

ORIGINAL ARTICLE

Gender-Specific Lipid Parameters Predict Excessive Daytime Sleepiness in Parkinson's Disease

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ABSTRACT

Background: Lipid metabolism plays an important role in neurodegenerative diseases, including Parkinson's disease (PD). However, the relationship between lipid profiles and excessive daytime sleepiness (EDS) remains unclear. This study aimed to explore the relationship between lipid parameters and EDS in PD patients, especially focusing on gender differences.

Methods: A total of 176 PD patients were included in this study, and clinical data was collected. The Epworth Sleepiness Scale (ESS) was used to classify patients into PD EDS (ESS $\geq$ 8) and PD non-EDS (ESS $<$ 8) groups. Univariate and multivariate analyses, along with receiver operating characteristic (ROC) analyses, were performed to detect potential biomarkers for EDS in PD.

Results: In male PD patients, univariate analysis indicated an association between disease duration, Hoehn-Yahr (H-Y) stage, and lipid parameters (total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C)) and EDS. Multivariate analysis identified TC and HDL-C as significant predictors, especially HDL-C. The TC/HDL-C ratio (AUC = 0.745) and non-HDL-C (defined as TC - HDL-C, AUC = 0.691) exhibited high predictive ability for EDS. Female PD patients, in contrast, showed no significant link between lipid parameters and EDS. Instead, motor dysfunction (UPDRS score) and psychological factors (HAMD/HAMA scores) were the main predictors of EDS in females.

Conclusions: Research findings indicate a significant gender difference in the factors influencing EDS in PD patients. In male PD patients, lipid metabolism disorders (elevated TC, reduced HDL-C) predict EDS, with TC/HDL-C and non-HDL-C as potential biomarkers. In female PD patients, motor and psychological factors primarily contribute to the risk of EDS.

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Supplementary Data

Table S1. Gender-stratified comparison of clinical features in PD patients.

Clinical parameter	PD-Male (n = 91)	PD-Female (n = 85)	t value	p-value
Age (years)	62.13 ± 10.13	64.39 ± 7.68	1.672	0.099
Education (years)	8.37 ± 4.54	5.96 ± 4.48	3.541	0.001
Disease duration (months)	57.92 ± 47.27	70.31 ± 58.29	1.541	0.125
ESS	7.53 ± 5.81	6.00 ± 5.77	1.749	0.082
HY stage	2.37 ± 0.74	2.38 ± 0.97	0.067	0.947
UPDRS total	45.77 ± 20.67	45.47 ± 25.68	0.085	0.933
UPDRSIII (motor)	30.04 ± 13.77	29.28 ± 16.06	0.339	0.735
PSQI	9.14 ± 4.49	8.92 ± 5.05	0.314	0.754
MMSE	26.68 ± 2.93	24.46 ± 3.92	4.216	< 0.001
MoCA	22.12 ± 4.86	18.67 ± 6.49	3.911	< 0.001
HAMD	10.85 ± 8.22	12.39 ± 9.10	1.172	0.243
HAMA	8.99 ± 7.14	10.33 ± 8.02	1.170	0.244
FSS	36.59 ± 16.47	36.94 ± 16.86	0.137	0.891
BMI	23.73 ± 2.75	23.09 ± 3.15	1.383	0.168

ESS: Epworth Sleepiness Scale. Data are presented as median (interquartile range) or mean ± SD.

Table S2. ROC analysis of lipid parameters for predicting EDS in male PD patients.

Lipid parameter	Cutoff	Sensitivity	Specificity	AUC (95% CI)	p-value
Traditional blood lipid parameters					
TC (mmol/L)	4.755	38.9%	84.6%	0.606 (0.482 - 0.731)	0.091
HDL-C (mmol/L)	1.180	69.4%	63.5%	0.653 (0.534 - 0.772)	0.015
Nontraditional blood lipid parameters					
TC/HDL-C	3.820	61.1%	84.6%	0.745 (0.638 - 0.851)	< 0.001
Non-HDL-C (mmol/L)	3.265	55.6%	80.8%	0.691 (0.578 - 0.804)	0.002

ROC: receiver operating characteristic, AUC: area under the curve, CI: confidence interval.

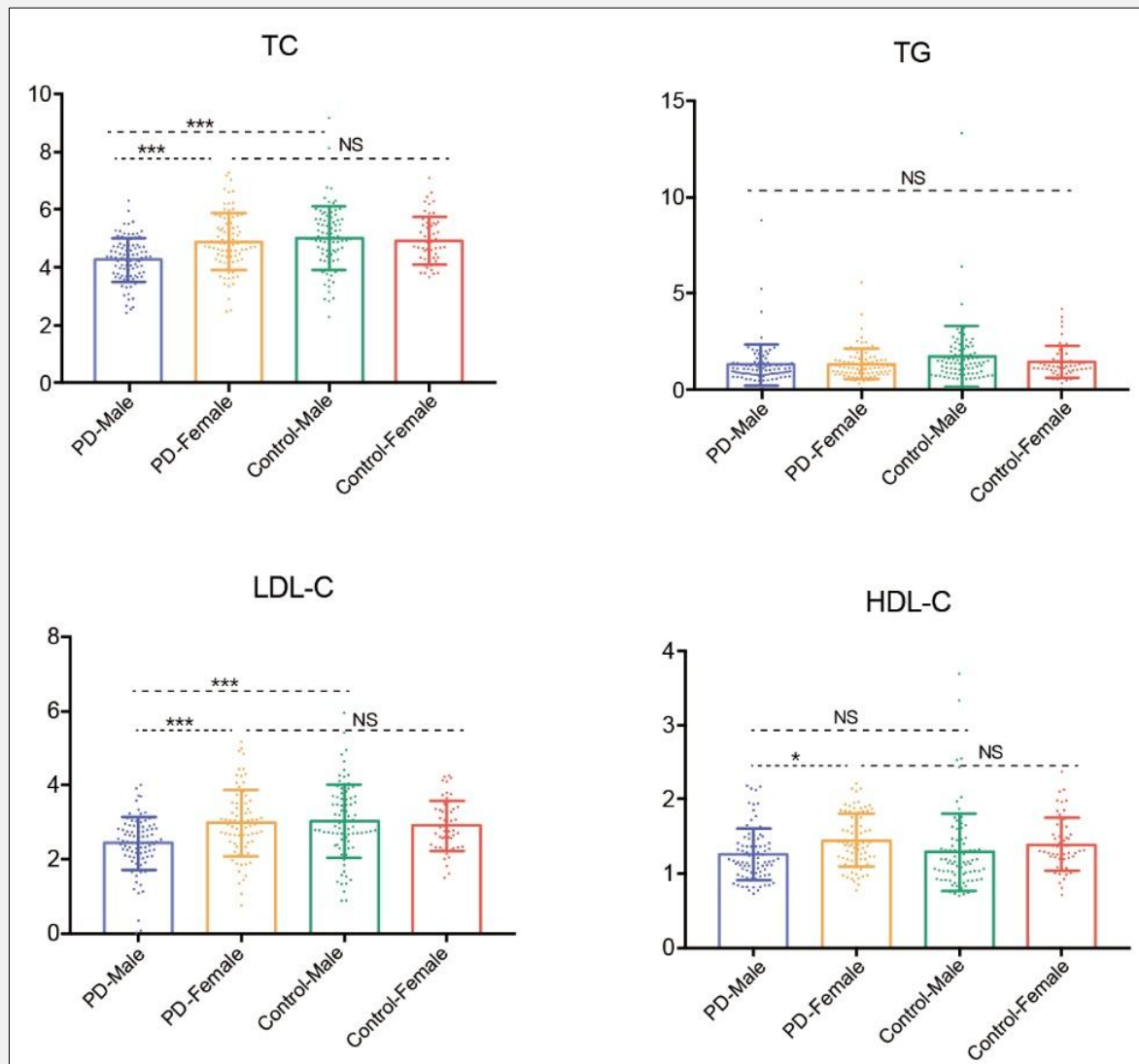


Figure S1. Differences in blood lipid profiles among PD-Male, PD-Female, Control-Male, and Control-Female groups.

* $p < 0.05$, *** $p < 0.01$.