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Assessment of Sexual Dysfunction in Male Parkinson's Disease Patients: A Cross-Sectional Study

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Abstract

Background

Erectile Dysfunction (ED) is a highly prevalent non-motor symptom in Parkinson’s Disease (PD), yet its vascular and hormonal factors require objective clarification. This study aimed to systematically assess ED prevalence, its association with clinical severity, cognition and quality of life (QoL), and its correlation with objective hormonal and penile hemodynamic parameters in male PD patients.

Methods

This cross-sectional study included 74 male PD patients. ED was quantified using the International Index of Erectile Function- 5 items (IIEF-5). Disease severity was measured by the Movement Disorder Society - Unified Parkinson’s Disease Rating Scale (MDS-UPDRS) and Hoehn and Yahr (H&Y) staging. QoL was assessed using the PDQ-39 (Parkinson’s Disease Questionnaire-39 items). Cognition was assessed using the MoCA (Montreal Cognitive Assessment). Correlations were analyzed with hormonal parameters (total/free testosterone, prolactin) and penile duplex ultrasound metrics.

Results

A total of 74 men suffering from PD (average age of 61 ± 8 years). ED seems to be highly prevalent, with 90.5% reporting some degree of dysfunction (mean IIEF-5: 13 ± 5). Correlations with erectile function are seen in hormonal components and duplex penile parameters, excluding prolactin and total testosterone. Older age and age at disease onset also significantly correlated with greater ED severity ($p < 0.001$). There was a correlation of levodopa use with diminished erectile function and lower free testosterone (all $p < 0.05$). There was a negative correlation between ED and quality of life. A significant association was also found between ED severity and cognitive impairment. There are negative correlations between IIEF-5 scores and UPDRS subscales and the Hoehn & Yahr stage; these scores reflect the overall burden of both motor and non-motor disease on sexual function.

Conclusion

ED occurs with considerable frequency in men with PD, exhibiting robust correlations with motor severity, non-motor symptom burden, hormonal dysregulation, vascular dysfunction, and diminished health-related quality of life. Contributory effects are magnified in

individuals receiving levodopa therapy and in patients with later-onset disease. Collectively, these observations substantiate the heterogeneous pathophysiology of ED in the Parkinson's cohort and accentuate the imperative for systematic sexual health screening and integrative therapeutic intervention in clinical care.

Background

PD is the second most frequent neurodegenerative disease after Alzheimer's [1], affecting approximately 1% of people over the age of 60 [2].

PD is a progressive disorder characterized by typical motor manifestations such as bradykinesia, rigidity, tremors and postural instability [3]. Along with the typical motor symptoms, PD also has an extensive list of non-motor symptoms (NMS), such as constipation, pain, mood or cognitive deterioration, swallowing problems, urinary and sleep disorders [4]. These non-motor symptoms critically impair patient quality of life [5].

Sexual dysfunction (SD) is a commonly overlooked non-motor major symptom in PD [6]. SD is a prevalent condition affecting over 43% of the general female population and around 31% of the general male population; however, patients with PD seem to have a disproportionately higher prevalence of SD [7]. Among male patients with PD, ED which is classified as SD is the most commonly reported condition, affecting as high as 79% of that population [8]. In female patients with PD, studies have found that up to 87% present with some form of SD. Loss of libido is reportedly the most common SD, occurring in 83% of cases and is doubled compared to the healthy population [9]. Furthermore, SD may have an adverse effect on the partnership [10].

In Egypt, almost 70% of PD patients suffer from SD, with worse function on both IIEF (International Index of Erectile Function) and ArFSFI (Arabic version of the Female Sexual Function Index), which were related to disease severity and severely impacted quality of life and social relationships [11].

Sexual health (SH) is influenced by multiple biological, psychological, and social factors, all of which can be impacted by PD [12].

The mechanisms driving SD in PD, remain diverse and not yet completely clarified [13]. Nonetheless, both central and peripheral neural pathways—affected by the disease's characteristic pathological changes, such as alpha-synuclein accumulation and degeneration of the nigrostriatal system along with related network and neurotransmitter impairments, and the influence of dopaminergic treatments, are believed to significantly contribute to the onset of sexual problems [14].

SD in PD patients may be secondary to motor impairment, pharmaceutical therapy, psychological, and social factors [15].

Methods

Study design and approval

Following institutional ethics committee approval **(KFSIRB200-781)**, observational analytical cross-sectional study was performed at the department of neuropsychiatry, Kafrelsheikh University Hospital, after obtaining written informed consent from all participants.

Sample size calculation

Sample size determination followed an internal pilot study (mean IIEF-5 score 19.8 ± 2.145) using MedCalc version 18. With 95% power, 5% significance, and 5% precision, the minimum required sample was 63. This was increased to 73 to accommodate possible attrition.

Eligibility criteria

The study population comprised sexually active male patients with idiopathic Parkinson's disease diagnosed based on the UK Brain Bank criteria and confirmed by trained neurologists with review from two movement disorder specialists [16]. Secondary parkinsonism, neuroleptic drug use, and other neurologic conditions with spinal cord lesions were among the exclusion criteria. Also, comorbidities of a metabolic or cardiovascular nature that lie in the range of sexually functional disorders or placed as neuro-vascular conditions were also considered exclusionary as were sexually inactive patients and females. Eligibility was based on patient flow from the outpatient and inpatient departments, with all processes being fully confidential.

Patients’ evaluation

Each patient was carefully evaluated with the following: history of demography, clinical history, and sexual history; a physical examination; a neurological examination; and the application of standardized assessments:the Arabic version of MDS-UPDRS [17, 18], the Arabic version of PDQ-39 [19, 20], the Arabic version of MoCA [21] and IIEF-5 scores [22]. These included the laboratory assessment of total testosterone, free testosterone, and prolactin using the enzyme-linked immunosorbent assay (ELISA) with a precision of the needed sensitivity and reference range as provided by the manufacturer (ABIA, Germany). For the imaging studies, along with a 3 Tesla Philips Ingenia MRI (T1, T2, and FLAIR sequences) of the brain to rule out structural pathology, a penile duplex ultrasound was performed following intracavernous injection of prostaglandin E1 to assess peak

systolic velocity (PSV), end diastolic volume (EDV), and resistive index (RI) at 30 minutes for documentation of arterial insufficiency or venous leak.

Statistical analysis

Data were entered into a Microsoft Excel sheet, then revised, cleaned, coded, and analyzed using the program of IBM SPSS statistics version 25 (Statistical Package for Social Sciences). Qualitative variables were presented using numbers and percentages, then compared using Chi-square test. Quantitative normally distributed variables were presented using means and standard deviations (SD), then compared using Student T test and One-way ANOVA test. Quantitative skewed data were presented using median (Q1-Q3) and compared using Mann-Whitney U test. Pearson's and Spearman's correlation were also used; respectively. All tests were two-tailed, and $p<0.05$ level was considered statistically significant.

Results

Baseline participants' characteristics

74 men with PD were included in the study. Their mean age was 61 years old (± 8 years), and their mean age at the onset of illness was 57 years old (± 8 years). Most patients (79.7%) had no family history of PD or consanguinity (**Supplementary table 1).**

Regarding baseline hormonal and penile duplex diagnostics, the median prolactin level was 4.10 ng/mL, while the mean total testosterone was 6.49±1.46 ng/mL and mean free testosterone was 152.08±44.35 pg/mL. Regarding penile duplex parameters, the mean PSV was 41.6±2.8 cm/s, the mean EDV was 2.4±1.3 cm/s, and the mean RI was 0.84±0.08 **(Supplementary table 2).**

IIEF-5 categories and item responses

The distribution of IIEF-5 categories showed that 50% of the participants had mild to moderate ED, 18.9% had moderate ED, and 12.2% had severe ED. Only 9.5% reported no ED. The mean IIEF-5 score was 13 ±5**.** For all five items assessing confidence, hardness, and maintenance of erection, and satisfaction with sexual intercourse, the highest percentage of responses was in the moderate category. The percentage of participants reporting a moderate level of function ranged from 41.9% to 44.6%. **(Table 1).**

Hormonal and penile duplex correlations with erectile function by IIEF-5

The IIEF-5 scores showed a significant correlation with all of the hormonal and penile duplex ultrasound metrics that were examined, except prolactin and total testosterone which had weak correlational values. The correlational direction was positive for all the

variables except for prolactin and EDV at the 5, 15, and 30 minutes intervals, which were negative concerning the IIEF-5 score (**Table 2**).

Effect of Levodopa use, age and age of disease onset on erectile function and related parameters

Interestingly, among the users of levodopa, 45% were considered to have moderate ED as per the IIEF-5 ($p=0.013$). Conversely, those who experienced more severe ED had a considerably higher age and age at which they developed PD: the mean age of onset of 64 for those with severe ED compared to 49 for those with no ED ($p < 0.001$) **(Supplementary table 3).**

A significant decrease in overall erectile function and related parameters was linked to levodopa use. Individuals receiving levodopa therapy showed statistically significant decreases in their average IIEF-5 scores (12.1 versus 14.5) and free testosterone levels (101.9 versus 124.5) ($p = 0.021$ and0.033 respectively) **(Supplementary table 4).**

Association of quality of life with ED by IIEF-5

The IIEF-5 score showed a statistically significant weak to moderate negative correlation to the total score of the PDQ-39 along with the PDQ-39 subdomains of mobility, activities of daily living, cognition, communication, and body discomfort. This suggests that patients with PD and more advanced stages of ED also experience a much poorer quality of life, particularly in the physical and mental aspects (**Supplementary table 5).**

Association between MoCA score and erectile dysfunction

Analysis revealed a statistically significant association between MoCA categories and IIEF-5 severity categories. This association is clinically supported by the observation that patients with normal MoCA scores had the highest probability of experiencing No ED (28.6%), while those with moderate cognitive impairment showed the highest combined prevalence of moderate and severe ED (33.3% and 27.8%, respectively). The continuous data further confirmed this inverse relationship, showing a highly significant drop in the mean MoCA corrected score as ED severity increased **(Supplementary table 6).**

Correlation between UPDRS subscales and ED

The extent of ED, as assessed by the IIEF-5, was markedly correlated with poorer motor and non-motor results of the UPDRS. The correlations with total UPDRS score (both on and off states), motor-off, and Postural instability and gait disorders *(*PIGD)-off sub scores were more strongly negative as compared to the correlations with non-motor daily living activities, cognitive–behavioral, motor-on, bradykinesia, and PIGD-on sub scores, which were weaker but still significant **(Table 3).**

Correlation between disease stage and erectile function, hormonal and penile duplex diagnostics

The stage of the disease, as indicated by the Hoehn and Yahr_OFF score, exhibited a notable correlation with erectile function as well as a significant portion of the hormonal and penile duplex parameters; while the correlations were generally weak and negative–indicating worse outcomes with advancing severity of the disease–prolactin and total testosterone had no association. The IIEF-5 score had a moderate negative correlation, whereas the EDV values had positive correlations **(Table 4).**

Discussion

This study investigated sexual dysfunction (SD) in men with Parkinson's disease (PD) and explored its possible associations with clinical, cognitive, motor, non-motor, hormonal, and radiological factors. To the best of our knowledge, only limited research in Egypt has studied this topic using a combined approach that integrates clinical assessment scales with hormonal evaluation and penile duplex ultrasound. Therefore, the present study aimed to provide a more comprehensive understanding of erectile dysfunction (ED) in PD patients and the factors that may contribute to it.

In the current study, ED was reported by 90.5% of the patients. Mild to moderate ED represented the most common form, affecting about half of the study population. These findings are comparable to those reported by Shalash et al. [13], who found that nearly 70% of PD patients experienced ED. In their study, sexual function was assessed using the IIEF questionnaire in 40 male PD patients and compared with a control group. Several mechanisms have been proposed to explain ED in PD, including central dopaminergic deficiency, autonomic dysfunction, psychosocial factors, and the side effects of medications.

However, our findings differ from those reported by Varlıbaş et al. [23], who observed ED in only 53% of their study group using the ASEX scale. Differences in the assessment tools used, as well as variations in patient characteristics and population background, may account for this discrepancy.

Regarding hormonal findings, the median prolactin level in our study population remained within the normal physiological range. This observation is consistent with the findings of Eisler et al. [24], who reported normal resting prolactin levels in patients with PD. One possible explanation is the inhibitory effect of dopaminergic therapy on prolactin secretion [25].

In contrast, Bellomo et al. [26] reported significantly higher nocturnal prolactin peak levels in untreated PD patients compared with healthy controls. Differences in sampling

conditions, particularly the timing of blood collection, or the influence of antiparkinsonian medications may explain this variation between studies.

Similarly, both free and total testosterone levels in our patients were within normal physiological ranges. This finding contrasts with that reported by Kenangil et al. [27], who found significantly lower free testosterone levels in PD patients compared with controls. Okun et al. [28] suggested that treatment status may partly explain such differences. In their study, testosterone levels increased following treatment with levodopa or pramipexole, whereas untreated patients demonstrated a decline in testosterone levels.

Evaluation of penile duplex parameters showed that the mean values of PSV and EDV were generally within normal limits, whereas RI values were elevated. This pattern may reflect functional vascular changes related to autonomic dysfunction in PD rather than structural vascular disease. To our knowledge, studies specifically examining penile duplex parameters in PD patients remain scarce.

Although most hormonal and duplex parameters were within normal ranges, our results demonstrated significant correlations between several of these variables and erectile function. Prolactin levels showed a negative correlation with erectile function, whereas both total and free testosterone demonstrated positive correlations. Among the duplex parameters, PSV and RI were positively associated with erectile function, while EDV showed a negative correlation.

The inverse relationship between prolactin levels and IIEF-5 scores supports previous findings suggesting that elevated prolactin may adversely affect erectile function, as reported by Cheng et al. [29]. In contrast, the positive correlation between testosterone levels and IIEF-5 scores highlights the well-recognized role of androgens in maintaining male sexual function through both central and peripheral mechanisms [30].

Our analysis also demonstrated that both age and age at onset of PD were significantly higher among patients with more severe ED. This observation suggests that older age and later disease onset may predispose patients to more pronounced sexual dysfunction. Age-related neurobiological changes, together with vascular comorbidities and progressive dopaminergic degeneration, may collectively contribute to this association. Patients with earlier-onset PD may retain relatively preserved sexual function due to fewer age-related risk factors, whereas those with later onset may experience the combined effects of neurodegeneration and physiological aging.

These findings are consistent with those reported by Özcan et al. [31], who found correlations between ASEX scores and both age and age at disease onset. In contrast, Guo et al. [32], in a large cohort of 522 PD patients evaluated using the Non-Motor Symptoms Scale, reported that sexual dysfunction was more frequent among patients with early-

onset PD. One possible explanation is that patients with early-onset disease may experience greater psychosocial stressors, which may influence sexual health [33].

Nevertheless, Špica et al. [34], using a similar assessment scale in a different sample, reported findings more consistent with ours, indicating that later age at onset was associated with more severe sexual dysfunction. Variations in sample size, population characteristics, and assessment tools may explain the inconsistencies across studies.

Regarding medications, our results did not demonstrate significant associations between dopamine agonists, anticholinergics, amantadine, or beta-blockers and IIEF-5 scores. Nevertheless, half of the patients receiving beta-blockers reported mild to moderate ED. Previous studies by Corradetti et al. [35] and Fusco et al. [36] suggested that beta-blockers may negatively affect sexual function through impaired cavernosal vasodilation and reduced sympathetic outflow.

The difference between our findings and previous studies may be related to the relatively small number of patients receiving beta-blockers in our cohort, as well as potential differences in dosage.

Interestingly, patients treated with levodopa in our study showed significantly lower IIEF-5 scores and lower free testosterone levels, indicating poorer erectile function. Nearly half of the patients receiving levodopa reported moderate ED.

Bronner and Vodušek [37] described the effects of dopaminergic therapy on sexual function as somewhat paradoxical. On one hand, restoration of dopaminergic pathways may enhance libido; on the other hand, hormonal and vascular alterations may contribute to erectile dysfunction.

Some earlier studies have even suggested that levodopa may increase sexual activity. Quinn et al. [38] and Brown et al. [39] reported increased libido and sexual activity following levodopa therapy, possibly due to stimulation of the brain’s reward system, which is largely dopamine dependent.

This apparent contradiction may reflect the dual central and peripheral actions of dopaminergic therapy. While dopamine may enhance sexual desire centrally, levodopa could simultaneously influence hormonal balance and autonomic regulation.

Our findings also demonstrated significant associations between ED severity and several domains of the PDQ-39 quality-of-life scale. Patients with more severe ED tended to have higher PDQ-39 scores, indicating a greater disease burden.

The negative correlations observed between IIEF-5 scores and several PDQ-39 domains—including mobility, activities of daily living, cognition, communication, bodily discomfort,

and the overall score—suggest that ED in PD is not simply an isolated symptom. Rather, it appears to be closely linked to the broader impact of the disease on physical functioning and independence.

Impairment in mobility, communication, daily functioning, and cognition may directly or indirectly influence sexual function, ultimately affecting overall quality of life. Conversely, the lack of significant associations between IIEF-5 scores and the emotional wellbeing, stigma, and social support domains suggests that sexual dysfunction in PD may be more strongly related to physical and cognitive factors than to psychosocial ones alone. Cultural context, partner support, and coping mechanisms may also play a role.

Similar observations were reported by Kinatedar et al. [7], who analyzed data from the PRISM study and highlighted the negative impact of ED on both quality of life and interpersonal relationships in PD patients. Other studies, including those by Deraz et al. [11], Metta et al. [33], and Santa Rosa Malcher et al. [40], have also emphasized the detrimental effects of ED on quality of life and partnerships among individuals with PD.

Another notable finding of this study was the relationship between cognitive performance and ED severity. Patients with moderate cognitive impairment tended to experience more severe ED, whereas those with normal cognition had the least impairment. MoCA scores appeared to reflect erectile function capacity to some extent.

This observation aligns with the findings of Shalash et al. [13], who reported a negative correlation between sexual function and the cognitive domain of the PDQ-39 scale.

The relationship between cognitive impairment and ED may be explained by overlapping neurobiological mechanisms affecting both cognition and sexual function, particularly involving frontostriatal and limbic circuits, dopaminergic depletion, and cholinergic dysfunction. In addition, cognitive decline may reduce motivation, impair executive functioning, and limit social interaction, all of which may contribute to reduced sexual activity.

Our results also demonstrated strong associations between ED severity and motor impairment, including the total UPDRS score, rigidity, bradykinesia, postural instability, and Hoehn and Yahr stage. These findings highlight the potential role of motor rehabilitation in improving sexual health in PD patients.

Motor symptoms may limit physical capability and coordination required for sexual activity. Moreover, as dopaminergic neurodegeneration progresses, both autonomic and motor pathways involved in sexual function may become increasingly impaired [37].

These results are consistent with findings reported by Raciti et al. [41], Shalash et al. [13], and Deraz et al. [11], all of whom observed significant correlations between UPDRS scores

and sexual dysfunction.

Our study also revealed significant correlations between most hormonal and penile duplex parameters and Hoehn and Yahr stage, with the exception of prolactin and total testosterone. Most of these correlations were negative, suggesting that more advanced motor impairment is associated with poorer erectile diagnostic parameters. EDV represented an exception, as it showed a positive correlation with disease stage, possibly reflecting progressive veno-occlusive dysfunction.

Similarly, the IIEF-5 score demonstrated a moderate negative correlation with Hoehn and Yahr stage, reinforcing the role of disease severity in the development of ED.

Comparable findings were reported by Paneyala et al. [42], who demonstrated that more advanced PD stages were associated with more pronounced sexual dysfunction.

These results are also consistent with the findings of Deraz et al. [11], who reported that sexual dysfunction among Egyptian PD patients was strongly related to disease severity.

The observed association with free testosterone may reflect the hormonal disturbances previously described in neurodegenerative disorders. Okun et al. [43] reported reduced testosterone levels in patients with Parkinson’s and Alzheimer’s diseases compared with controls, suggesting a potential role of androgen deficiency in sexual dysfunction among these patients.

The present study has several strengths. It represents one of the first attempts in Egypt to examine sexual dysfunction in male PD patients using a comprehensive, multimodal approach that integrates clinical scales, hormonal evaluation, penile duplex ultrasonography, and quality-of-life assessment. The use of validated instruments such as MDS-UPDRS, PDQ-39, MoCA, and IIEF-5 adds further reliability to the findings. Combining clinical evaluation with objective vascular and hormonal measurements allowed for a more comprehensive understanding of erectile dysfunction in PD.

Nevertheless, several limitations should be acknowledged. The cross-sectional design limits the ability to establish causal relationships between PD progression, treatment, and sexual dysfunction. Additionally, the study was conducted at a single tertiary center, which may limit the generalizability of the findings. Only male patients were included; therefore, the results cannot be extended to female PD patients. Future studies with larger, multicenter, and longitudinal designs are needed to further clarify the relationship between Parkinson’s disease and sexual dysfunction.

Conclusion

Men with PD report high rates of ED, which is attributable to the severity of motor symptoms, non-motor symptoms, cognition, hormonal changes, vascular deficiency, and quality of life.

The findings support how multifactorial the problem of SD in PD is and how it arises from the interaction of the neurodegenerative process, the endocrine and the vascular systems, and the effects of neuropharmacological agents such as the levodopa treatment. This supports the rational of periodically screening for SH in PD patients. This also presents the ongoing need for a comprehensive, holistic view of potentially all neurologic, endocrine, vascular, and psychosocial interactions.

Declarations

Author Contributions:

1. Omnya Eliraqy: study design, data collection, statistical analysis, writing.

2. Eslam Samra: investigations, data collection, resources, writing.

3. Ehab S Ramadan: conceptualization, methodology, resources, writing & editing.

4. Tarek Abdelbaky: data collection, visualization, writing, review & editing.

5. Shimaa Elgamal: conceptualization, methodology, resources, writing & editing.

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None to declare.

Conflict of interest:

No conflict of interest.

Ethics and consent statement:

The study protocol was revised and approved by the local institutional review board **(KFSIRB200-781).** A written informed consent was obtained from each patient before participating in the study.

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Tables

Table 1: Distribution of the IIEF-5 scale items among the participating Parkinson's patients (n=74)

		N	%
How do you rate your confidence that you could get and keep an erection?	Very low	12	16.2%
	Low	20	27.0%
	Moderate	32	43.2%
	High	4	5.4%
	Very high	6	8.1%
When you had erections with sexual stimulation, how often were your erections hard enough for penetration?	Very low	7	9.5%
	Low	21	28.4%
	Moderate	33	44.6%
	High	10	13.5%
	Very high	3	4.1%
During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?	Very low	10	13.5%
	Low	21	28.4%
	Moderate	32	43.2%
	High	10	13.5%
	Very high	1	1.4%
During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?	Very low	9	12.2%
	Low	22	29.7%
	Moderate	31	41.9%
	High	8	10.8%
	Very high	4	5.4%
When you attempted sexual intercourse, how often was it satisfactory for you?	Very low	12	16.2%
	Low	20	27.0%
	Moderate	31	41.9%
	High	8	10.8%
	Very high	3	4.1%
IIEF-5 categories	No ED	7	9.5%
	Mild ED	7	9.5%

	Mild to moderate ED	37	50.0%
	Moderate ED	14	18.9%
	Severe ED	9	12.2%
IIEF-5 score (mean±SD)		13±5	

Variables are presented as numbers and percentages or means and standard deviation (SD)

IIEF-5: The international index of erectile function- 5items, ED: Erectile dysfunction

Table 2: Correlation between IIEF-5 score and other hormonal and penile duplex diagnostics

		IIEF-5 score
Prolactin ng/mL	r	-0.325#
	P-value	**0.005**
Total testosterone ng/mL	r	0.334
	P-value	**0.004**
Free testosterone pg/mL	r	0.679
	P-value	**<0.001**
PSVcm/s 30 min	r	0.695
	P-value	**<0.001**
EDVcm/s 30 min	r	-0.572
	P-value	**<0.001**
RI	r	0.508
	P-value	**<0.001**

Pearson's correlation was used

#Spearman's correlation was used

Bold p-values are significant at level≤0.05

IIEF-5: The international index of erectile function- 5items, PSV: Peak systolic velocity. EDV: End diastolic volume, RI: Resistive index

Table 3: Correlation between IIEF-5 score and UPDRS score

		IIEF-5 score
UPDRS total score OFF	R	-0.589
	P-value	**<0.001**
UPDRS total score ON	R	-0.553
	P-value	**<0.001**
Nm_EDL total score	R	-0.356
	P-value	**0.002**
Cognitive behavior total score 1A	R	-0.226
	P-value	0.053
Cognitive behavior total score 1B	R	-0.349
	P-value	**0.002**
M_EDL total score	R	-0.441
	P-value	**<0.001**
Motor_OFF	R	-0.542
	P-value	**<0.001**
Motor_ON	R	-0.445
	P-value	**<0.001**
Bradykinesia total score OFF	R	-0.413
	P-value	**<0.001**
Bradykinesia total score ON	R	-0.370
	P-value	**<0.001**
PIGD_OFF	R	-0.514
	P-value	**<0.001**
PIGD_ON	R	-0.498
	P-value	**<0.001**

Pearson’s correlation was used

Bold p-values are significant at level≤0.05

IIEF-5: The international index of erectile function- 5items, Nm_EDL: Non-Motor Aspects of Experiences of Daily Living, M_EDL: Motor Aspects of Experiences of Daily Living, PIGD: Postural instability and gait disorders

Table 4 :Correlation between Hoehn and Yahr_OFF and IIEF-5 score, hormonal and penile duplex diagnostics

		Hoehn and Yahr_OFF
Prolactin ng/mL	r	0.110[#]
	P-value	0.349
Total testosterone ng/mL	r	-0.102
	P-value	0.386
Free testosterone pg/mL	r	-0.391
	P-value	**0.001**
PSVcm/s 30 min	r	-0.386
	P-value	**0.001**
EDVcm/s 30 min	r	0.311
	P-value	**0.007**
RI	r	-0.243
	P-value	**0.037**
IIEF-5 score	r	-0.529
	P-value	**<0.001**

Pearson's correlation was used

[#]Spearman's correlation was used

Bold p-values are significant at level≤0.05

IIEF-5: The international index of erectile function- 5items, PSV: Peak systolic velocity. EDV: End diastolic volume, RI: Resistive index

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