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Factors associated with Mediterranean diet adherence in Huntington's disease

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SUMMARY

Background & aims: Little is known about the importance of the Mediterranean Diet (MeDi) and dietary intake as environmental neuroprotective factors in Huntington's disease (HD); so, we evaluated and analyzed the prevalence and factors associated with MeDi adherence, and dietary intake in HD.
Methods: Spanish participants of the European Huntington Disease Network (EHDN) Registry study diagnosed with HD or premanifest HD gene carriers were included from June 2012 to August 2013. Self-reported dietary intake was collected by 3-day dietary record, MeDi adherence was assessed by 0–9 range (proposed by Trichopoulou et al.) and, other contributing factors related to nutrition were collected by telephone. Demographics and clinical variables were obtained from the EHDN Registry study database. Association of HD with MeDi adherence and nutritional characteristics were performed using logistic regression models.
Results: Ninety eight participants were included in the study, median age of 48 years (38–60 range), and median total functional capacity (TFC) 9 (5–13 range). HD severity was similar between participants with low vs moderate/high MeDi; however, quality of life ($P = 0.009$) was significantly higher among participants with moderate/high MeDi adherence. In terms of nutrients, higher MUFA/SFA intake was moderately correlated with better TFC and Unified HD Rating Scale (UHDRS) cognitive. Better TFC was associated with having a caregiver (OR = 11.86, $P < 0.001$), and non-smoking (OR = 0.21, $P = 0.013$). Moderate adherence to MeDi, was associated with older participants (OR = 1.19, $P = 0.031$), lower comorbidity (OR = 0.18, $P = 0.018$), lower UHDRS motor (OR = 0.90, $P = 0.041$), and lower risk for abdominal obesity (OR = 0.02, $P = 0.011$).
Conclusions: In HD the moderate MeDi adherence is associated with better quality of life, lower comorbidity, lower motor impairment and lower risk for abdominal obesity compared to those participants with low MeDi adherence.

1. Introduction

Huntington disease (HD) is a degenerative brain disorder caused by inheritance of an expanded cytosine-adenine-guanine (CAG repeat), usually beginning in middle adult life, is characterized by motor, psychiatric, cognitive, metabolic symptoms, and weight loss is also a recognized feature of the disease [1].

Around the world the Mediterranean-diet (MeDi) is one of the best models for healthy eating. A greater adherence to this dietary pattern have been associated with a lower incidence of cardiovascular disease [2], Alzheimer's disease [3], etc. However, adherence to the MeDi has not been associated with phenoconversion in HD [4].

The traditional MeDi was reported in some regions on the Mediterranean coast in the early 1960s [5]. It is characterized by a high intake of fruits and nuts, olive oil, vegetables, whole grains,

Abbreviations: HD, Huntington's disease; MeDi, Mediterranean-diet; EHDN, European Huntington's disease network; WHtR, Waist-to-height ratio; UHDRS, Unified HD rating scale; TFC, Total functional capacity; PBAs, Problem behaviors assessment scale; CIRS-G, Cumulative illness rating scale-geriatric; EAT-10, Eating assessment tool questionnaire; GPAQ, Global physical questionnaire.

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legumes; a moderate intake of fish and poultry, eggs, and dairy products; a low intake of red meat, processed meats, and foods rich in sugars; and moderate alcohol intake, mostly red wine with meals. The MeDi-score most used to evaluate adherence in a population was proposed by Trichopoulou et al. [6].

Because there is some evidence that the adherence to the Mediterranean diet could be a neuroprotective factor for neurodegenerative diseases, the aim of our study was to evaluate and analyze the prevalence and factors associated with MeDi adherence and dietary intake, and its association with HD.

2. Materials and methods

2.1. Study population

Participants were selected from a Spanish cohort of patients who participate in the EHDN (European Huntington's Disease Network) Registry study [7]. The study was Spanish multicenter, observational, cross-sectional, and was approved by the Ethics Committee of the Complejo Universitario de Burgos Hospital. Participants diagnosed with HD or premanifest HD gene carriers, and oral intake were included. It began in June 2012 and ended in August 2013. Written informed consent was obtained from all participants. More details of the characteristics of the HD sample and procedures have been described elsewhere [1].

2.2. Anthropometric data

The International WHO (World Health Organization) standards were used for BMI: BMI $\geq$ 18.5 < 25.0 kg/m^2 normal, BMI < 18.5 kg/m^2 underweight, BMI $\geq$ 25.0 < 30.0 kg/m^2 overweight, and BMI $\geq$ 30.0 obesity [8]. The waist was measured with a soft non-stretchable tape midway between the lowest rib and the iliac crest, also to the nearest 0.1 cm, by trained technicians in every Spanish medical center. The cut-off for waist-to-height ratio (WHtR) associated with risk for abdominal obesity, and chronic diseases was $\geq$0.5 [9].

2.3. Dietary intake and MeDi adherence

Dietary intake and adherence to the traditional MeDi were assessed by a 3-day dietary record [10]. The participants were instructed that 3 days of dietary record should not be consecutive days, holidays, or special meals, and at least one day should be weekend, and also were assisted by an instruction manual. In the case of institutionalized participants, 3-day dietary record was collected by trained nurse. In all cases, feeding exclusively orally without oral nutritional supplements or vitamin and mineral supplements was considered.

Food groups, macro- and micronutrients and calorie intake information were calculated using Alimentación y Salud software, version 2.0. Dietary reference [10], recommended energy and nutrients [11] intakes; and nutritional goals [12,13] for the Spanish population were approved by the Spanish Nutritional Association (Federación Española de Sociedades de Nutrición, Alimentación y Dietética, and Sociedad Española de Nutrición Comunitaria) and, used as the gold standard. For operational reasons, the consumption of each macro- and micro-nutrient intake were classified into high (>100% of recommended intake), adequate (90–100%), low (67–90%) and inadequate (<67%) consumption according to age and gender.

We computed the MeDi adherence according Trichopoulou et al. study [6]. Briefly, sex-specific medians of food group intake were calculated. For beneficial components, such as cereals, vegetables, fruits, fish, legumes, and the ratio of MUFA/SFA, 1 point was attributed if consumption was at or above the sex-specific median value. For components presumed to be detrimental, such as meats and dairy products, 1 point was given if consumption was below the sex-specific median value. Alcohol intake was assigned a score 1 for mild-moderate alcohol consumption (>0 to <30 g/day) and score 0 for either no (0 g/day) or more than moderate ($\geq$30 g/day) consumption [3]. The MeDi adherence was generated for each participant by adding the scores in the food categories (ranging 0–9); values 0–3 were considered low adherence and, values 4–9 were considered moderate/high adherences.

2.4. Clinical and sociodemographic data of Huntington disease

Participants defined as premanifest HD mutation carriers, were those rated by a movement disorder specialist as not meeting the clinical criteria motor Unified HD Rating Scale (UHDRS) score of either 0 or 1, indicating the presence of non-specific motor signs for HD [14]. Moreover participants were evaluated by expert neurologists using a standardized HD assessment tool, the UHDRS battery [15] with high scores denoting better performance, low behavioral and, motor scores denote better performance.

We also used Total Functional Capacity (TFC) score [15] which is derived from reports of the participant and his/her companion, quantifying the ability of a patient to perform both basic and instrumental activities of daily living, with higher scores indicating more intact functioning; so we used scores ranging from 0 to 6 (severe) and 7 to 13 (mild-moderate). The severity of psychiatric symptoms was assessed using the Psychiatric Behavioral Assessment (PBAs), with higher scores indicating greater severity [16]. Caregiver burden was assessed using the Caregiver Burden Inventory [17], with higher scores indicating higher caregiver burden, and quality of life using the Short Form 36 Health Survey, with higher scores indicating better quality of life [18].

Duration of HD disease, CAG repeats length, measurements and other clinical characteristics were obtained from EHDN Registry study database. Other assessments for comorbidity, dysphagia, physical activity, and other nutritional variables were administered by telephone by a trained rater. Comorbidity information was collected using the Cumulative Illness Rating Scale-Geriatric (CIRS-G) [19]. Dysphagia was assessed using the Eating Assessment Tool (EAT-10) validated for the Spanish population with a cut-off $\geq$ 3 [20]. The level of physical activity was assessed using the Global Physical Questionnaire (GPAQ) developed by the WHO [21], which comprises 19 questions, and physical activity being computed in terms of high, moderate, and low level of physical activity.

2.5. Statistical analysis

The IBM-SPSS version 19 statistical software was used for data analysis. To deal with missing values, case-wise deletions were adopted.

Descriptive analysis providing means (SD), medians (interquartile range) and frequencies (percentages) agreed characteristics and distributions of variables were performed. The MeDi was operationally dichotomized into the categories low adherence (MeDi scores from 0 to 3) and, 'moderate/high adherence' (MeDi scores from 4 to 9); CIRS-G into 'low comorbidity' ($\leq$8) and, 'high comorbidity' ($\geq$9) [22]; and also WHtR (yes vs. no).

Bivariate analysis was performed using the Chi-square (or Fisher) for qualitative variables, T-Student test or U Mann–Whitney or Kruskal–Wallis test for quantitative variables, based on the normal distribution, and Pearson correlations.

We conducted 2 logistic regression analyses. The goodness of fit of the regression model was evaluated using the HosmerLemeshow test, the Nagelkerke R^2 estimates, and Mantel–Haenszel