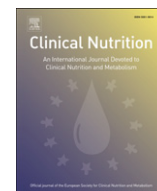


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Clinical Nutrition

journal homepage: <http://www.elsevier.com/locate/clnu>

Original article

Coffee consumption and health-related quality of life

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ARTICLE INFO

Article history:

Received 11 December 2012

Accepted 6 April 2013

Keywords:

Coffee

Health-related quality of life

Population study

SUMMARY

Background and aims: Understanding the effect of coffee on health-related quality of life (HRQL) would contribute to explain the mechanisms of the long-term effect of coffee on health. The aim of this study was to examine the association between coffee consumption and HRQL.

Methods: Cross-sectional study conducted in 2008–2010 among 11,423 individuals representative of the Spanish population aged ≥ 18 years. Habitual coffee and food consumption was assessed with a validated diet history. HRQL was measured using the Spanish version of the SF-12 questionnaire. The analyses were performed using linear regression and adjusted for the main confounders.

Results: Among men, no association was found between coffee consumption and the physical and mental composite summaries (PCS and MCS) of the SF-12. Among women, compared to those who did not consume coffee, habitual coffee drinkers showed similar scores on the PCS [beta coefficients (*p* value) for 1, 2, 3, and ≥ 4 cups/day: 0.49 (0.20), 0.62 (0.21), 0.50 (0.45), and 0.36 (0.59)]; but slightly better scores on the MCS [beta (*p* value): 1.58 (<0.001), 1.58 (0.004), 0.80 (0.31), and 1.22 (0.10)]. These results reflect mostly the consumption of non-filtered caffeinated coffee. Tea consumption and total caffeine intake did not show an association with HRQL.

Conclusion: We found no evidence of an adverse effect of coffee on HRQL. These results are consistent with the null association between this beverage and several chronic diseases and all-cause mortality reported in many studies. The weak positive association of coffee with the MCS found among women needs further confirmation.

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1. Introduction

There is substantial interest on the health effects of coffee because this beverage is widely consumed throughout the world. Although caffeine intake produces an acute increase in blood pressure¹ and coffee can trigger acute myocardial infarction² and stroke,³ habitual coffee consumption has a null or inverse association with long-term risk of several chronic diseases (e.g. diabetes, ischemic heart disease, stroke, several types of cancer, depression, etc.) and all-cause mortality.^{4–6}

The mechanisms of the long-term effects of coffee are unclear. First, because it is uncertain if habitual coffee drinkers develop tolerance to the acute effects of caffeine.⁷ Second, because in addition to caffeine, coffee contains hundreds of substances whose biological effects are mostly unknown.⁸ Moreover, among the few

substances whose effects are established, some seem to be beneficial (e.g., phenolic compounds, magnesium, trigonelline and quinides, which have antioxidant or antiinflammatory properties)^{8,9} while others may be detrimental (e.g., diterpenes, which might increase total and serum LDL-cholesterol).¹⁰ Thus, the net long-term impact of coffee on health should result from a balance of the effects of all those substances.

Health-related quality of life (HRQL) represents the individual perception of the impact of health status on different spheres of life, including physical, mental and social aspects.¹¹ A decline in HRQL has been shown to predict increased mortality in subsequent years, while its improvement is predictive of lower mortality.¹² However, no previous study has examined the association between coffee consumption and HRQL. A positive or null association would contribute to a better understanding of the mechanisms of the long-term effect of coffee on health and would add biological plausibility to the association between coffee and lower all-cause mortality reported in many studies.^{4,5} Thus, the objective of this study was to assess the association between habitual coffee consumption and HRQL in a representative sample of the Spanish population.

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2. Methods

2.1. Study design and participants

Data were taken from the ENRICA study, whose methods have been reported elsewhere.¹³ This is a cross-sectional study conducted in 2008–2010 among 12,948 individuals representative of the non-institutionalized Spanish population aged ≥ 18 years. Information was obtained in the households of study participants. Data collection included a health interview, samples of blood and urine, a physical examination, and a computerized dietary history to obtain habitual diet. Study participants gave written informed consent. The ENRICA study was approved by the Clinical Research Ethics Committees of the University Hospital 'La Paz' in Madrid and the Hospital 'Clinic' in Barcelona.

2.2. Coffee consumption

Habitual food consumption in the previous year was assessed with a computerized dietary history, developed from the one used in the EPIC-Spain cohort study.^{14,15} Coffee consumption was recorded in detail by asking the participants whether they consumed caffeinated or decaffeinated coffee and also about the method of preparation: drip coffee (filtered), percolated, espresso or instant (unfiltered). We considered the size of the cup and the addition of milk to the beverage to calculate the total amount of coffee in ml per day. Caffeine and other nutrient intakes were estimated using standard food composition tables.^{16–20} Thus, a cup of percolated caffeinated coffee (70 ml) was considered to provide 80 mg of caffeine, a cup of drip caffeinated coffee (70 ml) 115 mg of caffeine, and a cup of espresso caffeinated coffee (50 ml) 75 mg of caffeine.

To calculate the total caffeine intake per day we included caffeine from coffee and also from tea (a bag contained 30 mg of caffeine), caffeinated soft drinks (a 200 ml glass contained 20 mg of caffeine, and a 333 ml bottle contained 33 mg) and from chocolate (150 ml of hot chocolate contained 4 mg of caffeine, and 28.34 g of solid chocolate contained 6 mg).

2.3. HRQL

HRQL was measured using the Spanish version of the SF-12 questionnaire.²¹ This is a reduced version of the SF-36 questionnaire, one of the most widely used instruments to evaluate HRQL. This shorter version was obtained with a selection of 12 items, whose responses are coded and analyzed to reproduce the physical composite summary (PCS) and the mental composite summary (MCS) from the longer version. The PCS and MCS scores are standardized to a national norm with a mean of 50.0 and a standard deviation of 10.0. A zero score in PCS or MCS indicates the lowest level of health, and 100 indicates the highest level.

2.4. Other variables

Study participants reported their age, educational level, smoking habit, the total amount of hours of sleep per day, and whether they were living alone or not. Information on physical activity during leisure time was obtained with the questionnaire developed for the EPIC-Spain cohort, and was expressed in METs h/wk.²² Also, a Mediterranean diet adherence scale was calculated according to Trichopoulou et al.²³ In this scale, the intake of vegetables, legumes, fruits and nuts, cereal, and fish was considered beneficial and, thus, we assigned a value of 1 to consumption above the median in the study sample; in contrast, the intake of red meat, poultry and dairy products was considered detrimental, and a value of 0 was assigned

to consumption above the median. The range of the scale was 0–8. We did not include alcohol consumption in the scale because its effect on the association between coffee and HRQL was accounted for separately.

Weight and height were measured in each subject under standardized conditions. Body mass index (BMI) was calculated as weight in kg divided by squared height in m. Blood pressure was measured using a standard protocol.²⁴ Hypertension was defined as systolic BP ≥ 140 mm Hg, diastolic BP ≥ 90 mm Hg, or being under antihypertensive drug treatment. Type 2 diabetes was defined as fasting serum glucose ≥ 126 mg/dl or being treated with oral drugs or insulin, and hypercholesterolemia as serum total cholesterol ≥ 200 mg/dl or receiving lipid lowering drugs. Finally, participants also reported if they had suffered in the previous year any of the following physician-diagnosed diseases: pneumonia, asthma or chronic bronchitis, cardiovascular disease, sleep apnea, arthritis, hip fracture, gallstones, intestinal polyps, cirrhosis of the liver, peptic ulcer, urinary infection, cataracts, periodontal disease, cancer at any site, Parkinson disease, and Alzheimer disease.

2.5. Statistical analysis

Of the 12,948 study participants, we excluded 966 with missing or invalid information on diet, and 559 who lacked data on the rest of the study variables. Thus, the analyses were conducted with 11,423 persons. We calculated the age-adjusted means and their 95% CI for the PCS and MCS in the following five categories of coffee consumption: no consumption, 1, 2, 3, and ≥ 4 cups per day. In addition, we performed linear regression models for the association between coffee consumption and the SF-12 summaries. Regression models were adjusted for age, educational level, smoking status, alcohol intake, sleep hours, living alone, physical activity during leisure time, Mediterranean diet score, BMI, hypertension, diabetes, hypercholesterolemia, and reported morbidity. All variables were modeled as categorical with dummy terms.

Additionally, we calculated odds ratios (OR) for the association between coffee consumption and suboptimal HRQL, considering 'suboptimal' to be PCS and MCS scores below the sex-specific median. To assess the robustness of results, we also conducted stratified analyses by categories of age, smoking status, and alcohol intake. We tested the interaction between coffee and the categories of the stratification variables with the PCS and MCS by using likelihood-ratio tests, which compared the nested models with and without cross-product interaction terms. Finally, we studied the association of tea and total caffeine intake with the SF-12 summaries. All analyses were conducted using SAS (version 9.2, SAS Institute Inc, Cary, NC) statistical software and used techniques appropriate to the complex survey design of this study.

3. Results

In this study, 4297 (76.2%) men and 4504 (77.8%) women consumed at least 1 cup of coffee per day. The mean consumption of coffee was 78.7 ml/d (standard deviation: 86.1) in men and 81.4 (90.4) ml/d in women. Most of total coffee consumed was caffeinated (79%) and non-filtered coffee (85%) in this cohort. In comparison with those who did not drink this beverage, participants who drank coffee were older, had lower educational level, higher BMI and slightly higher prevalence of hypertension, diabetes, hypercholesterolemia and other diseases (Table 1). In addition, the higher the amount of coffee consumption, the higher the prevalence of smoking and alcohol consumption, and the lower the amount of physical activity performed during leisure time. Also, those with higher consumption of coffee were more likely to live

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