Clinical Nutrition xxx (2016) 1–6

Contents lists available at ScienceDirect

Clinical Nutrition

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

Original article

Adherence to a Mediterranean diet is associated with lower prevalence of osteoarthritis: Data from the osteoarthritis initiative

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ARTICLE INFO

Article history:
Received 22 July 2016
Accepted 29 September 2016

Keywords:
Osteoarthritis
Mediterranean diet
Aged
Healthy ageing
Lifestyle

SUMMARY

Background & aims: The Mediterranean diet appears to be beneficial for several medical conditions, but data regarding osteoarthritis (OA) are not available. The aim of this study was to investigate if adherence to the Mediterranean diet is associated with a lower prevalence of OA of the knee in a large cohort from North America.
Methods: 4358 community-dwelling participants (2527 females; mean age: 61.2 years) from the Osteoarthritis Initiative were included. Adherence to the Mediterranean diet was evaluated through a validated Mediterranean diet score (aMED) categorized into quartiles (Q). Knee OA was diagnosed both clinically and radiologically. The strength of the association between aMED (divided in quartiles) and knee OA was investigated through a logistic regression analysis and reported as odds ratios (ORs) with 95% confidence intervals (CIs), adjusted for potential confounders.
Results: Participants with a higher adherence to Mediterranean diet had a significantly lower prevalence of knee OA compared to those with lower adherence (Q4: 25.2% vs. Q1: 33.8%; $p < 0.0001$). Using a logistic regression analysis, adjusting for 10 potential confounders with those in the lowest quartile of aMED as reference, participants with the highest aMED had a significant reduction in presence of knee OA (OR, 0.83; 95% CIs: 0.69–0.99, $p = 0.04$). Among the individual components of Mediterranean diet, only higher use of cereals was associated with lower odds of having knee OA (OR: 0.76; 95%CI: 0.60–0.98; $p = 0.03$).
Conclusions: Higher adherence to a Mediterranean diet is associated with lower prevalence of knee OA. This remained when adjusting for potential confounders.

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http://dx.doi.org/10.1016/j.clnu.2016.09.035
0261-5614/

1. Introduction

The term 'Mediterranean diet' encompasses the traditional dietary habits of people from across the Mediterranean region and is usually depicted as a food pyramid [1]. The Mediterranean-style diet is an established healthy-eating diet pattern that has consistently demonstrated to have beneficial effects on musculoskeletal [2], cardiovascular [3], metabolic [4], and cognitive [5] diseases.

Recent global surveys of disease surveys have demonstrated that whilst average life expectancy is increasing [6,7], the number of years people that live with chronic conditions is also rising. One of the most common causes of years lived with disability are chronic musculoskeletal disorders [8,9]. Osteoarthritis (OA) of the knee is the 11th highest contributor to global disability [10]. The worldwide prevalence of OA has been estimated as 10% in men and 20% in women over the age of 60 years [11].

To the best of the author's knowledge, no analyses have investigated the relationship between Mediterranean diet and OA [12]. The Framingham Osteoarthritis Cohort study previously reported that participants with higher vitamin C and E and β-carotene intake may be less likely to have progressive knee OA [13]. However this is only one of the few studies investigating the effect of diet on OA in humans. In mice, the use of olive oil, an essential component of Mediterranean diet, appears to be associated with a lower articular cartilage degradation [14] suggesting a potential role of diets rich in this component for OA.

Given the potential benefits of the Mediterranean diet on several diseases and the absence of data on OA, this study aimed to investigate whether adherence to a Mediterranean diet is associated with lower prevalence of knee OA in a large cohort of North American people from the Osteoarthritis Initiative dataset. We hypothesized that higher adherence to Mediterranean diet was associated with lower prevalence of knee OA.

2. Materials and methods

2.1. Data source and subjects

Data were gathered from the Osteoarthritis Initiative (OAI) database. The OAI is a publically available database open at http://www.oai.ucsf.edu/. Within the OAI, potential participants were recruited across four clinical sites in the United States of America (Baltimore, MD; Pittsburgh, PA; Pawtucket, RI; and Columbus, OH) between February 2004 and May 2006. People eligible in the OAI either: (1) had knee OA with knee pain for a 30-day period in the past 12 months or (2) were at high risk of developing knee OA [15]. For the current paper, we used the data recorded during baseline and screening evaluations (November 2008).

All participants provided informed written consent. The OAI study was given full ethical approval by the institutional review board of the OAI Coordinating Center, at University of California in San Francisco.

2.2. Adherence to the Mediterranean diet (exposure)

Dietary pattern was analysed using a validated tool, the Block Brief 2000 food frequency (FFQ) questionnaire during the baseline visit [16]. Seventy items were assessed for checking the usual food and beverage consumption over the past year. The frequency of consumption was reported at nine levels of intake from "never" to "every day". In addition, seven dietary behavior questions were available regarding food preparation methods and fat intake, one question on fiber intake, and 13 questions on vitamin and mineral intakes.

Adherence to the Mediterranean diet was evaluated using the Mediterranean diet score (aMED) as proposed by Panagiotakos et al. [17]. This score is based on a food frequency questionnaire which was recorded during the baseline OAI visit. The aMED takes into consideration several foods commonly consumed within the Mediterranean diet. Each food has a score from 0 (less adherent) to 5 (better adherence); the total score ranges from 0 to 55, with higher values indicating higher adherence to a Mediterranean diet. Cereals (e.g. bread, pasta, rice), potatoes, fruits, vegetables, legumes (e.g. peas, beans), fish were categorized according to servings/month: 0 = never; 1 = 1–4 servings for month; 2 = 5–8; 3 = 9–12; 4 = 13–18; 5 = more than 18 servings/month. Since there was no information regarding the consumption of whole cereals vs. refined cereals, all types of grains were considered in the present analyses under the same heading. The consumption of red meat, poultry and full fat dairy products (e.g. milk cheese, yogurt) was categorized as: 0 = more than 18 servings/month; 1 = 13–17 servings for month; 2 = 9–12; 3 = 5–8; 4 = 1–4; 5 = never. The use of olive oil was categorised as the times used in a week: 0 = never; 1 = rare; 2 ≤1/weekly; 3 = 2 times/weekly; 4 = 3–6; 5 = daily. Finally, the consumption of alcoholic beverages was categorised as: 0 ≥ 700 ml/day or 0; 1 600–699 ml/day; 2 = 500–599 ml/day; 3 = 400–499 ml/day; 4 = 300–399 ml/day; 5 ≤300 ml/day.

Since there are no agreed cut-off scores for higher aMED adherence, we divided the population in to quartiles using 25, 28 and 32 points: aMED <25, 26–28, 29–32, and ≥33.

2.3. Outcome

The primary analysis was to determine the presence of knee OA, defined as the combination in the clinical reporting and assessment of pain and stiffness (i.e. pain, aching or stiffness in or around the knee on most days during the last year), and radiographical OA on the baseline fixed flexion radiograph based on the presence of tibiofemoral osteophytes (corresponding to Osteoarthritis Research Society International atlas grades 1–3, clinical center reading). In the OAI, the presence of pain, stiffness, and physical functioning (or disability) due to OA was assessed through the WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index). Briefly, the responses for each subscale (pain, stiffness, disability) are categorized on a five-point Likert scale ranging from none (0 points) to extreme (4 points) [18]. The maximum possible score is 68, and the final score was normalized to 100 (range 0–100), with higher scores reflecting greater activity limitations [18].

2.4. Covariates

We identified 10 potential self-reported confounders that we considered when assessing the relationship between aMED and knee OA. These included body mass index (BMI), physical activity evaluated using the Physical Activity Scale for the Elderly scale (PASE) [19], race, smoking habit, educational attainment level and yearly income (<or ≥$50,000 and missing data).

Validated general health measures of self-reported comorbidities were assessed through the modified Charlson comorbidity score [20]. Among the medical morbidities assessed through the Charlson co-morbidity score, we reported descriptively the prevalence of some common diseases in North American people, namely fractures, heart attack and failure, stroke, chronic obstructive pulmonary disease, diabetes and cancer [21].

2.5. Statistical analyses

For continuous variables, normal distributed data assumptions were tested using the Kolmogorov–Smirnov test. The data were

Please cite this article in press as: Veronese N, et al., Adherence to a Mediterranean diet is associated with lower prevalence of osteoarthritis: Data from the osteoarthritis initiative, Clinical Nutrition (2016), http://dx.doi.org/10.1016/j.clnu.2016.09.035