.
¥Candies and chocolates

**A homeade drink made with water, tropical fruit and sugar.
††Dairy includes milk, buttermilk, fresh cheese, and yogurt
§§Red meat includes beef and pork.

DISCUSSION

We characterize the diet and lifestyle of 34 long-lived inhabitants of the Nicoya Peninsula. Our data show that participants in the study had a diet and lifestyle that are consistent with recommendations to maintain a long-healthy life.(18,19) Most participants reported being physically active throughout their life (although men more so than women), very few were overweight or obese, they were past or none smokers, and none lived alone. In addition, most reported following a diet that included daily intake of fruits, vegetables, black beans, rice, tortillas and eggs. Only 41% reported daily intake of white bread and none reported daily intake of red meat, commercial sugar sweetened beverages, or salty snacks.

Sex is a strong determinant of age-related diseases.(20) For example, men are five times more likely to die early from cardiovascular disease than women. (21) In this study, 69% of women and 50% of men reported having hypertension, diabetes or other chronic diseases, suggesting that men with these chronic diseases are less likely to become centenarian. In agreement with this observation, the Gerontology Research Group(22) indicates that most long-lived people worldwide are women. Nevertheless, it has been suggested that in the Nicoya Peninsula the probability of becoming a centenarian is higher in men than women, because men are more physically active than women. (6) In our study, men were more likely to be physically active than women (89% versus 69%, respectively), but both were very physically active if compared to other populations in Costa Rica.

The benefits of regular physical activity are well documented and are likely to explain the longevity and well-being of this population.(23–25) In fact, physically demanding jobs, such as farming and agriculture also characterize the long-lived in other "Blue Zones" such Sardinia and Ikaria.(4,26,27) Participants in the study have maintained levels of physical activity that are consistent with recommendations for seniors issued by the World Health Organization.(28)

The aging population of Costa Rica has grown dramatically during the past 60 years.(29) According to the National Institute of Statistics and Census of Costa Rica (INEC), the number of centenarians grew from 5 in 1950 to more than 400 in 2011.(29) Whether this accelerated growth of long-lived individuals will continue in future generations needs to be determined. The beneficial outcomes of improved drug treatment and medical advances may be dampen by the detrimental changes in diet and lifestyle that have accompanied the epidemiological transition.(30–32) Although genetic factors are likely to affect longevity, numerous studies indicate that diet and lifestyle are the primary contributors.(33) Results from the Costa Rica Heart Study (CRHS), a large, population-based, case-control study in the Central Valley of Costa Rica, show that following a healthy lifestyle was potentially far more beneficial for heart disease than having a favorable genetic make-up.(33)

The relative isolation from large urban centers, has led to the hypothesis that inhabitants of the Peninsula Nicoya are more likely to maintain customs and food traditions that tend to disappear during the nutrition transition that results from development and globalization. (3,32,34) Our results support this hypothesis. For example, only 18% of participants in this study reported consuming commercial sugar sweetened beverages (SSB) more than once per week, whereas 62% of CRHS adults living in the Central Valley of Costa Rica did so.(35,36) Daily intake of commercial SSBs was associated with increased risk of adiposity and metabolic syndrome in CRHS, whereas intake of "fresco" (mostly consumed in the current study) was not.(35) As in many other developing countries undergoing the nutrition transition, urbanization in Costa Rica has been associated with lower intake of beans relative to rice.(37,32) However, consistent with the proposed hypothesis, over 80% of participants in this study reported daily intake of black beans and 74% reported daily intake of corn tortillas, both primary constituents of the traditional Costa Rican diet. This dietary pattern is consistent with that of long-lived people from other "Blue Zones".(6,27) Legume intake is strongly associated with lower risk of obesity and cardiovascular disease in numerous studies including those in Costa Rica.(38,37,39–41) Thus, together these factors suggest the maintenance of some traditional dietary patterns in the isolated region of Nicoya could be contributing to the prolonged age of this population.

Of great interest is the observation that none of the participants in this study reported daily intake of red meat. In addition, 65% reported intake of red meat 2-6 times per week compared to 82% and 56% who reported intake of chicken and fish, respectively. This level of intake is consistent with current health recommendations.(19) Red meat intake has increased in developing countries, a worrisome trend given the adverse potential effects of red meat on health.(42) Red meat is associated with increased risk of diabetes, cancer, and cardiovascular mortality.(43) In fact, daily intake of red meat was associated with a 31% increase in the risk of heart disease in CRHS.

Our study also found that a large proportion of participants had abdominal obesity despite an overall low average BMI level. Among those with abdominal obesity, there were 35% who were overweight but only 20% were overweight or obese. This result is most likely due to the age-related redistribution of fat towards the abdominal area. (44,45) Interestingly, those with abdominal obesity were more likely to have a diet that was somewhat higher in refined cereals than those without abdominal obesity, suggesting that refined cereals promote abdominal obesity. (46,47)

We recognize that this study is small and results could be due to chance. It is also possible that the use of FFQ in this elderly population with some level of cognitive impairment and low education could lead to larger error than in younger adults were the FFQ was validated.(13,14) Nevertheless, the validity of our findings is strengthen by the consistency between our results and those from other long-lived populations, the similarity between the reported dietary pattern and evidence-based recommendations to promote longevity and the finding of low BMI and high self-reported physical activity.

In sum, this study in a group of long-lived inhabitants of the "Blue Zone" of the Peninsula de Nicoya in Costa Rica supports findings indicating that healthy diet and lifestyle play an important role in promoting long and healthy lives.

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