Abstract: Objectives: This study examines whether risk factors for poor nutrition are associated with global cognitive function three years after confirmed Parkinson’s disease (PD) diagnosis. Design: The follow-up investigations for this prospective community-based study were conducted three years after PD diagnosis. Setting: The study participants lived in Västerbotten County, a region in northern Sweden with 142,000 inhabitants. Participants: This study population consisted of 118 PD outpatients from the study of Newly Diagnosed PD in Umeå (NYPUM). Measurements: Global cognition was assessed with the Mini Mental State Examination (MMSE) at baseline and at follow-up. Anthropometry, nutrition (Mini Nutritional Assessment, MNA, 3-day food registration, 3-FDR), olfactory function (Brief Smell Identification Test, B-SIT), and swallowing, cutting food, and salivation (single questions from the Unified Parkinson’s Disease Rating Scale, UPDRS) were used as markers for nutritional status. Results: The MMSE score decreased over three years (−1.06±3.38, p=0.001). Olfactory function at baseline was associated to MMSE at three years (B=0.365, p=0.004). Changes in waist/hip ratio (B=113.29, p=0.017), swallowing (B=1.18, p=0.033), and cutting food (B=−1.80, p=0.000) were associated with MMSE at follow-up. Conclusion: This study indicates that olfactory function, cutting food, swallowing, and visceral obesity are associated with MMSE three years after PD diagnosis.

Key words: Cognition, MMSE, olfactory function, Parkinson’s disease, UPDRS.

Introduction

Parkinson’s disease (PD) is a neurodegenerative motor disease with numerous non-motor manifestations, some of them associated with the ability to maintain body weight and nutritional status during disease progression. Dysphagia, constipation, sialorrhea (hypersalivation), disease severity, and levodopa dosage may affect nutritional status of patients with PD (1). In addition, stomach fullness and inability to finish meals due to delayed gastric emptying (diagnosed as gastroparesis) are often present in patients with PD (2). Women with PD are more prone to experience constipation, fatigue, feelings of nervousness, and sadness, whereas men with PD suffer from daytime tiredness and sialorrhea (3). Non-motor symptoms may, directly or indirectly, affect nutritional status, influence disease progression, and cognitive decline. In studies of newly diagnosed patients with PD, 19-36% of patients with PD were affected by cognitive dysfunction (4-7).

In patients with PD, malnutrition is likely to be an under-recognised issue (8, 9) and malnutrition may directly affect cognitive performance (10). The ability to eat, buy, and prepare meals is an important aspect regarding nutritional wellbeing (11). A baseline study within our present population found associations between a lower intake in nutrients, such as protein, and olfactory function (12). In a study of older adults, poor olfactory function was associated with decline in global cognitive function measured by the Mini Mental State Examination (MMSE) (13). Screening and assessment of nutritional status should be considered in vulnerable elderly and occur regularly in patients with PD (14, 15).

This community-based population study examines whether risk factors for poor nutrition at baseline – e.g., olfaction, cutting food, swallowing, and salivation – were associated with results from the MMSE given three years after PD diagnosis.

Methods and Materials

Study population

This community-based prospective study focuses on idiopathic forms of Parkinsonism in parts of Västerbotten County (a region in northern Sweden with 142,000 inhabitants) (16). All suspected cases with idiopathic Parkinsonism were referred to the only neurological department in the area. The area had no specialists in neurology working in private practise. From January 2004 through April 2009, 186 cases with Parkinsonism were identified in the Newly Diagnosed PD in Umeå study (NYPUM). Our study included 118 PD outpatients – 67 men (56.8%) and 51 women (43.2%) – who were assessed with MMSE both at baseline and at a three-year follow-up (Figure 1).

Assessments

All participants were extensively examined during repeated visits the first month following initial contact. Information about demographics and disease history was obtained. All cases with suspected idiopathic Parkinsonism underwent a
standardized clinical examination by a neurologist specializing in movement disorders. To confirm the presence of PD, another specialist in movement disorders (blinded to the assessment of the previous examiner) evaluated a videotape of the patient undergoing the Unified PD Rating Scale motor score (UPDRS-III) examination investigating PD related motor functions speech, facial expression, rigidity, tremor, posture, gait and bradykinesia (17). A patient was included if both examiners judged that the patient had fulfilled the clinical criteria for PD according to the UK PD Society Brain Bank (UK PDSBB) criteria i.e. bradykinesia plus at least one additional feature (rigidity, tremor or postural instability) and no exclusion criteria pointing to other causes of parkinsonism than PD (18).

Figure 1
Flowchart of included/missing patients with PD

As rigidity cannot be evaluated by viewing a video, the rigidity score made by the clinician who examined the patient was accepted by the clinician who evaluated the video (18). Disease severity was assessed by the UPDRS scale (17) and the Hoehn and Yahr staging scale (19). Swallowing, cutting food and salivation was assessed using the UPDRS II (17). The UPDRS scoring was performed with patients in the ON-phase, when started the dopaminergic treatment. The MMSE was used as a screening instrument for global cognition, including orientation in time and place, ability to follow simple commands, registration, attention and calculation, memory, naming, writing and figure copying (20). MMSE score range from 0 to 30, with higher scores indicating better cognitive functioning.

The exclusion criterion was a MMSE score < 24 (low cognitive performance) at baseline. The twelve-item Brief Smell Identification Test (B-SIT) was used to evaluate olfactory function. This test contains a booklet with scented strips that release stimulus when scratched (21). All tests were repeated at follow-up (three years after PD diagnosis) and diagnoses were updated in June 2013.

Traditional anthropometry
Anthropometric data were collected during the initial contact with the dietician, which was within the first two months after inclusion in the study and repeated after three years. Data were mostly collected with patients who were in the ON phase, and patient’s motor dysfunction is optimally treated. Dyskinetic-type involuntary movements were rare in this early phase of the disease and did not hamper assessments. Body weight was measured to the nearest 0.1 kg using a digital scale. Height was measured to the nearest 0.5 cm using a wall stadiometer. Body mass index (BMI) was calculated from body weight (kg) and height (m) measurements, kg/m2. Waist circumference measurements in cm were performed with a flexible measuring tape. The ratios waist/hip and waist/height were calculated in centimetres. Methods used have been described in an earlier publication (22).

Mini Nutritional Assessments and energy intake
The Mini Nutritional Assessments (MNA), an international validated screening tool, was used to assess nutritional status and was performed when anthropometrical measurements were gathered by the dietician. The screening consists of 18 questions regarding anthropometry, diet, and health. MNA scores between 24 and 30 points indicate optimal nutritional status, MNA scores between 17 and 23.5 indicate a risk for malnutrition, and MNA scores <17 indicate malnutrition.

As described in an earlier publication, energy intake (EI, kcal) was estimated using a three-day food registration (3-DFR) completed by the patients (22). To help patients estimate portion sizes, they were provided with a food template containing photographs of standardized portions. In addition to the anthropometric measurements, a 24-hour recall was collected during a meeting with a dietician. These data were used to replace missing values from the 17 PD patients who did not complete their 3-DFR. A 3-DFR/24 HR ratio was calculated separately for amount of EI and implemented as 3-DFR. The energy intake was calculated with Dietist XP (version 3.2 DkNoSe, Kost- och näringsdata, Bromma, Sweden) based on the National Swedish Food Composition Table (2011) created by the National Food Administration.

Statistics
Baseline values were reported in mean ± standard deviations (SD). Differences between men and women were analysed using the Independent T-test. To study changes over time, a Paired samples T-test was conducted and Wilcoxon’s signed ranks test was used for ordinal scales. One-way ANOVA was used to explore potential differences at baseline and at three-years between the PD subtypes: postural instability and gait difficulty (PIGD, n=61), Tremor dominant (TD, n=43), and the indeterminate group (n=14).