Nutritional evaluation in Parkinson's disease patients: a cross-sectional study.

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Background: Poor nutritional status results in a lower quality of life in the elderly and age related neurodegenerative disease such as Parkinson's disease (PD), where neurologic and nutritional elements may interact affecting each other [1].

Objective: The aim of this study was to identify different nutritional and dietetic patterns in PD with respect to controls and within PD subtypes (motor and cognitive).

Methods: In a University-Hospital setting, we performed a cross-sectional study recruiting patients with PD and controls matched by age and sex. Nutritional status was evaluated by anthropometry (Body Mass Index; calf, upper arm, waist and hip circumferences), Mini Nutritional Assessment (MNA), bioelectrical impedance analysis variables (fat mass, fat-free mass, muscle mass, total body water); macronutrients intake by nutritional anamnesis (lipid, protein and carbohydrate intake), level of physical activity and total daily energy expenditure were also collected, as well as gait speed at 6-m course and handgrip strength by dynamometer. Polypharmacoterapy, comorbidity quantified by modified Cumulative Illness Rating Scale, the presence of depression at Geriatric Depression Scale and the number of falls in the last 6 months were also investigated. Clinical assessment of PD patients provided the following variables: hystory of disease (age of onset, years of disease), motor subtypes (non tremor and tremor dominant), motor assessment by Unified Parkinson's Disease Rating Scale (UPDRS) part III and IV, non motor assessment by Non-Motor Symptoms Scale (NMSS), Quality of life by short form 8-item Parkinson's Disease Questionnaire (PDQ-8), PD progression index (H&Y/time and UPDRS III / time), antiparkinsonian drugs, Levodopa Equivalente Dose (LED),adherence to protein-redistribution diet.

Statistics: Data distribution was investigated by means of Kolmogorov-Smirnov (K-S) test to determine the appropriate use of parametric (K-S, $p \geq 0.05$) or non-parametric (K-S, $p < 0.05$) procedures; descriptive statistics were used for the characterization of the sample.
Differences in demographic, clinical, anthropometric, nutritional and dietetic features as weel as motor performance and strengh were explored between case and controls and within PD subtypes (motor and cognitive) by appropriate statistics.
A Spearman correlation test was applied between nutritional and dietetic parameters and scores of clinical scales in PD.

Results: Our sample was composed by 114 people (60 women, 54 man): 39 healthy controls (HC),18 affected by essential tremor (ET),57 affected by PD. HC and TE resulted similar in terms of demographic, nutritional and dietetic features, so they have been merged to form the control group. Demographic, clinical, antropometric, nutritional and dietetic characteristic and motor performaces have been shown in table 1. Clinical characteristics of cases have been illustrated in table 2.
No significative differences emerged in nutritional assessment between case and controls .
PD at risk of malnutrion (with MNA < 24) demostrated a significant higher burden of NMS (at NMSS) (81.6 ± 40.0 vs. 51.3 ± 29.7, p= 0.007) and a worse quality of life (at PDQ-8) (11.4 ± 5.8 vs. 6.8 ± 4.7, p= 0.003) ; even MNA scores resulted inversely related to NMSS (Rs = 0.322, p= 0.017) and PDQ-8 scores. (Rs= 0.396, p= 0.001),
Within PD, rigid-akinetic subtype resulted more frequently at risk of malnutrition with respect to tremorigen subtype (MNA < 24: 19 vs. 6; MNA $\geq$ 24: 14 vs.18, p= 0.015) .
PD with a MMSE score < 26 consumed more animal derived protein with respect of PD with a MMSE $\geq$ 26 (62.3 ± 9.4 vs. 58.1 ± 10.1 p = 0.001) .
An inverse correlation resulted between dairy products (Rs -0.384, p<0.001) as well as meat (Rs -0.371, p<0.001) consumption and cognitive performance at MMSE, whereas no correlation emerged between egg or fish consumption and MMSE scores.
PD with a slower progression of disease (HY/t and UPRDSIII/t) showed a higher intake of monoinsatured fats in their diet (Rs =-0.297, p=0.03 and Rs = - 0.284, p= 0.03 respectively) and in particular with olive oil (R -0.334, p < 0.001 and R -0.313, p< 0.001 respectively).

Conclusion: To our knowledge, this is the first study showing a possible role of olive oil in delaying the progression of PD; furthermore, a worse cognitive status in PD resulted correlated to the consumption of dairy products and meat. Our findings, which should be verified with a longitudinal study, set the basis to support a targeted nutritional intervention in PD patients.

Table 1: Demographic, clinical, antrophometric, nutritional, dietetic characteristics and motor performances of cases and controls.

	Controls	PD	p
Demographic variables			
Age	72.4 (± 8.8)	72.4 (± 8.6)	n.s.
Sex - women, n (%)	30 (52.6%)	30 (52.6%)	n.s.
Education (y)	10.2 (± 4.1)	11.8 (± 4.6)	n.s.
Clinical variables			
MMSE score	27.0 (± 2.6)	27.5 (± 3.3)	n.s.
Falls in the previous 6 months (n)	0.1 (± 0.4)	0.5 (± 1.2)	0.03
CIRS total score	0.7 (± 1.6)	0.8 (± 1.2)	0.018
CIRS 2	0.7 ± 1.6	2.2 ± 1.1	0.002
Current medication (n)	3.7 (± 3.3)	5.2 (± 3)	0.003
Depression, n (%)	6 (10%)	16 (28%)	0.02
Use of antidepressant drugs, n (%)	3 (5.2%)	10 (17%)	0.004
Anthropometric variables			
BMI (kg/m²)	25.5 (± 4.2)	26.1 (± 4.5)	n.s.
Arm circumference (cm)	28.7 (± 4.3)	28.9 (± 3.8)	n.s.
Calf circumference (cm)	34.9 (± 3.3)	35.5 (± 3.3)	n.s.
Waist circumference (cm)	94.2 (± 10.5)	97.6 (± 13.5)	n.s.
Hip circumference (cm)	100.9 (± 7.4)	100.3 (± 8.4)	n.s.
Nutritional and dietetic variables			
Fat mass	19.5 (± 8.3)	19. 3 (± 7.8)	n.s.
Fat free mass	47.3 (± 10.7)	51.5 (± 10.7)	n.s.
Muscle mass	45.4 (± 8.8)	48.8 (± 10.2)	n.s.
Total body water	33.3 (± 6.8)	35.7 (± 7.8)	n.s.
Total Daily Energy Expenditure (Kcal)	2756.3 (± 434.2)	2635.7 (± 482.3)	n.s.
Mini Nutritional Assessment score	24.3 (± 4.2)	24.1 (± 2.9)	n.s.
Total food energy intake (Kcal)	1863.9 (± 485.6)	1885.1 (± 499.1)	n.s.
Protein intake (g/kg)	1.0 (± 0.3)	1.0 (± 0.2)	n.s.
% of animal proteins	58.4 (± 10.3)	60.4 (± 9.4)	n.s.
% of vegetable proteins	32.6 (± 10.3)	39.4 (± 10.2)	n.s.
Animal / vegetable protein	1.5 (± 0.6)	1.7 (± 0.9)	n.s.
% lipid intake	32.2 (± 5.7)	31.8 (± 4.5)	n.s.
% monounsaturated fats	16.4 (± 3.8)	16.2 (± 2.9)	n.s.
% polyunsaturated fats	3.8 (± 1.2)	3.6 (± 1)	n.s.
Cholesterol (mg)	231.5 (± 96.8)	213.7 (± 85.3)	n.s.
% carbohydrates	18.9 (± 5.2)	20.6 (± 6.4)	n.s.
Fiber intake (g)	23.4 (± 6.9)	23.3 (±7.3)	n.s.
Fiber intake / 1000 kcal	13.1 (± 4.5)	12.7 (± 4.3)	n.s.
Water intake (ml)	1150.9 (± 464.7)	1124.5 (± 523.5)	n.s.
% of alcoholic beverages	3.3 (± 4.8)	2.7 (± 4.3)	n.s.
Motor performance variables			
Level of physical activity	1.5 (± 0.1)	1.5 (± 0.2)	0.007
Handgrip strength(kg)	26.1 (± 9)	26.9 (± 8.6)	n.s.
Gait speed at 6-m course (m/s)	6.5 (± 1.6)	5.6 (± 2)	0.03
Steps at gait speed at 6-m course(n)	11.0 (± 2.5)	12.5 (± 7)	< 0.001
Step width (m)	0.56 (± 0.1)	0.48 (± 0.1)	< 0.001

Table 2: Clinical characteristics of cases

	N	%		
Subtypes				
Non tremor dominant	33	57.9		
Tremor dominant	24	42.1		
Antiparkinsonian drugs				
Levodopa users	49	85.9		
Dopamine agonists users	31	54.4		
Protein-redistribution diet	13	22.8		
	Mean	**SD**	**Min**	**Max**
Hystory of PD				
Age of onset	65.3	8.8	47	87
Years of disease	7	4.3	1	19
PD progression index				
H&Y/ time	0.32	0.28	0.05	1.5
UPDRS III / time	3.77	3.0	0.05	1.5
Motor scales				
UPDRS III	18	11.3	1	52
UPDRS III – hypertonus	3.2	2.6	0	11
UPDRS IV - dyskinesias	0.6	1.2	0	5
UPDRS IV - fluctuations	0.6	0.8	0	4
UPDRS IV - dystonia	0.1	0.3	0	1
Non motor scale				
NMSS	64	37.2	1	178
Quality of life				
PDQ8	8.8	5.7	0	22
LEDD	502.6	324.9	0	1230

References
1. Barichella M, Cereda E, Pezzoli G. Major nutritional issues in the management of Parkinson's disease. Mov Disord. 2009;24: 1881-1892. doi:10.1002/mds.22705